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Content

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Insight on Vertical Handoff Policies

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ABSTRACT

In view of the remarkable growth of the mobile communication markets and the fixed, limited frequency allocated to this service, the efficient management and sharing of the spectrum among numerous users has become important issue. The most important feature of a wireless communication system is 'mobility' which makes the term 'wireless' expressive. Handoff management is one of the most important features of mobility management. There are two important performance indices used in designing cellular communication systems. The first index is the blocking probability of a new call, which is the probability that a new call is denied due to the unavailability of free channels. The second index is the forced termination probability of handoff call, which is the probability that an ongoing call is ended abruptly while a handoff attempt is being made, again due to the unavailability of free channels. To achieve this goal and to select the best network for a mobile terminal when moving from one network to another, it is necessary to have a good decision making algorithm which decides the best network for a specific application that the user needs based on QoS parameter. This paper presents an overview of handoff types, handoff process, and classification of vertical handoff, parameters required, existing work.

INTRODUCTION

Handoff has become an essential criterion in mobile communication system especially in urban areas, owing to the limited coverage area of Access Points (AP). Whenever a MS move from current AP to a new AP it requires handoff.For successful implementation of seamless Voice over IP communications, the handoff latency should not exceed 50ms[1]. Various wireless networks can be utilized to provide the demand of services of the users anytime, anywhere. As a result, the users in next generation networks (NGN) should be able to switch to whichever wireless network they want to use at any time or which satisfies their requirements to the maximum at that time, in a seamless manner. In the area of vertical handovers three main research directions have been identified: -

- Interworking between access networks
- Minimizing handover delay
- Keeping QoS parameters values during/after handover as close as possible to their values before the handover.

Numerous wireless networks such as Bluetooth, Wi-Fi, Wi-Max, GPRS and CDMA have been evolved. Also different operator offers different service demands from mobile users (voice, video, multimedia, text etc.) in the market. Because of these variations, when the mobile user moves there is a need to handover the communication channel from one network to another by considering its features and also the user requirements. During handover there is a need to decide and choose the best network as mentioned above. So the Vertical Handoff Decision Making is an important research issue.

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Types of Handoff

When a MS moves out of reach of its current AP it must be reconnected to a new AP to continue its operation. The search for a new AP and subsequent registration under it constitute the handoff process which takes enough time (called handoff latency) to interfere with proper functioning of many applications. Three strategies have been proposed to detect the need for hand off[2]: -

1. Mobile-controlled-handoff (MCHO): The mobile station (MS) continuously monitors the signals of the surrounding base stations (BS) and initiates the hand off process when some handoff criteria are met.
2. Network-controlled-handoff (NCHO): The surrounding BSs measure the signal from the MS and the network initiates the handoff process when some handoff criteria are met.
3. Mobile-assisted-handoff (MAHO): The network asks the MS to measure the signal from the surrounding BSs. The network makes the handoff decision based on reports from the MS.

Handoff can be classified into two types[1], i.e., Horizontal Handoff (Symmetric), which means the handoff within the same wireless access network technology. Vertical Handoff (Asymmetric) means handoff among heterogeneous wireless access network technology. A Vertical handoff mechanism can be broadly categorized in three steps: -

System Discovery**:** As MTs are equipped with multiple interfaces, during this step information is gathered from different networks to inspect the need of handoff and to find out which wireless network can be reached.

Handover Decision: In this step a handoff decision is made according to the algorithms and the parameters defined for selection of the most suitable network on the basis of the current running session on the MT[3]. For this phase a range of parameters can be examined e.g. bandwidth, RSS, velocity of mobile terminal, delay, jitter, monetary cost and battery status.

Handover Execution**:** In this step the user's active connection is switched from the current network to the most suitable network. Furthermore handoff can be categorized as hard or soft handoff[4]. Hard hand off is also known as break-before make, as the connection to the target network will only be made when the connection to the serving cell is terminated. On the other hand, soft handoff is known as make-before break, as the connection to the target cell will be made even when the connection to the serving cell is also active. Soft handoff is preferred over hard handoff because connection to the serving network is released only when the connection to the target cell has been established. This minimizes the chances of the call drop as MT is utilizing both network channels for the same call.

Classification of VHO

Vertical Handoff can be classified in to four types based up on its direction, process, control and decision[3]:-

1. **Upward and Downward Handoffs:**
   In Vertical handoff, if the mobile switches from the network with a small coverage to a network of larger coverage, it is termed as upward handoff. On the other hand, a downward handoff occurs in the reverse direction, i.e. from a network of larger coverage to a network of smaller coverage.
2. **Hard and Soft handoffs:**
   When the mobile node switches to the target network only after the disconnection from current network is called as hard handoff or break before make. On the other hand, in soft handover a mobile node maintains the connection with the previous base station till its association with the new base station is completed. This process is also termed as make before break.
3. **Imperative and Alternative handoffs:**
   When there is loss of signal strength an imperative handoff occurs. For imperative handoff the RSS is sufficient to be considered. On the other hand, an alternative vertical handoff is initiated to

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provide the user with better performance. For alternative handoffs several other network parameters such as available bandwidth, supported velocity and cost of the network are to be considered in addition to the device parameters such as quality of service demanded by the application and user preference.

VHO Decision Making Parameters

In heterogeneous networks, Vertical handoffs can be initiated for convenience rather than connectivity reasons. A decision algorithm gives a better performance when several parameters are considered, more, when a combination of static and dynamic parameters are considered. But the trade off is with the increase in decision time and complexity of the algorithm. The decision may depend on various groups of parameters such as[4]: -

- Network Related Parameters – Bandwidth, Latency, RSS, SIR, Cost, Security etc.
- Terminal Related Parameters – Velocity, Battery power, Location Information etc.
- User-Related Parameters – User profile and preferences
- Service Related Parameters – Service capacities, QoS etc.

(i) Bandwidth - Bandwidth is a measure of the width of a range of frequencies. Higher the bandwidth, lower the call dropping and call blocking probability.

(ii) Handoff Latency - The time elapses between the last packet received via the old access router and the arrival of the first packet along the new access router after a handoff. This is known as handoff latency. Handoff latency affects the QoS and it is essential to consider handoff latency while designing any handoff technique.

(iii) Power Consumption - During handoff, frequent interface activation can cause considerable battery drainage. It is also important to incorporate power consumption factor during handoff decision.

(iv) Network Cost - A multi criteria algorithm for handoff should also consider the network cost factor. Different charging policies are followed for different type of traffic. So that in some situation cost should also be considered as a factor for decision making.

(v) User Preferences - Based on the application requirements like (real time, non-real time), service types (Voice, data, video), Quality of service etc. the user may prefer different network according to the network performance which is the important benefit of heterogeneous networks.

(vi) Network Throughput - Network throughput refers to the average data rate of successful data or message delivery over a specific communication link. Handover to the network which has higher throughput is desirable.

(vii) Network Load Balancing - Network load is to be considered during effective handoff. It is important to balance the network load to avoid deterioration in quality of services.

(viii) Network Security - In a wireless environment, the security features provided in some wireless products may be weaker, to attain the highest levels of integrity, authentication, and confidentiality, network security features should be embedded in the handoff policies.

(ix) Received Signal strength (RSS) - A signal must be strong enough between base station and mobile unit to maintain signal quality at receiver. The RSS should not be below a certain threshold in a network during handoff. Traditional Handoff initiation is concerned with measurement of RSS.

(x) Velocity - Velocity of the host should also be considered during handoff decision. Because of the overlaid architecture of heterogeneous networks, handing to the small cell area, travelling at high speeds is discouraged since a handoff back to the original network would occur very shortly afterwards.

Vertical Handoff Decision Making Algorithms

In this literature survey various handoff decision algorithms have been discussed. Normally,

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these decision algorithms can be grouped as following[5]:
(1) Traditional (2) Function-based (3) User-centric (4) Multiple attributes decision making (5) Fuzzy logic and neural networks and (6) Context-aware.

Traditional handoff decision algorithm uses the received signal strength (RSS) with other parameters. The first policy-enabled handover strategy[4] proposes the cost function to select the best available network in the decision making. Optimized cost function is used to select the target network by introducing trade off between user satisfaction and network efficiency. Multiple Attribute Decision Making (MADM) deals with the problem of choosing an alternative from a set of alternatives which are characterized in terms of their attributes.

The Dynamic Decision Model for VHO adopts a three phase approach comprising Priority phase, Normal phase and Decision phase. The Priority Phase, assign the priorities to all candidate networks[6]. The Normal phase record the system information and user preferences. It then calculates a cost function for each candidate network. Finally, the Decision phase calculates a score function, for each candidate network. It then select a network having the highest value of score function as "Best" network to handoff and transfer all the current transmissions to selected network if different from the current network.

The existing fuzzy VHDA[7] deals with a vertical handoff decision based in fuzzy control theory taking into account three factors. The three factors are power level (PL) received from candidate BS, which is same as RSS, cost of operation networks (C) to which the candidates BS attaches to and the amount of unused bandwidth of candidate BS (BW). After establishing the membership functions, the membership degree is calculated as function of input parameters. The fuzzy vertical handoff decision value (F) is evaluated for each of the BS. The BS with maximum value of F function is chosen for vertical handoff[8].

Analysis

The traditional and function based methods considers only the minimum number of parameters. So its performance on throughput and others may decrease while more constraints were added. User centric approach considers the user related parameters and preferences. But in some situation the network conditions and constraints should also be considered. At that time the current method may become complicated and performance may degrade. Several VHO decision algorithms prefers Multi Attribute Decision Making (MADM) algorithm because more number of parameters can be used for decision making and the problem can be decomposed for simplicity in hierarchical model[9]. Some uses Fuzzy based decision making which is an intelligent approach but more number of fuzzy rule set should be formed. Context aware decision algorithm considers the user information, network and user device context information which is an efficient method but more constraints are there[10]. Apart from these many other methods like cross layer approach, game theory and genetic algorithms are also used for decision making. Normally all of these algorithms use both static and dynamic parameters for decision making. But only few papers consider call dropping rate as a decision parameter.

Conclusion

This paper presents a comprehensive survey of vertical handover decision schemes. Today's hot research area in wireless network is to find the best vertical handoff decision algorithm which meets the requirements of both user and network providers[11]. Several methods have been proposed in the literature survey, but still there is no standard and efficient method to fulfill both user and network requirements with QoS.

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Analysis of Ground Water Quality parameters of Bairagarh Area of Bhopal Madhya Pradesh

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ABSTRACT
Water quality parameters of drinking water was carried out by determining Temperature, pH, Total Dissolved Solids (TDS), Turbidity, Total Hardness (TH), Calcium Hardness (CaH), Magnesium Hardness (MgH), Chloride (Cl^-), Sulphate ($SO4^{2-}$) and Nitrate ($NO3^-$) of Bairagarh area Bhopal Madhya Pradesh, India. The sampling station was selected for the study for twelve months from November2014 to October 2015. It was found that the water quality ranged from good to marginal category.

INTRODUCTION

Water is one of the most important compound of the ecosystem. Quality of water is vital to the social, health and economic well- being of the population. Ground water is ultimate and most suitable fresh water resource (Sia Su 2007). As urban and industrial development increases, the quality of waste generated also increases (Mohmmed, 2006). Discharge of untreated waste in to surface waters, such as rivers, lakes and ponds; determine the contamination of waters for human purpose (Gabrieli et al., 1997). Better quality of water is described by its physical, chemical and biological characteristics. Rapidly shrinking surface water resources due to over-exploitation and contamination with several chemical and biological agents all over the globe has shifted tremendous pressure on the groundwater resources [Singh et al., 2006].

Method

The study was carried out during the period from November 2014 to October 2015 in Bairagarh area of Bhopal. The drinking water samples were collected in clean and dry polythene bottles. The water samples collected were analyzed within 5 hours after collection. The temperature of the samples was measured at the time of collection. The collected samples were kept in the refrigerator maintained at 4°C and analyzed for a few important parameters in order to have an idea on the quality of drinking water. Total alkalinity was evaluated by titration with standard 0.1M HCl using methyl orange and phenolphthalein as indicators (APHA 1996). Standard procedures involving AAS spectrophotometers, flame photometry and volumetric were used for the determination of hardness, total dissolved solids (TDS), sulphate, chloride, nitrate, calcium, magnesium etc. All the chemicals used were of AR grade [APHA 1996].

Result and Discussion

The results of different parameters are presented in Table 1 and their comparison with standard parameters is done in Table 2. The values obtained from November2014 to October 2015 of different parameters are compared in Graph 1 and 2.

Temperature-The maximum (26.6°C) temperature was recorded in the month of December and minimum (25.2°C) in the month of February.

Turbidity- The turbidity of water fluctuates from 0.8 NTU to 7.9 NTU. The maximum values (7.9 NTU) was recorded in the month of July. It might be due to human activities, decrease in the water level and presence of suspended particulate matter, and minimum value (0.8NTU) in the month of December.

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pH- The pH was alkaline values range from 7.2 to 7.42. The maximum pH value (7.42) was recorded in the month of November and minimum (7.2) in the month of July. The factors like air temperature bring about changes in the pH of water. Most of bio-chemical and chemical reactions are influenced by the pH.

Electrical Conductance- The electrical conductivity (EC) can be defined as it is a numerical expression that shown the ability of water to hold electrical current and it is related to ionic forces of the solution and the amount of salts dissolved in water [Sudhir et.al., 1999]. The EC values were found to be in the range of 473µS/cm to 660 µS/cm . Conductivity values of all samples were in agreement with conductivity range 160-1600 µS/cm of the guideline range for drinking water as indicated by WHO, SASO and GCS. It is evident from the graph 1, there is no significant change in conductivity.

Total dissolved solids- The total dissolved solids fluctuate from 196mg/l to 209mg/l. The maximum value (209mg/l) was recorded in the month of April and minimum value (196mg/l) in the month of February.

Alkalinity – Total alkalinity ranges from 128 mg/l to 164mg/l. the maximum value (164 mg/l) was recorded in the month of June and minimum value (128 mg/l) in the month of March. The alkalinity was maximum value in June due to increase in bicarbonates in the water.(Hujare 2008) also reported similar results.

Hardness – The value of hardness fluctuates from 302 mg/l to 322mg/l. The maximum value (322 mg/l) was recorded in the month of April and minimum value (30mg/l) in the month of February. (Hujare 2008) reported total hardness was high during summer than monsoon and winter. High value of hardness during summer can be attributed to decrease in water volume and increase of rate of evaporation of water. Similar result is obtained in the present study.

Calcium Hardness- The values of concentration of calcium hardness varied from 122 mg/l in the month of October to 142 mg/l.

Magnesium Hardness- The increase amount of magnesium is related to hardness. Magnesium hardness in the investigated water samples was ranging from 164 mg/l to 187 mg/l.

Chlorides- The value of chloride range from 213 mg/l to 248 mg/l. The maximum value (248 mg/l) was recorded in the month of March and minimum value (213 mg/l) in the month of October.

Sulphate - The value of sulphate range from 30 mg/l to 56 mg/l. The maximum value (56 mg/l) was recorded in the month of April and minimum value (30 mg/l) in the month of October.

Nitrates – The values of nitrate ranges from 17mg/l to 54 mg/l. the maximum value (54mg/l) was observed in the month of April it is slightly above the permissible limit as shown in Table 2 and minimum (17mg/l) in the month of October.

Conclusion

This study shows that ground water is the only source for people in that area, and the results of the chemical analysis of ground water indicate considerable variation. Most of the water samples comply with standards for drinking purpose. The water quality in the investigated area is found to be suitable for drinking, while as out prior treatments. It must be noted that a regular chemical analysis must be done to insure that the quality of water in this area is not contaminated. As the water level go down the contamination increases.

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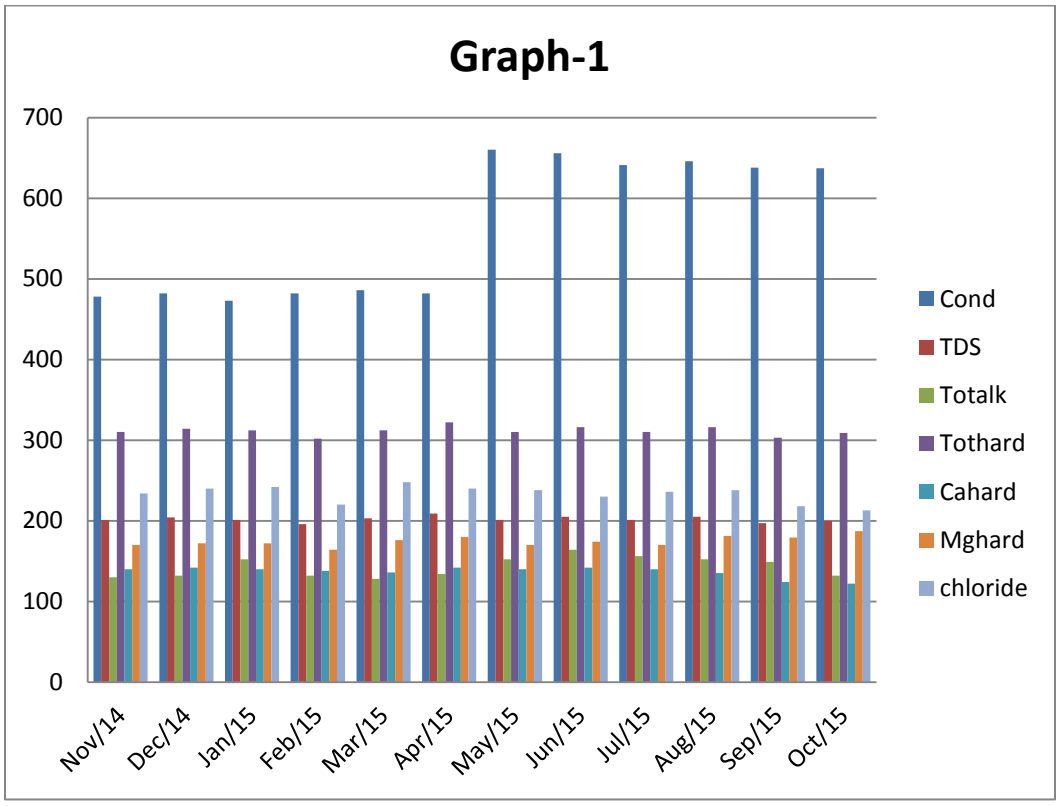

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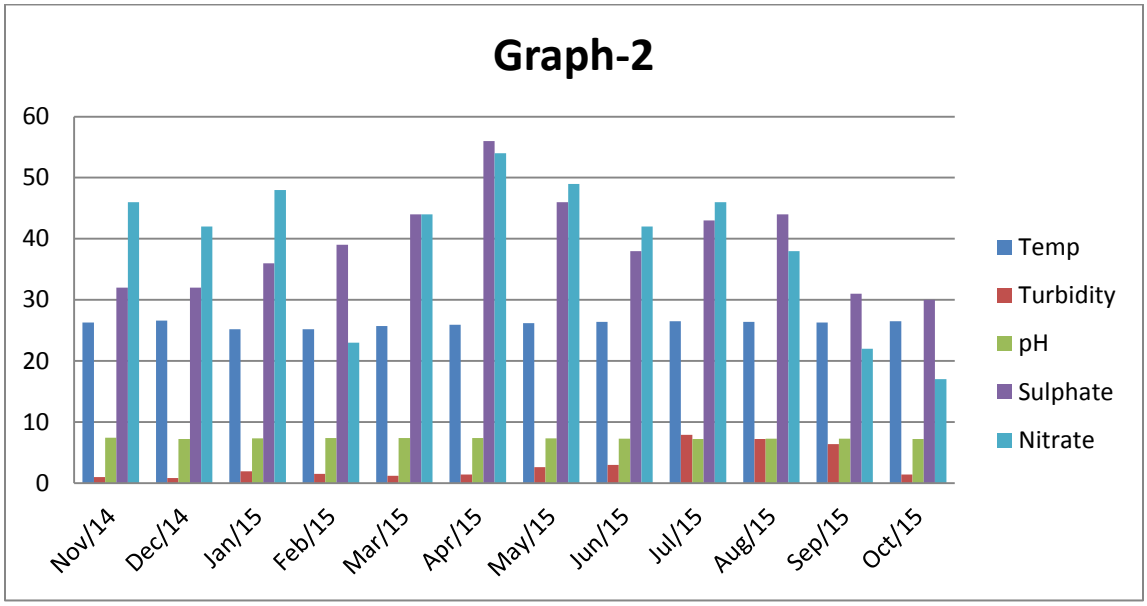

Table-1

	Temp	Tur	pH	Cond	TDS	TA	TH	Cah	MgH	Chlo	Sulp	Nitr
Nov-14	26.3	1	7.42	478	201	130	310	140	170	234	32	46
Dec-14	26.6	0.8	7.22	482	204	132	314	142	172	240	32	42
Jan-15	25.2	1.9	7.32	473	201	152	312	140	172	242	36	48
Feb-15	25.2	1.5	7.36	482	196	132	302	138	164	220	39	23
Mar-15	25.7	1.2	7.36	486	203	128	312	136	176	248	44	44
Apr-15	25.9	1.4	7.38	482	209	134	322	142	180	240	56	54
May-15	26.2	2.6	7.31	660	201	152	310	140	170	238	46	49
Jun-15	26.4	3	7.25	656	205	164	316	142	174	230	38	42
Jul-15	26.5	7.9	7.2	641	201	156	310	140	170	236	43	46
Aug-15	26.4	7.2	7.25	646	205	152	316	135	181	238	44	38
Sep-15	26.3	6.4	7.29	638	197	149	303	124	179	218	31	22
Oct-15	26.5	1.4	7.21	637	200	132	309	122	187	213	30	17

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TABLE 2					
COMPARISON OF RESULT WITH STANDARD VALUES					
Parameter	Maximum	Minimum	BIS	ICMR	WHO
Turbidity	7.9NTU	0.8NTU	10 NTU	5NTU	2.5NTU
pH	7.42	7.2	6.5-8.5	7.0-8.5	7.0-8.5
TDS	209mgl	196mgl	500mgl	500mgl	500mgl
TA	164mgl	128mgl		600mgl	
Tot H	316mgl	302mgl	300mgl	300mgl	200mgl
Chlo	248mgl	213mgl	250mgl	200mgl	200mgl
Sulphate	56mgl	30mgl	200mgl	200mgl	200mgl
Nitrate	54mgl	17mgl	45mgl	20mgl	45mgl

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REVOLUTIONIZING AN ERA OF 21ST CENTUARY GRID SMART GRID

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ABSTRACT
"POWER GRID"-It is the largest machine in the world -- an electric behemoth built on a skeleton of early 20th century engineering. The rest is a hodgepodge, a century's worth of innovations grafted onto an outdated framework. Yet, for the longest time, the Indian power grid has slogged on unchanged and rarely challenged, with a growing population shackled to its hide by every electrical gadget and appliance imaginable.
More than 300,000 miles (482,803 kilometers) of sprawling transmission lines twist and weave through our country. Yet despite the sheer size of the system, a few outages are enough to bleed us of at least $150 billion dollars annually. Meanwhile, a growing population continues to plug more and more power-hungry gadgets and appliances into the grid.
"How long can the beast shamble on without collapsing under the strain?"
To address the current power grid's shortcomings and prepare for the future, the DOE hopes to implement a number of changes in the years to come. The plan is to transition to a more efficient version of the current power grid, the smart grid.This paper discusses the key problems with the current system, How the smart grid will address these issues, and just what kind of short- and long-term methods figure in to the effort of revolutionizing the current grid to THE 21ST CENTUARY SMART GRID.
KEYWORDS- DOE (Department of energy), grid, transmission lines

INTRODUCTION

The Indian electrical grid, consisting of over 5,000 power plants, over 200,000 miles of high- voltage transmission, and over 5.5 million miles of distribution lines, is one of the most complex machines in the world. While the population has grown and the equipment using electricity at the other end of the lines has become increasingly sophisticated. Today's electrical grid suffers from a number of problems, including that it is:

1.1*Old* (the average age of power plants is 35 years)

1.2 *Dirty* (more than half of our electricity is generated from coal& diesel gensets)

1.3 *Inefficient* (the delivered efficiency of electricity is only 35%)

1.4 *Vulnerable* (the 2012 blackout in the Northeast Bina-Gwalior & Agra-Bareilly affected 300Million people for up to two days)

The grid is ill-equipped to handle both renewables, which are intermittent and less predictable than fossil fuel-based generators, or distributed generation. Finally, the current state of the grid limits the potential of energy efficiency efforts, as there are significant lags in the system such that users of electricity typically are unaware of their usage level at any given time. At the same time we are getting more & more "ELECTRONIC FRIENDLY". Thus making the appliances more sensitive to electrical variations. The growing chorous for building a new SMART GRID is simply a call to MORDERNIZE. Not only would a more efficient system sidestep many of the potential outages, but could also do wonders for the environment. The DOE estimates that if the grid were merely 5% more

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efficient, the energy savings would equal the fuel and greenhouse emission from 53 million cars. This inturn will go a long way toward reducing the effects of climate change.

I. WHAT IS SMART GRID?

INTERSECTION OF :-

ENERGY + INFORMATION TECHNOLOGY+ TELECOMMUNICATION TECHNOLOGY+ELECTRICAL POWER SYSTEM

The Smart Grid is a combination of hardware, management and reporting software, built atop an intelligent communications infrastructure. The world of the Smart Grid, offers tools to manage, monitor and respond to energy issues.

The flow of electricity from utility to consumer becomes a two-way conversation, saving consumers money, energy, delivering more transparency in terms of end-user use, and reducing carbon emissions.

The importance of this concept could be understood from the fact that this innovation was a part of "OBAMA'S STIMULUS BILL OF 2009".

II. FEATURES OF SMART GRID:-

2.1 Reliability

The smart grid will make use of technologies, such as state estimation, that improve fault detection and allow self-healing of the network without the intervention of technicians.

2.2 Flexibility in network topology

This next-generation transmission and distribution infrastructure will be better able to handle possible bidirectional energy flows, allowing for distributed generation such as from photovoltaic panels on building roofs, but also the use of fuel cells, charging to/from the batteries of electric cars, wind turbines, pumped hydroelectric power, and other sources.

2.3 Efficiency

Improvement of the efficiency of energy infrastructure from the deployment of smart grid technology, in particular including demand-side management, for example turning off air conditioners during short-term spikes in electricity price, reducing the voltage when possible on distribution lines through Voltage Optimization, meter reading, and improved outage management using data from Advanced Metering Infrastructure systems. The overall effect is greater utilization of generators leading to lower prices.

2.4 Load adjustment/Load balancing

Using mathematical prediction algorithms, it is possible to predict how many standby generators need to be used, to reach a certain failure rate. In the traditional grid, the failure rate can only be reduced at the cost of more standby generators. In a smart grid, the load reduction by even a small portion of the clients may eliminate the problem.

2.5 Peak curtailment/leveling and time of use pricing

Prices of electricity are increased during high demand periods, and decreased during low demand periods. It is thought that consumers and businesses will tend to consume less during high demand periods if it is possible for consumers and consumer devices to be aware of the high price premium for using electricity at peak periods. Hence smart grid offers a more energy efficient system.

2.6 Platform for advanced services

As with other industries, use of robust two-way communications, advanced sensors, and distributed computing technology will improve the efficiency, reliability and safety of power delivery and use. It also opens up the potential for entirely new services or improvements on existing ones, such as fire monitoring and alarms that can shut off power, make phone calls to emergency services, etc.

III. CONCEPTUAL MODEL: -

The Smart Grid, a "conceptual model" describes the Smart Grid in terms of domains (customers, markets,

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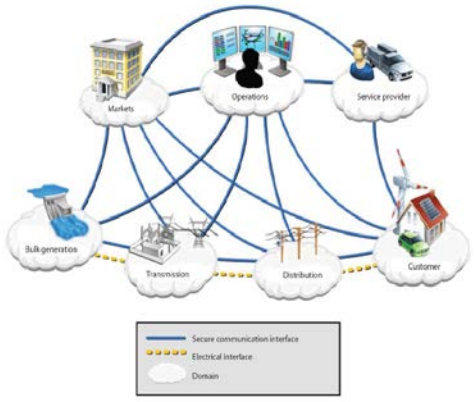
service providers, operations, bulk generation, transmission, and distribution).The model also refers to actors, applications, associations (logical



1. The basic conceptual model for the Smart Grid is useful in communicating the high-level concept. The detailed view in Figure 2 is messy, but vastly more informative.

connections) i.e. physical connections.*(Fig. 1)* is a diagram that represents each domain.

Figure 1: Architecture of smart grid

The functions & working of each domain is explained as:-

3.1 *The market domain*

The market domain is what makes the Smart Grid smart. Actors in the markets domain exchange prices and balance supply and demand within the power system. The function of the market domain in setting electricity prices takes the Smart Grid beyond the "simple" role of a continent-spanning industrial-control system. Its financial aspect gives its communications aspects the imperative for traceability and auditability.

3.2 *The service domain*

In the service provider domain, "services" are functions like billing and customer account management that support the business processes of power system producers, distributors, and customers. Major challenges include maintaining the cyber security, reliability, stability, integrity, and safety of the electrical power network. Communication with the operations domain provide system control and situational awareness.Communication with the markets and customer domains will support new "smart" services, particularly customer interaction with the market(s).

4.3 The customer domain

The Smart Grid is fundamentally about decreasing power consumption and increasing power generation as customers become active participants in the supply chain.

The customer domain is usually segmented by typical demand into sub-domains for home (less than 20 kW), commercial/building (20 to 200 kW), and industrial (greater than 200 kW). Each sub-domain has multiple actors and applications, and each has a meter actor and an energy services interface (ESI) that may reside in the meter, or an energy management system (EMS).

The ESI is the primary service interface. It may communicate with other domains via the advanced metering infrastructure (AMI) or some other means, such as the Internet.

The ESI communicates to devices and systems within the customer premises across a home-area network or other local-area network.

The EMS is the entry point for applications like remote load control, monitoring and control of distributed generation, in-home display of customer usage, reading of non-energy meters, and integration with building management systems and the enterprise. It may also provide auditing/logging for cyber security. Importantly, the customer domain may also provide micro-generated electricity to the grid. So this technology makes us not only the consumers but producers of electricity as well.

4.4 The operation domain

Actors in the operations domain are responsible for the smooth operation of the power system.

4.5 *The Bulk generation domain*

The bulk generation domain involves any kind of electrical generation: combustion, nuclear fission, flowing water, wind, solar radiation, or geothermal heat. The boundary of this domain is typically the

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transmission domain, to which it is hard-wired. But the bulk generation domain also shares interfaces with the operations and markets domains.

4.6 *The transmission domain*

In this context, transmission is the bulk transfer of electrical power from generation sources to distribution through multiple substations. The domain may contain DERs such as electrical storage or peaking generation units. The network is typically operated by a regional transmission operator (RTO) or independent system operator (ISO) whose primary responsibility is maintaining stability on the electric grid by balancing generation (supply) with load (demand).

4.7 *The distribution domain*

The distribution domain encompasses the electrical interconnection between the transmission domain and the customer domain. It includes the metering points for consumption, distributed storage, and distributed generation.

IV. BRINGING INTO ACTION: BABY STEPS TOWARDS SMARTER GRID

In the era of smartphones, touchscreens our nation's century old grid also ripe for an upgrade. A single fix cannot accommodate this change. Numerous concepts, philosophies & technologies go into steering the system to a more efficient future. Here are few of the big ones: -

5.1 Advanced metering infrastructure (AMI)-Smart meters & Thermostats

Figure 2: Smart meters

Instead of just waiting for the bill or staring dumbfounded at the spinning dials on the power meter outside, users can now use wattage readers to check how much juice their gadgets and appliances use. A smart meter is an electrical meter that records consumption -of electrical energy in intervals of an hour & communicates that information daily back to the utility for monitoring and billing purposes. Smart meters enable two way communication between meter and central system.Theycompose a neighborhood area network (NAN). Meter can be read remotely using network hand-held / walk-by, drive -by energy consumption calculation on annual, monthly, weekly, daily or even on an hourly basis.

Smart Thermostats are programmable & Wi-Fi equipped to keep track of the weather forecast. These features allow for a more fine-tuned and efficient use of home heating and cooling.

5.2 *E-meters*

With the E-Meter system we connectsmart meters to smart phones.As smart phones are almost always connected to the Internet and within reach of every user. So by using smart phones to visualize electricity consumption enables households to easily understand their electricity consumption.

The E-Meter Architecture:

The E-Meter system consists of three independent components: - a smart electricity meter that monitors the total domestic load; a gateway that manages and provides access to the logged measurement data; and a portable user interface on a mobile phone that provides real-time feedback on energy consumption and enables users to interactively monitor, measure, and compare their energy consumption.

5.*3 Micro-grids*

Microgrids, are localized grids that can disconnect from the main grid to operate autonomously and help mitigate grid disturbances to strengthen grid resilience, can play an important role in transforming the nation's electric grid. They are able to continue operating while the main grid is down & can function as grid resource for faster system response and recovery. They use the local widely available renewable sources of energy to serve local loads, helps reduce energy losses in transmission and distribution, further increasing the efficiency of the electricity system. In peak load periods it prevents

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utility grid failure by reducing the load on the utility grid.

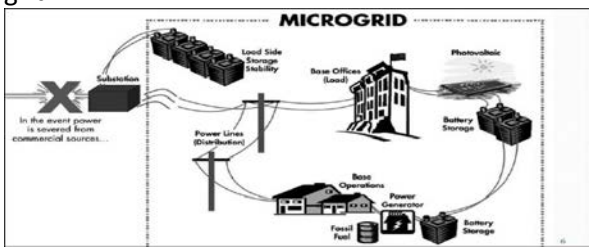


Figure 3:How micro grid works

5.4 *HVDC- High voltage direct current*

*T*he amount of electricity lost during DC transmission would be far less than with AC.

Let's say you're transmitting a given amount of power by high-voltage DC: When you double the voltage, you need only half the current of a comparable AC system, thus reducing your line losses by a factor of four. You also need a lot less wire, because DC current penetrates the entire conductor of a power line, whereas AC current remains largely near the surface.

Put another way, for the same conductor size, the effective resistance is greater with AC, and more power is lost as heat. In practice, that means the overall transmission infrastructure for AC far exceeds that for DC. To transmit 6,000 megawatts using a 765-kilovolt AC system, for instance, you need three separate single-circuit transmission lines, which would cut a right-of-way path about 180 meters wide. Compare that with an 800-kV DC system, which would require just one 80-meter-wide path.

HVDC also allows for the easy transfer of power between grids that are operating at different frequencies. HVDC also results in increase of system stability and system security. Today HVDC has spread only modestly in North America, but it has taken off in other parts of the world, most notably Brazil, China and Western Europe.

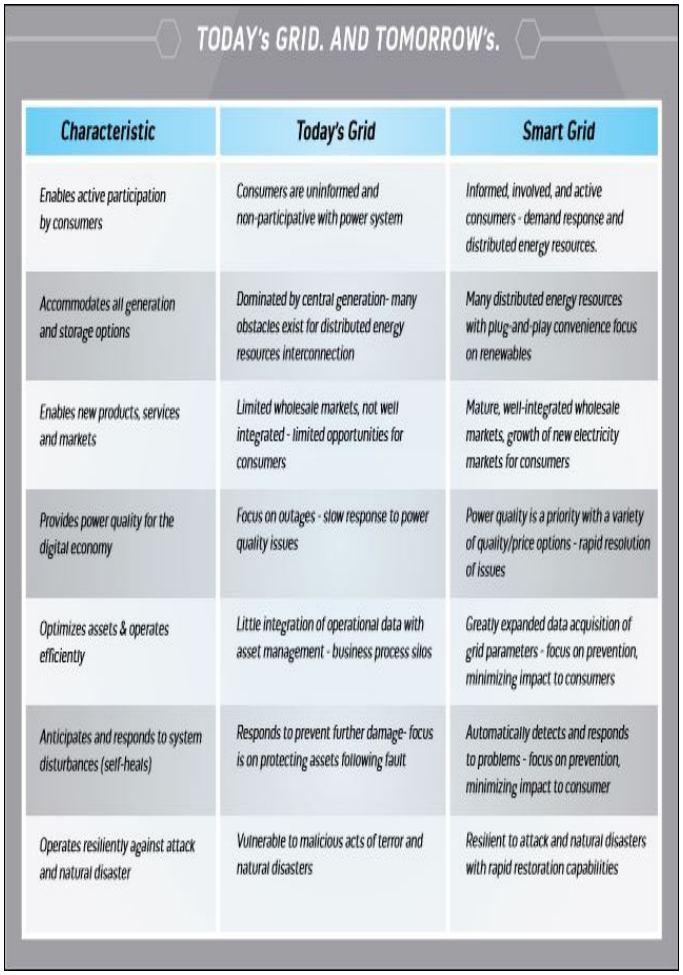
5.5 *Distributed generation*

Distributed generation is the use of small scale power generation technologies located close to the load being served, capable of lowering costs, improving reliability, reducing emissions and expanding energy options. An automated distributed energy network is characterized by a two way flow of electricity and information and will be capable of monitoring everything from power plants to customer preferences to individual appliances. It incorporates into the grid the benefits of distributed computing and communications to deliver real time information and enable the instantaneous balance of supply and demand at device level.

5.5 *Others*

Advanced sensors which report line conditions in real time and enable more power to flow over the existing lines.

Superconducting power cables, wireless technology & "set it and forget it" energy management tools along with increased access to energy data thus enables the customer to gain more control on the electricity cost anduse.



V. ADVANTAGES OF SMART GRID

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1. *Economic Development:* -The manufacture, installation, operation and maintenance of the smart grid and its components will create new jobs within the state.

2. Innovation: - Smart grid innovation will enable the growth of business while rewarding customers with valuable new products.

3. Lower Costs: Costs rise over time and energy is no exception, but the smart grid should provide less costly energy than otherwise would be possible. As such, it will save customers money.

*4. Higher Customer Satisfaction:*The combination of lower costs, improved reliability and better customer control will raise satisfaction among all types of customers.

5. Improved Reliability: Smart grid will reduce and shorten outages and improve the quality of power.

6. Customer Energy/Cost Savings: As pricing becomes more transparent and is aligned with the underlying economics of generation and distribution, customers' decisions to save money will benefit society as well.

VI. CHALLENGES

1. *Biggest concern*: Privacy and Security.
2. Some types of meters can be hacked.
3. *Hackers* may gain control of thousands, even millions, of meters, Increase or decrease the demand for power.
4. Not simply a single component, various technology components like software, the power generators, system integrators, etc. are involved.
5. *Expensive* in terms of installation.

VIII. CONCLUSION

'City of mirrors, City of mirages, at once solid and liquid, at once air and stone. My Dream is of a place & time where India will once again be seen as, The Golden Bird- The last best hope of the world.'

Smart grid is an emerging technology to provide next generation power grid and should be promoted as a way of addressing Energy Independence, global warming and emergency Resilience issues. In the 21st century, if India dreams to emerge out as a developed nation, energy efficiency and energy conservation integrated with IT infrastructure is required to be implemented. Smart grid strongly pose one option which can drive India an inch closer to be once again The Golden Bird of 21st centuary.

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Trend analysis of growth of herbal medicinal industry in India:

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ABSTRACT
This paper will throw light on the growing herbal industry and will also give brief description about the role played by herbal medicinal industry over the years. Medicinal plants though traditionally used by Vedas and Hakims in India, now is one of the emerging industries in India and all over the world. Herbal medicine has suddenly come into trend with the idea of "wellness" becoming integral to the healthcare business. With the marketing of the concept of wellness, the herbal medicine market in India is all set to look up and clock a growth rate of 12-15 per cent a year. The growth will also be driven by the upcoming medical cities that promise to provide consumers the option of herbal and ayurvedic treatments. Many new pharma companies are entering in to the business due to the huge potential of herbal medicines in India. Indian herbal industry is likely to double from presents.7, 500 crore - Rs. 15,000 crore by 2015, according to a study by Associated Chambers of Commerce and Industry (ASSOCHAM). The study expects the domestic herbal industry to grow rapidly in the coming years and by 2015, it is expected to rise to Rs. 15,000 crore, reflecting a compound growth rate of over 20 per cent. This study is based on the data published by AYUSH department, NMPB, ASSOCHAM, FRLHT, CERPA and other departments associated with herbal medicines. Various research papers are also consulted in making this research paper viz. Future Prospects of herbal medicinal industry in terms of employment and revenue generation.

INTRODUCTION

There are large number of manufacturing units using various herbal medicines under Ayurveda, Siddha, Unani and Homeopathy. Raw materials for all these diverse industries are largely derived from wild sources.

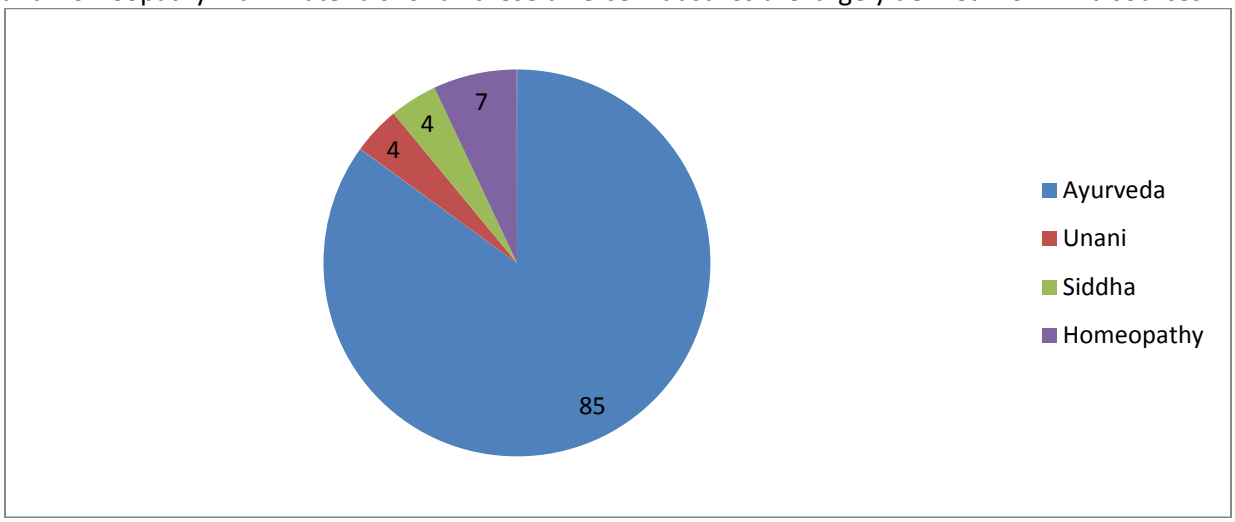

Fig.1: Proportion of manufacturing units of different systems.
Source: Dept of AYUSH.

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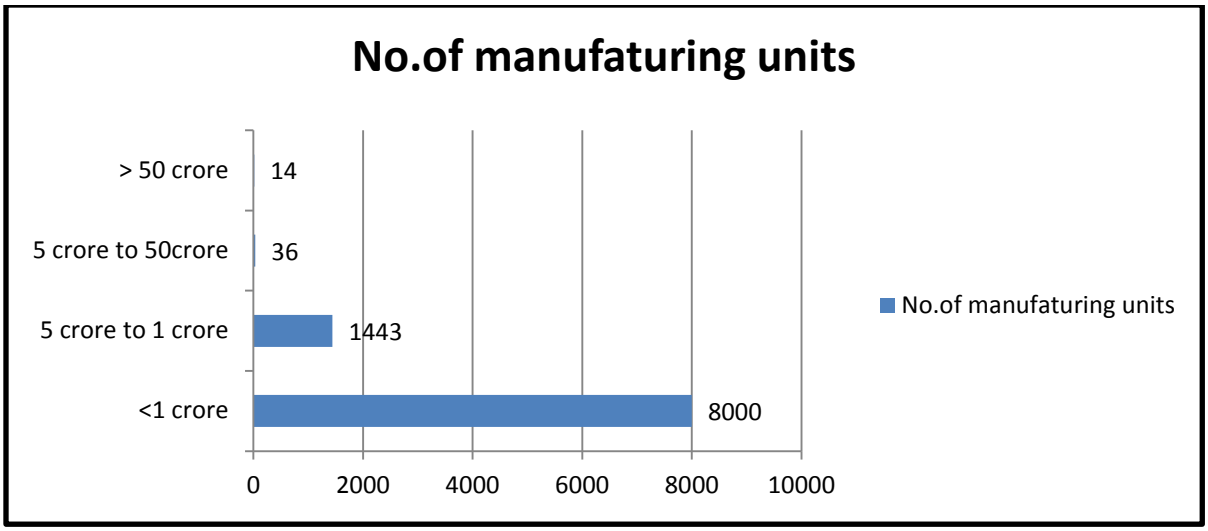

Fig2: Source: Demand and Supply, NMPB

There are total 10,000 manufacturing units, of which mostly are small scale units having an annual turnover of less than 1 crore. Some of the well known industrial houses with annual turnover of more than 50 crores are Dabur, Zandu, Himalaya, Shree Baidyanath, Araya Vaidya Shala etc.

Methodology:

A very simple procedure is used by using historical data for projecting future growth of herbal medicinal industry in India. It assumes the availability of at least two years of historical data for being forecast.

Using two years of historical data, an annual growth factor (AGF) is calculated as follows:

$$AGF = (T2/T1)^{1/(Y2-Y1)}$$

Where T1 is total production in year Y1 and T2 is Total production in year Y2.

The annual growth factor can then be applied to predict future demand (T3) for some future year (Y3) as follows:

$$T3 = T2\ AGF^{Y3-Y2}$$

For example, assume TP is 8,000 in 1990 and 10,000 in 1995. Using this simple procedure, the forecast number of truck trips for the year 2005 is 15,625; i.e.,

$$AGF = (10,000/8,000)^{1/5} = 1.04564.$$

$$15,625 = (10,000)\ (1.04564)^{10.}$$

Manufacturing units in India:

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Worldwide, alternative medicines are becoming popular and herbal medicines have become one of the most common forms of alternative therapy. The international herbal market is approximately $61 billion. Annual sales of herbal medicinal products (HMPs) are approximately $3 billion in the US.

Ayurvedic medicines are produced by several thousand companies in India, but most of them are small. The total ayurvedic production in India is of the order of 1 billion dollars (U.S.). There are almost 30 companies that are dominating Indian herbal market doing more than a million dollar per year business to meet the growing demand of ayurvedic business. The Indian market is growing at 15- 20 percent per annum.

A brief description of major suppliers in Ayurveda in India is given, which together have about 85% of India's domestic market.

Table 1: Major Manufacturing units in ayurveda in India:

Name of the company	Year of establishment	Turnover(million dollars/year)	Employment
Dabur India Ltd	1884	650	2000
Sri Baidynath Ayurvedic Bhawn Ltd.	1917	350	1600
Zandu Pharmaceuticals	1919	45	200
Himalaya Drug Company	1934	500	1700
Charak Pharmaceuticals	1947	120	350
Vicco Laboratories	1958	40	200
Emami Group	1974	110	300
Aimil Pharmaceuticals Ltd.	1984	20	100

Source: Institute for Traditional Medicine, Portland, Oregon

Current Status and Future Growth in Herbal Medicinal industry in India:

Year	**>5o Crore Industries**	**Growth (%)**	**< 1 crore industries**	**Growth (%)**	**Ratio Large: Small**
1990(y1)	**14**		**7000**		**1:500**
2010(y2)	**30**	**114%**	**9500**	**35%**	**1:316**
2020(y3)	**44**	**46%**	**11038**	**16%**	**1:250**

Table reflects over the years growth in small scale industries is less as compared to the growth in large scale industries. The only valid reason may be the base of large industries was too small. Over all the sector is growing but not at the rate it should be growing.

Using two years of historical data, an annual growth factor (AGF) is calculated as follows:

$$AGF = (T2/T1)^{1/(Y2-Y1)}$$

Where T1 is total production in year Y1 and T2 is Total production in year Y2.

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$$AGF = (30/14)^{1/(2010-1990)}$$

$$= 1.03877$$

The annual growth factor can then be applied to predict future demand (T3) for some future year (Y3) as follows:

$$T3 = T2\ AGF^{Y3-Y2}$$

$$T3 = 30\ (1.03877)^{(2020-2010)}$$

$$= 44$$

Using the above formula 46 % growth rate is predicted that is good for the industry in India. This means in India there will be 50 companies doing more than 50 crore business.

Similarly the growth rate in industries doing less than 1 crore business can be predicted as:

Using two years of historical data, an annual growth factor (AGF) is calculated as follows:

$$AGF = (T2/T1)^{1/(Y2-Y1)}$$

$$= (9500/7000)^{1/(2010-1990)}$$

$$= 1.01511$$

Where T1 is total production in year Y1 and T2 is Total production in year Y2.

The annual growth factor can then be applied to predict future demand (T3) for some future year (Y3) as follows:

$$T3 = T2\ AGF^{Y3-Y2}$$

$$= 9500\ (1.01511)^{10}$$

$$= 11038$$

By using above methodology the industrial growth is having positive trend.

In terms of Production growth of herbal medicines:

Years	Value of Total production (Crores)	Growth	Exports	Growth
2010	**7000**		**3600**	
2012	**14500**	**107%**	**9000**	**150%**

The Indian herbal market is rising sharply and is expected to hit Rs 14,500-crore mark with exports reaching Rs 9,000 crore by the year 2012.

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The herbal market has an annual compounded growth rate of 20 and 25 per cent, respectively. India is followed by China as the largest producer of medicinal plants having more than 40 per cent global diversity, Ayushkati Ayurved's promoter Pankaj Naram said in a statement here.

Worldwide, the ayurvedic industry is put at $3 billion and is slowly gaining acceptance as an alternative system of medicine and health care, Naram said.

According to the study on 'Herbal Industry Biz Potential', currently, the Indian herbal market is worth Rs 7,000 crore ($1.7 billion) and India exports herbal raw materials and medicines worth over Rs 3,600 crore ($902 million).

OTC (over the counter) products constitute 20 per cent of the $165-billion health care industry in the US, in India, it constitutes only 5 per cent of the Rs 19,000 crore health care industry.

Conclusion:

The future belongs to herbal companies in India and it depends on how it prepares itself for the challenges and the bottlenecks it offers for the sector development, the main concern remains the quality control procedures for those industries have to invest huge sums for the development of their R & D sectors of international standards. Other concerns may include regulatory, consumer perceptions and the competitions. Government has to play important role not only to ensure the policies that will facilitate the industrial units and encourage the growth but also to make sure every industry meet the guidelines like international standards, good agricultural practices, good laboratory practices, good clinical practices, and good manufacturing practices in order to have quality and safe products.

Newer approaches utilizing collaborative research and modern technology in combination with established traditional health principles will yield rich dividends in the near future in improving health, especially among people who do not have access to the use of costlier western systems of medicine.

Opportunities:-

The forecast is that the global market for herbal products is expected to be $5 Trillion by 2050. Herbal remedies would become increasingly important especially in developing countries. India, with its biodiversity has a tremendous potential and advantage in this emerging area. India, with its vast biodiversity could become a world leader in the supply of herbal raw materials for the herbal medicinal industry.

The introduction of medicinal herbs into cropping patterns can provide impetus for the growth of herbal medicines and also will result in increasing returns.

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CHEMICAL HAZARDS & THEIR IMPACT

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ABSTRACT
Bhopal gas tragedy, the worst industrial disaster in the history, is especially significant in generating the environmental revolution by triggering the mechanisms to prevent or contain hazards in work or living environment that otherwise may meet vulnerable land-uses and result in major disasters.The worldwide awareness and action in the forms of political, policy and regulatory developments at international, national and regional level, besides scientific, engineering and management delineations for risk assessments, accident analysis, effect & consequence modeling, and mitigation methods.

INTRODUCTION

At present there are over 1724 Major Accident Hazards (MAH) units and other small and medium–sized industries all across the nation and new industries are also establishing at a rapid rate. Chemical accidents can occur due to lack of safety measure, technical break down, or due to a human error. It, thereby, initiates a series of uncontrolled physiochemical phenomenon such as runaway chemical reactions, large spills, fires and explosions. These phenomena eventually targets both human and non-human in the form of immediate and residual or long term consequences. Thus, it is imperative to develop preventive measures like adoption of safer engineering practices, improved safety devices and elimination of human errors by regular checks.

2.SOURCES OF CHEMICAL DISASTER:-

Chemical accidents may originate in:
i) Manufacturing and formulation installations including during commissioning and process operations; maintenance and disposal.
ii) Material handling and storage in manufacturing facilities, and isolated storages; warehouses and godowns including tank farms in ports and docksand fuel depots.
iii) Transportation (road, rail, air, water, and pipelines).

Causative Factors Leading to Chemical Disasters Chemical disasters, in general, may result from:
i) Fire.
ii) Explosion.
iii) Toxic release.
iv) Poisoning.
v) Combinations of the above.

2.1 Fire involving hazardous chemicals

Chemicals are involved in almost all fires. There may be multiple products of combustion that may be more dangerous than the burning chemical. People exposed to a fire can inhale toxic or corrosive gas, or develop skin irritation and burns. Once in contact with fire, some chemicals may cause greater thermal radiation or produce flying projectiles. Oxidizers may facilitate further combustion making fire containment more difficult. In the process of extinguishing the fire, runoff of contaminated water and foams may pollute the environment and later might affect living organisms.

2.2 Explosion of storage containers

Many chemicals used in the industry are often stored in tanks or drums. Flammable gas or liquids, toxic gas, corrosives liquids and similar others may be found in large quantities at the industry sites. Examples of flammable products are fuel, solvents, etc. If the tank is heated in a fire it may explode causing flying projectiles of burning parts to a radius

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of hundreds of meters. Burning parts of the tank might also cause a fire in another location. Furthermore, toxic gases may be released, causing severe burns to many people as well as exposure to combustion products. Traumatic injuries can be inflicted due to the explosion wave or the impact of objects.

2.3 Chemical leaks

Chlorine, used for water treatment, is stored in pressurized tanks and if there is valve failure, toxic chlorine gas can escape into the environment. Chlorine gas has great expansion factor, meaning that an increase in volume covering a large area can occur rapidly. This "toxic cloud" may move according the weather conditions and may travel over medical facilities, schools, sports club, or cover a town just in minutes. Acute toxic manifestations such as eye and skin irritation and respiratory difficulties can develop following exposure.

2.4 Transport Related

During transportation of chemicals, spillage can occur following accidents in the roads or sea hence contaminating the environment (land, sea, air) and affecting communities, wildlife (fishes, birds etc) or the food chain. If fires develop, explosion may occur.

2.5 Chemical Contamination of products

Contamination of products like food, water, medicine or goods (shampoo, etc.) is a potential threat. Contamination may be accidental due a missuse of chemical (ie. Inappropriate spraying of persistent pesticides), manufacturing error (ie. use of ethylene glycol instead of propylene glycol in vaccine production), uncontrolled release of chemicals, or intentional (i.e. malicious contamination of cyanide in medicines). Following ingestion or use of these contaminated products, poisoning may occur and these harmful health effects may be immediate or may appear much later (days, months or years). It must be emphasized that poisoning in living organisms may appear far away from the site of the chemical incident (for instance, chemical release in food production area and later transported to consumer area).

2.6 Improper disposal of chemical waste

This occurs when there is inappropriate process for landfill, unexpected discharge of industrial effluents or untreated chemicals into the waterways or sewerage causing chemical contamination in vegetation and bodies of water, which in turn affect the ecology. The situations presented here illustrate the complexity of the chemical incidents and the necessity of multi-sectoral response to ensure the safety of the population exposed or the environment contaminated. There are many other types of incidents with various degrees of complexity. They are detailed in the the specialized courses for firefighters, rescue teams, physicians, etc.

3. BHOPAL TRAGEDY-A CASE STUDY OF OUR OWN CITY:-

If we see the history of worst chemical disasters, in industries the first thing that comes to our memory is one at Bhopal

On the night of Dec. 2nd and 3rd, 1984, a Union Carbide plant in Bhopal, began leaking. due to run-away reactions, temperature and pressure rise and the safety valve lifted to the atmosphere. About 25-27 tons of the deadly gas methyl isocyanate spread through the city of Bhopal.

Half a million people were exposed to the gas. Protective systems that should have prevented or minimized discharge were out of service. Refrigeration system to cool the reactor was down. Scrubbing system to absorb the released vapour was not immediately available. Flare system to burn vapours getting past the scrubber was out of service.

Lessons we learned form Bhopal Tragedy

1)Reduce inventory of hazardous material (MIC)
2)Keep all the safety related equipment in order
3)Keep residential areas away from the plant
4) Proper Management

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4. **WHAT CAN WE DO AS PREVENTION?**

• Emphasis on regular safely audit
•Commissioning and decommissioning of chemical industries
• Preparation of on -site and off site plans
• Regular testing of emergency plans
• Need of medical first responders and medical inventory
• Crises management plans of hospitals
• Concept of mobile hospital and mobile teams

5. CONCLUSIONS

We learn best through our own experiences in different phases of our life.

Mistakes could be catastrophic in a chemical plant, but it is a great opportunity to learn and design a safer plant in the future.

We must learn from previous incidents and develop new procedures, practices and management systems.

These incidents have much learning which reveal many hidden facts about safety and provide efficient tools for prevention of similar incidents in the future.

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वर्तमान युग विज्ञान का युग है। हमारे चारों ओर अनेक परिवर्तन दिखाई दे रहे हैं। प्रत्येक दिन नवीन वस्तुओं का निर्माण हो रहा है अथवा पूर्व निर्मित वस्तुओं के स्वरूप में सुधार हो रहा है। गुणवत्ता, गति आदि में प्रतिदिन परिवर्तन हो रहा है। आज विज्ञान को प्राथमिक कक्षा से लेकर उच्च कक्षाओं तक पढ़ाया जाता है किन्तु प्रायः विद्यार्थियों में हिन्दी भाषा में विज्ञान लेखन व कौशल का अभाव पाया जाता है, जिससे लेखन को पढ़ने व समझने में अत्यधिक कठिनाई होती है। इस कारण विद्यार्थियों को हिन्दी भाषा में विज्ञान लेखन कौशल के लिए एक क्रियात्मक अनुसंधान का प्रस्ताव बताया गया है कि किस प्रकार विज्ञान लेखन को सुधारा जा सकता है। इसमें मुख्यतः लेखन से संबंधित प्रमुख समस्यों को एक परिकल्पना के माध्यम से कार्य योजना के अनुसार पूर्व परीक्षण एवं अंतिम मूल्यांकन के आधार पर बताया गया है कि किस प्रकार मूल्यांकन करना चाहिए। पूर्व परीक्षण एवं अंतिम मूल्यांकन के आधार पर निष्कर्ष निकाला गया है कि विद्यार्थियों को पहले मात्राओं, वर्णों एवं चित्रों को पहचानने की समझ विकसित करना, फिर छोटे–छोटे वाक्य स्वयं लिखने व उनको प्रोत्साहित करने से हिन्दी भाषा में विज्ञान लेखन एवं रचना की क्षमता को विकसित किया जा सकता है।

प्रस्तावना

भाषा और विज्ञान के सम्बन्ध को प्रत्यक्ष सहसम्बन्ध के रूप में देखा जा सकता है। एक सहज सम्बन्ध तो भाषा की अभिव्यक्ति का साधन होता है। यह अन्य शास्त्रों एवं विद्याओं की भांति विज्ञान से अभिव्यक्ति देती है जो कि उसके विकास और संसार के लिए तात्विक और मूल है। विज्ञान भाषा–बोध के लिए आवश्यक तकनीकें और विधाएं उपलब्ध करता है। शब्द अथवा वाक्य रचना के बोध, विश्लेषण और संश्लेषण से ही सम्भव है। निर्णयन प्रक्रिया में सामान्यीकरण अपनी उत्पत्ति में विज्ञान की ही तकनीक है। यह व्याकरण का प्राण है। व्याकरण स्वयं भाषा की आत्मा है। इसको भाषा विज्ञान के ही नाम से जाना जाता है क्योंकि इसकी और विज्ञान की संरचना व विकास प्रक्रियाएं तद्रूप हैं।

समस्याः हिन्दी भाषा में विज्ञान लेखन व कौशल संबंधी कठिनाइयों का अध्ययन।

समस्या का स्पष्टीकरणः प्रायः विद्यार्थियों को हिन्दी भाषा में विज्ञान लेखन व कौशल संबंधित कार्य करने में कठिनाई होती है। वे लेखन के द्वारा अपने विचारों की अभिव्यक्ति को शुद्ध नही लिख पाते हैं, जिससे लेखन को पढ़ने में कठिनाई होती है। इस कठिनाई का अध्ययन कर इसे दूर करने हेतु क्रियात्मक अनुसंधान का प्रस्ताव किया गया है।

उददेश्य

- विद्यार्थियों में भाषायी एवं रचना कौशल का विकास करना।
- विद्यार्थियों को हिन्दी भाषा में विज्ञान लेखन लिखने का अभ्यास कराना।
- खोज विधि द्वारा विज्ञान के प्रयोगों का पर्याप्त अभ्यास कराना।
- विज्ञान लेखन को समझने के लिए तर्कयुक्त व क्रमबद्ध ढ़ंग से विचार कराना।
- विद्यार्थियों में वैज्ञानिक चिंतन का विकास करना।
- परिचित व्यक्तियों, वैज्ञानिकों एवं वस्तुओं पर निबंध लिखने की क्षमता विकसित करना।

परिकल्पनाः विद्यार्थियों को हिन्दी भाषा में विज्ञान लिखने, बोलने व उचित ढ़ंग से अभ्यास कराने से विज्ञान लेखन में सुधार किया जा सकता है।

सीमांकनः भोपाल जिले में एक हिन्दी माध्यम का विद्यालय।

न्यादर्शः कक्षा 8 के 50 विद्यार्थियों तक यह अनुसंधान सीमित है।

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संभावित कारणः प्रस्तुत समस्या के संभावित कारण निम्नलिखित हैं:

क्रमांक	संभावित कारण	साक्ष्य	तथ्य/अनुमान	नियंत्रण
1.	विद्यार्थियों में स्वलेखन की प्रेरणा का अभाव	लेखन हेतु दिए गए कार्य का अवलोकन करने पर	तथ्य	निरंक
2.	प्रायः विद्यार्थियों में हिन्दी भाषा में विज्ञान लेखन लिखने का अभाव	विज्ञान के कुछ चुने हुए शब्दों को लिखवाकर अवलोकन करना	तथ्य	निरंक
3.	विज्ञान रचना कौशल का विकास न हो पाना।	विज्ञान के कुछ चित्रों को बनवाकर अवलोकन करना	तथ्य	शिक्षक
4.	विद्यार्थियों में अर्थपूर्ण वाक्य बनाने के ज्ञान का अभाव	सभी छात्रों को वर्णों एवं मात्राओं को लिखवाकर जांच करना	तथ्य	शिक्षक

सबसे प्रमुख कारणः विद्यार्थियों को स्वयं हिन्दी भाषा में विज्ञान लेखन व अर्थपूर्ण वाक्य बनाने का अवसर नही देना एवं विज्ञान रचना कौशल का पर्याप्त अभ्यास नही कराना।

कार्य योजना

क्रमांक	क्रियाकलाप	उपकरण	प्रक्रिया	अवधि
1.	पूर्व परीक्षण		कक्षा 8 के विद्यार्थियों द्वारा लिखे गए हिन्दी भाषा में विज्ञान लेखन का परीक्षण कर उनकी कमियों का पता लगाना	5 दिन
	निष्कर्षः पूर्व परीक्षण के आधार पर यह पाया गया कि विद्यार्थियों में हिन्दी भाषा में विज्ञान लेखन लिखने व कौशल की क्षमता का अभाव है।			
2.	पहचानने का अभ्यास कराना	चित्र	श्यामपटट् पर शुद्ध–शुद्ध मात्राओं एवं वर्णों को लिखकर व उच्चारण कर पहचानने का पर्याप्त अभ्यास कराना।	10 दिन
3.	लिखने का अभ्यास कराना	चित्र/पाठ्यवस्तु	वर्णों को मिलाकर शब्द लिखने व बोलने का पर्याप्त अभ्यास कराना	15 दिन
4.	विज्ञान रचना कौशल का विकास कराना।	चित्र	किसी महापुरूष का चित्र दिखाकर उसके सभी अंगों की रचना हिन्दी भाषा में करने का पर्याप्त अभ्यास कराना।	20 दिन
5.	अर्थपूर्ण वाक्य बनाने का अभ्यास कराना	वस्तु/चित्र/मॉडल अथवा उदाहरण के माध्यम से	विद्यार्थियों द्वारा दैनिक जीवन में देखी गई किसी वस्तु/चित्र/मॉडल आदि पर 10–10 वाक्य लिखवाना व लिखकर चर्चा करना एवं शब्दों को मिलाकर अर्थपूर्ण वाक्य बनाने का पर्याप्त अभ्यास कराना	15 दिन
6.	परिचित व्यक्तियों, वैज्ञानिकों एवं वस्तुओं पर निबंध लिखने की क्षमता विकसित करना।	चित्र	विद्यार्थियों को परिचित व्यक्तियों, वैज्ञानिकों एवं वस्तुओं को दिखाकर निबंध लिखने का अभ्यास कराना।	20 दिन
7.	विज्ञान लेखन की विधि बताना	प्रारूप	विद्यार्थियों द्वारा लिखे गए लेखन के आधार पर लेखन की विधि बताकर पर्याप्त अभ्यास कराना।	12 दिन

विज्ञान लेखन का अभ्यास कराने के लिए निम्नलिखित प्रारूप/विधि का उपयोग कक्षा शिक्षण में किया जा सकता है:

- **स्व–अध्ययन प्रारूपः** यह प्रारूप विद्यार्थियों को पढ़ने व समझ के आधार पर मानस चित्र बनाने, विषयवस्तु का सारांशीकरण करने व चर्चा करने के कौशलों को विकसित करने में सहायक है।

प्रारूप

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आयाम	स्वरूप	कैसे/ गतिविधि	समय

- **सह–अध्ययन प्रारूपः** इस प्रारूप में पूरी कक्षा के छात्रों को दो–दो की जोड़ी में बैठाकर पाठ की विषयवस्तु का आवंटन करके विषयवस्तु को दोहराया जाता है। वे बच्चे जो ठीक से नही पढ़ पाते हैं या अटक–अटक कर पढ़ते हैं उन बच्चों की दृष्टि से यह प्रारूप अधिक उपयोगी है क्योंकि यह अपने सहयोगी की सहायता से झिझक दूर करने में सहायक है।

प्रारूप

आयाम	स्वरूप	कैसे/ गतिविधि	समय

- **चित्र, चॉक व चर्चा प्रारूपः** इस प्रारूप में चित्रांकन व सुनने पर अधिक बल दिया जाता है। इसमें छात्र पाठ के प्रारंभिक सत्र में चित्रांकन की गतिविधि प्रारंभ कर देते हैं। यह विधि विज्ञान विषयों के लिये अधिक उपयुक्त है।

प्रारूप

आयाम	स्वरूप	कैसे/ गतिविधि	समय

- **SQ4R प्रारूपः** इस प्रारूप में प्रश्नों द्वारा सीखने पर अधिक बल दिया जाता है। यहाँः S का अर्थ है– सर्वे (Survey): इसके अन्तर्गत प्रायोगिक उपकरण, प्रयोग प्रदर्शन, फील्ड विजिट, मॉडल, चार्ट आदि के साथ निर्धारित पाठ्यांश का सर्वे भी किया जाए। Q से आशय है (Question) प्रश्न करना। R से आशय है– पढ़ना, यहाँ पर 4R दिए गये हैं– जिसमें प्रथम R_1 का अर्थ है– पढ़ना (Reading)। द्वितीय R_2 का अर्थ है–बताना (Recite)। तृतीय R_3 का अर्थ है–समीक्षा (Review) । चतुर्थ R_4 का अर्थ है चिंतन/चर्चा (Reflect)। इस प्रारूप में शिक्षक बच्चों को प्रश्न बनाने के लिये सकारात्मक वातावरण उपलब्ध कराने के साथ–साथ मार्गदर्शन भी देते हैं तथा इस बात पर ध्यान देते हैं कि कोई आवश्यक प्रश्न छूट न जाये।

प्रारूप

आयाम	स्वरूप	कैसे/ गतिविधि	समय

मूल्यांकन

1. विद्यार्थियों को हिन्दी भाषा में विज्ञान विषय पर लेख लिखवाना, जिस पर लेखन का अभ्यास नही कराया गया हो।
2. विज्ञान रचना कौशल का पर्याप्त अभ्यास करवाना, जिस चित्र अथवा मॉडल पर रचना न की गई हो।
3. रचना की गई अथवा लिखे गए विज्ञान लेखन की भाषा, शैली और विषयवस्तु का मूल्यांकन कर पूर्व परीक्षण के निष्कर्षों से तुलना करना।

निष्कर्ष

पूर्व परीक्षण एवं अंतिम मूल्यांकन के आधार पर निष्कर्ष निकलता है कि विद्यार्थियों को पहले मात्राओं, वर्णों एवं चित्रों को पहचानने की समझ विकसित करना, फिर छोटे–छोटे वाक्य स्वयं लिखने व उनको प्रोत्साहित करने से हिन्दी भाषा में विज्ञान लेखन एवं रचना कौशल की क्षमता को विकसित किया जा सकता है।

सुझाव

1. विद्यार्थियों को मात्राओं एवं वर्णों को पहचानने तथा अर्थपूर्ण वाक्य बनाने का पर्याप्त अभ्यास करवाना व स्वयं लिखने के लिए प्रेरित करना चाहिए।
2. विद्यार्थियों द्वारा दैनिक जीवन में देखी गई किसी वस्तु/चित्र/मॉडल आदि पर रचना कौशल का विकास करना एवं चित्रों को देखकर हिन्दी में विज्ञान लेख लिखवाने का पर्याप्त अभ्यास करवाना।
3. विद्यार्थियों को विज्ञान लेखन व रचना का अभ्यास कराने के लिए मुख्यतः स्व–अध्ययन प्रारूप, सह–अध्ययन प्रारूप, चित्र, चॉक व चर्चा प्रारूप एवं SQ4R प्रारूप का उपयोग कक्षा शिक्षण में किया जा सकता है।
4. छात्रों की लेखन व रचना में केवल कमियॉ बताकर ही हतोत्साहित न करें, वरन् उनकी अच्छे लेखन व रचना की सराहना भी करें।
5. विद्यार्थियों द्वारा विज्ञान लेखन व रचना को अधिक अच्छा बनाने के लिए सुझाव देकर सुधार कराएँ।

संदर्भ

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