

SPE NEWS LETTER

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THE SOCIETY OF POWER ENGINEERS (INDIA)

VADODARA CHAPTER (ESTD. 1996)

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*Intelligence is the Ability to
Adapt to Change*

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EVENT MEMORIES



Participants relishing lunch during Surat Seminar



Er. Keyur Nanavati from ETP-Technologies-Exhibitor, honored by Er. HM Solanki



Presentation of event participation certificate

Chairman's Desk



ELECRAMA 2018, the world's largest exhibition of electrical equipment was organized in Delhi from 10th to 14th March this year. ELECTRAMA is the flagship showcase of the Indian electrical industry, organized every two

years by Indian Electrical and Electronics Manufacturing Association (IEEMA)

It is found that ELECRAMA is very well in tune with the transformations taking place in electrical industry to meet the requirement arising out of ambitious plan of government to make India a manufacturing superpower.

ELECRAMA was very successfully organized this year in very spacious exhibition ground in Greater Noida with excellent infrastructure and management skill, compared to all previous exhibitions organized by IEEMA. It was praised by all visitors and participants equally. The exhibition space was claimed to be more than 10 Acres in addition to space provided for many pavilions, displays and events. The arrangements for transport, parking, registration and food/water were par excellent. It hosted renewable energy pavilion, power pavilion, special pavilion for railways and international pavilion from many countries. There were many stalls showcasing electric transportation, energy storage, solar energy, electro-nics and automation, IoT technologies.

It is also a platform for knowledge sharing in form of industry summits and technical conferences running concurrently in different pavilions. This year, new

events focusing on new technology including IoT, innovations and disruptive technologies in electrical and electronic industries, were organized very effectively.

Energy infrastructure, smart grid, smart cities are some of the most important feature for all the developmental programs under-taken by the govt. It's 'Make in India' Program has given global recognition to Indian economy and placed India on world map as a manufacturing hub. The efforts and involvement of govt agencies in making ELECRAMA a great success, is quite visible in this direction.

We can see clearly the modern trends in development of power system particularly digital technologies for its use in all segments like manufacturing, generation, transmission and distribution, industrial process and grid operation, micro grids etc. The benefits of digital technologies in terms of its speed, accuracy, data storage and retrieval, capability of transmission of data at any distance and many other qualities are encouraging and compelling the engineers and researchers to adopt it very quickly in every electrical equipment. Our engineers and manufacturers of electrical equipment and systems are acquiring digital technologies very fast.

The Exhibitions like ELECTRAMA provide good opportunity of business development and technological up-gradations to all the stake holders in Power sector.

Best wishes to the readers

- GV Akre

Editor's Desk



Dear Reader,

India's Electricity Sector is undergoing a major transformation and we are privileged to be witnessing it. The year 2017 may well in hindsight be

seen as the tipping point in India's electricity transition. A cascade of record lows in solar PV tariffs

has pushed the price of solar below the tariff for NTPC's existing coal-fired generation fleet, for the first time. In addition, reverse auctions for wind power have resulted in similar rapid price reductions. And, perhaps most important, 2016-17 was the first year in which total clean energy capacity additions clearly outstripped new thermal generation. 2016-17 was the first year in Indian history in which renewable capacity installs (15.7GW, 2.5 times the 6.5 GW of

renewable installs in 2015-16) exceeded net thermal power installs (7.7 GW, down 65% year on year). While 11.6GW of thermal power plants were commissioned, a record 3.9GW of end-of-life thermal power plants were decommissioned in 2016-17. This is expected to be the new norm. These new realities are also becoming evident in official government policies. India's draft third National Electricity Plan (NEP3), released in December 2016, covers the next two five-year periods to 2027, and concludes that beyond the half-built plants already under construction, India does not require any new coal-fired power stations over this period. The expectation is that new electricity demand will be met with clean renewable energy.

The challenges to integrating India's 40% renewable energy target by 2030 are not to be underestimated. However, the momentum over the past three years, gained through clear government policy and growing economic merit, give us confidence India will stay the course.

India has invested US\$15-20bn annually in its power transmission network expansion since 2010. This investment has helped facilitate the transition from five independent regional grids in 1990 to a nationally connected structure today, along with a small but growing international connectivity. India is now linked to Bhutan and Bangladesh, and there are plans to expand international connectivity tenfold over the coming decade, potentially adding Nepal and Sri Lanka to better integrate renewables and enhance energy security.

Two years in, Ujjwal DISCOM Assurance Yojana (UDAY) scheme for power distribution company reforms, has started bearing fruit, with major improvements in both the financial and operational performance of India's debt-laden DISCOMs. At the end of March 2017, 26 states and one union territory have joined UDAY; Nagaland, Odisha and West Bengal have not joined the scheme. Until FY17, Rs. 2.69 Lakh Crore of DISCOMs' debt qualified for restructuring, and state governments and DISCOMs together issued bonds worth Rs. 2.33 Lakh Crore (86% of the total debt). As of fiscal year 2017, the value of pending bonds to be issued by Indian states is estimated to be Rs. 36,278 Crore. Issuance by state governments will be subject to the fiscal space of each state. Some "green shoots" have emerged, with reduced interest costs and lower power purchase costs leading to improved financial performance by some distribution companies. For example, the Chhattisgarh DISCOM turned profitable in the first quarter of 2016-17, while Gujarat DISCOMs increased their profitability in Apr-Dec 2016-17. Similarly, Haryana DISCOMs turned profitable in the second and third quarters of 2016-17.

We will be extremely happy to receive your views, opinions and suggestions. Please feel free to reach out to us.

Happy Reading!



(AWADHESH KUMAR SINGH)

Chapter's Activities



➤ **On 23 Jan 2018**, a 1-Day Seminar on "Power System Basics for Academicians & Practicing Engineers" was organized. Report of the same is brought out in this issue.

➤ **On 27 Jan 2018**, a lecture on "Investor Awareness Programme" was arranged at Hotel Regenta Inn, VedT ranscube Plaza, Central Bus Terminal, Vadodara. The lecture was sponsored by Trust Care and Tata Investors and delivered by Mr. Ashish Shah, B.Com., LLB and Certified Financial



Ashish Shah
Investment Consultant
TRUSTCARE



SPE members with spouse involved in presentation

Planner.

The introduction of the program was given by Er. PA Shah, Advisory Committee Member, SPE (I), Vadodara Chapter. The Speaker explained various types of investment plans like Fixed Deposit in Bank, MIS-NSC & other schemes of Post Office, Mutual Fund, Investment in Shares, and so on. The main aim of the lecture was to guide the members in selection of the Agent who can show clear cut ways and means of the investment and pros and cons involved in the investment. The big benefit may remain a distant dream in the life, if proper information is not gathered. The risk factor plays an important role in the investment in addition to the locking period. Moreover, the taxation shall be kept in the mind while making proper investment. The tax payable and tax exempted are to be kept in mind for each scheme. What are the long-term benefits and short-term benefits must be analyzed.

The programme was presided over by Er. SM Takalkar Vice-Chairman, SPE (I), Vadodara Chapter. The lecture was arranged for the members & their spouse which was appreciated by all 150 participants. The lecture ended with vote of thanks by Er. SM Godkhindi, Secretary, SPE (I), Vadodara Chapter followed by Dinner in the Hotel.

➤ **On 27 Feb 2018**, a 1-Day Seminar on “Power System Basics for Academicians & Practicing

Engineers” was jointly organized by SPE(I) Vadodara Chapter Jointly with Institution of Engineers(I), Southern Gujarat Chapter, Surat. Report of the same is brought out in this issue.

➤ **On 27 Mar 2018**, Chapter organized evening lecture on the topic of Electric Vehicles at the Golden Jubilee Auditorium of the Faculty of Social Work, MS University, Fatehgunj, Vadodara.

Dr. CD Upadhyay, Professor, LD Engineering College, Ahmedabad was the speaker. The lecture revolved around the following.

- Electric Vehicles were introduced in the end of 19th Century.
- The electric vehicles can be classified depending upon number of wheels i.e. two wheelers, three wheelers, four wheelers and goods carriers.
- Electric vehicles have two major parts i.e. battery management system & power electronic systems.
- Series, parallel, series & parallel and hybrid systems – advantages & disadvantages.
- The Indian scenario of electrical vehicles and issues in the market.
- Initiatives taken by the industries and utilities.
- The vehicles can become popular by increasing awareness, development of sophisticated

battery technology and use of lithium- iron in place of lead acid batteries.

- The total population of electric vehicles throughout the world is 8.0 Lac out of which 6 Lac vehicles are in China.
- Battery maintenance is a big challenge. The remedies are to maintain the water level and temperature.

The lecture was followed by good amount of interaction. About 100 members attended the lecture programme. Er. SM Godkhindi gave welcome speech. Er. SM Takalkar briefed about the SPE's activities. Er. PA Shah introduced the speaker. Er. AN Makwana presented vote of thanks.

- **SM Godkhindi**

BRIEF REPORT ON BHARUCH SEMINAR

The Vadodara chapter of SPE (I) organized a 1-Day seminar on “**Power System Basics for Academicians & Practicing Engineers**” in the Auditorium of the Rotary Club, Bharuch on 23 Jan 2018. About 150 delegates hailing from academic institutions, industries, utilities and consulting firms attended the seminar.



The inaugural function was presided over by Er. GV Akre, Chairman of SPE (I) Vadodara Chapter. Others who shared the dais included Er. SM Takalkar, Vice-Chairman, SPE(I) Vadodara Chapter, Er. SM Godkhindi, Secretary, SPE (I), Vadodara Chapter and Prof. Praful Chudasama, SRICT College, Valia. Er. GV Akre welcomed the dignitaries,

delegates and the guests. He briefed the gathering about the activities of SPE(I). Er. SM Takalkar gave brief information about the Seminar. Prof. Praful Chudasama informed about the activities being done for the benefits of Students and Academicians by SPE(I) and SRICT. Er. SM Godkhindi presented vote of thanks. Er. Tandel, Chairman of IE(I), South Gujarat local also spoke on the activities of IE(I), South Gujarat Local Chapter, Surat.



After the inaugural function, technical sessions started. The sponsors, co-sponsors, supporters, guests like Er. Tandel, Chairman and Er. Mukund Master, Secretary, IE(I) Southern Gujarat Chapter, Surat and well-wishers of the Seminar, were honored by presenting Bouquet and Memento.

Technical sessions were conducted as briefed below:

1. **Er. SM Takalkar**—MD, TPEC-Vadodara and Vice-Chairman, SPE (I), Vadodara Chapter.



Topic : Over View of Power System.

Brief of presentation

- Distribution Network.
- Transmission Network.
- Power System of India – NEWS.
- Substation.
- Bus bar arrangements etc.

2. **Er. Mohan Tilwalli**-Director, Gururaj Engineers, GIDC, Makarpura, Vadodara



Topic : Industrial Automation–PLC application there of

Brief of presentation:

- The definition of the Automation.
- Advantages and Disadvantages of Automation.
- Presented some examples of Industrial Automation.
- He gave details of the various applications of automation everywhere like home, office, malls, industries, dairy, manufacturing etc.

3. **Er. CG Ramatirth** – Former Western Railway Engineer and now a Practicing Railway Engineer.



Topic: Electric Traction

Brief of presentation:

- SLD of 25kV AC locomotive.
- Traction power circuits
- Primary bogies and Tap changer control circuit
- Difference amongst locomotive, bogy and guard
- AC & DC Locomotives.
- Difference between passenger locomotives and freight locomotives.

4. **Er. GR Patel** – Former ABB Vice-President and Practicing Consulting Engineer



Topic: Circuit Breakers and Application thereof.

Brief of presentation:

- Explained the development of Circuit Breakers.
- Type of Circuit Breakers.
- Comparison between SF₆ and CO₂ Gases considering the application to the Circuit Breakers.
- Signification of parameters for design and manufacture of Breakers; like Rated voltage, Insulation levels, Rated frequency, rated normal and short circuit breaking current, Applicable standards and Special requirements

5. **Er. PA Shah** – Associate Engineer, Takalkar Power Engineers & Consultants Vadodara & Practicing Electrical Engineer.



Topic: Solar Power Project & Tidal Power Project.

Brief of presentation:

- Development of Power in India in General and Solar Power Projects in Gujarat in particular.
- Working of Solar Power Projects.
- Type of Solar Power Projects.
- Site Selection of Solar Power Projects.
- Statutory requirements for establishment of Solar Power Project.
- Development of Tidal Power Plants in World.
- Types of spring and neap tide and its causes
- Energy from Sea and its generating methods.

- Status of Tidal Power Plant in Gujarat.
- Advantages and Disadvantages of Tidal Power Plant.

6. **Er. (Ms). Varsha Joshi** - DE, MGVCL, Hi-Tech Laboratory, Vadodara.



Topic: Energy Meters.

Brief of presentation:

- Definition & Importance of Meters.
- Types of Electrical Meters and their working.
- Advantages and Disadvantages of each type of Meter.
- New Generation Meters, STATIC Meter, ABT Meter and Bi-directional Meters.
- Automatic Meter Reading application.

7. **Er.GV Akre** - MD,Hivoltrans Electricals,Halol and Chairman of SPE (I), Vadodara Chapter.



Topic : Instrument Transformers – Current and Potential Transformer.

Brief of presentation:

- Introduction of Instrument Transformer.
- Use of Instrument Transformer.
- Working Principles, Construction and Types of Transformer.
- Primary & Secondary windings of Instrument Transformer and importance thereof.
- Voltage and current ratings of Instrument Transformers.

8. **Er. SM Takalkar** - MD, TPEC-Vadodara and Vice-Chairman SPE (I), Vadodara Chapter.



Topic : Industrial Electrification.

Brief of presentation

- Size of Industry Small Scale, Medium Scale, Large Scale and Very Large Scale.
- Explained typical Network in an Industry.
- Power Demand – Electrical Installation, capacity and procedure for application.
- Sizing of Transformer, Bus Bar, Battery, Battery Chargers, Cables (Power and Control), MCC & PCC, Capacitors, Earthing etc.
- Design of Illumination system in Industry.
- SCADA and APFC.

Inaugural session and the technical sessions were anchored by Er. PA Shah. Question/Answers were taken up for each topic at the end of each session. All participants took good interest in interactions with the lecturers. The participants appreciated the Seminar for the technical contents & presentations made by the lecturers as well as other arrangements.

At the end, the participants gave feed-back on the total proceedings of the Seminar. Er. SM Godkhindi thanked all the participants, Lecturers, Sponsors, Co-sponsors, Supporters, Donors, Well-wishers, Rotary Club Management, Media and those who have worked directly or indirectly to make this event successful. Er. SM Godkhindi also thanked Er. CK Patel (Bharuch), Er. RN Panchal (Ankleshwar) and all the office bearers and Advisory Committee Members for making this programme a great success.

BRIEF REPORT ON SURAT SEMINAR

The Vadodara chapter of SPE (I) organized a 1-Day seminar on “Power System Basics for Academicians & Practicing Engineers” jointly with Institution of Engineers (India), Southern Gujarat Chapter, Surat in the Auditorium of Institution of Engineers (India), IchchhaNath, Opp. SVNIT, Surat on 27Feb 2018. About 110 delegates hailing from academic institutions, industries, utilities and consulting firms, attended the seminar.



The inaugural function was presided over by Er. SM Takalkar, Vice-Chairman, SPE (I), Vadodara Chapter. Others who shared the dais included, Er. SM Godkhindi, Secretary, SPE (I), Vadodara Chapter, Er. PH Tandel, Chairman, IE(I), Southern Gujarat Chapter, Surat and Er. Mukund Master, Secretary, IE(I) Southern Gujarat Chapter, Surat. Er. SM Takalkar welcomed the dignitaries, delegates and the guests. He briefed the gathering about the activities of SPE(I) and also, briefed about the Seminar. Er. PH Tandel also spoke on the activities of IE(I), Surat Chapter. Er. SM Godkhindi presented vote of thanks.



After the inaugural function, technical sessions started after prayer of Sarswati Devi. The sponsors, co-sponsors, supporters, guests and well-wishers of the Seminar were honored by presenting Bouquet and Memento.

Technical sessions were conducted as briefed below:

1. **Er. SM Takalkar** – MD, TPEC-Vadodara and Vice-Chairman, SPE (I), Vadodara Chapter.



Topic : Over View of Power System.

Brief of presentation

- Distribution Network.
- Transmission Network.
- Power System of India – NEWS.
- Substation
- Bus bar arrangements etc.

2. **Er. PA Shah** – Associate Engineer, TPEC-Vadodara & Practicing Electrical Engineer.



Topic : Solar Power Project.

Brief of presentation:

- Development of Power in India in General and Solar Power Projects in Gujarat in particular.
- Working of Solar Power Projects.
- Type of Solar Power Projects.
- Site Selection of Solar Power Projects.
- Statutory requirements for establishment of

Solar Power Project (including roof top solar project).

Illustrated example of Energy Bill for three cases i.e. Import of Power (Drawl from Grid) is more than Export of Power (Injection to Grid), Import of Power (Drawl from Grid) is equal to Export of Power (Injection to Grid) and Import of Power (Drawl from Grid) is less than Export of Power (Injection to Grid).

3. **Er. Mohan Tilwalli** - Director, Gururaj Engineers, GIDC, Makarpura, Vadodara



Topic : PLC application in Industries

Brief of presentation:

- The definition of the Automation.
- Advantages & Disadvantages of Automation.
- Presented some examples of Industrial Automation.
- Explained the working of Roti Maker being successfully used in Shri Sai Mandir, Shirdi by presenting a video.
- He gave details of the various applications of automation everywhere like home, office, malls, industries, dairy, manufacturing etc.

4. **Er. NV Lathia** - SE, GSECL Corporate Office, Vadodara.



Topic : Fuel Management.

Brief of presentation:

- Informed about types of fuels used in Power Station in India.
- Characteristics of fuels like Indian Coal,

- Imported Coal, Lignite, Gases, etc.
- Installed capacity of Power Station in India and Gujarat.
- Requirement of Fuel and Issues & Challenges thereof.
- Pros & Cons of uses of coal as a fuel.
- Possible Risks involved in use of Imported Coal.

5. **Er. GR Patel** – Former ABB VP and Practicing Consulting Engineer



Topic : Circuit Breakers and Application thereof.

Brief of presentation:

- Briefed about the development of Circuit Breakers.
- Type of Circuit Breakers.
- Comparison between SF₆ and CO₂ Gases considering the application to the Circuit Breakers.
- Significance of parameters for design and manufacture of Breakers; like Rated voltage, Insulation levels, Rated frequency, rated normal and short circuit breaking current, Applicable standards and Special requirements

6. **Er. SM Takalkar** – MD, TPEC, Vadodara and Vice-Chairman SPE (I), Vadodara Chapter.



Topic : Industrial Electrification.

Brief of presentation

- Size of Industry Small Scale, Medium Scale,

- Large Scale and Very Large Scale.
- Typical Network in an Industry.
- Power Demand – Electrical Installation, capacity and procedure for application.
- Sizing of Transformer, Bus Bar, Battery, Battery Chargers, Cables (Power and Control), MCC & PCC, Capacitors, Earthing etc.
- Design of Illumination system in Industry.
- SCADA and APFC.

7. Dr. Naimesh Zaveri - Professor & Head, Electrical Engineering Department, CJ Pithawala College of Engineering, Surat.



Topic : Power System Operation, Control and Power Quality Issues

Brief of presentation:

- Explained about kVA, kW, kVA_r and Power Factor.
- Gave example of Non-linear load, Effect of Poor Power Factor,
- Application of FACT Devices and generation of Harmonics in Power System.
- Graphical presentation of Sinusoidal wave of Voltage, Current, THD_v & THD_i. Mathematical equations and series.
- Applicable standards including IEEE, IEC, IS, etc.
- Case study of one of the utility of Surat.

8. Er. VJ Desai - EC Member, SPE (I), Vadodara Chapter and Consulting Engineer.



Topic : Instrument Transformers – Design & Operations

Brief of presentation:

- Introduction of Instrument Transformer.
- Use of Instrument Transformer.
- Working Principles, Construction and Types of Transformer.
- Primary & Secondary windings of Current Transformer and importance thereof.
- Voltage and current ratings of Instrument Transformers.

9. M/s ETP Technologies, Sachin, Surat displayed its Modern Earthing System for the benefit of delegates. There was good response to its demonstration.

Inaugural session and the technical sessions were anchored by Er. SM Godkhindi and Er. PA Shah. All participants had interactions with the lecturers of the topics. The participants appreciated the Seminar for the technical contents & presentations made by the lecturers as well as other arrangements.

At the end, the participants gave feed-back on the total proceedings of the Seminar. Er. SM Godkhindi thanked all the participants, Lecturers, Sponsors, Co-sponsors, Supporters, Donors, Well-wishers, Institution of Engineers (India) Sothern Gujarat Chapter, Surat and those who have worked directly or indirectly to make this event successful. Er. SM Godkhindi also thanked all the office bearers and Advisory Committee Members for making this programme a great success.

REVIEW REPORT OF SURAT SEMINAR

The review of Seminar was taken in the concluding session. The feedback forms duly filled in by the participants were collected. The activities like Registration Arrangement, Registration Kit, Technical Topics Covered, Presentation, Hospitality, etc. The review was categorized as E – Excellent, V – Very Good, G – Good, A – Average and P – Poor. A tabulation for activity and its feedback is in Annexure-1.

Further the activity wise and category wise feedback reviewed and tabulated below:

Annexure-1

Particular	E	V	G	A	P
Arrangement of Registration	37	35	25	2	0
Registration kit including literature	33	33	25	8	0
Technical topics covered	27	51	20	2	0
Presentation by Speakers	31	35	27	6	0
Reception Hospitality	35	25	29	8	2
Food Hospitality	41	35	22	0	2

The overall feedback for each activity in percentage is as under:

EXCELLENT	34 %
VERY GOOD	36 %
GOOD	25 %
AVERAGE	4 %
POOR	1 %

OBITUARY



ER. RAMESHBHAI M. BHATT, Retd. DE (Hot Line), GETCO and Life Member of Society of Power Engineers(I), Vadodara Chapter passed away on 02 Feb 2018.

In his death, the Chapter has lost a well-wisher and an active member.

May God give peace to the departed soul.

The observations are as under:

- The overall performance is in the rank of 71%, Good is 25% while Average is 4% and 1% have given feedback as poor.
- Further, all activities are weighted between 20% to 41% except about 5% average 4% hospitality.

The suggestions received from participants are exhibited below:

- If possible, seating arrangement is to be improved.
- Ac hall shall be arranged for the seminar.
- The auditorium is lacking the modern concept like sound system, air conditioning, etc. It needs complete renovation.
- The course contents are very good, needs to be optimized for 1-Day program.
- For the same course contents, the duration should be 2 days to cover all major topics.
- Good initiative, keep going!
- We will invite speakers to our college.
- Very good seminar conducted by SPE (I), Vadodara Chapter.

Technical quiz

A room is of 4 M length, 3 M width and 3 M height. There is a lamp in the room 20 cm. down from the center of the ceiling. There is a window on 4M long wall having 1 M height and 80 cm. width at level of 1 M above the floor and 1.5 M from the side wall.

Draw the shape, size and location of the light falling on floor outside in porch. Ignore thickness of wall.

NB : This pertains to engineering drawing.

Hint : Find horizontal trace of four light rays passing through four corners of the window.

Solution in next issue

By N D Makwana

EFFECT OF TEMPERATURE ON SOLAR PANEL



Large number of Power Consumers are now installing solar PV panels on their roofs to take advantage of the feed in Grid and get the benefit of export power tariff available when you sell power to the grid. The power produced from the rooftop panels can be consumed by the owner or can be fed in to the Grid.

It goes without saying that maximizing the amount of electricity you produce (i.e. number of Units-kWhs) is key to ensuring healthy returns on investment and shortening the payback period. You can start not only making money by producing electricity via the subsidies available, but also use the electricity you produce to reduce your power bills.

One of the key factors impacting the amount of electricity your solar panels generates, is the temperature at which they operate. It is a notion that more sun means more heat and more electricity, but this is wrong.

Different solar panels react differently to the operating ambient temperature, but in all cases the efficiency of a solar panel decreases with increases in temperature. The impact of temperature on solar panel efficiency is known as the temperature coefficient.

The Temperature Coefficient

Normally the temperature coefficient is mentioned as pMax. This value is given in the form of negative percentage and indicates the impact of temperature on the panel.

Solar panels are tested at 25°C. The temperature coefficient percentage illustrates the change in

efficiency as it goes up or down by a degree. For example, if the temperature coefficient of a solar panel is minus 0.5%, then for every 1°C rise, the maximum power from a panel will reduce by 0.5%.

Therefore, on a hot day, when panel temperature reaches 45°C, a panel with a temperature coefficient of minus 0.5% would result in a maximum power output reduction of 10%. Contrary to it, if it is a winter's sunny morning, the panels will be more efficient.

Each type of solar cell has a different temperature coefficient as detailed below:

- ➔ Both mono-crystalline and poly-crystalline cells have temperature coefficient pMax between minus 0.45% to minus 0.50%.
- ➔ Amorphous based Thin Film panels have temperature coefficient pMax rating between minus 0.20% to minus 0.25%.
- ➔ The Hybrid Solar cells currently on the market sit in the middle temperature coefficient i.e. Max between minus 0.20% to minus 0.32%.

To conclude, it can be stated that the generation efficiency of Solar Power is inversely proportional to the Panel Temperature. The governing factor is temperature co-efficient.

Compiled by

Er. PA Shah

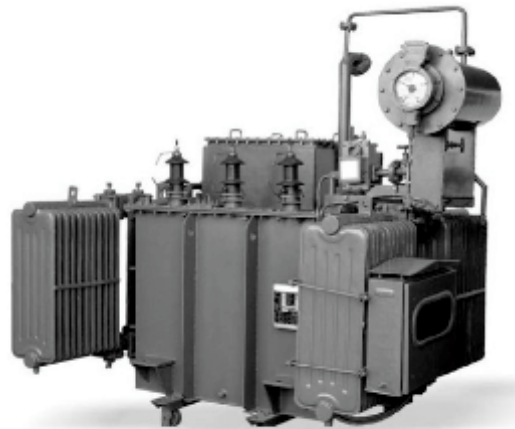
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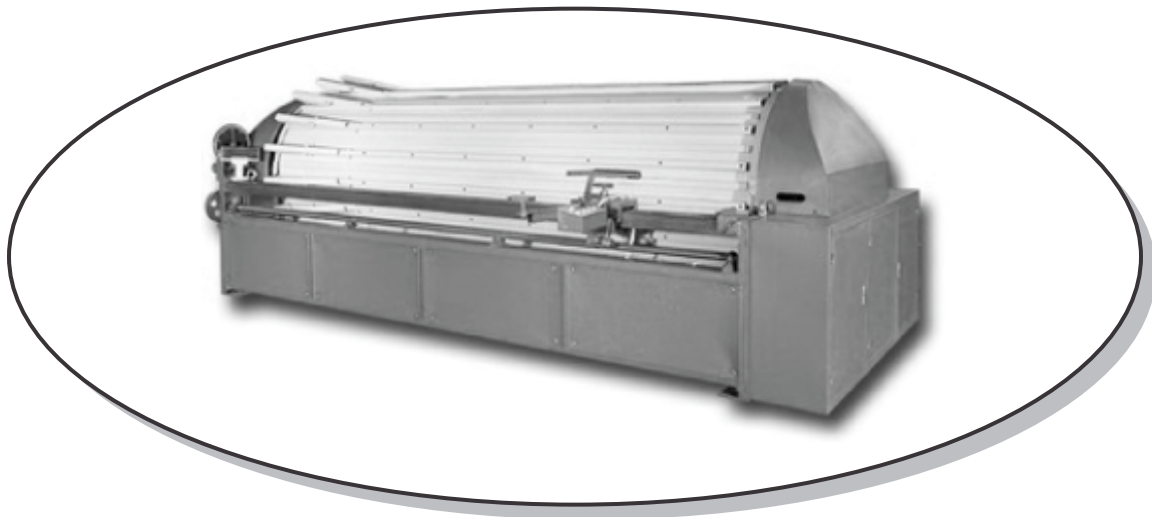
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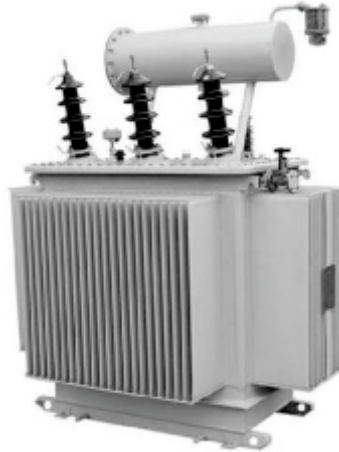
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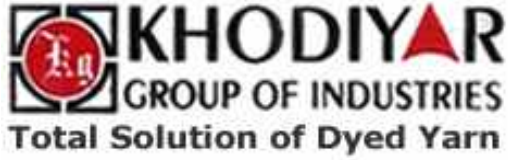
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12/A Dahej, GIDC, Industrial Estate, Dahej Bharuch, Dahej, Gujarat 392130



GFL is accredited with ISO 9001:2000 certification for the
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Contact No. : +91 98259 58514
+91 99251 83468

N. K. Electricals

Consultans & Liasioning Works

**Erection of H.T. L.T. Line & T/C Center,
66KV Transmission Line, Under Ground Cable Laying,
Switchyard Work on GEB Approved Licences Contractor**

Off. : 4, Aakar Complex, Ground Floor, B/h. Petrol Pump,
Old Bazar Karjan, Dist. : Vadodara - 391240.
email ID : nkelectricals62@gmail.com

EVENT MEMORIES



Group photo of Bharuch Seminar



Question-Answer Session of Bharuch Seminar



Participants of Bharuch Seminar



Participants relishing lunch during Bharuch Seminar



Pillars of Surat Seminar



Participants of Surat Seminar



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To _____
