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S P E NEWS LETTER

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New Year Greetings

The Executive Committee, the Advisory Committee and Editorial Board of SPE NEWS LETTER wish all the Members, Readers, Patrons and well wishers a very Happy New Year.

May god shower thousands blessings on you and your family members in the New Year.

From The Chairman's Desk

By the time you receive this Newsletter, the New Year, 2014 have commenced. I wish that this New Year brings happiness, prosperity, health and peace to the members of SPE(I), Vadodara Chapter, the readers and their family members. May this New Year also see the fast development in power sector in our country.

The recent change in the environment ministry has promised rapid approvals of the projects involving coal and gas due to which many power projects which are stalled, are likely to start operation. This may help the power sector and also reduce the import of coal and gas to some extent. But the issues pertaining to environment will continue to remain major concern to our nation. There has to be a solution to the fast deteriorating condition of environment due to global warming, which mainly lies in fast adoption of renewable power as main resource of the energy.

As a part of our responsibility towards controlling global warming, India has given significant importance to development of renewable energy. Wind power is the most developed sector as a renewable source in India during last decade. Other significant sectors like small hydro, biomass, biofuel, waste to power, waves and tidal, geothermal also have large potential. However solar power is most promising sector and Government has announced very ambitious plan called "Jawaharlal Nehru National Solar Mission-2010" for fast development in this sector. As per mission document, it is planned to install 20 GW of solar power by year 2022. However, experts in this industry foresee much higher capacity, around 75 GW by 2022.

Though costly at present, it is viable solution in long term due to ever increasing cost of fossil fuel. Also improvements in PV solar technologies with higher efficiency and mass production has reduced the cost of generation drastically since last few years and will be in cost parity with fossil fuel soon. It remains a fact that solar power is a clean form of energy. Even if it is apparently expensive, in real terms it is not expensive. If the total energy required to mine, transport, efficiency and ash disposal is taken into account, the solar power may not be much expensive.

Gujarat is leading in the solar power sector and apart from grid connected solar farms; it has undertaken implementation of Roof Top solar systems in few cities. In Gandhinagar, the state has already installed a 5MW system using government offices and residential premises. Similar programmes are also being launched for other cities like Vadodara, Surat, Rajkot, Mehsana and Bhavnagar. The GOG has also planned to install solar panels on the State's Canal System. The land has become very scarce and hence roof tops provide very promising solution for harnessing solar energy that can be connected to local grid. However, the cost of the infrastructure is high and it needs the prices of the solar components to substantially decline to attract the individual families and societies to use the power as consumers.

There is good amount of awareness in rural sector about the solar energy for its use in farming, and irrigation systems, such as tractors, cold storage etc. and also for home lighting which will save millions of litres of diesel saving resulting in to the saving of foreign exchange without affecting the environment.

The solar energy projects are largely subsidized by the government for encouraging faster development. There has to be dedicated focus on the development of this sector from all the governments, researchers, consultants and manufacturers.

I am pleased to state that SPE Vadodara Chapter is contributing its might in spreading the awareness about this technology by organizing seminars and lectures regularly.

I once again wish you Very Happy New Year.

GV Akre
Chairman

Editorial

This time I would like to say something on the topic of 'SPECIFICATIONS'. The word specification means something specific. Whenever you buy anything, specification emerges instantaneously. When we try to understand specification for purchase or services needed by large undertakings and industry, it means a lot. Normally, everyone who is entrusted with the task of preparation of specification tries to refer to the earlier specification prepared by his predecessor or his counterpart in similar organization. The improvement in the specification is done by such person on the strength of his level of understanding the impact of change in technical and or commercial part of the specification. The impact of a change can alter prices, quality or time schedule of procurement or the services included in the specifications.

I, as an employee of GEB/GETCO and now as a Consultant, have observed that there is lot of reluctance to dilution of terms in specification for the fear of substandard material or services or for shirking the responsibility. In large PSUS and public limited companies, the entire tendering process is handled by many departments. The specification is prepared by an indenter. The commercial terms and legal terms are introduced / reviewed by respective department. Each department responsible for his part, many times does not bother about the difficulties which the indenter would face. “No Deviation Permitted” is a standard phrase everywhere. Most of the specifications are one sided. There are clauses like “Any other item specifically not indicated in the specification but required for completion of the project will be deemed to have been included in the total cost”, “Approval of drawings design by the purchaser does not absolve the bidder/contractor from his liabilities for the performance of equipment/services”, “Training inland/overseas will be included”, “The prices shall be firm without any variation” etc. Such clauses are like a marriage party of groom dictating the bride's party ignoring the fact that each party leads the other party.

In addition to above, large number of references to rules, acts and standards, are required to be followed. In most of the cases, the specifications run into volumes and the time to bid is not enough even to completely read the pages.

All the above result in to lot of delay in finalizing the order. The supplier or service provider will definitely like to load the prices for each uncertainty. The finalization of tender may take a very long time but date of completion is fixed. Thus the successful bidder will have to run from pillar to post while chasing the completion schedule.

While we are viewing the problem only from the purchaser's side, there are slip shots. The bidder reviews the specifications but tries to read between the lines of the technical, commercial or legal part of the specification. Unwarranted delay in execution leads path to nowhere. There are bidders who resort to arm twisting during the execution by favorable interpretation of the specified clauses.

The best specification is one which is clear in technical, commercial & legal terms without a bias towards the purchaser. The specification should also spell out the obligations of the purchaser in meeting the time schedule. This may include timely approval of drawings, inspection of material/services and time bound payments of the supply/services by the contractor. The best specification can be prepared if the prospective bidders are involved and their views are taken into account. Pre-bid conference for this purpose avoids delay as well as clarity amongst the bidder. While deciding the qualifying criterion, the aspects of price impact, faithfulness, timely completion of the project and healthy competition should be given due weightage. Normally the statutory approvals for the project are required to be obtained by the purchaser. However, these days many specifications try to transfer the responsibility to the bidder/ contractor. The red tapism escalates the project cost and delays the project. This aspect needs to be addressed. To summaries, it can be stated that a project is a table where the purchaser and the contractor are on the opposite side of each other with a sole aim to complete the work as per schedule. Unilaterally devised specifications disregarding the ground realities of the project work, are bound to harm the project and the country.

'Happy New Year of 2014' to all the readers.

- Er. SM Takalkar

Minutes of National General Body Meeting of SPE(I) on 12 Oct 2013 held at Vadodara

All India (National) General Body Meeting of Society of Power Engineers (India) was held on 12 Oct 2013 at Vadodara. The meeting was presided over by Er. PP Wahi, Treasurer, SPE(I). Other dignitaries who graced the dais were Er. GV Akre, Chairman, Er. SB Lele, Vice-Chairman and Er. VB Harani, Secretary Vadodara Chapter of the Society. 71 members were present.

Er. Vishan Dutt, Sr. Manager, CBIP/SPE(I) welcomed all the participants and read out the agenda items which were taken up for discussion.

The minutes of last AGM already stands circulated and also enclosed with the agenda of the meeting were confirmed unanimously. The secretary's report as well as the audited account circulated in the meeting were also considered as passed.

Thereafter the amendments in the Bye Laws were taken up for discussion.

The existing rules, the amendments as proposed and passed by General Body are given in the table below:

Clause No.	Existing provision	Provision passed by General Body
1.1	Society or SPE means "The Society of Power Engineers (India)".	Society or SPE means "the Head Quarter office or Chapter office of the Society of Power Engineers (India)".
1.2	Committee means "The Executive Committee of the Society elected or constituted under these rules	Committee means "The Executive Committee of HQ or the Chapter elected or constituted under these rules"
2.1.1	An "Honorary Fellow" shall be a person who has distinguished himself as outstanding work in power engineering and who the committee desires to honour for services rendered to the society or whose association therewith is to benefit to the Society.	Add "The person on whom the honorary fellow membership is to be conferred can be an ordinary member or a non-member
2.1.4	Those enrolled as Honorary Fellow shall convey their acceptance to the enrolment within three(3) months from the date of intimation to them, failing which their enrolment shall be deemed to be non-effective and the committee will be entitled to enroll new Honorary Fellows in their place if they so desire. The total number of Honorary Fellow shall not be at any time exceed thirty(30)	The last three lines shall be replaced by the following: The Honorary Fellow membership shall be conferred upon a person who is not less than 40 years of age on the day of receipt of his nomination. The words "Three(3) months" appearing in the fourth line shall stand replaced by the words "one month".
2.3.1	He shall be at least 30years of age on the date of application or 5 years service whichever is advantageous to the applicant.	He shall be at least 26 years of age on the date of application or 5 years service for degree holder and 10 years service for diploma holder (members).
2.4.1	He shall be at least 22 years of age on the date of application.	He shall be at least 16 years of age on the date of application
2.4.4	2.4.3 He shall have at least one year of professional experience. 2.4.4 He shall be engaged at the time of his application in the Power Engineering field	The clause no. 2.4.3 to be deleted
3.4	The committee shall be responsible to direct and manage the property and affairs of the Society for and on behalf of the membership	Correction in the last word in the clause reading "membership" shall be replaced by the word "Members".

Clause No.	Existing provision	Provision passed by General Body
9	Annual General Meeting A notice of the AGM together with the audited statement of accounts shall be circulated to the member's at least 21 days before such meeting. The AGM shall be held within 6 months of the end of financial year of the Society to transact the following business	Revise this para as under: A notice of the AGM together with the audited statement of accounts shall be circulated to the member's at least 14 days before such meeting.
11.1	Voting at any Annual or Extra Ordinary General Meeting shall be restricted to such of the members of the society who have paid all the dues to the society and whose names are in the current list of members. Student members shall not be eligible to vote at the annual and extra ordinary meeting. Votes may be cast either by members present personally or by proxy. Every qualified member shall have the right for 1 vote	To remove the words “either” and “or by proxy” from the clause.
13.2	In the event of a poll being necessary, later than the 25th Dec each year, the Secretary shall circulate to the members entitled to vote, a list of valid nominations received	Delete the word “later than 25th Dec. each year” Add: The nomination should be from Life Member The term for President/Secretary can be for two consecutive terms and after a gap of one year he/she is entitled for contesting election again
Bye Laws		
2.4	Diploma and certificates of membership Subject to such regulations and on payment of such fees as the committee may from time to time decide, the committee may issue to every honorary fellow, fellow, members, associate member and student member a diploma of membership under its seal. Every such diploma or certificate shall remain the property of and shall on demand be returned to the society.	Please delete “student member” from the line no. 10 and please add the following. The student member shall be admitted to the society by the respective chapters and a certificate regarding his membership shall be given by the secretary/chairman/vice-chairman of the chapter.

Table-1 The charter of subscription as decided in the meeting is as follows:

1. INDIVIDUAL MEMBER

Grade	Admission fee in Rs.	Subscription in Rs.
Life Fellow / Fellow	500	5,000
Life Member	200	3,000
Member/Associate Member(Annual)	100	400
Student Member (Annual)	100	200

2. INSTITUTIONAL MEMBER

Grade	Admission fee in Rs.	Subscription in Rs.
Academic Institution	500	5,000 – 2 Member
Organisation(Having employees up to 100)	500	5,000 – 2 Member
Organisation(Having employees more than 100)	1,000	10,000 – 5 Member

The year for annual subscription will be financial year

Clause No. 10.0 of Bye Laws to be revised as follows:

(i) Chairman (ii) Vice-Chairman (iii) Secretary (iv) Joint Secretary (v) Treasurer (vi) 4 other members. The local centre committee may also co-opt various other committee members for diversification of works.

Any increase in members can be done with approval of HQ.

Er. GV Akre while addressing the participants suggested revival of chapters of SPE(I), organization of regional level conferences by SPE(I) and also the organization of event by CBIP in association with SPE(I) and its Chapters. He also suggested using the expertise of Sr. Experts of SPE(I) for training of more people.

Er. PP Wahi appreciated the suggestions made by Er. Akre and assured to consider these for improving the activities of SPE(I).

Er. Wahi informed that there are no activities from Vallabh Vidyanagar chapter opened recently. He requested Vadodara chapter to depute a team to visit Vallabh Vidyanagar chapter and get the latest status and submit its report. The same was agreed.

The meeting was ended with vote of thanks presented by Er. Harani, Secretary, Vadodara chapter.

This was followed by a technical lecture on "New Generation Conductor" delivered by Er. SM Takalkar, founder member of SPE(I) Vadodara Chapter.

The speaker gave details of various types of conductors for transmission and distribution lines which are different from conventional ACSR, AAAC and AA conductors. He gave case studies of up-gradation/ up-rating of existing transmission lines using new generation conductors. The lecture was well received.

CHAPTER'S ACTIVITIES

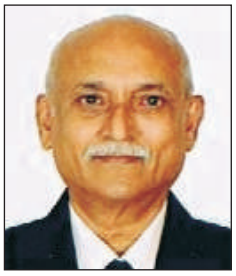
- On 10 Nov 2013 Chapter celebrated Power Day by organizing a lecture on the topic of "Medical Astrology - Heal Yourself, be your own Doctor". The speaker was Dr. Shruti Shah, NDSc. RNP presently working with Mr. Bejan Daruwala, a famous Astrologer for more than 10 years. The speaker gave detailed account of correlation of disease with the Rashi, Nakshatra and how Astrology can help curing the disease. The programme was appreciated by the members who were present and requested to re-arrange this lecture for their spouse even by charging a token fee.
- On 14 Dec 2013, the chapter celebrated Energy Conservation day. Er. SK Nayak of TL & FS Vadodara was invited for a lecture on the topic of "Energy Conservation Opportunity – case studies from Industry".

In the first half of the lecture, the speaker gave detailed account of Energy Audit of Thermal Power Stations. In the second half he elaborated on the energy audit case studies for various industries for the Thermal, Gas and Nuclear Power Stations. He stated that it is possible to get a saving of 6% to 16.8% in auxiliary consumption. The saving would come from CT fans, Boiler Feed Pumps, preventing boiler leakages, monitoring heat rate of turbines, cooling system etc.

In the Industrial Sector he stated to have audited 250 units. The energy saving was brought about by replacement of higher size motors by lower size, improvement in PF and reducing contract demand.

The event was organized at GETRI Auditorium. After the opening remarks by Er. SB Lele, Vice-Chairman, the speaker was introduced by Er. VB Harani, Secretary. Vote of thanks was presented by Er. SM Takalkar.

Members in News



Er. R N Purohit, Life Member and Executive Committee Member of SPE(I) Vadodara Chapter, 39th years after completing BE (Elec.) from Mumbai University the then Bombay University), obtained LLM Degree from MS University with Justice Chaturbhai N Patel Gold Medal in Business Law securing 1st rank with 1st class.

Congratulations to

Er. RN Purohit.

Er. Nikunj A Makwana, Dy. Engr. in SLDC Gotri was deputed by GETCo to Hitach-Japan between 18 Nov 2013 and 06 Dec 2013 for "Advance Training & Technique Introduction of Grid Network Stabilization Solution of Renewable Energy Integration" Er. Nikunj Makwana is a Life Member of the Chapter and son of Er. AN Makwana, Treasurer of the chapter.

Congratulations to

Er. Nikunj A Makwana.

S. Ramanujan and Magic Squares

y: Dr. C. S. Indulkar, Life Member, SPE(I) Vadodara

Abstract

In this article, a biography of the great mathematical genius, S. Ramanujan, and the description of his magic squares of orders 3 x 3 up to 9 x 9 are presented. Finally, as a contribution of this paper, the methods of obtaining the generalized squares of orders 3 x 3 and 4 x 4 are also described.

Srinivasa Ramanujan has been hailed as a mathematical genius and compared to all time great mathematicians, Euler and Gauss, by his friend, philosopher and guide, G H Hardy. In 1940, Hardy gave two lectures at Yale University, which were subsequently published as a book entitled: "Ramanujan: Twelve Lectures inspired by his life and work". Earlier, in 1927, Hardy, along with Dewan Bahadur Ramachandra Rao(an M.A in mathematics, then the Collector of Nellore, stationed at Tirukkoilur) and P V Seshu Iyer, brought out the "Collected papers of Srinivasa Ramanujan", which have been reprinted in 1999, by the American Mathematical Society and London Mathematical Society. This reprinting of the two volumes at the dawn of this century clearly is an indication of the intrinsic worth of the work of Ramanujan in his brief life span of 32 years, 4 months and 4 days, of which he spent five years, 1914-919, at the Trinity College, Cambridge University. Hardy convinced the authorities to award to Ramanujan the BA degree, by research, of the Cambridge University, for his contributions to mathematics, including his longest paper on "Highly Composite Numbers", which Hardy considered was in the "scientific backwaters", of mathematics of the times, but was unique as far as its originality and Ramanujan's creativity in mathematics are concerned. Unfortunately, for about half of the duration of his sojourn in England, Ramanujan was in and out of Sanatoria, and wrongly diagnosed and treated for tuberculosis. In 1919, when Ramanujan was ill, Hardy spoke to Sir Arthur Eddington, who was the Chairman of the Royal Society, London then, to make Ramanujan a Fellow of the Royal Society (FRS), which Hardy felt would act as a stimulus for further research by Ramanujan. When Eddington asked Hardy whether Ramanujan could wait for the FRS to be awarded to him one year later, Hardy told Eddington that Ramanujan may not be at Cambridge since he was contemplating to send him back to India, whose warmer climate, he thought, would restore Ramanujan's health and spirits. So, on February 28, 1919, Ramanujan was elected Fellow of the Royal Society. In India, February 28, is celebrated as "Science Day", due to the discovery and announcement of the Raman Effect by Sir CV Raman on February 28, 1928. It would be fitting if it is also recognised as the day on which Ramanujan became a Fellow of the Royal Society-the first Indian mathematician to become a FRS Professor. GH Hardy sent a telegram to Mr. Dewsbury, Registrar of the Madras University, announcing the award of this distinction, on that day. The cause of the death of Ramanujan was not the then dreaded TB, but hepatic amoebiasis, which was the cause of his illness twice in his younger days, in India. Since TB was diagnosed, in 1919, by doctors in England and in India, after his return, on March 27, 1919, as a celebrity, he got the best medical attention and the full-fledged backing of the University of Madras. Since the treatment was (not for hepatic amoebiasis but) for TB, it led to his premature death, at about 10 am, on April 26, 1920. Ramanujan was born on December 22, 1887, to Komalathammal and K Srinivasa Iyengar, a "gumastha" or clerk to a cloth merchant in Kumbakonam, at his mother's residence in Erode. He passed the Matriculation Examination of the University of Madras, in December 1903.

Ramanujan's mother used to go regularly to the Sarangapani temple to be one of the lead singers in the Bhajans. This is possibly because at the end of the group singing, "Prasaadam" (food offered to the God) would be distributed to all present. Occasionally this was the meal for her first born Ramanujan, since the meager earning of about Rs 25-30 per month, by his father, as a clerk to a cloth merchant, was inadequate to make both ends meet for the growing family of Srinivasa Iyengar and Komalathammal! Ramanujan won prizes in School for proficiency in English and in Mathematics. SL Loney's "Trigonometry" was a prize book for him in his Form IV at School and he mastered this book. He also won prizes in Form II and Form VI. In 1905, Ramanujan joined the Government Arts College's Intermediate class in his first year. However, after a few months, he stopped going to the college, probably because he found the classes uninteresting. His own productive period in mathematics also started with his jotting down of mathematical results in his Notebooks, during those 5 years between 1905 and 1909, when there is scant amount of information about his activities. It is known that he even went to Visakhapatnam, perhaps in search of tuitions to eke out a livelihood, for a brief period without informing his family. As Ramanujan was in Triplicane, he was close to the Parthasarathy Temple, which he frequented and more importantly, was where he came into contact with S Narayana Iyer, MA (Mathematics), Manager of Madras Port Trust, whose residence was close to Ramanujan's. In fact, it was Narayana Iyer who discovered the talent in Ramanujan and brought him into contact with the right people at the right time. He was a pillar of strength for Ramanujan, not only throughout Ramanujan's lifetime but also even after his death. Narayana Iyer and his wife helped Janaki Ramanujan, Ramanujan's wife, in every possible way. From the 75th Birth Anniversary of Ramanujan, in 1962, when the Government of India issued a stamp to mark the occasion, Janaki started getting recognition as the wife of the mathematician who impressed everyone with whom he came into contact with, be it Narayana Iyer, Ramaswamy Iyer, Ramachandra Rao, Seshu Iyer, Sir Francis Spring, GT Walker, EH Neville, or GH Hardy. It is the orchestrated efforts of these great human beings, which were responsible for Ramanujan getting all the recognition which he richly deserved - the financial support required for his visit to and stay in England, the BA Degree of the Cambridge University, the Fellowship of the Royal Society, the Trinity

College Fellowship, and for tirelessly disseminating his name, fame and achievements, to all concerned. Ramanujan, who failed in his FA degree examinations of the University of Madras in 1905 and, again in 1907, became the first Indian mathematician to be awarded the FRS. He was at Cambridge for 5 years, before he returned to India, "only to die", as Janakiammal regretted soon after Ramanujan died on April 26, 1920. Janaki Ramanujan lived for ~74 years after the death of Ramanujan, till she passed away, on April 13, 1994.Ramanujan published 39 papers in all, of which 5 were in collaboration with Hardy. Janaki was chosen as a wife for Ramanujan, by his mother on a visit to Rajendram, Komalthammal arranged the marriage of her 22-year-old son with the 9-year-old girl herself. Janaki went through several travails but learnt suturing. With her pension earnings-from the Port Trust, Madras University and the Hinduja Foundation - she survived without her husband, who died in 1920, for 74 years. From around 1955, she fostered a young boy W Narayanan and supported him for his collegiate studies, got him a job with the State Bank of India, and conducted his marriage to Vaidehi (also a bank employee) and was a guiding spirit for them. She also fully supported her nephew, T Ramaswamy, for his collegiate studies and for his employment. She spent a large part of her later life as a philanthropist, with W. Narayanan at Hanumantharayan Koil Street, Triplicane.

Magic squares

A magic square is an arrangement of numbers (usually integers) in a square grid, where the numbers in each row, and in each column, and the numbers in the forward and backward main diagonals, all add up to the same number. A magic square has the same number of rows as it has columns; "n" stands for the number of rows (and columns) it has. A magic square always contains n2 numbers. It is possible to construct a normal magic square of any size except 2 x 2. The sum of every row, column and diagonal is called the magic constant or magic sum, M, which is calculated from:

$$M = n(n^2+1)/2$$

Here n is the order of the magic square. For normal magic squares of order n = 3, 4, 5, 6, 7, and 8, the magic constants are, respectively: 15, 34, 65, 111, 175, and 260.

The smallest magic square of order 3, with a magic constant, M of 15, is shown in Fig.1.

2	7	6
9	5	1
4	3	8

Fig.1 Smallest magic square, M=15.

History

Magic squares were known to Chinese mathematicians as early as 650 BCE, and to Arab mathematicians possibly as early as the 7th century CE. The first magic squares of order 5 and 6 appear in an encyclopedia from Baghdad circa 983 CE; simpler magic squares were known to several earlier Arab mathematicians. Some of these squares were later used in conjunction with magic letters, to assist Arab illusionists and magicians.

Chinese literature dating from as early as 650 BCE tells the legend of Lo Shu or "scroll of the river Lo". According to the legend, there was at one time in ancient China a huge flood. While the great king Yu was trying to channel the water

out to sea, a turtle emerged from it with a curious pattern on its shell: a 3x3 grid, shown in Fig.2 , in which circular dots of numbers were arranged, such that the sum of the numbers in each row, column and diagonal was 15, which is also the number of days in each of the 24 cycles of the Chinese solar year.

4	9	2
3	5	7
8	1	6

Fig.2 Lo Shu square, M=15.

According to the legend, thereafter people were able to use this pattern in a certain way to control the river and protect themselves from floods. Fig.2 and Fig.1 are identical magic squares except that the top to bottom rows of Fig.1 appear as right to left columns in Fig.2. The Lo Shu Square, as the magic square on the turtle shell is called, is the unique normal magic square of order three in which 1 is at the bottom and 2 is in the upper right corner. Every normal magic square of order three is obtained from the Lo Shu square by rotation or reflection. The Lo Shu Square is also referred to as the Magic Square of Saturn.

The 3x3 magic square has been a part of rituals in India since Vedic times, and still is today. The Ganesh yantra is a 3x3 magic

square. The Kubera-Kolam, a magic square of order three, is commonly painted on floors in India, Fig.3. It is essentially the same as the Lo Shu Square, but with 19 added to each number, giving a magic constant of 72.

23	28	21
22	24	26
27	20	25

Fig.3 Kubera-Kolam Magic square with modified Magic constant, M=72.

There is a well-known 10th-century 4x4 magic square on display in the Parshvanath Jain temple in Khajuraho, India, Fig.4.

7	12	1	14
2	13	8	11
16	3	10	5
9	6	15	4

Fig.4 Magic square displayed in Parshvanath Jain Temple (Khajuraho), M=34.

This is known as the Chautisa Yantra. Each row, column, and diagonal, as well as each 2x2 sub-square, the corners of each 3x3 and 4x4 square, the two sets of four symmetrical numbers (1+11+16+6 and 2+12+15+5), and the sum of the middle two entries of the two outer columns and rows (12+1+6+15 and 2+16+11+5), sums to 34.

In this square, every second diagonal number adds to 17. In addition to squares, there are eight trapeziums - two in one direction, and the others at a rotation of 900, such as (12, 1, 16, 5) and (13, 8, 9, 4). And in addition to trapeziums, four triangles are also present, where three numbers connect to a corner - for example, the numbers 2, 3, 15 connect to 14 form a triangle. This triangle can also be rotated 900.

Magic squares of order 3 through 9, assigned to the seven planets, shown in Fig.5 , and described as means to attract the influence of planets and their angels (or demons) during magical practices, can be found in several manuscripts all around Europe starting since the 15th century.

Saturn, M=15		
4	9	2
3	5	7
8	1	6

Jupiter, M=34			
4	14	15	1
9	7	6	12
5	11	10	8
4	14	15	1

Mars, M=65				
11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

Sol = 111					
6	32	3	34	35	1
7	11	27	28	8	30
19	14	16	15	23	24
18	20	22	21	17	13
25	29	10	9	26	12
36	5	33	4	2	31

Venus, M = 175						
22	47	16	41	10	35	4
5	23	48	17	42	11	29
30	6	24	49	18	36	12
13	31	7	25	43	19	37
38	14	32	1	26	44	20
21	39	8	33	2	27	45
46	15	40	9	34	3	28

Mercury, M=260							
8	58	59	5	4	62	63	1
49	15	14	42	53	11	10	56
41	23	22	44	45	19	18	48
32	34	35	29	28	38	39	25
40	26	27	37	36	30	31	33
17	47	46	20	21	43	42	24
9	55	54	12	13	51	50	16
64	2	3	61	60	6	7	27

Luna, M=369								
37	78	70	21	29	62	13	54	5
6	38	30	71	79	22	63	14	46
47	7	80	31	39	72	23	55	15
16	48	40	81	8	32	64	24	56
57	17	9	41	49	73	33	65	25
26	58	50	1	18	42	74	34	66
67	27	10	51	59	2	43	75	35
36	68	60	11	19	52	3	44	76
77	28	20	61	69	12	53	4	44

Fig.5 Magic squares assigned to the seven Planets

The magical operations involve engraving the appropriate square on a plate made with the metal assigned to the corresponding planet, as well as performing a variety of rituals. For instance, the 3x3 square that belongs to Saturn has to be inscribed on a lead plate.

3x3 Magic square

The generalized squares of any order can be formed if the first row of the square is assumed to be known. For example, the 3x3 magic square can be formed as shown inFig.6 if the values in the first row of Fig.6 are known.

Generalized Squares:

a	b+	c
c+3	b-2	a-1
a+2	b-4	c+2

Fig.6. Generalised 3x3 magic square, M = a + b +c

Fig.6. Generalised 3x3 magic square, M = a + b +c

2	7	6
9	5	1
4	3	8

Fig.7. 3x3 Magic square, M =15

Additive magic square

An additive magic square can be formed if the values in all the rows are increased by an amount v. Thus, if v=1, the additive magic square of Fig.7 would be as shown in Fig.8, and its M value would be M new =M+3v=18.

3	8	7
10	6	2
5	4	9

Fig.8. Additive 3x3 Magic square, M_{new} =18

Note that the Fig 7 magic square is formed of successive numbers 1 to 9, and that the Fig. 8 magic square is formed of successive numbers 2 to 10. Similarly, another magic square could be formed of numbers 3 to 11, and its M value would be M new = 21.

A multiplicative magic square is formed by multiplying each value in the three rows of Fig.7 by x.

If x=2, the multiplicative magic square would be as shown in Fig.9, its M value being M new = 2. M=30.

Multiplicative magic square

4	14	12
18	10	2
8	6	16

Fig.9. Multiplicative 3x3 Magic square, M new = 30

4x4 Magic Square

S. Ramanujan's 4x4 magic square, with magic sum, M= 139, which refers to Ramanujan's birth date (22 December 1887), is given below in Fig. 10.

S. Ramanujan's Birth Date, M=139			
22	12	18	87
66	50	19	4
41	23	47	28
10	54	55	20

Fig. 10.

Now, we describe how the magic square pertaining to anybody's birth-date can be constructed.

Let the birth-date be 12 Nov.1932, the magic square for this birth-date can be obtained from the generalized square, shown in Fig.11.

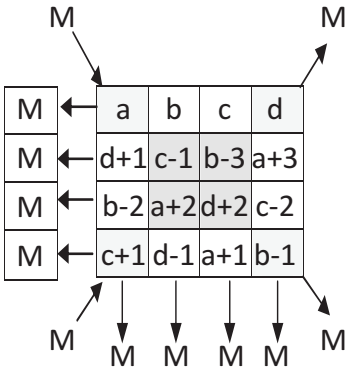


Fig.11. Generalised 4x4 Magic Square

For birth-date, 12 Nov.1934, selecting a=12, b=11, c =19, d =34, we get the corresponding magic square, shown in Fig.12. For this magic square, M=76

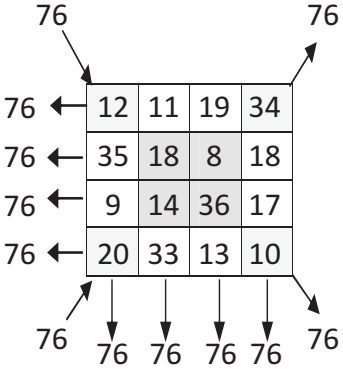


Fig. 12 Magic square 76 for date of birth, 12 Nov.1932

In the 4x4 generalized square, for any values of a, b, c, d, M gives the sum of numbers of any row = sum of numbers of any column = sum of numbers of any diagonal = sum of corner numbers of the magic square = sum of 2x2 central square numbers = sum of each 2x2 corner square numbers.

An infinite number of generalized magic squares, similar to the one shown in Fig. 12, can be constructed for arbitrary initial values of a, b, c, d in the first row, and different values (dependent on a, b, c, d) in the cells of remaining three rows.

Using Fig.11, Fig.13 shows the magic square with M=10, when a=1, b=2, c=3 and d=4 respectively.

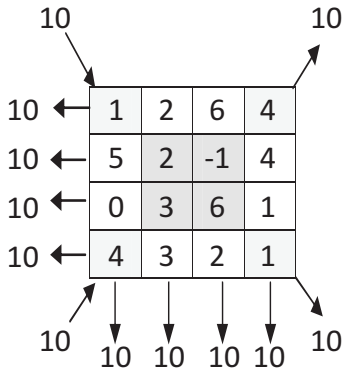


Fig.13. 4x4 Magic square, M=10 for a=1, b=2, c=3, d=4.

A summative 4x4 magic square and a 4x4 multiplicative magic square are shown in Figs.14 and 15 respectively

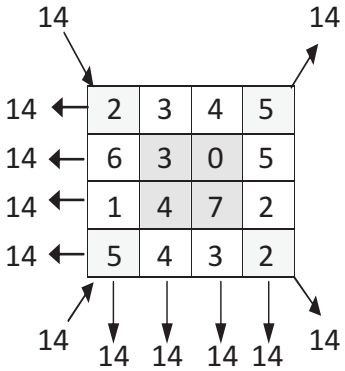


Fig.14. Summative 4x4 Magic square, with M=14 for a=2, b=3, c=4, d=5.

2	4	6	8
10	4	-2	8
0	6	12	2
8	6	4	2

Fig.15. Multiplicative 4x4 Magic square, with M=20 for a=2, b=4, c=6, d=8.

Conclusions

A brief biography of Ramanujan and a brief history of his magic squares are presented in this article. Further, we have described the method of constructing 4x4 magic squares pertaining to anyone's date of birth. We have also presented the methods of constructing summative and multiplicative 3x3 and 4x4 magic squares and determining their magic constants. The methods can be easily extended to higher order magic squares. An infinite number of generalized magic squares, similar to the one shown in Fig. 12, can be constructed for arbitrary initial values of a, b, c, d in the first row, and different values (dependent on a, b, c, d) in the cells of remaining three rows.

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1	2	3	4
5	2	-1	4
0	3	6	1
4	3	2	1

METHODS OF POWER SWING DETECTION AND PREVENTION

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Abstract: This paper discusses the methods of power swing detection and prevention.

1. Introduction

Power systems under steady-state conditions operate typically close to their normal frequency. A balance between generated and consumed power exists during steady-state operating conditions. Power system faults, line switching, generator disconnection and the loss or application of large blocks of load result in sudden changes to electrical power, where as the mechanical power input to generators remains relatively constant. These system disturbances cause oscillations in machine rotor angles and can result in severe power flow swings. Depending on the severity of the disturbances and the actions of the power system controls, the system may remain stable and return to a new equilibrium state experiencing a recoverable power swing. Severe system disturbances, on the other hand, could cause large separation of generator rotor angles, large swings of power flows, large fluctuations of voltages and currents, and eventual loss of synchronism between groups of generators or between neighbouring utility systems. Large power swings, stable or unstable, can cause unwanted relay operation at different network locations, which can aggravate further the power system disturbance and possibly lead to cascading outages and power blackouts. Transient Stability studies are aimed to determine if the system will remain in synchronism following major disturbances. There is an increase of awareness to the impacts to the power system brought by power swing and out-of-step (OOS) phenomena, and the complexities involved in applying power swing blocking (PSB) and out-of-step tripping (OST) protection. [2]

Conventional PSB and OST functions may use dual-quadrilateral characteristics that are based on the measurement of the time interval it takes the positive sequence impedance to cross the two blinders. An extensive number of power system stability studies may be required, taking into consideration different operating conditions, in order to determine the settings for the dual-quadrilateral PSB and OST functions. This is a costly exercise, and not certain that all the possible scenarios and operating conditions were considered. The swing centre voltage (SCV) method calculates the positive sequence SCV rate of change and does not require any stability studies or user settings for the proper blocking of relay elements. This method is well suited for long, heavily loaded transmission lines that pose significant problems for traditional power swing detection methods. [3]

2. Transient Stability Concepts Review

Transient stability concept will be reviewed with a simple lossless transmission line connecting two sources corresponding to a generator at a location S and equivalent network at a location R. It is well known that the active power, P, transferred from generator into the network can be expressed as:

$$P = \frac{Vs \times Vr}{X} \sin \partial$$

Where Vs is the sending-end source voltage magnitude, Vr is the receiving-end source voltage magnitude, δ is the angle difference between the two sources, and X is the total reactance of the transmission line that connects the two sources.

With fixed Vs, Vr and X values, the relationship between P and δ can be described in a power angle curve as shown in fig 1:

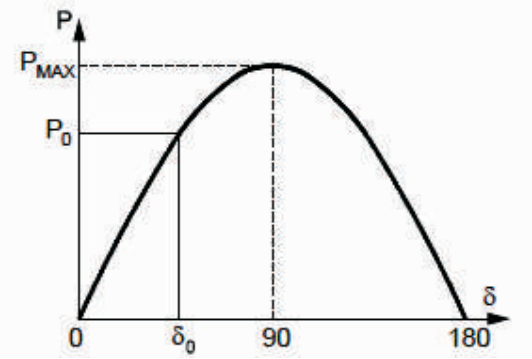


Figure 1: Power Angle Curve

Starting from δ = 0, the power transferred increases as δ increases. The power transferred reaches the maximum value P_{MAX}, when δ is 90^0. After that point, further increase in δ will result in a decrease of power transfer.

During normal conditions, the output of electric power from the generator produces an electric torque that balances the mechanical torque applied to the generator rotor shaft. The rotor therefore runs at a constant speed with this balance of electric and mechanical torques. When a fault occurs, the amount of power transferred is reduced and so the electric torque that counters the mechanical torque. If the mechanical power is not reduce during the period of the fault, the generator will accelerate proportionally to the net surplus of

torque input. To better explain the physical behaviour of a power system under faults or disturbances, consider the simple two line system of fig 2.

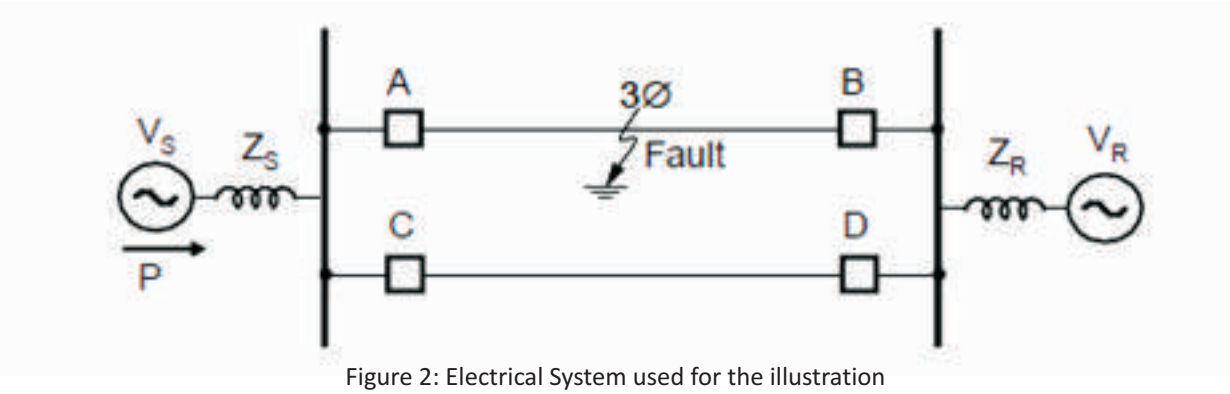


Figure 2: Electrical System used for the illustration

If a three phase fault occurs at the upper line, the power output is reduce from point D to E, the rotor therefore accelerates and the surplus power starts increasing the angular displacement along the new power transfer curve to point F as indicated in fig 3.

When breaker A opens the power transfer function increases to point G. The rate of angular displacement is reduced but still increasing to point H when Breaker B opens in Zone 2. The fault is then cleared, the power output goes to point J and a decelerating torque appears on the rotor because the electric power output at J is larger than the mechanical power input Po. However, because of the inertia of the rotor, the angle does not go back immediately. Rather, the system then swings along the new power transfer function that is lower than the original because one line is now out, and reaches point K when the decelerating energy of Area II equals the accelerating energy of Area I. This is the so-called equal-area criterion.

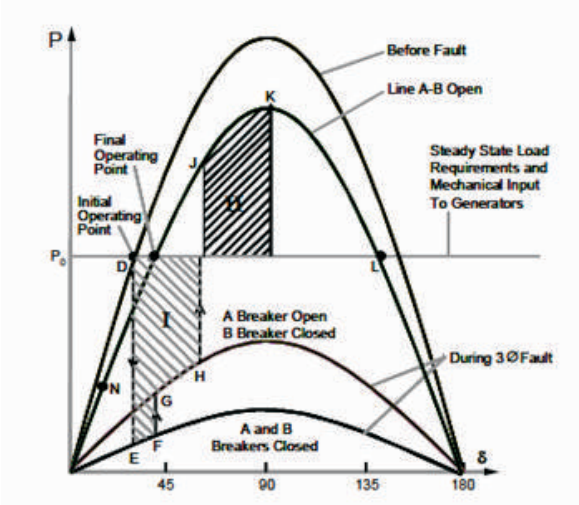


Figure 3: Transient Stable Condition

With sufficient damping, the angle difference of the two sources eventually goes back to a balance point. There is a critical angle for clearing the fault in order to satisfy the requirements of the equal area criterion mentioned above. If area II is smaller than area I at the critical angle, then further increase in angle δ will result in an electric power output that is smaller than the mechanical power input. Therefore, the rotor will accelerate again and δ will increase beyond recovery. When an unstable condition exists in the power system, one equivalent generator rotates at a speed that is different from the other equivalent generator or the system. Such a condition is referred to as a loss of synchronism or an out-of-step condition of the power system.

If such a loss of synchronism occurs, it is imperative that the generator or system areas operating asynchronously be separated immediately using OST defined as 78. [1]

3. Power Swing Phenomena

Power swings are variations in power flow that occur when the internal voltages of generators at different locations of the power system slip relative to each other. Power oscillations are inherent to occur in power system. They usually arise as a consequence of an event, for example line switching, short

circuit faults, generators tripping or severe load drop. During normal operation the magnitude of the oscillations are usually small and are quickly damped out. However, during abnormal operation the oscillation can be more severe and in some cases even have an increasing magnitude that alerts the mechanical equilibrium of one or more machines. A power swing is recovered when, following a disturbance, the rotation speed of all machines returns to synchronous speed. A power swing is nonrecoverable when, following a disturbance, one or more machines do not return to synchronous speed, thereby loosing synchronism with the rest of the system.

4. Blinder-Based PSB Schemes

Conventional PSB schemes are based mostly on measuring the positive sequence impedance at a relay location. During system normal operating conditions, the measured impedance is the load impedance, and its locus is away from the distance relay protection characteristics. When a fault occurs, the measured impedance moves immediately from the load impedance location to the location that represents the fault on the impedance plane. During a system fault, the rate of impedance change is very fast. During a system swing, the measured impedance moves slowly on the impedance plane. Power swings can cause the impedance presented to the distance relay to fall within its operating characteristics, away from the pre-existing steady-state load condition, and cause an undesired tripping of a transmission line.

The main function of the power swing blocking (PSB) function available in relays is to differentiate between fault and power swings, and block distance relay elements from operating during a power swing. However, faults that occur during a power swing must be detected and cleared with a high degree of selectivity and dependability.

The difference in rate of change of the impedance vector has been used to detect a power swing and block the operation of distance protection element before the impedance enters the protective relay operating characteristics. This detection method is based on the fact that it takes a certain time for the rotor angle to advance because of system inertias. In other words, the rate of change of impedance vector is slow during power swings, because it takes a finite time for the generator rotors to change position with respect to each other because of their large inertias. On the contrary, the rate of change of the impedance vector is very fast during a system fault. [4]

PSB schemes, normally available in the distance protection relays, use the difference between impedance rate of change during a fault and during a power swing to differentiate between a fault and a swing. For the purpose, two concentric impedance characteristics, separated by impedance ΔZ, are placed on the impedance plane and a timer is used to time the duration of impedance locus as it travels between them. If the measured impedance crosses the concentric characteristics before the time expires, it is considered by the relay as a system fault. Otherwise, the relay classifies the event as a power swing. Over the time, the impedance characteristics designed for power swing detection are as shown in fig 4.

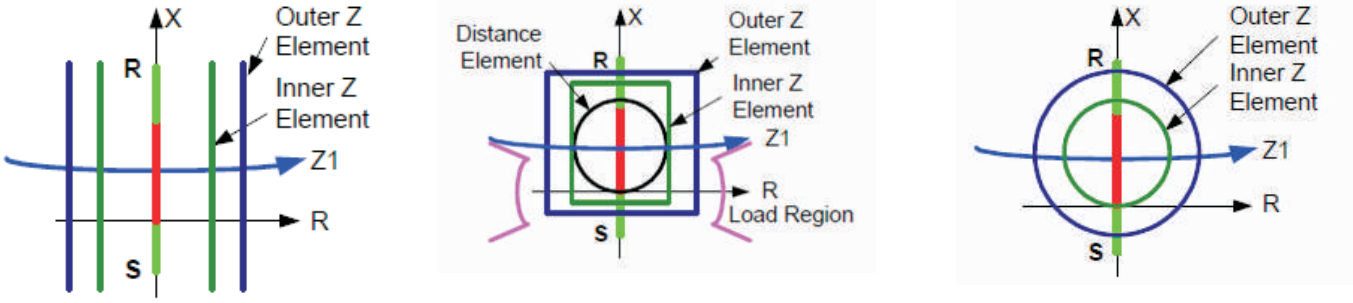


Figure (a): Double Blinders

Figure (b): Polygons

Figure (c): Concentric Circles

Figure 4: Conventional Blinder Schemes for Power Swing Detection

There are number of issues with regards to properly applying and setting the blinder based PSB relaying function.

- The PSB inner impedance element must be placed outside the largest distance protection characteristic to be blocked.
- The PSB outer impedance element must be placed away from the load region to prevent PSB logic operation caused by heavy loads.

These relationships among the impedance measurements elements are shown in Fig 4(b), in which concentric polygons are used as PSB detection elements.

The above requirements are difficult to achieve in some applications, depending on the relative line- and source-impedance magnitudes. Figure 5 shows a simplified representation of one line interconnecting two generating sources in a complex plane. A swing locus is bisecting the total impedance.

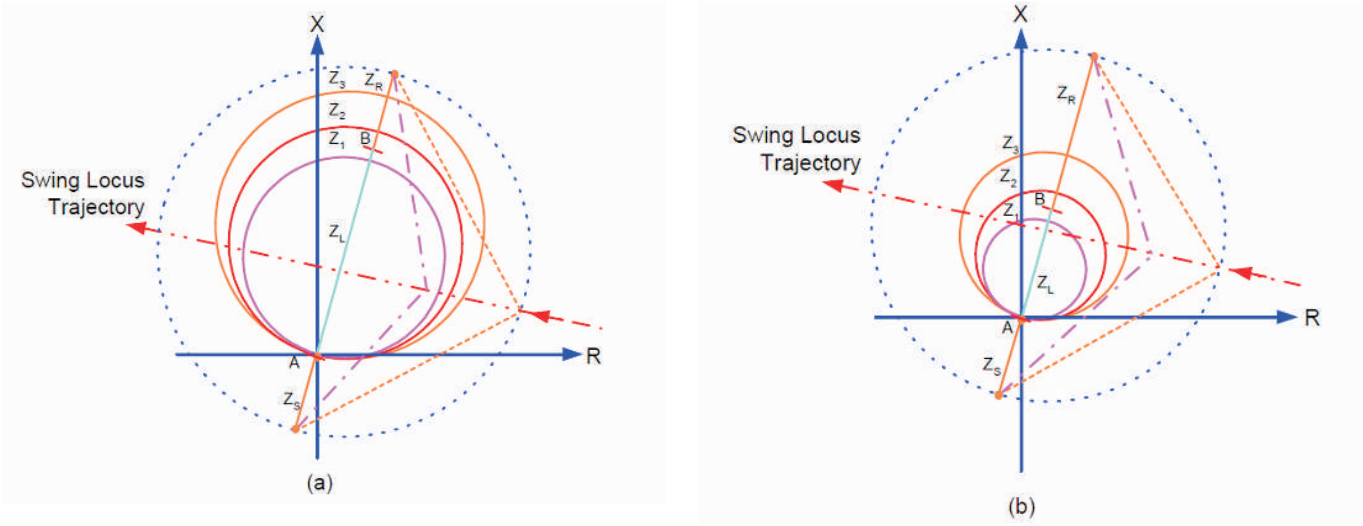


Figure 5: Effects of Source and Line Impedance on the PSB Function

Figure 5(a) depicts a system in which line impedance is large compared to system impedances, and Figure 5(b) depicts a system in which line impedance is smaller than the system impedances.

It is observed from fig 5(a) that swing locus could enter the relay characteristics, to be blocked on power swing, before the phase angle difference of the source voltages reaches 120 degrees, i.e. even during a recoverable power swing. It becomes difficult to set the inner and outer PSB impedance elements in this case. Especially when line is heavily loaded, the necessary PSB settings are so large that the load impedance could establish incorrect blocking. To avoid incorrect blocking resulting from the load, lenticular distance relay characteristic, or blinders that restrict the tripping area of the mho elements are being applied. On the other hand, the system in Fig 5(b) becomes unstable before the swing locus enters the Z2 and Z1 relay characteristics. Here, it is relatively easy to set the inner and outer PSB impedance elements.

The separation between PSB impedance elements and the timer setting that used to differentiate a fault from a power swing are also not trivial to calculate. Depending on the system conditions, it may be necessary to run extensive stability studies to determine the fastest power swing and proper PSB impedance element settings. The rate of slip between two systems is a function of the accelerating torque and system inertias. In general, the relay cannot determine the slip analytically because of the complexity of the power system. However, by performing stability studies and analyzing the angular excursions of system as a function of time, one can estimate an average slip in degrees/s or cycles/s. This approach may be appropriate for systems whose slip frequency does not change considerably.

For setting a polygon characteristic, guidelines in general are outlined as follows:

i. Set the outer characteristic resistive blinders inside the maximum possible load with some safety margin.

ii. Set the inner resistive blinders outside the most overreaching protection zone that is to be blocked when a swing condition occurs. Normally, the distance elements that issue a trip without a time delay are blocked. These elements include the Zone 1 instantaneous tripping element and the Zone 2 element that is used in a communications-assisted tripping scheme.

Based on the outer and inner blinders set in the previous steps, the PSB timer value can be calculated from the following equation where,Ang6R and Ang5R are machine angles at the outer and inner blinders reaches, respectively,as shown in fig 6.

$$\text{Timer Value} = \frac{(\text{Ang5R} - \text{Ang6R}).\,\text{Fnom(Hz)}}{360.\,\text{Fslip(Hz)}}\,(\text{Cycle})$$

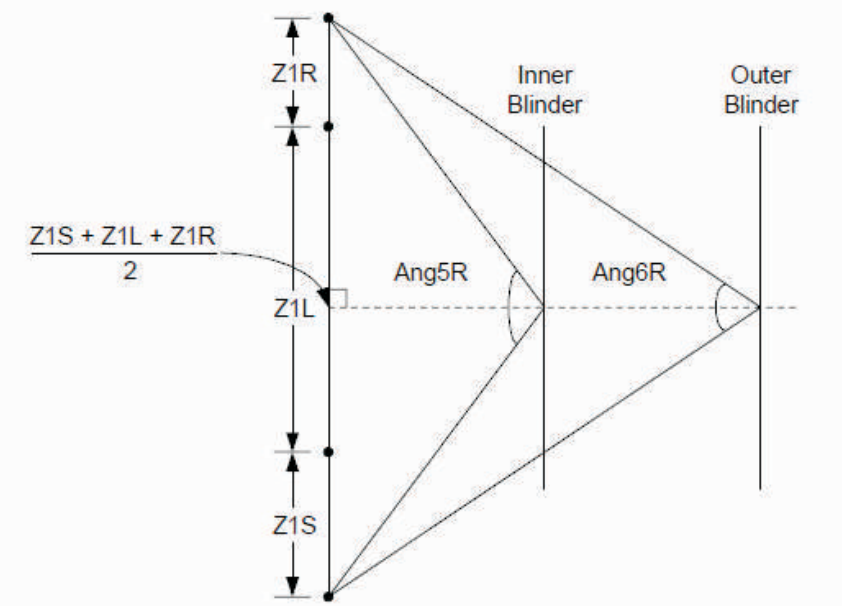


Figure 6: Equivalent Two-Source Machine Angles during OOS

Where the information required is, Z1S-Local Source Impedance, Z1L-Line Impedance, Z1R-Remote Source Impedance and Fslip-Maximum Slip Frequency assumed (Typically 4 to 7 Hz).

In a complex power system, to obtain the power source impedance values is difficult, as it varies constantly as the network changes. The source impedance could also change drastically during a major disturbance and at a time when the PSB is called upon to take the proper actions. Normally, very detailed system stability studies are necessary to consider all contingency conditions in determining the most suitable source impedance to set the conventional PSB function.

For a long line with heavy loads, the load region is closed to the distance element that needs to be blocked during power swing condition. In this condition, the spacing between the inner and outer blinders may be small enough to cause a significant timing error for a power swing. [4]

Fortunately, most numerical distance relays allows some form of programming capability to address these special cases. However, to set the relay correctly, stability studies are required; a simple impedance based solution is not possible.

5. Swing-Center-Voltage

Swing Center Voltage (SCV) is defined as the voltage at the location of a two-source equivalent system where the voltage value is zero when the angles between two sources are 180 degrees apart. Fig 7 illustrates the voltage phasor diagram of a general two source system.

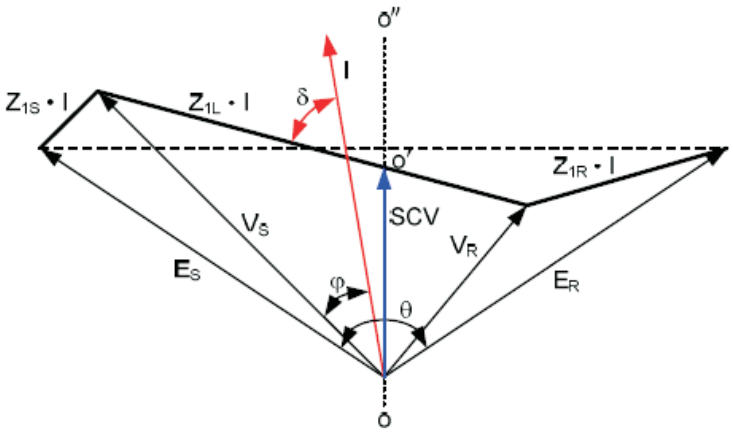


Figure 7: Voltage Phasor Diagram of the two source system

SCV is shown as the phasor from origin o to the point o'. In OOS condition after some disturbance, the angle difference of the two sources, Δ(t), will increase as a function of time. SCV can be represented as equation (1). Assuming an equal source magnitude, SCV can be represented as,

$$SCV(t) = \sqrt{2}.E\sin\left(\omega t + \frac{\theta(t)}{2}\right).\cos\left(\frac{\theta(t)}{2}\right) \qquad (1)$$

SCV(t) is the instantaneous SCV. Equation (1) is a typical amplitude-modulated sinusoidal waveform. SCV with an average frequency of 50 Hz and a constant slip frequency of 5 Hz is shown in fig 8. In the case of OOS situation, frequency of a sinusoidal input is different from that assumed in its phasor calculation resulting in oscillations in phasor magnitude. However, the amplitude calculation in fig 8 is smooth because the positive sequence quantity effectively averages out the amplitude oscillations of individual phases.

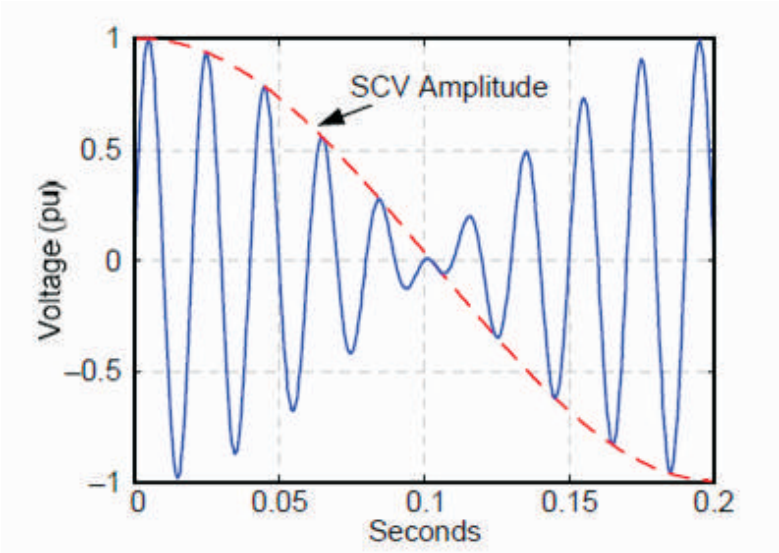


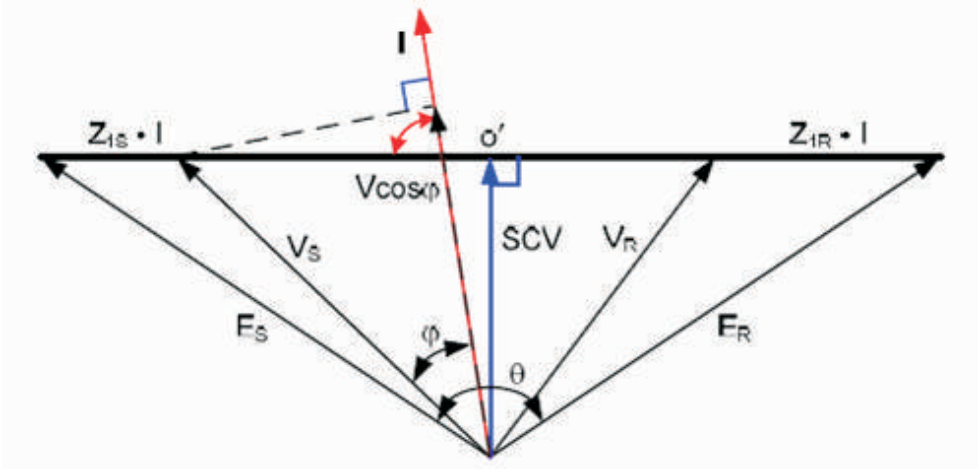
Figure 8: SCV during an OOS condition

The magnitude of the SCV changes between 0 and 1 per unit of system nominal voltage. With a slip frequency of 5 Hz, the voltage magnitude is forced to zero every 0.2 seconds. Under normal conditions the magnitude of the SCV remains constant.

One popular approximation of the SCV obtained through the use of locally available quantities is,

$$SCV \approx |Vs|.\cos\omega \qquad (2)$$

Where, |Vs| is magnitude of locally measured voltage and ω is the angle difference between Vs and local current as shown in fig 9.



igure 9: Vcosω is a projection of local voltage Vs, on local current I

In fig 9, we can see that VcosΔis a projection of Vs, on to the axis of I. For a homogeneous system with the system impedance angles close to 90 degrees, VcosΔ approximates well the magnitude of the SCV. For the purpose of power swing detection, it is the rate of change of the SCV that provided the main information of the system swings. Therefore, some difference in magnitude between the system SCV and its local estimate has little impact in detecting power swings.

Using (1) and keeping in mind the approximation in (2), the relation between the SCV and phase angle difference, Δ, of two source voltage phasors can be simplified as,

$$SCV1 = E1.\cos\left(\frac{\theta}{2}\right) \qquad (3)$$

In (3), E1 is the positive sequence magnitude of the source voltage, Es, as shown in fig 9. SCV1 is used in power swing detection for the benefit of its smooth amplitude during a power swing on the system. The magnitude of the SCV is at its maximum when the angular difference between the two sources is zero. Conversely, it is at its minimum (or zero) when the angular difference between two source is 180 degrees. With this property, the power swing can be detected by calculating the rate of change of the SCV. The time derivative of the SCV1 is given by (4).

$$\frac{d(SCV1)}{dt} = -\frac{E1}{2}\sin\left(\frac{\theta}{2}\right)\frac{d\theta}{dt} \qquad (4)$$

Equation (4) provides the relation between the rate of change of the SCV and the two machine system slip frequency, dΔ/dt. Note that the derivative of the SCV voltage is independent from the network impedances. In fig 10, SCV1 and rate of change of SCV1 are plotted, assuming a constant slip frequency of 1 radian/s.

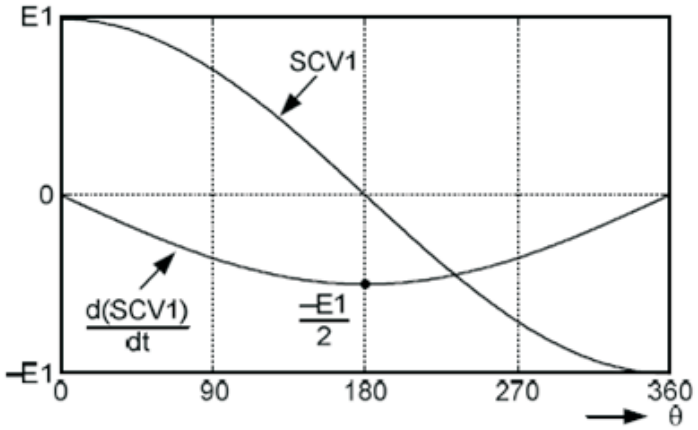


Figure 10: SCV1 and its rate of change with unity source voltage magnitudes

When the angle of the two machines is zero, the rate of change of SCV is also zero. The maximum value of the derivative of the SCV occurs when Δis 180 degrees. [3]

The following two differences between the system swing center voltage and its local estimate are required to be noted:

1. When there is no load flowing on a transmission line, the current from a line terminal is basically the line-charging current that leads the local terminal voltage by about 90 degrees. In this case, the local estimate of the SCV is close to zero and does not represent the true system swing center voltage.
2. The local estimate of the SCV has a sign change in its value when the difference angle, Δ, of two equivalent sources goes through zero degrees. This sign change results from the reversal of the line current (i.e. Δ changes 180 degrees when Δ goes through the 0-degree point). The system SCV does not have this discontinuity. [4]

Conclusion

1. The contents of two methods of power swing detection discussed above are mainly the glimpses from the different topics from the references below.
2. Conventional PSB functions are based on blinder schemes.
3. Extensive system stability studies and detailed source information viz. Local Source Impedance, Line Impedance, Remote Source Impedance and Maximum Slip Frequency are necessary in setting this function based on blinder schemes.
4. In modern complex interconnected systems, it is difficult to get equivalent source impedance. The source impedance is also constantly changing because of addition of new generation or up gradation of the existing generating units.
5. Assumptions are required to be made about the worst-case power swing slip rate, unless historical or other data are available.
6. The second method is based on the SCV and is not dependent on any system source impedance or line impedance.
7. This method does not require any system studies to be conducted and, as such, does not required any user-defined settings.
8. The quantity of VcosΔ, a local estimate of SCV, was first introduced by Ilar in Brown Boveri Publication, 1997 [8]. The quantity was used by Schweitzer Engineering Laboratories engineers to find out an alternate solution to the Double-Blinder Power Swing Detection Characteristic [3, 4].

Energy Meter

- By Er. N. D. Makwana

Energy meters are meant to record electrical energy generated, transmitted or utilized at a point. It is the base for financial transaction for energy exchange between Generation, Transmission and Distribution Utilities as well as between Distribution utility and the consumer. Hence its performance, consistency and credibility are equally important.

Earlier electromagnetic type energy meters were used. It had moving mechanism and hence there were problems for accuracy (slow/fast), non working (stop) or undue running (creep) etc. Even after testing, adjustment and calibration at the laboratory, the meter were found to be defective at site due to disturbance during handling, i.e. transport, installation, ageing etc.

Electronic energy meter are solid state having no moving mechanism and hence performance is far better. Electromagnetic energy meters are now obsolete and are being replaced with electronic meters. Now all the new installations have provision of electronic meters.

In case of electronic energy meter, it is feasible as well simple to derive various electric parameters like Watt, VAR, VA, Frequency, Voltage, Current and its derivative like maximum, minimum, average over specified interval, cumulative entity like KWh, KVARh, KVAh from basic input of voltage and currents. Therefore, energy meters now available in the market and used by most of utilities, have many parameters available and are displayed in cyclic mode. It seems to be favorable as all parameters are available at no extra cost.

Electronic meters are the best. But best can be made better than best. Following points need review from point of view of ultimate users i.e. technicians, meter readers and consumers. Most of the users take it for granted that available version is the optimum and there is no scope for improvement.

I had interaction with real users i.e. field staff and consumers. Amongst the other issues, energy meter related points were analyzed and few suggestions as under are laid down for up gradation of meters to make it more versatile.

LED display is preferable being self illuminated. However generally it is not adopted due to the issue of power and life of it. Alternatively the LCD display may have modifications as under.

Now display has green lighting that can be white, because reading may be easy due to better contrast with white light on black letters as compared to green light. At present light source is on one side and at a very low angle. Hence light intensity on display is poor. Lighting from front may not be practical due to space constraint but proper reflecting surface can be provided on back side of border of display window, so that maximum light reflects on display. This will reduce difficulty in reading.

At present all the parameters derived as above are displayed in cyclic manner. Data appearing cyclically are identified by its units on the side in very small letters that may be difficult for meter reading. Energy is identified as kWh but there are alike identifiers like kW, kVA, kVAR, kVARh and kVAh. This adds to difficulty level in selecting the reading. Out of all cyclic data only few may be useful once a while in specific cases only, whereas energy data is the most important.

The most of the energy meters at site may not be at comfortable position. In case of individual bungalow or tenement in society, it may be possible to have meter at convenient location but in case of multi storied buildings, all the meters are located at a one place in basement. It may be one above the other and side by side at varying height. In case of villages, towns and city area, there is no scope for convenient location for meter due to congestion and layout of the houses. In such cases meter may be at odd place such as in corner or at very low or high level as per the available space. At many places day light may not be available so also approach to meter location may be difficult due to house owner's dump on the floor under meter. Meter reader has to lean forward, backward or sidewise for reading the meter. When meter is at height, he has to be up on toe and read from angle or alternatively has to get stool from house owner. When meter is at low height, he has to bent or seat.

In such awkward position, the meter reader has to continuously watch in dim light and tiny letters of units changing cyclically and differentiate kWh amongst other similar units and immediately has to read and write the data. But there are equal chances that before he could read all the digits and memorize, data flips and has to continue till next cycle. Practically reader has to watch continuously for about three to four cycle. Such wearying and time-consuming task leads to irritation and delay. That results in error and lesser output per day.

Therefore, energy meter should have display of energy only. This may reduce cost of meter to some extent. However, if other parameters are required, it should be on demand cyclic type. Normally meter may continuously display energy meter reading only. Cyclic display of all parameters for one cycle can be triggered by command from remote device via sensor provided on the meter. After one cycle again it may return to normal display of energy meter. This remote device may be very simple with single function and common code so that one remote may be useful for all meters.

Joint reading and recording by representative of Supply Company and consumer is important for initial reading when new meter is installed and final reading when meter is removed for any cause. If any dispute arises afterward as regards to its correctness, there is no need for verification. However in case of periodic reading, error is detected in next reading as meter remains at the place.

But due to the difficulties as above, meter reading is not feasible by unaccustomed consumer when meter is in position.

So joint meter reading can be done on floor before installation of new meter or after removal of old meter. But there is difficulty that display is not available when no power. Small portable power pack can be made available that delivers 50Hz and rated voltage by inverter using DC from battery cells. Supply from this pack may be applied for a while to meter without any connection on load side and reading can be noted.

By time and motion study, about 30 % improvement in efficiency for meter reading is estimated. So there is direct advantage for cost cutting in meter reading. Indirect advantage is early revenue realization due to fast reading and billing. Financial advantages reflect in cost to serve and ultimately in tariff. A win win situation for energy supplier and users.

Easy energy meter reading enables individual electricity users to monitor energy consumption under various applications/conditions/saving measures. The effect of various energy/bill saving actions tried by him can be promptly observed by him practically at his own premise. Such personal realization will encourage him and his group for more and regular adoption of energy saving ideas. It is practically not possible to conclude on base of bi monthly billing as there is wide variation in energy consumption pattern on account of other factors like seasonal, environmental, festival, house close period etc. Even the time of sun rise and sun set reflects on lighting requirements. In a way this modification may be instrumental in the energy conservation drive.

The utility should frame regulation for positioning of meters for accessibility and viewing. This will make meter reading faster.

In view of the above, up-gradation is important and worth for implementation. All concerned should have positive attitude without any undue reservation. Consumer forums can voice for, regulators can direct, utilities can modify specification and manufacturers can compete for up gradation.

Remembering DADA

Er. NN Jadhav, popularly known as DADA, passed away on 28 Oct 2013, few days before the Diwali festival. Er. Jadhav was actively involved in the activities of the chapter for over 15 years. He was seen on the Registration counter during any event of the chapter. His residence being close to the chapter's office, he volunteered to contribute in day-to-day functioning of the office. His services were selfless. While the office bearers and committee members were busy in office and other activities, he used to provide peripheral services like organizing Tea/Snacks, preparations for events, dispatching invitation & quarterly SPE News letter, going to the banks etc. He never refused to do any work for the Society. He also propagated activities of the chapter everywhere and roped in new members. He used to do all the work willingly. He was kind hearted and would help many in getting their children employed or properly trained trough the goodwill generated by him in the society. He never craved for name or fame and served SPE as a Soldier. Er. Jadhav joined GEB as a Junior Engineer in Saurashtra region, worked in Dhuvaran TPS for many years and then retired as Executive Engineer from Head Office of GEB.

In his death the society has lost a real working hand, a patron and a dedicated member. We will be missing him a lot.

May God give peace to the departed soul and give strength to his family members to bear the impact.

List of new members enrolled during the quater

Sr. No.	G.R. No.	Name	Member	Sr. No.	G.R. No.	Name	Member
1	2133	Soni Nareshchandra V.	Life Member	8	2140	Jadhav Girish V.	Life Member
2	2134	Saiyed Mohammed Adil J.	Student Member	9	2141	Dhruv Dilipkumar T	Life Member
3	2135	Bhopi Imran I.	Student Member	10	2142	Shah Harsh P.	Student Member
4	2136	Kumar Ashutosh	Student Member	11	2143	Khalasi Dipeshkumar B	Associate Member
5	2137	Shah Aakash M.	Student Member	12	2144	SB Polytechnic	Institutional MemberGroup-B
6	2138	Bhatt Chintan B.	Student Member				
7	2139	Patel Pratik B	Student Member	13	2145	Pandya Samir B	Institutional MemberGroup-B

Random Thoughts

- N. Dinker

The living organism cannot survive beyond few days if they do not take food. Food is therefore, not only important, but essential for all living being to survive and grow. Human beings, as we all know is distinct in many aspects and endowed with many enviable faculties to lead a better life, in comparison to other living organism including animals. But, unfortunately we human beings, have in us that 'characteristic' to which leads us to our downfall and all sorts of problems. What is this undesirable 'characteristic'. It is the ever increasing 'wants' and 'Greed'. Most of us, exemptions are bound to be there, are not satisfied and there is an unquenchable appetite for having and annexing 'more and more'. Examples are galore in various aspects, but let us take one or two aspects only. 'Dwelling' (मकान). An occupant/ owner of a kutcha hut, wants/desires to possess house - then slowly/gradually to 2/3 BHK, sooner or later then a Bungalow, and then dreams to possess a palace too. After 'मकान', another component is 'कपडा'. Quality & brand names. Further, newer and better gadgets etc. etc. Such an appetite is 'infinite' and difficult to be fulfilled.

But the creator has endowed human beings with a 'finite' capacity stomach. Here, any 'giver' can 'very soon' satisfy the 'receiver', as once the stomach is full, will say 'No' to further serving 'अन्नदान ' (Food donation) is considered therefore to be the best, effective and most satisfying donation, not only from the point of view of giver & takter but on a larger perspective of the nation itself and survival of human beings on this planet.

In its latest new report, UN food Agency states that every year, in the whole world, almost 1/3 of Food Gravis produced is wasted (1.3 Billion Tonnes). Indirectly it brings out the fact that billions of dollars are expended waste fully towards the loss. This huge quantity of food grains which is wasted now, otherwise, can fill the stomach of a large population.

In our country, a large population goes to bed without food. On the other extreme, a huge portion of food grains produced is wasted (though not intended) for want of good storage facilities and lack of effective distribution system. Food Security Bill is a very welcome Bill (without going into politics), but everything depends on its implementation, however good intentions of the Bill may be.

For the benefit of the readers of SPE News Letter an extract of the opinions and views expressed in the seminars of IEI on 'Environment Day' at its various centres docketed below.

- Creating awareness amongst the masses to reduce food wastage. Concerns on issues like lack of storage capacity/ infrastructure, poor transportations and distribution system, poor co-ordinations between the farmers & food supply chain members.
- Food waste is an enormous drain on natural resources and a contributor to negative environmental impacts. Think before we eat & help save only environment.
- The wastage of food by the affluent class. There will be no shortage of food in the country provided the food is distributed judiciously.
- Accelerating infant mortality rate owing to malnutrition. Locally Grown seasonal food can save environment & money. Wastage of food not only involves wastage of money, more importantly it is the share of the deprived one that is being wasted.
- Realization of different facts about quality & availability of food, minimization of wastage of food choice of food based on need for self and family.

To prevent the great loss of costly and much needed food grains, therefore becomes the duty of each citizen and there is a dire need for each citizen to understand the gravity of the situation. SPE as an organisation can take upon itself the duty of spreading awareness among its members through seminars and campaigns.

Knowledge Corner

I Vegetarianism

- Vegetarianism has roots in ancient India. In fact, currently 70% of the world's vegetarians are Indians and there are more vegetarians in India than in any other country in the world.
- The first vegetarian society was formed in England in 1847. The society's goal was to teach people that it is possible to be healthy without eating meat.
- There are several types of vegetarians. The strictest type is vegans. Vegans avoid not only meat but also animal products.
- A fruitarian is a type of vegetarian in which a person eats just fruits, nuts, seeds and other plant material that can be harvested without killing the plant.
- Famous vegetarians include Leonardo da Vinci, Henry Ford, Brad Pitt, Albert Einstein, Ozzy Osborne, and (debatably) Hilter.
- Many Vegetarians avoid meat because they ethically object animal cruelty.
- An Ovo - vegetarian will eat eggs but not other dairy products. A lacto vegetarian will eat dairy products but not eggs.
- Vegetarians can be deficient in vitamin B12, which only

comes from animal sources.

II Indian Money

- The word 'rupee' comes from the Sanskrit word 'raupya'. The meaning of which is 'silver'.
- Sher Shah Suri introduced the first rupee. The first paper note was issued by Bank of Hindustan.
- After the independence of India, the first coins were introduced in 1950. It was made of Cupro-nickel. In 1964 aluminum coins were first introduced for up to 20 paisa, stainless steel coins (10, 25 and 50) were first introduced in 1988
- 500 rupees note was introduced in1987 and 1000 rupee note was introduced in 2000.
- In 2010 Indian rupee symbol ₹ was adopted. D. Udaya Kumar is the creator of the rupee symbol. The parallel line in symbol is given to look like tricolor of Indian National flag.
- The current series of bank notes are called Mahatma Gandhi Series. The Mahatma Gandhi series of notes were introduced in 1996.
- Indian Currency notes are printed at currency note press in Nashik, the Bharatiya Note Mundra Nigam (P) presses at Salloni and Mysore, watermark paper Manufacturing Mill in Hoshangabad.
- On each bank note, the amount is written in 15 different languages of India, besides English and Hindi.
- The Reserve Bank has the sole authority to issue bank notes in India.

III Facts about Handwriting

- National Handwriting Day is celebrated every year on 23 January, which is the birthday of John Hancock, the first person to sign the Declaration of Independence.
- Handwriting identifies to the conscious and subconscious traits of an individual personality. If anyone struggles with handwriting, they suffer from the ability of self-expression.
- Slow Hand Writers have problems with poor motor mind co-ordination, spelling, letter formation word shapes and discrimination between upper and lower case.
- Boys have higher frequency of Handwriting problems than girls at initial stages.
- Handwriting is a brain's writing. One can judge an individual mind state, personality from his writing style, pressure, slant, space and from margins etc. At different mind state writing differs and each time it will tell different story about the writer.
- No two people write a like. Our handwriting is an unique as our fingerprints!
- Research shows that you remember information better when you write it by hand than when you type it.
- Graphology is the pseudo scientific study and analysis of handwriting especially in relation to human psychology.

Wisdom Statements

- There is no pond which the sun cannot dry up.
- The creature is not greater than Creator.
- A hunter with only one arrow does not shoot carelessly.
- A bird will always use another bird's feathers to feather its own nest.
- The wise create proverbs for fools to learn, not to repeat.
- You always learn a bit more when you lose than when you win.

Quote for the Day

- Common sense is calculation applied to life.
- Everything has its beauty, but not everyone sees it.
- Often we live our lives in chains and never even know we have the key.
- To get the full value of joy, you must have someone to divide with.
- I am an optimist. It does not seem too much use being anything else.
- If road is beautiful then worry about destination, but if destination is beautiful, then don't worry about road.
- Success does not depend on making important decisions quickly, but it depends on taking quick action on important decisions.

Laugh -a- While

- Mom: "whom do you love moreΔMe or your wifeΔ"

  Son: I don't know!" But your love makes me forget my wife and her love and care reminds me of you!"
- A lady in the theatre: Pardon me sir does my hat bother youΔ"

  Gentleman behind: Definitely no, but it bothers my wife. She wants one like that.
- A small boy, leading a donkey, passed by an army camp. A couple of soldiers wanted to have some fun with the lad.

  Why are you holding onto your brother so tight, SonnyΔ Said one of them.

  So he won't join the army, the youngster replied.
- An illiterate farmer from a village, who has become rich, bought a car, and also hired a chauffeur to drive it.

  One day, while driving through a busy town, he became so annoyed at the chauffer pulling out his hand at every crossing, that he turned to him and said," Get on with your work. I'll tell you when it is raining"

PHOTOGRAPHS OF NATIONAL AGM OF SPE(I)

August gathering during The National AGM

Er. Vishen Dutt persuing agenda of the General Body Meeting.
Sitting (L to R) Er. PP Wahi, Er. GV Akre, Er. SB Lele and Er. VB Harani

PHOTOGRAPHS OF NATIONAL AGM OF SPE(I)

Er. VB Harani, Secretary, SPE(I) Vadodara, presenting welcome address. Sitting on dias (L to R) Er. Vishen Dutt, Sr. Manager, CBIP, Er. PP Wahi, Director (Engg.) CBIP, Er. GV Akre Chairman, SPE(I) Vadodara and Er. SB Lele Vice-Chairman, SPE(I) Vadodara.

Er. GV Akre briefing about the activities of SPE(I) Vadodara.
Sitting (L to R) Er. Vishen Dutt, Er. PP Wahi, Er. GV Akre and Er. SB Lele

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