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PREFACE

At the present time technologies in the fields of education, science and technology play a significant role in our daily life. Appreciation to all the dedicated researchers, now we can live in suitable surroundings by using M-learning, cloud databases or even robots. Researchers from all over the world devoted to IT, consumer and control fields and these research results have immense hard work in many different fields. IT, engineering and control researches engage the use of electronic devices to control applications or tools in different fields such as industrialized, biomedical and supremacy applications. The information technology, consumer and control are like a human brain in the machine, it will give the correct direction for computer or biomedical applications or other devices. Many people are benefit from the development of technology, for example, doctors can use CT, MRI and 3D print to look at their patients; entrepreneurs can grasp video conferences with their workers. We consider that all the papers available in this unique issue will have immense persuade on the engineering, communication and technology fields in the education. Approximately 200 papers from all over the South India have been rigorously reviewed before being accepted for this special issue. According to their topic and their worth by professionals, twenty four of the best papers are incorporated in the issue.

We thank all of the authors who contribute to this special concern.

Dr. Shahana A M, Editor-in-Chief
Dr. A. Sivakumar and Mr. V. Parthiban, Editors

CONTENTS

IOTA CRYPTOCURRENCY
AN EXPLORATORY ANALYSIS

Deepthi Rani S S
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ABSTRACT

IOTA is a novel cryptocurrency that uses distributed ledger technology based on directed acyclic graph data structure. Security of cryptocurrencies ought to be scrutinized in orderto acquire esteemed security, attain trust, and accomplish indelible adoption. Although IOTA prefers resilient security controls, IOTA security is not yet well explored. Among all the propounded IOTA vulnerabilities that have been identified, we pragmatically exploit replay attack against IOTA. It further analyze the attack to perceive its impact. Attack methodology and proof of concept for the replay attack is presented. Our proposed exploitation methodology is based upon address reuse, while IOTA in default mode does not reuse addresses. Distrust and privation of balance can be some of the severe impacts ofthis vulnerability. This system introduces the Crypto Terminal, a new open device for securing blockchain wallets.

Index Terms: IOTA, Blockchain, cryptocurrency, security exploitation, and replay attack,Cryptoterminal.

INTRODUCTION

Blockchains, such as Bitcoin [3] or Ethereum [8], relies on distributed ledgers, storing transactions signed by users' private keys. Transactions, hosted in P2P networks, are bounded to addresses computed from public keys, whose owners are authenticated by their private keys.IOTA is a new generation cryptographic token, designed to be light and proposed in the Internet of Things, unlike other cryptocurrencies that are different by type and are on complex and burdensome blockchains[1]. In the next decade services of unimaginable

utility can be made available, but at the same time having to deal with very complicated problems, including that of micro transactions. These devices are in fact able to exchange small amounts of money with each other, in an immediate and possible way without forcing the manufacturers to compromise in design and hardware equipment. Precisely for this purpose IOTA was conceived, which however is also considered nec- essary for any other scenario in which there is need to manage micro transactions in addition to the IoT. IOTA is not based on block chain technology, but on the Tangle. IOTA's distributed ledger does not consist of transactions grouped into blocks and stored in sequential chains (Blockchain), but as a stream of individual transactions entangled together

Iota is a cryptocurrency that promises high scalability, near instant transfers at zero cost, focused on Internet of things solutions. The Internet of Things (IoT) is a large global information system composed of massive heterogeneous and decentralized devices that can be identified, sensed, and processed based on standardized and interoperable communication protocols[12]. The currents centralized systems are unlikely to scale enough to support millions of micro transactions per second efficiently and enable greater automation in dynamic factory processes, automated decision making, and successful negotiation and are vulnerable to many issues of security and privacy; these issues have been limiting the adoption of IoT . In many cases, IoT data are stored on different cloud servers and processed and accessed in a distributed manner. However, cloud services can expose security breaches to the Internet and are susceptible to cyber-attack . With so many objects connected, the obstacles appear, it is not easy to monitor with security and enable billions of low-power connected devices to share collected data.

The development of the Iota technology is basically related to two factors, namely, the growth of connected devices and the Blockchain. Blockchains were first proposed in 2008 isthe technology behind the Bitcoin, can say that Blockchainas a type of Distributed Ledger Technology (DLT)[11], where

changes in the ledger are reflected in all computers in the network. More precisely, through a consensus mechanism the information is replicated and cannot be changed by a user or a group of users . Currently Blockchains have face the challenges of being “decentralized”, “secure” and “scalable” at the same time. Blockchain systems can only have, two of the three properties problem is known as the “Scalability Trilemma” . Important design issues in today’s Blockchain systems, such as the presence of fees, high processing time, and lack of scalability, do not fit well into a heterogeneous device scenario such as those arising from the new economy that emerged with IoT [6] .

IOTA Tangle

In 2015, Popov presented the document that characterizes the technology behind Iota and expose its goals. The article named “Tangle” was changed to “The Tangle”. It has been revised several times and will be the basis of the concepts presented in this section that underlies the technology. This paper indicates that the Iota project focuses on providing a micro transaction infrastructure for the IoT universe . It is a more energy-efficient technology compared to Blockchain, that increases transactions speed and makes possible transac- tions at no cost. While systems like Bitcoin and Ethereum use the Blockchain that has sequential blocks, with multiple transactions within a block, a type of directed acyclic graph (DAG) restricted a connection only a single path (the next Block) , the Iota use one other type of DAG less restricted named the Tangle . In the Iota Tangle network there are no blocks, each new transaction references the previous two transactions and is not necessary to obtain immediate consen- sus. Whenever a participant wants to add a new transaction to Tangle he must approve any two transactions previously attached. When a new transaction references two previous transactions, it works as a statement of “I certify that these transactions, which have not been proven before, as well as all their predecessors, and their success is tied to my success”. The consensus is related to the number of transactions that approved a certain transaction. The transaction that receives additional approvals has a higher level

of confidence . Since network users themselves who validate the transactions, no miners necessary (computers responsible for validating the transactions and obtain consensus, in case the Blockchain), allparticipants in the network play the same role, all participants issue and validate transactions and are equally responsible for the consensus. Therefore the cost of a transaction involves only the computational cost of validating two other transactions[1].

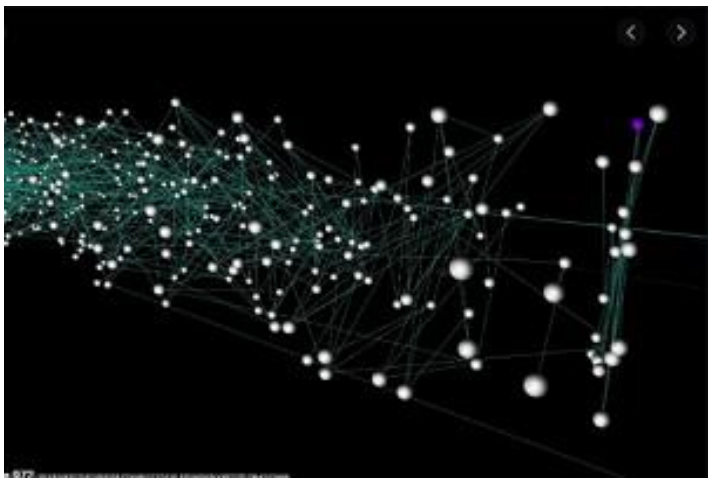

Fig 1.Structure of a Tangle[6]

TRUST ISSUES FOR BLOCKCHAIN TECHNOLOGIES

Malware Injection

Illustration of a malware injection[1] using duplicated code shards. In 2018 a supply chain attack was performed againsta Ledger Nano S device, in order to extract the seed used to compute private keys. A malware is injected in a duplicated piece of code between bootloader and firmware (see figure2), which defeats the onboard integrity test. Another malware injection was performed in , based on code compression and storage in SRAM.

According to the ”double and add” algorithm, a public key (zG, G being a generator) is computing by parsing bit per bit, the private key z. An elliptic curve (EC) addition is computed for every non null bit, what enables the bit recovery, forexample by monitoring the power consumption. 2.2 Trusted Computing

In 2010, EC private keys were extracted from PS3 consoles by exploiting the lack of random generator .Given a message signature made of two integers (r,s), with s = k-1 (e + x r) mod n (n being the EC group order); given two signatures of two different messages, M1 and M2, with the same r (r,s1) and (r,s2), e1=h(M1), e2=h(M2); the private key is computed as z = (e1 s2 - e2 s1) r-1 (s1-s2)-1 mod n.

RELATED WORK

Coordinator and Coordicide

To allow the network to grow to a more mature state, Iota relies on a Coordinator to provide safety against the risk of dishonest actors that may attack the network. The current consensus definition of Iota demands that a confirmed transaction should be referenced (directly or indirectly) by a transaction signed by the Coordinator known as Milestone [1], which is emitted every two minutes; all transactions approved by it are considered as 100confidence, immediately [1]. The Coordinator also ends up facilitating the checks for double-spending. As with Blockchain, the scalability trilemma stands here, and Iota increased centralization in favor of scalability and safety with the use of the Coordinator. This is not well regarded for a cryptocurrency because, it allows IotaFoundation to choose which transactions get priority, to freezefunds, ignore transactions, and is a central point of attack.If the Coordinator stops working, network confirmations will stop. Recently a paper entitled “The coordinate”, published in May 2019, detailed how the Coordinator in the Tangle network may be detached. The authors detail new safety schemes for the network in the absence of the Coordinator and promise faster transactions, ordered and reliable timestamps, a new rate control algorithm, which, in theory, prevents invadersfrom overloading the network, among other things. In case of success, it is essential to point out that the information in this paper still holds true. New components have been predicted, but the fundamental design characteristics from Tangle remain[10].

Since a large amount of data is being exchanged, the

network can grow too big, especially for allowing zero value or data-only transactions. When snapshotting, only the balances remain (addresses with an account balance¿0), everything elseis deleted. The instant capture is like Blockchain removal, except snapshotting has the significant advantage of grouping various transactions the same address in a register, whichrequires fewer storage [6]. In the past, the Iota Foundation made "Global Snapshots" on irregular intervals. Today there are local snapshots which replace the global snapshots. Local snapshots of the Tangle are taken independently by Full nodes, manually or fully automatically. One frequent IoT application is the transmission of sensor data. Iota allows transactions without the exchange of tokens; therefore, an address can be used to store measured data. However, since transactions are public, how to stop an invader from falsifying measuring data or interfering with spams? Would it be possible to control the data access from other users? Masked Authenticated Messaging (MAM) was developed to solve this type of issue. MAM acts as a data communication protocol, cryptographing,and authenticating data flows; it is a module base on the Iota protocol that provides functions to send and read message flows using Tangle. Cryptography and system authentication aims to ensure that messages will not be altered and come from a specific sender. With MAM, linked message flow is created from messages, sending each message to a new address inthe form of Tangle transactions. Each message is linked tothe subsequent message [23], and each transaction n has a pointer to the transaction n + 1. However, they do not know the location of the transaction n1.

Seeds, public key and private key

In the Iota Tangle network, a "seed" acts as a password that grants access to the user account. The seed must be randomly generated and consists of 81 trytes. Moreover, in Iota, thereare the concepts of private and public key. Private keys are calculated by hashing the seed concatenated with the address index, where the index can be any positive integer [3]. Public keys are addresses, and they are calculated by hashing their associated private keys. An address contains tokens and canbe

used as input to a transaction (the token is spent) or output to a transaction (the address is given a token). Funds from all addresses (public keys) are summed to calculate a user's account balance.

PROPOSED METHOD

Crypto Terminal

Justifying This system uses a cryptoterminal,this device includes a processor, a touch screen, a removable smartcard, and a Bluetooth Low Energy (BLE) module. Smartcard is the core security, it manages cryptographic procedures and keys. The terminal is bare metal, i.e. its firmware and the BLEfirmware can be erased and uploaded at anytime. The softwareintegrity of the programmer that performs these operationsis checked by an innovative integrity probe. A use case is illustrated with a smartphone.The Crypto Terminalis built over hardware and software open technologies. It is engine by an AVRATMEGA2560 (Arduino) processor, it includes a smart card socket, an ILI9486 touch screen, a removable javacard (JC 3.04), a CC2541 [4] Bluetooth Low Energy module (BLE), and an external programmer token (USBASP).

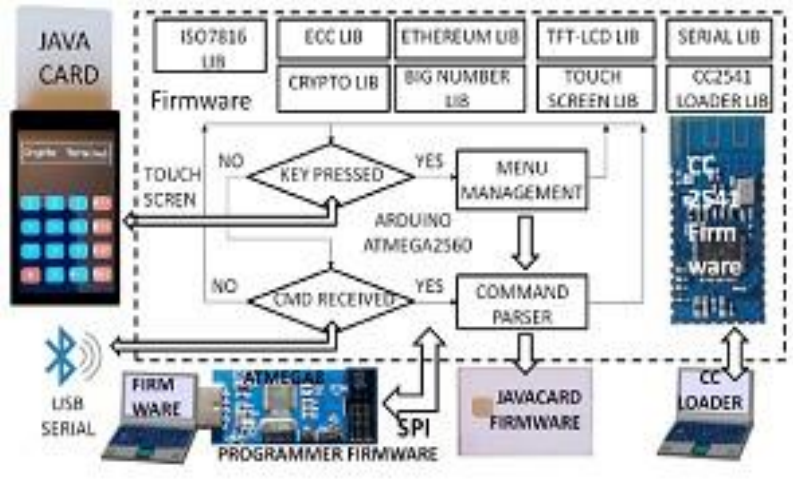

Fig 2. Architecture of Crypto Terminal[5]

Smart card is the core security. Java card is a secure micro- controller, including a Java Virtual Machine (JVM), which is EMVCo certified and claims, according to common criteria (CC) standards, an EAL5+ (Evaluation Assurance Level), given a scale ranging from EAL1 to EAL7. It embeds a crypto processor providing cryptographic operations over the scep256k1 elliptic curve (used by most blockchain platforms), in particular private/public keys generation and ECDSA algo- rithm. It also provides a true random generator (RNG) andthe SHA512 hash procedure needed by the BIP32 recom- mendation for hierarchical deterministic wallets. The javacard firmware enforces private key storage, computes ECDSA signatures and BIP32 key trees.

A crypto terminal is similar to bank card payment terminal. It implements a firewall between blockchain smartcard and connected devices such as PC or smartphone. All critical oper- ations (PIN code, key generation, signature . . .) are controlled by the user, via a touch screen. Bare metal approach prevents supply chain attacks. In order to avoid firmware hijacking all processor memories (ATMEGA2560 and CC2541) can be fully erased and flashed, thanks to Serial Programming Interface (SPI) port and CCLOADER software component [2].The trust of SPI programmer is a critical issue. We use an USBASP (USB programmer for Atmel AVR controllers [9]) token based on the ATMEGA8 processor (with 8KB FLASH, 1KB SRAM and 512B EEPROM) programmer.

Big Bang

The main idea is to check the programmer bootloader integrity, before downloading the USBASP software.In the classical approach the loaded application can't detect corrupted bootloader. According to the BigBang paradigm , dedicated application, named Integrity Probe (IP), checks the bootloader integrity. It should be noticed that USBASP programmers may program each other.

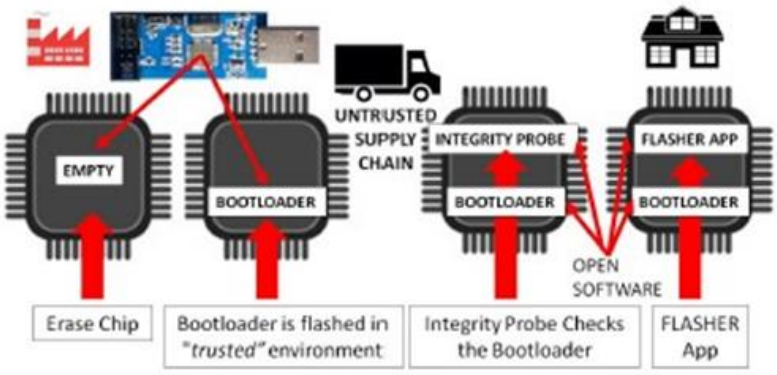

Fig 3.BigBang paradigm according working with Integrity Probe[11]

All memories are hashed in a pseudo random order [7]; this calculation generates an Integrity Code (IC). The IC computing time (ICT) is included in the IC calculation. All unused memories (FLASH, SRAM, EEPROM) are filled up with pseudo random values. All keys are obfuscated in the IP code. The integrity probe works with the Keccak256 hash function. There are about 254 permutation keys. The ICT precision is 64 cycles with 12MHz clock (5,33s). The ICT average time is 18000ms, with maximum/minimum range of 60ms (about 10 bits entropy). The computed IC code is displayed as 16 bits integer, by blinking LEDs.

Cryptoterminal Operations

Serial (RFCOMM) communication is opened between the CT and a mobile phone, running a hot wallet. This wallet sends the ”user” command that trigs PIN entering by the user; this operation unlocks the smartcard. Afterwards it collects Ethereum addresses bound to cryptographic keys, and finally requests (via the ”settrans” command) the generation and signature of a transaction, which must be approved by the user.

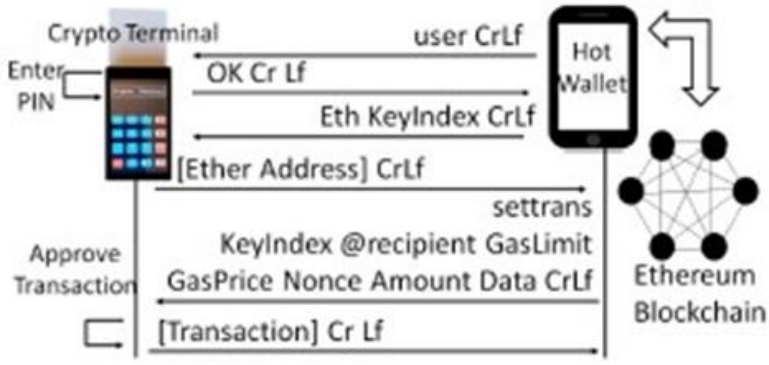

Fig 4.Ethereum transaction generation with a CryptoTerminal

VALIDATION AND RESULT

It implements a firewall between blockchain smartcard and connected devices such as PC or smartphone. All critical oper- ations (PIN code, key generation, signature . . .) are controlled by the user, via a touch screen. Bare metal approach prevents supply chain attacks. In order to avoid firmware hijacking all processor memories (ATMEGA2560 and CC2541) can be fully erased and flashed, thanks to Serial Programming Interface (SPI) port and CCLOADER software component [13]. The trust of SPI programmer is a critical issue. We use anUSBASP (USB programmer for Atmel AVR controllers [8]) token based on the ATMEGA8 processor (with 8KB FLASH, 1KB SRAM and 512B EEPROM) programmer. USBASP is supported by the AVRDUDE (AVR Downloader/UploaDEr) open software. The 2KB bootloader [9] is a tiny USBASP programmer; which can download 6KB embedded application,such as USBASP firmware [8], or integrity probe ([11] see next section).

CONCLUSION

IOTA is an open-source distributed ledger and cryptocur- rency designed for the Internet of Things.IOTA does not use miners to validate transactions, instead, users that issue a new transaction must approve. The attacker compromised over 50 IOTA seeds, resulting in the theft of approximately 2 Million USD worth in IOTA tokens. This poster introduces the Crypto

Terminal, a new open device for securing blockchain wallets. This device includes a processor, a touch screen, a removable smartcard, and a Bluetooth Low Energy (BLE) module. Smart-card is the core security, it manages cryptographic procedures and keys. The terminal is bare metal, i.e. its firmware and the BLE firmware can be erased and uploaded at anytime. The software integrity of the programmer that performs these operations is checked by an innovative integrity probe. A use case is illustrated with a smartphone.Future system can use the design of hardware accelerators for IOTA cryptocurrency. This accelerators speeding up the calculation of Curl hash function and PoW operation,it has a parameterizable structure. It is possible manually set the number of PoW computing units.

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RESEARCH CONTRIBUTION OF IOT IN ENVIRONMENT SCIENCE BASED ON WEB OF SCIENCE DATABASE

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ABSTRACT

In the current scenario, the innovations in the Internet of Things in Environment Science are among the research priorities within the scientific communities because of its applications spreading across various domains in IT and non IT fields. With the exponential growth in the number of users of internet and devices connected to the internet, IoT is the booming technology and will be in the near future. A total of 4469 bibliographic records from the Web of Science (WoS) database were extracted and analyzed to report the analysis of scientific state of the authors, journals, countries, and categories. Histcite and VoS viewer softwares are used for analyzing records. In this study, we have analyzed annual contribution, authorship pattern, type of document, degree of collaboration, time series analysis, relative growth rate and doubling time, exponential growth rate, activity index, and correlation of ranking of countries, co-authorship index, cited authors and cited journals. The results indicate that China and USA are the most contributing countries. This study therefore, provides an extensive understanding about the trends and research patterns of Internet of Things in Environment Science efforts worldwide. Finally, research gaps and Environment issues are highlighted and the scope for future is

discussed.

Key words: Environment Science, Internet of Things, Scientometric, Histcite, VoS viewer.

INTRODUCTION

Sustainable growth of the whole world depends on several factors such as agriculture quality education, industries economy, and many others, but environment is one of the factors that play the most vital role. Health and hygiene are key components of the sustainability of mankind and progress of any country, which comes from a clean, pollution free and hazardous free environment. Air quality, water pollution, and radiation pollution are major factors that pose genuine challenges in the environment. The environment monitoring has turned into a smart environment monitoring (SEM) system, with the advances in the internet of things (IoT) and the development of modern sensors. IoT based framework that effectively monitors the change in an environment using sensors, microcontroller, and IoT based technology. By using this Modern technology user can monitor temperature, detect the presence of harmful gases in the environment. So the present investigation is focused on the growth of research during the period from 1998-2020 using scientometrics analysis.

Scientometrics is a quantitative method of knowledge to find temporal and structural changes in a given subject area [1-2].This method uses mathematical and statistical techniques to describe the developmental trends of the desired subject [3-4] is plenty of software for visualizing information like BibExcel, CiteSpace, and HistCite [5]. In this study, the Hitecite and Bibexcel software was applied for analyzing the data. By using VoSViewer, drawing the co-citation country, and bibliographic coupling networks are being possible. Hitecite and Bibexcel software was analyzing authorship pattern, Document type, Degree of Collaboration, Relative growth rate and Doubling time, Exponential growth rate, Activity index, spearman's rank correlation coefficient and Co-authorship Index.

DATA GATHERING

In this study, all documents retrieved from the Web of Science, which contains citation information of the world's core journal in scientific disciplines were analysed and had been conducted through the Web of Science databases using the following search string. ALL = IoT in Environment Science during the period of the study 1998-2020. To include all possible data, no limitations for language were considered. According to the search, 4469 documents were retrieved. Regarding the above database mechanisms, the retrieved data were stored as text files in plain text format with all cited references.

RESULTS AND DISCUSSION

Table 1 Main Information about the Sample Data

S.No.	Details about Sample	Observed Values
1	Duration	1998-2020
2	Time Span	23
3	Total No. of Records	4469
4	Total No. of Authors	12018
5	Contributed Journals	701
6	Document Types	11
7	Languages	1
8	Frequently Used Words	5624
9	Contributing Countries	105
10	Contributing Institutions	3643
11	Local Citation Score	3769
12	Global Citation Score	57354

DATA COLLECTED FROM WEB OF SCIENCE

The data collection of duration from 1998 to 2020 has been analysed. The outputs from this analysed shown in Table 1 indicate that Time span is 23 years. 4469 documents are collected from Web of Science, 12018 authors are contributing the documents following contributions by 701 Journal, 5624 Keywords, 1 Languages, 105 countries and 3643 Institutions. Citation Score of the documents are 3769 Local citations and 57354 Global citations.

Table 2 Annual Contribution of IoT in Environment Science

S.No	Years	Global Publication	Percentage	TLCS	TGCS	India Publication
1	1998	1	0.02	0	162	-
2	1999	1	0.02	0	0	-
3	2000	2	0.04	0	71	-
4	2001	3	0.07	0	77	1
5	2002	3	0.07	0	94	1
6	2003	2	0.04	0	18	1
7	2004	3	0.07	1	35	2
8	2005	2	0.04	0	28	1
9	2006	1	0.02	0	0	1
10	2007	1	0.02	0	47	1
11	2008	2	0.04	0	54	1
12	2009	1	0.02	0	0	1
13	2010	1	0.02	41	263	1
14	2011	7	0.16	25	214	3
15	2012	26	0.58	36	819	6
16	2013	69	1.54	119	1750	2
17	2014	80	1.79	381	4021	2
18	2015	136	3.04	244	4119	6
19	2016	276	6.18	402	6444	5
20	2017	435	9.76	642	10024	26
21	2018	745	16.67	1001	13798	78
22	2019	1098	24.57	649	9872	85
23	2020	1574	35.22	228	5444	188
	Total	4469	100	3769	57354	412

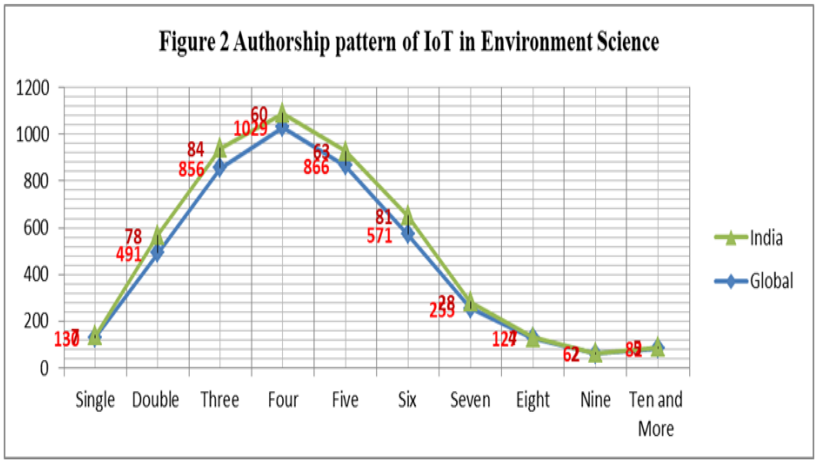
TLCS-Total Local Citation Score, TGCS-Total Global Citation Score

PATTERN OF OUTPUT DURING 1998-2020

Table 2 reveals that in the initial years the research output is low, but it started increasing after 2012 to reach a peak in 2020. The growth pattern of literature represents slow development from 1998 to 2011. The maximum contribution is 1574 publications in the year of 2020. The publications are gradually increasing trend in the study period. One possible reason for low output in the initial years may be that Scopus database started publishing only in 2004 and before that period it might be having a lower coverage of journals published from India, which might have increased in later years [5].

Table 3 Authorship pattern of IoT in Environment Science

Authors	Global Publication	Percentage	India Publication	Percentage
Single	130	2.91	7	1.70
Double	491	10.99	78	18.93
Three	856	19.15	84	20.39
Four	1029	23.03	60	14.56
Five	866	19.38	63	15.29
Six	571	12.78	81	19.66
Seven	255	5.71	28	6.80
Eight	127	2.84	4	0.97
Nine	62	1.38	2	0.48
Ten and More than Ten	82	1.83	5	1.22
	4469	100	412	100`



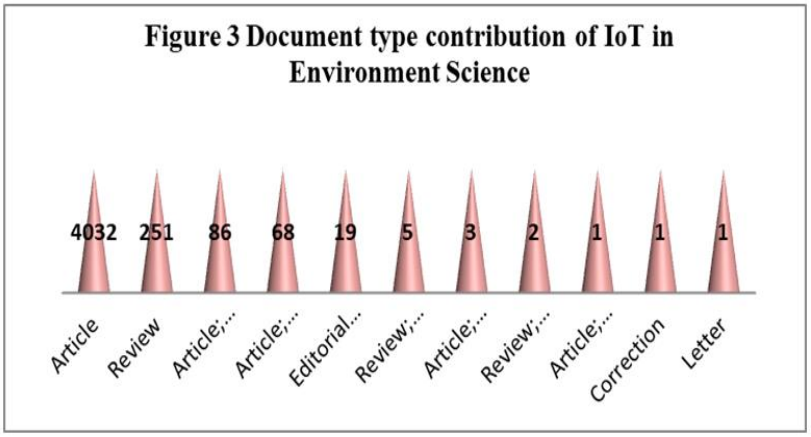
AUTHORSHIP PATTERN

Table 3 and Figure 2 illustrate the authorship pattern of IoT in Environment Science Literature. Out of 4469 papers, the authorship pattern up to nine authors results a total of 4387 research output remaining 82 papers have been published by more than ten authors. Single author contributions were accounted to 2.91% during the study period. The highest percentage of 23.03% was recorded by four authors.

Table 4 Document type contribution of IoT in Environment

Science

S.No	Document wise	Records	%	TLCS	TGCS
1	Article	4032	90.2	3474	49656
2	Review	251	5.6	269	6768
3	Article; Early Access	86	1.9	0	173
4	Article; Proceedings Paper	68	1.6	21	635
5	Editorial Material	19	0.5	5	51
6	Review; Early Access	5	0.1	0	6
7	Article; Book Chapter	3	0.1	0	10
8	Review; Retracted Publication	2	0.0	0	19
9	Article; Data Paper	1	0.0	0	15
10	Correction	1	0.0	0	0
11	Letter	1	0.0	0	21
	Total	4469	100	3769	57354

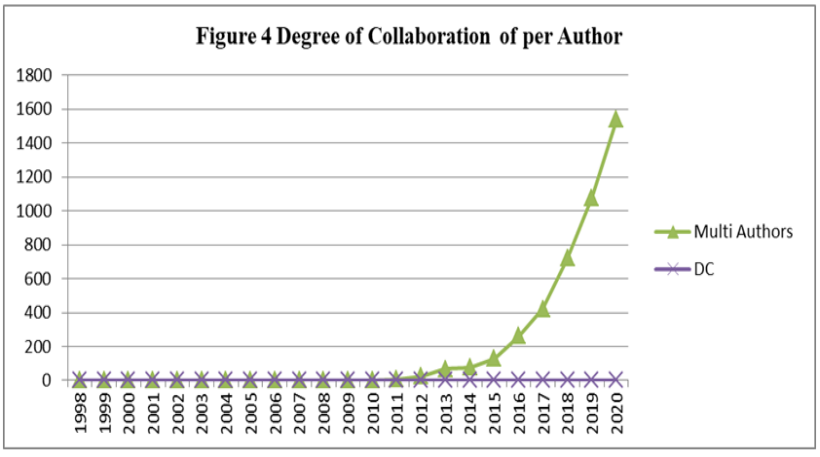


CATEGORY OF DOCUMENT

Table 4 and Figure 3 shows that total 4469 papers have been published on IoT in environment science research by researchers of during the last 23 years from 1998 to 2020.The total publications of about 90.2% (4032) published as articles, 251as Review, 86 as early access and followed by as Proceeding paper, Editorial Material, Early Access, Book Chapter, Retracted publication, Data paper and Letter.

Table 5 Degree of Collaboration of per Author

S.No	Years	Single Author (Ns)	Multi Author (Nm)	Total No. of Articles (Ns+Nm)	DC
1	1998	-	1	1	1
2	1999	1	0	1	0
3	2000	-	2	2	1
4	2001	2	1	3	0.33
5	2002	1	2	3	0.67
6	2003	-	2	2	1
7	2004	2	1	3	0.33
8	2005	-	2	2	1
9	2006	1	0	1	0
10	2007	1	0	1	0
11	2008	2	0	2	0
12	2009	-	1	1	1
13	2010	-	1	1	1
14	2011	1	6	7	0.86
15	2012	1	25	26	0.96
16	2013	1	68	69	0.99
17	2014	3	77	80	0.96
18	2015	8	128	136	0.94
19	2016	13	263	276	0.95
20	2017	13	422	435	0.97
21	2018	25	720	745	0.97
22	2019	20	1078	1098	0.98
23	2020	35	1539	1574	0.98
	Total	130	4339	4469	0.97



COLLABORATIVE MEASURES

Degree of Collaboration:

The degree of collaboration can be calculated using K.Subramanyam's formula.

The formula is C = $\frac{N_m}{N_m + N_s}$

Where,

C = Degree of collaboration in a discipline

Nm = Number of multiple authored papers

Ns = Number of single authored papers

Table 5 and Figure 4 represents the Degree of Collaboration was 1.00. In the year 1998, 2000, 2003, 2005, 2009, 2010 the degree of collaboration is much similar. The average Degree of Collaboration was 0.97.

Table 6 Relative Growth Rate and Doubling Time

Years	Records	W1	W2	RGR	Dt
1998	1	-	0	-	-
1999	1	0	0	0	-
2000	2	0	0.69	0.69	1.00
2001	3	0.69	1.10	0.41	1.69
2002	3	1.10	1.10	0	0
2003	2	1.10	0.69	0.41	1.69
2004	3	0.69	1.10	0.41	1.69
2005	2	1.10	0.69	0.41	1.69
2006	1	0.69	0	0.69	1.00
2007	1	0	0	0	0
2008	2	0	0.69	0.69	1.00
2009	1	0.69	0	0.69	1.00
2010	1	0	0	0	0
2011	7	0	1.95	1.95	0.36
2012	26	1.95	3.26	1.31	0.53
2013	69	3.26	4.23	0.97	0.71
2014	80	4.23	4.38	0.15	4.62
2015	136	4.38	4.91	0.53	1.31
2016	276	4.91	5.62	0.71	0.98
2017	435	5.62	6.08	0.46	1.51
2018	745	6.08	6.61	0.53	1.31
2019	1098	6.61	7.00	0.39	1.78
2020	1574	7.00	7.36	0.36	1.93

RELATIVE GROWTH RATE AND DOUBLING TIME

The relative growth rate and doubling time model developed by Mahapatra to examine the growth rate.

A specified period of the interval can be calculated from the following equations:

$$R(1-2) = \frac{W_2 - W_1}{T_2 - T_1}$$

Where *R* (1-2) = mean relative growth rate over the specified period of interval.

W1 = log W1 (Natural log of initial number of publications/pages).

W2 = log W2 (Natural log of initial number of publications/pages).

T2-T1 = The unit difference between the initial time and final time.

The relative growth rate for both publications and pages can be calculated separately.

Therefore,

R (a) = Relative growth rate per unit of publications per unit of time (year).

R (p) = Relative growth rate per unit of pages per unit of time (year).

DOUBLING TIME

From the calculation, it is found that there is a direct equivalence exists between the relative growth rates and doubling time. If the number of publications/pages of a subject doubles during a given period, then the difference between the logarithm of the numbers at the beginning and at the end of the period must be the logarithms of the number 2. If one uses a natural logarithm, this difference has a value of 0.693.

The corresponding doubling time for publications and pages can be calculated by using the following formula: Doubling time (Dt) = 0.693 / R

Table 6 shows that The RGR value for the year 2000 is 0.69 and it is observed that the relative growth rates have decreased to 0.36. In contrary, the Doubling Time for publication

of all sources in IoT in Environment Science research output has increased from 1.00 to 1.93 and it gradually increased up to 2020.

Table 7 Exponential Growth Rate of IoT in Environment Science

Years	Records	Exponential Growth Rate
1998	1	-
1999	1	1
2000	2	2
2001	3	1.5
2002	3	1
2003	2	0.67
2004	3	1.5
2005	2	0.67
2006	1	0.50
2007	1	1
2008	2	2
2009	1	0.50
2010	1	1
2011	7	7
2012	26	3.71
2013	69	2.65
2014	80	1.16
2015	136	1.70
2016	276	2.03
2017	435	1.58
2018	745	1.71
2019	1098	1.47
2020	1574	1.43
Total	4469	37.78

EXPONENTIAL GROWTH RATE

Table 7 shows that the exponential growth rate of the publications in IoT in Environment Science during the study period of 23 years (1998-2020). The highest growth rate was found 1.00 during the year 1999 with 1 publications. During the period of study the growth rate was within the range of 1.00 to 1.43, which is on an increasing trend is with a very low significant margin.

Table 8 Activity Index of Indian IoT in Environment Science

research output

Years	Indian Output (Nij)	Nio =A	World Output (Noj)	Noo =B	A/B = AI Value
1998	-	-	1	0.02	0
1999	-	-	1	0.02	0
2000	-	-	2	0.04	0
2001	1	0.24	3	0.07	3.43
2002	1	0.24	3	0.07	3.43
2003	1	0.24	2	0.04	6
2004	2	0.49	3	0.07	7
2005	1	0.24	2	0.04	6
2006	1	0.24	1	0.02	
2007	1	0.24	1	0.02	12
2008	1	0.24	2	0.04	6
2009	1	0.24	1	0.02	12
2010	1	0.24	1	0.02	12
2011	3	0.73	7	0.16	4.56
2012	6	1.46	26	0.58	2.52
2013	2	0.49	69	1.54	0.32
2014	2	0.49	80	1.79	0.27
2015	6	1.46	136	3.04	0.48
2016	5	1.21	276	6.18	0.20
2017	26	6.32	435	9.73	0.65
2018	78	18.93	745	16.68	1.14
2019	85	20.63	1098	24.58	0.84
2020	188	45.63	1574	35.23	1.30
Total	412	100	4469	100	

RELATIVE ACTIVITY INDEX OF INDIAN RESEARCH OUTPUT

A comparison of Indian research contributions with the world contributions was carried out using Relative Activity Index (RAI), first suggested by Frame and subsequently made use of by bibliometricians.

Here RAI is worked out for each year as:

{Indian output in IoT in Environment Science /total Indian output}/ {World output in IoT in Environment Science /total world output} ×100

In Table 8 it is identified that the Activity Index (AI) for India has been calculated to analyse how India's research performance changes over different years. The Data indicates that India's research effort in IoT in Environment Science research an average productivity that of world average for the

years 1998 to 2020. Further, it is observed that the Activity Index (AI) has reflected gradual increasing trend during the study period.

Table 9 Spearman's rank correlation coefficient of Countries distribution of IoT in Environment Science

Years	Indian Output	Rank (R_1)	World Output	Rank (R_2)	D (R_1-R_2)	D^2
1998	-	-	1	20.5	-20.5	420.25
1999	-	-	1	20.5	-20.5	420.25
2000	-	-	2	15.5	-15.5	240.25
2001	1	16	3	12	4	16
2002	1	16	3	12	4	16
2003	1	16	2	15.5	0.5	0.25
2004	2	10	3	12	-2	4
2005	1	16	2	15.5	0.5	0.25
2006	1	16	1	20.5	4.50	20.25
2007	1	16	1	20.5	4.50	20.25
2008	1	16	2	15.5	0.5	0.25
2009	1	16	1	20.5	-4.50	20.25
2010	1	16	1	20.5	-4.50	20.25
2011	3	8	7	10	-2	4
2012	6	5.5	26	9	-3.5	12.25
2013	2	10	69	8	2	4
2014	2	10	80	7	3	9
2015	6	5.5	136	6	-0.5	0.25
2016	5	7	276	5	2	4
2017	26	4	435	4	0	0
2018	78	3	745	3	0	0
2019	85	2	1098	2	0	0
2020	188	1	1574	1	0	0
Total	412		4469			1232

SPEARMAN'S RANK CORRELATION COEFFICIENT OF COUNTRIES

A correlation of Indian output with the world output was carried. (Daniel; 1990)

The formula is:

$$r = 1 - \frac{6 \sum D^2}{N(N^2-1)}$$

Where,

r = spearman's rank correlation coefficient,

D = difference between rank1 and rank2 and;

N = number of pairs of ranks / scores.

Calculation

$$r = 1 - \frac{6 * 1232}{23(23^2-1)}$$

$$r = 1 - \frac{6 * 1232}{23(529-1)}$$

$$r = 1 - \frac{7392}{23(528)}$$

$$r = 1 - \frac{7392}{12144}$$

r = 1- 0.6086

r = 0.39

r > 0 implies positive agreement among ranks

The spearman's rank correlation coefficient indicated that there was a significant agreement among the Indian Research output and World Research output in the IoT in Environment Science scientists was concerned. This indicates a strong positive relationship between the individuals rank obtained in the India and Global Level, i.e., the higher ranked in World research productivity and the higher ranked in Indian research productivity in IoT in Environment Science also vice versa.

Table 10 Co-authorship Index

Year	Single Author	CAI	Two Authors	CAI	More than two authors	CAI	Total
1998	-	0	1	909	-	0	1
1999	1	3448	-	0	-	0	1
2000	-	0	2	909	-	0	2
2001	2	2298	-	0	1	39	3
2002	1	1149	1	303	1	39	3
2003	-	0	2	909	-	0	2
2004	2	2298	1	303	-	0	3
2005	-	0	2	909	-	0	2
2006	1	3448	-	0	-	0	1
2007	1	3448	-	0	-	0	1
2008	2	3448	-	0	-	0	2
2009	-	0	1	909	-	0	1
2010	-	0	-	0	1	116	1
2011	1	492	1	130	5	83	7
2012	1	132	4	140	21	94	26
2013	1	50	6	79	62	104	69
2014	3	129	8	91	69	100	80
2015	8	203	19	127	109	93	136
2016	13	162	38	125	225	95	276
2017	13	103	51	107	340	91	435
2018	25	116	83	101	637	99	745
2019	20	63	113	94	965	102	1098
2020	35	77	158	91	1381	102	1574
	130		491		3848		4469

CO-AUTHORSHIP INDEX (CAI)

For calculating Co-Authorship Index (CAI), Garg and Padhi proposed a formula-

CAI= ((Nij /Noj)/(Noj/ Noo))100

Where Nij = number of papers having *j* authors in block *i*

Nio = total output of block *i*

oj = No. of papers having *j* authors for all blocks.

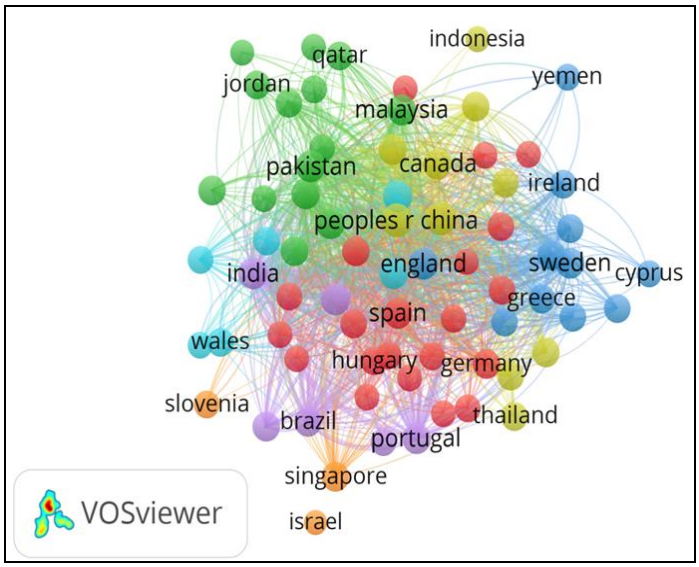
Noo = total number of papers for all authors in all blocks

J = 1, 2, 3…N

The results analysis is shown in Table 10. It indicates that multiple authors papers are higher than that of single authored papers. Hence it can be inferred that collaborative research is prevalent in IoT in Environment Science research. From this domain the CAI is increasing and decreasing trend during the study period.

Table 11: Country-wise co-authorship network

country	documents	citations
peoples r china	1989	24852
USA	815	17335
South Korea	553	5569
India	412	5849
England	364	5780
Australia	237	5678
Saudi Arabia	231	3166
Taiwan	230	2320
Pakistan	197	2510
Spain	181	2569
Canada	149	2778
Italy	143	3004
Japan	123	1534
Portugal	109	1765
Brazil	105	1378
France	100	1433
Malaysia	81	1888
Sweden	81	2107
Germany	77	927
Singapore	73	1234
Egypt	63	694
Iran	62	1242
Finland	58	1185
Greece	54	775
Scotland	50	723



Country-wise co-authorship network:

Table 11 reveals that the software separates these 71 countries into 7 clusters which form 2447 links with total link strength of 1486212. India has the total links strength of 208890 with the other countries, followed by peoples R china (1989), United States (USA) (815), South Korea (553) and India (412) respectively. Therefore this kind of analysis has identified the scenario of global cooperation in scholarly communication.

CONCLUSION

This chapter deals with the growth and development of the IoT in Environment Science by applying a new research approach. Data were collected Web of science literature, reliable paper journals and proceedings from the beginning of 1998 until the end of 2020 without exception, as a dynamic representation of the growth of knowledge in the field is the main component. At most (97.09%) of the papers were published as multi-authored and mega-authored papers. An increasing trend in publications from 1998 to 2020 is observed. Furthermore, this studied documents published only in English language. Peoples R china country is the most prolific researcher. This chapter shares Information about application of IoT in environment science using Scientometric study.

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ROLE OF SELF HELP GROUP IN DEVELOPING INCOME GENERATING ACTIVITIES FOR SUSTAINABLE LIVELIHOOD: A NARRATIVE REVIEW

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ABSTRACT

Self Help Group (SHG) is a group of rural women between 10 to 20 members associated with it, that work together to improve their socio economical conditions or vulnerability which they face daily in their livelihood. The concept of SHG was formally started by NABARD in the late 20th century but the growth has been identified in the recent times due to its financial inclusion and entrepreneurial characteristics. Women belong the group work together for their better development in the case of both socially and financially. Income generating activities include all small and medium activities that help in generating monetary value or economical benefits towards better livelihood for the rural poor women. In the beginning, the paper describes the concept of Self Help Group and in later it showcase the role performed by Self Help Group in generating or earning income for themselves which facilitates sufficient food availability, hygienic health facility, fresh drinking water and other basic amenities that are responsible for sustainable livelihood in the

rural areas and most importantly, they become financially self reliant in the long term as well.

***Keywords**:* Income generating activities, Sustainable livelihood, Self Help Group

1. INTRODUCTION

1.1 Self Help Group: An Introduction

Self Help Group concept was given by Prof. Mohammad Yunus in Bangladesh that works as a facilitator in developing socio-economic conditions, helps in accessing financial linkage at an economical rate (Bori, 2017). Members of Self Help groups containing 10 to 20 members of having same economic background, belonging to the same village, same community who assembled together in order to solve their common problems (Soni, 2015). SHG are voluntary system of group that forms to achieve their main objective to become self reliant. Self Help Promoting Institutions performs welfare development programmes in the context SHG promotion and achieving its objectives. NGOs promotes community enhancement of the group by providing suitable trainings and advisory sessions whereas banks main contribution towards SHG is to provide lending services as SHG-Bank Linkage monetize money saving habits as well as availability of credit facilities to the women SHGs (Jung, 2008). Promoting agencies of SHGs are public departments, commercial banks and voluntary organisations that mostly focus on socio-economic problems related to capacity building and financial services (Sharma, Dua & Hatwal, 2012).

SHGs form with the prime objectives of establishing formal credit systems and building mutual understanding among group members and ultimately establishing small business enterprises such as dairying, goats and poultry farming to support their livelihood (Brook, Hillyer & Bhuvaneshwari, 2008). In order to avail lending facilities from the bank, a SHG would save for about six months and performs internal lending to develop money saving habits and strengthen internal collective strength. Guidelines and procedures are strictly followed by financial institutions to credit the SHGs as NABARD is the

regulator of the SHG-Bank linkage programme (Shylendra, 2013).

SHG Bank linkage programme exposes the rural women to the formal banking system and simultaneously they can mobilize savings, access to credit, develops leadership trait and participate in the development process of the society as well (Singh, 2008). The spread of the SHG Bank linkage programme mainly depends on the factors like proactive efforts of state governments, NGOs, socio-cultural factors, activeness of SHG etc. (Tripathi, 2013). Since the beginning of SHG which is about 25 years, the SHG-Bank linkage programme has reached its high peak among towards success among its stakeholders. According to NABARD annual report 2018, about 87 lakh of SHGs are registered having transactions in deposits crossed to 195,000 million whereas annual lending crossed to 470,000 million (NABARD 2018). Das and Guha (2019) observed majority of the SHG groups promoted under the various promoting agencies was formed to access low cost and affordable landings from the formal banking system. But the sustainability of a group is the main challenging issue as after getting the funding groups become idle and dysfunctional. Thus, success of SHG group is relied on it continuous growth and not on the duration of the group formation.

1.2. Income generation through micro entrepreneurship: An Introduction

Micro level enterprise development turned out to be a solution for unemployment. It creates employment for the women in the long term. Any income generating activities that leads to sustainable livelihood by generating income refereed as micro entrepreneurship for women (Singh, Thakur and Gupta, 2013). Entrepreneurship is an effective tool in generating incomes for the long term that empowers women group members to become self reliant that leads to socio-economically independence (Soni, 2015). Entrepreneurship development represents each and every activity that forces an individual to start an enterprise and to generate a sustainable income sources (Toli, 2018). For various government based entrepreneurial

programs and schemes, the main respondents are woman of which most of the schemes have common feature i.e. facilitating financial credits. Of them small portion of groups opt for business activities even if they have opportunities due to constraints imposed on women entrepreneurs by their immediate environment, such as family responsibilities, the absence of an appropriate psychological disposition etc. (Thomas & Jose, 2018).

2. SHG AND ITS SUPPORTING ROLE TOWARDS SUSTAINABLE INCOME GENERATION

In the following section, various supporting roles played by an SHG towards income generation are displayed in brief towards sustainable livelihood development and how training proved to be an important tool in staring any business entity is also explained and at the end the various barriers faced by SHG group members is also explained in a very brief manner.

2.1. SHG and income based entrepreneurial activities

SHGs members create trust among the group members and with the surroundings which helps in determining trust level that can be used for making social and cooperative relationship with the stakeholders (Sabhlok, 2011). Women entrepreneur creates positive atmosphere in developing a business entity that deals with risk and uncertainty, look for business opportunities, marketing process analysis etc. (Bori, 2017). The rural women are equipped with basic local level skills and knowledge and possess the potential and relevant resources to set up and manage an enterprise. Whereas funding and training related welfares are supported by Government agencies and other external agencies such as NGOs, cooperative societies and community based organisations (Sharma, Dua and Hatwal, 2012). Rajasekaran and Sindhu (2013) have observed SHGs are having sufficient workforce to start an enterprise which can be efficient if it is nourished well by external agencies by providing need based training. The basic objective of micro entrepreneurship is to develop the socio economic condition of women and improve the status of women in households and

communities. Collective actions are best nurtured under the NGO promoted SHG as compared to government based promoting agencies. The best way to develop the collective action of government promoted SHGs it has to follow the NGO based system as the level of collective action impacts the performance of the group (Bharamappanavara, Hanisch, & Rommel, 2014).

Exposure to micro-entrepreneurship strengthens the women empowerment variability and downgrades the gender inequalities in locality. SHG-Bank Linkage's micro credit facility pushes group members to participate in the community development activities and also it growingly promoting small scale business development to generate income (Toli, 2018). Need based skill development programmes under the SHG supported programmes acts as a catalyst for women in taking up small businesses and become self-reliant and also it enhances the knowledge level of group women members. Thus, they become more confidence of taking decision in starting a new business activity (Bori, 2017). It is observed; 70 percent, 15.25 percent & 14.75 percent women involved in entrepreneurial activities are doing trading such as opening of bakery business, general or stationary stores, garment shops; selling any products to others and manufacturing respectively (Soni, 2015). Providing finance based services, documenting procedures, skill based training to the SHGs had positive result in generating income for themselves to start a micro level enterprises in the village within their locality (Vejju & Sridevi, 2020).

Effectiveness of the enterprise, availability of capital, confidence boosting among women for entrepreneurship are some of the major indicators towards the success of an enterprise for the women SHG group members. Social and economical position, self motivation of women is also a part of the women entrepreneurship. Women who are associated with a SHG group are more self reliant than non SHG women in order to start an enterprise (Nachimuthu & Gunatharan, 2012). Financial inclusion of SHG members are promoting positively towards enterprise development but sometimes failed to expand their business activity due to less amount of loan accessibility. One of

the major objectives of micro entrepreneurship development programme is to generate employment in their locality and to better their livelihood (Bharti, 2014).

2.2. Role of skill based training towards income generation

Availing skill based training is an indispensible impetus towards women empowerment or an essential element through which conditions empowerment can be achieved. It is also observed that women who were facilitated by skill based training related to finance and entrepreneurship has better knowledge in loan access and development of ideas to start a business enterprise (Banerjee & Ghosh, 2012). Women SHG members who are involved in income generating activities promotes economic advantages in low households and proved to be an effective instrument in women empowerment (Swain & Wallentin, 2012).

Women are more active in agro based industries because most of the women are involved in household and farm based activities as these are their hereditary activities (Sharma, Dua and Hatwal, 2012). It is observed based on analysis on skill based training that woman based training promotes around 40 percent up gradation in skill relates to entrepreneurship. Skill development programmes are major determinants to become a micro level entrepreneur. Other related factors such as financial awareness, internal lending, micro credit planning, loan repayment, decision making etc. do not have major impact on entrepreneurship development (Soni, 2015). Micro entrepreneurship development needs to be sustainable for the long term in order to improve women's livelihoods (Chatterjee & Datta, 2020).

2.3.Barriers towards new entrepreneurship development in order to generate income

Entrepreneurial skill enhancement training should works towards marketing based skill development, product development, finance and legal based knowledge enhancement that further defines growth of the enterprise. Marinating social relations can also promote business enterprise (Vanithamani & Menon, 2012). Outreach programmes may be arranged with the

outer agencies in order to visit their business houses for the SHGs to experience their business activities and processes (Rajasekaran & Sindhu, 2013).

Access to sufficient fund to start enterprises is always the main barrier for women as they don't have collateral (UN ESCAP, 2014). Micro level enterprises face difficulties in availing formal access to finance due to lack of collateral so they move towards informal sources of finance. Lacks in access to suitable market is also a major constraints towards development of an enterprises as produced products or services needs to be sold to the potential customer. In the beginning it is difficult to establish a potential market due to lack of market knowledge and experiences (Chatterjee & Datta, 2020).

CONCLUSION

In current scenario, Self Help Groups are emerging as an effective tool for the society in empowering women by performing various income generating activities such as tailoring, cultivation, preparing pickle, incense sticks, papad making etc. It helps in mobilising rural women, build confidence, promote positive attitude among them. Apart from this, with the help of SHG-Bank linkage programme, members of the group gets a platform to connect with the banking system and do their financial transactions such as savings, lending money at regular interval. In the next step, with the financial support from financial institutions, some SHG start their own small kind of business activities.

It is observed with the above discussion by analysing various factors associated with entrepreneurship, an SHG group facilitates all necessary perquisites required to start a business entity. An SHG group gets financial support through linking with the financial institutions and avails skill based training by supporting agencies such as NGOs, cooperative agencies etc. In this way SHG is turning out to be an effective tool in promoting micro entrepreneurship among women group members.

SUGGESTIONS FOR FUTURE RESEARCH:

1. Establishment of common loan centres to facilitate loan

related services in the rural base.

2. Regular engagement of SHG members with their promoting agencies in order to know about the available opportunities towards entrepreneurship.
3. Facilitation of need based skill training to the SHG members by the NGOs, and promoting agencies.
4. Promotion of entrepreneurship by taking example of existing women entrepreneurs.
5. Due to shortage of bank branches in the rural areas bank should use SHGs as banking facilitators.

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ELECTRICAL POWER TRANSMISSION SYSTEMS IN REACTIVE-POWER CONTROL

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ABSTRACT

This chapter is on how to better appreciate the issues of reactive power networks. Where it comes to transmission systems, ways of increasing or decreasing reactive capacity (also called reactive power) are a topic of discussion. A prior knowledge of the reactive force in AC systems is needed to advance.

1.1 REACTIVE POWER - INTRODUCTION

As they are energised, the AC networks and the resulting voltage and current flows provide their own time-varying fields as well as electrical fields. Constructing energy when they grow, these fields unleash it as they collapse. Other than resistive equipment, such as transformers and devices, all else from engines and turbines (i.e., machines) operates depending on their ability to retain and release electricity. Fig. 2 contains the AC circuit (as seen in the illustration) (a), Transient power delivered to the load from the voltage source is expressed as the word Z/Z, in terms of instantaneous voltage and current.

$$p = vi \qquad (1.1)$$

Where V and I are the respective root mean square (rms) values of v and i.

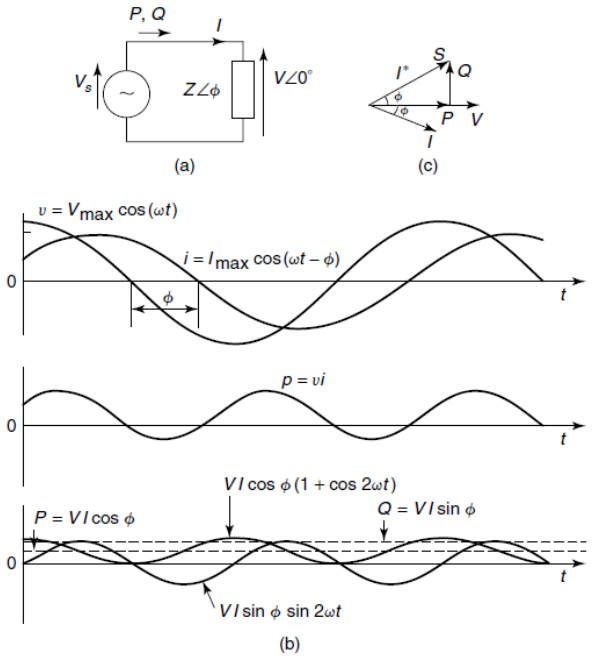

Figure 1 The Electrical Parameters in An Ac Network.

In the steady state, where $v = V_{max}\cos(\omega t)$ and $i = I_{max}\cos(\omega t - \phi)$:

$$p = \frac{V_{max}I_{max}}{2}[\cos\phi + \cos(2\omega t - \phi)]$$
$$= VI\cos\phi(1 + \cos 2\omega t) + VI\sin\phi\sin 2\omega t$$

Pictures can be found in Fig. 1 (b). In equation (2.2), two complex-valued I + j)Q components are found. The intensity function has both an average value and a maximum value of VI. The active control, P, is supplied by the supply to the unit. The second term has a zero mean, but a positive and negative peak value of f. The detailed equation of a complex force appearing in Fig. 2(a) is in phase domain.

$$S = \overline{V}\cdot\overline{I}^*$$
$$= P + jQ = VI\cos\phi + jVI\sin\phi$$

Volts/W = reactance and is labelled ampere active (var). From Equations (2.3) and (2), the reactive power's peak value is found to be in Eq. (2).

Creating the requisite coupling fields for energy devices is a need for reactivity. It loads circuits but does not result in an average power usage. Active and reactive capacity is used in high-power networks. A view of a commonly used power structure seen in figure 2.1(c) is pictured here.

Gadgets are essentially antennas that receive radio waves and store that energy as magnetic field. They do not work well because they pull electricity from lagging currents; they are often called "reactive power absorbers". electrostatic systems accumulate static energy Leading currents are pulled, which causes a negative Q rating; therefore, they are seen as providers of reactance. The convention for sources and loads are different, so it is recommended that one uses voltage and current rather than their respective signals, otherwise they would not be misled, and to the Q (and not voltage or current) to give reactive power a symbol.

2 UNCOMPENSATED TRANSMISSION LINES

To get a comprehensive understanding about the need for active and reactive management, assume a line-to-straightaway of a connection between a source V and a load that requires just the minimum of it. The above circuit contains just one reactance, an inductive reactance. Figure 2 depicts such a network, with a Phas Diagrams 2. V = I with its parameters. In figure 2, it is obvious that there is a magnitude and a step variance between the transmitting and receiving voltages Reactive current flowing in the load accounts for the majority of the line voltage decrease (I = DV1 and V = Ix). keeping the voltages in relatively equal will need two solutions: either increasing or decreasing current/ voltage may be balanced by increasing or decreasing current.

1. Load compensation, and
2. System compensation.

2.1 Load Compensation

For this capacitive load, Ic − Ix in this equation, a parallel reactive current component may be added, resulting in Ic + Cc. For that purpose, using this approach increases the successful

power factor of the combination to unity. When the voltage 1 is lower than the total of Vs and DV, the absence of load (voltage cancellation) is referred to as load compensation. On the contrary, by charging more for extra reactive fuel, consumers get a benefit in return for doing so Loads minimise line voltage drop, but do not remove it entirely; they also undergo a 2X DV2 voltage drop..

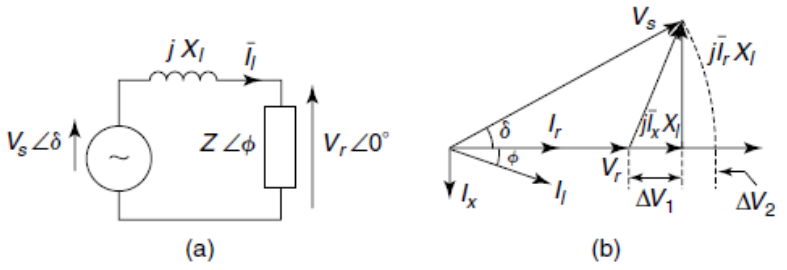

Figure 2 A Short, Lossless Transmission Line Feeding A Load.

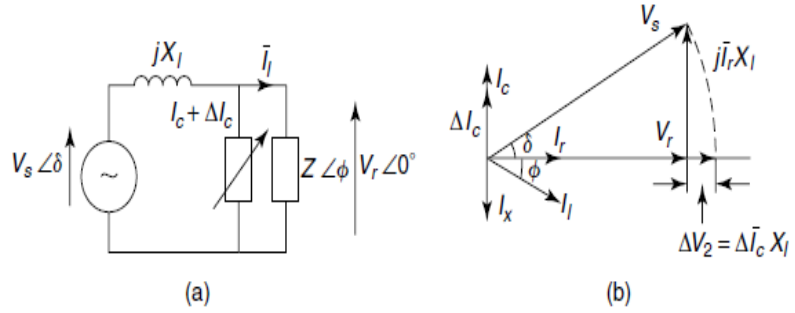

Figure 3 The Reactive-Power Control for Voltage Regulations.

2.2 SYSTEM COMPENSATION

At the rated voltage, a reactive power compensator may be used to control Fig. 3. 2,' In this compensator, the voltage decrease of DV 1 is negated and the reactance of IlXl. To counteract the DV2, Ov draws a secondary current equal to and in magnitude to the terminal voltage V c is equivalent to the destination voltage, V s. Quality of supply compensators are used by electricity providers to have consumer stability.

3. CONCLUSION

This chapter is not intended to provide a comprehensive analysis of trans- mission lines. Rather, its objective is to

examine those aspects that enhance the understanding of the interplay between voltages on the line and the resulting reactive-power flows.

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INFLUENCE OF SOCIAL MEDIA FOR EFFECTIVE LEARNING, TEACHING AND COMMUNICATION PROCESS

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ABSTRACT

The evolution of social media is a wonderful tool in this modern world to develop the skills of Communication, Teaching and Learning technologically emerged by internet facilities. This technology is knowledge based effective learning tool for the students and teachers in most educational institutes following the social media to enhancing the research skills. Nowadays, the usage of Facebook, WhatsApp, Skype, Twitter, blogging sites, Instagram and other user browsing network have more opportunities to share the individual's capacity through this social communicational media. Abundantly the sources are published and established through the websites for searching the needed content from that sources for the professors and students benefits. At present condition the study environment totally changed and by online study mode in the universities, colleges and schools ICT is more powerful in education field and develop the standardised education. Massive Open Online Course (MOOC) by SNSs is an educational resource integrated and created the chances gain the educational knowledge and provides facilities for learners. The most familiar universities by using the novel communication technology for the students and teachers. In this 21st century the social media and social network expanding the learning, teaching and research applications to make an efficiency and forms revolution in the field of education and communication.

Index Terms: Social media, Networking, Teaching, Learning, Communication.

INTRODUCTION

The Social network sites has revolutionized communication tools for facilitating teaching and learning activities. Nowadays, social media networking has become one of the most significant communication tools among people; In which exist through the Internet browsers that provides accessibility for awesome amount of people. Applying Social Networking Sites(SNSs) in teaching and learning give a positive impact on the adoption of SNSs and open the door to the new days of learning and teaching. Use as tools for teaching and learning.

New technologies, most often referred to as web 2.0 have created and developed in public and academic use, changing the way organizations and people create and share existing or newly produced information through multi-way communication.

EDUCATIONAL AND SOCIAL NETWORKSITES

Many teachers and teacher educators remain uncertain about how to meaningful blended this technology or assess its impacts(crook 2012). Assessing the processes and products of students thinking in projects involving the Internet or identifying how online applications could aid them in developing their capacity for such assessment, can be especially difficult even for experienced content – and technology – using teachers(Green. 2006). Web based social networks introduce tools, people, and materials to school culture that could help to break up established routines and assist teachers and students in getting feedback on their performances.

INFLUENCES OF SOCIAL MEDIA ON EDUCATION

Social media has exploded as a class of on-line discourse in which human beings create content material, share it, book mark it and network at a prodigious rate. Because of its ease of use, velocity and attain, social media is speedy changing the public discourse in society and placing traits and schedule in topics that variety from the surrounding and politics to technology and the entertainment enterprise. Lusk shared the same concept of social media. For him social media is the use of

Facebook, Blogs, Twitter, My space and LinkedIn for the purpose of this study social media is captured within the use of Internet through Facebook, WhatsApp, Twitter, Skype, Myspace as well aa Yahoo Messsenger for communication sharing of ideas, sharing of photos and videos by users. The increased use of Social Networking Websites has become an international phenomenon in the past several years. According to the research university college students use social networks. Technology has shown a fast development by way of introducing small communication gadgets for gaining access to social networks any time everywhere, as these devices consists of packet computers, laptops, ipads or even smart phones.

MOOCS

A Massive Open Online Course (MOOC) also works on the notion of bespoke learning which is a feature of learning via SNSs, too. In fact, a MOOC will be offered and typically spread through an online social network. A MOOC integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources, the emergence of MOOCs in a continuum from open educational resources to open access to the results of scientific production provides anyone, anywhere in the world with the same content available at the most prestigious universities and by the most renowned specialists, for a more structured education and the award of degrees(Lockyer. L; Patterson, J. 2008).

There is a similarity between MOOCs and SNSs is when a MOOC builds on the active engagement of several thousand students who self-organise their participation according to learning goals, prior knowledge and skills, and common interests. Therefore, SNSs are capable of boosting the opportunities for joint learning offered by MOOCs. However, despite the huge potential afforded by these communication resources among young people, their use as a learning support remains deficient. We seem to know rather little about how to introduce them to learning in a way that truly acknowledges their peculiarities as a

support to communication(Cormier, D.; Siemens, G. 2010). Informal learning in social networks has great potential to bridge the gap between the so-called Digital Natives" (the students) and the Digital Immigrants (the teachers) (Seely Brown, J; Adler, R.P. Minds on fire. 2008).

Interestingly, many Learning Management Systems (LMS) seem to replicate the status quo at real university campuses, by making a distinction between social spaces and formal learning situations, by designating class areas and chat areas within the LMS forums, in the same way that you would find student bars and classrooms in a campus. In contrast, SNSs appear to erase this distinction and seem to suggest that mixing all types of activity is something useful. It would appear that the problems and tensions faced when trying to link SNSs to formal learning arise when the network structure comes into conflict with the hierarchic structure of traditional learning.

There is currently an interesting and rigorous debate on the role that SNSs play in learning. From an educational point of view, there have been many attempts by teachers and students themselves to introduce learning activities into social networks. One of the most delicate issues about the use of SNS in higher education is that they attract students precisely because they are not controlled institutionally like LMSs, which most universities implement with a sole objective(namely, learning). Without ignoring current limitations and possible risks, we believe that all of us, university teachers, must remain optimistic and advocate for teaching innovations, in favour of promoting SNSs or recognising them as an additional support to the learning generated in the classrooms. We must legitimise the social interactions and exchanges taking place in these social spaces, which attract participants mainly because of their shared interests.

SOCIAL FACTORS AFFECTING THE ACADEMIC PERFORMANCE

Dr Islam study has identified many factors that are pre-admission qualification, time spent in studying, regular class attendance, probation status, father's education, parental

support and involvement, interest in major subjects of study and the gender of the students as significant determinants of academic performance of the students(Islam, MMazharul, 2015).

POPULAR SOCIAL MEDIA SITES

1. **Facebook:** It creates a space for students to ask and answer questions. When students get home and begin working on their homework, they can post a question to the groups so as to get it answered by the group member. It is also ideal for teachers using in flipped classroom. Post videos, photos, documents and other resources on the group's wall and student can access before class or when they work on their assignments.

   Facebook can be the perfect social media platform to incorporate into the classroom. Instead of putting instructors and students alike through a new learning curve when dealing with a traditional online classroom dashboard, stick to something everyone already knows.

   Have students follow the class's and the instructor can use it to post class updates, share homework assignments and encourage discussion.
2. **Twitter:** Offers a quick way to post class announcements and remainders as well as real time information on class field trips. It also helps classes track information on any topic. Twitter can be great as a discussion board or message board for a class. Teachers can create a single Twitter handle per class and reuse it every year.
3. **Blogs:** Instead of traditional writing projects, blogs creates opportunities for students to write and display their writings on large scale.
4. **Youtube:** It is like a Facebook, Youtube is an excellent option of flipping classroom in that students can watch lectures and resources before entering the classroom. Again, like blogging, since the material will be seen by a wider audience, students will be more apt to do their very best in creating a video, and they will enjoy being able to express

their creativity as they connect more deeply with the course matetrial.

5. **Instagram**: can showcase student work by offering a place to feature student hard work or even interesting details about a student.

   Students can use Instagram to present a series of photos or graphics in a visually appealing manner. Instagram allows students to practice digital storytelling in ways that other social media platforms may fall short.

6. **Google Docs:** It is a popular technology with teachers and students. Students and teachers can use these tools to collaborate on assignments, projects, newsletters among other things. It allows more than one person to work on a particular document at the same time. Google docs can promote the team work.

SOCIAL NETWORKING SITES

The phrase social networking sites is an umbrella term used for social media and includes but is not limited to Facebook, Twitter, LinkedIn, Myspace. Social media is internet based technologies that allow more free flowing communication among its users.

New communication tools develops communication through audio and video capturing string, connecting a features that include:

Blogs that make authors publish/post their work and invite comments on it.

Writing blog posts gives students another outlet for digital content that they can then easily link back to class social channels. There are many different platforms available, such as WordPress, SquareSpace, Wix, Blogger, Tumblr or Medium, where teachers can create a class blog.

Wikis which have capability to promote and facilitate common creation of through joining academic ventures.

Social bookmarking is used to enable users for collating, tagging, and sharing websites of their interests.

Media Sharing Spaces provide spaces and opportunities to the user community of posting and sharing pictures, podcasts and videos.

Collaborative Tools extend documents sharing and editing capabilities to multiple users.

SOCIAL MEDIA IN TEACHING AND LEARNING PROCESS

Social media into their crisis communication plan. Keep parents and students updated on the situation by sharing information about the crisis and if authorities are involved.

Many campuses have automated messaging alerts set up, but using Social media will keep even more people updated and informed.

Regarding to the relationships between students concurrent with the past studies that find that online communication is linked to time spent in offline relationships.

1. Information
2. Knowledge
3. Changing Nature of Learners
4. Ourselves the World
5. Constant connection
6. Adopting Social Media, Classroom
7. New Opportunity
8. Social media as a tool

CONCLUSION

Social media, Facebook, Twitter, Instagram, Blogs and internet are relevant field of education technology and this is still has a long period of evolution. It is a challenge to learn via social

media, Facebook or internet as the students should be very serious to adopt it. There is no way for students not learning seriously, if it happens, the students will go beyond the context of learning, since the learning process goes forward. Many social media platforms have shortcomings that weaken their appeal for formal professional development, and establish them only as platforms for resource finding and creating connections with others. In particular. Many social media platforms are not able to provide learning opportunities that are in line with established best practices for professional development, particularly in the ability to create contextualized hands-on learning opportunities. This being said, Google Plus and LinkedIn standout as social media platforms that start to address that concern. An immediate opportunity that becomes visible is the aggregation and curation of content. When we consider increasing the robustness of the learning that happens through social media channel we also run into well established platforms that exist outside the social media space, specifically MOOCs and Learning Networks. In our opinion then, new opportunities in this space are more likely to be found by extending the functionality of existing platforms such as Google +, or in the integration of social media for existing learning networks or MOOCs, than in creating a social networking platform that would focus solely on professional development.

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STATIC VAR COMPENSATOR AND IT'S APPLICATIONS

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ABSTRACT

This chapter provides a thorough description of the voltage regulation mechanisms, including information on the operational amplifiers (O.A.) and how to build an operational amplifier voltage regulator (P.V.R.O. regulator). Network resonances, electrode saturation, as well as voltage distortion, are all factors that can have a significant impact on SVC efficiency.

1. INTRODUCTION

SVCs are often used in power systems to regulate voltage or to do something else, such as device stability. As series-compensated networks are used, the control parameters and filters are required to be tuned differently. Details about the SVC voltage regulator specification are addressed in this part.

2. VOLTAGE CONTROL

2.1 V-I Characteristics of the SVC

Dynamic voltage and steady- and reactive strength are used to characterise the variability of SVC voltage and SVC current 2 different forms of these properties are seen in Figure 5.1a. This shows the terminal voltage (a)–S voltage connection and reactive strength is shown by (b). In textiles, SVCs are listed

as having numerous and complex V/I characteristics in this text.

In the case of a saturated compensator reactor. As a general rule, values of V ref max is about 1.05 and V ref min is about 0.95.

Linear Range of SVC Control

The voltage around the inductive-to-capacitive and the whole reactive power spectrum (or SVC) differs linearly.

Slope or Current Droop

The voltage-magnitude slope or droop (or droop of the V-I characteristic) is the relationship between voltage and current as it is being controlled along the axis. To thus reflect slope K S, a K-slope of

$$K_{\mathrm{SL}} = \frac{\Delta V}{\Delta I}\ \Omega$$

where $\Delta V =$ the change in voltage magnitude (V)
$\Delta I =$ the change in current magnitude (A)

The per-unit value of the slope is obtained as

$$K_{\mathrm{SL}} = \frac{\Delta V/V_r}{\Delta I/I_r}\ \mathrm{pu}$$

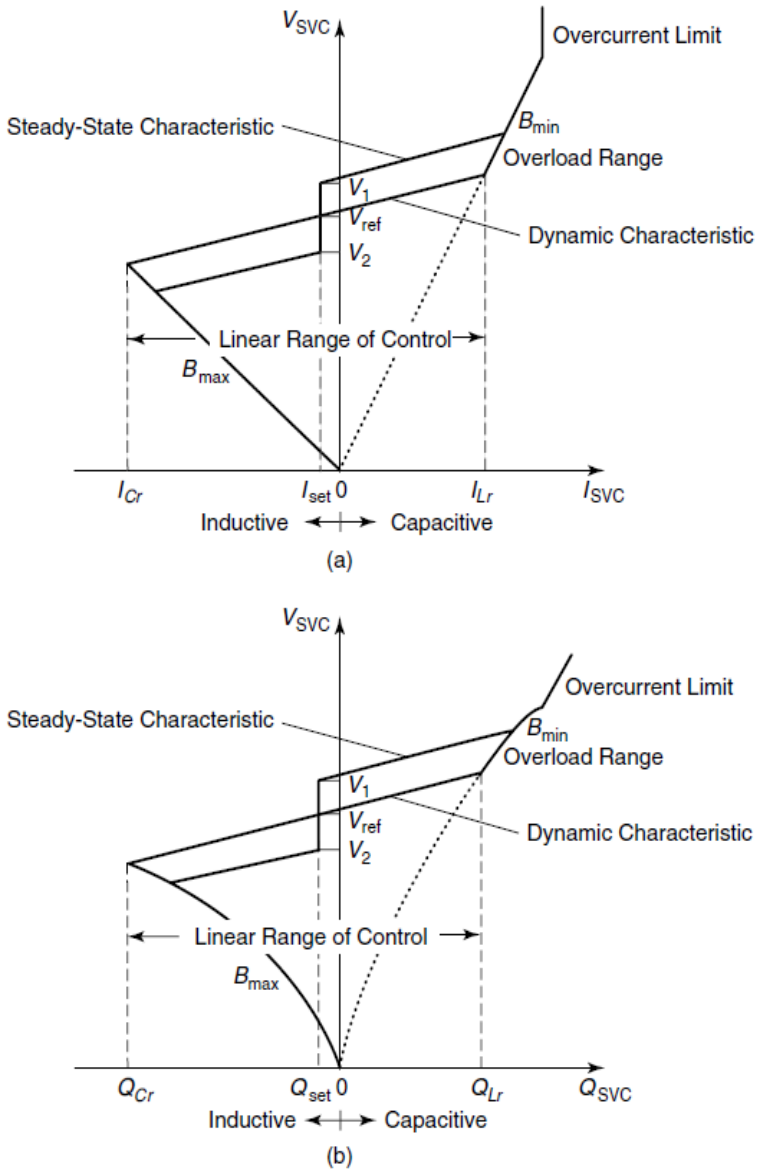

Figure 1 (A) The Voltage–Current Characteristic Of The SVC And (B) The Voltage– Reactive-Power Characteristic Of The SVC

where V_r and I_r represent the rated values of SVC voltage and current, respectively.

For $\Delta I = I_r$,

$$K_{\mathrm{SL}} = \frac{\Delta V(\text{at } I_r \text{ or } Q_r)}{V_r} \text{ pu}$$

$$= \frac{\Delta V(\text{at } I_r \text{ or } Q_r)}{V_r} \cdot 100\%$$

where Q_r represents the rated reactive power of SVC.

Here the slope can be described as the voltage shift relative to the rated voltage, normally equal to either inductive or capacitive-active electricity. beyond recognition As the SVC shifts out of the linear control plane, it begins to act like a nonlinear inductor. The proactive and reactive forces of the SVC In certain literature, the combined inductive and capacitive strength of the SVC is known as the reactive power. Equivalent impedance is measured as a ratio: The slope is represented as an equivalent reactance.

$$X_{\mathrm{SL}} = K_{\mathrm{SL}} \qquad \text{in pu}$$

With saturated control compensators, the slope is adjustable by the control mechanism; with the multistage system, the slope is fixed by the slope adjustment capacitors. Slope is always having a nominal range of 1–10%, with a median value of 3–5% In addition to being essential for bus regulation, it is desirable to integrate a finite slope in the V-I characteristics for reasons that are mentioned below.

3. CONCLUSION

Additionally, to save the thyristor valves from being exposed to thermal pressures, a regulator is put in place that limits the inductive current inside the overload range.

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MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

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ABSTRACTS

"The Environment is an important aspect of peace because When our resources become scarce, we fight for them" Wangari Mathai – Nobel peace prize 2004 The word environment was derived from the *French word environed,* which means to surround or encircle and literally it means surroundings. The environment is everything around us. It includes all of the living and the non-living things with which we interact. And it includes a complex web of relationships that connect us with one another and with the world we live in. Despite our many scientific and technological advances, we are utterly dependent on the environment for air, water, food, shelter, energy, and everything else we need to stay alive and healthy. As a result, we are part of, and not apart from, the rest of nature. *"Environmental science is defined as the study of physical, chemical and biological conditions surrounding the living organisms which influence them internally and externally*." Environmental science and Multidisciplinary study of how humans interact with the environment of living and non-living things. It integrates information and ideas from the *natural sciences,* such as biology, chemistry, and geology, the *social sciences,* such as geography, economics, political science, and demography (the study of populations), and the *humanities,* including philosophy and ethics . The goals of environmental science are to learn *how nature works, how the environment affects us, how we affect the environment, and how to deal with environmental problems and live more sustainably.* A key subfield of environmental science is ecology, the biological science that studies how organisms, or living things, interact with their environment and with each other.

INTRODUCTION

The environment is not a single subject. It is an integration of several subjects that include both Science and Social Studies. To understand all the different aspects of our environment we need to understand biology, chemistry, physics, geography, resource management, economics and population issues. Thus the scope of environmental studies is extremely wide and covers some aspects of nearly every major discipline. We live in a world in which natural resources are limited. Water, air, soil, minerals, oil, the products we get from forests, grasslands, oceans and from agriculture and livestock, are all a part of our life support systems. Without them, life itself would be impossible. As we keep increasing in numbers and the quantity of resource improving this situation will only happen if each of us begins to take actions in our daily lives that will help preserve our environmental resources. We cannot expect Governments alone to manage the safeguarding of the environment, nor can we expect other people to prevent environmental damage. We need to do it ourselves. It is a responsibility that each of us must take on as one's own. The Productive value of Nature: As scientists make new advances in fields such as biotechnology we begin to understand that the world's species contain an incredible and uncountable number of complex chemicals. These are the raw materials that are used for developing new medicines and industrial products and are a storehouse from which to develop thousands of new products in the future. The flowering plants and insects that form the most species-rich groups of living organisms are thus vital for the future development of man. We degrade their habitat these species will become extinct. If one sees being sold or used, a product that comes from an illegally killed wild species, if we do not inform the authorities, we become a party to its extinction. Once they are lost, man cannot bring them back. When we permit the destruction of a forest, wetland or other natural area and do not protest about it, future generations are being denied the use of these valuable resources and will blame us for these rash and negligent actions towards the environment. Thus the urgent need

to protect all living species is a concept that we need to understand and act upon. While individually, we perhaps cannot directly prevent the extinction of a species, creating a strong public opinion to protect the National Parks and Wildlife Sanctuaries in which wild species live is an important aspect of sustainable living. There is a close link between agriculture and the forest, which illustrates its productive value. For crops successful, the flowers of fruit trees and vegetables must be pollinated by insects, bats and birds. Their life cycles however frequently require intact forests .Aesthetic/Recreational value of nature: The aesthetic and recreational values that nature possesses enliven our existence on earth. This is created by developing National Parks and Wildlife Sanctuaries in relatively undisturbed areas. A true wilderness experience has not only recreational value but is an incredible learning experience. It brings about an understanding of the oneness of nature and the fact that we are entirely dependent upon the intricate functioning of ecosystems. The beauty of nature encompasses every aspect of the living and non-living part of our earth. One can appreciate the magnificence of a mountain, the power of the sea, the beauty of a forest, and the vast expanse of the desert. It is these natural vistas and their incredible diversity of plant and animal life that has led to the development of several philosophies of life. It has also inspired artists to develop visual arts and writers and poets to create their works that vitalize our lives. A wilderness experience has exceptional recreational value. This has been described as nature tourism, or wildlife tourism, and is also one aspect of adventure tourism. These recreational facilities not only provide a pleasurable experience but are intended to create a deep respect and love for nature. They are also key tools in educating people about the fragility of the environment and the need for sustainable lifestyles. In an urban setting, green spaces and gardens are vital to the psychological and physical health of city dwellers. It provides not only an aesthetic and visual appeal but the ability to ensure that each individual is able to access a certain amount of peace and tranquility. Thus urban environmental planners must ensure that these facilities are

created in growing urban complexes. Another important conservation education facility in urban settings includes the need to set up well designed and properly managed zoological parks and aquariums. These have go great value in sensitizing school students to wildlife. Many young people who frequented zoos as young children grow up to love wildlife and become conservationists. In the absence of access to a Protected Area, a botanical garden or a zoo, one concept that can be developed is to create small nature awareness areas with interpretation facilities at district and taluk levels. These areas can be developed to mimic natural ecosystems even though they could be relatively small in size. Such nature trails are invaluable assets for creating conservation education and awareness. They can be developed in a small woodlot, a patch of grassland, a pond ecosystem, undisturbed r*iver or coastal area. This would bring home to the visitor the importance of protecting our dwindling wilderness areas. The option values of nature: While we utilize several goods and services of nature and enjoy its benefits', we must recognize that every activity that we do in our daily lives has an adverse impact on nature's integrity. Thus if we use up all our resources, kill off and let species of plants and animals become extinct o*n earth, pollute our air and water, degrade land, and create enormous quantities of waste, we as a generation will leave nothing for future generations. Our present generation has developed its economies and lifestyles on unsustainable patterns of life. However, nature provides us with various options on how we development of several philosophies of life. It has also inspired artists to develop visual arts and writers and poets to create their works that vitalize our lives. A wilderness experience has exceptional recreational value. This has been described as nature tourism, or wildlife tourism, and is also one aspect of adventure tourism. These recreational facilities not only provide a pleasurable experience but are intended to create a deep respect and love for nature. They are also key tools in educating people about the fragility of the environment and the need for sustainable lifestyles. In an urban setting, green spaces and gardens are vital to the psychological and physical health of city

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SCOPE

- The science most close to Nature is Environmental science.
- This field today's parlance is encompassing issues of pollution, waste water treatment, solid waste management, wildlife, study of air, water and land, global warming, climate change and so on.
- Provides the knowledge about ecological systems and biodiversity richness
- Enables one to understand the causes and consequences due to natural and man induced disasters
- Exposes the problems of over population, health, hygiene, etc, and the role of arts, Science and technology in eliminating / minimizing the evils from the society.
- Enables theoretical knowledge in to the practice and the multiple use of environment.
- Without scientific approach we cannot understand nature and without awareness among the people, we cannot sustain Nature.
- The main role of environmental scientist is to understand the nature and its components eliminate disturbing factors which are pressuring sustainability and natural living.
- To identify and develop appropriate and indigenous eco-friendly skills and technologies to various environmental issues.
- Teaches the citizens the need for sustainable utilization of resources
- Environmental science provides job opportunities as environmental scientist, environmental engineer, consultant, teacher, analyst, pollution control officer etc.

THE MAIN OBJECTIVES OF ENVIRONMENTAL SCIENCE ARE

- ✓ Understanding the ecosystem functioning
- ✓ Understanding the ecosystem functioning and consequences of perturbations

- ✓ Familiarization with identification, source and effects of environmental pollution and their control techniques and solid waste management
- ✓ Familiarization with methods of managing environmental pollution through administrative measures such as environmental regulations and environmental impact assessment
- ✓ Understanding the environmental policies, laws, treaties for sustaining environment
- ✓ Knowledge of natural resources and their management for sustainability

IMPORTANCE OF ENVIRONMENTAL SCIENCE

- ✓ The study enables the people to understand the complexities of the environment and need for the people to adapt appropriate activities and pursue sustainable development, which are harmonious with the environment.
- ✓ The study motivates students to get involved in community action, and to participate in various environmental and management projects.
- ✓ Environmental study is a key instrument for bringing about the changes in the knowledge, values, behaviors and lifestyles required to achieve sustainability and stability within and among countries

GENERAL IMPACTS OF MINING ON THE ENVIRONMENT

1. It consumes huge energy
2. Occupational health hazards
3. Air pollution with dust and gases due to drilling, blasting, mine haulage and transportation by road, and also from waste heaps;
4. Water pollution when atomic elements and other harmful elements are present in the ore/mineral mine effluents;
5. Land pollution
6. Biodiversity loss and ecosystem damage

7. Modifying water regimes such as surface flow, groundwater availability and lowering down of water table;
8. Soil erosion, soil modification with dust and salt;
9. Noise and vibration problem in the mine and adjoining habitat including wild life;
10. Alteration of the landform;
11. Deforestation affecting flora and fauna; and
12. Spoiling aesthetics with untreated waste dumps.

ENVIRONMENTAL EFFECTS OF FOOD PRODUCTION

Both industrialized and traditional agriculture significantly affect our air, soil and water in various ways. These include loss in biodiversity due to habitat loss when natural systems like forests and grasslands are cleared, or wetlands are drained, for establishing agricultural fields.

- Replacement of thousands of wild varieties of crop plants with fewer high yielding varieties (as in green revolution) causes loss in genetic diversity.
- Inadequate safeguards in agriculture may lead to soil erosion and decreased soil fertility, and in extreme cases even water logging, Stalinization and desertification.
- Excessive employment of farm machinery causes increased air pollution and greenhouse gas emission from the fossil-fuel used.
- Heavy use of pesticides (often having long persistence in soil) in industrialized agriculture results in pollution of air, water as well as soil.
- Pesticides may kill fishes and contaminate drinking water.
- Similarly, substantial fraction of heavy fertilizer inputs may be leached causing water pollution (e.g. high nitrate contamination of drinking water). As such agricultural systems require huge amounts of surface water resource
- The main role of environmental scientist is to understand the nature and its component eliminate disturbing factors which are pressuring sustainability and natural living.

- To identify and develop the appropriate and indigenous eco-friendly skills and technologies and various environmental issues.
- Teaches the citizens the need for sustainable utilization of resources.
- Environmental science provides job opportunities as environmental scientist, environmental engineer, consultant, teacher, analyst, pollution control officer etc.

THE EFFECTS OF AGRICULTURE ON THE ENVIRONMENT CAN BE BROADLY CLASSIFIED INTO THREE GROUPS, VIZ. GLOBAL, REGIONAL AND LOCAL:

(1) Global Effects:

These include climate changes as well as potentially extensive changes in chemical cycles.

(2) Regional Effects:

These generally result from the combined effects of farming practices in the same large region. Regional effects include deforestation, desertification, large scale pollution, increase in sedimentation in major rivers and in the estuaries at the mouths of the rivers and changes in the chemical fertility of soils over large areas. In tropical waters, sediments entering the ocean can destroy coral reefs.

(3) Local Effects:

These occur at or near the site of farming. These changes / effects include soil erosion and increase in sedimentation downstream in local rivers. Fertilizers carried by sediments can also transport toxins and destroy local fisheries

Environment

Natural **Artificial**

(Forests, air, water, wildlife, soil) (Housing, technology, working)

ECOLOGY

- The term Ecology was coined by combining two greek words, **oikos** (meaning house or dwelling place) and **logos** (meaning the study of)

- Ecology is the study of structure and function of ecosystem
- Ecology is defined as the study of interrelationship between the organisms and environment

Ecology was first described as a separate field of knowledge in 1866 by the German Zoologist Ernst Haeckel, who invented the word Ecology for 'the relation of the animal to its organic as well as its inorganic environment, particularly its friendly or hoplite relations to those animals or plants with which it comes in contact.

IMPORTANT DEFINITIONS IN ECOLOGY

- **Species:** It is defined as the uniform interbreeding population spread over time and space
- **Population:** A population is a group of individual organisms of the same species in a given area
- **Community:** A community is a group of populations of different species in a given area
- **Biome:** The complex of several communities in any area, represented by an assemblage of different kinds of plants, animals, etc., sharing a common climate , is called biome
- **Niche (Ecological niche) :** The specific physical space occupied by an organism and the functional role of an organism in ecosystem
- **Eked :** A ***egad*** of plant species is a population of individuals which although belong to the same genetic stock, but differ markedly in vegetative characters such as size, shape, number of leaves , stems etc.,
- **Ecotype:** An **ecotype** is a population of individuals of a species, which are genetically different. Their variations are permanent and irreversible as these are genetically fixed
- **Ecotone :** A transition zone between two adjacent biomes
- **Standing state or standing quality:** The amount of inorganic substances, such as C, H ,N ,P ,S etc., present at any given time in the environment of an ecosystem is known as standing state or standing quality**.**

- **Standing crop:** The amount of living material, present in the population at any time is known as standing crop.
- **Succession:** It is a natural process by which different groups or communities colonize the same area over a period of time

THREE BASIC OBJECTIVES FOR THE CONSERVATION OF BIODIVERSITY

(a) To maintain essential ecological processes and life supporting systems.

(b) To preserve the diversity of species.

(c) To make sustainable utilization of species and ecosystems.

STRATEGIES FOR CONSERVATION OF BIODIVERSITY

1) All the possible varieties (old or new) of food, forage and timber plants, livestock, agriculture animals and microbes should be conserved.
2) All the economically important organisms in protected areas should be identified and conserved.
3) Critical habitats for each species should be identified and safeguarded.
4) Priority should be given to preserve unique ecosystems.
5) There should be sustainable utilization of resources.
6) International trade in wild life should be highly regulated.
7) The poaching and hunting of wildlife should be prevented as far as practicable.
8) Care should be taken for the development of reserves and protected areas.
9) Efforts should be made to reduce the level of pollutants in the environment.
10) Public awareness should be created regarding biodiversity and its importance for the living organisms.
11) Priority should be given in wildlife conservation programmed to endangered species over vulnerable species and to vulnerable species over rare species.

12) The habitats of migratory birds should be protected by bilateral and multilateral agreement.

13) The over exploitation of useful products of wild life should be prevented.

14) The useful animals, plants and their wild relatives should be protected both in their natural habitat (*in-situ*) and in zoological botanical gardens (*ex-situ*)

15) Efforts should be made for setting up of National parks and wild life sanctuaries to safe guard the genetic diversity and their continuing evolution.

16) Environmental laws should be strictly followed.

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REVIEW ON THYRISTOR-CONTROLLED SERIES CAPACITOR (TCSC)

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ABSTRACT

Due to their small size, shunt capacitors have many advantages. To increase the reactance, you use a parallel- or series- connected capacitor, whereas to increase the voltage you use a shunt.

1. INTRODUCTION SERIES COMPENSATION

A system benefit can be obtained by adding 3 to 6 to the actual power rating of a series capacitor additionally, the shunt capacitors must be coupled in sequence, although this is not necessary for parallel capacitors.

The following two quantities have to be equal in order to ensure the greatest possible voltage output over a line that has a full angular separation between its ends: Qse and shunt capacitor = shunt capacitor magnitude multiplied by its minimum angular displacement (displacement factor of maximum) and now he said:

$$\frac{Q_{se}}{Q_{sh}} = \tan^2\left(\frac{\delta_{max}}{2}\right)$$

Specifically, for Qsh = 10% of Qmax in spite of having two times the per unit operating voltage, the average expense of a series compensation system is smaller than that of a shunt compensation.

2. Advantages of the TCSC

Thyristor has not yet found practical use in series capacitors since the ability to control or fine-tune the settings through thyristor is underappreciated. Continuous, line-speed modulation of the differential torque level Optimal power flow management inside the transmission networks to enable power to be applied to all the equipment in the network thereby eliminating the possibility of an energy loop dispersion of the power shifts from surrounding and intra-areal sources.

The suppression of oscillations on the other hand The TCSC naturally resists–reacts at sub-harmonic frequencies Since the amount of continuous energy is not sufficient, the sub synchronous oscillations become self-sustained, and damping occurs.

Decreasing the DC offset The DC voltage which inevitably accompanies the insertion of series capacitors can be rendered to vanish rapidly (by a switching capacitor) an improved degree of security for capacitor sequence Thyristor acid build-up may be bypassed by thyristor build-up as voltage has exceeded the capacitors in the capacitive circuit. also, however, capacitors may be easily re-inserted by way of torsion to stabilise the device during fault clearing.

Multilayers that provide voltage help series capacitors in combination with line regulators, help with voltage control and voltage stabilization short-shortening the electrical current Transistors can revert from controlling capacitance to the controllable mode during short-circuited events.

3. THE TCSC CONTROLLER

Fig. 1 depicts a simple TCSC, which is connected to a thyristor-controlled reactor, LS (a). However, a realistic capacitor module also contains the components shown in Fig. 1 (b). voltage. A metal oxide varistor (MOV), or a nonlinear resistor, is

attached in parallel with the series capacitor to stop the incidence of a voltage that may potentially be higher than the voltage rating of the capacitor.

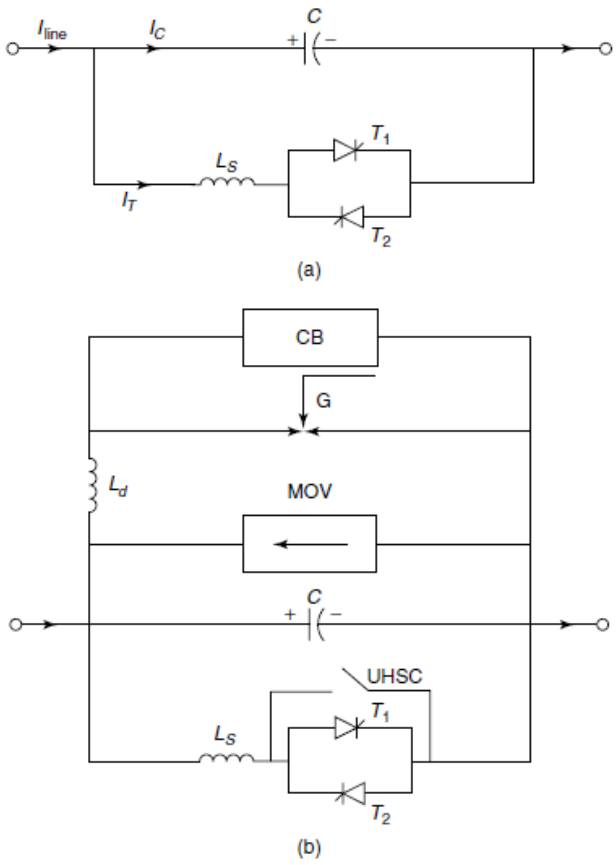

Figure 1
A TCSC Module: (A) A Basic Module And (B) A Practical Module.

high voltage The MOV would not only limits the voltage but it causes the capacitor to be retained in the circuit while the state that caused the voltage excursion to be stable.

Over the capacitor is a circuit breaker, CB, which switches the connector on and off to allow the user to insert it. Notice that it can even override the capacitor during extreme faults or where there is a problem with the machinery. When capacitors are used in a circuit, a current-limiting inductor, or LC, is needed to prevent both the voltage and current in the capacitor from rising

beyond a specified value.

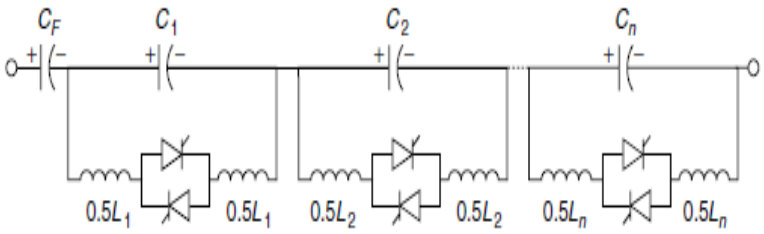

Figure 2 A Typical TCSC System.

The transducers in their absolute "up" position keeps conductive losses low by using ultra-high speed (UHSC) contacts (AKC). A feature is provided in metallic contact with a near-zero loss, enabling it to perform several operations with a single throw. The touch is short closed after the application of the the thyrasonic valve, which can be opened again until it is shut off. as well in situations of rapid-release valve overload, the metallic elements can be used to eliminate the burden on the valve.

In a TCSC, the variable-series capacitors normally do not have with a fixed-capacity While variable-capac capacitor are considered more cost-effective, this fixed capacitor is used mainly to reduce costs. In figure 7.2 is an example of a simple logical framework with only essential elements. The various capacitor values —C1, 2, C—and Cn are used to adjust the spectrum of reactance to the desired level. antipr. In the event of thyristor valves come in contact, this component is double wound to shield thyristor motive actions.

4. THE TSSC

Figure 3 depicts a several sequence connections of TCMs connected to a single capacitor Either in "blocked" or "bypassing" thyristor functions as a thyristor, which are in "on" or "off" modes." the inductors, L1, L2, and the inductors Ln in Figure 2 are used to inhibit transients in the thyristor valve currents during switching for each revolution of the associated with a valve, a new capacitor is added or removed throughout the circuit.

5. CONCLUSION

Since the thyristor do not wear down, there are an infinite number of procedures that can be performed. We do this to compensate for differing line pressures more often, and we monitor the power flow's degree of variation. But thyristor switching may also eliminates or greatly reduces switching transients. While, on the other hand, the changeover of mechanical breakers is uncoordinated.

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MACHINE LEARNING AND DEEP LEARNING ALGORITHM USED IN RETAIL SECTOR

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ABSTRACT

Artificial intelligence (AI) and machine learning (ML) are among the top technology trends in the retail world. They are having a great impact on the industry. Stores are changing. We see it happening before our eyes, even if we don't always realize it. Little by little, they are becoming just one extra step in an increasingly complex customer journey. If you're a retailer searching for new ways to attract customers, analyzing business data is a smart way to begin your search. Data analysis offers insights to help you increase customer engagement, but it's tough to accurately analyze large data volumes on your own. That's where machine learning can come to your rescue. A machine learning model can analyze and break large volumes of complex data into actionable insights, so we can better understand customer behavior and market trends. Using these insights, you can estimate future demand, set competitive prices, personalize offerings for customers, and much more.

The quality of the experience, a feeling of belonging and recognition, the comfort of the purchase… all these parameters now matter as much as sales per square meter, and must therefore submit themselves to the optimizations prescribed by Data Science and its "intelligent algorithms" (artificial Intelligence in the form of machine learning and deep learning). Both AI and ML by focusing on learning key aspects of customer behavior and individual preferences can better predict purchases

and interactions that earlier analytics could not do. Machine Learning particularly came as the most promising technology for retailers across the niches and sizes.

Keywords: Machine learning, Deep Learning, Artificial Intelligence, Data Science.

INTRODUCTION

Stores are changing. We see it happening before our eyes, even if we don't always realize it. Little by little, they are becoming just one extra step in an increasingly complex customer journey. Thanks to digitizing and retail automation, the store is no longer an end in itself, but a mean of serving the needs of the brand at large. The quality of the experience, a feeling of belonging and recognition, the comfort of the purchase… all these parameters now matter as much as sales per square meter, and must therefore submit themselves to the optimizations prescribed by Data Science and its "intelligent algorithms" (aka artificial Intelligence in the form of machine learning and deep learning).

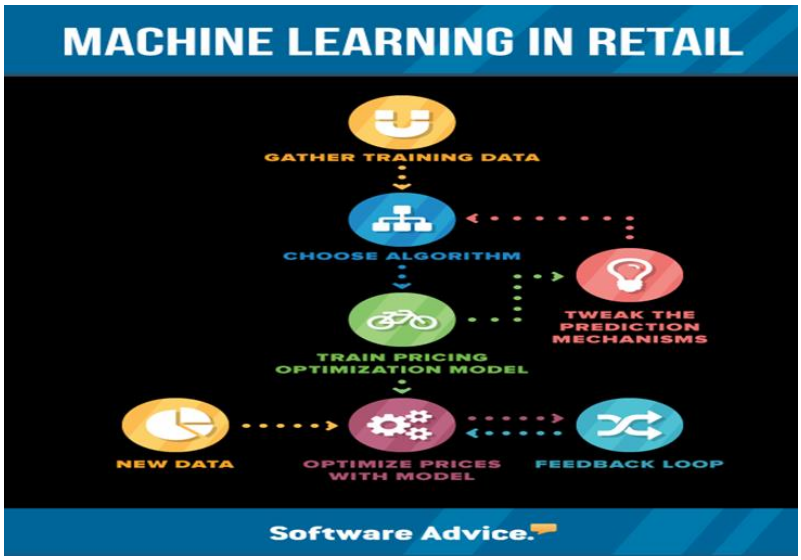
The use of artificial intelligence is, above all, a competitive necessity. Indeed, e-commerce players did not wait on anyone: note, for example, the adaptation of online search results to the end customer, or the recommendations made based on a digital profile. These two aspects are impossible for brick and mortar (for now). However, physical commerce has its own strengths. Olfactory, visual, auditory, etc. data can be used to give the consumer a feeling of having experienced something unique and made specifically for them. In addition to customer relationship improvements, artificial intelligence also makes it possible to seek the resolution of problems that have long represented a burden for retailers: better inventory management, optimization of store space, optimization of employee time.

MACHINE LEARNING IN RETAIL

Machine learning is a type of artificial intelligence (AI) that lets computer systems analyze and learn from data to make smart decisions and predictions, with minimal human

involvement.In the retail function, machine learning was initially used to automate daily operations, such as in-store robots restocking empty shelves and guiding customers to the right product areas, and chatbots answering customer questions and suggesting products.

But today, the use of machine learning in retail is no longer restricted to physical automation or the replacement of humans. It has expanded to automated data analysis, data-driven recommendations and decision-making, payment processing, and much more.



Let's see the role of Machine Learning in product price optimization for the retailer.

- **Gathering Data for Training the Machine:** By gathering data corresponding to the choice of products and their respective price range, the pricing model is pre-trained.
- **Using an Algorithm:** Now the retailer also needs to use an algorithm for analyzing the features of the products mentioned in the training data and come with the precise prediction about the right price of the product.
- **Training the Model for Pricing Optimisation:** Now the Pricing optimization model of the algorithm checks the

predictions about the right price for the customer against the real product prices.

- **Changing the Prediction Mechanism:** The retail algorithm equipped with the Machine Learning technology continues to change and adjust the prediction mechanism over time.
- **Pricing Optimisation for the Model:** As soon as the pre-training is completed, predictions on a variety of selling prices measured against product features and quality attributes come to surface.
- **Feedback Loop:** Whenever a product is sold the price of the product in that respective sale is considered as a fresh input in the feedback loop for training the pricing model to come with more accurate prices.
- **New Data Inputs:** To utilize the pricing optimization model to the advantage of product marketing on a continuous basis, new product data is always incorporated for the model to refine the price predictions further.

KEY BENEFITS OF MACHINE LEARNING IN RETAIL

Machine Learning has opened a new vista of marketing and business process optimization in the retail sector. To understand the principal advantages of Machine Learning for retail, let us have a look at the various contexts this technology is used for retail.

- To offer retail customer truly personalized product recommendations.
- Offering a better price to boost sales by real-time and dynamic adjustment of prices.
- Making better inventory planning and ensuring better maintenance with right predictions.

- Offering faster and more efficient delivery based upon past customer data and customer behavior.
- Better prediction of sales and customer service based upon earlier customer behavior data.
- Perfecting app user experience and optimizing website content based upon in-app and on-web customer behavior and interactions.
- Better segmentation of customers on the basis of previous customer behavior.

FOUR APPLICATIONS OF MACHINE LEARNING (ML) IN RETAIL

Intelligent automation company WorkFusion has a number of automation products that use data to churn out smart solutions for retail, including its robotic process automation platform RPA Express.

Here are four ways retailers are using ML to improve their retailing needs.

1. **Stocking and Inventory**

   One of the key elements of running a successful business is the ability to streamline the stocking and inventory management process in a swift and automated manner. ML is offering retailers the chance to purchase online and offline data to predict inventory needs in real time, breaking down these factors based on different segments such as day of the week, season of the year and activity in a particular store. This information could be used to create a daily dashboard of suggested orders for a purchasing manager. Machine vision may also be used soon in the form of cameras that can detect the number of items of a particular product throughout the entire store just by looking at it.

2. **Predicting Customer Behavior**

   The technology also has a positive role in analyzing customer data and predicting future behavior. Retailers can use this data to better understand the needs of their customers by examining the price range of their previous purchases, recommending items that they may be interested in. ML

algorithms can generate suggestions for items that are complementary to items they are buying instead of simply pushing a hot item that is completely unrelated to what they are purchasing. Additionally, retailers can use add-on options for hygienic and other daily products that they may want to buy on a monthly or quarterly basis if they're happy with the product.

3. **Tracking Behavior for Marketing Purposes**

   ML can also be used to determine how well a product sells based on the position it's in relative to the rest of the store. One way to predict how customers react to certain products is with cameras that detect the walking patterns and the direction customers face when walking down the store. These cameras could compile data that measure the interest of various products, which could be use to restructure store layouts. They could also be used to test new items or determine whether products with declining sales should be phased out.

4. **Dynamic Pricing**

   Companies know that ensuring an item is priced accurately can make or break their business. ML now has the capability of offering dynamic pricing options, which means that the price of certain products change over time through an algorithm that considers a variety of pricing variables. These metrics could include the season of the year, as well as supply and demand. With this technology, retailers have more flexibility when generating the right price at the right time without losing sight of their main goals, including profit or revenue optimization. By learning the performance of a product over time, ML can easily adapt to changes in the market and improve a company's ROI.

CONCLUSION

Machine learning offers a lot of assistance to the retail sector. However, many retailers are in favor that it helps them mostly in personalization.They are not wrong; as the business expands, so does the type of customers. As discussed above, no

customer wants to be blasted with impersonal emails. “Great customer experience… will come from blending technology with a more personalized touch,” Karen Katz, President, and CEO of Neiman Marcus Group. For instance, Amazon, with an estimated 35 percent of its sales coming from machine learning-driven product recommendations which are tailored for individual buyers. A significant number of online shoppers become return customers of a brand that personalizes their digital shopping experience, making them feel special. As mentioned earlier, businesses need to consider all the pros and cons of technology before investing in it. Choosing the right digital product development partner for your business will decide your fate in the market. Rapidops has developed various award-winning digital products that have helped various retail businesses capture maximum customer attention. If you want to know more about how machine learning and artificial intelligence can help you in providing better experience to your customers, connect with us.

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EMERGING FACTS CONTROLLERS

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ABSTRACT

This section presented that STATCOM, SSSC, offering minimal relation to other controls that may also be included. used on less expensive technologies such as turn-off thyristor controllers (TOCs) and insulated-gate bipolar transistors (IGTs).

1. INTRODUCTION

Due to the and complexity of global power grids and the challenges of supplying reliable, sustainable, effective, and economical power, it is expected that FACTS controllers will be crucial in the future. Information is widely available—for instance, SVCs and FACs have already been explained in previous chapters. Besides, several other quick and efficient FACS controllers exist.).

2. THE STATCOM

Reactive power is regulated by this STATCOM (or SSC) to both generate and provide new reactive power. Reactive and real power can be generated or absorbed at the output terminals of the solid-state converter, whichever is preferable. This means the STATCOM being reviewed in this chapter delivers 3-phase dc voltage, with the relationships derived from a particular dc voltage supply that is in- 3-phase with respect to its performance (which is provided by either an interface reactor or the leakage inductance of a coupling transformer). An energy capacitor is used to generate the dc voltage.

It can boost the efficiency of power systems in these ways:

1. Dynamic voltage regulation in transmission and distribution systems;
2. Force-oscillation damping in power-transmission systems;
3. intermittent stability;
4. voltage flicker control; and
5. control of not just reactive power but also constructive power in the linked line, which requires a direct current energy supply.

Furthermore, a STATCOM does the following:

It has a minimal footprint because it substitutes passive banks of circuit elements with lightweight electronic converters; it delivers flexible, factory-built devices, which reduces site labour and commissioning time; and it uses encapsulated electronic converters, which reduces its environmental effects..

In this way, a STATCOM acts like an ideal sinusoidal generator, which provides three sinusoidal voltages that are produced at the fundamental frequency and can be adjusted for amplitude and phase. This ideal computer is instantaneous but has zero inherent friction, has no impedance on the existing device, and generates reactive strength.

This is the first hundred-megavolta (100 megavolta) substation that the TVA has built: TVA installed STAT-COM in Sullivan. energising STATCOM can minimise TV's need for transformer strain, thereby reducing the associated losses. Due to the more complicated and labor-intensive transformer bank installation, the STATCOM solves the off-peak voltage issues and avoids an extra transformer bank. Also, this STATCOM allows for better voltage modulation, allowing the TVA greater room for bulk trading.Spoken simply, a STATCOM controller either derives or absorbs reactive power at the point of general coupling.

2.1 The Principle of Operation

Reactive-power or reactive frequency stat (STAT) switches. The solution provides the power generation and current absorption entirely through electronic process (VSC). the

same as in Fig. 1(a), which includes a single-line STATCOM, as shown by the magnet, attached to a bus by magnetic coupling. By comparison, in Fig. 1(b), capacitor banks and shunt reactors are considered to be inconvenient since both can increase voltage and reduce current output, which results in smaller or in noise, but STATCOM reactors are described as having less of both these problems.

In Fig. 1, we can alter the magnitude of the AC voltage Es exchanged between the device and the converter to vary the capacity of the battery (c). increasing the voltage strength of the current in the output leads to the capacitive power in the load. To decrease the output voltage, current; if the frequency of the current is decreased below the utility frequency, then the converter inductive-active systems pick up (or require) the same amount of voltage control drawn from the AC if the reactive capacity is zero, the STATCOM is assumed to be in a "floating".

Similar to varying the phase relationship between the output voltage and the ac device, shifting the phase of the voltage converter will do the same for real electricity. It means that if the converter voltage leads the device voltage, the converter will supply real power to the ac system. The other advantage is that it draws its power from the ac system if the voltage is lower than the main system.

The STATCOM provides the necessary reactive power by sending reactive power among the phases in response to fluctuating reactive loads. When it comes to the internal mechanisms of the converter, it is important to know how the output power translates to or is consumed by the converter. Instead of using an intermediary device to transform direct converters, we link the DC circuit directly to the AC circuit. As soon as electricity flows into the circuit, it must be dissipated (neglecting losses)

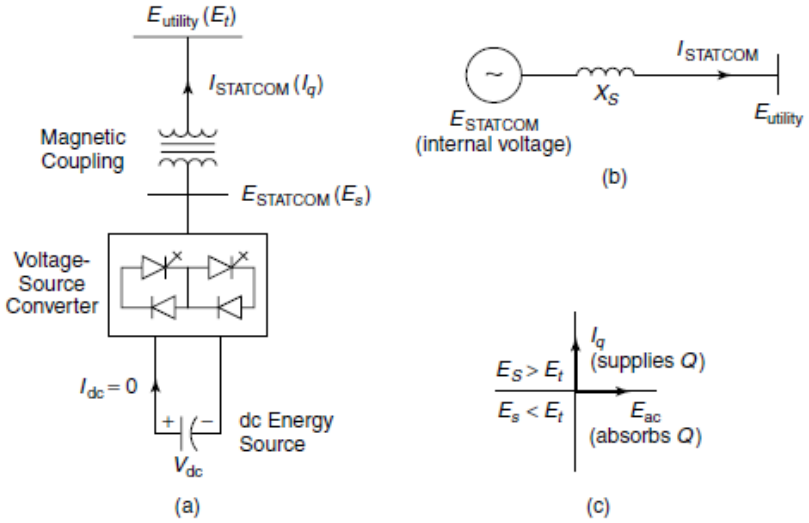

Figure 1 The STATCOM Principle Diagram: (A) A Power Circuit; (B) An Equivalent Circuit; And (C) A Power Exchange

Let's assume the converter delivers reactive electricity. In this scenario, the dc source must supply zero power to the converter. Because zero-frequency power does not have reactive power as an input, it is not essential for the production of reactive power in the DC supply. To simplify, the overall circuit, the converter is a three-terminal plug. If the ac mechanism is thought of as a whole, the converter sets up a reactive-power exchange. However, of instance, the converter's actual power would of course must be supplied from its AC terminals, or consumed by the capacitor connected to the device.

Switches do produce their own power inside the circuit, but they must also be wired to an external capacitor. It is important to have a current direction as well as a voltage source for the primary need for the capacitor. It is deliberately adjusted to provide a steady voltage so as not to add to the ripples in the current. The VSC-output voltage consists of a sinusoidal staircase of voltage through which continuous, non-sinusoidal current flowing from the AC device to the converter. It is however desirable to provide instantaneous power equality at both input and output, which is maintained by varying the current. using converter configurations, it is possible to quantify the minimum

dc voltage ripple and reactive power required by the device.

It performs equally well for either a capacitive or an inductive load. Thus, the STATCOM has half the dynamic spectrum of VAR (this also contributes to a compact design). It is used to help sustain the balanced voltage needed for the VSC activity.

CONCLUSION

In this form of STATCOM, the reactive power is produced from an electrical sources connected to a voltage-meter. Depending on the appropriate output strength and voltage, it may be of the 2-or 3-level variety. Multiple STATCOM circuits are used to synthesise a VSC. In steady state operation, the VSCs employ constant-frequency switching to lower losses from the converter. However, in time-limited fault situations, a pulse width-modulated (PWM) is employed to avoid V-outs from connecting to the ground to reduce voltage spike current. in this way, the STATCOM is able to maintain the characteristics of pure sine wave, even under intermittent conditions.

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THE FLIPPED LEARNING: DRILLING TRANSFORMATION IN TEACHING AND LEARNING

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ABSTRACT

Education sector should keep moving with the change and adapt new transformation for active and effective learning. It should also make a shift and ponder on student-centred teaching tactics which may increase student and teacher's efficacy. Currently, the flipped learning mode has been introduced to support the transformation in teaching and learning. Though, flipped learning is a known area, it has not been much adopted in the teaching learning module. Flipping is essential to be applied as this new change may help the students to think differently, work upon their thoughts, evoke their own creativity apart from studying and depending just on teachers notes. This module may also aid teachers in moving towards new way of teaching embracing computerised learning hand in hand with traditional teaching. Moreover, in the conventional teaching and learning framework, students first interact with the new concept and perceive the topic in the classroom i.e., "group space" and then further detailed study is given as homework where a student individually does the work i.e., "individual space" but here the student limits its thinking to the classroom teaching and teachers notes where he is unable to brainstorm. Flipped learning puts first interaction with new ideas and thoughts individually before getting into group space discussion and activities. The basic idea of involving flipped learning is to evoke innovative ideas, thoughts in students mind in order to develop student's way of thinking for acquiring knowledge. Conventional teaching assumes that students arrive in the classroom with no prior knowledge regarding the concept to be learned whereas flipped

learning states that students get a prior knowledge about the study concept and come to the class with new thoughts and ideas which can be discussed in the classroom and make it an interactive session. Most significantly, this learning module believes in developing an ability to self-regulate the knowledge.

Key Words: Flipped Learning, transformation, self-regulate, innovative ideas and thoughts.

INTRODUCTION

Education at a higher level has always been in a traditional format, historically we have seen that a lecturer or a professor delivering lectures to the students in a closed arena or "sage on the stage" by King (1993), where a teacher transmits the knowledge and the students receive it. Nevertheless, this practice has been criticized since ages as in this type of teaching students in the class are inert and there is less involvement of engaging intellectually and also the learning needs are not completely fulfilled. Conventional lectures are not suitable for higher Education by (Bonwell**, 1996**; Huxham, **2005**; Cashin, **1985**; Young, Robinson, & Alberts, **2009**). Consequently, various educators have promoted technology-based teaching grounded on active learning despite of this conventional lectures continues to prevail as dominant factor of Education.Here's the time when the concept flipped learning was involved and derived by Jonathan Bergmann and Aaron Sams in 2012. They said flipping speaks the language of today's students, mainly it helps the student to speak, discuss, interact in the classroom. Flipped learning helps a student to engage in the classroom, interact with the teacher as well, students try to brainstorm and come up with new thinking and ideas. Flipping is basically evoking innovative ideas, thoughts in students mind in order to develop student's way of thinking for acquiring knowledge through switching the class where teacher provides study materials and presentations as a homework and to be discussed in the classroom, taking up their views. Flipped classroom allows a student to learn and study in his own pace and encourages him to actively participate in the classroom discussion, where a teacher gets an opportunity

to assess students learning.

RATIONALE AND SIGNIFICANCE

Adapting this innovative method in education can be a prime factor for measuring the quality in classroom and developing the education system. Flipped Learning is one of the most advanced methods of teaching that has progressed in the current times. It is nothing but a blended approach of teaching and learning. The objective of implementing this type of method may enhance the student engagement and get rewarding outcomes.

The main benefits of Flipped Learning are that it helps the students to make a shift from traditional learning to updated one. It helps them for active dynamic learning which aids active collaboration for both teachers and students. Flipped Learning also benefits the teachers to accept the change from conventional teaching to playing role of a mentor or coach. The use of technology augments flipped learning procedure by indorsing control of skills which is need of hour. So, it becomes significant to adapt flipped learning for advancement of teacher as well as student.

RESEARCH DESIGN

The Flipped Learning: Drilling Transformation in Teaching and Learning with a conceptual and exploratory study with the help of **Secondary Data**. The conceptual study is completed through subjective study of **Flipped Learning, transformation, self-regulate, innovative ideas and thoughts, need for adapting new techniques in teacher education for developing education system**. This is an indicative study which emphasises on the demand for familiarising and adapting flipped learning in order to evoke innovative ideas, thoughts in students mind in order to develop student's way of thinking for acquiring knowledge and analyse learning outcomes. The scope of the study is to understand the need for new evaluation tools which essential for a teacher to learn innovative assessment techniques and implement it during the course of study. Implementation of such techniques will contribute in making the student teacher

proficient in their area. Implication of innovative practices may widely help teacher educators to develop assessment skills in themselves and become competent enough for practice it and improve the methodology for critical evaluation.

The data collection for this study was through secondary sources in the form of books, magazine, internet and Journals. Th primary data was out of scope due to time constraint which turned up as a **limitation of the study.**

OBJECTIVES OF THE STUDY

The author has considered the following objectives for the study:

- To study the importance of a shift from conventional evaluation techniques to innovative practices for a teacher as well as student
- To study teacher student achievements and learning process analysed with the help of flipped learning
- To study the importance of teacher student interaction and involvement
- To study about how and up to what extent the student tries to brainstorm and express his thoughts and ideas
- To study the importance of technology

LITERATURE REVIEW

Enfield (2013), clarified that students are encouraged and motivated to change learning criteria and shifting from classroom sessions to learn and study anytime and anyplace by the flipped learning method. The utmost convenient study approach can be selected and used by the students while taking up their own pace through the instructions given by the teachers.

Hung(2015), proved that a student's contribution, satisfaction, presentation and performance displayed a optimistic and constructive change after taking up / inclusion of flipped learning in the education system.

McLaughlin and Rhoney(2015), stated that the teachers or educators adapting flipped learning methodology have increased and improved teaching strategies and ultimately developing their skills as well as knowledge.

Kong (2014), specified that teacher opting for flipped learning improves the kind of resources they have, they experience thoughtful discussions and try sharing their instructional performance by using the flipped learning method.

FLIPPED LEARNING

Flipped learning is also referred to inverted learning which give extension to the typical learning aids beyond the classroom pace with the help of online platforms. In this methodology, some of the part or all of the instructions are timely delivered through online sources videos and other media wherein the classroom time is used for student engagement for collaborating actively, hands-on the activities through interactive session. Many educational institutes have praised flipped learning method as it provides opportunities to the students for increased peer interaction and involvement with the study material (Johnson, Adams Becker, Estrada & Freeman, 2015). Flipped learning act as a bridge between these two opposite thoughts/ viewpoints and is probably one of the few pedagogical creation and mode of study that has received much interest and attention. Despite of such increase in interest, there doesn't seems to be an agreement in majority of institutes on what does flipped learning exactly means and how effective it is improvising student learning. Therefore, it is necessary to analyses and adapt research findings to describe the current requirement of knowledge and inform future development efforts and research.

The method focuses on the study that prepares students for the exploring new ideas and interacting openly. The learning objectives of the study is on the one hand to provide students understanding of the basics of their own internal strategies, thinking and brainstorming, and on the other hand to familiarize students with application of qualitative and quantitative methods.

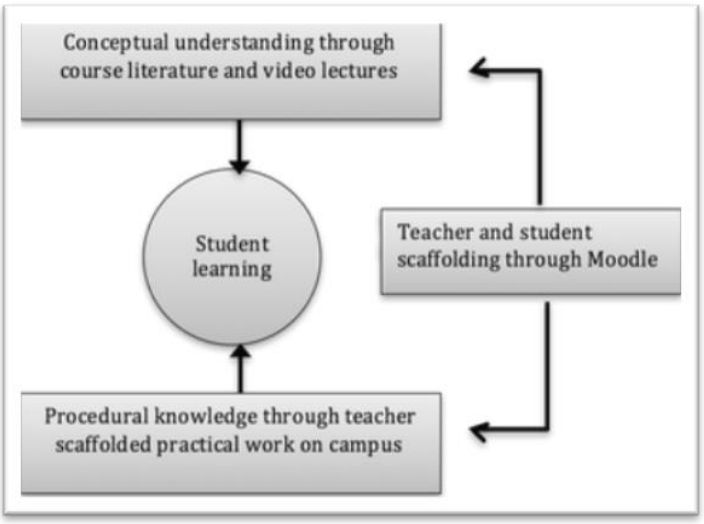

Fig.1 Pedagogical Structure

NEED OF THE STUDY

Flipped learning puts first interaction with new ideas and thoughts individually before getting into group space discussion and activities. The basic idea of involving flipped learning is to evoke innovative ideas, thoughts in students mind in order to develop student's way of thinking for acquiring knowledge

The author considers the need as

- Flipped learning puts first interaction with new ideas and thoughts individually before getting into group space discussion and activities.
- To understand the need of certain modifications to be adapted in order to increase efficacy of a student as well as teacher
- To identify strength and weakness of flipped learning module and implement the probable requirement
- To impart well-organized training to teachers to be proficient with the technology
- To realize that the skilled teachers are means to better students learning

IMPORTANCE OF FLIPPED LEARNING

Flipped Learning is the new pedagogy that has grown in multi-discipline which outcomes have proven effective and empirical. The flipped learning method allows the students to review the topics given prior to learn at an individual pace and apply the gained understanding and knowledge in classroom activities.

- Students are given opportunities to apply the gained knowledge into the real-life situation in collaborative learning environment.
- Increasing interactions through learning, improving student's accomplishment and enhancing their thought processes.
- Stimulate student's curiosity which can also improve students' attitude towards education
- Students receive a custom-made education to suit their learning method

The main purpose of this methodology is it helps the student to be prepared prior to the learning in classroom which plays an important role to make this method positive and fruitful. Why this type of methodology, because when a student come to the classroom, he is unaware about the topic going to be explained in the classroom and while the teaching session he might be blank with no ideas and thoughts in him and will not be able to involve in the learning session actively. Educational institute is a place where a student learns and improvise himself

PROCEDURE

The general features of this pedagogical approach.

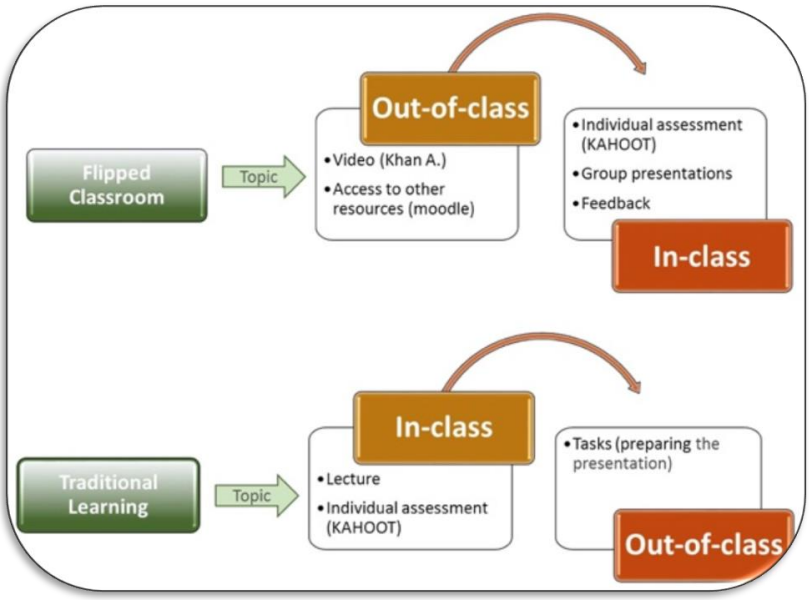

Fig. 2 Learning process of (flipped classroom) and control group (traditional learning).

PROS OF FLIPPED LEARNING

- Students get an education in classroom tailored with the help of students individual learning needs.
- Students gets advanced at faster rate as they try to brainstorm them before the classroom session
- Teachers can provide Just-in-time learning
- Flipped learning helps the student to interact with his own ideas and saties him, which ultimately promote creativity.

PROBABLE CONS OF FLIPPED LEARNING

- This approach needs technology so it can't help students who can't afford to technology
- There might be lot of preparation work that the teacher might have to look into lessons
- Its time consuming for the students
- Students might not watch the instructional video
- Some students are incapable of learning without teacher's assistance

CHALLENGES OF FLIPPED LEARNING

Like any new approach, flipped learning fetches some challenges for instructors and students. The major challenge for teachers can be the hefty workload prior to and during the classroom. Changing a course from a traditional teaching approach to a flipped learning format require a rational amount of front-end investment from faculty members (Ghadiri *et al*., **2014**; Kalavally *et al*., **2014**).

Challenges for students may include tedious online material, technical problems and inadequate knowledge about the new method. Other researchers found that students could easily skip some of the materials in the flipped learning. For example, Ossman and Warren indicated that rather than watching the videos, students read the slides (2014). Velegol and her colleagues made the lecture attendance optional, so students who were able to finish their homework on their own chose not to attend the class (2015).

Although in current time it is generally accepted that net generation students universally use various technological tools and applications in their daily lives, this combination implies that technical issues frustrated students (Clemens *et al*., **2013**; Tague & Baker, **2014**). Students may complain about internet connectivity issue speed which is assumed to have been resolved at least on higher education campuses (Everett, Morgan, Stanzione, & Mallouk, **2014**).

One another challenge student resistance that flipped learning teachers may face. Gone through a traditional method throughout their educational career, students may feel overwhelmed when they face a new approach that allows them to actively participate in the learning process (Amresh *et al*., **2013**; Bland, **2006**; Gannod, Burge, & Helmick, **2008**).

TRENDS IN THE FLIPPED LEARNING

The publication trend designates that there is a thriving interest in flipped learning in education system. Benefits such as gains learning, suppleness, opportunities for interaction and student engagement seem to have encouraged educators to

convert their traditional classrooms to a flipped format. However, the shortage of archived journal publications specifies that research on flipped learning is still in its infancy. The conference proceedings usually adopted a practice-oriented approach; and focused on documenting the design and development process and sharing some preliminary findings and student feedback. Further systematic research investigating different components and claims of flipped learning using various research methods is needed to establish flipped learning as an effective pedagogical approach in the field.

THEORETICAL FRAMEWORKS

The most commonly cited motivation behind converting a course from the traditional to a flipped format was the use of in-class time for *active learning* exercises rather than for lecturing. However, active learning itself is an ambiguous term that has been used and interpreted differently by various researchers and practitioners (Prince, **2004**). A multitude of activities ranging from pausing the lecture for a few minutes and asking students to compare notes with each other to simulations and games would fall under the category of active learning. Some of these activities do not necessarily require flipping the instruction. Therefore, specific pedagogical models that may fall under the umbrella of the term "active learning" such as case-based reasoning, problem-based learning and project-based learning could provide a clearer direction for researchers and practitioners.

Evaluation methods were limited to grade comparisons to measure learning gain and surveys to get student feedback. These methods provide valuable information about the role of flipped approach in student learning; however, they may fall short in analyzing the overall impact. Bishop and Verleger (**2013**) called for more experimental studies to investigate the effectiveness of the flipped approach, but this review indicated that more systematic qualitative and mixed-method approaches are needed to understand what flipped learning entails and how it supports student learning in various ways.

EFFECTIVENESS OF THE FLIPPED LEARNING

Students are given opportunities to apply the gained knowledge into the real-life situation in collaborative learning environment. Increasing interactions through learning, improving student's accomplishment and enhancing their thought processes. Stimulate student's curiosity which can also improve students' attitude towards education Students receive a custom-made education to suit their learning method. Flipped Learning is one of the most advanced methods of teaching that has progressed in the current times. It is nothing but a blended approach of teaching and learning. The objective of implementing this type of method may enhance the student engagement and get rewarding outcomes. The main benefits of Flipped Learning are that it helps the students to make a shift from traditional learning to updated one. It helps them for active dynamic learning which aids active collaboration for both teachers and students.

CONCLUSION

Implementation of such techniques i.e., flipped learning will contribute in making the student proficient and active learner in their area and also improve teaching and assessment methodology. Implication of innovative practices may widely help teacher and student to develop skills in themselves and become competent enough for practice it and improve the methodology for critical evaluation. Compulsion of Implementing innovative tools and techniques may benefit pedagogy where a student's progress and achievements are measured through the course of learning process and the teacher may aspect various requirement of criteria's for evaluating the students which may also help them to set their own standards according to the requirement and improve assessment techniques further. the new pedagogy that has grown in multi-discipline which outcomes have proven effective and empirical. The flipped learning method allows the students to review the topics given prior to learn at an individual pace and apply the gained understanding and knowledge in classroom activities. Flipped

learning puts first interaction with new ideas and thoughts individually before getting into group space discussion and activities. The basic idea of involving flipped learning is to evoke innovative ideas, thoughts in students mind in order to develop student's way of thinking for acquiring knowledge. Adapting this innovative method in education can be a prime factor for measuring the quality in classroom and developing the education system. Flipped Learning is one of the most advanced methods of teaching that has progressed in the current times. It is nothing but a blended approach of teaching and learning. the flipped learning mode has been introduced to support the transformation in teaching and learning. Though, flipped learning is a known area, it has not been much adopted in the teaching learning module. Flipping is essential to be applied as this new change may help the students to think differently, work upon their thoughts, evoke their own creativity apart from studying and depending just on teachers notes.

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COORDINATION OF FACTS CONTROLLERS

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ABSTRACT

These examples show varying outcomes where FACTS controllers don't fit well together. More strategies for FACTS coordinate using a linear-control technique can be found, but the same approaches can often be used to coordinate FACTS as well.

1. INTRODUCTION

In certain cases, they use the original transmission system's power capacity and then expand it, sometimes in others, they make it more flexible or increase its margin of protection to a defined maximum. fast FACTS controllers provide a number of advantages but have the potential to impair machine function adversely with one another. Generally speaking, if the parameters of a dynamic device are adjusted to achieve the optimum results, the power in the residual power system remains static or expressed by static elements with slowly changing output values. An expectation stated on the other controller may be different from what was observed in the actual system; hence, the modified parameters could not be ideal.

2. CONTROLLER INTERACTIONS

An excellent discussion on controller interactions is presented in refs. [1], [2], and [3]. Controller interactions can occur in the following combinations:

1. Multiple FACTS controllers of a similar kind.
2. Multiple FACTS controllers of a dissimilar kind.
3. Multiple FACTS controllers and HVDC converter controllers.

2.1 Steady-State Interactions

When one machine is used to monitor several subsystems, interactive activities arise when various subsystems are regulated. Creative analogy: They are "steady state" designs, which do not use any controller sequencing They describe stable voltage and power support as well as other problems, such as bus adequacy and device support, among others, such as the upper limits of the reactive power requirements. A suitable types of voltage regulation may be steady-state voltage regulation by FACTS (Frequency-Amplitude Communication and Tracking Systolic Transducers) combined with HVDC (Harmonic Velocity Dependent Control).

An effective balance of flow-flow FACTS and equipment can be used to analyse this after the following control experiences. Often conductometric index machines use indexes, such as voltage-stability factors (VSF) are. Coordinated monitoring and a mixture of local and centralised controllers are usually provide similar results.

2.2 Electromechanical-Oscillation Interactions

Finally, FACTS include synchronous engines, compensator systems, and stabilising equipment, as well as generators that run electrically in sequence. Usually, inter-area oscillations have frequencies in the region of 0.8 to 2 oscillations per minute, whereas local oscillations are in the range of 0.8 to 1.8 oscillations per minute. the synchronous supply is provided by generating systems situated near one another, while the inter-area solution depends on power flow between widely separated power plants connected by weak lines. rums, they may be of use in other applications, such as reducing the amplitude of electric oscillations. As many FACTS controls work together, it is possible to suppress the effect of mechanical modes individually. Instead, FACTS controllers should work in conjunction to reduce the area'

sensitivity analysis is used to calculate the mode frequency and damping of influence.

2.3 Control or Small-Signal Oscillations

Both FACTS and individual FACTS can cause oscillations between 2–15 Hertz (the range may even extend to 30 Hz). This system is highly based on FACTS voltage controllers, as the resonance between series capacitors and series-shunt reactors is found to be in the frequency range of 4-15 Hz Control signal rises affect this and other changes in the system gain, which may alter the stability of these oscillations the analysis of these rapid and/frequent waves can be accomplished using the first two kinds of analysis software tools above, which use electromagnetric stimuli (EMTPs) and simulation techniques (analog or digital). If higher-frequency modes are to be modelled, so they can be leveraged through advanced valuation techniques as well.

2.4 Sub synchronous Resonance (SSR) Interactions

Synchronous oscillations can be the product of the series-transmission system and HVDC converter's relationship, the generator's torsional function, or the generator excitation controls. Oscillations that may theoretically affect generator shafts vary from 10 to 50 hertz to 60 hertz Synchronous damping controls have been given for the single DC circuits and DC lines of the SVC/HVDC pair. these oscillations. These control interaction analysis techniques and analysis methods are like those mentioned in the 2.3 section.

2.5 High-Frequency Interactions

For transients over a frequency of 15 Hz, a nonlinear component such as a broad capacitor or a reactor switch causes the problem. To minimise bus crossings, FACTS and HVDC controllers can need to be spaced about three yards apart.

2nd to 5th harmonics is more likely to be present in FACTS controller loops due to the loop amplification Harmonic instabilities can often arise from geomagnetic currents, or saturation, transformer discharge, or both (GICs). To prevent or neutralise these interactions, FACS controllers must be

synchronised. Approaches to certain methods are laid out in Section 2.3.

2.6 The Frequency Response of FACTS Controllers

A FACTS controller's composite-frequency response, together with its associated ac device, is particularly valuable for control system stabilization when integrating several FACTS or HVDC controllers uncoordinated FACTS detectors and frequency response-based time domain measurements (FMRT) are used to extract time responses from person and organised FACTS A FACTS controller uses a current-sensing source to insert a spread of frequencies in the array. The harmonic quality of the bus voltage is analysed by a Fourier analysis. Detailed versions of FACTS controllers are included in many of the modelling experiments.

In order to prevent the action of some device part in the nonlinear field, the injected-amplitude harmonic currents are kept minimal. of 0.58 in injection current angle trigger a firing angle in the HVDC transformers the frequency response of an illustration of the FACTS controller is given below:

2.6.1 The Frequency Response of the SVC

Recommended to be depicted in Fig. 9. Two similar systems are linked by a +50 MVAR SOC at the midway point in the network, providing the ability to move data between both. You can only get usable responses at two different operating points on levels.

Such that it has a reactive capacity of 22.5 mvar at the first point of operation (inductive). in terms of sound, injection, short-magnitude harmonics are involved at frequencies of 5 and 45 Hertz. When one power supply is fed to another, the resulting impedances are equal to the ratio of the voltage and current in the feed source being divided. These figures are: 2 and 3 depict the amplitude and phase of the resistance and capacitance with respect to time (across space) graphs. Capacoustic resonance appears at 33 Hz and seems to become capacitive at the next lower frequencies as it ascends to 33 Hz.

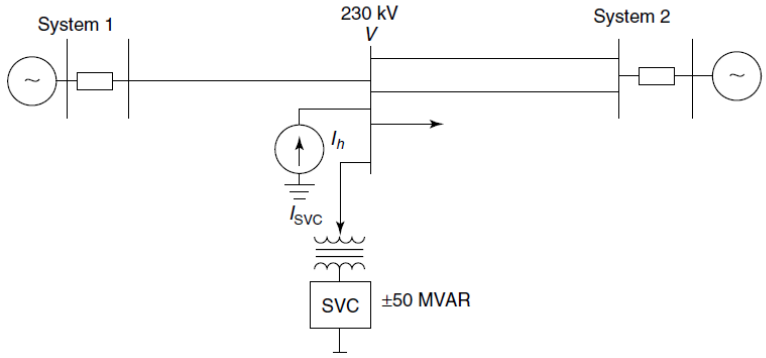

Figure 1 A Study System for Frequency Scanning Of The SVC

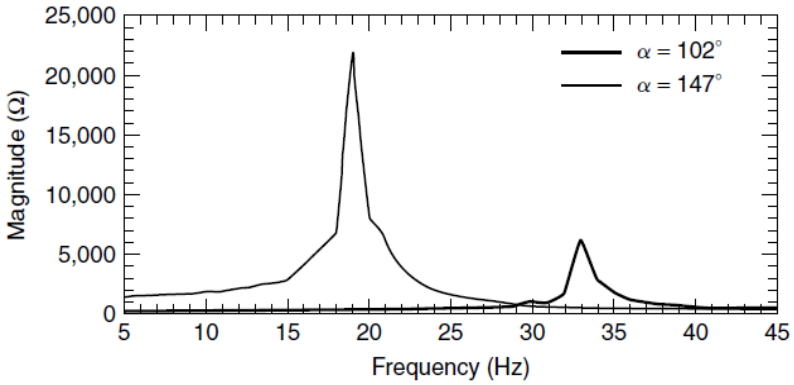

Figure 2
The Impedance Magnitude of The SVC Frequency Response.

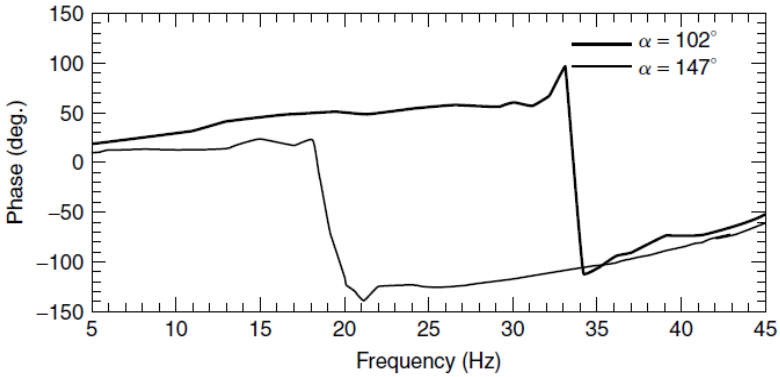

Figure 3 The Impedance Angle of The SVC Frequency Response.

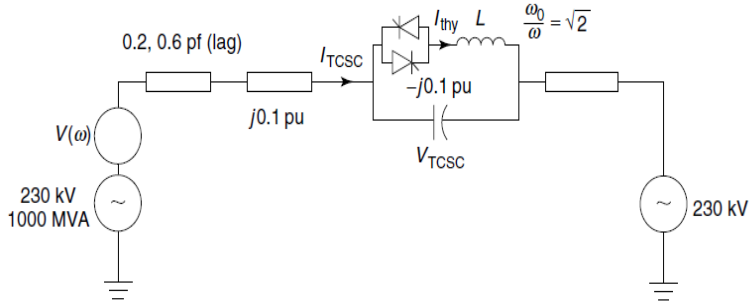

Figure 4 A Study System for The TCSC Frequency Response.

3. CONCLUSION

The transfer function uses the 2nd order filter's second order frequency response. The bus voltage is still regulated at 1.10 volts, with the thyristor voltage injection amount being equal to 0.78 megavar (capacitive). Figures 2 and 3 all show the degree and angle-frequency responses. Resonant frequency is adjusted to 19 Hz, and the SVC modal impedance is three times higher than usual at resonance. the wider the frequency spectrum of action, the lower the firing angle, step

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A CASE STUDY ON SMART TECHNOLOGY USING IN ATM

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ABSTRACT:

The main goal of our framework is to make identification and authentication of people a normal occurrence today. Nowadays Biometric technology is increasing rapidly. Biometric is used for personal identification. We're using biometric fingerprint scanning to gain access to ATM computers. The fingerprint data is stored in the Aadhar card database through the bank's enrollment process. Bank provides authentication to the customer that can be accessed while performing the transaction process. Transactions are carried out if a fingerprint match is identified in the database. After verification, if the fingerprint does not match transaction will be canceled. Using a fingerprint-based ATM system users can make a secure transaction. at the same time, these fingerprints can access multiple bank account in a single ATM system.

Key points : Fingerprint, Aadhar card, ATM Machine and bank account.

INTRODUCTION :

Our main focus is to develop the better security system by using fingerprint based ATM. Biometrics is a technology that helps to make your data extremely secure, unique all the users by way of their personal physical characteristics. Biometric information used to identify the people perfectly by using their fingerprint, face, speech, iris, handwriting, or hand geometry and so on. Using biometric identifiers offers several advantages over

traditional and current methods. Tokens such as magnetic stripe cards, smart cards and physical keys, can be stolen, lost, replicated, or left behind; passwords can be shared, forgotten, hacked or accidentally observed by a third party. There are two key functions offered by a biometric system. One technique is identification and the other is verification.

Fingerprint technology is highly accepted and matured biometric technology and is the easiest to develop and for an advanced level of security at the fingertips. It is easy to implement and it takes minimum time and effort to obtain one's fingerprint registered with a fingerprint identification device. Now a day, in the self-service banking system has wide popularization with the characteristic offering excellent 24 hours' service for customer. Using the ATM (Automatic Teller Machine) which provide customers with the convenient banknote trading is very common.

Automated teller machine is a mechanical device that has its roots embedded in the accounts and records of a banking institution. In the real world, today people are concerned about their safety, for their valuable things. Old concepts and devices are getting modified as per requirement of people. Crime at ATM‟s has become a nationwide issue that faces not only customers, but also bank operators. In day to day life we need to seek new security system. So we develop to provide the maximum level security system. Money transactions play an important role in the nature of trade.

Biometrics and Aadhar card can be defined as a measurable physiological and behavioral characteristic that can be subsequently compared & captured with another instance at the time of verification. These technologies are a secure way and customer can access more then one bank account in a ATM machine without debit or credit card. We can use one ATM to connect multiple bank accounts with more security.

II - AUTOMATED TELLING MACHINE

The term ATM stands for automated teller machine. It is an electronic device that is used by only bank customers to process account transactions. The users access their accounts through a special type of plastic card that is encoded with user information on a magnetic strip. The strip contains an identification code that is transmitted to the bank's central computer by modem. The users insert the card into ATMs to access the account and process their account transactions. The automated teller machine was invented by John Shepherd-Barron in the year 1960. This article discusses an overview of the automated teller machine (ATM).

By using an automated teller machine or ATM we can perform different financial transactions such as cash deposits, withdrawals, transfer funds, information of account, ATM PIN change, and also linking the Aadhaar number to the bank account so that the interaction between the bank staff and the customer can be reduced.

The automated teller machine (ATM) is an automatic banking machine (ABM) that allows the customer to complete basic transactions without any help from bank representatives. There are two types of automated teller machines (ATMs). The basic one allows the customer to only draw cash and receive a report of the account balance. Another one is a more complex machine that accepts the deposit, provides credit card payment facilities and reports account information

Figure 1. ATM transaction

III - EXISTING SYSTEM

The Customer inserts a plastic ATM card with four digit secret pin number if the pin is correct the system allows for the further transaction. Using the ATM customer can access the bank accounts to make the transaction such as cash withdrawals, cash Deposit balance enquire etc.., the disadvantage is without ATM card we cannot do any transaction in ATM, that is the big problem are faced by customers and some other problems like smart cards and physical keys, can be stolen, lost, replicated, or left behind; passwords can be shared, forgotten, hacked or accidentally observed by a third party. The banks required a better system to maintain security for the customer to do the transaction in their banks. To overcome these problems, the developed this fingerprint based ATM system.

IV PROPOSED SYSTEM

The proposed system to increasing the safe and security by introducing fingerprint system. The advantage of finger-scan technology is accuracy. By using fingerprint system many Bank Account transaction can access in a ATM machine and its reduce time. They are we need not to carry ATM card in your wallet and no chance of loss card, CARD can be stolen, password can be shared or, hacking many customers are satisfied by our system because of quick and better service. Moreover, initially we store the Aadhar card link to bank Account so that fingerprint connect to aadhar database. Customer having more bank account then they connect to Aadhar link in all banks. So it easy access all bank transection in single ATM machine without cards.

V SYSTEM MODEL

In the plan of biometric based frameworks, an innovation that utilizes the idea of example coordinating is utilized. Two information devices and four output devices make up the automated teller machine. Speaker, show screen, receipt printer, and money investor are instances of info gadgets, while speaker, show screen, receipt printer, and money contributor are instances of yield gadgets.

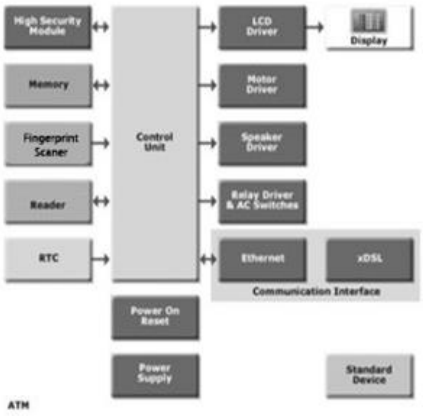

Figure 2. ATM-Block-Diagram

Figure 3:System Diagram

These qualities are then coordinated, prepared, and contrasted all together with check the proprietor's character. Both equipment and programming parts are utilized in the gadget. The equipment segment contains an electronic pack, sensors, cameras, and different gadgets to record input information, while the Software utilizes calculations for security improvement and the age of an exceptional layout ID for every individual as their own personality.

Input Devices

The input devices like Fingerprint Sensor and keypad.

Fingerprint Sensor

The Fingerprint Sensor is an input device that peruses information from a client. The Fingerprint peruser is essential for the distinguishing proof of your specific List of Bank account Details and matches the Aadher card database. The Fingers pushed on the sensor peruser which catches your Bank account data for example the information from the Aadhar card is given to the host processor (Bank worker). The host processor accordingly utilizes this information to get the data from the client.

Figure 4. ATM Fingerprint Reader

Keypad

The fingerprint is recognized after the machine asks for further details like your withdrawal and some other transaction.

Figure 5. ATM Keypad

Output Devices

The output devices are speaker, display screen, receipt printer and cash depositor.

Speaker

The speaker provides audio feedback when a particular key is pressed.

Display Screen

The display screen displays the transaction information. Each step of withdrawal is shown by the display screen. A CRT screen or LCD screen is used by most of the ATMs.

Receipt Printer

The receipt printer prints all the details recording your withdrawal, date and time, and the amount of withdrawal and also shows the balance of your account in the receipt.

Cash Dispenser

The cash dispenser is the core of the ATM. This is a focal arrangement of the ATM from where the necessary cash is gotten. From this segment, the client can collect the cash. The cash allocator should tally each bill and give the necessary sum. On the off chance that at times the cash is collapsed, it will be moved to another part and turns into the oddball bit. Every one of these activities are done by high-exactness sensors. A total record of every exchange is kept by the ATM with the assistance of a RTC device.

ATM Networking

The web access supplier (ISP) additionally assumes a significant part in the ATMs. This gives correspondence among ATM and host processors. At the point when the exchange is made, the subtleties are contribution by the cardholder. This data is given to the host processor by the ATM. The host processor checks these subtleties with an approved bank. On the off chance that the subtleties are coordinated, the host processor sends the endorsement code to the machine so the money can be moved.

CONCLUSION

This technique for biometrics ATM frameworks will furnish us with headways in innovation just as a more solid cash handling machine later on. Lately, current ATM networks have pulled in countless programmers and fraudsters who participate in fake exercises, for example, pin cushion overlays, card skimming, etc. As referenced in the agreement, clients' fingerprints and Aadhar cards are perceived Databases. Since each administration framework currently gathers singular biometrics to check an individual's character utilizing an Aadhar card, because of the above strategy, we can induce that biometric ATMs can give undeniable level security and can deal with exchanges from numerous financial balances. In this paper, our main aim is about Aadhar card link to bank Account so that fingerprint connect to Aadhar database. so it easy access all bank transection in single ATM machine without cards.

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ANALYSIS OF THYRISTOR - CONTROLLED SERIES CAPACITOR (TCSC)

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ABSTRACT

The study of TCSC action is done in the Vernier mode. Transmission current is considered an external and is modelled as a current (t). The current is therefore modelled as being sinusoidal, as little harmonics cannot be found in the measurements. However, the study described below is only valid up to a certain degree. Stresses and strains arising from operating under these circumstances are exceedingly uncommon, and the terms recorded in the text below are used often.

1. ANALYSIS OF THE TCSC

The current through the fixed-series capacitor, *C*, is expressed as

$$C\,\frac{dv_C}{dt} = i_S(t) - i_T(t)\cdot u$$

That is, while the thyristor are conducting, the switching vector called u 1 is in motion. However, if thyristor, that is, when switch S is open, there is no radiation from either. Thyristor value and the like currents are typically known as thyristor.

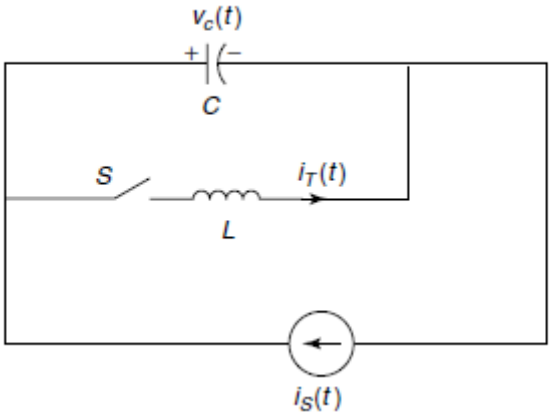

Figure 1 A Simplified TCSC Circuit.

$$V_{CF} = \frac{4}{\pi} \int_0^{\pi/2} v_C(t) \sin \omega t \, d(\omega t)$$

$$X_{\text{TCSC}} = \frac{V_{CF}}{I_m} = X_C - \frac{X_C^2}{(X_C - X_L)} \frac{2\beta + \sin 2\beta}{\pi} + \frac{4X_C^2}{(X_C - X_L)} \frac{\cos^2 \beta}{(k^2 - 1)} \frac{(k \tan k\beta - \tan \beta)}{\pi}$$

2. MODELING OF THE TCSC

It's based on voltages and currents in the capacitor and discrete-time dynamics in the thyristor. It is a difficult and demanding job.

2.1 Variables-Reactance Model

TCSC model in figure 2. In this quasi-steady approximation, the dynamics, the reactance varies at the resonant frequency in a quasi-static manner. Variations such as the TCSC answer with varying firing angles are not accounted for in the model.

No other dynamics were expected to exist in the transmission method, only in the frequency domain of generators and PSS. Since the line dynamics have a frequency of 1 to 2 cycles per second, the statement is right.

Previously, as shown in Fig. 1, the reactance-capability curve of a single-module TCSCs was shown to have two peaks. Nonetheless, this distinction is narrowed thanks to the use of an MTS. The variable-reactivity TCSC paradigm holds true for multimodal TCSC setups. This model is mostly used for intra-area study, and when the reactance boost (c XSC) is less than 1.5 the precision is nearly Perfect.

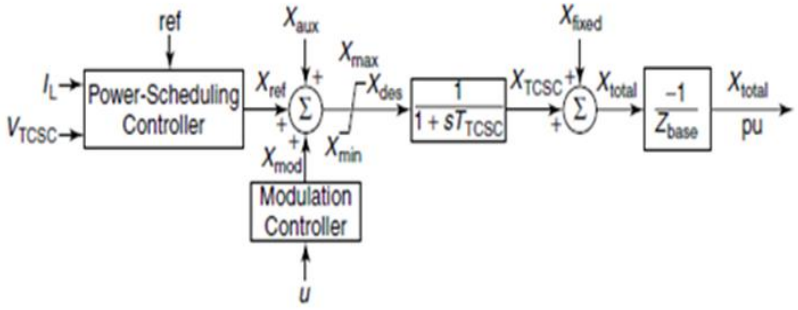

Figure 2 A Block Diagram of The Variable-Reactance Model Of The TCSC.

2.2 Transient-Stability Model

With the basic variance concept of stability studies, a standard transmission is determined from a power-scaling control using the target flow definition of X ref A X ref value can be adjusted by hand on the fly if supplied by an energy centre, and it denotes the start point of the TCSC in relation to RCs (if any). Additional modulation is made from the controller, X mod, for example to improve the resonant value. This is received at the summing junction, which is often used as an open-loop signal, known as the open flow auxiliary signal, Aux X. reactor with a magnitude X Reactance may be generated at a finite delay in conjunction with the answer of the TSC. It can be modelled by a delay circuit with a time constant, such as 15–20 milliseconds, known as the standard delay.

The lags performance of the buffer is adjustable as seen in Fig. 1, dependent on the relative reactance curve as determined by the application of TCSC Thus, the resultant solution of the XSC + FC part combination is applied to the total solution of the X-fixed antenna.

Multiply each individual units of the total reactance, Ztotal, by the equalisation value, Epeak,

$$Z_{\text{base}} = \frac{(\text{kV}_{\text{TCSC}})^2}{\text{MVA}_{\text{sys}}}$$

where kV_{TCSC} c the rms line–line voltage of the TCSC in kilovolts (kV) MVA_{sys} c the 3-phase MVA base of the power system Capacitive reactance has a positive meaning, so TCSC multiplies it by a negative to produce consistent load flow and stability in current analysis. The initial operating point for stability tests, X ref, is selected at The Creative.

$$X_{\text{ref}} = X_{\text{total}} - X_{\text{fixed}}$$

In the figure, the reactance X-Y representation of the multimodal TCS can be clearly approximated by the X-Y one shown in the figure the shape of this graph matches well with the vector reactance model, and the influence of TSC transient loadings can be measured from this graph.

To offer a fair comparison, Fig. 6 has marked the current as a series of distinct values for various components. at times of high line current, only certain TCSC modules can switch into bypass, which lowers the overall line current and therefore lowers the overall need for all of the TCSCs in bypass.

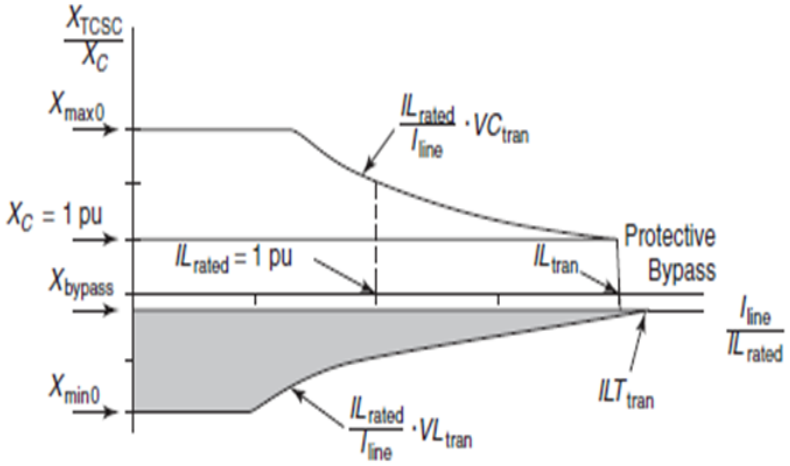

Figure 3 A Simplified Reactance-Capability Curve of A Multimodule TCSC.

Typical TCSC Data for Stability Studies (TCSC with Capacitive-Vernier Capability Only)

Input Data	Description	Units	Typical Value
kV_{rated}	Rated rms line–line voltage	kilovolts	—[a]
IL_{rated}	Rated rms line current	amperes	—[a]
X_C	Nominal TCSC reactance	ohms	—[a]
X_{fixed}	Fixed compensation	ohms	—[a]
T_{TCSC}	Time constant associated with the TCSC firing control	seconds	0.015
X_{bypass}	TCSC reactance for the bypass mode	pu of X_C	–0.15
$X_{max\ 0}$	Upper limit of TCSC reactance	pu of X_C	3
VC_{tran}	Maximum voltage of the capacitive-vernier region for the transient overload	pu of $IL_{rated} \cdot X_C$	2
IL_{tran}	Maximum transient line current	pu of IL_{rated}	2
T_{delay}	Protective-bypass recovery delay	seconds	0.025

[a] — indicates that the value is dependent on a specific application.

2.3 Long-Term-Stability Model

The length of the voltage and current working conditions affect the TCSC's ability curves. In general, TCSC operates in two time-limited regions: a transitory zone, which lasts 3–10 seconds, and a temporary area, which can reach a maximum of 30 minutes. The X-I reactance response curve as seen in Figure 2, with the information in Table 1.

It is essential to have an overload management feature in a control system that can last for long time periods of time. These parameters maintain track of TCSC variables, but also adjust the XMAX and XMIN limits, for which they modify XMAX and XMIN. If the controller has been examined, the same changes are applied to it.

3. CONCLUSION

While the constant- variance model does account for the underlying TCSC reaction time, the variable-rate model does not take into account the dependency on the operating conduction angle. Often, the TCSCs may only be used for the operations with a power swing of 2 Hz or less. The model is commonly employed in industrial damping programmes for its simplicity, as well as in initial system-and-predictive studies of the TCSC An theory

behind the model's popularity is that controls to correct the TCSC reaction are part of the control scheme by the maker, which means they are still accessible, and so are perfect. Hence, the model predicts the actual answer. Where the answer time of the TCSC fails to match reality, a more refined model must be created that better reflects the lag time.

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HYRBRID TEACHING: TEACHING STRATEGIES TO OPTIMIZE LEARNING SPACES

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ABSTRACT

The arrival of new information and communication technology in education has created a drastic change and altered common approaches in teaching and learning. Due to this covid pandemic situation, the present teaching and learning now focus more on the learner and his needs. The learner expects more interaction with the learning materials, with their peers and resource persons, and studying independently at their own pace. Hybrid learning is not a mere combination of face-to-face learning and online learning but also a combination of various methodologies. In this learning, lectures can be replaced by interactive activities under the supervision of the instructor. Due to it the teacher has more time to interact it the individual students and enhance the quality of education with the help of technology. It increases more convenience and flexibility, improves learning outcomes, and improves the efficiency of classroom use. The success of hybrid learning requires a reconceptualization of teaching, learning, and assessing. To transform the traditional learning environment into hybrid learning, the teacher/instructor must carefully examine the learning objectives and develop the methodology and assessment process. This new learning methodology will meet the challenges of expansion and cater to the needs of students. It helps to adopt

new technologies and explore new paths to reach the goal of quality educational opportunities.

Keywords: Hybrid learning, assessment, blended learning, communication technology

INTRODUCTION

Every learner is unique. Every teacher is unique. And every learner-teacher relationship is unique- Brown, 1987 Hybrid instruction is an innovative educational model, sometimes also called blended learning. It is defined as "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences". This learning strategy combines live instruction with web-based delivery and allows instructors to make better use of classroom time, which is at an increasing premium these days (Tatiana Usova,2011). Hybrid learning environment gives students the privilege to understand and to explore the real world issues through authentic learning experiences, facilitated in an online learning environment (Ellis, 2001). It combines online with face-to-face learning. The goal of hybrid learning is to provide the most efficient instruction experience by combining delivery modalities (Kumar,2012). Hybrid learning terminates the conventional start –to –end notion of acquiring education, and in turn the concept of lifelong learning endeavor that can be acquired throughout the persons individual life span, but courses should by through the learning stem (Alnajdi,S.M.2014). The role of technology in learning requires a delicately balanced blend of traditional and innovative pedagogical initiatives where learner's presence dictates and outcomes.

LEARNING AND HYBRID LEARNING SPACES

The COVID-19 pandemic radically disrupted every aspect of life, including education, and left educational institutions clamoring for systems and structures that ensure a continuation of learning for all students. Remote learning experiences implemented by schools and universities during the pandemic revealed challenges, including equity, access, and capacity. The educational models of teaching during pandemic situation are as

follows.

Partial opening- Partial opening of the schools allow specific students to attend the traditional school environment and many students attend their class through virtual mode of learning.

Synchronous and separated - Some educational institutions are conducting face-to-face and online instruction at the same time. Some students are in-person while others are joining the same class remotely.

Rotational - Other schools are rotating students on and off campus throughout the week.

Hybrid learning is a mix of all models. It create a learner-centered experience that is profoundly personalized, relevant and engaging. It incorporates peer tutoring, self-assessment and collaboration among instructors and peers. It is students centered method. With digital engagement it can enhance and accelerate learning by providing student-centered approaches to meet diverse learner's needs. Hybrid learning spaces can take account of the interactions between learner, teacher and researcher to extend how learning is optimized. Teacher can utilize variety of strategies as follows

Small group discussion- In this students are break students into small groups to solve problems, discuss concepts, or debate topics. Students joining remotely can work with students attending in-person to engage in the small group discussions.

Hands on activities- It helps the students to practice or visualize the concepts.

Demonstrating the concepts- Students should be provided with the enough time to process and practice concepts individually.

Reflecting- In this students reflect on a question, and not allowing anyone to raise their hand to answer the question until everyone (both in-person and remote students) is showing a "thumbs-up.

Free to collaborate - Asking students to change their status to red if they are still working or they are having trouble with a

concept and to change their status to green when they are finished working or feel confident with the concept. Remote students can change their statuses to busy for red and available for green; in-person students can use a notecard with a red dot on one side and a green dot on the other side and flip to the appropriate selection.

Online assessment- teacher can evaluate the students' performance with the help pf Creating an @forms or Polly poll, , or a Kahoot or Quizlet activity and ask all students to participate

CONCEPT OF HYBRID LEARNING

The term hybrid learning has been now commonly used, particularly in corporate and higher education settings. Graham, 2005 have been identified four main principles of the hybrid learning methodology so far:

- a thoughtful integration of face-to-face and fully online instructional components;
- innovative use of technology;
- reconceptualization of the learning paradigm; and
- Sustained assessment and evaluation of hybrid learning (Klimova,B.F.,& Kacetl,J. 2015).

The principle involved in the hybrid learning are

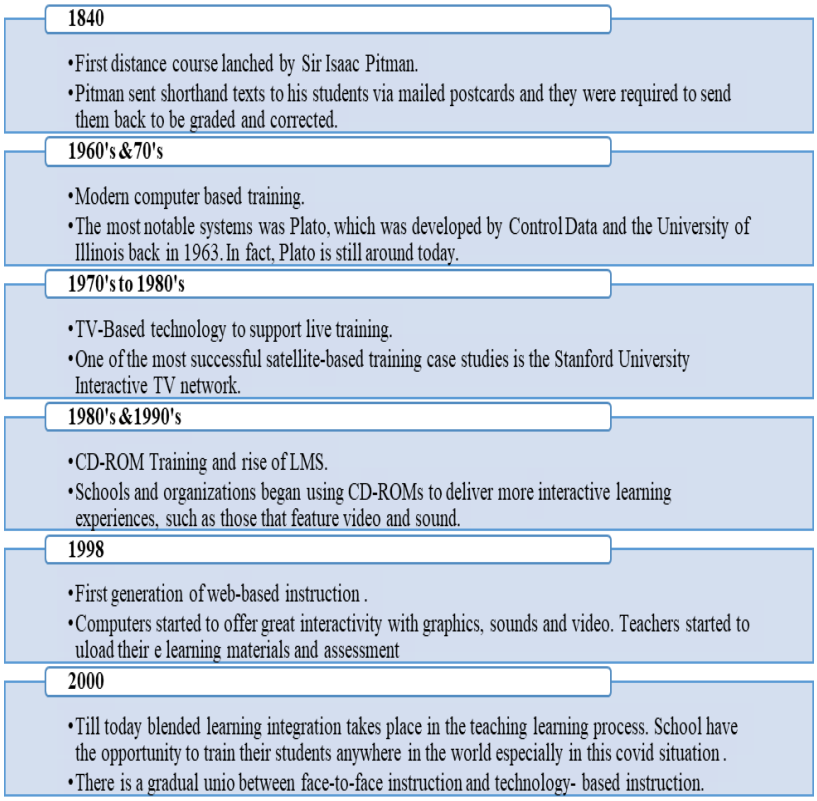
It attempts to enrich the benefits of both environments and successfully meet the diverse students' needs and preferences.

Any technology should be applied in a pedagogically appropriate way and used for creating and maintaining socially situated and highly interactive learning (Vaughan, 2007).

It tries to incorporate new emerging pedagogies and learning theories such as constructivism or activity theory with the new challenging roles of students and teachers in the process of acquiring knowledge and its understanding.

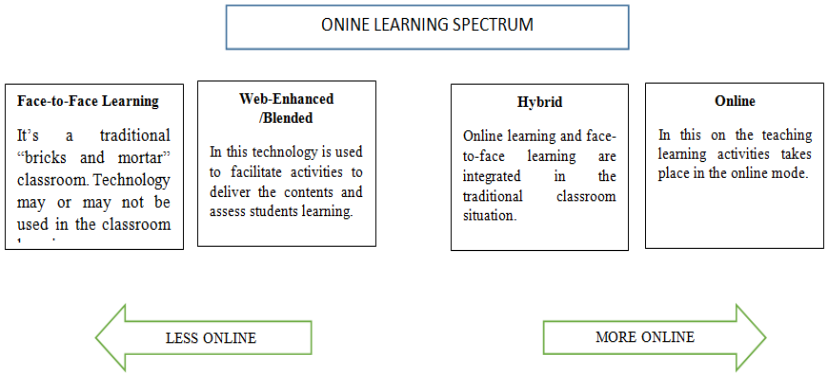
The hybrid learning methodology should ensure the quality and effectiveness of education.

DEVELOPMENT OF HYBRID LEARNING



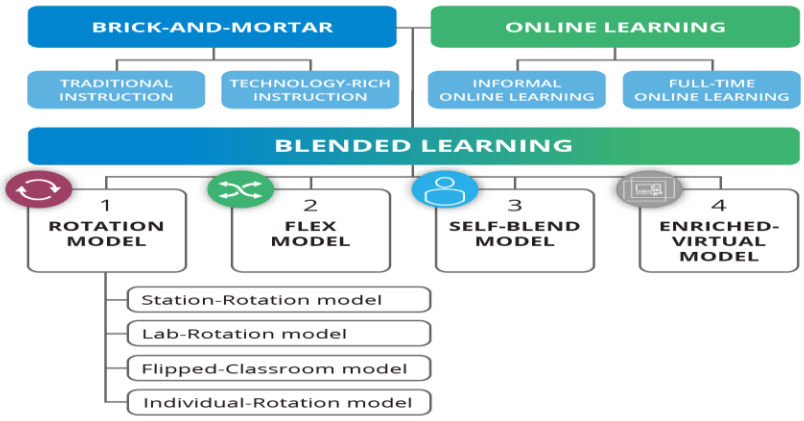
HYBRID LEARNING MODEL

Hybrid learning model vary based on the content and teacher expectations for the subject. , hybrid and blended are but two terms in what we might think of as a larger "online learning spectrum"



HYBRID LEARNING IN TEACHING

The current paradigm sees teaching and learning as social processes where the students are active co-constructors of knowledge with their teachers. The teacher is becoming a facilitator, mediator, mentor or a coach. Hybrid learning is a teaching method where teachers instruct in-person and remote students at the same time. In hybrid learning models, asynchronous teaching methods can be used to supplement synchronous, face-to-face instruction. It merge the online learning and in person learning following picture is the example of hybrid learning model.



STEPS INVOLVED IN HYBRID TEACHING LEARNING

The following are the steps involved in the hybrid class planning for the subject

Step 1: Start at the Foundation- Each course has a goals and

objectives. It contains picture of the course which will help to drive the course entire development process.

Step 2: Plan Assessments- It is the second step in the hybrid teaching learning process. Teacher should plan both the major, summative assessments (projects, portfolios, etc.), as well as smaller, formative ones (homework, discussions, etc.).

Step 3: Create a Course Map- Teacher must create a chart (course map, table, etc.) that sequences what the units/modules will be, the order they should go in, and what resources and activities you plan to provide along the way within each module.

Step 4: Plan Activities - Identify activities that capitalize on the strengths of each type of environment (online or face-to face), and include those in your course map.

Step 5: Create/Find Content Developing online - content is the most time-consuming aspect of designing a hybrid course. Plan to carve out the majority of your course development time on this step.

Step 6: Ensure for Quality- At this point, teacher should have an entire "draft" of the course. Now it needs some editing and refinement. Teacher should go online and find some quality checklists that apply specifically to hybrid courses and use them to "grade" the course. She must communicate with the students and ask them to give you feedback on your description of the course. Teacher can even do pilot study about her course with some willing students or fellow faculty members, and ask them to provide with written feedback which will help to upgrade the course.

BENEFITS OF HYBRID LEARNING

The goal of hybrid learning is to combine the two formats to create a singular learning experience without any weak spots. The benefits of hybrid learning are:

A flexible learning experience- It gives a flexible learning schedule, flexibility in teaching modes, flexibility in how students engage with their learning materials, and flexibility in collaboration and communication between peers and their

instructor. For students who aren't able to attend classes' in-person, the hybrid learning environment allows them to learn remotely from home.

Synchronous communication opportunities-Few learning experiences match the immediacy and intimacy of in-person academic discussions. The face-to-face aspect of hybrid learning benefits from the opportunity for real-time engagement between peers.

The freedom of independent academic exploration- Online learning comes with many freedoms. Those students who excel at self-management and independent learning will thrive under these freedoms: the freedom to learn from the location of their choosing, the freedom to revisit materials any number of times at any pace, and the freedom to develop an in-depth asynchronous discourse with your peers.

More efficient use of resources- It will help to plan the teaching resource for each lesson and increase the use of online resource in the classroom.

Personalized Learning: The hybrid approach to learning makes it possible for every student to learn at a pace that is comfortable for them, thereby increasing retention. Students can participate in a variety of synchronous and asynchronous learning activities that are aligned to their learning styles, thereby helping them gain a deeper understanding of the subject matter. Due to a smaller group, teacher – student interactions can be much more personalized and effective.

Increased flexibility: A hybrid approach gives control to the students over the time, place and pace of learning. This flexibility often translates to increased attendance and participation in the classes.

Sophisticated assessments and reporting: Comprehensive student evaluations, peer benchmarking facilities and granular reporting are all made possible through the use of technology in the Hybrid learning model.

Instant Feedback: Customized assessments, participation in live lectures, live chats with teachers are ways of providing immediate feedback to students that is very valuable for learning.

Use of technology to increase scope of personalization and engagement: Use of Artificial Intelligence will help to customize learning to suit different learning styles that eventually leads to better learning outcomes. Gamification, self-paced learning, short videos with inter-leaved exercises are different ways in which technology can help make the hybrid learning environment more productive.

CONCLUSION

Hybrid learning can be employed in the teaching learning process which contribute to pedagogy and supports more interactive strategies. It encourages collaborative learning where students and educators work together in their own pace. Teachers and students both are able to get immediate feedback that in turns is favourable for teaching learning process. Face to face interaction is highly motivating for both the teachers and students and it gives a human touch to the process. Student interaction with course content- traditional mode of teaching and the school campus provides student time to interact directly with their course content through printing material and ICT mediated learning provides them indirect interaction with their course content in a versatile and diverse interesting way. The videos provide required realism to the content and sharing on blogs and visiting e-books provide new and updated perspectives to the content. Peer group interaction- inside the school campus students learns by formal means and they also learn informally when they interact with their peer groups.

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TRANSITION FROM TRADITIONAL TO ONLINE TEACHING USING INNOVATIVE TECHNOLOGIES

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ABSTRACT

The education system has always been oriented in the direction of traditional classroom method of teaching. Present pandemic situation has opened the avenue of online learning. It has been observed that online teaching has taken precedence over the traditional classroom teaching. Online education was introduced with the aim that learner should not be deprived of any knowledge and every one should have the equal opportunity to study. Traditional teaching demands physical presence of students in the class with. face-to-face interaction. In the present crisis this is not possible, and has been replaced by virtual classroom learning. This led to the transformational approach towards bringing the classroom environment live and virtual using innovative technological solutions for teaching and learning.Online learning has the advantage that the learner can take the session any time any where.it is observed that a blend of traditional teaching and online teaching will yield more convincing results. This Blend is named as Hybrid or Blended Teaching. Even Flipped Classroom was developed in accordance with this. In this paper, various online teaching solutions for every aspect of teaching learning process is presented. platforms like google classroom, zoom, conference app, for delivering lectures, software like MOODLE, MOOC, LMS, LeD, WordPress, for content management and comprehensive studies. for evaluation, tools like quiz, questionnaire, poll etc., are presented so as to make learning more interesting. As it is well known that the traditional teaching is more teacher centric but

the usage of the mentioned technologies prove that online teaching is completely student centric. The pros and cons of these online solutions are also discussed.

Keywords: Online Teaching, Blended Teaching, LMS, Moodle, MOOC and others

INTRODUCTION

This is a fact that our education system still relies on traditional methods and the present condition of pandemic has generated the need to combine the traditional teaching with modern teaching aids for a better and advanced education system Martinez [1] discussed about the COVID-19 pandemic and how there has been an increasing move towards teaching online because of shutting down of schools, colleges and universities for an indefinite time as the only option left . The present pandemic has caused a lot of harm to almost all walks of life with everything coming to a standstill. But it is also a blessing in disguise as people have adopted and using technology to wade away the present situation by going online.

This technological advancement has facilitated and strengthened the education. In the field of education, technological progress is directed in the development of many information and communication technologies (ICT). ICT's always impact the development of teaching and learning processes Ursula Holtgrewe_[2] presented the future and the present of work in information and communication technology. Cohen, E [3] et.al suggested that the concept can be better understood when is integrated into a context in which technology is used in order to meet people's need to learn and evolve.

Online education allows for the elimination of spatial-temporal barriers, as well as access to a large amount of information, with different formats. It has also led to the improvement of students' motivation, involvement and attitude towards educational content. The e-learning method becomes a pedagogical tool that facilitates access to learning for the whole of society. This method has a history long back dated to 1993. Prior to that date, distance learning was widely used for informal

education. This method of teaching is currently on the rise due to COVID-19 pandemic. Its flexibility in terms of location, time, effort and costs, makes it the most appropriate option for training and evaluating students. Learning abilities in students has increased due to online teaching as they are more motivated to choose learning mode of their choice and subject of their interest.

Traditional classroom provides opportunities to the students to work in teams or group. Mamta Thakur [7] has studied the role of team work in improving affective abilities of engineering mathematics students. In the present scenario this activity lacks its essence, instead online group meetings are generated to fill the gap. Lokanath Mishra [4] et.al has studied about Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. The paper employs both quantitative and qualitative methods to study the approach of teachers and students on online teaching-learning modes and also emphasize on the implementation process of online teaching-learning modes. De-schooling society Illich [5] suggested purposes of education system which include provision for the learner to access the resources at any time in their lives and share it to create opportunities. Lederman [6] justly stated that due to the COVID-19 crisis teachers and students both find themselves in the situation where they felt compelled to embrace the digital academic experience as the ultimate goal of the online teaching-learning process. Motivated by these studies, the present paper discusses all possible emerging technologies which facilitate online teaching and learning.

EMERGING TECHNOLOGIES TO FACILITATE ONLINE TEACHING AND LEARNING

Online education has a transition from the traditional method to the modern methods of teaching-learning .transition of Regular Classrooms to virtual class rooms and from in -person seminars to online webinars education process has transformed itself. Earlier e-learning, distance education and correspondence courses were popularly considered as the part of non-formal

education, but now it is slowly replacing the formal education system. The use of e-learning by the members involved in the teaching and learning process becomes a challenge, because an average level of digital competence is required to apply it. The teachers and students need to be trained in the use of the various technological and digital resources. Some educational institutions were not well equipped or prepared for such an emergency. The reasons must have been from the non-availability of technical resources to untrained staff and students.

The COVID-19 pandemic has forced the universities to close face-to-face education and send the students home and introduce courses through online portals. To continue the process of learning, universities and other educational institutes decided to take online classes for their students. Various suggestions were sought from all stake holders of the education system. Earlier the traditional classrooms were the source of knowledge but now due to this pandemic, educational institutions are adapting the change in teaching learning methods by opting for technologies like Zoom meetings, Microsoft platform, Cisco WebEx ,Blackboard and Google Classroom to deliver their lectures

In the study it has been observed that most commonly used platforms are Google meet, Zoom meetings , MS teams and Cisco WebEx. Both the learners and the instructors were asked to install and became familiar of these platforms so as to make the teaching and learning process successful. The major difficulty faced was of internet issue low band width was treated as the major problem faced during online sessions. not only students But faculties also faced internet issues during the sessions.

To enhance the teaching -learning process educators have been looking for apps, platforms which consume considerable data and is free to use The difficulties also include the availability of device to take the online session. Many platforms are improvised so that they are compatible with IOS, Android phones also so as to reach larger chunk of learners. Moodle LMS: Learning Management System (LMS) is a very good

platform to engage student in learning process .But it has got its own restriction Now a days MOOC are also preferred . Massive Open Online Courses (MOOCs) are free online courses available for anyone to enroll and learn as per their convenience. MOOCs provide an affordable and flexible way to develop skills like Coursera, Edx courses NPTEL SWAYAM Courses, IIT Bombay X platforms are of the same kind with some specific learning criteria.

To reach large number of learners, many institutes and academies have preferred YouTube and websites using WordPress as a channel, where they will post Learning Dialogues (LeD). These LeD's are small videos of not more than 5 minutes to teach a particular topic of the subject. This really helps the learners as they feel that they are not burdened with the huge syllabus. Google Classroom is the most preferred mode of content sharing platform through which both learner and instructor can interact in a nonverbal way.

Teachers have implemented many ways to make the process of teaching innovative. The methods involve adjusting the phone over the book or board in such a way that the learner can see the content easily. Then there comes the improvised approach where the ppt of the content is prepared and screen sharing is done. All above mentioned platforms are suitable for screen sharing. Many apps have flooded the technological market which have features like Live class Recording, Automated Attendance, Interactive Online Whiteboard, Online Tests and MCQ Assessments, Automated Grading, Content Sharing, Inbuilt LMS and more. Teachmint is one such free download app. Some paid are FoxFi, Audioboo, Animoto, Evernote, TeacherKit, Educreations etc. Also, there are some chatting apps like Whatsapp, google hangouts, slack which are very good platform for sharing notes, opinion, and discussion about any topic of interest.

Assessment Tools has made the process of evaluation easier. Many educators are making use of wide range of such tools not only for their subject evaluation but also for their

research survey. Quizzz, Kahoot, Google forms, questionnaire creators, live Polling tool Mentimeter etc., are really a boon to all teachers.

Some of the most popular online communication platforms that are revolutionalising the whole education system across the world in post-COVID-19 circumstances are Start. me, Neo, Class time, Classwize, Ted-Ed, Coursera, Google Classroom, Bakpax, Pronto, Skillshare, ClassDojo, Edmodo, Blackboard Learn, Parlay, Docebo, Feedback Fruits, Udemy, WeVideo, WizIQ, Flipgrid, Codeacademy, Gynzy, Adobe Captivate, Seesaw, Edx, GoGuardian, Elucidat, Kami, Pluralsight, G Suite, Otus, Articulate 360, Floop, Future Learn, Hapara, Shift, Lectora Inspire, Kialo Edu, Buncee, LanSchool and many more.

Flipped Classroom, Hybrid education, Blended class room are the best suited teaching methodologies which are giving excellent solutions to the problems which once were treated difficult with traditional methods of education. These are the integration of latest edtect tool with the traditional teaching methods. They are designed to meets the needs of students, teachers. This mode of imparting knowledge can be used for professional development of the staff, to reduce the learning gap among learners and many more.

ADVANTAGE & DISADVANTAGE OF ONLINE LEARNING

Advantages of Online learning: The following are some important advantages of online teaching.1. Remote learning, Flexibility, Study as you wish approach, choose subject of your interest, Cost effective and progress as you learn.

- **Remote learning**: Online education provides equal access to all the learners irrespective of their geographical location (near or far). This allows to access the course material online through provision of login or subscriptions.
- **Anytime – Anywhere**: Provides access the course from anywhere and at any time during the day/night irrespective of the geographical time zones. This also provides the flexibility to create study plan according to his needs and time.

- **Virtual Learning Platform:** Creating a study platform for all students to meet, learn, discuss and share knowledge. This virtual platform has allowed large student communities from different geographies to register online and meet vast student groups from diversified societies. Enabling them to learn new cultures, lifestyles and new courses. Also, provides a virtual learner – tutor interaction.
- **Teaching Methodology:** Moving away from traditional teaching (one-to-many classroom) to a more focused teaching methodology (one-to-one) allowing to have a dedicated teaching mechanism.
- **Course Selection:** Offers a wide range of topics and diverse courses. From different sectors like education, business, industries, technology, medicine, engineering to real-time experiences all a click-away.
- **Course Material:** Online material availability to select from different study levels from beginners to advanced. This allows to plan, study and make steady progress.
- **Advanced Technology:** With varied benefits of moving from silos study patterns to adopting the advanced teaching methodologies, platforms, apps and tools. The learning has changed drastically and has become more focused, dedicated and committed.
- **Cost-Effective:** There have been so many integrated courses that have mushroomed to provide varied courses/topics in multitude languages to varied audience across the world. These courses are available in abundant at low-costs and subscription.

Disadvantages of Online Learning: Online education has its own drawbacks. Learners have to be self-disciplined and keep themselves motivated as there are equal chances of distractions, which will divert the learner in an unexpected direction .They should always be oriented towards their learning. The virtual environment alone cannot maintain the full concentration of the student.

- It is must for every online learner to maintain basic requirements like a good computer , mobile phone or any device with good internet connection. Also, some courses or activities demand webcam, headphones and other devices.
- Online laboratories never give real time experiences. This can be a good alternative to offline laboratories.

CONCLUSION

Online teaching and Learning have become a boon in the time of pandemic. The learner can stay back at home safely with necessary equipment and internet connections to take the class and enrich the knowledge in the particular topic. Many innovative technologies are mentioned. learner and instructor can choose any platform to have a successful teaching learning process and learn as per their need. I feel that even after this pandemic the online learning will not cease but will become the integral part of the normal teaching process. Future is all about Hybrid or Blended learning.

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A REVIEW ON UNIFIED POWER FLOW CONTROLLER

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1. THE PRINCIPLE OF OPERATION

Voltage compensation, sequence compensation, and step shifting are features have not yet been used in FACTS controllers. it can separately control both true and reactive voltage flows You can see the circuit of Figure 10.25, in which two VSCs are connected to a common ground terminal, then in a voltage division. One pair of VSCs are linked in series with the transmission line with a coupling transformer, whereas the other is related by means of an interface transformer. They use the same popular capacitor bank to power both converters.

A voltage phaser is operated between 0 V and V ppq max. Furthermore, the phase angle of V PQ is individually adjustable from 08 degrees to 360 degrees. Reactive and actual control are exchanged in this sequence converter. Though the reactive power is produced inside the device, it, it is absorbed by the DC-energy unit.

The shunt converter 1 is more often used to supply the actual power requirement of the real power converter 2.

The constant voltage regulator keeps the dc bus voltage from dropping out of phase with the charging voltage. Thus, the

total actual power delivered to the ac grid by the AC network is proportional to the two AC power converters' losses plus the network losses. In addition, it serves as a STATCOM and controls the bus voltage by absorbing/generating the reactive electricity.

The UPFC definitions are shown in Figs. 4(a) (d). General inclusion illustrates part (a)

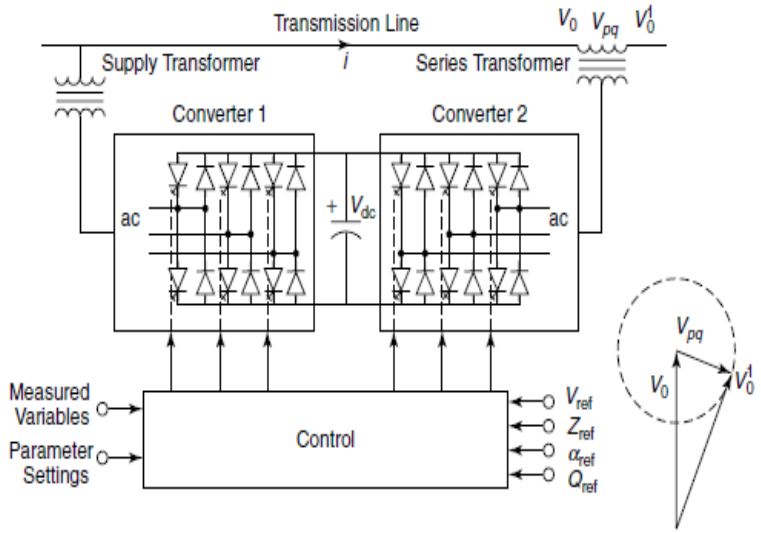

Figure 1 The implementation of the UPFC using two "back-to-back" VSCs with a common dc-terminal capacitor.

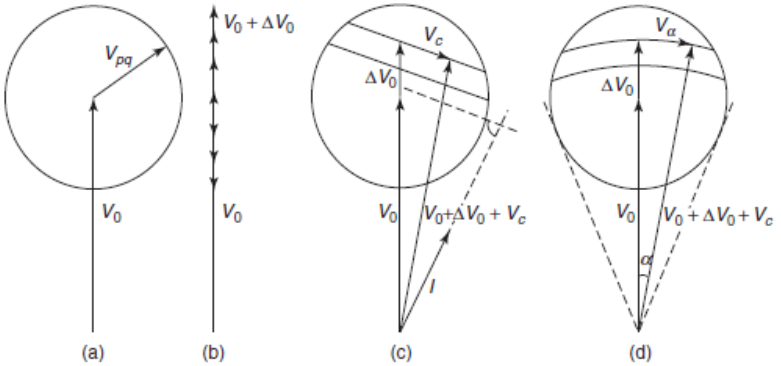

Figure 2 A phasor diagram illustrating the general concept of series-voltage injection and attainable power-flow control functions: (a) series-voltage injection; (b) terminal-voltage regulation; (c) terminal-voltage and line-impedance regulation; and (d) terminal-voltage and phase-angle regulation.

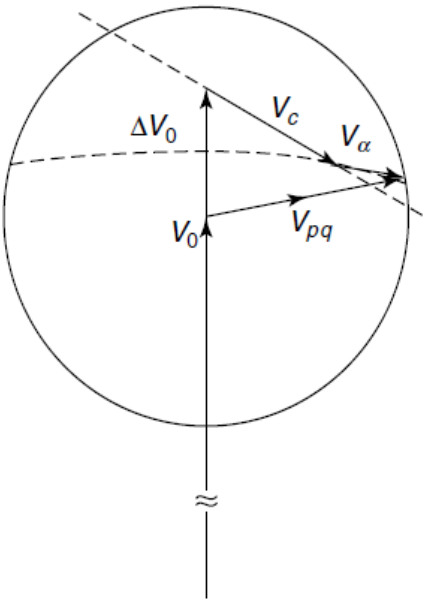

Figure 3 A phasor diagram illustrating the simultaneous regulation of the terminal voltage, line impedance, and phase angle by appropriate series-voltage injection.

360 degrees Component voltage control is influenced by part voltage, as seen in the diagram above (b).

A series compensation portion, VV, is implemented in part (c).a UPFC generated voltage V pq in the phase-sh method appears to be a mixture of voltage-shaping voltage DV 0 and phase-shifting voltage V V an adjusts the phase angle of voltage phor phor, equal to phor V0 plus dV. The result of satisfying all three power-flow goals is shown in Figure 10. The UPFC controller selects either one or a single control goal to satisfy, or the device criteria may be satisfied by using one or a mixture of functions.

The various parameters of the UPFC are limited in the following ways: series-injected voltage; Refs on UPFC-control architecture and equipment ranking is known; they are therefore not included in this description.

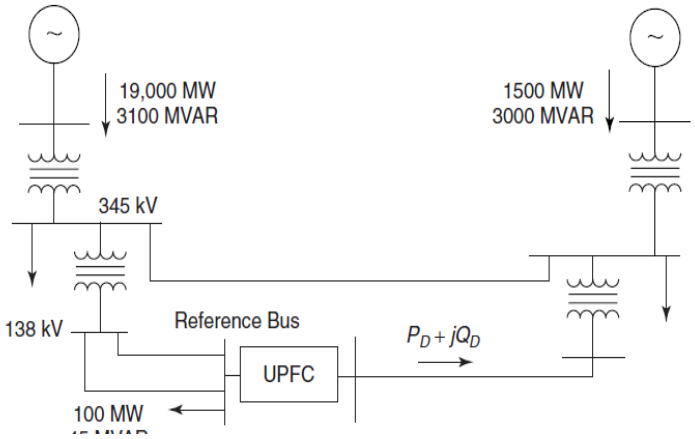

Figure 4. A Case-Study System.

2. APPLICATIONS

This case study illustrates power flow and oscillation damping in Fig. 4 as seen in reference Two wires transmit varying amounts of electricity, one operating at 350kV, and the other at 138kV. Even though the 345-kV line is 100 miles long, the 138-kV grid consists of two parallel lines each of 60 miles (distributing power to a different area) and a shorter one serving as a feeder line to the other (distributing power to a different region).

The 345-kV line performance is calculated by the transient-steadiness of the power-transmission. For 138-kV electrical service, the UPFC is in place. To force a 3-phase fault on the 345-kV line for four cycles, the 345K voltage is added, and disconnected. The highest allowable power flow of 138kV in the circuit, which represents the maximum output for a system without the UPFC, as shown in Figure 3. The capability of the UPFC can be increased to 181 MW (a big improvement in capacity of approximately 237 percent." This raises the UPFC power output, but only approximates the theoretical maximum power boost, suggesting that the UPFC has already reached its functional limit.

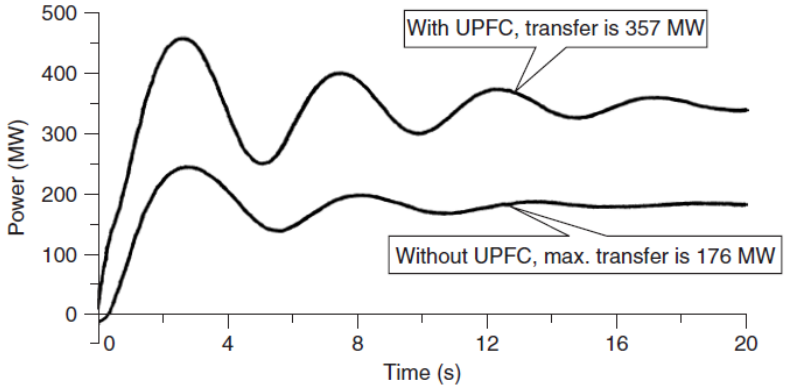

Figure 5 Power-Transfer Capability with the UPFC.

3. CONCLUSION

Power oscillations are dramatically reduced in the UPFC operational range. In the following, the numerical representation of the three-phase-to-to-ground fault clearing after 4 voltage cycles is shown in figure 10. Due to the current being routed through the 345-kV circuit, the expected oscillating frequency seen in the examples is inaccurate. Improvements in power softness are recorded in the Mead–Phoenix project

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A REVIEW ON SVC- SVC INTERACTION

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ABSTRACT

The numerous details of the control of a complex system of SVCs is provided in the references SVC interactions are examined with regards to their relationship to the shorting behaviour at the SVC buses.

1.1 The Effect of Electrical Coupling and Short-Circuit Levels

Case studies of interaction between multiple systems that regulate a vast electric distribution plants are included in the literature (see References). The relationship is investigated as a feature of the connection between the SVC buses' connection level and the short circuit level.

1.2 Uncoupled SVC Buses

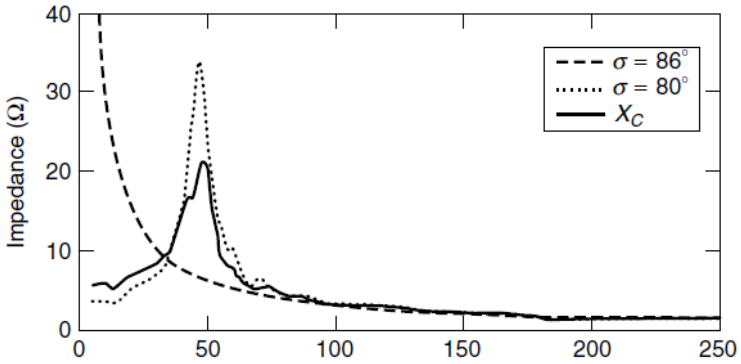

Figure 1 The Impedance-Magnitude Plot of The TCSC Frequency Response.

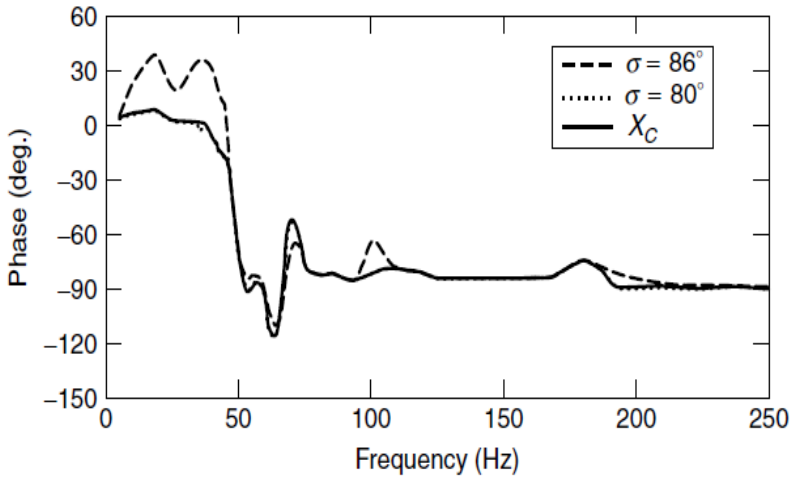

Figure 2
The Impedance-Angle Plot of The TCSC Frequency Response.

Fig. 1, which depicts a simpler test method, would be used in root-locus plots and the values of an easy to measure variables, which the eigenvalues help explain. There are infinitely many buses to serve all the generating units When buses 1 and 2 have an excessively high impedance, the attached SVCs do not affect each other. Increasing the relative advantage of SVC 1 (to the point of rendering it instable), affects only the phase configuration of SVC 2.

1.3 Coupled SVC Buses

Even if the opposing bus signals provide a high electrical coupling, a phase relation, in the sine/TC network, it is possible to provide inadequate magnitude separation. Once again, the regions in which the SVCs are located have two possibilities with regard to short-circuit performance: the area with a higher short-circuit capability and the region with a lower short-circuit capacity. Increase the relative gain of a second SVC to SVC as seen in Fig. 2 to demonstrate that the eigenvalues are impacted.

Nothing controls the exchange occurs between the two SCs as long as they are all in a high short circuit. To understand this, it is helpful to remember that there is an interlinked variable between the two lines, the bus voltage between them is essential. Since the short-circuit potential of the SVC area is limited,

changes to the relative gain of SVC 2 can affect the SVC controls. It is therefore essential that an effort be put forward to monitor both of both SVCs be planned.

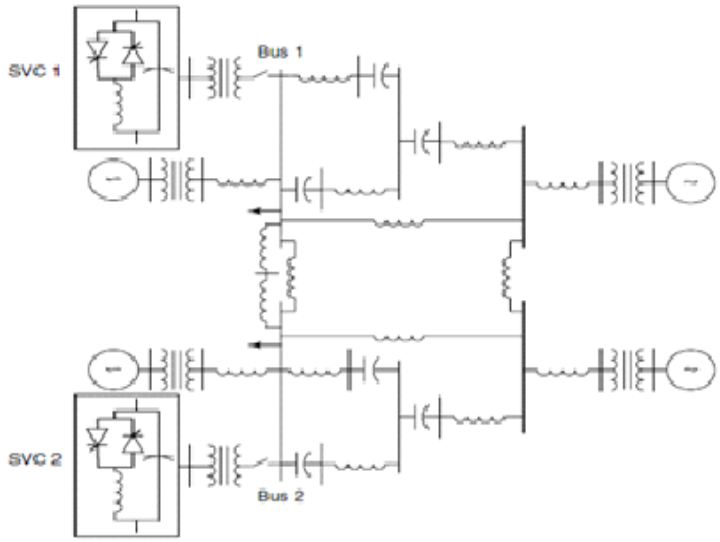

Figure 3 An SVC interaction-analysis network.

3 The System Without Series Compensation

Where the more than the reliability of individual voltage-control loops for power systems with multiple SVCs, there is the limitation of the total response of the SVCs during major incidents.

3.1 Shunt-Reactor Resonance

Device compensation of the inductance can incorporate additional series resonant modes through shunt capacitance resonance with the system induct These mode frequencies are graphically illustrated in the driving-pressure-impedance charts, as shown in the image on page (202), which normally fall between 0–20 Hz in the graph on page (202). For the study system, the oscillation frequencies are at 6 and 9 Hz and 17 Hz, and location-specific magnitudes may be defined. Q-factors and shunt reactors are responsible for their more damping here than other reactors because of their very limited line resistance and extremely strong switch resistance.

At a root locus in Fig. 3, a signal reflected as a detuned to the anti-resonant is reaper shows a difference of 43 Hertz (i.e., equivalent to the phase in the measurement scheme. as the T A1 - mode answer rate approaches zero and approaches infinity. a potential problem may be avoided by mounting a high-pass filter on the AC measurement circuit having a cut off frequency of 15 to 20 Hertz The root loci of the study method with and the no filter (dashed line) is seen in Figure 3.

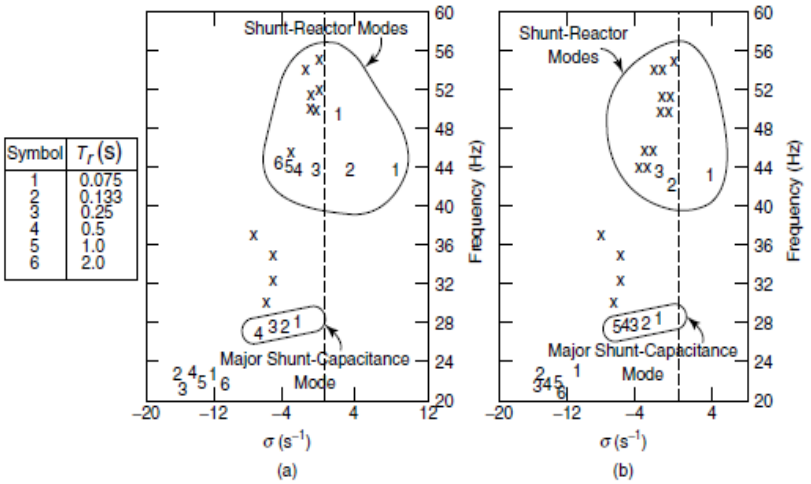

Figure 4 Effect of The High-Pass Filter On Sub Synchronous Modes For A Mostly Series-Compensated La Verendrye System (Contingency At 280 MVAR/SVC): (A) With No High-Pass Filter And (B) With A 15-Hz High-Pass Filter.

Without the filter, the mechanism being broken for 0.25 seconds, the system will be marginally functional; however, with the filter in place, it operates as intended.

In figure 4, we see transient time responses in both the system with and the system without the 15-Hz filter. A single-mode circuit operation mode is seen in the 60-hertz frequency response.

It has been calculated that the cut-off frequency of the high-pass filters was chosen in order to preserve low-frequency stability while keeping the shunt reactor frequencies unchanged. As when the cut-off frequency is raised to stabilise the free-resonator modes, certain lower-frequency modes are

suppressed, resulting in resonance that may trigger an annoying electrical buzz.

3.2 High-Frequency Interactions

In reference, two transformers in the same electrical field communicate in an extremely subtle way in terms of interaction frequencies. In the study system, we've two voltage-controlled systems graded from +30 to -70 MVAR. For instance, due to the high-frequency interactions being observed, transmission lines may be assigned with p compartments. all things considered; the complete structure can be modelled as having 78 possible values has been modelled with generalised switching functions; the second SVC with reference to the computing point uses equalised operating capacity.

3.3 Additional Coordination Features

3.3.1Parallel SVCs

Providing the required reactive-power sharing in either situation can be achieved with the two SVC slope settings on the bus, SVCs in a subsystem that are attached to the same bus must be short-circuited.

Although the two internal shunt-sensing filters and two external shunt reactors could be capable of being operated separately from the EHV bus, it is also possible to set the switches to coordinate their operation if all SVCs are attached to the same bus.

This will enable one sequencer to operate the external reactors and filter banks of the other sequencers. The items mentioned here occur in the ESKOM transmission in Cape Town.

3.3.2 Electrically Close SVCs

If the SVCs ever decides that their voltage-controller gains are no longer needed, they will turn the controller off, preventing the circuit from damaging itself by doing so-called self-dissipation work on the loop.

Injecting a tiny MVARs into the device and calculating the bus voltage difference is an excellent way to measure the system's power state. The method then picks out a volume and

sets its corresponding gain equal to the measured strength. Since there are no two sources of voltage modulation in this electrical circuit, the system must regulate just one.

If two or more SVCs are electrically similar to one another, their values will likely to be out of sync. The result is that when an SVC move is applied, the other steps react automatically.

4. CONCLUSION

Therefore, an interface is formed between the various SVCs to coordinate the selection of transmission gain. The benefit is correspondingly decreased on all VCs to maintain device consistency, while this conclusion is made "Eskomuti" is a sophisticated legislation scheme used in the Natal province of South Africa, where two ESKOM systems are based and benefits by one ESKOM are limited by a factor of 0.55. Controller architecture has these steps: Derivation of the device model; collection of the system performance specifications; organisation of design and validation.

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SIGNIFICANCE OF FLIPPED TEACHING-LEARNING PROCESS IN CURRENT EDUCATION SYSTEM

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ABSTRACT

One of the most raising developments in the recent classroom is flipped learning. It is an approach that lets teachers employ a methodology, or different methodologies, in their classrooms. Flipped Learning changes the classroom from inactive to active learning, focusing on higher-order thinking skills such as assessing, examining, and making to engage students in learning. Woodland Park High School chemistry teachers Jonathan Bergmann and Aaron Sams began practicing flipped teaching at the high school level in 2007. There are different types of Flipped Learning such as Traditional Flipped, The in-class flip, Flipped Mastery, and Flipped Learning 3.0. The flipped classroom tools namely Edpuzzle, Padlet, and Teachem etc., can be used alone or in joint to make flipped classrooms more engaging. Flipped learning employs a more application-based approach for students (i.e. hands-on and problem-solving activities). Flipped learning provides more freedom for teachers and more collaboration time for students. Flipped classroom enhanced the learner performance and learning experience successfully as compared to the traditional method, and learners' response was also mostly positive. Teacher, administrator, and classroom flexibility are necessary to the victory of a flipped classroom.

Keywords: Flipped Teaching-Learning, Flipped Classroom, Educational Approach.

INTRODUCTION

One of the most raising developments in the recent classroom is flipped learning. It is an approach that lets teachers employ a methodology, or different methodologies, in their classrooms. Flipped Learning changes the classroom from passive to active learning, focusing on higher-order thinking skills such as assessing, examining, and making to engage students in learning. It assists teachers to prioritize active learning during class time by assigning learners lecture materials and presentations to be sighted at home or outside of class. The approach relies on understanding the difference between information and knowledge gaining, providing students with active learning possibilities. Students are given chances to take greater responsibility for their learning. Class time focuses more on the investigation, finding meaning, and application of knowledge. Teaching is focused more on providing important learning opportunities, providing feedback through various educational tactics, and ensuring understanding. Flipping assists learners of all capabilities to shine because all the direct instruction is recorded, learners with individual needs can look at the videos as many times as they want to learn the material.

HISTORY

In 1993, Alison King published "From Sage on the Stage to Guide on the Side," in which she focuses on the significance of the use of class time for the construction of meaning rather than information transmission. Harvard professor Eric Mazur published a book in 1997 outlining the strategy, entitled Peer Instruction: A User's Manual. Lage, Platt, and Treglia published a paper entitled "Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment" (2000), which confers their research on flipped classrooms at the college level. J. Wesley Baker presented a paper discussing what he termed the "classroom flip" at an education conference in the year 2000 in what may be the first published mention of the word "flip" associated with this model of teaching and learning. Perhaps the

most recognizable contributor to the flipped classroom is Salman Khan (2004).

Woodland Park High School chemistry teachers Jonathan Bergmann and Aaron Sams began practicing flipped teaching at the high school level in 2007. In 2011 educators in Michigan's Clintondale High School flipped every classroom. On June 27, 2016, Jonathan Bergmann, one of the originators of flipped learning, launched the Flipped Learning Global Initiative, led by Errol St.Clair Smith. On January 26, 2018, the Flipped Learning Global Initiative introduced its International Faculty, created to deliver a consistent standard of training and ongoing support to schools and school systems around the world.

MEANING OF FLIPPED CLASSROOM

The Flipped classroom is an instructional plan and a type of blended learning that reverses the conventional educational arrangement by bringing instructional content, frequently online, outside of the classroom. It shifts activities, including those that may have conventionally been considered homework, into the classroom. In a flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home and engage in concepts in the classroom with the guidance of the instructor.

MEANING OF FLIPPED LEARNING

Flipped Learning is an educational approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter.

DIFFERENCE BETWEEN FLIPPED CLASSROOM AND FLIPPED LEARNING

The difference is that flipped learning may not alter the whole arrangement of the physical classroom. Kyle Niemis explains flipped learning, a learning style generally used in conjunction with a flipped classroom, as the transition from the “sage on the stage” style to the “guide on the side.”

THE FOUR PILLARS OF F-L-I-P

Many teachers may already flip their classes by having students read text outside of class, watch supplemental videos, or solve additional problems, but to engage in Flipped Learning, teachers must incorporate the following four pillars into their practice.

1. Flexible Environment: Flipped Learning permits for a variety of learning styles; teachers often physically reschedule their learning spaces to accommodate a lesson or unit, to support either group work or independent study. They make flexible spaces in which students decide when and where they learn. Also, teachers who flip their classes are flexible in their expectations of student timelines for learning and their assessments of student learning.
2. Learning Culture: In the usual teacher-centered model, the teacher is the main source of information. By contrast, the Flipped Learning model intentionally changes instruction to a student-centered approach, where in-class time is dedicated to searching topics in larger depth and making rich learning opportunities. As a result, students are actively involved in knowledge building as they take part in and evaluate their learning in a personally meaningful way.
3. Intentional Content: Flipped learning educators repeatedly believe about how they can use the flipped learning model to assist students to build up conceptual understanding, as well as procedural fluency. They decide what they want to teach and what materials students should explore on their own. Educators use deliberate Content to maximize classroom time to adopt techniques of student-centered, active learning strategies, depending on grade level and subject matter.
4. Professional Educator: The function of a professional educator is still more important, and frequently more challenging, in a flipped classroom than in a traditional one. During class time, they repeatedly watch their students, providing them with appropriate feedback at the moment, and assessing their work. Professional educators are reflective in their practice, connect to develop their

instruction, admit useful criticism, and stand controlled chaos in their classrooms.

TYPES OF FLIPPED LEARNING

The different types of Flipped Learning are:

1. Traditional Flipped
   The traditional flipped classroom is where students watch a video of the lesson and learn the lesson at home and do the traditional homework problems in class where fellow students and the teacher can assist the students to understand the material.
2. The in-class flip
   In which students do not have access to the internet or lacking a device, or students not even watching the videos or studying the materials at home altogether, the need to flip the flipped classroom emerged. By bringing the flip in the classroom, these issues were addressed through station work. This means students work individualized activities in themed stations according to their needs. When doing so teachers have different pathways they can use in the learning process:
   1. Simple sequence — making earlier stations for groups of students to rotate to, managing all the activities in order.
   2. Mixed sequence — students attending stations only if needed.
   3. Looped sequence — students can start at any station and rotate until they close the loop.
   4. Half n' half sequence — half of the students work with flipped content and the other half receives teacher support, then they switch stations.
   5. No stations sequence — students can work alone, with a partner, or in groups.
1. Flipped Mastery
   Flipped Mastery stands for students gathering at least 75% of the requirements or else they have to repeat the entire program. It gives students the chance to attain goals according to their learning ability speed. If they get 75% or

above on the assessment and move onto the next objective otherwise they go back and relearn the material and try the assessment again. The student's grade is often based on how many objectives the students get down in the course. This innovative method encourages students to become masters of their knowledge.

2. Flipped Learning 3.0
   This is a new approach based on the idea that learning is not static, but it involves interaction, engagement, and retention. This new option to the traditional Flipped Classroom is based on the following ideas:
   - A change in teachers' attitude about how face-to-face time can be used more effectively in class.
   - A universal involvement of every stakeholder in getting students engaged in active learning with parents particularly understanding that through this new approach, teachers have more one-on-one time with the students.
   - Technology and the simple tools it can provide for the flipped classroom are important in giving students autonomy in their learning.
   - The need to adapt teacher evaluation standards to the flipped environment.
   - Training teachers to practice this approach and getting the certification for their work.

REASONS FOR A FLIPPED CLASSROOM

The concept of flipped classroom was first brought up by Jonathan Bergmann and Aaron Sams, who were both high school chemistry teachers. In their book: Flip your classroom: Reach every student in every class every day (2012), they discussed a couple of reasons why teachers should consider flipping (p.20-33):

- Flipping talks the language of today's students.
- Flipping aids busy students.
- Flipping assists struggling students.

- Flipping helps students of all capabilities to stand out.
- Flipping lets students pause and rewind their teacher.
- Flipping enhances student-teacher interaction.
- Flipping allows teachers to identify their students better.
- Flipping raises student-student interaction.
- Flipping permits for true differentiation.
- Flipping alters classroom management.
- Flipping changes the method we speak to parents.
- Flipping educates parents.
- Flipping creates our class transparency.
- Flipping is a great method for absent teachers.
- Flipping can lead to the flipped mastery program.

TOOLS FOR A FLIPPED CLASSROOM

The following tools can be used alone or in joint to make flipped classrooms more engaging. Whether students do the advanced work at home or in class, these tools assist teachers to track their work and assess their understanding.

Google Classroom: Teachers use Google Classroom in different ways to bring assignments to students, to give useful and efficient feedback and it can be a great landing page for students as they navigate assignments.

Edpuzzle: (Android, iOS, Chrome, YouTube extension) - EdPuzzle is a wonderful tool to create any video interactive using audio and questions.

Padlet: Padlet gives teachers a way to have students not only review and reflect on content but also work together with their peers. Teachers can make a new Padlet wall for each video or unit and encourage students to ask questions and answer their peer's questions about content as a review for unit assessments.

Quizizz: Teachers can generate gamified formative assessment activities for their students using Quizizz and assign these activities as homework, which permits the students to play the games individually.

YouTube: YouTube presents a user-friendly, generally understood platform for taped lectures and other educational videos. Teachers can structure coursework according to the topic and create student "playlists" while enjoying basic video editing features, such as captioning, sound-tracking, and trimming/ stabilizing.

Teachem: Teachem facilitates educators to construct classes around YouTube videos. Teachers can make their videos or source from YouTube itself; flashcards and time-stamped "smart notes" complement video learning.

Camtasia (PC and Mac) - Using Camtasia, teachers can add music effects, video effects, notes, annotations, and more to the recorded video.

Edmodo is an educational technology company offering a communication, collaboration, and coaching platform to K-12 schools and teachers. The Edmodo network facilitates teachers to share content, distribute quizzes, assignments, and manage communication with students, colleagues, and parents.

Symbaloo: Symbaloo aids to organize web resources like videos, links, BookWidgets exercises, and more in one place. It has a special section that gives teachers the chance to create their learning paths or lesson plans.

BrainPOP: BrainPOP makes animated resources that support teachers and engage students - in school, at home, and on mobile devices. Their content includes movies, quizzes, games, mobile apps, activity pages, and much more.

Duolingo: Duolingo is a microlearning app, ideal to use for flipped learning. It is made for teaching foreign languages. It focuses on words and their translation and is very intuitive.

TED-Ed: TED-Ed is create a growing library of original animated videos, and gives a worldwide platform for teachers to create their interactive lessons.

Clarisketch: Clarisketch is an app that allows users to make their short tutorial videos by taking a picture and drawing on top of it while speaking.

TES Teach: Tes Teach (iOS and Google Chrome) - With Tes Teach, teachers can create interactive lessons, projects, presentations, quizzes, and discussions. It includes support for YouTube links, PDFs, Drop box, and Google Drive.

Khan Academy: Khan Academy started with its famous YouTube videos for the subjects like Math, Science & Engineering, Computing, Arts & Humanities, and Economics & Finance.

Nearpod: With Nearpod, teachers can create interactive presentations.

PlayPosit: It is an online learning environment in which teachers can create and share interactive video lessons.

Show Me: ShowMe lets teachers to create video lessons on whiteboards and can use this tool to write, draw, talk and record their voice.

Doceri iPad: It is an interactive whiteboard and screencast recorder with sophisticated tools for hand-drawn graphics and built-in remote desktop control. Teachers can edit a lesson at any time and also add an audio file at any point when creating their flipped lesson.

Loom: Loom is a screen capturing software that allows teachers to make instructional videos. Capture their screen and narrate it all at once, then instantly share it with their students with a simple link.

Classflow (PC and Mac) - Classflow can be used to create a presentation for interactive displays like Smart, Epson, and others. Teachers can add interactive quizzes, polls, and activities.

With the help of these tools, teachers can put into practice a flipped-classroom approach with students working on their own either at home or in the classroom and give a more individualized learning experience for all their students.

IMPLEMENTATION OF A FLIPPED CLASSROOM

Jeff Dunn (2014) has written a short piece on "The 6-step guide to flipping your classroom", which presented 6 easy steps for implementing the flipped classroom.

1. Plan: Figure out which lesson, in particular, we desire to flip. Outline the key learning results and a lesson plan.
2. Record: Instead of teaching this lesson in person, make a video that is appropriate and necessary. A screencast works. Make sure it contains all the key elements we'd mention in the classroom.
3. Share: Send the video to our students. Make it engaging and clear. Clarify that the video's content will be fully discussed in class.
4. Change: Now that our students have viewed our lesson, they're prepared to go more in-depth than ever before.
5. Group: An effective method to discuss the topic is to divide into groups where students are given a task to do. Write a poem, a play, make a video, etc.
6. Regroup: Get the class back together to share the individual group's work with everyone. Ask questions, dive deeper than ever before.

BENEFITS OF THE FLIPPED LEARNING

There are different benefits recognized to the flipped learning approach, including:

- Flipped learning employs a more application-based approach for students (i.e. hands-on and problem-solving activities).
- Review the video lectures more than once
- Proactive student attitude through self-learning
- Online collaboration with a peer will open new doors for learners
- The new generation of students discovers the model appropriate to match their skills and gadget know-how

ADVANTAGES OF FLIPPED LEARNING

- The Extra time between teacher and student.
- More collaboration time for students.
- Students learn at their speed
- It promotes students to come to class prepared.

- Practical things like missing class due to sickness turn into less problematic.
- Subject matter content becomes markedly richer.
- Better engagement and Deeper subject understanding
- More freedom for teacher and Work accessibility
- May develop examination performance and Transparency for parents

DISADVANTAGES OF FLIPPED LEARNING

- The technology required (computers, smart gadgets, internet, etc.)
- Flipped classrooms that use videos to deliver instruction from time to time suffer technical challenges/ difficulties.
- Increases the time spent by students on computer screens.
- Relies on student preparation and May not cover everything necessary for a test.

CHALLENGES OF THE FLIPPED LEARNING

- Lack of knowledge of online learning for both teachers and students. Many teachers are disheartened when they see a long list of software that wants to be learned before they become an online teacher.
- Lack of high-class and effective digital content. The teacher wants to expand technical skills in addition to the subject knowledge and pedagogy to make effective material. The development will be time-consuming and it needs expertise.
- Teachers might end up with a lot of teaching hours and student support.
- Slow learners will have a challenge in catching up with the class.

CONCLUSION

Flipped classroom enhanced the learner performance and learning experience successfully as compared to the traditional method, and learners' response was also mostly positive. There is more than one appropriate way to implement a

flipped classroom. Through existing technology, expertise, and ambition, an educator can successfully deliver instructional materials to students outside of the classroom then employ available class time to improve student learning, give instant feedback, and readily clear up misconceptions that stand in the way of proper understanding and learning. However, there are several concerns, and criticisms; there is research and support for this recent pedagogy. Teachers must do their research before implementing this kind of model in their classroom. Teacher, administrator, and classroom flexibility are necessary to the victory of a flipped classroom.

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FUNDAMENTAL OF MEASUREMENTS AND INSTRUMENTATION INTRODUCTION

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1.1 FUNCTIONAL ELEMENTS OF INSTRUMENTS

A device or system which maintains a functional relationship between physical variables must be an instrument. The much of the measuring method in Figure 1 shows the following practical elements:

Primary Sensing Element.

1. Variable Conversion Element
2. Variable Manipulation Element
3. Data Transmission Element
4. Data Presentation Element

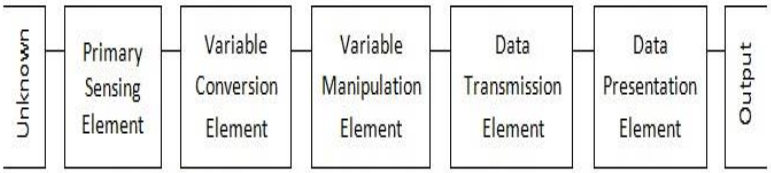

Figure 1 – Block Diagram of Instrumentation Concept

Primary Sensing Element: - A primary aspect measures; the measuring is sensed by primary sensing. the measured-to-to-

variable conversion phase transitions to subsequent processing the feedback signal of a primary sensor (for example, displacement or voltage) is a physical vector such as the movement or voltage of the object that's piston+

Variable Conversion Element: - As a primary sensor feature, the output signal can need to be changed to remain in a reasonable shape. Variable transduction is employed by this transducer, making it possible to view it as a tertiary operation.

Variable Manipulation Element: - This degree of measurement straddles the point of a measurement device. Rather than adjusting the raw power, the variable is amplified, filtering, and other processes are added; the result is a corresponding signal which retains the physical characteristics of the original input.

Data Transmission Element: - There is a need for the practical components to be spaced spatially segregated if they are used in a measurement device. The functions are made to order by means of data transfer. Warnings or Alerts should be an important feature where remote control is required.

Data Presentation Element: - For tracking and control and review, much of the details should be factual. Thus, in order to be comprehensible, it must be expressed in the context of human ability. This part of the process is achieved by the use of data presentation.

1.2 UNIT OF MEASUREMENT

There is a quantifiable value, specified and accepted by convention or statute, for each item, unit of measurement. Equal to some other kind of calculation can be regarded as a multiple of the original unit.

Fundamental and physical quantities:

Aside from duration, temperature, there are 7 physical quantities like mass, period, volume of matter, strength, present, current, strength, and substance. All in physics is quantified in those three ways. Length, density, and time are three universal physical quantities.

Fundamental and Derived Units

The basic physical amounts include units. pound, kilogramme, and second Neither of these units may be taken from another, nor reduced to it. It is irrespective of everything else.

Elements in terms of fundamental units may be referred to as derived units. Can be regarded as a derived entity Similarly, the area of a rectangle is equal to that of a square. Same, the volume of a cube is L by L by L-by-L equals L, so the volume is L A physical quantity has an equation that defines it as a unit.

1.2.3 System of units:

Following are the common system of units to measure mass, length, and time.

CGS

The most important units of duration, mass, weight, and time are kilogrammes, centimetres, and seconds.

MKS

Basis units of duration, mass, mass, and time are the metre, and the kilogramme. This is a logical, cohesive set of units.

FPS

Regarded as an English scheme, rather than a metric system, it is known as 'the British system.' It is made up of foot, pound, pound, pound, and second. Usefulness is decreasing in science literature.

SI

A modern Weights and Measures scheme was adopted by General Conference in 1960. The international system is "Le System International".

It has seven basic and three supplementary units.

Basic physical quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	Second	s
Temperature	kelvin	K
Electric current	ampere	A
Luminous intensity	candela	cd
Quantity of matter	mole	mol

Supplementary quantities and their units

Physical quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	Steradian	sr
Radioactivity	Curie	ci

Big and tiny words are also appropriate. This table presents prefixes in powers of 10, their symbols, and their assigned values in the SI system.

Prefix	Symbol	Power of 10
deci	d	10^{-1}
deka	da(D)	10^{1}
centi	c	10^{-2}
hecto	h	10^{2}
milli	m	10^{-3}
kilo	k	10^{3}
micro	μ	10^{-6}
mega	M	10^{6}
nano	n	10^{-9}
giga	G	10^{9}
pico	P	10^{-12}
tera	T	10^{12}
femto	f	10^{-15}
peta	P	10^{15}
atto	a	10^{-18}
exa	E	10^{18}
zepta	z	10^{-21}
zetta	Z	10^{21}
yocto	y	10^{-24}
(yotto)	Y	10^{24}

1.3 STANDARD:

The norm is a unit of measurement expressed as a tangible object. A well-established and often reliable physical measurement is known as norm. the comparative methods use these standards to define the relative values of physical quantities Once all of the elements have been identified, the result of a chemical analysis is expressed in terms of one of a norm or of phenomena like physical and atomic constants.

Another example: for instance, the SI base unit of duration, the metre, is described as the distance between two fine gold plugs on a platinum-iridium alloy's seventh decimal place, with no net error. Computational metaphors are focused on the application's components.

Standards are classified into four categories as

i. International standards
ii. Primary standards
iii. Secondary standards
iv. Working standards

International standards:

The principles adopted by international consensus are international. They are measured by absolute physical units of measurement on a cyclical basis. near to an approximation by the precision that is feasible by the use of scientific and technological measures the international specifications are only applicable to designers and others with sophisticated math and metrology abilities.

International ohms:

It is defined as mercury, having a density of 14.21 g/cm2 in square centimetres, uniform cross section, and length of 106. m in still ice.

International Amperes:

The present would not transform into a vital and passing it into a solution of silver nitric acid, at 0.111 g/5 water mass, deposits 0.111 mg of silver.

Primary standards:

The secondary standards simply check whether the principal standards are right. First principles are the official guidelines at national laboratories around the world. While their actions may have significant applications outside the National Laboratory, they are unavailable to the general public. Primary levels of perfection that may be used as the benchmark.

Secondary standards:

The principles of quality are simple measurements and laboratory standards used in industries. Industry secondary standards: That set of regulations govern the secondary standards are enforced by the market in which they originate. Each sector has its own basic reference laboratory that they follow in order to the primary specifications, so that the measurements can be accurately calibrated to it.

Working standards:

A laboratory's criteria of excellence are the lab's working instruments. A common value like these is often used in laboratories to verify and control the output and calibration of electronic circuits. Conformance testing should be done with a known norm resistor, a known resistance, or an applied standard.

2. Conclusion

In this Chapter Basics of Measurements and Instrumentation with their Definitions, Formulas and Standards have been discussed in details with SI Units too. The block diagram explains the basic concept of Measurements.

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A REVIEW ON ELECTROCHEMICAL ENERGY

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INTRODUCTION

Electrochemical resources into electrical energy This is a whole procedure/process; everything about it is a solution (reduction- oxidation). Decrease: when a product is reduced to one valence electron. When a compound releases an electron, it loses the ability to oxidase Electrons cannot live in isolation. A reduction has occurred during this phase, so an oxidation occurred as well.

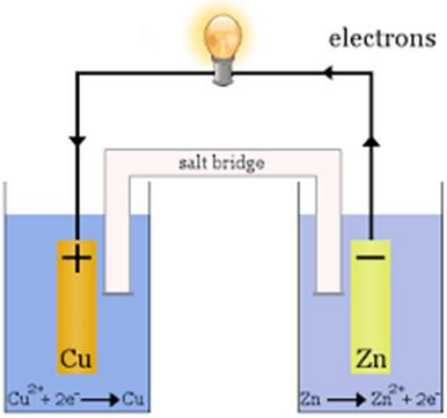

Fig.1.Electrochemical Cell

Example “Redox” process (fig.1)

Reduction: $Cu_2+ + 2e- \rightarrow Cu$ (Copper)

Oxidation: (Zink) $Zn \rightarrow Zn_2+ + 2e-$

ELECTROCHEMICAL CELLS

The energy developed by electrochemical cells is usually used to produce other energy. An electrochemical cell uses chemical reactions to produce a change in ability. electrochemical cells are representations of Galvanic and electrolytic cells.

In other words, there are only two simple kinds of cells: one for producing electricity and another for making chemicals.

It gets electricity by having a galvanic electricity (a natural electricity-generating battery produce electricity through galvanic or a voltaic cell). The primary internal battery in your house would usually contains one or two galvanic batteries. Galvanic cells, which use chemical reactions to produce electricity, are often classified as "voltaic cells". A random chemical reaction is employed. Most common galvanic cells use a salt bridge or a porous membrane.

The chemical energy (electrolysis) may be transformed into electrical energy by means of an electrolytic cell. To go in the right direction, the activation energy is no longer required. Electrolysis is normally used for separation, particularly for purification. The electric energy in the reaction is supplied by the wire.

ELECTROLYSIS

An electrolytic method. This procedure of passing an electric current through a solution turns the chemical energy into electrical energy.

Because of their combined chemical resources, electrolysis materials will also go into a self-reproduction cycle and recreate the reactants that were absorbed. Electrolysis involves an anode and cathode. Different electrolysis techniques are mostly determined by the form of electrolyte used.

Polymer Electrolyte Membrane Electrolyzes

In PEM electrolyzes, the electrolyte is a polymer. At the anode, water decomposes into positively charged hydrated hydrogen ions (protons) and oxygen molecules. This describes the passage of electrons beyond the chip and the preferential flow of hydrogen ions through the cathode.

At the cathode, the external circuit, hydrogen ions bond with electrons to create steam.

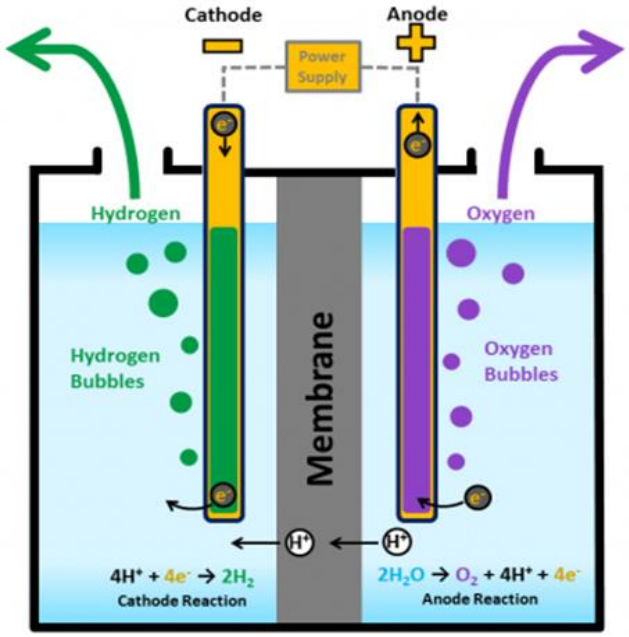

Fig.2 Polymer Electrolyte Membrane Electrolysis

Anode Reaction: $2H_2O \rightarrow O_2 + 4H+ + 4e^-$

Cathode Reaction: $4H+ + 4e- \rightarrow 2H_2$

Alkaline Electrolyzers

Hydrogen is produced on the cathode (side of the electrolyte) by the transport of hydroxide ions (OH-) through the electrolyte from the cathode to the anode. An alkaline solution based on sodium or potassium hydroxide has been on the market for a long time now. Solid alkaline exchange membranes are more effective in laboratories, in general.

Solid Oxide Electrolyzers

While most solid oxide electrolyzers use a solid oxide as the electrolyte for hydrogen gas production, and can conduct negatively charged oxygen ions (O2-) to higher temperatures, a somewhat different way uses a ceramic material to conduct the ions to selectively produce hydrogen at room temperature. At the cathode, water interacts with external circuit electrons to create negative hydrogen ions and water molecules. They go through the ceramic membrane and interact with the anode to form oxygen, which then passes through the gas circuit and serves as a source of current.

A PEM electrolyzers need elevated temperatures of 700–800 degrees Celsius for the solid oxide membranes to be functional (compared to commercial alkaline electrolyzers, which have a temperature range of 100–150 degrees Celsius, and PEM membranes which can run at temperatures between 70 and 90 degrees Centigrade.) Elevated temperatures can help the solid oxide electrolyzers, as they use heat from nuclear reactors to decrease electrical energy required for the electrolysis of water.

ELECTROCHEMICAL ENERGY STORAGE

Through its nature, the electrochemical method is an energy storage system. This electricity-liquid cooling method profits from the fact that they use the same carrier, the electron. This simplifies loss-control.

Common forms for electrochemical storage and conversion

- Batteries and accumulators
- Capacitors
- Fuel cells
- Lead-acid accumulator

Batteries and accumulators

It's not hard to say that a battery is electrochemical energy storage. It is also made up of galvanic cells i.e. This battery consists of two electrodes divided by an electrolyte. This represents a range of materials (e.g. lithium, alkali manganese, lead). By using various kinds of chemicals, the battery voltage

and energy density varies. Nominal voltage is regulated by the material used for the electrodes. the amount of material in the battery to store depends on the energy the battery can produce as discharge proceeds by an electrochemical process, energy is retained in chemical form as well as electrical energy.

Any battery is built with active electrodes, electrolyte, electrolyte containers, and normally separators, but the cell is the basic component of the battery. Capacity is described by the size or weight, and the internal configuration of the electrodes, as well as the composition of the materials.

An electronic circuit that helps control the performance of the battery when monitoring the characteristics of the individual cells, such as the voltage, current, and internal resistance overcharging, deep discharging, electrical shocks, elevated temperature, and short circuits are both observed and guarded against when the machine is in use..

Dry cell battery

Appliances which will include a number of small electronics and flashlights. This is a misconception: the “dry cell” isn't exactly a “dry cell” because the electrolyte is ammonium chloride paste Typical reaction of dry cell battery:

$Zn \rightarrow Zn^{2+} + 2e-$

$2\ MnO_2 + 2H+ + 2e- \rightarrow Mn^2O_3 + H_2O$

Lithium cell battery

With the assistance of ionic transporters, modern cells transport Li+ ions from one electrode to another. Cathode materials such as lithium-containing carbonate (LiCoO2) are used in dry batteries, and lithium metal is used in wet ones. Non-oxidating metal species does not undergo oxidation-reduction.

CONCLUSION

It is often used in wristwatches, power tools, and other applications Compressed natural gas (CNG) has often commonly seen its application as a back-up gas for hybrid vehicles. Non-rechargeable models and rechargeable ones are also available.

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NEO-ENVIRONMENTAL DETERMINISM – THE NEED OF THE HOUR

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ABSTRACT

This article critically revealsthe various negative impact of Possibilism and the need of neo-determinism or stop and go determinism for sustainable development. The Possibilism is in javelinstage prevailing from the last century. As a result,the quality of contemporary environment and geographical elements are catastrophically decreased and huge environmental disasters are induced whichcrucially affects the human physical and mental health. Keeping these as background the authors indented to describe various negative impact of Possibilism and insisting the need of neo-determinism for prolonged holistic lives.

INTRODUCTION

Ancient human beings accepted the environmental determinism and gradually they enjoyed the pro-environmental lives and neo-determinism. But, for the past twenty decadespeople were fascinated towards material and theyseverally adopted human Possibilismby introducing various revolution such as industrial revolution 1.0, 2.0, 3.0 and 4.0,Agricultural revolution, information and communication technology (ICT) revolution, etc., as human determinism. Initially,these revolutions were looking holistic but later the qualities of environmentseverely decreased. As a result, many hazards are taking place in the contemporary world such as Heat Island, global warning, drought, famine, epidemic and endemic

disease, various pollutions and its related diseases, seasonal changes, groundwater depletion, etc. Hence, it need of the hour to go back to neo-determinism or stop and go determinism.

OVERVIEW OF DETERMINISM

The German geographer Carl Ritter (1779-1859) introduced an anthropocentric form of geographical determinism in the early 19thcentury. However, there were certain notable thinkers of geographical determinism even before or concurrent to this. Later Alexander Von Humboldt (1769-1859), Charles Darwin (1809-1882), William Morris Davis (1850-1934), etc., are pioneer in the field of environmental determinism. In the early 19th century, geographical determinism was popularized in the US by Ellen Churchill Semple in 1903, by description of how the physical environment greatly controls human activity and Ellsworth Huntington **(**1876 - 1947**)** describes how the climate influences human occupancy and civilization, and how the climate stimulates the development of human accomplishment. However, since the 1920s Geographical determinism was frequently interpreted in terms that were politically racist and facilitated thought on empires and imperialism. By 1950, Environmental Determinism was completely replaced by the Environmental Possibilism.

ONSET OF POSSIBILISM

After Industrial revolution, man started to invent technologies, began to modify his surroundings. He began to think that he is superior to the environment. This tendency gave birth to the concepts like Possibilism and its extreme form, voluntarism**.** Atend of 17th century Malthus (1798) believed environmental determinism and he observed that 'population growth takes place at the rate of geometric methods and production food grains are in the arithmetic methods'. Hence, he suggested to control the growth of population or increases production of food grains. Later the Vidal De la Blache (1845 – 1918) initiated the theory of Possibilism and simultaneously the green revolution, industrial revolution, revolution in ICT, etc. These revolution gradually leads to material life and

environmental degradation which creates the contemporary environmental issues and huge threats to human lives. Because, as Vidal (1845 – 1918) says the relationship between human activity and the environment is not just a 'one-way road', but more a two-way mutual relationship in which both things are interrelated and influence one another.

VARIOUS FORMS OF ENVIRONMENTAL POSSIBILISM

i. **Industrial revolution:**At the beginning of18th century the onset of first generation of industrial revaluation was started in the form of chemical industries, various manufacturing industries, iron and steel industries, utilization of steam energy and water energy, manufacturing of machine tools and the rise and spread of the mechanized factory system thought the world. The second industrial revolution was started in the middle of 19th century inUnited Kingdom, Germany and the United States, France, Italy and Japan.The industrial revolution 2.0 was includes the expand of railroads, huge iron and steel production, global spread and use of machinery in manufacturing, greatly increased and multi-use of steam power, revolution of telegraph, use of petroleum products and onset of electrification.

   In the late 19th century the industrial revolution 3.0 was started which was includes the utilization of computer technology onset of information and communication technology, increases in utilization of electronic devices, automated in industries, use of renewable energy and initiated innovation in various filed. The contemporary 21st century is flourishing with the industrial revolution 4.0. The modern industrial revolution includes smart work rather that hard work with the help of smart mechanism with artificial intelligence and cloud computing, invention of new material and chemicals using nanotechnology and chemical engineering.

ii. **Green revolution:** The green revolution was started in Mexico by Norman Borlaug in 1940s. His success caught the attention of the world, and soon these technologies spread,

helping farmers across the globe create more calories of food per acre (Bisenius, 2016).While 1961, India was on the brink of mass famine, Dr. M. S. Swaminathan introduced and further developed high-yielding varieties of wheat in India.Later there are huge new technologies and invention such as pesticides, insecticides, chemical fertilizer, genetically modified crops, etc., were introduced.Due to these Possibilism in agriculture the theory of population by Malthus (1766-1834) was nullified.

iii. **ICT revolution:**From ancient period till date thereweremany quick shift was happens in information and communication technology which are as follows:

Phase	Techniques	Inventions
Phase first	Using sound to communicate	Stone tools
Phase second	Adaptation of simples to make meaningful voice/ sound	Utilization of fire
Phase third	Gradual development of regional language	Invention of wheel
Phase fourth	Development of epics, inscription as painting and documentation	Used animal and trees, metallic tools
Phase fifth	Innovation in documentations	Pen ,Paper, Type writer
Phase sixth	Innovative reproducing	X-ray machine, T.V, Radio
Phase seventh	Modern technology – ICT	computer, internet, mobile phone, memory device

(Source: From "Understanding the paradigm shift in teaching and learning" by G. Thirumoorthy and S. Arulsamy, 2014, International Journal of Social Science, 3(4), p.444.)

The modern ICT revolution provides the Artificial intelligence, 5G internet connection, very low cost ICT devices, Robotics technologies, etc., are the positive view towards technologies. At the same time social, physical and psychological issues are becoming worst negative impacts of modern technological growth.

NEGATIVE IMPACTS OF ENVIRONMENTAL POSSIBILISM

i. **Urbanization:** Possibilism provide the opportunities in the form of urbanization which includes construction of multistoried building, over bride, developing drainage system, underground transport system, etc. As a result, huge environmental issues such as solid waste management, sewage management, heat island, air pollution, noise

pollution, decreases of agricultural lands, water pollution, etc., prevail.The cities such as Ghaziabad, Lahore, Delhi, Lucknow, Muzaffarnagar, Dhaka, Antakya, Hapur, PeshawarKampala, etc., are the top ten most polluted urban cities in India.

ii. **Air pollution:** Huge crises areemerging while exceeding the limits of environmental Possibilism. The present-day air pollution is a typical example for failure of environmental Possibilism. To produce energy we use to burn the fossil fuel and conventional energy resources such as crude oil, coal, firewood, natural gas, etc., whichcreate huge air pollution. Air pollution increases risk of respiratory illness and cardiovascular problems, increased risk of skin diseases, may increase the risk of cancer, Global warming, Acid rain, Ozone depletion, Hazards to wildlife, etc. As a results the ambient air pollution accounts for an estimated 4.2 million deaths per year due to stroke, heart disease, lung cancer and chronic respiratory diseases. Around 91% of the world's population lives in places where air quality levels exceed limits fixed by the World Health Organization (WHO, 2021). According to the Greenpeace Southeast Asia Analysis of IQ Air data, in India around 120,000 people died in 2020 as a result of air pollution and related problems. Further it reveals that air pollution caused economic damages to the tune of ₹2 lakh Crore in India, including about ₹12,365 Crore in Bengaluru.

iii. **Water pollution:** The environmental Possibilism crucially polluted not only surface water resource but also underground water. The water pollution may be due to mining, toxic industries, urbanization, modern agricultural activates, atomic and thermal power plants, etc. Hence, water quality is one of the main challenges that societies will face during the 21st century (UNESCO, 2021). One in nine people worldwide uses drinking water from unimproved and unsafe sources, 2.4 billion people live without any form of sanitation, 90% of sewage in developing countries is discharged untreated directly into fresh water bodies such as river, lake, bonds, etc. Every day,two million tons of sewage, Industry

discharges an estimated 300-400 megatons of waste and other effluents drain into the world's water.

iv. **Landdegradation and soil pollution:** The land and soil is the prime resources which provides shelter to all specious, helps to produce food and fodder to all specious. It is very worst and unfortunate that in the name of human Possibilism violations are made on land and soil. There are huge geomorphological distractions are made by human being in the name of mining, intensive and commercial agricultural, dumping of atomic and radioactive wastages, inefficiently managed municipal solid waste, E- waste, etc. According to Global Environmental Facility (2021) globally, about 25 percent of the total land area has been degraded and scientists recently warned that 24 billion tons of fertile soil was being lost per year, largely due to unsustainable agriculture practices. By 2050, nearly 95 percent of the Earth's land areas would become degraded. Globally, 3.2 billion people are affected by land degradation, especially rural communities, smallholder farmers, and the very poor. In India, National Bureau of Soil Survey and Land Use Planning (NBSS&LUP, 2010), Nagpur of ICAR & National Rainfed Area Authority (NARA, 2010) have reconciled data on land degradation and reported that out of total geographical area of 328.73 million hectares (m.ha), about 120.40 m.ha (37%) is affected by various kind of land degradation.

v. **Noise pollution:** Human Possibilism crucially creates the noise pollution which is also known as environmental noise, which propagates noise with harmful impact on the activity ofhuman or animal life. Prolonged exposure to noise above 60 decibels (dB) can lead to irreversible Noise Induced Hearing Loss (NIHL). Various sources of noise pollution such as traffic noise, air traffic noise, construction sites, noise in industry, religion and recreational noise. The World Health Organization (WHO) in its 1999 guidelines for community noise, declared, Worldwide, noise-induced hearing impairment is the most prevalent irreversible occupational

hazard, and it is estimated that 120 million people worldwide have hearing disability. The study reveals that the noise pollution in cities is directly linked to 64 percent of hearing loss. As per WHO's (2007) estimation, almost six per cent of the people in India suffer from hearing loss. But it is unfortunate that the common people do not realizethe noise pollution can be hazardous to our health in various ways. Nose pollution lead to hypertension, hearing loss, sleep disturbances, dementia, psychological dysfunctions, wildlife and marine life, etc.

vi. **Radiation pollution:** Due to environmental Possibilism there are huge radioactive wastes generated during the mining and processing of radioactive minerals, nuclear fuels used in nuclear reactors for power generation, use of radioisotopes, nuclear fallout due to the testing of nuclear weapons, X-rays,spillage of radioactive chemicals, radiotracers for detecting and curing cancers, microwaves, cell phones towers, radio transmitters, wireless devices, computers, are causing micro to macro level radiation pollution. Radiation pollution affects both human and natural elements. The Genetic Mutations may happen which includes some cells may die or become abnormal, either temporarily or permanently, damaging the genetic material (DNA) contained in the body's cells, and can cause cancer, create nausea, vomiting, diarrhoea, loss of hair, bruises due to subcutaneous bleeding etc. The radiation pollution leads to soil infertility and it also transferred into plants and brings genetic mutation and affects the plant's normal functioning.

vii. **Light pollution:** Due to human determinism the light becoming a worst pollution. Light pollution is an unwanted consequence of outdoor lighting which includes sky glow, clutter light trespass, and glare. Globally the artificial lights overpower the darkness and our cities glow at night, disrupting the natural day-night pattern and shifting the delicate balance of our environment. Due to light pollution the negative impacts including increasing energy consumption, disrupting the ecosystem and wildlife, harming

human health, etc. Plants and animal kingdoms daily cycle rhythm to govern life-sustaining behaviour such as reproduction, nourishment, sleep and protection from predators are also disturbed due to light pollution. If humans are exposed to light while sleeping, melatonin production can be suppressed.

viii. **Thermal pollution:** The human determinism creates very worst threats to environment in the form of thermal pollution. According to Conserve Energy Future (2020) the thermal pollution is when an industry or other human-made organization takes in water from a natural source and either cools it down or heats it up. Causes of thermal pollution may be due to using of water as a cooling agent in atomic power station, manufacturing and industrial plants, textile and dyeing effluent, leather industries, etc. The manipulated heat fluctuation in the water bodies which changes the oxygen levels, increase in toxins and can have disastrous effects on local ecosystems, loss of biodiversity, effectsreproductive systems, increases metabolic rate and communities' migration.

ix. **Negative impacts of human Possibilism /** Determinism **on ecosystem:** Eco system is very essential to sustain various specious lives and reproduction. But due to in the name of human determinism different eco systems are disturbed. Especially due to extreme mining the, air pollution and acid rainfall, increasing the intensive agricultural activities, etc., are affects the forest ecosystems, grassland ecosystems, desert ecosystems and tundra ecosystems. The aquatic ecosystems are affected due to dumbing of solid wastages, thermal pollution, urban drainage, textiles and industrial effluence in to the ocean and fresh water.

INITIATION OF NEO-DETERMINISM

Meaning of Neo-Determinism: The concept was given by Griffith Taylor (1920) to explain the human limit after the concept ofAllen C. Sample (1903, Determinism). Neo-Determinism or stop and go-determinism means 'one should regulate one's activitiesas a Red light acts for traffic regulations'.

According Taylor, human can change the environment through various innovations and activities, but there is a limit to change by human, the environment compels them to stop. The optimum utilization of natural resources or without harming or disturbing the environment,the human activities must find the various ecofriendly alternatives to fulfill their needs. On other wards the nature has provides possibilities and scope for development but also put limits on it.

Educate about the need of Neo-determinism

The following initiatives may be taken to educate people to understand the need of Neo-determinism:

i. ***Stop consuming fossil energy and need to promote non-conventional energy:***While consuming the conventional energy resources such as natural gases, crude oil, coal, etc., the natural environment is disturbed very worsely. Hence, need to promote eco-friendly, non-conventional such as solar energy, geo thermal energy, wind energy, etc., at micro level to macro level. The new technologies are invented to increase the efficiency in producing the non-conventional energy. It is need of hour to provide complements, full subsidies, free of tax, awards and rewards to individual, institutions, organization, NGOs, etc. to motivate in adaptation of nonconventional energy resources.
ii. ***Conservation and promoting of ecosystem and bio diversities:***The human determinism may destroy all the ecosystem for developmental activities. The human cannot bear the deficiency of ecosystem which is very essential for retain and sustain the living species. The ecosystems provides food, water, timber, oxygen and air purification, soil formation and pollination, provides shelter to microorganism to huge animals, etc. But in the name of developmental activates ecosystem are catastrophically disturbed. As a result huge number of species are extinct and huge number of species are under red and yellow list.
iii. ***Sustainable / Eco-friendly economic development:***By human determinism people are able to destroy the ecosystem

for economic development. In the last few decades people use to destroythe ecosystem for temporary economic benefits. As a result, huge negative symptoms and environmental crisis are emerged such as flood, drought, famine, increases in environmental temperature and melting of permanent icecap due to global warming and rising of sea level, acid rain, extinction of species, etc., are the indication from the nature to stop further progress and find other alternative ways.

iv. ***Ecofriendly innovation:***The contemporary world in the name of human Possibilism there are huge inventions are made for human sophistication but most of them are non-ecofriendly. Especially the innovations such asartificial chemicals, radioactive weapons, toxic dying materials, fossil fuel based vehicles, non-degradable use and throw materials, etc., are crucially injuring the ecosystem. Hence the emerging innovation in the name of Possibilism must be ecofriendly.

v. ***Constitutional law and stop and go determinism:***There were many commissionsinsisted andrecommendations given and constitutional law was created at global, regional and national level. Especially in India,many constitutional lawswere created to sustain the quality of environment. The lawsshould act as traffic controller in the environment, who alters the rate, not the direction of progress.

vi. ***Should not compromise the quality of environment for economic development:***Environment is the fundamental assert for human welfare. Hence at any situation we should not compromise in the quality of environment for short term economic development. Especially in the name of mining, using of atomic energy, construction activities, deforestation in the name of developmental activities, etc., should not be allowed or should be delimited at environmentally acceptable level. Because the non-renewable resource is the core driving factor for living specious survival. Once if we lose the non-renewable natural resources we cannot create again and we cannot avail the benefits from precious resource.

vii. ***Promoting ecofriendly behaviour:***To retain the precious environment, human being should follow the stop and go or neo determinism in the form of ecofriendly behaviour as follow.

- Promoting 3Rs - Reduce, Reuse & Recycle.
- Promoting the researchers to invent, public to adopt and policy new non-conventional.
- Educating the public to reduce the usage of personal conventional vehicle and to promote to use non convention vehicle, common transport like buses and train.
- Every individuals need to engaged their Day to day life in protection and promoting the environment.
- Macro and micro planning associated with environment are executed by individual and government.

Summary

Along with the growth and development the needs of human also increases in the form of material and luxurious life. People indented to compromise the quality of environment to fulfill their needs. The nature is not only for human being but also for huge other living organisms. It provides opportunities to flourish not only human beings but all so huge number of plants and animal kingdoms. It is very unfortunate that except human being all other living beings are living ecofriendly and surviving with neo / stop and go determinism. The very worst attitude and behaviour found among human beings are exploiting the natural resources and destroying the mother planet. The nature cannot tolerate their ruthless behaviour after certain limits. If man crosses the optimum limits the nature may get annoyed and may destroy the mankind. Hence, the mankind need to utilize the natural resources without harming and without disrobing the natural environment. Hence it is the need of the hour to follow the neo / stop and go determinism.

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PRESENTATION ON -LITERACIES AS A SOCIAL LEARNING EXPERIENCE

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ABSTRACT

Social learning is based on a theory developed by psychologist Albert Bandura that proposes learning is a cognitive process that takes place in a social context and occurs purely through observation or direct instruction, even in the absence of motor reproduction or direct reinforcement.It is human nature to want to be accepted by others, so we automatically observe how others behave and what the consequences are in order to adapt our behaviour. With social learning, we use this technique to adopt the behaviour with which another person has been successful in order to achieve the desired result. While social learning is usually associated with learning specific content, it is actually a process that we naturally use subconsciously every day of our lives.The term social here refers to the fact that one questions and adjusts one's behaviour based on observation of other people in a social setting to achieve a desired outcome. Motivation, work ethic and learning techniques are examples of observed behaviour you can imitate to achieve a desired result. Behaviour learned through social environments can have a circular impact and inspire others in the same social setting.Literacy may be defined as the ability of an individual to use information to function in society, to achieve goals, and to develop her or his knowledge and potential. Historically, the field of education has placed great emphasis on improving literacy skills. As a result, reading and writing are often perceived by

administrators, teachers, and students as subjects that can be taught and learned as content to be remembered and tested. The perception of literacy as content influences classroom literacy practices in a way that leads to reading and writing being taught as subjects in and of themselves, not as communicative practices that support all learning.

Key words: Literacy as a learning experience , human behaviour, Education, Public Administration, Public Relations and information and technologies.

INTRODUCTION

Literacy is defined as being able to read and write, or to having knowledge about a specific subject. When you can read, this is an example of literacy. When you are familiar with math, this is an example of literacy in mathematics.The condition or quality of being literate, especially the ability to read and write.

Literacy as a learning experience

The literacy experiences and outcomes promote the development of skills in using language, particularly those that are used regularly by everyone in their everyday lives. These include the ability to apply knowledge about language. They take account of national and international research and of other skills frameworks.Students need literacy in order to engage with the written word in everyday life. Being able to read and write means being able to keep up with current events, communicate effectively, and understand the issues that are shaping our world.

Literacy skills are all the skills needed for reading and writing. They include such things as awareness of the sounds of language, awareness of print, and the relationship between letters and sounds. Other literacy skills include vocabulary, spelling, and comprehension. The Literacy Knowledge & Skills domain describes skills that provide the basis for children's emerging ability to read and write. This domain also addresses early reading skills, such as the ability to hear and differentiate sounds in words and some basic letter knowledge. Engaged, effective learning involves learning experiences that are thought-provoking, challenging, relevant, and meaningful to students'

lives. Effective means a learning experience that is designed to help learners experience an intellectual payoff. They learned something and they know it.

The content of the learning experience was personally relevant, interesting, useful, or meaningful to the learner. The learner had choices, shared authority, control, and responsibility. The learning was hands-on and experiential. The learner learned from and taught others. Key Learning Experiences can occur in any setting, formal, or informal. A Key Learning Experience is an experience, event, or time in your life that had significant impact on you, making it particularly memorable. Critical literacy is a central thinking skill that a tertiary education seeks to develop in students. It involves the questioning and examination of ideas, and requires you to syntheses, analyse, interpret, evaluate and respond to the texts you read or listen .

HUMAN BEHAVIOR

Human behavior is the potential and expressed capacity (mentally, physically, and socially) of human individuals or groups to respond to internal and external stimuli throughout their life. the eleven main aspects of human behaviour. The aspects are:- Psychology, Personality, Interest, Attitude, Emotions, Wishes, Prejudice, Stereotype, Thinking and Reasoning, Frustration and Adjustment, Deviant Behaviour. Psychology is the science of human behaviour, Behaviour of an individual refers to anything an individual does. Personality is the unique, integrated and organized system of all behaviour of a person. Personality is the sum total of one's experience, thoughts and actions; it includes all behaviour patterns, traits and characteristics that make up a person. A person's physical traits, attitudes, habits and, emotional and psychological characteristics are all parts of one's personality.

An interest is a preference for one activity over another. The selection and ranking of different activities along a like-dislike dimension is known as expressed interest. An interest is made manifest (visible), when a person voluntarily participates

in an activity. All port (1935) defined attitude as a mental state of readiness, organized through experience, exerting a directive and dynamic influence upon the individual's response to all objects and situations with which it is related.

Attitudes are formed in relation to objects, persons and values. Attitudes are not innate, but are formed as a result of individual's contact with the environment.

Attitudes have direction; positive or favourable, negative or unfavourable. They also vary in degrees. Attitudes are organized into a system and do not stand loosely or separately. Attitudes are rooted in motivation and provide a meaningful background for individual's overt behaviour. Attitudes develop through a consistency among responses. They are more stable and enduring than opinions. Attitudes are prone to change. Changes in attitude may be brought about by training and, other instructional methods and aids. Emotions denote a state of being moved, stirred up or aroused and involve impulses, feelings and physical and psychological reactions. A negative emotional response may lead to non-cooperation and non-participation in program, stoppage of work or even destruction of the work done. In a programme of planned change, the extension agent should take care of the state of emotion of the client system. While wish-goals are oriented toward achievement in the future, what is significant is its influence on behaviour in the present. Wishes are based on subjective judgement which may at times be irrational and otherwise faulty. At any one time, a person may have several wishes and it may become necessary to set priorities for their achievement.

Prejudice means pre judgement. Judgement before due examination and consideration of facts, and based on certain assumptions generally lead to the formation of prejudice. Prejudice is normally negative and difficult to reverse. Prejudices may lead to hostile attitude towards persons or objects. Expressing ill feeling or hostility towards some minority or caste groups, or an innovation are examples of prejudice. Stereotypes are fixed images formed in one's mind about people, practices or

various other social phenomena on the basis of experience, attitudes, values, impressions or without any direct experience, Stereotypes help in knowing how people perceive various groups of people or practice or various other social phenomena.

According to Garrett (1975), thinking is behaviour which is often implicit and hidden, and in which symbols (images, ideas, and concepts) are ordinarily employed. Group thinking, in which a number of persons participate in the solution of a problem, is usually more efficient than individual effort and is often more satisfactory. A common pattern of human behaviour involves hopes for future achievement. Such ambitions and goals are generally termed as wish. Frustration is a condition in which an individual perceives the wish goal blocked or unattainable. This creates some tension in the individual. When faced with such a situation, the individual tries to make several kinds of adjustments in the behaviour pattern. This is achieved through defense mechanism. Some individuals' personality traits and behaviour differ considerably more than others' from the norms. Such behaviour is termed as deviant behaviour and the individuals are known as deviants.

EDUCATION

Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, morals, beliefs, and habits. Education can be thought of as the transmission of the values and accumulated knowledge of a society. In this sense, it is equivalent to what social scientists term socialization or en culture. Children whether conceived among New Guinea tribespeople, the Renaissance , the middle classes of Manhattan are born without culture.

Education is designed to guide them in learning a culture, molding their behaviour in the ways of adulthood, and directing them toward their eventual role in society. In the most primitive cultures, there is often little formal learning little of what one would ordinarily call school or classes or teachers. Instead, the entire environment and all activities are frequently viewed as school and classes, and many or all adults act as

teachers. As societies grow more complex, however, the quantity of knowledge to be passed on from one generation to the next becomes more than any one person can know, and, hence, there must evolve more selective and efficient means of cultural transmission. The outcome is formal education the school and the specialist called the teacher.

The term education can be applied to primitive cultures only in the sense of enculturation, which is the process of cultural transmission. A primitive person, whose culture is the totality of his universe, has a relatively fixed sense of cultural continuity and timelessness. The model of life is relatively static and absolute, and it is transmitted from one generation to another with little deviation. As for prehistoric education, it can only be inferred from educational practices in surviving primitive cultures.

PUBLIC ADMINISTRATION

Administrative communications involve writing business correspondence such as memos, notices, reports and letters, speaking in meetings and presentations and listening to all levels of employees, co-workers and superiors to be productive and effective in your position. Effective communication either leads to the success or failure of their public agencies. Public administrators must develop effective means of sharing information with each other and with stakeholders, especially the public. Communication is a vital part of society. It plays a lot of roles, and it is essential for survival. People use it to encourage, share ideas, connect, inform, and more. Without communication, there will be a misunderstanding.

Communication skills are crucial to building relationships with service users, colleagues and collaborative partners,' says Dr Law. 'You'll need to be able to persuade and explain effectively, listen well and vary your verbal and writing style to get your point across.

Reading, writing, speaking, and listening are basic communication skills necessary for effective communication in any environment, particularly the workplace. we will gain a solid

understanding of the skills and demands required for a career in the public services, learning about a range of subjects such as leadership, health and lifestyle, citizenship, politics and law.

Top skills & qualities you need for the Public Sector

- Excellent organization and negotiating skills.
- Creativity and flexible thinking.
- Leadership.
- Decision-making ability.
- Team working skills.
- The ability to work alone.
- Good communication skills, written and oral.
- Enthusiasm and commitment for politics, policy issues and current affairs.

PUBLIC RELATIONS

Communication plays a vital role in effective public relations. Its very important to communicate between both parties so that both organizations are on the same page. The organization that is doing the PR must understand exactly what it is their other party wants for exposure. It improves channels of communication and to institute new ways of setting up a two-way flow of information and understanding- Media Relations. Preparing position papers on issues of importance to the organization., Guest Relations. Guest reception activities, Publications, Marketing Publicity and Others. Public relations (PR) can help raise your business' profile and improve your reputation. If done well, it can be a cost-effective way to get your message to a large audience. However, it can be tricky to guarantee success.

The 10 characteristics of a successful PR professional

- Flexibility. It's difficult to come up with a career that demands as much flexibility as public relations.
- Meticulous learning. Becoming a well-rounded PR person is not a walk in the park.
- Collecting information.
- Seeing the bigger picture.

- Building relationships.
- Knowledge.
- Strong writing.
- Honesty.

INFORMATION AND TECHNOLOGIES

Information technology (IT) refers to everything that businesses use computers for. Information technology is building communications networks for a company, safeguarding data and information, creating and administering databases, helping employees troubleshoot problems with their computers or mobile devices, or doing a range of other work to ensure the efficiency and security of business information systems. Demand for professionals in this field is high and growing, and people entering the field have a range of career paths to choose from.Information technology, examples run from tiny consulting firms to huge multinational corporations, and from highly technical specialties to management ladders that demand strong people skills. Here are some examples of routes you might choose:

Computer Support Specialist– These positions require a bachelor's degree and are a good fit if you enjoy answering questions about computer software and hardware, setting up equipment, and training computer users. People in this position need to have a strong grasp of many kinds of software, including database interface programs, development of environment tools and operating system software.

Network and Computer Systems Administrator– This job often requires a bachelor's degree in a computer-related field, though some employers may only ask for an associate degree or post secondary certificate.

Computer Network Architect– This is a step up the career ladder for a network administrator and usually requires a bachelor's degree and previous experience in the IT field. People in this position design and build networks, such as intranets, local area networks and wide area networks.

Database Administrator– This fast-growing field involves protection and security of data such as financial information and customer shipping records. The jobs are often in specialized firms that provide services to other companies, or in data-heavy industries like insurance.

Computer Systems Analyst– This job, also known as system architect, demands an understanding of both IT and business systems. As with many information technology careers, the typical background for the job is a bachelor's degree in a computer or information science field, but some people come to this work after studying business or even liberal arts.

Information Security Analyst– This is one of the fastest-growing jobs in IT, with an expected 32% increase by 2028, according to BLS. Professionals in these positions shield company networks and systems from cyber attacks.

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REVIEW ON DC BRIDGES IN MEASURING INSTRUMENTATION

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1. INTRODUCTION

It uses comparative techniques and operates on nullification. The bridge computes the sum of an unidentified component compared to a precise value. Therefore, the precision is to be said to be affected by the bridge modules, not the null pointer. Accuracy is therefore maximized. In the most basic type, it is a four-resistance circuit. current is given to two electrodes. It is hooked up to the rest of the network and has two extra connections.

2. ADVANTAGES OF BRIDGE CIRCUIT

- For so many benefits, it is surprising that one of the drawbacks is that the bridge circuit equation is independent of input voltage or source impedance. Since the quantities mentioned in the balance expression are not included in the calculation, they have units of their own:
- As the normal meaning serves as a guide, it's far more important to know how accurate the calculation is.
- Null detectability is independent of part values and based on

the location only.

- As a result, the equilibrium is independent of the null detector's sensitivity.
- If the source and detector are interchanged, the situation stays the same.

3. D.C BRIDGES

i. Wheatstone bridge:

To calculate a lower or uncertain electrical resistance, it balances two circuit legs. The initial potentiometer's operation is identical to that of the microphone preamp cartridge (VPA)

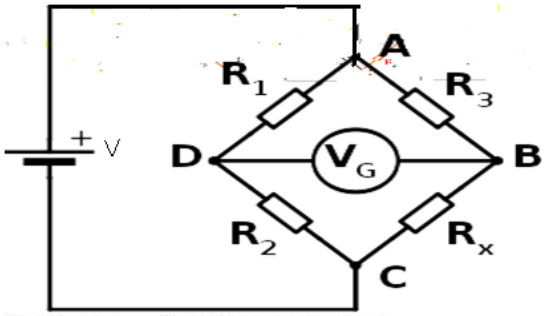

Figure 1 Wheatstone bridge

Operation

R1, R2, R3, and R4 are resistors with proven resistance, but R2 is the unknown variable. If the established leg resistance (R2 is the same as the uncertain leg R1) and voltage (B and D) are the same, so no current can go through the galvanometer. As R2 nears this target state, R will be constant. If the current is going in the opposite direction, it suggests that R2 is too strong or too short.

It can be achieved with extreme precision (see galvanometer). Because of this, the values of R1, R2, and R3 must be understood with absolute certainty. The less the shifts, the more difficult they are to track in rhythm. At the moment of equilibrium, the ratio of R2 to R1 is equal to Rx/R3.

Therefore,

$$R_x = \left(\frac{R_2}{R_1}\right) R_3$$

Knowing the R2 but not being able to change it allows the disparity between R1 and R3 to be calculated using Kapp's circuits. It is normally easier to calculate a strain and resistance with this gauge, since the readings are almost zeroed out while the needle is at rest; but, in resistance thermometers it is used more often because the metre needles have no effect on the other voltages.

$$I_3 - I_x + I_g = 0$$
$$I_1 - I_2 - I_g = 0$$

Then, Kirchhoff's second rule is used for finding the voltage in the loops ABD and BCD:

$$(I_3.R_3) - (I_g.R_g) - (I_1.R_1) = 0$$
$$(I_x.R_x) - (I_2.R_2) - (I_g.R_g) = 0$$

The bridge is balanced and Ig = 0, so the second set of equations can be rewritten as:

$$I_3.R_3 = I_1.R_1$$
$$I_x.R_x = I_2.R_2$$

Then, the equations are divided and rearranged, giving:

$$R_x = \frac{R_2.I_2.I_3.R_3}{R_1.I_1.I_x}$$

From the first rule, I3 = Ix and I1 = I2. The desired value of Rx is now known to be given as:

$$R_x = \frac{R_3.R_2}{R_1}$$

To find the voltage over the bridge, figure out the voltage from each of the resistors (with the supply voltage levels and ground in view), and then deduct one value from the others. The equation for this is:

$$V_G = \frac{R_x}{R_3 + R_x}V_s - \frac{R_2}{R_1 + R_2}V_s$$

With node B being (V_G) positive, and node D being (V_G) negative.

Significance:

Wheatstone's bridge does an excellent job of showing a variance measuring principle Tungsten Wheatstone bridges, among other things, are used to calculate capacitance, impedance, inductance, and other amounts like combustible gases. The Kelvin bridge was made with very low resistors in mind. For several purposes, unknown resistances, the Wheatstone bridge is important, for instance when used to measure power, temperature, strain, etc...

ii. Kelvin Bridge

The Kelvin bridge principle A modified Wheatstone bridge gives highly accurate measurements of low resistance readings. a greater comprehension of the Kelvin bridge can be attained by working with Wheatstone's Equations in tandem with low-valued resistors.

This bridge circuit reflects the relationship seen in the following diagram. It has R and S as the resistance, with r being the unseen resistance and S. Two galvanometers shown with dotted in the circuit diagram can exist. the cable could be connected either to point 'm' or 'n' as the connecting-j leads are inserted, the galvanometer can output too poor a reading for established resistance S. As the relation "n" is created, R increases to infinity...

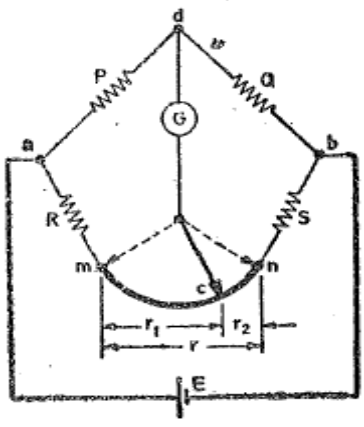

Figure 2 Kelvin Bridge

Instead of making the galvanometer relation at point 111, which yields a low results, let's move to the complete line in Figure, which boosts the result to 111. if R is split into two bits, so that, at point (c), it would be equivalent to twice the resistance R1 and R2.

$$\frac{r_1}{r_2} = \frac{P}{Q}$$

Then the presence of r1 the resistance of connecting leads, causes no error in the result. We have,

$$R + r_1 = \frac{P}{Q}(S + r_2)$$

But,

$$\frac{r_1}{r_2} = \frac{P}{Q}$$

So,

$$r_2 = \frac{Q}{P + Q} r_1$$

Conversely, increasing the contact resistance of the leads of the galvanometer with the body does not influence the results.

The Kelvin double bridge combines a second collection of ratio arms, called the Kelvin, resulting in a double bridge. Thus, it uses four separate resistor circuits, one for each resistance. A representation of the Kelvin Bridge's circuit design is seen. The ratio weapons on the three C's are P and Q. The second arm, p and q, is used to compensate for the relationship between the unknown ratio c, R, and the known constant, c to link the galvanometer points at the known point such that the unknown ratio, which is defined by means of p/c, does not affect the voltage drop, n and the normal resistance, R.*S.*

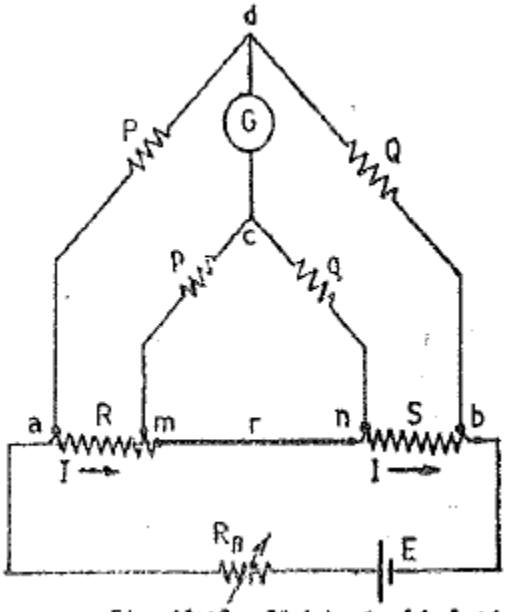

Figure 3 Kelvin Bridge

$$R = \frac{P}{Q} * S\frac{q_r}{p+q+r}\left[\frac{P}{Q} - \frac{p}{q}\right]$$

The proportion p/q is equivalent to P: q is obtained. If E is equivalent to or lower than Ec under conditions of equilibrium, therefore there is no new electromagnet.

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INTRODUCTION TO MEASURING INSTRUMENTS

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1. CLASSIFICATION OF MEASURING INSTRUMENTS

1. **Mechanical instruments: -** They're highly dependable when it comes to a static and secure setting. Although they cannot react quickly to change, their disadvantages include them being unable to respond to complex and transient situations.
2. **Electrical instruments: -** In comparison to mechanical indicators, electrical indicators show the performance of detectors faster. A mechanical metre movement is usually used to indicate unit activation.
3. **Electronic instruments: -** Those equipment react extremely quickly. For eg, a cathode ray oscilloscope (CRO) is capable of tracking adjustments of the order of a few nanoseconds, including complex and intermittent occurrences (10-9 sec).

2. DC and AC POTENTIOMETERS

2.1 DC Potentiometers

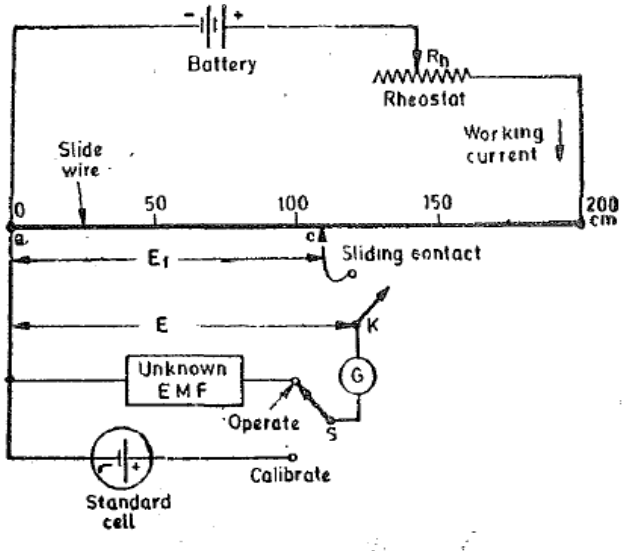
A potentiometer is a device that is used to calculate an uncertain voltage by adding it to a measured voltage. A kind of voltage reference source (either a normal cell or another type of voltage reference source) might be supplying the voltage known by the designer. In comparison measurements, the results are not

influenced by the real deflection of a pointer so only the voltage of the reference source matters.

The potentiometers have an additional benefit in that because the device relies on the balance point, or null state, there is no current flow, and therefore no power is absorbed in the circuit housing the uncertain emf. Since the source resistance doesn't affect the voltage on the potentiometer, finding the voltage by using a potentiometer is very straightforward.

Potentiometers are good for calculating voltage, but you can use them to calculate current as well. A potentiometer is a widely used testing tool for voltmeters and ammeters and has in turn been the standard for these calibrations. The potentiometer has achieved all of the benefits discussed above due to the versatility and accuracy it offers in the area of electrical measurements and calibration.

Both potentiometers follow the same circuit schematic that displays the simple slide wire potentiometer schematic. The battery provides the "functional current" (in terms of amps) to the rheostat and the slide wire while the galvanometer key is open, and the switch 'S' is in the "operate" role. You may change the functioning current by adjusting the rheostat. The uncertain voltage, E, is found by closing the sliding touch and finding a spot for it such that the galvanometer displays zero deflection, which is referred to as null state. The two possible results are that the unexplained voltage, E, is equivalent to the voltage decrease, Ei, over the section of the slide wire called ac, or that zero galvanometer deflection occurs.



There now becomes a question of finding the significance of the uncertain voltage on the section AC of the slide wire. A standardised cross-section for the slide wire results in uniform resistance over its entire length. An precisely measured scale in centimetres and fractions of centimetres is set up along the slide wire, enabling the moving touch to be positioned anywhere along the wire to the desired spot. Voltage drop along the slide wire may be regulated by regulating the current that flows through the slide wire. Using a set reference voltage, the current in the wire should be set such that the voltage decrease in the section of the wire matches the normal reference voltage.

2.2 AC Potentiometers

Using the potentiometer concept, the d.c. potentiometer is a reliable and flexible device. This means the principle is applicable to measurements of alternating currents and voltages. It is important to note that all direct current potentiometers and alternating current potentiometers use the same concept. Although only one magnitude and one phase need to be equivalent in a d.c. potentiometer to achieve equilibrium, all magnitudes and phases must be equal in an a.c. potentiometer in order to attain balance. Certain improvements have to be made to the d.c. potentiometer so that it can be used for a.c.

calculations.

When using the a.c; potentiometer, there are some critical considerations to be aware of. They are as follows:

To have proper balance in an a.c potentiometer, it is important to ensure that all voltages being compared are equivalent at all times. It needs phase and magnitude to be the same at all times. To put it another way, the current in the potentiometer circuit must match the voltage being calculated exactly. Because all a.c. potentiometers need the same source of voltage or current to be supplied, the potentiometer circuit must also be supplied from the same source.

A tuned instrument, which is also called a vibration ga1vanometer, is generally employed as a detector in an electric circuit, potentiometers. A tuned detector (responding to only one frequency) might be present. Using an average detector would not have the same balancing result as using an rms detector. It is likely that an optimal equilibrium cannot be reached, since the detector can only reveal the existence of minimal balance. Accuracy of calculation is significantly compromised in such a case. Therefore, to maximise the sinusoidal nature of the.a.c. supply, the source is sinusoidal.

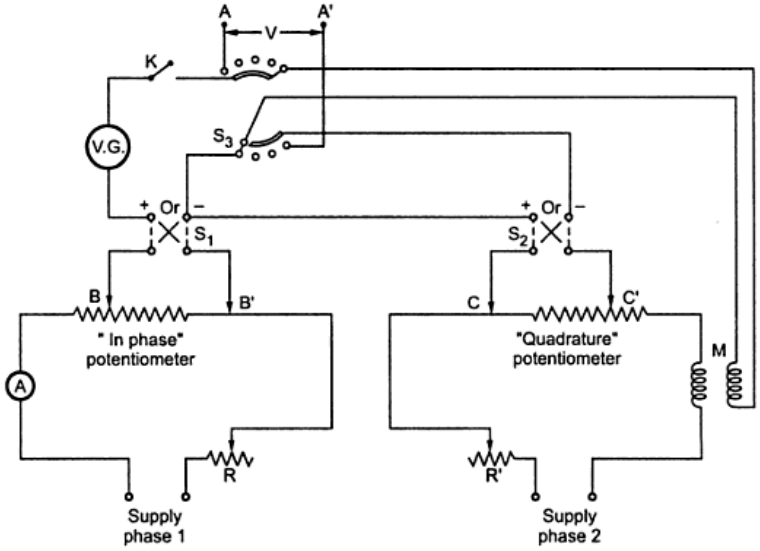
Using a potentiometer, it is possible to accurately calculate the combination of two voltages (i.e., the unknown voltage and the voltage around the potentiometer). Voltage value is precisely quantified whether the reference voltage (i.e. voltage through the potentiometer) is known or the reference current (i.e. operating current) is known with high precision. The precision of voltage calculation in an a.c. potentiometer cannot be compared to a d.c. measurement due to the absence of an a.c. reference source (the reference source in d.c. is a normal cell or a Zener source).

2.3 TYPES OF POTENTIOMETERS

i. Co-ordinate Type Potentiometer:

This potentiometer is made up of two potentiometer circuits which are located inside the same case. An in-phase potentiometer is referred to as a "input potentiometer" and a

quadrature potentiometer is referred to as a "output potentiometer." To keep a 90-degree phase difference, the slide-wire circuits are fed with currents that have a 180-degree phase difference. In phase with the current in the slide-wire circuit of the potentiometer, the "unknown" voltage portion of the potentiometer is calculated. The "unknown" voltage in phase quadrature with the current in its slide-wire circuit is determined on the other potentiometer. As the two observed values are the quadrature components of the undefined voltage, the two current values are the quaternary parameters of the voltage.

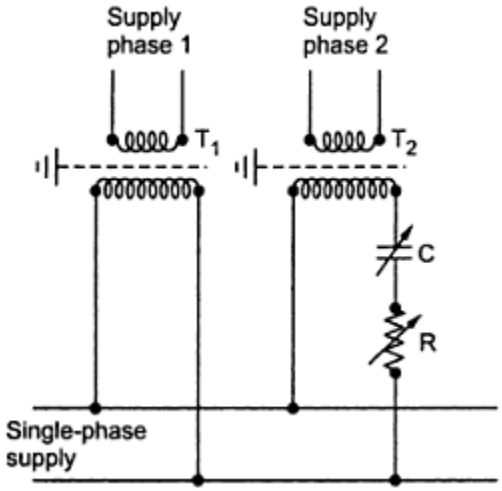


There are two transformers that move down the voltage by 6 volts, one of which is referred to as T1 and the other is referred to as T2. Even, they function like a Faraday cage, shielding the potentiometer from the power lines. The windings are normally supplied with a grounded mesh panel between the windings. Phase separation is accomplished by means of a variable resistor and a variable capacitor. By varying C and R, the quadrature phase displacement is achieved.

Operation

A direct current supply is connected to the in-phase potentiometer's standard cell, and a standard cell connected to the vibration galvanometer is used to set the current to its standard value. Torsion head ammeter type is a torsion head that turns to ensure zero torsion head deflection on direct current. The slide-wire current is held constant when the calibration is running, with alternating current, and the X-axis deflection is made to zero again. Finally, the galvanometer is plugged into the circuit and alternating current is supplied instead of direct current.

The normal value of 50 mA applies to both the in-phase and quadrature potentiometer wires, meaning the current in both wires must be equal to this value. Quadrature components of these two currents must both be equal and opposite. Once the normal voltage is set using the in-phase potentiometer wire, R is balanced until the current is at the desired level. Once the selector switch S3 has been placed in the test spot, it is turned on. Assuming the mutual inductor M is free from eddy current influences, the emf caused in the secondary winding will lag 90° in step behind the current in the primary winding, and this secondary winding will be the quadrature potentiometer slide-wire. However, the emf induced in the secondary is 2π x frequency x M x I assuming I is the main present.



To ensure a consistent reading, set the slide wire of the in-phase potentiometer to the measured value of induced emf in the secondary of M, and change the rheostat and capacitor R until equilibrium is achieved. A positive current on the quadrature potentiometer wire may be maintained by adjusting the slide-wire so it has a 90° phase shift to the normal (steady) current. The current in the main of M must be in exact quadrature with the current in this in-phase slide-wire in order for the emf in the secondary of M to be in-phase with the voltage decrease over a section of the in-phase slide-wire. To compensate for the disparity in polarity between the two loops, switches S1 and S2 swap their signs.

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DIGITAL METER

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1. INTRODUCTION

Often technicians refer to these types of voltage metres as digital Voltmeter (DVM), which transform analogue signals into digital and represent voltage values as distinct numerals instead of pointer movement. Voltmeters such as this may be used to display and quantify A.C and D.C voltages, as well as strain, temperature, stress, and several other variables. An advanced optical voltmeter (DVM) is used to calculate voltage in great detail. The electrical potential distance between two conductors in a circuit is measured by these instruments. Electronic voltmeters are also known as Digital Voltmeter modules (DVMs), and they are widely favoured because they provide a number of advantages over analogue devices. A voltmeter is used to calculate the voltage change in a circuit between two stages. The circuit being checked has all the leads attached in parallel to either foot. To maximise the number of counts shown on the metre, the positive terminal of the metre should be attached to the power supply. After the circuit being checked, the negative terminal will be attached. the voltage calculation will be shown as an analogue dial or digital monitor.

2. RAMP TYPE DVM

It uses a linear ramp technique or staircase ramp technique. The stair case ramp technique is simpler than the linear ramp technique.

i) Linear ramp technique

In such measurements, the time required for a linear ramp to go from 0 V to the input voltage level or to go from the input voltage level to 0 V is measured. The period shown on the graphical monitor is seen in the numeric form with the aid of electronic time interval counter.

Block Diagram

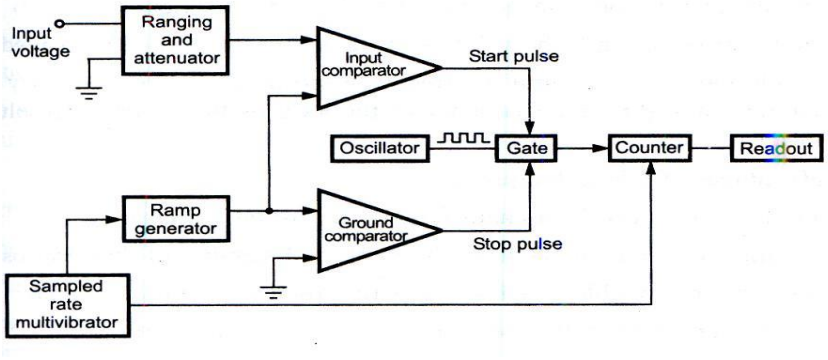


Fig. Linear ramp technique

- The input of the input comparator is connected to a properly attenuated input signal
- A proper linear ramp signal is produced and applied to all the comparators.
- The start pulse is sent using the input comparator, while the stop pulse is sent using the ground comparator.
- Applying the input ramp to the input comparator causes the comparator to trigger and thus initiate a gate opening.
- The oscillator provides the driving force for the counter. The counter begins at zero as soon as the oscillator signals are sent.
- At this point, the input ramp is added to the ground comparator, and the slope is decreasing.

- Ramp becomes negative, causing the inputs of the ground comparator to become zero and to which the gate sends a stop pulse, completing the circuit.

ii) Staircase Ramp Technique

This kind of DVM uses a staircase ramp instead of a linear ramp. The digital to analogue converter is used to produce the staircase ramp. The staircase ramp technique is also known as the null balance technique.

3. BLOCK DIAGRAM

- Attenuation is added to the input voltage, and is then connected to a null detector. The null detector receives feedback from the digital to analogue converter's staircase ramp.
- People sometimes refer to the ramp as being analogous to the input signal.
- As the logical control circuit sends a rest signal, this denotes that the equipment is idle. This resets the counter. This converter changes the optical signal to an analogue signal as well.
- The digital to analogue converter gives the output counter to the ramp generator.
- When you think about it, any little improvement you see is a gradual step in the overall increase in the ramp. thus, the ramp leading up to the upper level of the building is generated by the digital to analogue converter.

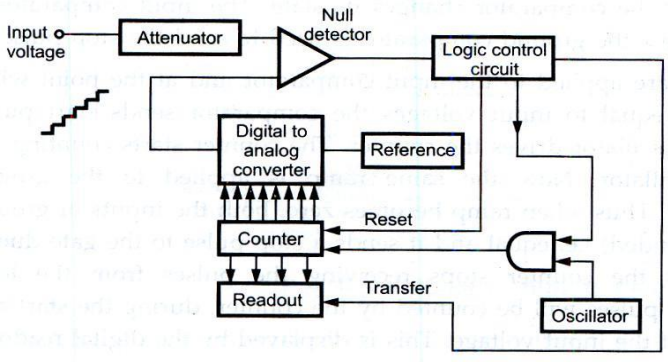
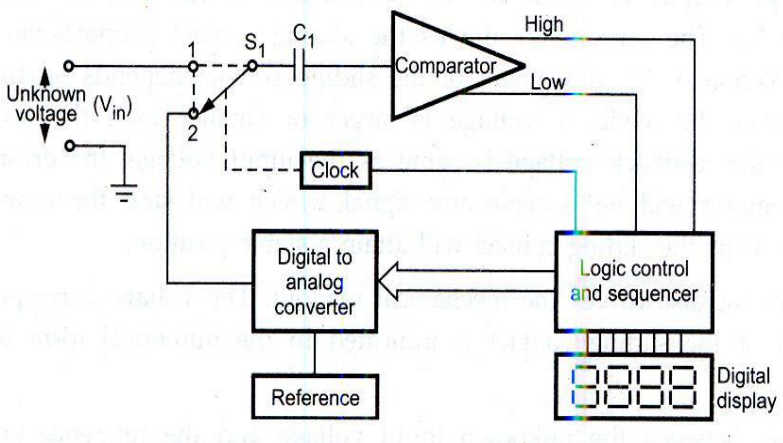


Fig Staircase ramp technique

- This is a second input to the null detector.
- The ramp begins to rise in voltage until it reaches the output voltage equivalent to the input voltage.
- The null detector detects equivalent voltages and thus produces a signal which in turn causes the logic control circuit to initialize

4. SUCCESSIVE APPROXIMATION TYPE DVM

- Stepper motor Controlling potentiometric A DVM is a straight-line divider, but a wireless divider is used in successive approximation.
- A wireless divider is a D/A converter.
- In this scenario, an electrical logic was substituted for a servo motor.
- While the fundamental theory of measuring by this approach is equivalent to a simple example of weighing an item, the process by which the result is determined is somewhat different.
- On one side of the balance, the estimated weight is put, and on the other side is an entity, which is



Successive Approximation Type DVM

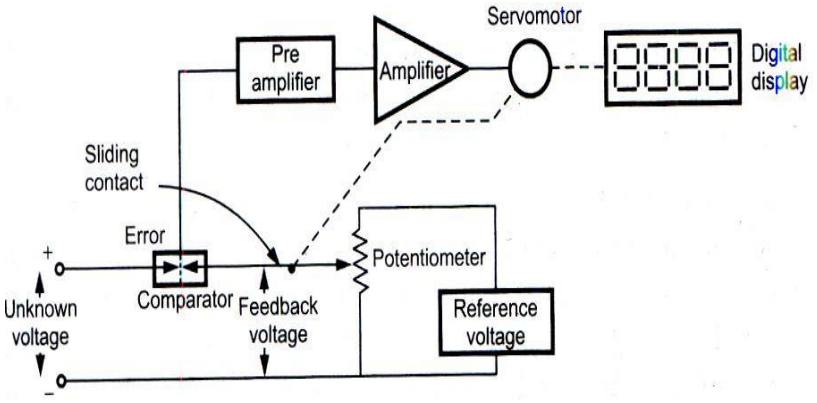
- Lighter weight is applied if this weight is less than the object.
- thus, by repeating this method, the weight of the item is calculated

- In fact, successive approximation is the same concept applied to the DVM.
- The comparator contrasts the output of a digital to analogue converter with the uncertain voltage in successive approximation form DVM.
- Because the comparator produces logic high or low signals, the appropriate signal is used in the circuit.
- the set pattern of signals is successively produced with the digital to analogue converter
- The digital to analogue converter converts the digital value into an analogue voltage before the performance of the converter is equivalent to the uncertain voltage

5. SERVO BALANCING POTENTIOMETER TYPE DVM

Unknown voltage is contrasted to a defined voltage using a potentiometer setting. A null balance is obtained by varying the arm of the potentiometer.

Block diagram



Servo Balancing Potentiometer Type DVM

The internal reference voltage is given in the potentiometric voltmeters. In order to find the input voltage, a voltage calculation procedure is used. In order to find out the uncertain voltage, which is being related to the reference voltage, the potentiometer is used, or, the setting of the potentiometer is used. To achieve the equilibrium state, the potentiometer's arm is varied. The voltage current at the potentiometer's terminals is

known as the internal reference voltage. If the uncertain voltage is lower than the dial setting of the potentiometer, the null state is achieved. Null balancing is performed dynamically. Self-balancing potentiometric form DVM is a voltmeter that operates in this manner. It's called a servo balancing potentiometer and it is used to adjust the potentiometer's handle, and so it's often called a DVM (Digital Varying Motor).

6. DUAL SLOPE INTEGRATING TYPE DVM

The most common way of analogue to digital conversion is to use a sample rate converter. Using the ramp methods and the noise, which occurs in these types of ramps, can result in significant errors, but using the dual slope form, which has the opposite ramps in the incorporation phase, the noise is averaged out. This approach uses a defined period of time to incorporate the input signal. In order to make the integrator hold a constant voltage, it is connected to the reference voltage in the opposite direction to the voltage increase.

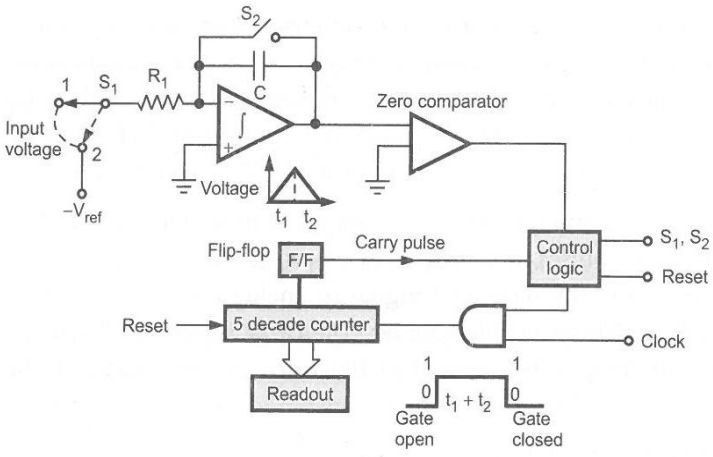


Fig..Dual slope integrating Type DVM

7. DIGITAL MULTIMETER

A digital multimeter shows measurement results in one of three ways: utilising 7-segment LED displays, numeric displays, or liquid crystal displays (LCDs). Digital multimeters are devices that are capable of calculating voltage measurements, current measurements, and resistance values through a variety

of ranges. A multimeter, also known as a volt/ohm metre or VOM, is a device that integrates many calculation functions into one instrument. Both multimeters usually have voltage, current, and resistance measurement functions. Depending on the model, multimeters may be analogue or electric (often abbreviated DMM or DVOM.) Instruments which rely on a microammeter's pointer moving over a scale calibration normally use analogue designs, while digital instruments will show numbers, but in certain cases the length of a bar will be shown. As a multimeter is generally used for tasks including fault detection and field support, it may also be used as a bench instrument that measures precision to very high degrees. The same types of cable used to repair household machines and commercial machinery may often be used to troubleshoot certain electronic issues. They have the following advantages over traditional multimeters: Digital multimeters have the following advantages over analogue multimeters.

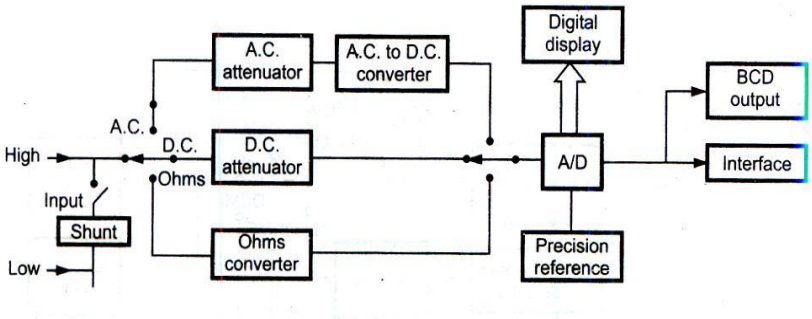
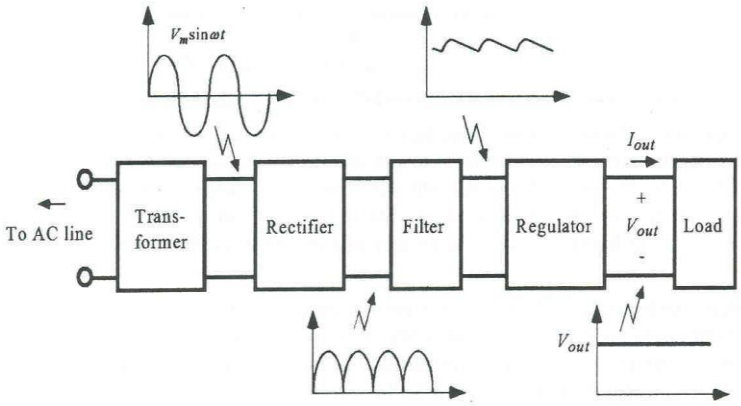


Fig. Digital Multimeter

- 7-segment LED displays, alphanumeric displays, or liquid crystal displays (LCDs) are used to represent measurement values in optical multimeters.
- The digital multimeter can measure AC voltage, DC voltage, AC current, and DC resistance over a number of scales.
- Present flows into a low shunt resistance and is transformed to voltage.
- Rectifiers and filters are used to transform the AC volumes to DC.

- when applying a precision low current source to the uncertain resistance, the metre consists of a DC voltage source.
- Both amounts are seen in graphical form on the monitor using an analogue to digital converter.
- While analogue multimeters need more strength, they are less susceptible to electrical noise and isolation problems.
- The overall accuracy is quite good.
- This means there is no loading impact since the input impedance is very strong.
- At larger viewing distances, a clear reading is observed.
- This can be used to interface with external devices, because it is electrical.
- Prices are decreasing.
- In dimension, it is small.
- Accuracy is about perfect.

Block diagram of supply



Components of a typical linear power supply

Contemporary multimeters can measure many quantities. The common ones are:

When a circuit conducts, the continuity beep begins to sound. are counted in forward-direction drops (measuring forward decline in diodes and transistors) (measuring current gain and other parameters) For basic 1.5V and 9V batteries, search the

battery. This voltage scale is currently loaded. If you are using a DC voltage scale to test batteries, ignoring internal resistance rises as the battery gets used up.

Various sensors can be attached to multimeters to take measurements such as:

- Light level Acidity/Alkalinity(pH)
- Wind speed
- Relative humidity

The resolution of a multimeter is also defined in "digits" of resolution. For eg, a multimeter with a monitor that shows five and a half digits is referred to as a five and a half digit multimeter. It is common practise to represent numbers from zero to nine with a half-digit and those greater than one but not nine using a three-quarters digit. a three-quarters digit (often 3 or 5) is the highest value of three-quarters of a number.

For all values shown, the fractional digit is the most important digit. It will have five full-digit dials, with one-half-digit that just shows 0 or 1. A metre like this could display values ranging from 0 to 199,999. There are different manufacturers and their systems for labelling the display. While a digital monitor can conveniently be expanded with precision, the extra digits are of little use if not preceded by caution in the construction and configuration of the analogue portions of the multimeter. Instrument parameters, effective control of measurement conditions, and traceability of the instrument calibration are all essential for meaningful high-resolution measurements. It is also possible to determine the resolution in terms of "display counts."

Monitor counts offer the maximum amount, or the largest number plus one (so the count number appears nicer) the multimeter's display will reveal, ignoring a decimal separator. This is a good example: A five-and-a-half digit multimeter may also be defined as a display count of 199,999 or a display count of 200,000. In multimeter standards, the output count is also only called the count.

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INSTRUMENT USED FOR MEASUREMENT OF FREQUENCY AND PHASE

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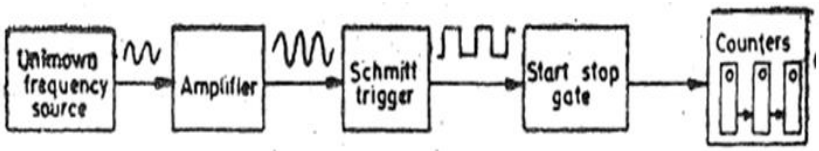
1. DIGITAL FREQUENCY METER

To calculate the frequency of the signal, a train of pulses is produced. A specific time period is timed, and the number of pulses occurring within that interval is calculated using an electronic counter. The number appearing on the counter corresponds to the frequency of the unknown signal since the bursts reflect the periods of unknown signal. With the electronic counters operating at a faster speed, it is possible to know the frequency of high frequency signals.

The circuit diagram of a wireless frequency meter is shown in the figure below. The unknown frequency signal is fed to a Schmitt trigger, which then generates an interrupt.



Until being added to Schmitt trigger, the signal can be intensified. The signal is changed to a square wave that has very short rising and fall time and is then differentiated and trimmed. In other words, a Schmitt trigger's performance is made up of a

train of pulses, one pulse for each loop of the signal.

The Schmitt control output pulses are fed to the start-stop doors. The input pulses enter this gate as the gate opens, after which they proceed to the electronic clock, which begins to count the input pulses. As the gate is disabled, the number of pulses supplied to the counter is terminated, and the counting will end.

To know the pulse rate and hence the frequency of the input signal, you must first know the length of the time period between start and end. If we make f the uncertain signal's frequency, N the number of counts shown by the clock, and t the period between the start and end of the gate, we get the following equation:

∴ Frequency of unknown signal, $f = N / t$

Clearly, to get an accurate understanding of the frequency of the input signal, we must know precisely how long it takes for the gate to start and close. Time base is the length of time that you can wait before doing action again. A time-base is an oscillator with a fixed frequency. The dock oscillator, as its name implies, must be exceptionally precise. In order to ensure its consistency, the crystal is placed in a constant temperature oven to prevent it from changing temperature. This constant frequency oscillator's output is fed to a Schmitt trigger, which in turn outputs a train of pulses whose frequency matches that of the clock oscillator.

The time base may be picked using the selection switch located above it.

1. WESTON FREQUENCY METER

The two coils are placed opposite to each other. Two separate coils are provided for the larger model. In the diagram seen above, the relations are as they are now. When it comes to the branch circuit of coil A, resistor RA is used in series with it when reactance coil LB is used in series with coil B. When connecting circuits, A and B in tandem, the reactance coil LA is linked to circuit A, and the resistance coil RB is linked to circuit B.

The needle is made of soft iron and is capable of

movement. On the spindle, this needle is pivoted and mounted with a pointer and damping vanes. The force cannot be regulated. Instrument measurement requires reducing the overtones in the current, and the series L-type reactance coil can help reduce higher harmonics in the current and thereby further reduce the waveform errors in the instrument's indication.

Working:

Currents flow from the supply to the two coils as they are connected by the meter. Two opposite magnetic fields are generated in this manner and are perpendicular to each other. The field strength depends on the current in the coil. Fields which work on the soft iron needle have an influence on where the needle is placed. Because the needle's location is dependent on the two field strengths and the currents, the two fields have an equal and opposite effect on each other.

The meter's configuration allows for a natural voltage decrease through reactance LA and resistance RB, which equates to equivalent current across coils A and B. as shown in the above figure, then the needle will be at a 45-degree angle relative to both the coils and the pointer will be in the middle of the scale.

The resistance declines, while the reactance of LA and LB rises, while the frequency increases above its usual value. Thus, when the strength of the applied voltage to coil A rises, so does the voltage impressed on coil B. Since the current in coil A is increasing, the current in coil B is decreasing (owing to increase in reactance of LB). So, the field in the area between coils A and B is heavier. If the needle points to the stronger sector, it will try to align itself up with coil A's axis. To return the pointer to its left place, the mark deflects to the left.

The cursor deflects to the right as the frequency reduces.

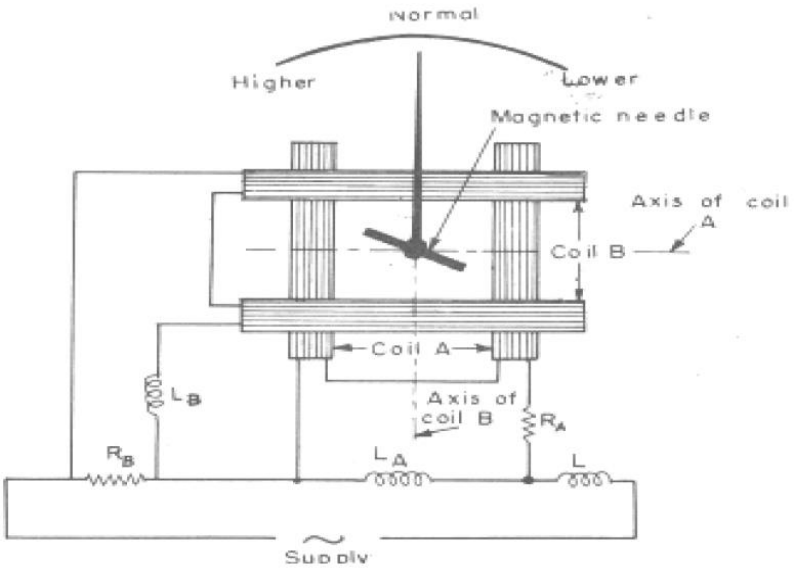


Figure 1 Weston frequency meter:

2. DIGITAL PHASE METER

The digital phase meter circuit measures the phase difference between the edges of the two pulses of the second clock signal in the two-pulse sampling interval. In one implementation of this phase meter circuit, the output of the horizontal flyback pulse of a television receiver is used as the first clock signal, and the emitted phase comparison pulse is used as the second clock signal. The phase meter circuit has an A/D converter, a switchable multiplier, and an integrator which are all clocked at a multiple of the horizontal fly-back pulse repetition pace. A novel and interesting aspect of the invention is that the optical phase meter circuit incorporates smaller amounts of circuitry than previously available circuits, enabling smaller integrated circuit chip areas.

For an unlocked delay line, the delay times for m delay elements (i.e., m cell elements) and the m cells of a first register are determined, and the phase difference between the first and second clock signals is determined by dividing the difference in frequencies of the two clock signals with a frequency divider. When the levels of the outputs of the kth register cells are disparate, logic 1 occurs at the output of the kth XOR gate. As the

multiple adder adds the logic levels together, the step is reached at the n-bit output. The precision, which is defined as m, is 2n.

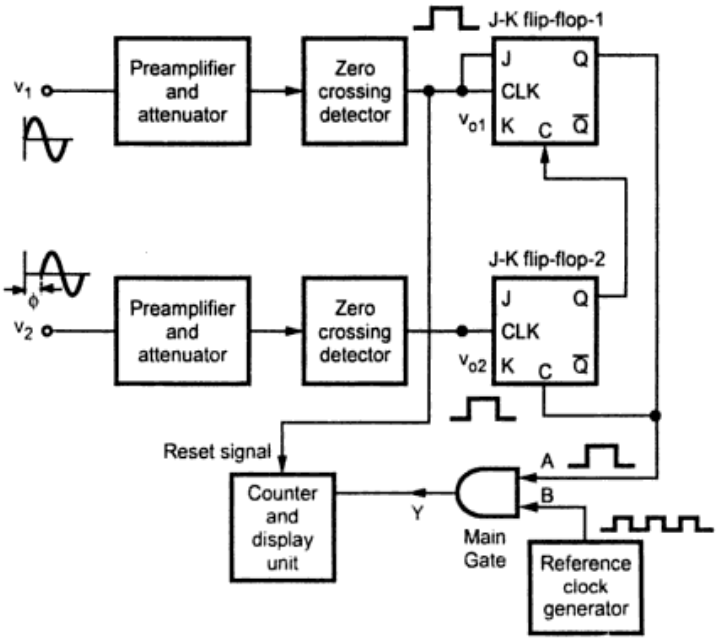


Figure 2 Digital Phase Meter

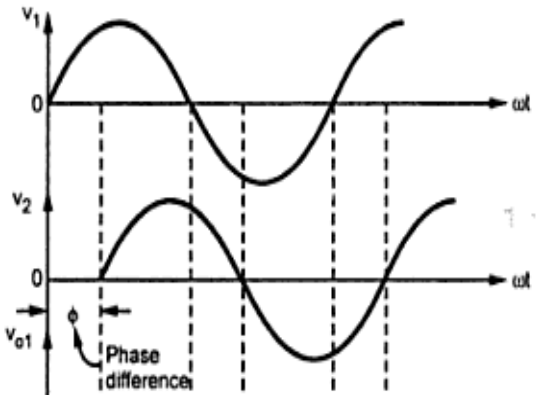


Figure 3 Output of Digital Phase Meter

Because of the delay elements, register cells, XOR gates, and multiple adder, you can install the automated phase meter circuit according to the innovation with 2n delay elements, 2n register cells, 2XOR gates, and a 2-bit multiple adder whose performance produces an n-bit signal. Conversely, if the multiple

adder's output signal is taken to be a binary fraction, the binary adder's output precisely corresponds to the digital values of the coordinates of the edges of the pulses of the first clock signal and is positioned relative to the edge of a pulse of the second clock signal in the sampling period of two pulses of the second clock signal.

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A STUDY ON STORAGE, DISPLAY DEVICES AND TRANSDUCERS

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1. MAGNETIC DISK AND TAPE

Principle of Magnetic Tape Recorders:

The initial coil current difference over time occurs as magnetic pattern distributed in space around the tape as a magnetic tape is moved via a recording head. If the tape is pushed through one of the heads used for reproducing or playing, it creates slight differences in the winding resistance, which, in turn, causes a voltage to be produced in the winding depending on the path of magnetization and its severity. The voltage produced by the magnetic flux linkages is proportional to the rate of change of flux linkages. As the amount of emf induced in the winding of the head is proportional to the difference in the amount of magnetization on the tape, the amount of emf induced in the winding of the head is proportional to the output rate of the head.

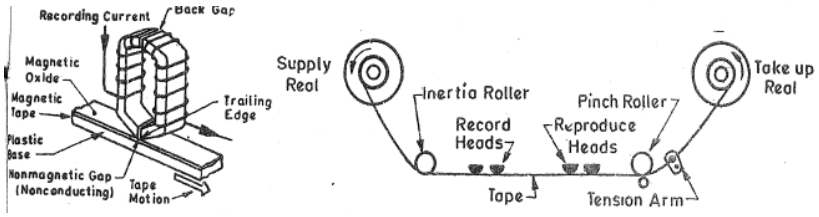


Figure 1 Magnetic Tape Recorders

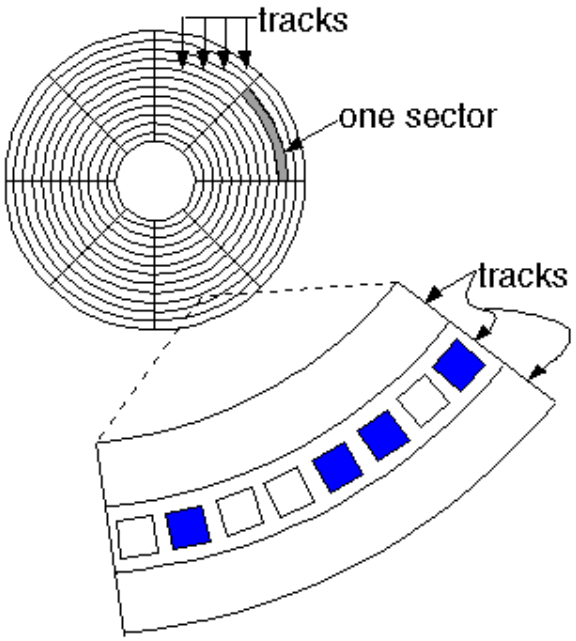
Components of Magnetic tape recorders:

1. Recording Head : In order to do this, a magnetic pattern is produced in a magnetizable medium when a magnetic signal is applied.
2. Magnetic Tape: Magnetic tape is made up of a rubber cord coated with a thin layer of magnetic iron oxide crystals. Tape has a standard width of 12.7 mm and a thickness of 25.4 μm. They then organise and adhere to the magnet's magnetic field, preserving the template that was placed on them. ·
3. Reproducing Head: To track the retained magnetic pattern, the reproducing head transforms the electrical signal into a magnetic pattern, and then the pattern is converted back into an electrical signal. Similar to a recording head, the reproducing has a very similar look.
4. Tape Transport Mechanism: This system transports the tape at a steady pace over the recording or reproducing heads. It must be capable of supporting different tape operating modes without causing distortion, straining, or wearing the tape. This requirement involves precise guiding of the tape with plans, precise stress management, and a great deal of tape-to-magnetic-head interaction. Quick winding and reversing are included as well.
5. Conditioning Devices : These instruments have amplifiers and filters that may be applied to change the signal from an original shape to one that is compatible with being captured on film.

2. MAGNETIC DISK RECORDERS

The only storage unit in the monitor. Magnetically captured and re-recorded several times, including tape The surface of a revolving disc is made up of two large, stationary platters on either side of a central spinning portion, each of which is suspended by a spring-loaded arm. On a floppy disc, finding a spot will take up to one second, while finding one on a hard disc can only take a couple of milliseconds. Magnetic discs are hollow plates of metal or plastic, with a thin layer of iron oxide applied on all ends. when the disc is rotated by a drive unit,

an input signal is captured on the surface of a disc by using magnetic patterns or spots in spiral tracks that are recorded by a tracking head. It is possible to locate the heads anywhere on the disc they can be required with great precision. When storing machine files, the number of discs placed vertically on the spindle of a drive device is up to 20, which is called a disc pack. The drive device is fitted with various head configurations, including a combination of both reading and writing heads. Magnetic disc players are better than cassette recorders due to these characteristics. Instead of individually going through the entirety of an audio or video file or data block in search of specific material, a disc device may locate it somewhere on the recording and thus access it even faster. By having direct access to a particular track on a specific disc, a disc machine in a magnetic disc configuration may limit retrieval time to a fraction of a second. Magnetic disc technology was extended to data storage in 1962, when hard disc drives were introduced. These devices were particularly useful for use as auxiliary memories in high-speed computer systems due to the arbitrary usability of data stored on disc units. At the end of the 1970s, compact plastic discs, often known as floppy discs, came into the market. While floppy discs are less able to hold and retrieve information than other types of discs, they are ideal for use with minicomputers and microcomputers, which place emphasis on low cost and simplicity. Magnetic disc recording has other applications, such as archiving and replication. Where it comes to office dictating devices and transcribing units, there is a method for saving spoken messages and then retrieving them for later usage. In live telecasts, particularly of sporting events, the process known as “instant replay” is greatly facilitated by magnetic disc technology. A replay of, for example, a key play in a football game is done during a television stream of the game. However, the videotape recorders proved too cumbersome, which explains why they were not originally used for instant replay. This special videodisc system Ampex created in 1967 reduced the amount of time needed to find and repeat a desired action to around four seconds.



Tracks and Spots

The disc surface is separated into concentrated tracks (circles within circles). The more the tracks are smaller, the more storage. The data bits are recorded on the paths as small magnetic spots. The smaller the place, the smaller the bits per inch and the larger the storage.

Sectors

Tracks are further split into segments that include a single block of read or written data; READ SECTOR 782, for example, WRITE SECTOR 5448. One or more sectors will be interpreted, modified and written back to disc in order to update the disc. The operating system determines how data should be placed in these fixed areas. Modern discs have more areas on the outside than in the inside, so the outer region is larger than the inner radius.

3. STRIP CHART RECORDER:

It records one or more variables with respect to time. It is a X-t recorder.

A strip chart recorder consists of:

1. A long roll of graph paper moving vertically.
2. A system for driving a paper at some selected speed. A speed selector switch is generally provided. Chart speed of 1-100 m/s are usually used.
3. A stylus driving system which moves the stylus in a near exact replica or analog of the quantity being recorded.

A range selector switch is used so that input to the recorder drive system is with in the acceptable level.

A. Paper drive system: The paper system should move the paper at a uniform speed. A spring would be used but in most of the recorder a synchronous motor is used for driving the paper.

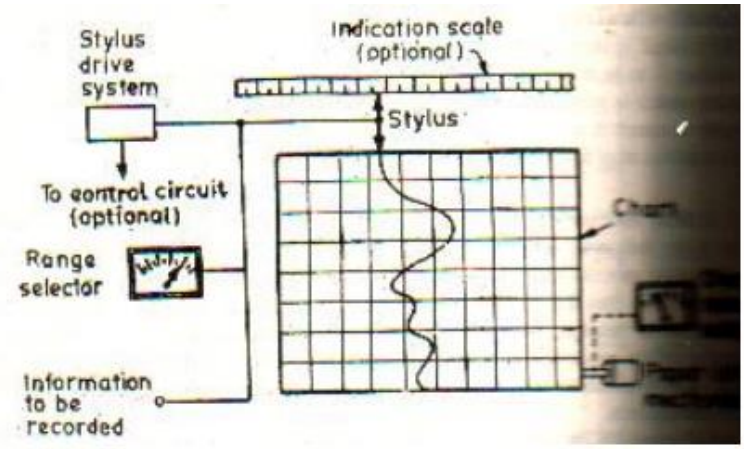
B. Marking Mechanism: There are many types of mechanism used for making marks on the paper. The most commonly used ones are:

1. Marking in style packed with pigment. The stylus is loaded with gravity or capillary measures. This allows the pointer to accommodate a storage tank and a stylus or a capillary connection between the stylus and a stylus. Red ink is generally used but other colours are usable and a colour code may be followed in the instrumentation show.
2. Marking of style headed. Some recorders have a heated style that is written on a special pad. This approach overcomes the problems in writing systems.
3. Chopper Bar. A basic recording mechanism is feasible if a diagram made of pressurised paper is used. A V-shaped pointer is placed under a chopper bar that presses the pen once per second to the page, creating a series on the special paper. This method is not strictly constant and is thus ideal for recording different amounts.
4. Marking with electric stylus. This approach uses a document with a special coating that is current-sensitive. A mark occurs on the page while the current is from the stylus to the paper. The electric style marking system clearly has a broad variety of marking rates, low style friction and a long stylus

existence. The downside is that paper costs are very large.

C. Tracing system: There are two types of tracing system used for producing graphic representation.

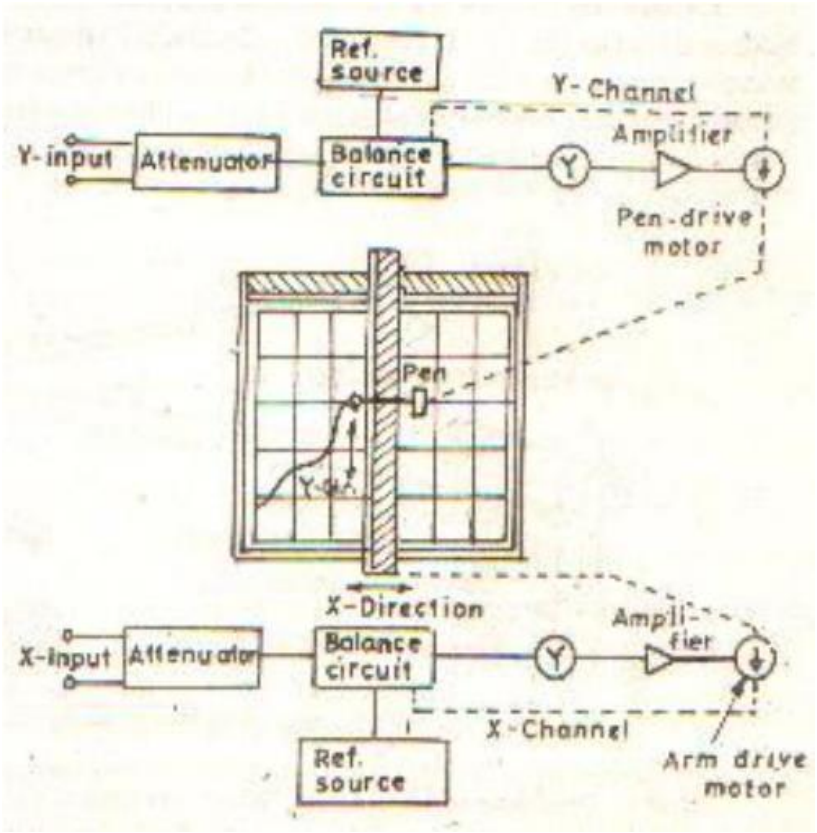
1. Device curvilinear. In the curvilinear method, the style is placed on a central pivot, which allows for maximum width labelling of the diagram. The line drawn across the map is angled and the time intervals are in the curved segments whether the style takes a full spectrum recording.
2. System rectilinear. It is noted that a constant timeline is perpendicular to the time axis and that this method thus provides a straight line around the map distance. Therefore, the style is driven by a drive cord on sweaters to achieve forward and back movement as dictated by the drive mechanism. A self-balancing potentiometer, a photoelectric deflection device, a photoelectric potentiometer or a bridge balance system can be used to control the style. Typically, this device is used for thermal or electrical wiring.



4. X-Y RECORDER

A strip chart recorder records the time variations of the amount, while the X-Y recorder is an instrument which records the relationship between two variables. Self-balancing potentiometers are commonly found in strip map recorders. These self-equilibrating potentiometers represent the emf in terms of time. The X-Y recorder, an emf, is designed to work with another emf.

The self-balancing potentialometer controls the location of the rolls and another self-balancing potentiometer controls the position of the ink. In an XY recorder one independent potenciometer circuit pushes a pen to the X direction and another self-equilibrating potentiometer circuit moves the pen to the Y direction at the right angle to the X direction, while the paper is still stationary.



There are several XY recorders variants. The emf cannot actually just calculate voltages for activity of XY recorders. The emf calculated would be the transducer performance that can quantify the displacement power, vibration, tension, light strength, or some other physical quantity. Thus, a physical quantity may be compared to another physical quantity with the aid of XY recorders and suitable transducers. Thus, an XY recording device consists of a pair of serving systems which

drives the pen in two axes through a correct sliding pen and moving arm, referring to a stationary paper diagram. Each of the two channels has a signal. The signal is attenuated to the maximum size inherent in the recorder, then the signal is sent to a balance circuit as compared to an internal reference tension.

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REVIEW ON AC BRIDGES IN MEASURING INSTRUMENTATION

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1. A.C. BRIDGES

The a.c. bridge in its fundamental shape comprises of four legs, a trigger of excitement and a balancing sensor. Any arm is an impedance. The output is a.c. supply that delivers a.c. volt at the necessary frequency. The electrical oscillators are often used as basis for high frequencies. Bilanz sensors for a.c. bridge are widely found in headphones, tunable amplifiers or vibration galvanometers. As detectors at frequencies between 250 Hz and 3 and 4 kHz, the headphones are used. A tuning detector is perhaps the most intuitiveness when operating for a single frequency. Vibration's galvanometers may be used from 5 Hz to 1000 Hz for low audio frequencies, but are usually used for less than 200 Hz. Tunable amplifier sensors are used for the 10 Hz to 100 Hz frequency spectrum.

i. Schering Bridge:

A Schering bridge is a bridge circuit used for the measurement and dissipation of uncertain electric power. The dissipation metric of a condenser is the resistance ratio to its

capacitance. The Schering Bridge is essentially a four-arm AC circuit, the calculation of which depends on the balance of the load on the axes.

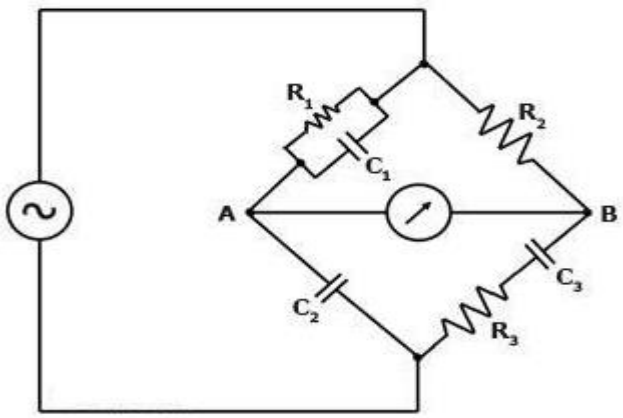

Figure 1. Schering Bridge

The resistance values for resistance values R1 and R2 are known in the Schering Bridge above, while the resistance value for resistance R3 is uncertain. The C1 and C2 capacities are both established when the C3 capacitance is the calculated amount. To calculate R3 and C3, the C2 and R2 values are set, while the R1 and C1 values are balanced until the current is 0 via the ammetric between A and B points. This occurs if the voltages are identical at points A and B, in which case the bridge is called 'balanced.' If the bridge is balanced, Z1/C2 = R2/Z3, with Z1 being the impedance of R1 parallel to C1 and Z3 being the impedance of R3 in C3 Series. The condenser adds to the impedance of an AC circuit that includes a condenser. The capacitance reaction of a condenser C is $1/2\mu fC$.

As such, $Z_1 = R_1/[2\pi fC_1((1/2\pi fC_1) + R_1)] = R_1/(1 + 2\pi fC_1R_1)$

While $Z_3 = 1/2\pi fC_3 + R_3$.

Thus, when the bridge is balanced:

$$2\pi fC_2R_1/(1+2\pi fC_1R_1) = R_2/(1/2\pi fC_3 + R_3); \text{ or}$$

$$2\pi fC_2(1/2\pi fC_3 + R_3) = (R_2/R_1)(1+2\pi fC_1R_1); \text{ or}$$

$$C_2/C_3 + 2\pi fC_2R_3 = R_2/R_1 + 2\pi fC_1R_2.$$

When the bridge is balanced, the negative and positive reactive

components are equal and cancel out, so

$$2\pi fC_2R_3 = 2\pi fC_1R_2 \text{ or}$$

$$R_3 = C_1R_2 / C_2.$$

Similarly, when the bridge is balanced, the purely resistive components are equal, so

$$C_2/C_3 = R_2/R_1 \text{ or}$$

$$C_3 = R_1C_2 / R_2.$$

ii. Maxwell Inductance Bridge:

The Maxwell Bridge is used for calibrated resistance and ability measurement of uncertain inductance. It is more complex to produce calibration inductors than equivalent precision condensers, and thus the usage of the basic "symmetric" inductance bridge is not often feasible. As the phase changes of inductors and condensers are opposite each other, the capacitive impedance will complement an inductive impedance, as it is, in contrary legs of a bridge. The lack of a measuring error related to the reciprocal inductance between two inductors is a further benefit of utilising a Maxwell bridge instead of a symmetrical inductance bridge.

Magnetic fields can be hard to protect and even slight coupling between coils in a bridge can, under some circumstances, cause significant errors. No second inductor to respond to in the Maxwell Bridge eliminates this issue.

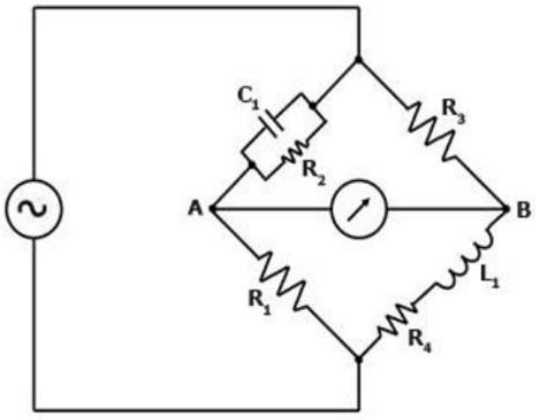

Figure 2.Maxwell Bridge

As shown in the Figure, one arms of both the Maxwell bridge is made from a condenser in parallel (C1 and R2), and another arm is made up of an L1 inductor with a resistance string (L1 and R4). The other two weapons compose of just one resistor (R1 and R3). R1 and R3 values are established and R2 and C1 may be modified. The values of L1 and R4 are uncertain. As most bridge loops, a Maxwell Bridge's measuring capacity relies on 'balancing' the circuit. The circuit is balanced in Figure and implies to change C1 and R2 until the current is zero through the bridge between points A and B. This occurs if the voltages are identical at points A and B.

When the Maxwell Bridge is balanced, it follows that

$Z_1/R_1 = R_3/Z_2$

Where in Z1 is the impedance of C2 in parallel with R2, and Z2 is the impedance of L1 in

series with R4. Mathematically,

$Z_1 = R_2 + 1/(2\pi fC_1)$; while $Z_2 = R_4 + 2\pi fL_1$.

Thus, when the bridge is balanced,

$(R_2 + 1/(2\pi fC_1)) / R_1 = R_3 / [R_4 + 2\pi fL_1]$; or

$R_1R_3 = [R_2 + 1/(2\pi fC_1)] [R_4 + 2\pi fL_1]$;

When the bridge is balanced, the negative and positive reactive components cancel

out, so

$R_1R_3 = R_2R_4$, or $R_4 = R_1R_3/R_2$

iii. Wien Bridge:

2. DEFINITION

A Wien Bridge Oscillator is a kind of sinewave generating electronic oscillator. It may provide a wide variety of frequencies. The circuit is built on an electricity grid that Max Wien initially established in 1891. Wien has no way to improve electrical gains such that a viable oscillator cannot be implemented. The contemporary circuit comes from William Hewlett's master's thesis in Stanford University in 1939. Hewlett co-founded Hewlett-Packard along with David Packard. Their first model has

been the HP 200A, a sine-wave oscillator built on the bridge at Wien. The 200A became one of the first tools to achieve this low distortion.

Diagram

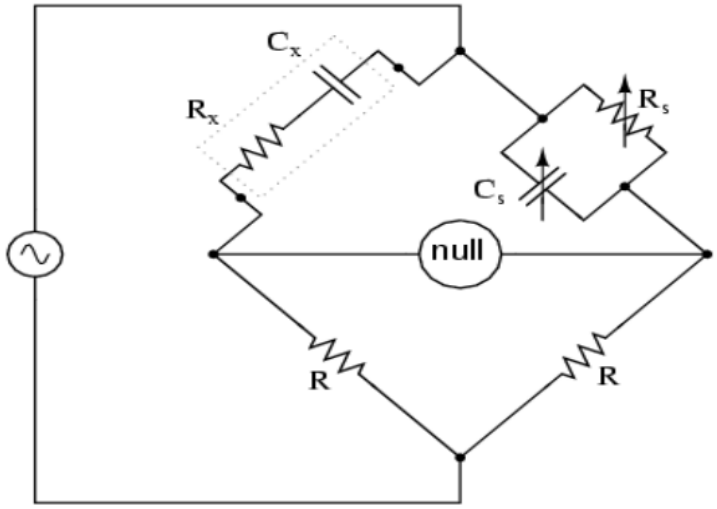

Figure 3.Wein bridge

3. AMPLITUDE STABILIZATION

- Efficient amplitude stability is the secret to Hewlett's low deformation oscillator, and the amplitude of electronic oscillators continues to rise before the clipping or other gain limit is hit. This contributes to strong, sometimes unwanted, harmonic distortion.
- Hewlett used a bulb in the oscillator feedback route as a positive temperature coefficient (PTC), to minimise the benefit.

  The light bulbs and related heating components rise with increasing temperatures.

iv. Anderson Bridge:

The Anderson's Bridge is an A.C bridge used for measuring the spindle's self-induction. It allows the induction of a coil to be measured with a regular condenser and resistors. It does not need the bridge to be repeatedly balanced. It is a

variation of Maxwell's Bridge where it can also be compared with the normal condenser to achieve the self-inductance benefit. The links below are seen.

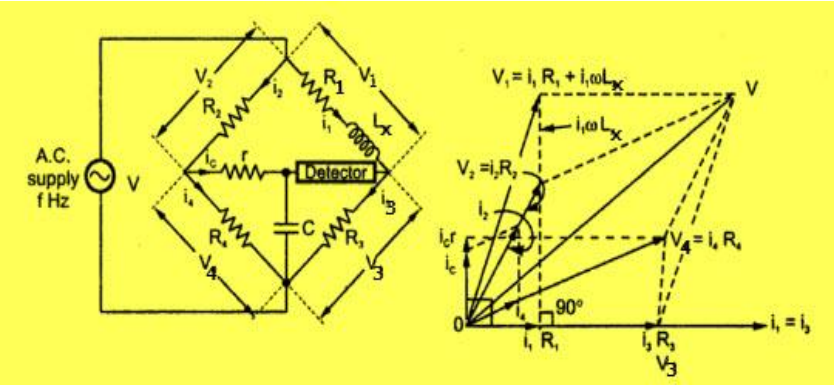

Figure 4. Anderson bridge

The uncertain inductor Lx with established series resistance with Lx is one arm of the bridge. This R1 resistance requires the inductor resistance. Capacity C is the regular condenser of non-induction type with r, R2, R3 and R4.

The equations of bridge equilibrium are,

i1= i3, and i2= i4+i_c,

V2= i2.R3 and V3= i3.R3

V1= V2+ic.r and V4= V3+ $\mathbf{i_c r}$

V1=i1.R1+i1.ω.L1 and V4=i4.R4

If the condenser used is not ideal, the inductance value stays constant, but the R1 value varies. The Bridge approach from Anderson can also be used to calculate the C condenser if the self-inductance is calibrated.

The equation we obtained above is more complicated than the Maxwell bridge. By following these equations, we can easily conclude that, to achieve equilibrium convergence easier, alternate changes of R1 and r should be made at Anderson's bridge.

Now let us see if we can experimentally obtain the significance of the unknown inductor. First set the frequency of the signal generator to the audible range. Now change R1 and r to

provide minimal sound to the headphones (null detector). Measure the R1 and r values (obtained after these adjustments) using the multimeter. Use the method we obtained above to detect the undisclosed inductance value. You should replicate the experiment with the different meaning of the regular condenser.

$$L_x = \frac{CR_3}{R_4}[R_2 r + R_4 r + R_2 R_4] \quad \text{and}$$

$$R_1 = \frac{R_2 R_3}{R_4}$$

4. ADVANTAGES OF ANDERSONS BRIDGE

- Fixed condenser, whereas some bridges use a variable condenser, is used to determine inductance accurately in a millimetre region.
- This bridge also provides a reliable outcome for inductance capacity calculation.
- The bridge can be easily balanced from the perspective of integration compared with the Maxwell Bridge for low Q values.

5. DISADVANTAGES OF ANDERSONS BRIDGE

- *The amount of elements required is very complicated than most bridges.*
- *Balanced calculations are often complicated to derive.*
- *Due to the additional interface the bridge cannot be conveniently protected to mitigate the impact of stray capacitances.*

6. APPLICATIONS OF ANDERSONS BRIDGE

- It is used to calculate autonomy of the coil(L)
- Locate the inductive reaction value (XL) at a given frequency of the spool

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STUDY ON INDUCTIVE TRANSDUCERS

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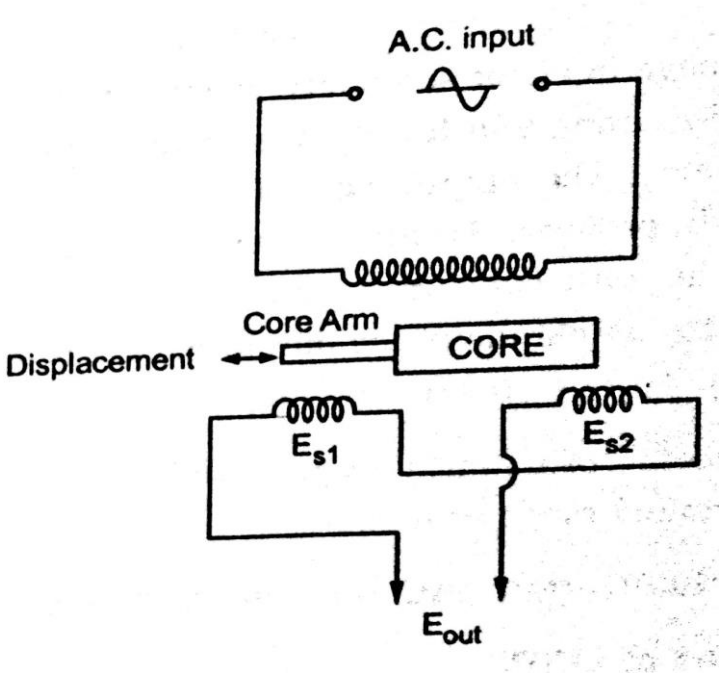
4. LINEAR VARIABLE DIFFERENTIAL TRANSFORMER (LVDT)

The sequential variable differential transducer is the most widely used induction transducer to translate linear motion into electric signal (LVDT). The transmission line comes from a single P1 primary winding and two secondary S1 and S2 wounds on the former cylindrical one. The secondary windings are equally turned and on both sides of the secondary winding are placed identically. The primary windings are connected with a different current source. The secondary output voltage, S1, is Es1 and the secondary one, S2, is Es2. The two secondary S1 as well as S2 are directly linked in series opposition in required to persuade the outputs of S1 and S2 into single voltage signal.

Thus, the transducer voltage is the difference between the two voltages.

Output voltage difference, E0 = Es1 – Es2

If the core would be moved left of both the NULL location, more flow is linked to S1 and less to S2. Accordingly, the secondary winding Es1 voltage is more than Es2, which is the secondary winding S2 output voltage.



The output voltage magnitude is thus Es1-Es2, and the voltage drop is in phase with Es1 i.e., the secondary winding output voltage S1. This makes Es2 larger than Es1. The output voltage is E0 = Es2-Es1 and is in the Es2 phase i.e., the secondary winding voltage S2.

Since the core is moved from null position in one direction, the difference of the secondary voltages in the differential voltage increases, while maintaining some in relation the with voltage from either the input source. The quantity and orientation of the motion of the core and, consequently, the displacement can be determined by comparing the scale but instead phase of the production (different) voltage to that of the source.

An LVDT's output voltage is a linear function of the core displacement, i.e., about 5 mm from either the null position.

Advantages:

- Linearity,
- Infinite resolution,

- High Output,
- High Sensitivity,
- Ruggedness,
- Less friction,
- Low hysteresis,
- Low power consumption.

Disadvantages:

- Sensitive to streaky magnetic fields, however, shielding is possible.
- Vibration influences the quality of the transducers many times
- The dynamic behavior is restricted
- The temperature affects the transducer's performance

Applications:

- LVDT could be used in only certain application areas for measured displacement from fractions of mm to few cm
- This could be used as a secondary transducer for measuring force, weight but also pressure etc.

2. CAPACITIVE TRANSDUCER:

It is critical to note the basics of a parallel platform condenser in order to learn about a capacitive transducer. The simplest form of a condenser is two parallel plates, separated by a dielectric or insulator with permittivity of E. (for air). The most widely used dielectric is air, other than paper, vacuum, and semi-conductor depletion.

Because of the possible differences between the conductors, there is an electric field across the insulator. This causes positive charges in one plate to accumulate and negative charges in the other. The condenser value is generally indicated by its capacity measured in Farads. The ratio of the electric charge in each conductor to the difference in voltage between them can be defined.

The capacitance is denoted by C. In a parallel plate capacitor,

C = [A*Er*9.85*1012 F/M]/d

Where,

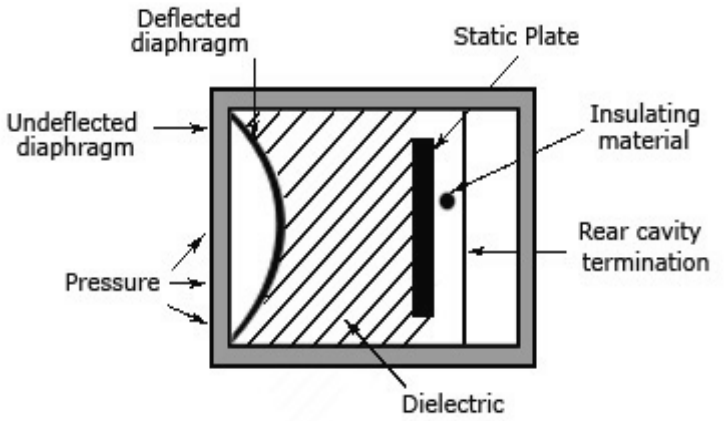
A – Area of each plate (m)

d – Distance between both the plates (m)

Er – Relative Dielectric Constant

The value 9.85*1012 F/M is an Eo constant called the dielectric free space constant. The equation shows that the capacitance C value and the distance here between parallel plates are inversely proportional. An increase in the distance between parallel plates will correspondingly decrease the capacitance value. In a capacitive transducer, the same theory is used. This transducer converts the frequency displacement or pressure change value.

A capacitive transducer, as seen in the figure below, has a fixed plate and a back heeled flexible diaphragm with dielectric between. The displacement between the aperture and the topic is presented changes when a force is exerted on the external side of the diaphragm. This results in a capacitance measured by an electric voltage bridge or a tank circuit.



A tank circuit is preferred because it causes frequency changes based on the capacitance changes. This frequency value is the same as the displacement or force provided to the input.

Advantages

It produces an accurate frequency response to both static and dynamic measurements.

Disadvantages

The exactness of the device is related to an increase or decrease in the number to a high level. As the lead is long, errors or distortions in signals can be caused.

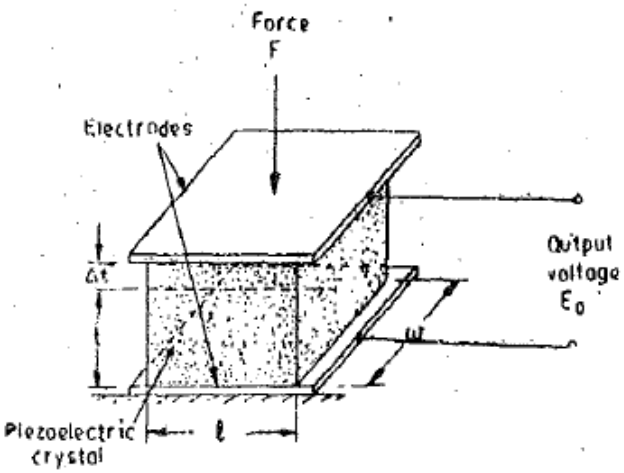
3. PIEZOELECTRIC TRANSDUCER:

A piezoelectric material does seem to be one in which a potential electrical power appears on certain crystal surfaces if the parameters of the crystal are modified with the application of a magnetic material. This potential is generated by charging displacement. The effect is reversible, that is to say, when the right axis of the crystal has a variable potential, it changes the crystal's dimensions and thereby deforms it. This effect is called a piezoelectrical effect. Elements with piezoelectric characteristics are sometimes called electro-resistive elements.

The materials with an important and valuable piezoelectric effect were being divided into 2 categories: I natural, and (ii) synthetic.

Quartz and Rochelle are natural, while lithium sulphate and ethylene diamine tartarated are part of the synthetic group.

The piezo-electric impacts can be done in many different ways to respond to (or cause) computer-controlled deformations of the material. The modes can include thickness extension, cross expansion, thickness shear and face shear. The mode of motion affected depends on the body shape and location of the electrodes in relation to the crystal axis. A piezo-electric element can be considered as a charge generator and a condenser for transferring mechanical motion to electric signals. Mechanical deformation produces a load, and this load appears in the electrodes as voltage. The tension is E=Q/C.



4. OPTICAL ENCODERS AND DIGITAL TRANSDUCERS:

Tachometer transducer:

It is an encoder by one output for each displacement increase. This same output is in pulse form. For movement in only another position, displacement can be achieved using digital counters to count pulses on the output. But this transducer produces the same pulses for motion in the opposite direction.

Incremental encoders:

The accumulative encoders use two or three minimum output data to identify the pulses to move in the reverse direction and the reference position. The output gives the pulses in different directions for the corresponding motion, and the third output results in a single pulsation per turn to produce zero reference.

Absolute encoders:

Those are all mainly used for single revolution measurement. These encoders are read with multiple outputs to produce the final product in binary angular shaft format. Linear and Rotary encoders:

Linear Encoder:

The linear encoder seems to be a sensor, transducer but rather reading head paired with a position encoding scale. The sensor reads this same scale to turn the encoded positions into a

digital or analogue signal, which can be decoded in the digital reading (DRO) or movement controller position.

Either accumulative or absolute can be the encoder. Movements can be determined over time by change in position. The technology of linear encoders is optical, magnetic, inductive, capacitive, and current eddy. Optical technologies include shadow, self-imagination, and interferometry technology. In metrology instruments, motion systems but instead high precision machining tools, from digital calipers and measurement machines through stages, CNC mills, manufacturing panels and semi-conducting tables, linear encoders are used.

Rotary Encoder:

An electro-mechanical device, also referred to as a shaft encoder, converts an angular or axial position of a shaft or axle into an analogue or digital code.

Two main types exist: absolute and progressive (relative). The performance of absolute microcontrollers indicates the current place of the shaft and makes angle transducers. The output of iterative encoders provides information on the shaft movement, which is typically further processed in information such as speed, distance, and location elsewhere.

Rotary encoders are used in many applications, including contemporary businesses, robotics, specific photography lenses,[1] computer input devices (e.g., optomechanical mouse and balls), controlled stress rheometers and rotating radar platforms that require unlimited rotations from the shaft.

When energy is discarded, an "absolute" encoder retains position information. The placement of the encoder is immediately available on application power. At assembly the relationship between some of the encoder value and the position of the controlled machinery is set. To maintain position accuracy the system does not want to return to a calibration point. An "incremental" encoder records position changes accurately but does not enable a firm relationship between the encoder state

and emotional position. Incremental encoders-controlled devices may have to "go home" to a fixed point of reference to initialize position measurement. An absolute rotary multi-turn encoder contains additional code gears and gears. A high-resolution wheel involves measuring the fractional rotation, and the number of whole shaft revolutions is recorded by geared code with a lower resolution.

A composition has multiple code rings with different binary weights that provide a data word that represents the encoder's absolute position in one revolution. This type of encoder is often called an absolute parallel encoder.

A reticular formation works differently to provide an A and a B application of risk that does not provide usable information for itself. Instead, external electronics are counted. The point at which the count actually starts depends on the counter in the effects of urban and not on the encoder position. To provide useful location coordinates, the position of the encoder must be referenced by an index pulse to the device to which the device is attached. The distinctive feature of the amount of phenolic compounds is the increase in the position of the encoder in the counting electronics.

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AN OVERVIEW OF STEPPER MOTORS

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INTRODUCTION

Stepping motors or stepping motors transform electrical pulses into mechanical movement proportional to the pulses. An extended succession of distinct single-step events makes up each rotation of the stepper motor's shaft. The angular rotation that the output shaft undergoes each time the motor gets a step pulse is referred to as a step. Digital control circuits, such as robotics, often employ these sorts of motors due to their ability to effectively receive digital pulses for step control. Rotating the shaft by each step results in rotation that is a particular number of degrees. The output shaft rotates by the amount of one step for each rotation of the input shaft, which is expressed as a step angle. Simply illustrates the use of a stepper motor as a basic example. Paper is moved incrementally whenever the controller gets an input signal. Machine tools, process control systems, tape and disc drive systems, and programmable controllers use stepper motors to complete the motion required to manufacture various goods and also for process control.

In stepper motors, feedback sensors are not required for positioning or control since the motors are accurate enough without them. Each time a pulse of electricity is given to the motor, the shaft moves an exact amount of degrees. As each pulse

is given, the motor shaft only makes the number of degrees for which it was built, so you may adjust the number of pulses given, which you can then use to adjust the placement and speed. Torque is produced when the magnetic field in the stator and the rotor interact. Magnetic field intensity is related to the current provided to the stator and the number of windings.

A stepper motor employs the magnetic theory of operation to provide accurate motor rotation when an electric pulse is applied. You previously learnt that oppositely-oriented poles of a magnet repel one other, while attract each other. This cross-sectional drawing depicts the typical internal structure of a stepper motor's rotor and stator. According to this drawing, the stator (which has eight poles) is stationary, while the rotor (which has six poles) rotates (three complete magnets). It will take 24 electrical pulses to rotate the whole rotor one full revolution. It is said that a motor may rotate 15 degrees for each electrical pulse it receives. A 360° turn on the shaft is equivalent to two poles, meaning that a pulse of power to the motor will result in a rotation of two poles. Since there are 15 degrees in a whole circle, a stepper motor that rotates 360° will have 15 separate steps.

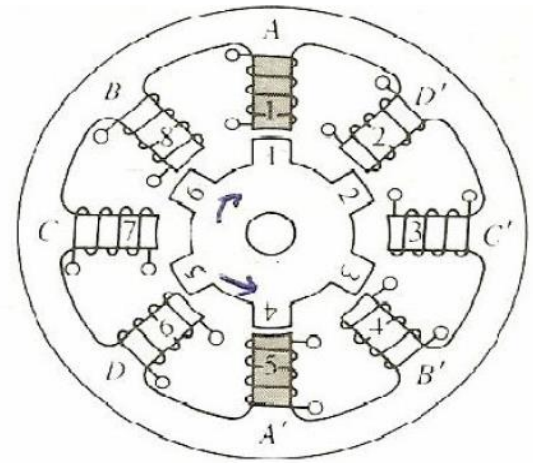
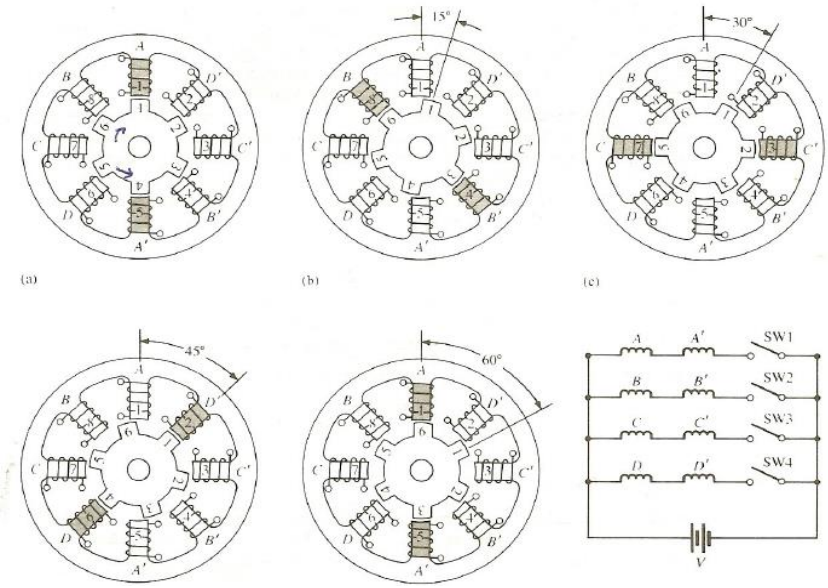


Fig 1. Diagram that shows the position of the six-pole rotor and eight-pole stator of a typical stepper motor.

Once the motor is de-energized, residual magnetism in the rotor's rotor magnets will force the rotor to orient one of its magnetic poles with a stator magnet's magnetic pole. In this case, the detent has 24 potential places. The rotor will have enough magnetic force to restrict the shaft from advancing to the next position while it is in a detent position. Because of this, the rotor seems to generate a "clicking" sound when you revolve it manually with no power provided.



As electricity is provided, the stator winding is redirected such that just one of the windings is a magnet. The North Pole and the South Pole will each have an own coil. The rotor tooth with the opposite polarity will fly to the closest stator coil with the North Pole attracting rotor teeth, and the rotor tooth with the opposite polarity will fly to the closest stator coil with the South Pole attracting rotor teeth. The holding torque occurs when current flows between these poles and the rotor becomes more strongly attracted to the stator winding.

With the stepper motor rotor moving while current is pulsed to the stator, the movement occurs. The current is now running on the A and A' windings, which means the A winding is pointing north. B and B' windings are connected to each other by

current, hence B' winding is north. the C winding is pointed to the north because current is supplied to it. To keep track of the direction of the wind, current is supplied to the D and D' windings, resulting in D being north. In order to apply current to the A and A' windings, the A' winding must be set to be north.

The magnetic field will be rotated 45° by moving the current flow to the next stator winding. Once the rotor's magnetic fields are again aligned with the stator field, it will only turn 15 degrees. The stator's magnetic field is altered with each revolution of the rotor to provide the 360-degree complete rotation. Using the figure, you can see how the rotor is changing in relation to the current delivered to the stator.

As current is delivered to the A and A' stator windings, they will form a permanent magnet with the north pole located at the top of the winding and the south pole located at the bottom. Since the rotor's south pole aligns with the stator's north pole, and the rotor's opposite end is the north pole, then you can see that this action will move the rotor just a little to bring its south pole into alignment with the stator's north pole (at A). To observe the movement of the magnetic field while current is being switched from one winding to the next, a line is attached to the south-pole piece. Current is now applied to the stator windings of the motor as shown in Fig. 2b. The occurrence of this causes the stator winding at the B position to have the south pole of the stator magnet's polarity, and the winding at the B position is configured to have the north pole of the stator magnet's polarity. To reach this point, the following rotor pole in the clockwise direction from the preceding pole is the next pole we must align with the stator magnets. Thus, the rotor just has to revolve 15° in the clockwise position to align itself with the stator poles in order for this set of poles to become magnetized and so attractive to the rotor poles.

As you can see in the illustration, the C and C' stator windings are ignited, this time at their respective poles (North and South) of the magnetic field. Until the rotor's poles line up with the C and C' stator poles, the rotor will turn 15 degrees in

the clockwise direction. In this situation, you should see that the rotor pole formerly designated as 1 has now shifted three steps clockwise.

D stator winding is activated; D position stator winding is the north pole. The rotor will rotate another 15° to the right as a result of this shift in polarity. As you can see, the rotor has advanced four steps of 15° each, for a total of 60°. By viewing the rotor pole and noting that it is now pointing to the stator winding at the 2 o'clock position, it may be confirmed that this is accurate.

The stator windings in Fig. 2e are activated, with winding A position located on the south pole. The rotor will rotate another 15° to the right as a result of this shift in polarity. When you watch the rotor rotate, you should note that it has moved 75° in total, which indicates it has travelled four steps of 15° each. Thus, in the clockwise direction, the sequence of energizing ABCDA will rotate the rotor. Verification of the sequence for the counter-clockwise direction is simple.

Stepper Motor Switching Sequence

In terms of how far it travels, the stepper motor may be controlled in three modes: full-step, half-step, and microstep.

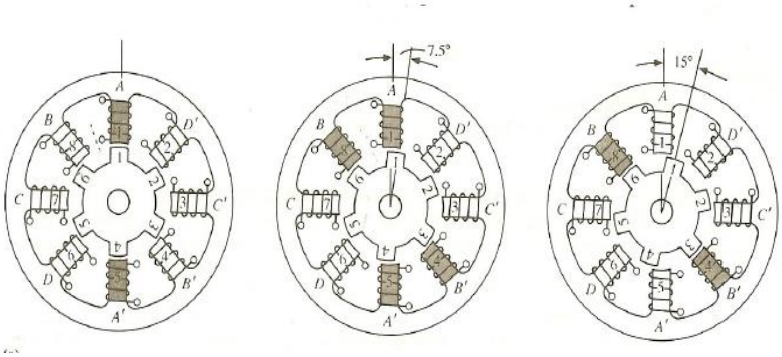
Full-Step

It has previously been mentioned that the stepper motor is running in a four-step switching sequence. This is a full-step switching sequence.

Half-Step

An eight-step or half-step switching sequence for the stepper motor is another name for a switching sequence for the stepper motor. The half-step sequence's switching diagram is seen in Fig. 3. One significant aspect of this stepping sequence is that when the rotor moves half the distance, the resolution of the stepper motor may be doubled. To get a resolution of 400 steps and 0.9°, you must use a 200-step motor with a resolution of 1.8°. A specific stepper motor controller is required, however a conventional hybrid motor may be utilised in conjunction with the half-step switching sequence. To go from a half-step to a

whole step, the controller energises both phases with equal current.



The switching sequence for the eight-step input (half-step mode).

SW1 is on, while SW2, SW3, and SW4 are all off in this next level. First, there is the full-step sequence, and then there is the identical sequence for the first step. The second stage is all switches are off except for SW1 and SW2. Because of the equal magnetic forces acting on the rotor, the rotor moves another half-step to the equilibrium point and completes a half-step rotation. Also known as step 3 in the entire step sequence, SW2 is on, while SW1, SW4, and SW3 are all off. The process loops back to the beginning, and then goes through it again. In the energizing sequence for half step, A is the only variation. AB B, BC, C, CD, D, and DA.

Micro Step Mode

A little of twitchiness may be seen in the full-step and half-step motors when the motor transitions from step to step. The number of physical poles the rotor has also limits the level of resolution. Changing the current that the controller gives to the motor at each step allows for an increase in the level of resolution. You may alter the current to seem like a sine wave. The waveform for the current to each phase is seen below. It can be seen from this schematic that the amount of current flowing to each of the four windings is timed to keep phase differences with each other present.

The rotor can achieve hundreds of intermediate steps because the current to each particular phase grows and declines like a sine wave, and this always occurs in time with the other phase. In actuality, the controller may attain up to 500 micro steps of motion, and this results in a 100,000-step full-step sequence.

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AN OVERVIEW OF PERMANENT-MAGNET (PM) STEPPER MOTORS

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1. INTRODUCTION

A permanent-magnet stepper motor works by creating a magnetic field that attracts the permanent-magnet rotor to it. This is seen in Figure 6, a simple two-pole PM stepper motor. In Figure 6(a), you will see a rotor that contains two permanent magnets, one at each end. Figure 6 shows the stator (b). This has been shown to have teeth on both the stator and rotor. To ensure that there are only a limited number of rotor teeth aligning themselves with an energized stator pole, the teeth on the rotor surface and the stator pole faces are offset. Step angle depends on the number of teeth on the rotor and stator. There is a positive correlation between the number of teeth and the step angle.

A PM stepper motor's rotor may overcome residual torque when a DC signal is provided to one of the motor's stator windings. To move the rotor one complete step, you must provide the specified amount of torque. This PM stepper motor feature is crucial because it maintains the holding torque for as long as the rotor is stopped. Magnetic force is created between the permanent magnet and the stator when no electricity is provided to the windings. A residual or detent torque is termed a magnetic force of this magnitude. When you crank a stepper

motor by hand, you will observe a detent torque about one-tenth of the holding torque. A permanent magnet stepper motor with four stator windings is shown in the image below. It is possible to regulate the speed and direction of the motor by regulating the speed and direction of the motor through providing pulses to the stator coils. This timing diagram displays the lengths of the pulses needed to spin the PM stepper motor, as shown in the picture. This alternating pattern of positive and negative pulses causes the motor shaft to revolve at 90-degree intervals in a counterclockwise direction. Figure shows how the overlapping waves are connected to make the motor revolve counterclockwise 45 degrees at a time.

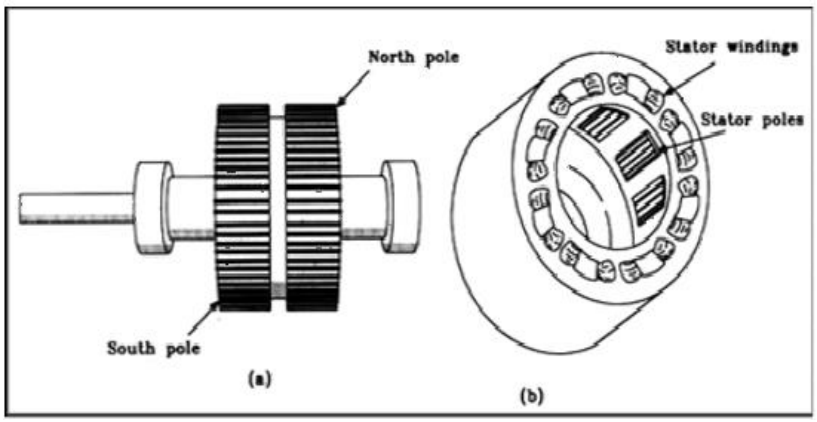


Fig Permanent-magnet (PM) Stepper Motors

More recently, PM stepper motor technology has advanced with the use of a thin-disk rotor. In comparison to a cylindrical rotor, a stepped motor consumes much less power in heat losses and, as a consequence, is far more efficient. An efficient motor runs cooler and produces greater torque or speed for its size. PM stepper motors are capable of providing up to 2.9 times the number of steps per second of a normal PM stepper motor. Take a look at how a thin-disk rotor PM motor is built. Cobalt-steel is used to manufacture the rotor, which is misaligned by one-half of a rotor segment, resulting in the stator poles not aligning perfectly with the rotor poles.

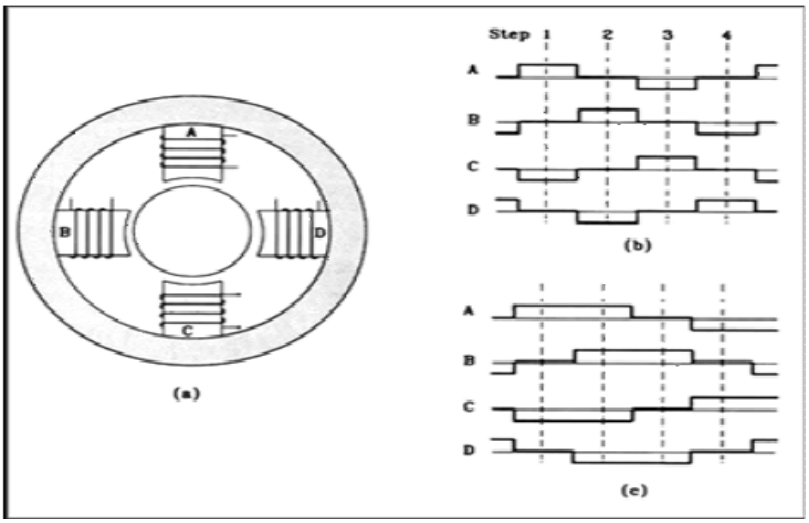


Fig Permanent-magnet (PM) Stepper Motors pulse sequence

2. VARIABLE-RELUCTANCE (VR) STEPPER MOTORS

In the case of the VR (variable-reluctance) stepper motor, no permanent-magnet rotor and no residual torque are used. The rotor will align with the energised stator poles when the stator coils are activated. In this sort of motor, the applied magnetic field is maximised along the path of the field. The stator field is being changed and the rotor is shifted to a new location with the alternating windings that are activated in the stator. A stepper motor's stator is made using a stack of steel laminations around a magnetic core. This part is comprised of soft steel with teeth and slots cut into it. Using the following equation, we can describe the connection between step angle, rotor teeth, and stator teeth.

$$\Psi = \left(\frac{N_s - N_r}{N_s N_r} \right) 360°$$

Where Ψ = step angle in degrees

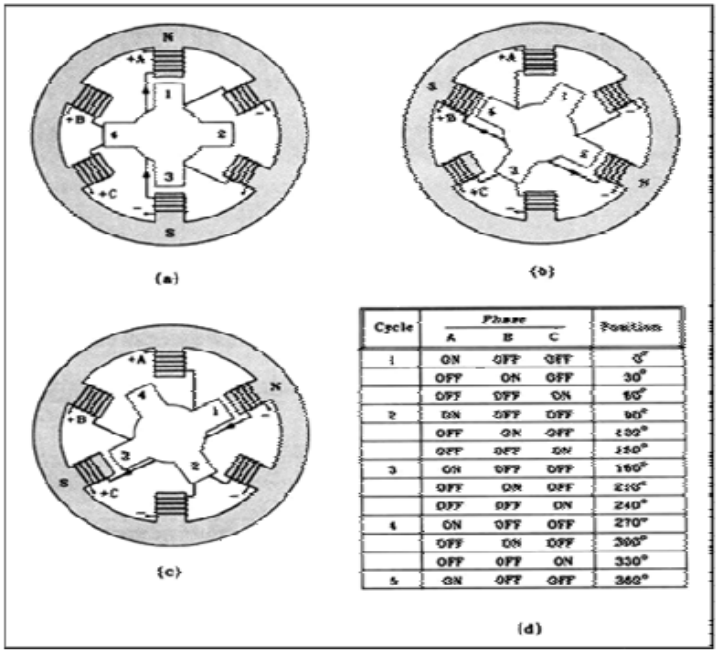
N_s = Number of teeth on stator core

Nr = Number of teeth on rotor core

A simple variable-reluctance stepper motor is shown in Figure 3. The rotor is illustrated with fewer teeth than the stator in this circuit. By avoiding two different instances of stator and rotor teeth aligning at the same time, this arrangement assures that only one pair of stator and rotor teeth will be present at any given moment. To activate the stator coils, there are separate sets of phases.

There are six teeth on the stator and four on the rotor in Equation states that each time a pulse is delivered, the rotor will revolve by 30°. This graphic illustrates the state of the rotor when phase A is turned on. The rotor will remain motionless as long as phase A is activated. The rotor will turn 30° once phase A is turned off and phase B is enabled. The overall impact of deactivating phase B and activating phase C is represented in the following figure. This is an example of the third kind of phase circuit: the rotor has shifted 30° and is now positioned beneath the north and south poles that were generated by phase C. The step sequence has completed one cycle after the 60° rotation or displacement. This figure illustrates the switching process for a variable-relucynce motor with six stator poles and four rotor poles, showing rotation along both axes. Forcing the motor to turn in a clockwise manner using this repeated pattern will result in a clockwise rotation. A method for changing the direction of the motor is to reverse the process of turning each phase on and off.

So far, we've seen just single-stack VR stepper motors. This means that all the phases are stacked together in a single plane. While this design for a stepper motor has its own set of advantages, it is often impractical, due to the enormous step angles (over 15°). When a multistack stepper motor is separated along its axial length into magnetically separated parts, or stacks, lower step sizes are produced. While each of these portions are stimulated by various winding, or phases, they are quite different from one another. The different stacking sequences (phases) for this sort of motor are all associated with a single tooth pitch, which are also the same for the stator and rotor..



Cycle	Phase A	Phase B	Phase C	Position
1	ON	OFF	OFF	0°
	OFF	ON	OFF	30°
	OFF	OFF	ON	60°
2	ON	OFF	OFF	90°
	OFF	ON	OFF	120°
	OFF	OFF	ON	150°
3	ON	OFF	OFF	180°
	OFF	ON	OFF	210°
	OFF	OFF	ON	240°
4	ON	OFF	OFF	270°
	OFF	ON	OFF	300°
	OFF	OFF	ON	330°
5	ON	OFF	OFF	360°

Fig Variable-reluctance (VR) Stepper Motors

3. HYBRID STEPPER MOTORS

In addition to iron strips and a magnetic, axially magnetised rotor, this hybrid step motor has two individual pieces of soft iron. Hybrid describes this machine, which utilises both permanent magnets and variable reluctance motors, because of its working principles, which are based on both magnetic forces and torque. A hybrid motor stator core construction is almost identical to a VR one. This motor, in contrast, only has one of the two coils for one phase twisted on one pole. Each coil of a pole is coiled in a bifilar connection pattern. For each of the motor's poles, the soft steel teeth are placed equally spaced throughout the whole pole. There is a pitch error in which the teeth on the two parts of each pole are not perfectly aligned with each other. In the hybrid motor, torque is formed when the magnetic fields of the permanent magnet and the stator come into contact with each other. When choosing a stepper motor, you should consider its speed, step angle, and maximum torque (a measure of how much effort the motor can

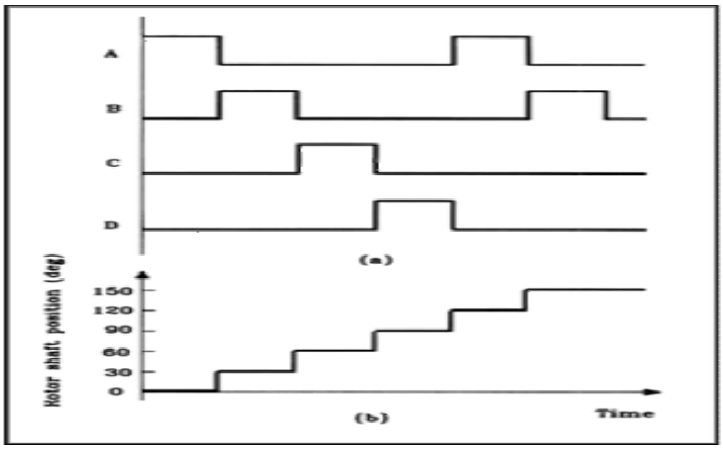
overcome). The stepping rate is another common term for the number of steps per second. To get the real speed of a stepper motor, use the following equation:

$$N = \frac{\Psi(s/s)}{6}$$

Where N = motor speed in RPM

Ψ = step angle in degrees
s/s = number of steps per second

Fig No of Pulse per Steps



When using the clockwise or counterclockwise drive circuits, the direction of rotation is decided by applying the pulses. With each successive pulse, rotor displacement may be extremely precisely replicated. By using no feedback, the control circuit is much simpler with stepping motors. The unipolar stepper motor driving circuit is among the most popular, as depicted in Figure. To regulate the direction of rotation and the stepping rate of the motor, this circuit employs bifilar windings and four Darlington transistors.

Half-step and full-step stepper motor drivers are offered. A full-step driver uses two on-time intervals (like stepping on the gas) and two off-time phases (like stepping off the gas). With

half-step mode, a quieter, smoother performance with increased speed and economy is achieved. Stepper motor switching sequence wave forms are shown in the diagram above. Every four input pulses, each stepper motor winding is activated. For each winding, the pulse train is set at 25% duty cycle. A 30° step angle is provided for the motor output in Figure.

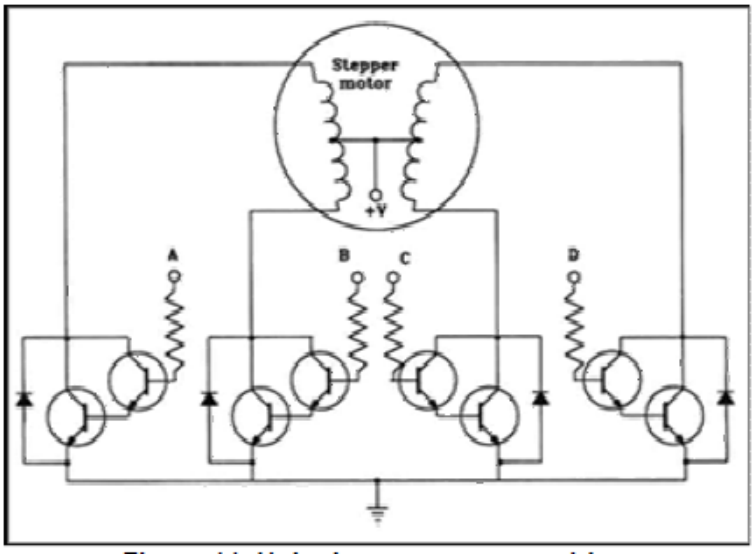


Fig . Stepper Motor clockwise or counterclockwise drive circuits

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AN OVERVIEW OF SWITCHED RELUCTANCE MOTOR

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1. INTRODUCTION

These switching reluctance motors (SRMs) were developed during the last decade. It has been postulated that for variable speed applications, a variable reluctance motor has been in use since 1969. This motor originated in 1842, but the reinvention is conceivable owing to the affordability and high-power switching devices that were available about the same time. The machine has several novel features, even though it is a type of synchronous machine.

In this kind of motor, torque is created by the propensity of the moving element to travel to a point where the winding's inductance is energised.

The phrase “switched reluctance” means the resistance isn't really switched, but rather the currents in a motor are reversed to make it work..

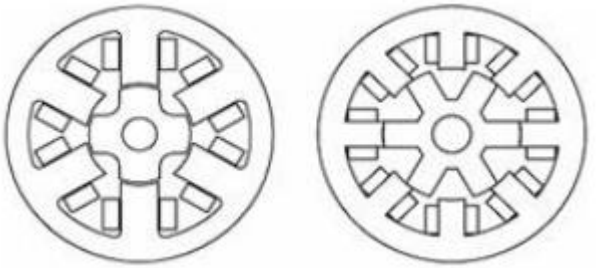
2. SWITCHED RELUCTANCE MOTOR (SRM)

Electromagnetic and Electro-dynamic equipment uses electricity to produce mechanical work. This is a high-speed stepper motor that goes much beyond just high speed. Combining the desired properties of both induction motor devices and D.C. commutates motor drives, it is considered an excellent example of D.C. commutates motor drives.

3. CONSTRUCTIONAL FEATURES

The SRM machine uses a variable reluctance technique to create electromagnetic torque, and thus makes it one-coupled and two-coupled. It is equipped with a stator and a rotor. The

poles are composed of silicon steel stampings that are fastened to silicon steel studs. It might be an even or odd number of stator poles. Field coils on these poles are coupled such that their magnetic flux is cumulative. Phases winding are the same thing. The terminals of the motor are linked to the ends of the phase windings. The power semiconductor switching terminal inputs are a D.C. supply.



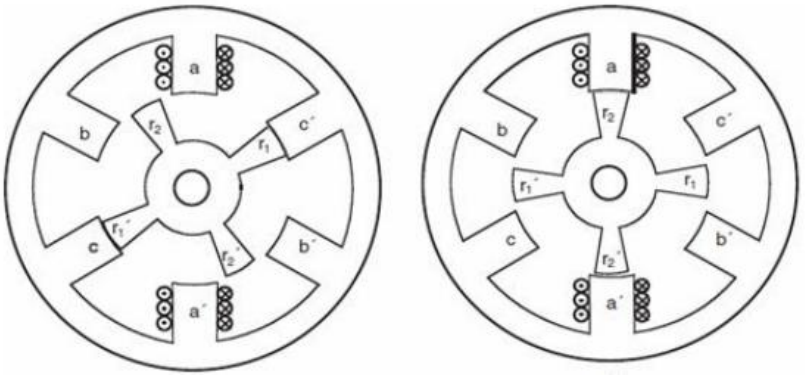
It is a silicon steel stamping and an exposed conductor with projecting poles. There is no winding (or) magnet on the rotor. There are more rotor poles than stator poles. The maintenance tools don't include slip rings and brushless upkeep. A rotor position sensor is located in the shaft. Turning on and off various semiconductor switches affected by signals from the rotor position sensor had an impact on the different states the switches were in. The shaft-position feedback technique is used in SRM, which is regulated by the rotor position to effectively excite the needed phase winding with regard to the exact rotor positions.

4. PRINCIPLE OF OPERATION OF SRM

SRM is a spinning electric machine with two prominent poles on both the stator and rotor. SRM is happy to apply the following series of current pulses at each step. Thus, as a result of these distinct phases being set off, the motor begins to revolve. When it is at its peak, the inductance profile has a triangle form and maximum inductance occurs when it is misaligned. The motor produces torque in the direction of increasing inductance when the voltage is supplied to the stator phase. The rotor rotates to the next position of maximum inductance when the phase is ignited at its least inductance state. Consider a 6/4 SRM

(which would be, for example, a 6-pole stator and 4-pole rotor motor), a 6/4 SRM (6 stator poles and 4 rotor poles). There are three distinct steps to any 6/4 SRM recipe. Two sets of coils are coiled on opposing poles and linked in series to make up each phase.

Initially rotor poles aa' get aligned with stator poles AA' by the excitation of winding A. There are in minimum reluctance position .The inductance of phase winding A is maximum and $\frac{\partial L_A}{\partial \theta}$=0.$L_B$ And L_C are neither maximum nor minimum. There exist $\frac{\partial L_B}{\partial \theta}$ and$\frac{\partial L_C}{\partial \theta}$. Now if phase winding B is energized, then the rotor develops a torque because of variable reluctance and existence of variation in inductance $\frac{\partial L_B}{\partial \theta}$. Electromagnetic torque=$\frac{1}{2} i_B^2 \frac{\partial L_B}{\partial \theta}$.



The direction of this torque is such that BB' and bb' are get aligned. If this torque is more than the opposing load torque and frictional torque, then the rotor starts rotating. When BB' and bb' are in alignment, no torque is produced as $\frac{\partial L_B}{\partial \theta}$=0 in this position.$L_B$ is maximum. Rotor has already moved an angle of θ=30^c. Now phase winding c is energized and remaining windings are de-energized. Then rotor experience a torque as$\frac{\partial L_C}{\partial \theta}$ exists. Torque=$\frac{1}{2} i_B^2 \frac{\partial L_B}{\partial \theta}$ The rotor poles aa' get aligned with

stator poles cc'. When rotor rotates further 30^{c}, there is no torque as $\frac{\partial L_C}{\partial \theta}$=0.$L_C$ is maximum.

In order, phase winding c is turned OFF, and then phase winding is turned on. Finally, torque is applied and the rotor turns another 30 degrees. Windings A, B, C, A, B are stimulated one by one, therefore each step of the rotor will rotate the rotor 30 degrees. SRM has the unique ability to self-start.

5. POWER CONTROLLERS

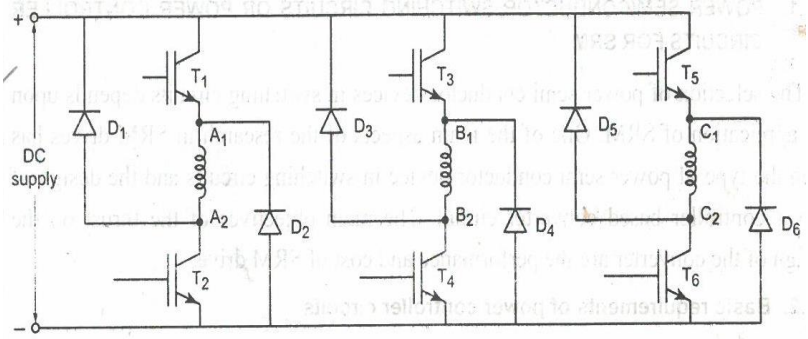
Basic requirements of power controller circuits:

In order to keep the chopping time as short as possible, unrestricted wheeling should be allowed throughout the chopping phase. The demagnetization energy of the outgoing phase should be able to be used in one of two ways: to replenish the energy source, or to use it in the following conducting phase.

6. TYPES OF POWER CONTROLLERS FOR SRM

i) Two-phase semiconductor switching devices per phase:

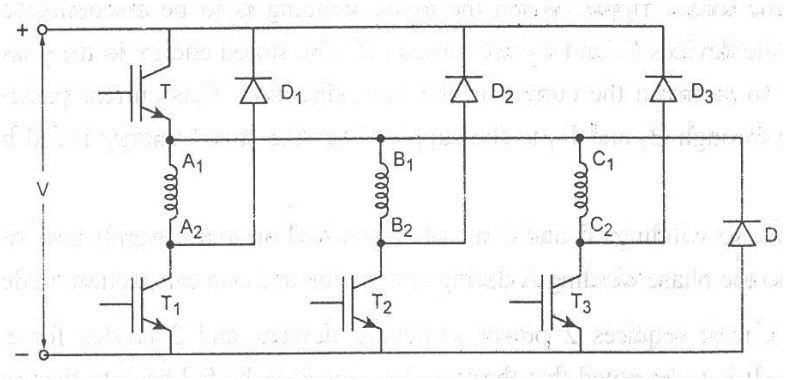
The circuit may also be referred to as 2-transistor/phase circuit or traditional converter circuit. Each phase in this circuit contains two power switches and two diodes. In this circuit, A is phase-wound and coupled to the dc supply via T1 and T2.



Phase winding A is energised by turning on T1 and T2. Phase current reaches the reference value before the phase inductance starts to grow because this conduction is started before the rotor and stator poles overlap. Reducing torque

ripple helps To disconnect A from the power, the switch at T1 and T2 must be switched OFF. When phase winding has a great deal of stored energy, it tends to sustain the current going through D1 and D2 to the supply. Because of this, the stored energy is returned to the main power grid.

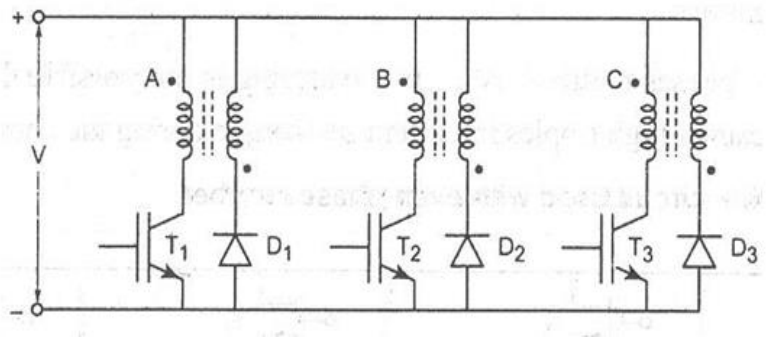
ii) (n+1) power semiconductor switching devices and (n+1) diodes per phase:



N -phase winding number. Turning on T1 and T when the winding is to be detached provides energy for the winding, while simultaneously powering down T1 and feeding power stored in the winding back to the power source via D1 and D. There can be no following stage initiated until the previous one has been fully demagnetized. B and C are linked to and separated from the power source by flipping the relevant switches ON and OFF. Thus, the cycle repeats.

iii) Phase winding using bifilar wires:

There are bifilar-wound coils in each stator pole. is precisely the same two phase windings, which are magnetically connected and one winding is turned on. When the D.C. current flows through winding A, phase winding A is activated. When the switch is switched OFF, the stored energy returns to the source by way of terminals A and D1. When the rotor position sensor outputs a signal, T1, T2, and T3 follow in consecutive order..



ADVANTAGES

- Cost of power controller is reduced.
- This allows fast demagnetization of phase during commutation.

DISADVANTAGES

- As the coupling between the 2 bifilar winding perfect, there are presence of voltage spikes turn –OFF.
- Poor utilization of copper.

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