Vol 58 No 1 January 2018 ₹ 100

Since 1961

Electrical India

India's oldest magazine on power and electrical products industry

Fifty-Eight Year of Service to the Power Industry 58 Since 1961

Losses in Distribution & Transmission Lines

Smart Meters Market worth 19.98 Billion USD by 2022

EESL Launches $454 mn Project

Smart Maintenance of Power Transformers

A Big Turn-Around in India's Power Sector

Efficient Energy Consumption and Economic Growth

A Chary Publication®

Scan the QR Code to know more about EI Website

Follow us on

SUBSCRIBE/RENEW Online • Log on to www.electricalindia.in

Smart is In
Better Power Quality Management

L&T SWITCHGEAR
SAFE & SURE

Power Capacitors

Capacitor Duty Contactors

Thyristor Switching Modules

APFC Controller

Reactive Power Management Solutions

Active Harmonic Filter

Detuned Harmonic Filter Reactor

Harmonic Filtering Solutions

L&T Electrical & Automation, India's leading switchgear solutions company, provides Power Quality Management Solutions that help industrial and infrastructural installations operate more cost-efficiently.

Lower Bills. Higher Productivity.

Higher use of energy-saving devices leads to increased harmonics. This lowers productivity through overheating of equipment, electrical component failure and ultimately, expensive shutdowns, besides having an adverse impact on the power factor.

Our Active and Passive Harmonic Filtering Solutions help reduce harmonic distortions. Combined with our range of Reactive Power Management Solutions, they enhance the power factor and help reduce your electricity bills.

For more information on how our 'smart' Power Quality Management Solutions can ensure continuing productivity and profitability, visit www.Lntebg.com

LTCBMC/RDP/08/2017

Customer Interaction Centre (CIC)
BSNL/MTNL (Toll free): 1800 233 5858 Reliance (Toll free): 1800 200 5858
Tel: +91 22 6774 5858 Fax: +91 22 6774 5859 E-mail: cic@Lntebg.com

LARSEN & TOUBRO

Regd. Office: Larsen & Toubro Limited, L&T House, N. M. Marg, Ballard Estate, Mumbai - 400 001, INDIA CIN: L99999MH1946PLC004768


Smart solutions
you can trust.
Electrical safety matters.
Hager provides world class solutions for residential and commercial buildings.
Hager modular protection devices are designed and manufactured with German quality giving reliable protection to your homes and offices against electrical faults.
Hager Electro Private Limited
Office 2A, First Floor, North Court Building, Opp. Joggers Park,
Kalyani Nagar, Pune - 411006 India
Tel: +91 20 41477500 Fax: +91 20 41477510
Toll free no.: 1800 103 5440 Email: hagerwow@hager.co.in
hager.co.in
:hager

PUBLISHER'S LETTER

Hello and welcome once again to *Electrical India*. I wish you all a Happy New Year.

Here, we would like to begin the New Year on a positive note with review of Indian power sector's achievements. The sector has witnessed an unprecedented turnaround during the past three years. Earlier, the sector was marred by continuous shortages and lack of quality and steady supplies to residential as well as commercial sectors. As a result, India has become a net exporter of electricity exporting around 5,798 million units to Nepal, Bangladesh and Myanmar in 2017.

According to Ministry of Power, within three years, India's total power capacity has increased by nearly one third from 2,43,000 MW in March 2014 to 3,20,000 MW in March 2017 and the conventional or coal based power capacity has increased by 26% (one fourth) from 2,14,000 MW in March 2014 to 2,70,000 MW in March 2017. UDAY scheme launched in end 2015 is gradually making inroads and some early signs of revival are seen although premature to confirm the success. UDAY is likely to provide three fold benefits firstly the transfer of debt load to states to reduce the substantial interest burden leading to immediate release of liquidity for the discoms.

According to India Ratings & Research, the sector is rightly poised to witness a strong growth subject to continued policy impetus. The tremors of the state's unilateral action could jeopardize the bankability of projects and could risk the 1,75,000 MW renewable plan of federal government, if left unchecked.

In this issue, we shed light on *Losses in Distribution & Transmission Lines*. The article covers in detail Technical Losses as well as Non-Technical Losses and also gives solutions for reducing these losses.

The article *Efficient Energy Consumption & Economic Growth* suggests a need to navigate the energy transition for sustainable growth in socio-economic aspects of the country. Though the energy consumption per GDP (Gross Domestic Product) is higher, production of valuable goods is quite low in the country which shows that there is a need to improve the end use efficiency.

Technical article *Harmonics in Power System* discusses distribution of the harmonic sources that require close monitoring between OEM & users for making a stringent specification in order to minimize voltage-distortion levels.

Hope you enjoy reading this issue as much as we have in bringing this to you. Please send in your comments and or suggestions to me at miyer@charypublications.in

Mahadevan.

Publisher & Editor-In-Chief

Vol 58. Issue No. 1 • January 2018

Directors
Pravita Iyer
Mahadevan Iyer

Publisher & Editor-In-Chief
Mahadevan Iyer
miyer@charypublications.in

Editorial Department

Associate Editor
Supriya Oundhakar
editorial@charypublications.in

Sub Editor
Dhanya Nagasundaram
edit@charypublications.in

Editorial Co-ordinator
Nafisa Kaisar
nafisa@charypublications.in

Advertising Department

Director Advertisement
Pravita Iyer
pravita@charypublications.in

Advertising Manager
Yasmeen Kazi
yasmeen@electricalindia.in

Advertising Executive
Nafisa Khan
advt@electricalindia.in

Design
Nilesh Nimkar
charydesign@charypublications.in

Subscription Department
Priyanka Alugade
sub@charypublications.in

Accounts Department
Dattakumar Barge
accounts@charypublications.in

Sonali Pugaonkar
mktg@*charypublications.in*

Digital Department
Ronak Parekh
dgmarketing@charypublications.in

Chary Publications Pvt. Ltd.
906, The Corporate Park, Plot 14 & 15,
Sector 18, Vashi, Navi Mumbai 400703
Phone: 022 2777 7170 / 71

Single Issue: ` 100 / Annual Subscription: ` 1000

Printed, Published and owned by Mahadevan Iyer from 906, The Corporate Park, Plot 14 & 15, Sector 18, Vashi, Navi Mumbai 400703 and Printed at Print Tech., C-18, Royal Indl Estate, Naigaum Cross Road, Wadala, Mumbai - 400 031. **Editor: Mahadevan Iyer**

SCOPE

Power Generation to Consumption at home,
Testing & Maintenance is the key.

- HISAC Series, Circuit Breaker Operational Analyser
- SCOT Series, Circuit Breaker Timer
- CRM Series, Contact Resistance Meter
- SA Series, 3rd Harmonic Leakage Current Analyser
- HISAC Series, Circuit Breaker Operational Analyser
- DIR CT, CT Polarity Tester
- Mag D, Step Up Transformer
- CFL Series, Cable Fault Locator

Corporate office
402, Aurus Chambers, Annex - A, S. S. Amrutwar Marg,
Worli, Mumbai 400 013, INDIA,
Phone: +91 22 4344 4244, e-mail: marketing@scopetnm.com, Web: www.scopetnm.com

We are committed to provide
Simple solutions for difficult measurements®

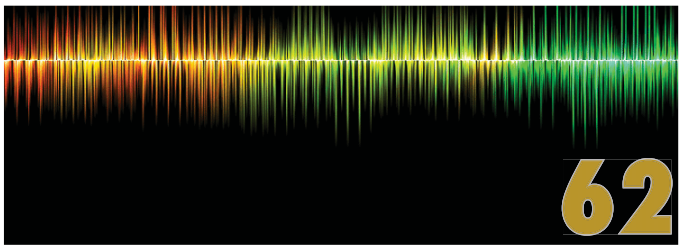
contents

Vol. 58 | No. 1 | January 2018

Losses in Distribution & Transmission Lines

It is fact that the unit of electric energy generated by power station does not match with the units distributed to the consumers. Some percentage of the units is lost in the distribution network. This difference in the generated & distributed units is known astransmission and distribution loss...

ARTICLES



FEATURES

DEPARTMENTS

www.leoni-transportation.com

High-tech cables & systems

for rolling stock applications in tropical and hot climates

Circuit integrity up to
180 minutes

BETAtrans® **GKW**
BETAtrans® **GKW-INX**
BETAtrans® **GKW FE180**

Intrinsic fire proof and fire survival cables

- Irradiation cross-linked
- Flame-retardant
- Halogen-free
- EN 50200
- BS 6387
- IEC 60331
- EN 45545
- PN-K-02511
- UIC 564-2
- GOST 31565
- GOST R 54965-2012
- NFPA-130:2010
- RDSO ELRS-0019 rev.2

LEONI

Business Unit Transportation · leoni-cables-india@leoni.com

BHEL bags EPC contract for 1,320 MW Supercritical TPP

Against stiff International Competition Bidding (ICB), Bharat Heavy Electricals Limited (BHEL) has won an order for setting up a 1,320 MW Supercritical Thermal Power Project (TPP) in Tamil Nadu.

Valued at over Rs.7,300 Crore, the order for setting up the 2x660 MW Udangudi TPP has been placed on BHEL by Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO).

Significantly, this is the fourth order for supercritical sets finalised in the last three years by TANGEDCO, and all the four orders have been won by BHEL. The previous three orders viz 2x660 MW Ennore SEZ, 1x800 MW North Chennai Supercritical TPP Stage-III and 2x800 MW Uppur TPP were also secured by BHEL on ICB basis, reinforcing its position as the frontrunner in the power generation equipment industry in India.

Located at Udangudi in Thoothukudi district of Tamil Nadu, the greenfield project will be executed by BHEL on Engineering, Procurement, Construction (EPC) basis. BHEL's scope of work in the current contract involves design, engineering, manufacture, supply, erection, commissioning and civil works for the entire plant including sea water intake & outfall systems.The implementation of the new projects will help foster growth in Tamil Nadu and provide easy access to electricity to the people of the state.

Energy Efficiency initiatives implemented by EESL help India

Energy efficiency initiatives being implemented by Energy Efficiency Services Limited (EESL) have cumulatively led to energy savings of over 3,700 crore kWh and a reduction of 3 crore tonnes of greenhouse gas (GHG) emissions. The World Bank President Jim Yong Kim, at the One Planet Summit in Paris, singled out the work done by EESL in the space of Energy Efficiency and called out EESL as a Star Performer.


Saurabh Kumar

He highlighted that through the concentrated efforts of the government to push energy efficiency, the expansion of LED bulbs and tubelights will have, by mid-2019, saved up to 20 GW of electricity capacity, that would otherwise have been generated from coal.

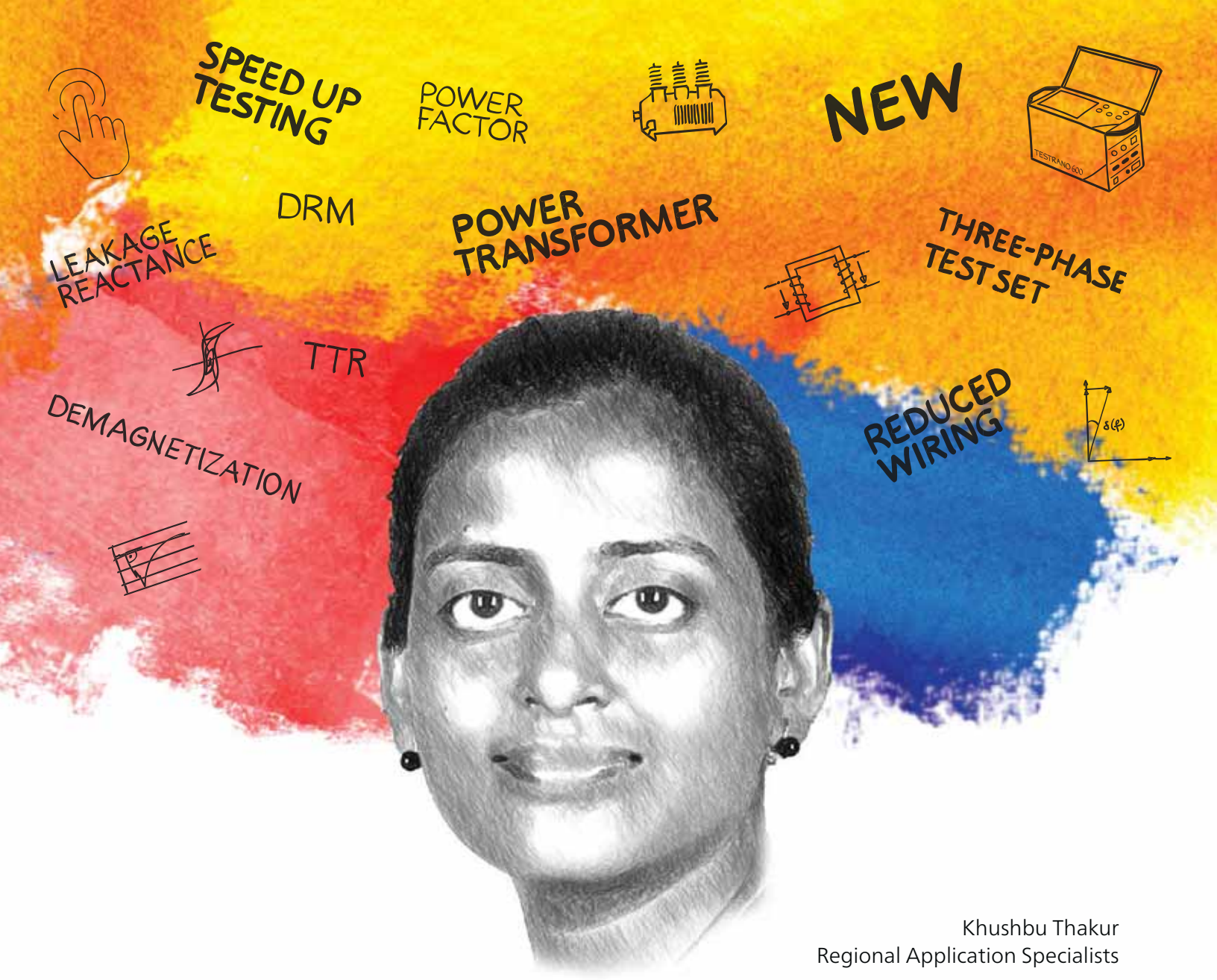
Saurabh Kumar, Managing Director, EESL, said, "EESL's business model has incentives for all stakeholders and deliver outcomes in a time bound manner to enable more. It has the power to unlock demand in sectors, where none existed and therefore EESL is able to drive large-scale initiatives to create market for disruptive solutions."

ISA becomes a Treaty-based International Intergovernmental organisation

In terms of its Framework Agreement, with ratification by Guinea as the 15th country on 6th November 2017, the International Solar Alliance (ISA) became a treaty-based international intergovernmental organisation on 6th December 2017. The ISA, headquartered in India, has its Secretariat located in the campus of National Institute of Solar Energy, Gwalpahari, Gurgaon, Haryana.The ISA is an Indian initiative, jointly launched by the Prime Minister of India,

Narendra Modi and the President of France on 30th November 2015 in Paris, on the sidelines of COP-21, the UN Climate Conference. It aims at addressing obstacles to deployment at scale of solar energy through better harmonisation and aggregation of demand from solar rich countries lying fully or partially between the Tropic of Cancer and Tropic of Capricorn.

As of date, 46 countries have signed and 19 countries have ratified the Framework Agreement of ISA.



Khushbu Thakur
Regional Application Specialists

Quicker and easier transformer testing than ever before …

… was our vision for our new powerful and lightweight test set.
TESTRANO 600 is the world's first portable, three-phase test system which supports all of the common electrical tests done on power transformers.

With just one setup for multiple tests, **TESTRANO 600** significantly reduces the wiring effort and testing time. Its specially designed power amplifiers ensure a new level of accuracy. And the multi-touch color display enables smart and comfortable operation.

www.omicronenergy.com/newTESTRANO600

Visit us at ELECRAMA 2018, March 10-14, Hall H1, Stall H1B28

OMICRON

Smart EV charging station at New Delhi powered by NTPC

A smart EV charger of Fortum India has been installed at SCOPE Complex, New Delhi. The charger will be powered by electricity from NTPC Ltd., the largest power generator of the country. The charger has ability to recognize authorized users based on RFID technology. Fortum India is a wholly owned subsidiary of Fortum Oyj, a clean energy company in the Nordics has.

The charger was inaugurated by A K Gupta, Director (Commercial & Operations), NTPC Ltd. During the launch, he shared, "Today, the energy landscape in India is undergoing a major shift towards cleaner means of energy generation and consumption. e-Mobility paves the road ahead with great impact on cleaner cities and reduce fuel imports as well. Keeping this in mind, we are in the process of exploring possible ways to put up charging stations across all NTPC stations and also in discussion with a few states." Fortum intends to work together with NTPC .

PM of India dedicates 60 MW Tuitial HEPP in Mizoram

Prime Minister of India, Narendra Modi, in the august presence of Hon'ble Governor of Mizoram, Lt Gen.(Retd.) Nirbhay Sharma; Chief Minister of Mizoram, Lal Thanhawla; Minister of State (IC) for Development of North Eastern Region (DoNER); Prime Minister Office, Personnel, Public Grievances and Pensions, Department of Atomic Energy and Department of Space, Dr. Jitendra Singh and Minister of State (IC) for Power and New & Renewable Energy, R.K. Singh, formally dedicated the 60 MW Tuirial Hydro Electric Power Project (HEPP) to the Nation.

The Tuitial HEPP has been constructed as a Central Sector Project and implemented by North Eastern Electric Power Corporation (NEEPCO), under the administrative control of the Ministry of Power, GoI.

The Cabinet Committee on Economic Affairs (CCEA) cleared the Project for implementation in July 1998 with commissioning scheduled in July 2006. After completion of about 30% of the project activities, the works were totally suspended w.e.f. June 2004 due to local agitation. With sustained efforts by NEEPCO and with active support of Ministry of Power and Ministry of DoNER, GoI and Government of Mizoram, the stalled works of the project were resumed in January 2011.

15,183 villages electrified in the country

Minister of State (IC) for Power and New & Renewable Energy, Raj Kumar Singh (R. K. Singh), in a written reply to a question in Rajya Sabha recently, informed that as on 1st April, 2015, there were 18,452 un-electrified villages in the country and as on 30th November, 2017, 15,183 villages have been electrified and 1052 villages have been found un-inhabited. All un-electrified villages are targeted for electrification by 1st May, 2018.

R.K. Singh

Singh informed that as reported by the States/UTs, 14,528 villages have been electrified during the last three years i.e. 2014-15 to 2016-17. Further, a subsidy of Rs. 15,840 crores has been released under DDUGJY across the country during the last three years i.e. 2014-15 to 2016-17. The Minister also stated that based on the information furnished by the States/ UTs, free electricity connections to 44.41 lakh BPL households have been released under DDUGJY across the country during the last three years. Electricity is a concurrent subject and distribution of electricity to consumers including poor villagers is primarily the responsibility of the respective State Government/ Distribution utility.

riello ups

Reliable Power for a Sustainable World.

Riello UPS win *New Product Innovation Award 2015* FROST & SULLIVAN

Global Leaders in Uninterruptible Power Supply Systems

Riello: 1st European manufacturer to rate its product for Eco-Energy Level efficiency

- Riello is one of largest manufacturer of UPS System
- Complete range from 1kVA - 6400 kVA
- Riello Power India has delivered over 10000 successful installations in India & Indian subcontinent
- Technical Support Team at your service 365 days 24 x 7
- PAN India presence with offices in all major cities

When it comes to expertise in Uninterrupted Power supplies Riello Power India has it all

- IGBT Rectifier / IGBT Inverter with built in glavanic isolation transformer
- Advanced Battery Management
- Very Low Total Harmonic Distortion (THDi < 3%)
- High Input Power Factor > 0.99
- High Output 0.9 (High Watt)
- Overall efficiency upto 95%

Riello Power India Pvt. Ltd.
(A 100% Subsidiary of RPS S.p.A., Italy. Formerly known as Riello PCI India Pvt. Ltd.)

318, 3rd Floor, Time Tower, MG Road, Gurgaon, Haryana – 122002
Tel: +91-124-4727134 • Mob:07838552211 • Email: ups@riello-power.com • Web: www.riello-ups.in

ABB receives order from Emami Cement

ABB India has received an order for an automation and electricial system for a 2 MPTA greenfield plant in Odisha by Emami Cement, the flagship company of the Kolkata-based Emami Group. Emami is setting up advanced and energy-efficient cement plants to meet the future demand of cement coming out of steadily rising infrastructure spend in the country. The solution implemented will minimise energy consumption and enhance the overall plant performance helping the plant support infrastructure growth in the region.

ABB will be undertaking complete project implementation including supply, erection, testing and commissioning for the electrical distribution and distributed control system (DCS). The 800xA DCS will help monitor, control and optimise the cement manufacturing process while maximising plant uptime. The electrical distribution system inlcudes 220 kV switchyard with 20/25 MVA 220kV/11kV Transformer, 11 kV Board, Intelligent Motor Control Centre, Distribution transformer, medium- and low-voltage capacitors and allied accessories.

L&T commissions Power Plant in Bangladesh

Shailendra Roy

Larsen & Toubro Limited (L&T) has successfully commissioned and handed over the state-of-the-art 225 MW Sikalbaha Combined Cycle Power Plant to Bangladesh Power Development Board (BPDB) for commercial operation. This power plant, located near the port city of Chittagong in southeastern Bangladesh, has been inaugurated on December 10, 2017 by the Hon'ble Prime Minister of Bangladesh Sheikh Hasina Wazed.

L&T's scope of work included design, engineering, supply, installation and commissioning of the complete power plant on a turnkey basis, with Gas Turbines, Steam Turbine and Generators from Siemens AG, Germany. Work on the Sikalbaha project had started in April 2015 and the power plant was partly commissioned in Open Cycle in May 2017.

Shailendra Roy, CEO & Managing Director–L&T Power & Whole-Time Director–L&T, said, "We are proud to be associated with Bangladesh authorities for the power project. Their thorough professionalism ensured that the project smoothly got off the ground."

Rays Future Energy executes 60 MW of capacity in Karnataka

Ketan Mehta

Rays Future Energy, a subsidiary of Rays Power Infra, is executing 60MW of capacity under open access systems in Karnataka, which will be completed by the end of the current fiscal year. The company has identified over 50 highly-rated private commercial and industrial consumers to whom this energy will be offered, providing them access to power at reduced costs sourced from solar parks being developed by the company, one of India's leading solar EPCs. The Indian solar sector witnessed rapid capacity addition in the last two years due to favourable policy environment & public sector help.

Ketan Mehta, CEO, Rays Power Infra Pvt. Ltd., said, "The open access model is perfect for regions like Karnataka, where the grid is robust, the demand for power is high, and there is going to be substantial demand for energy that will continue to increase. Open access becomes a win-win business model for all stakeholders as private consumers get cheaper power, thereby boosting their productivity and competitiveness, developers get returns on their investments, and it also contributes to the government's solar mission of having 100 GW of solar power capacity by 2022."


GreatWhite®
THE FUTURE OF BRIGHT
HAR
DESIGN
MEIN
WOW
Add a futuristic look to your living spaces with beautifully designed titanium color switches & accessories. Experience our elegant accented switches, perfectly encapsulated in a flawless glass plate - adorned with a stylish chrome bezel. Sure to make you go wow.
myrah®
IMAGINATION UNLIMITED
www.myanchor.in

Siemens to manufacture new generation of PV inverters in India

Siemens India launched with Sinacon PV a new generation of photovoltaic (PV) central inverters with an output up to 5,000 kVA. The inverter is part of the Siemens new electrical Balance of Plant (eBoP) solution for PV power plant installations.

The state-of-the-art Sinacon PV inverter will be locally produced and manufactured at Siemens' Kalwa plant near Mumbai for the domestic market as well as for export into the region. The Indian renewable energy sector is the second most attractive renewable energy market in the world Crossing 14 GW of already installed solar capacity, the Government is firm on its ambition of 100 GW of installed solar generation by 2022. A solar PV inverter converts the variable direct current (DC) output of a photovoltaic solar panel into a utility frequency alternating current (AC) that can be fed into a commercial electrical grid or used by a local , off-grid electrical network.

Harald Griem, Executive Vice-President and Head of Energy Management, Siemens Ltd, said, "Siemens is committed to partner the Government in its endeavour to increased use of clean energy sources. The National Solar Mission of the Government aims to establish India as a global leader in solar energy. Siemens aspires to contribute to this with local value-addition in line with Make in India."

Suzlon receives wind power project order from a Global Utility

The Suzlon Group is one of the leading renewable energy solutions providers in the world with an international presence across 18 countries in Asia, Australia, Europe, Africa and North and South America. With over two decades of operational track record, the Group has a cumulative installation of approximately 17 GW of wind energy capacity, over 8,200 employees with diverse nationalities and world-class manufacturing facilities.


J. P. Chalasani

A leading Global Utility has awarded a wind power project of 252 MW to Suzlon Group. This project is won by the Utility through SECI II auction held recently. J.P. Chalasani, Group CEO, Suzlon Group, said, "We are glad to partner with the leading Global Utility yet again for their SECI II bid project. We are encouraged by the trust and confidence demonstrated by them in Suzlon's technologically advanced products. Our strategy of having initial tie-ups is clearly paying off. With the introduction of the bidding regime, the industry is poised to grow to 8-10 GW annually. With our over two decades of experience, proven technologies, comprehensive product portfolio, and end-to-end solutions along with integrated maintenance and services, Suzlon is best positioned to cater to demand growth and maintain our leadership."

Tata Power strives to make local communities ODF

Tata Power, India's well known integrated power company, has always been at the forefront of improving the quality of healthcare and standard of living of the communities living in and around its areas of operations. In line with this philosophy, Tata Power's Community Development Trust (TPCDT) in Haldia worked with the local government bodies to build toilets for the communities, thereby, making the surrounding villages Open Defecation Free (ODF).

The objective of this initiative was to promote the use of toilets and put a halt on the practice of open defecation, thereby, sensitising the community on various health and hygiene related issues caused due to sheer negligence on the matter. While support for construction toilets came from Government subsidies, the TPCDT team raised mass awareness around the need for toilets and overall wellbeing through intervention programs, home visits, and SHG sensitisation programs. Khanpur is one such village where 90% people go for open defecation, and where the TPCDT team worked with the different stakeholders viz village panchayat, teachers, SHG members, etc.

FIND THE PROBLEM...

BEFORE THE PROBLEM FINDS YOU.

- Thermal Cameras
- Clamp Meters
- Multimeters
- Non-Contact Voltage Detector
- Moisture Meters
- Flex Clamps

The Original IGM™

INFRARED GUIDED MEASUREMENT

Images for illustrative purposes only.

For more details call us on: +91-11-4560 3555 or write to us at flirindia@flir.com.hk

FLIR Systems India Pvt. Ltd.

1111, D Mall, Netaji Subhash Place, Pitampura, New Delhi – 110034 | Fax: +91-11-4721 2006

WWW.FLIR.IN

FLIR®

Renewable Energy Investment across India Gets US$ 400 Million Boost

Expansion of renewable energy power generation across India will be supported by a new US$ 400 million joint initiative backed by the European Investment Bank and YES BANK, India's 5th largest private sector bank. YES BANK will manage the new co-financing programme for construction of new solar power plants and wind farms across the country.


Rana Kapoor

The new US$ 400 million private sector renewable energy financing programme was announced in New Delhi by Donal Cannon, Head of the European Investment Bank Representation to South Asia and Arun Agrawal, Group President, International Banking, YES BANK.

Rana Kapoor, Managing Director & CEO, YES BANK, said, "The new cooperation between YES BANK and the European Investment Bank, demonstrates another milestone in our leadership as India's pre-eminent 'Green Bank'. The highly successful transaction showcases continued trust and enthusiasm of Global multilaterals and Finance Institutions in partnering with YES BANK. With this transaction we remain well on track to achieve our commitment to finance 5,000 MW of RE made at the 1st RE-INVEST Summit in Feb 2015."

GE Power's LMS100 Gas Turbine to support grid stability in South Asia

GE Power revealed that it has been selected by the Jiangsu Etern Company Limited to supply its LMS100 gas turbine for an upcoming 100 (±10) megawatt (MW) simple cycle natural gas-based power plant located in the city of Shahjibazar in Bangladesh. The order, worth multi-million USD, includes supplying the gas turbine equipment and providing related services for installation, testing and commissioning. The project is expected to be commissioned in the second quarter of 2019.

The LMS100 is among GE's high-efficiency aeroderivative gas turbines ideally suited to meet fluctuating grid conditions due to their heightened flexibility and helping to provide a high degree of stability to the grid.

The embedded dual-fuel capability gives additional flexibility to the gas turbine, enabling it to operate on both natural gas and LPG with zero fuel transition cost. GE's LMS100 technology is apt for the power plants currently running on Heavy Fuel Oil (HFO) or Diesel in South Asian countries of India, Bangladesh and Sri Lanka.

JinkoSolar supplied solar modules to Armenia's largest solar PV plant

JinkoSolar, a well known leader in the photovoltaic (PV) industry, revealed that it supplied polycrystalline photovoltaic panels to the first solar power plant in Armenia. The opening ceremony took place earlier in November in the city of Talin. Due to its scale, this project is of significant importance to the Armenian solar, ecology, and economic development sectors.

The opening ceremony was well-attended by various leaders in Armenia, including, but not limited to, Prime Minister, Karen Karapetyan; Minister of Territorial Administration and Development, Davit Loqyan ; Deputy Minister of Energy Infrastructures and Natural Resources Hayk Harutyunyan.

Deputy Ambassador of German Federal Republic to Armenia Klaus Wendelberger, and General Secretary of the Energy Charter Secretariat Urban Rusnák.

Approximately 3700 JinkoSolar's high efficiency polycrystalline photovoltaic panels were installed in this 1MW solar power plant and will operate there throughout the 25 year product lifespan. Arpi Solar, which designed the project and implemented the construction, cooperated with its leading international partners such as JinkoSolar, Staubli, Enerparc, Sungrow, which guarantees long-term and productive revenues for the next 25 years.

HAVELLS

Install Havells APFC Panel & save money by reducing KVAH

Cutting-edge industrial products from Havells

ELECRAMA
we are all about electricity

Visit stall H2A19 & Hall – 2
March 10 - 14, 2018
India Expo Mart, Greater Noida.

Why pay more due to low Power Factor?

Is there still a difference in KVAH and KWH in your Electricity Bill due to low Power Factor?

Features

- Manufactured with highly precise modern **Amada CNC Machine**
- **11 Tank Process** for corrosion proof powder coating
- Ergonomic, compact and robust design
- Designed with **100% Copper Conductor**
- **Heavy Duty Power Capacitor** for long life
- **Advance C-MOS Technology** based micro processor for intelligent power factor control
- **Air Core Reactor** for extra safety from inrush current
- Provision of top and bottom cable entry
- Automatic temp. control through fans and louvers in panel
- Double side earthing connection

www.havells.com
marketing@havells.com

/havells
/havellsindia
/havellsindia
/havells__india

ON SITE SERVICE Within 24 hours

HAVELLS CONNECT

Toll Free No.: 1800 11 0303 (Toll Free), 011-4166 0303 (Landline), 1800 103 1313 (All Connections).
For dealer interested in opening new Havells Galaxy Store, please e-mail at: galaxy@havells.com

*Conditions apply.

Sterlite Power wins the largest project in Brazil Transmission Auction

Sterlite Power participated in the transmission auction held by the Brazilian Government last Friday, and won the largest lot of the auction of ~ US $ 800 million. The 1800 km transmission project represented one-third of the total auction value, which had global majors such as State Grid of China, Engie and Elecnor in the fray. The bid of Sterlite had a discount of 35.72% over the proposed maximum annual revenue and was one of the lowest discounts of the auction, which had an average discount of 40.46%. Sterlite had won two projects in the earlier auction in April 2017.


Pravin Agarwal

Pravin Agarwal, Chairman, Sterlite Power, said, "Sterlite has demonstrated its international competitiveness by winning the largest lot on offer in the auction. We are committed to building a global transmission company by focusing on talent, technology and innovation"

The project won by Sterlite will be executed in north of Brazil, in the states of Pará and Tocantins, with more than 1800 km of transmission lines.

Wärtsilä to increase the share of renewables in Jordan

The technology group Wärtsilä recently has signed an EPC contract to supply a 52 MWp solar photovoltaic (PV) power plant to AM Solar BV/ Jordan, a joint venture between energy provider AES Jordan and Japanese conglomerate Mitsui & Co., Ltd. The order was booked in November 2017.

This is the first Utility Scale PV Solar Plant signed by Wärtsilä globally. NEPCO (National Electrical Power Company) is the offtaker of the solar plant and will be responsible for constructing the interconnection facilities. Wärtsilä's scope is full EPC (Engineering Procurement and Construction/ Commissioning) and the PV plant will be connected to a 132kV Grid.

The construction of the new plant is expected to start in June 2018 and the Commercial Operation is expected to take place in July 2019.

Pekka Tolonen, Director, Solar at Wärtsilä Energy Solutions, commented, "We expect rapid growth in the use of solar energy, and we are excited to be contributing to a cleaner environment with our solar PV power plant solutions. Wärtsilä's global capabilities in delivering turnkey power plants, our extensive sales and service network."

World Bank supports Togo's Power Sector

The World Bank today approved a $35 million (about FCFA20 billion) International Development Association (IDA) credit to support the country's investments in the energy sector.


Pierre Laporte

The newly approved Togo Energy Sector Support and Investment Project (TESSIP) will help improve the operational performance of the power sector and increase access to electricity in the capital city, Lomé. It will benefit over 80,000 people and small businesses in the urban and peri-urban areas of Lomé who will receive additional daily hours of electricity and a better voltage of electrical current that will enable adequate running of their electrical equipment.

Pierre Laporte, World Bank Country Director for Togo, said, "TESSIP will help Togo in reaching its goals of increasing access to reliable and competitively priced electricity, which is essential for business development, job creation, income generation and international competitiveness. Moreover, it will help create an environment likely to ensure the financial viability of the energy sector so that the private sector can engage in power generation and along the entire value chain."

HAVELLS

“Switch to intelligent protection with HAVELLS Microprocessor based release ACB”

Cutting-edge industrial products from Havells

ELECRAMA
we are all about electricity

Visit stall H2A19 & Hall – 2
March 10 - 14, 2018
India Expo Mart, Greater Noida.

Presenting Titania ACBs, designed keeping in mind the present day complex requirement of electrical systems which makes it essential to have a reliable product that ensures un-interrupted service, meeting all the stress that the system encounters.

C^3 Technology: Common height, common depth and common door cutout facility with common accessories for entire range.

Ref. Standard: IS / IEC 60947-2
Range: 630A - 4000A
No. of Frames: 3
Execution: 3P & 4P
Breaking Capacity: 50/65/75/100kA
Version: Fixed / Drawout
Operation: Manual / Electrical

Features: Circuit Breaker
- Icu=Ics=Icw (1Sec.)
- First frame size up to 2000A
- Common height, depth and panel door cutout
- Plug in type, common front accessible accessories
- Easily replaceable arcing contacts

Features: Microprocessor Release
- LSI / LSIG, LCD display optional
- Fault history record & display
- Breaker terminal temperature display per phase
- Metering : V, I, PF, Hz, kVA, kWh & Max demand
- Alarm functions : Under voltage, over voltage & pre-trip at 80%.
- Password protected
- Fault indication LED
- Communication through RS-485

www.havells.com
marketing@havells.com

/havells
/havellsindia
/havellsindia
/havells__india

ON SITE SERVICE Within 24 hours

HAVELLS CONNECT

Toll Free No.: 1800 11 0303 (Toll Free), 011-4166 0303 (Landline), 1800 103 1313 (All Connections).
For dealer interested in opening new Havells Galaxy Store, please e-mail at: galaxy@havells.com

*Conditions apply.

Dr. Cris Eugster appointed Co-Chair of PREPA'S TAC


Dr. Cris Eugster

The Puerto Rico Electric Power Authority (PREPA) revealed that CPS Energy's Chief Operating Officer Dr. Cris Eugster has been appointed co-chair of the Transformation Advisory Council (TAC).

The TAC was formed to provide guidance to PREPA's Governing Board and management team on the development of a long-term vision and transformation execution plan for the power system in Puerto Rico.

"I am honoured by the appointment and excited to represent CPS Energy and San Antonio in helping Puerto Rico achieve a sustainable future," said CPS Energy's Chief Operating Officer Dr. Cris Eugster. "The Transformation Advisory Council members bring a broad range of expertise, and I am confident that together, we will guide critical decisions that will help rebuild and transform Puerto Rico's electric system," he added.

The Council will be comprised of 11 executive leaders from the public power and investor owned utility sector and from select non-governmental organisations. The founding members will provide advice and share knowledge.

Computer scientist Randy Katz named vice chancellor for research


Randy Katz

Randy Howard Katz, who helped develop many of the wireless tools and fast, reliable computer storage we take for granted today, has been appointed vice chancellor for research at UC Berkeley.

Katz, the United Microelectronics Corporation Distinguished Professor in the Department of Electrical Engineering and Computer Sciences, will assume the position Jan. 1, 2018. He will take over from G. Steven Martin, who has served as interim vice chancellor since Paul Alivisatos was appointed executive vice chancellor and provost in July.

A 1980 Ph.D. graduate of UC Berkeley who joined the faculty in 1983, Katz is well known in the computer industry for his development of RAID computer storage systems in the 1980s with professor emeritus David Patterson and then-graduate student Garth Gibson.

He is also known as the scientist who brought the nascent internet to the White House. In the 1990s, he set up the email accounts of former President Bill Clinton and Vice President Al Gore and built the original whitehouse.gov site.

Shantenu Jha named Chair of Brookhaven Lab's Center


Shantenu Jha

Computational scientist Shantenu Jha has been named the inaugural chair of the Center for Data-Driven Discovery (C3D) at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory, effective October 1. Part of the Computational Science Initiative (CSI), C3D is driving the integration of domain, computational, and data science expertise across Brookhaven Lab's science programs and facilities, with the goal of accelerating and expanding scientific discovery.

Outside the Lab, C3D is serving as a focal point for the recruitment of future data scientists and collaboration with other institutions.

Jha holds a joint appointment with Rutgers University, where he is an associate professor in the Department of Electrical and Computer Engineering and principal investigator of the Research in Advanced Distributed Cyberinfrastructure and Applications Laboratory (RADICAL). He also leads a project called RADICAL-Cybertools, which are a suite of building blocks enabling the middleware (software layer between the computing platform and application programs) .

HAVELLS

More power and less energy consumption with Havells IE2 & IE3 motors

Cutting-edge industrial products from Havells

ELECRAMA
we are all about electricity

Visit stall H2A19 & Hall – 2
March 10 - 14, 2018
India Expo Mart, Greater Noida.

IE2 and IE3 Motors are equipped with AEG Technology ranging from 0.12 HP to 470 HP, that are accepted worldwide for utilising energy efficiently. So your savings are generated automatically.

Features:

- All Aluminum Motors come with multi-mount construction and easy change of terminal box position (up to 160 frames)
- 6 Lead Terminal Box • Suitable for standard VFD drives • Low weight-to-output ratio • Better heat dissipation
- Cast iron motors from frame 80 to 355 with good aesthetics and surface finish

Wide range of Motors

Smoke Extraction Motor | Foot Mounted Motor | Flange Motor | Foot cum Flange Motor | Crane Duty Motor | Inverter Duty Motor | Brake Duty Motor

Prima Series
CE IE2 IE3
HAVELLS-LAFERT MOTORS

www.havells.com
marketing@havells.com

/havells
/havellsindia
/havellsindia
/havells__india

ON SITE SERVICE within 24 hours*

HAVELLS CONNECT

Toll Free No.: 1800 11 0303 (Toll Free), 011-4166 0303 (Landline), 1800 103 1313 (All Connections).
For dealer interested in opening new Havells Galaxy Store, please e-mail at: galaxy@havells.com

*Conditions apply.

MYSUN's Marketing Head conferred with a title

Arpit Verma, who leads Marketing and Product Development at Solar Solutions and Technology firm MYSUN, was cited as one of India's 'Most Influential Marketing Leaders' by the World Marketing Congress. The recognition comes from Arpit's contribution to MYSUN's incredible growth story, which has made it India's leading online rooftop solar platform. Arpit was felicitated at the 4th edition of the World Marketing Congress, held at Taj Lands End, Mumbai, on the 24th and 25th of November, 2017.

Arpit Verma

The conference, entitled 'Purposeful Purpose', focused on purposeful marketing, i.e, the use of marketing to promote commerce of a higher purpose, including sustainable development that caters to the needs of the environment. Arpit has been instrumental in helping MYSUN make significant strides towards a sustainable tomorrow through the use of its web platform and mobile apps which seeks to educate customers about the benefits of using rooftop solar power as well as make their solar journey easier.

Racold wins Most Energy Efficient Appliance of the Year

Racold, India's largest provider of water heating solutions has been conferred the 'Most Energy Efficient Appliance of the Year' award in the storage water heater category. It is the only brand in the category to receive this award.

The prestigious award by Bureau of Energy Efficiency was presented to Racold's Head of Research and Development, Abhijit Banshelkikar by the Hon'ble Minister of State (I/C) for Power and New & Renewable Energy, R. K. Singh with the chief guest as Hon'ble President of India, Ram Nath Kovind at a glittering ceremony in Delhi.

The Bureau of Energy Efficiency, Ministry of Power felicitated the winners out of 322 energy efficient companies from select sectors across India. This is the 8th consecutive BEE win for Racold with the first BEE award being conferred in 2010.

Vikram Solar awarded Gold Certificate

Vikram Solar, a well known solar energy solutions provider was awarded with the 'Gold Certificate of Merit' for its Kolkata (Falta) based facility by Frost & Sullivan & FICCI's India Manufacturing Excellence Awards 2017. The award ceremony was held in Mumbai.

The India Manufacturing Excellence Awards is seen as a pragmatic approach towards identifying opportunities for improvement within the organisation. The assessment team identifies the current standing of the facility through software and the resultant charts capture.

Ivan Saha

Ivan Saha, CTO and BU Head- Solar Manufacturing, Vikram Solar, said, "It gives us immense happiness and pride to have won this prestigious award. Each of such recognition reminds us of the phenomenal work and effort that the team puts everyday as this would not have been possible without the collective inputs. India is at the helm of the Solar Power revolution, and we feel that it is our responsibility and duty to keep growing and performing at the present remarkable rate to achieve the goals set by the Government."

TURBINOL

A revolution for a life time

HP Turbinol Grades have revolutionized the power generation industry. Consistent performance, impeccable quality and hassle-free operations make them a popular choice across all categories. They are premium quality turbine oils made from Group II Base Stocks having excellent oxidation and chemical stability. These properties are further enhanced with incorporation of carefully selected antioxidants, rust inhibitors and anti-foam agents. Excellent demulsibility and quick release of entrained air make it a long service oil. These turbine oils ensure flawless operations and coupled with a team of skilled HP Technical Service Engineers surely make it a revolution that will last for the years to come.

POWER TO PERFORM

HP

LUBRICANTS

PREMIUM TURBINOL OILS

For Details Log on to: www.hindustanpetroleum.com | Email: lubescare@hpcl.in
Toll Free: 1800 120 4725 / 1800 121 4725 | Phone: +91 22 23030000
Follow us on : www.facebook.com/hplubricantsfromhindustanpetroleum

स्वच्छ भारत एक भारत स्वच्छता की ओर | पहल | #GiveItUp | उज्ज्वला | PAHAL DBT | SANKALP SE SIDDHI

INDUSTRY KNOWS, WHAT THEY WANT

We know, what the industry wants.....

For all your promotional and branding needs we have the best platform

LOOK NO FURTHER

"**We** will help you **promote your products** and services in the most effective manner."

HURRY! Don't loose time. Just keep your branding needs ready and come to us.

Apart from print we also have the digital platform for you to explore.

CONTACT THE AD DEPARTMENT
022 2777 7170
022 2777 7196
022 2777 7180
info@charypublications.in
yasmeen@electricalindia.in

Since 1961

Electrical India

India's oldest magazine on power and electrical products industry

www.electricalindia.in

INVITING ELECTRICAL ENGINEERS, CONTRACTORS & CONSULTANTS TO

EXPLORE INNOVATION & TECHNOLOGY IN HVACR

Special attraction:

Brana

Fully functional high performance exhibit for a greener tomorrow

COME TO

ACREX India 2018

SOUTH ASIA'S LARGEST EXHIBITION ON REFRIGERATION & COLD CHAIN, AIR CONDITIONING, VENTILATION AND INTELLIGENT BUILDINGS

a member of BUILD FAIR ALLIANCE
Integrated Building Solutions

22 - 24 FEBRUARY 2018

Venue: **Bangalore International Exhibition Centre (BIEC)**
India's first "LEED Certified" Green Exhibition & Conference Facility

- Build Fair Alliance (BFA) - Integrated Building Solutions under one roof
- More than 600 exhibitors & 50,000 visitors
- Participation from more than 30 countries
- Country Pavilions from Germany, Italy, Korea, China, USA
- An International Congregation of top Architects, Developers, Consultants, HVACR Professionals & Contractors
- Interactive workshops & seminars

DEDICATED PAVILIONS:
Refrigeration & Cold Chain and Building Automation

Curtain Raiser & aQuest Partner: HITACHI

Partner in Excellence: DAIKIN

ACREX Hall of Fame Partner: Danfoss (ENGINEERING TOMORROW)

Knowledge Partner: VOLTAS LIMITED, A TATA Enterprise

Titanium Partner: BLUE STAR

Gold Partners: ABS, COSMOS Air Distribution Products, GANDHI Automations Pvt Ltd

Mobile App Partner: edgetech

Theme & BMS Partner: eneffen

Hospitality Partner: SAMSUNG

Social Media Connectivity Partner: LG Life's Good

Silver Partners: AHRI CERTIFIED, KELLEY, FRANKLIN

Digital Connectivity Partner: EMERSON

Building Automation Partners: DELTA, MESSUNG

IAQ Pavilion Partner: aeropure

Refrigeration Partner: RINAC

Bronze Partners: ADVANCE VALVES, AIP AEROFLEX, armacell, CARYAIRE NICOTRA Gebhardt, frascold, HUMIDIN, CASILICA, Be sure., systemair, Zamil Air Conditioners

Show Daily Partner: CRYSTAL

For more information, contact:
NürnbergMesse India Pvt. Ltd.
T: +91-11-47168829/31
E: mansi.chawla@nm-india.com
mehak.mamtani@nm-india.com

Organiser: ISHRAE

Event Producer: NÜRNBERG MESSE

Endorsed By: ASHRAE

O2C Supported By: UN environment

DOWNLOAD THE ACREX INDIA 2018 APP FROM THE IOS / ANDROID PLAYSTORE

www.acrex.in

Smart Meters Market worth 19.98 Billion USD by 2022

The global market is witnessing a significant growth, which is driven by government policies, energy conservation, increasing smart grid deployment, and utilities urge to enhance distribution efficiency...

The smart meters market is expected to grow from an estimated USD 12.79 billion in 2017 to USD 19.98 billion by 2022, registering a CAGR of 9.34% from 2017 to 2022. The global market is witnessing a significant growth, which is driven by government policies, energy conservation, increasing smart grid deployment, and utilities urge to enhance distribution efficiency.

Residential – the largest smart meters market by application

The smart meters market has been classified based on application, into three segments, namely, residential, commercial, and industrial. The residential segment accounted for the largest market size, in terms of value, in 2016. The meters measure the electricity, water, and gas consumption and communicate this to the central utility system. The installations of these devices in the residential sector helps in reducing CO2 emissions globally as the consumer's inclination towards peak time savings of energy would increase. The increasing residential construction activities and government mandates such as the European Union 20-20-20 policy, which aims to convert 80% of the installed meter base to smart one, have ensured the growth in the demand for smart meters.

'The AMR technology segment would dominate the global smart meters market'

The Automatic Meter Reading (AMR) segment was estimated to be the largest market for smart meters in 2016. AMR is a metering technology that collects consumption data from the meters and transfers it to a central database (in the utility station) for billing and other purposes (one-way communication only). It is the initially developed smart metering technology and, hence, it has widely been adopted since its inception. North America and Europe are the regions that have much embraced this technology. It is less costly when compared to the Advanced Metering Infrastructure (AMI) and, hence, has a high market size.

North America: The leading market for smart meters

The North American market dominates the smart meters market during the forecast period. In North America, the growth of the smart meters market can be attributed to focus on electricity, water, & gas, monitoring & prevention of leakage, and the repair & upgrade of aging infrastructure. Lot of smart meters rollouts are taking place in countries such as the US, Canada, and Mexico which would impart growth in the North American region.

To provide an in-depth understanding of the competitive landscape, the report includes profiles of some of the leading players in the smart meters market, namely, Itron Inc (US), Kamstrup A/S (Denmark), Holley Metering, Ltd (China), Honeywell International, Inc (US), and Toshiba Corporation (Japan). Leading players are trying to penetrate the markets in developing economies and are adopting various strategies to increase their market share.

hakel®
THE QUEEN OF POWER

ISOLGUARD
insulation monitoring device

HOSPITAL SYSTEMS
HIG95/485

hakel®
THE QUEEN OF POWER

Hakel spol. s.r.o.
Bratri Stefanu 980
500 03 Hradec Kralove Czech Republic
t: + 420 494 942 300
f: + 420 494 942 303
e: info@hakel.cz
w: www.hakel.com

APS

ALLIED POWER SOLUTIONS
(ISO 9001:2008 & UL listed LPS installer)
T - 4, 5 & 6, Third Floor, Pankaj Plaza - 3
I.P. Extn., Patparganj, Delhi - 110 092 (INDIA)
t: +91 11 2224 7322
e: info@alliedpowersolutions.com
w: www.alliedpowersolutions.org
Bengaluru: +91 98869 63195, 98860 08218
Kolkata: +91 83348 95599

Surge
Protection
Device

Insulation
Monitoring
Device

For ungrounded networks www.hakel.com www.isolguard.com

EESL Launches $ 454 mn Project

EESL's projects, under one of the largest funding by GEF till date, will mitigate 60 million tonnes of CO2 equivalent. UN Environment's 'District Energy in Cities' Initiative already identified $600 million of Energy Efficiency projects across five cities in India...

Recognizing India's efforts towards a low emission-economy and focusing on energy efficiency programmes, the Global Environment Facility (GEF) has now partnered with Energy Efficiency Services Limited (EESL), under Ministry of Power, for the project 'Creating and Sustaining Markets for Energy Efficiency'. The project will receive a composite funding of USD 454 million comprised of the GEF grant of $20 million and co-financing of $434 million in the form of loans and equity, including a $200 million loan from the Asian Development Bank (ADB). EESL further proposes Energy Efficiency Revolving Fund (EERF) for sustainable funding mechanism of energy efficiency projects. The EERF mechanism will support the 'proof of concept' investments for the new technologies of super-efficient ceiling fans, tri-generation technologies & smart grid-applications and ultimately scaling up energy efficiency financing and programme development to help cover initial investment costs of identified energy efficiency programmes like street lighting, domestic lighting, five-star rated ceiling fans and agricultural pumps in the country. This unique model will help in addressing the upfront risks of new technologies. Further, the accrued savings from these technologies can then be used to finance additional projects, which would allow capital to revolve as a sustainable funding mechanism.

The GEF project further brings together many technical and financing partners including United Nations Environment (UN Environment), Asian Development Bank (ADB) and Kreditanstalt für Wiederaufbau (KfW) which aims to mitigate 60 million tons of CO_2 eq (carbon dioxide equivalent), that will enable a total direct energy savings of 38.3 million GJ by 2022 and 137.5 million GJ by 2032.

Ajay Kumar Bhalla, Secretary, Ministry of Power, said that currently around two-thirds of total power generation capacity in India is based on fossil fuels. By 2030, India is committed to achieve 40% of the installed capacity based on clean energy sources. To achieve this target, it is imperative to create awareness in the citizens, especially, among youth, to encourage energy efficiency measures like use of electric vehicles, energy efficient building codes etc, he added.

Anil Kumar Jain, Additional Secretary Ministry of Environment, Forests and Climate Change, said that the overall size of energy efficiency market in India is estimated to be $23 billion. Initiatives like these seek to tap that market by implementing an innovative business model that is scalable, flexible, embraces different and emerging technologies.

Naoko Ishii, Chairperson and CEO, GEF said that with the strong leadership of EESL and the Government of India, the penetration of these clean energy technologies will help India leapfrog to a more sustainable future. Kenichi Yokoyama, Country Director of India Resident Mission of ADB, said that ADB will partner EESL to implement energy efficiency projects in India to facilitate sustainable growth by addressing climate change issues, boosting the economy and generating employment in the country.

Geordie Codville of the UN Environment said that the project is aimed at scaling up energy efficiency efforts to achieve India's Intended Nationally Determined Contribution (INDC) goals and ultimately the UN Sustainable Development Goals (SDGs). EESL also has its sights set on district cooling systems which can reduce energy demand for cooling by up to 50 percent. EESL has partnered with UN Environment's District Energy in Cities Initiative, which has already identified $600 million of projects across five cities in India. EI

FROM PRINT WORLD TO THE E-WORLD

ELECTRICAL INDIA ENHANCES LIFE WITH ENGINEERING EFFICIENCY

BESIDES MONTHLY MAGAZINE, TAKE ADVANTAGE OF THE DIGITAL TECHNOLOGY & READ **ELECTRICAL INDIA** MAGAZINE ONLINE, AS WELL AS WEEKLY E-NEWSLETTER ON YOUR PC, TABLET OR LAPTOP.

FOR SUBSCRIPTION PLEASE
CONTACT PRIYANKA ON
022-27777182/8652142057 OR
Email on **sub@charypublications.in**

Since1981
Electrical India
India's oldest magazine on power and electrical products industry

Please turn back for the subscription form.

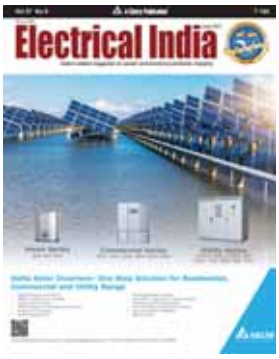
To Advertise, in Electrical India newsletter/magazine please contact YASMEEN on 022 2777 7196 / 9867914216 or email on yasmeen@electricalindia.in

SUBSCRIBE

Since 1961

Electrical India

India's oldest magazine on power and electrical products industry



Subscription Offers

Sub. Period	No. of Issues	Subscription Type					
		Print		Digital		Print+Digital	
		Actual Rate	You Pay	Actual Rate	You Pay	Actual Rate	You Pay
1 Year	12	1200.00	1000.00	1200.00	1000.00	2400.00	1500.00
2 Years	24	2400.00	1750.00	2400.00	1750.00	4800.00	2625.00
3 Years	36	3600.00	2500.00	3600.00	2500.00	7200.00	3750.00
5 Years	60	6000.00	4000.00	6000.00	4000.00	12000.00	6000.00
E-Newsletter							
1 Year	52	N. A.		365.00		N.A	

PLEASE SELECT MODE OF DISPATCH FOR PRINT EDITION –
(1). By REGISTERED PARCEL – Rs. 435/- year (2). By COURIER – Rs. 600/- year
KINDLY ADD POSTAGE CHARGES IN SUBSCRIPTION AMOUNT.

Subscription / Renewal Form

To,
The Subscription in-charge
ELECTRICAL INDIA
Email: sub@charypublications.in

Are you a Subscriber,
Please submit your Subscription no:

Yes, I would like to Subscribe/renew ☐ **Electrical India** / ☐ **EI e-Newsletter** for _____years at ₹_____.

PAYMENT DETAILS :

Cheque / DD No. _____ Dated _____ Drawn on Bank _____

_____ Branch _____ in favour of **Chary Publications Pvt. Ltd.**

Bank details for **NEFT / RTGS / IMPS** : **Account Name: Chary Publications Pvt. Ltd.**

Bank Name: Bank of India **Branch: Chembur, Mumbai - 400 071** **Account Type: Current Account**

IFSC Code: BKID0000009 **Bank A/C Number: 000920110000322** **SWIFT CODE :BKIDINBBCHM**

Name: _____

Company: _____ Designation: _____

Address: _____

_____ City: _____ Pin: _____

Telephone: _____ Mobile: _____

Email: _____

Signature: _____ _____
Stamp

Chary Publications Pvt. Ltd.
905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703.
Phones: +91 22 27777 170 / 171 • Email: sub@charypublications.in • **Contact : Priyanka Alugade** • +91 22 27777182 / +91 8652142057

Worldwide manufacturer of high-end test and measurement systems for the power industry.

ISA s.r.l. is a reputed manufacturer of high quality electrical test and measurement equipment since 1938. With a state-of-the-art manufacturing facility at Taino, Italy; the company's operations are spread over more than 100 countries, either through resource centers or through fully trained sales representatives. Innovative products with rugged hardware and user-friendly software are the hallmark of brand ISA. Every product at ISA is developed, designed and manufactured in compliance with international standards and is tested thoroughly to be used in severe working environments like HV / EHV substations and heavy industrial plants.

ISA's customer base includes:

- **Power utilities**
- **Equipment manufacturers**
- **Oil & Gas sector**
- **EPC contractors and electrical consultants**
- **Testing service companies**
- **Renewable energy producers**

Our Product Portfolio

- **Multi-functional Test Kit for Power Transformer, Instrument Transformer etc. (STS Family)**
- **Automatic Three Phase Relay Test Kit (DRTS Family)**
- **Single Phase Secondary Injection Kit (T 1000 Plus / TD 1000 Plus)**
- **Circuit Breaker Analyzer (CBA 1000 / CBA 2000 / CBA 3000)**
- **Primary Current Injection Kit (T 2000 / T 3000 / eKAM / KAM)**
- **Automatic Tan Delta Test Kit (TDX 5000 / STS 3000 + TD 5000)**
- **Metal Oxide Surge Arrestor Test Kit (SCAR 10)**
- **Battery Test Set (BTS 200 MKII/ELU 200 MKII)**
- **Online Diagnostics & Measurement System**

TDX 5000

TAN DELTA AND CAPACITANCE DIAGNOSTIC SYSTEM FOR POWER APPARATUS

TDX 5000 is developed as a fully automatic and compact solution for high voltage Capacitance & Tan Delta (Dissipation Factor) measurements. Using the reactor option, TDX 5000 can also perform tests on rotating machines. It includes Advanced Test & Data Management Software for test set control, results storage and analysis

E KAM

ELECTRONIC AND AUTOMATIC PRIMARY INJECTION TEST SYSTEM

E KAM is the new fully automatic electronic primary injection test equipment which includes two portable units: one control unit with a large graphical display, that adjusts output, and one current unit (up to 2000, 3000, 5000A). It can also perform Step & Touch tests with the optional modules STLG-STSG and ground grid accessories kit.

CBA 3000

ALL IN ONE CIRCUIT BREAKER ANALYZER

CBA 3000 is the ultimate all-in-one circuit breaker analyzer: safer, faster and more accurate than ever. It allows any timing test, motion and speed analysis, multiple contemporary static and dynamic contact resistance measurements, Both Sides Grounded (BSG) tests, Undervoltage condition test and more. All these functions are integrated in one lightweight test case.

The subsidiary company, **ISA Advance Instruments India Pvt. Ltd.** provides proactive support to ISA's Indian customer base. Since its inception in 2012 the company has witnessed exponential growth with the support of a dedicated team of application engineers.

South Asia - Regional Office: C-33, Ground Floor, Sector-2, Noida- 201301, Uttar Pradesh, India
T: +91 120 4543853 / 54 / 4222712 | F: +91 120 4574772 | Email: info.asia@isatest.com

www.isatest.com

Efficient Energy Consumption & Economic Growth

There is a need to navigate the energy transition for sustainable growth in socio-economic aspects of the country. Though energy consumption per GDP is higher, production of valuable goods is quite low in the country which shows a need to improve the end-use efficiency....

Energy plays a pivotal role in the development of a region. Increasing dependency on fossil fuels has caused serious concerns at the local (energy dependency, pollution, etc.) and global (global warming, GHG emission, etc.) levels. Harvesting of energy depends on the availability of resources apart from the economic viability and technical feasibility of meeting the demand. The energy requirement of India is mainly supplied by coal and lignite, followed by crude oil and petroleum products and electricity.

However, energy consumption in rural India is largely dependent on non-conventional energy sources due to the availability, possibility of rapid extraction, and appropriate technologies. Globalization and consequent opening up of Indian markets has led to urbanization with the enhanced energy demand in the industrial and infrastructure sectors. There is a need to navigate the energy transition for sustainable growth in socio-economic aspects of the country. Though the energy consumption per GDP (Gross Domestic Product) is higher, production of valuable goods is quite low in the country which shows that there is a need to improve the end-use efficiency. Coupled with this inefficiency, the perishing stock of global fossil fuel reserves and the growing concerns of global warming and consequent changes in the climate has necessitated the improvements in end use energy efficiency along with the exploration of cost effective, environment friendly, and sustainable energy alternatives.

Renewable sources of energy such as solar and wind are emerging as viable alternatives to meet the growing energy demand of the burgeoning population. Strengthening of transmission and distribution network with the integration of local generating units (RE-based standalone units) would help in meeting the demand. Distributed generation (DG) with micro grids are required to minimize transmission and distribution (T and D) losses, and optimal harvesting of abundant local resources (such as solar,

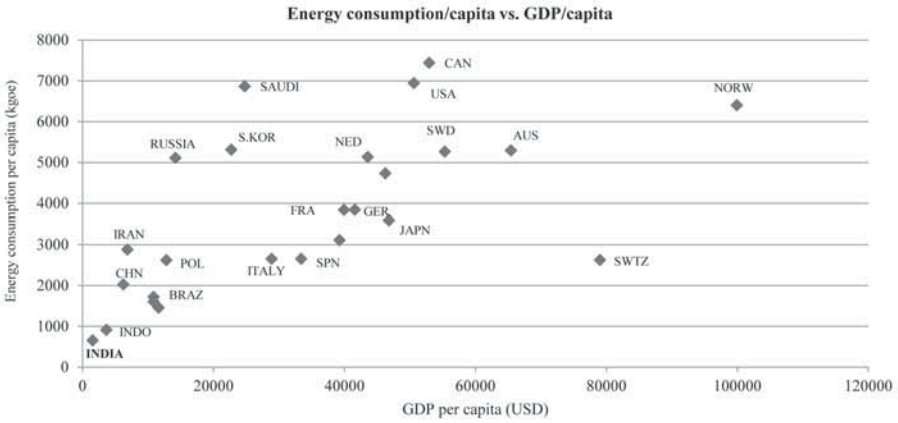


Figure 1: Country-wise energy consumption per capita versus GDP per capita

biofuel, etc.). The focus of the current communication are i) understanding the energy scenario in India; ii) sector- and source-wise energy demand with the scope for energy conservation; and iii) prospects of renewable energy with smart grids to meet the distributed energy demand while optimizing harvest of local energy sources. Per capita energy consumption varies across countries (based on the analysis of 2004-05 and 2014-15). It is higher in developed nations (USA-7.3 TOE, Canada-7.6 TOE, Japan 3.7 TOE) compared to the developing (India-0.6 TOE, China-1.8 TOE, Brazil-1.4 TOE) and less developed nations (<0.4 TOE). Figure 1 compares the energy consumption per capita versus GDP (Gross Domestic Product) per capita among the countries (Top 25 GDP countries). Norway (99,933 million USD) tops in GDP per capita followed by Switzerland (79,024 million USD), Australia (65,430 million USD) and Sweden (55,341 million USD) which shows the effective utilization of energy. The per capita GDP value of India is 1555.50 million USD, which is lowest among these countries. But, Energy consumption per GDP (Energy intensity) of India is higher, hinting the inefficient use of energy. Figure 2 compares the energy intensity (the ratio of energy consumption per GDP) versus GDP per capita of various countries. Energy intensity of India is about 0.42 kgoe/million USD which is more than 12 times that of Switzerland (0.033 kgoe/million USD), more than 4 times that of Germany (0.092 kgoe/million USD), more than 3 times that of USA (0.137 kgoe/million USD) and about 1.3 times that of China (0.325 kgoe/million USD). The prosperity of a nation depends on the efficient use of energy or the energy intensity than the per capita energy consumption.

Most of the Asian countries have high energy intensity (energy/GDP) and lower per capita consumption, which illustrates the inefficient use of energy. This highlights the need of improved end use efficiency to enhance the GDP with the present level of energy consumption.

Global studies also emphasize the efficient use of the energy have also demonstrated the relationship between efficient energy consumption and economic

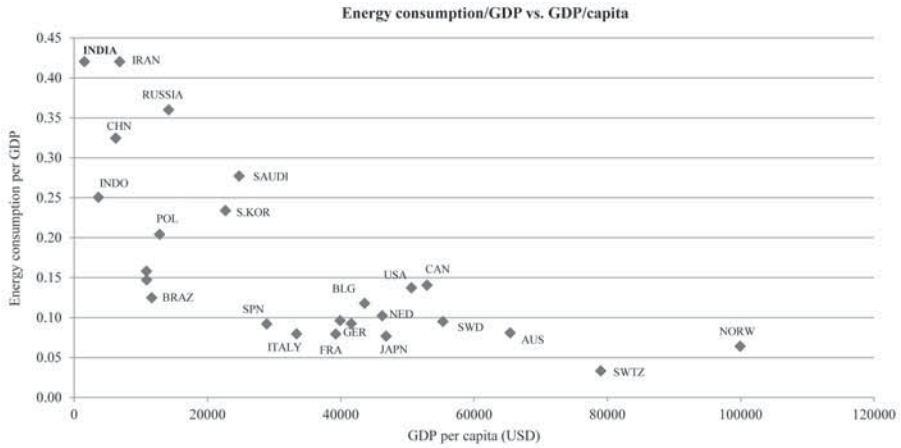


Figure 2: Country-wise energy consumption per GDP versus GDP per capita

growth. Emission of greenhouse gases (GHG) is proportional to energy utilization and is found higher in developing countries due to the inefficient use of energy.

End-use efficiency improvement

More than 70 per cent of the population resides in rural regions and 85 per cent of the energy requirement is met by traditional fuel through energy inefficient devices. Industrial energy consumption is also inefficient in most of the cases due to the aged equipment, lack of lubrication, torn out parts, and non-scientific combustion. The overuse of energy resources in the commercial domain and unmetered energy supply for irrigation pumps have aggravated the energy crisis.

The primary need of energy resources in rural India is for cooking, water/space heating, and lighting. Most of the energy for cooking and heating is supplied by bioenergy (fuel wood, dung cake, etc.) which is locally available. However, the conventional cook stoves used for combustion of biomass have lower thermal efficiency (<10 per cent). Compared to these, improved cook stoves (ICS) have higher efficiency (20–30 per cent) and there is a scope to reduce 27 to 42 per cent of the fuel wood requirement. A typical rural household consumes about 5l of kerosene every month. Average electricity consumption in rural household ranges between 50–60 kWh/month which is mainly used for lighting, entertainment, water pumping, and air cooling. About 30–40 per cent of energy conservation is possible in the domestic sector using CFL/LED lamps for lighting, energy efficient heaters, and coolers.

The domestic energy requirement of an urban household is supplied by electricity, LPG (Liquefied Petroleum Gas), fuel wood, etc. Even though an urban household consumes about 11 kg of LPG per month, 22 per cent of the urban households depend on firewood and kerosene as primary energy need. Electricity is the main source of lighting, cooling, and water heating in urban area where the consumption ranges from 100–125 kWh per month. Use of ICs, CFL/LED lamps, and energy efficient heaters and coolers can conserve a significant amount of energy. Solar water heater and rooftop solar PV installation can substitute electricity and biomass consumption for lighting and water heating, respectively.

Energy conservation in irrigation pump sets is possible by avoiding over capacity installation, maintenance and lubrication, selecting proper foot valves and pipelines, drip irrigation, and sprinkler installation, etc. Energy supply for agricultural purposes is to be metered and tariff has to be applied on the basis of installed capacity. This would help in the optimal irrigation of agriculture

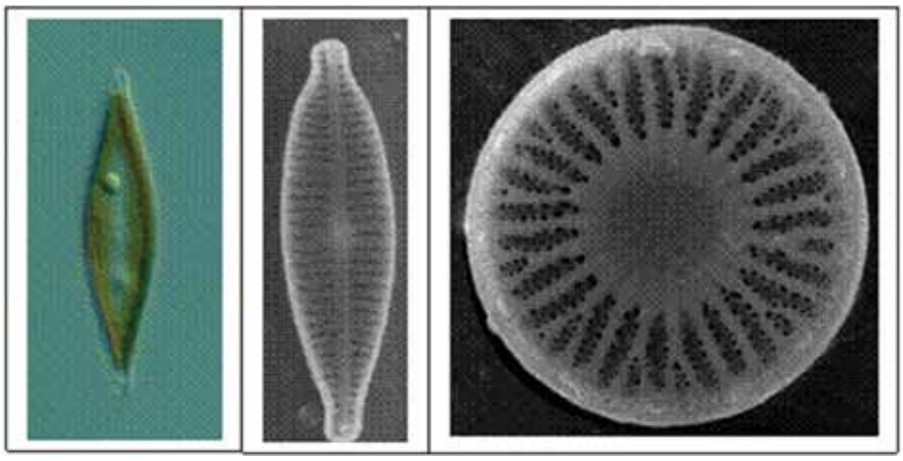


Figure 3: Pennate and centric diatoms (*Navicula sp.*, with an oil droplet)

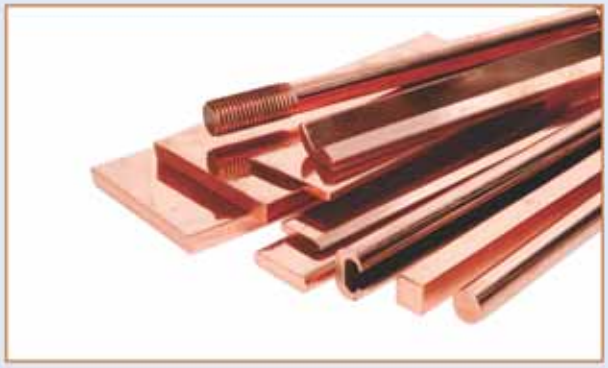
CITIZEN METALLOYS LTD.

An ISO 9001, ISO 14001 & BS OHSAS 18001 Company
Govt. Recg. Star Export House

Personifying Copper

Manufacturer of

World Class Quality, Oxygen Free & ETP Grade High Conductivity Copper



COPPER FLAT / BUS BARS

Cross Section area upto **5000 sq.mm.**

COPPER ROD - (Round, Square, Hexagon)

Size: Diameter **3 mm** to **115 mm**

COPPER PROFILE / SECTIONS

Wide range of profiles & sections
developed like J,C,L,Z sections etc.
and also can develop as per customer requirements.

COPPER COMPONENTS

Processes :
Cutting, Punching, Bending, Plating, Coating, Sleeving, Turning, Tapping, Twisting, Milling, Drilling, Stud Fixing, Forging, Forming, Ultrasonic Welding and specialized in Cold Forming.

EXPORT TO 37+ COUNTRIES

"AWARDED FOR EXPORT EXCELLENCE - STAR PERFORMER FOR FIVE CONSECUTIVE YEARS FROM EEPC"

ELECRAMA we are all about electricity **10-14 MARCH 2018 Hall 1 | Stall no. H1 B10**

Registered Office:
808, Sukh Sagar Complex, Nr. Hotel Fortune Landmark, Usmanpura, Ahmedabad - 380 013, Gujarat, INDIA.
Tel: +91 79 2755 0272 | 2755 0227 | e-mail: info@citizenmetalloys.com | sales@citizenmetalloys.com
www.citizenmetalloys.com

fields. Wind pumps and solar PV pumps can be installed for small area irrigation (5–10 hp) which would replace the diesel or kerosene fueled pumps.

Industries are the highest energy consumers in India which use all forms of energy resources. Many of the Indian industries use coal, oil, and electricity. About 30–40 per cent of energy conservation is possible with upgradation of equipment and technology. However, there is a need to reform policies and tariffs for industrial energy consumption to promote captive generation through renewable energy sources. Energy consumption in the commercial sector has increased considerably during the last decade. Energy conservation in the commercial sector through interventions in lighting technologies (LED/CFL), green buildings, and energy efficient equipment would reduce the energy consumption and decrease the energy intensity.

Innovations in Energy Sector

Development of economically viable and technically feasible new energy harvesting technologies is expected to change the present energy mix. Technology innovation in non-fossil energy resources - solar thermal and PV, bioenergy, off-shore wind, hydrogen, artificial photosynthesis, etc. would meet the future energy demand. The current focus is on bioenergy, bio-oil, and biological hydrogen production. Technologies like bio-oil and ethanol production from algae would significantly replace the fossil oil for transportation and electricity generation. Many of these technologies are in the lab scale at the moment and thus, have shown great potential in cutting down the cost and also tapping a wide range of renewable energy sources.

In the face of increasing CO_2 emissions from conventional energy (gasoline) and the anticipated scarcity of crude oil, a worldwide effort is underway for cost effective renewable alternative energy sources. Efforts are in progress at Energy & Wetlands Research Group, CES, at the Indian Institute of Science, Banaglore, towards developing the gasoline secreting diatom solar panels to produce gasoline from diatoms sustainably. Diatoms being the major group of planktonic algae (Figure 3) can be used sustainably for production of bio-fuel, by the usage of diatom-based solar panels. Studies have shown that diatoms could make 10 to 200 times as much oil per hectare as oil seeds and the techniques involved towards developing oil secreting diatoms to minimize the cost of oil extraction. It was found that some diatoms secrete more lipid content when subjected to unfavorable environment or culture conditions, such as nutrient starvation or extreme temperatures. Unlike crops, diatoms multiply rapidly. Some diatoms can double their biomass within an hour to a day's time. Since each diatom creates and uses its own gas tank, it is estimated that diatoms are responsible for up to 25 per cent of global carbon dioxide fixation. This means that while diatoms can be cultivated for oil extraction, they can automatically reabsorb carbon dioxide in the process. Diatoms may have a major role to play in the coming years with regard to the mass production of oil. This entails appropriate cultivation, harvesting and extraction of oil, using advanced technologies that mimic the natural process while cutting down the time period involved in oil formation.

Dr T V Ramachandra

Indian Institute of Science
Bangalore

RISHABH

Adopt Intelligence !

ND30 | ND30PNET

Power Network Meter

Visit Us @
ELECRAMA
we are all about electricity
10-14 March 2017
Hall H1A, Stall No. H1AE2

Solar On-Grid Invertors
Hall No. 8 Stall No- B52

Features

- Measurement and recording of 54 parameters
- Current and Voltage harmonics up to 51st
- 8 parameters display (user selectable) on Colour graphic LCD screen
- Alarm, Analog outputs & 2 x Pt100 inputs for measurement of transformer temperature.
- Data logging in the internal memory 8 GB (Option - Only ND30).
- RS485 - Modbus RTU & Ethernet - Modbus TCP/IP - inbuilt www & FTP server (Only ND30).
- RS485 & Profinet (Only ND30PNET)

Measure | Control | Record | Analyze

RISHABH INSTRUMENTS PVT. LTD.
Trishala Unit, C-6, NICE Area, MIDC, Satpur, Nashik - 422007, India.
Tel: +91 253 2202028/099 | Fax: +91 253 2351064 | E-mail: marketing@rishabh.co.in | www.rishabh.co.in

Losses in Distribution & Transmission Lines

It is fact that the unit of electric energy generated by power station does not match with the units distributed to the consumers. Some percentage of the units is lost in the distribution network. This difference in the generated & distributed units is known as transmission and distribution loss...

Transmission and distribution (T&D) loss are amounts that are not paid for by users.

T&D Losses= (Energy Input to feeder (Kwh)-Billed Energy to Consumer (Kwh)) / Energy Input kwh x100.

Distribution Sector considered as the weakest link in the entire power sector. Transmission losses are approximately 17% while distribution losses are approximately 50%. There are two types of transmission and distribution losses:

1. Technical Losses

2. Non-Technical Losses (Commercial Losses)

Technical Losses

The technical losses are due to energy dissipated in the conductors, equipment used for transmission line, transformer, sub- transmission line and distribution line and magnetic losses in transformers. Technical losses are normally 22.5%, and directly depend on the network characteristics and the mode of operation. The major amount of losses in a power system is in primary and secondary distribution lines. While transmission and sub-transmission lines account for only about 30% of the total losses. Therefore, the primary and secondary distribution systems must be properly planned to ensure within limits. The unexpected load increase was reflected in the increase of technical losses above the normal level Losses are inherent to the distribution of electricity and cannot be eliminated.

There are two types of technical losses.

a. Permanent / Fixed Technical Losses

Fixed losses do not vary according to current. These losses take the form of heat and noise and occur as long as a transformer is energized. Between 1/4 and 1/3 of technical losses on distribution networks are fixed losses. Fixed losses on a network can be influenced in the ways set out below:

- Corona Losses
- Leakage Current Losses
- Dielectric Losses
- Open-circuit Losses
- Losses caused by continuous load of measuring elements
- Losses caused by continuous load of control elements

(b)Variable Technical losses

Variable losses vary with the amount of electricity distributed and are, more precisely, proportional to the square of the current. Consequently, a 1% increase in current leads to an increase in losses of more than 1%. Between 2/3 and 3/4 of technical (or physical) losses on distribution networks are variable losses. By increasing the cross sectional area of lines and cables for a given load, losses will fall. This leads to a direct trade-off between cost of losses and cost of capital expenditure. It has been suggested that optimal average utilization rate on a distribution network that considers the cost of losses in its design could be as low as 30 per cent.

- joule losses in lines in each voltage level
- impedance losses
- Losses caused by contact resistance.

Main Reasons for Technical Losses

Lengthy Distribution lines

- In practical, 11 KV and 415 volt lines in rural areas are extended over long distances to feed loads scattered over large areas. Thus, the primary and secondary distributions lines in rural areas are largely radial laid usually extend over long distances. This results in high line resistance and therefore, high I2R losses in the line.

- Haphazard growths of sub-transmission and distribution system into new areas.
- Large scale rural electrification through long 11kV and LT lines.

Inadequate Size of Conductors of Distribution lines

The size of the conductors should be selected on the basis of KVA x KM capacity of standard conductor for a required voltage regulation but rural loads are usually scattered and generally fed by radial feeders. The conductor size of these feeders should be adequate.

Installation of Distribution Transformers away from Load Centers

Distribution transformers are not located at load center on the secondary distribution system. In most of case, distribution transformers are not located centrally with respect to consumers. Consequently, the farthest consumers obtain an extremity low voltage even though a good voltage levels maintained at the transformers secondary. This again leads to higher line losses. The reason for the line losses increasing as a result of decreased voltage at the consumers end. Therefore, in order to reduce the voltage drop in the line to the farthest consumers, the distribution transformer should be located at the load centre to keep voltage drop within permissible limits.

> Residential customers generally draw their highest power demand in the evening hours. Same commercial customer load generally peaks in the early afternoon. Because current level (hence, load) is the primary driver in distribution power losses, keeping power consumption more level throughout the day will lower peak power loss and overall energy losses.

Low Power Factor of Primary and Secondary Distribution System

In most LT distribution circuits normally the power factor ranges from 0.65 to 0.75. A low power factor contributes towards high distribution losses. For a given load, if the power factor is low, the current drawn in high and losses proportional to square of the current will be more. Thus, line losses owing to the poor PF can be reduced by improving the power factor. This can be done by application of shunt capacitors. Shunt capacitors can be connected either in secondary side (11 KV side) of the 33/11 KV power transformers or at various point of distribution line. The optimum rating of capacitor banks for a distribution system is 2/3rd of the average KVAR requirement of that distribution system. The vantage point is at 2/3rd the length of the main distributor from the transformer. A more appropriate manner of improving this PF of the distribution system and thereby, reduce the line losses is to connect capacitors across the terminals of the consumers having inductive loads. By connecting the capacitors across individual loads, the line loss is reduced from 4 to 9% depending upon the extent of PF improvement.

Bad Workmanship

Bad Workmanship contributes significant role towards increasing distribution losses. Joints are a source of power loss. Therefore, the number of joints should be kept to a minimum. Proper joining techniques should be used to ensure firm connections. Connections to the transformer bushing-stem, drop out fuse, isolator, and LT switch etc should be periodically inspected and proper pressure maintained to avoid sparking and heating of contacts. Replacement of deteriorated wires and services should also be made timely to avoid any cause of leaking and loss of power.

Feeder Phase Current and Load Balancing

One of the easiest loss savings of the distribution system is balancing current along three-phase circuits. Feeder phase balancing also tends to balance voltage drop among phases giving three-phase customers less voltage unbalance. Amperage magnitude at the substation doesn't guarantee load is balanced throughout the feeder length. Feeder phase unbalance may vary during the day and with different seasons. Feeders are usually considered "balanced" when phase current magnitudes are within 10. Similarly, balancing load among distribution feeders will also lower losses assuming similar conductor resistance. This may require installing additional switches between feeders to allow for appropriate load transfer.

Load Factor Effect on Losses

Power consumption of

Innovative Cable Solutions

unicab

105°C LV & MV XLPE Cables

No Worries For Cable Overloading

Apar Industries Ltd, a Rs 5000 Cr (USD 800 Million) company has presence in Transformer /Specialty Oils, Overhead ACSR/AAAC & HTLS conductors and a wide range of Electrical & Telecom cables. Apar offers several innovative products, one of them being higher temperature rated XLPE cables. If the ambient temperature like in North India is about 48-50 Deg C during summer, or say 50-55 Deg C in Desert areas, then 90 Deg C rated XLPE cables need to be de-rated significantly, or a higher cross section is used. Thanks to new development of 105 Deg C rated XLPE LV and MV cables, you can now safely relax and need not worry about any overload conditions during summer. The product is ideal for Solar Industry, North based Utilities and in the Middle East.

E-BEAM

- Ship Wiring Cables
- Locomotive Cables
- Solar PV Cables
- Wind Mill Cables
- Control & Flexible Cables
- PVC Winding wires
- Automotive Wires
- Speciality Cables.

ELECTRICAL

- PVC Cables UPTO 3.3 KV
- XLPE Cables UPTO 66 KV
- LT & HT ABC Cables
- Instrumentation Cables
- Concentric Core Cables
- Flexible cables & Wires
- FR /FRLS/LSOH Cables
- Fire Survival Cables
- Under water Cables

ELASTOMER

- Trailing Cables
- Locomotive Cables
- Ship Wiring Cables
- Wind Mill Cables
- Welding Cables
- Mining Cables
- LFH Cables & Wires
- Fire Survival Cables
- EPR,Silicon & EVA Cables

TELECOM

- Optical Fibre Cables
- Armoured Optic Fibre Cables
- Torpedo Cables
- Tow Cables
- Indoor Telephonic Cables
- Composite Cables With OFC
- Fire Survival Cables OFC
- Cat 3 / Cat 5 LAN Cables
- Railway signaling Cables

APAR INDUSTRIES LTD. (UNIT : UNIFLEX)
12/13, JYOTI WIRE HOUSE,Off. Veera Desai Road, Andheri (West), Mumbai -400053
Phone : 022-26740001 / 02 / 03, Fax : 022-26740600
email : info.cable@apar.com , website : www.apar.com

customer varies throughout the day and over seasons. Residential customers generally draw their highest power demand in the evening hours. Same commercial customer load generally peaks in the early afternoon. Because current level (hence, load) is the primary driver in distribution power losses, keeping power consumption more level throughout the day will lower peak power loss and overall energy losses. Load variation is called load factor and it varies from 0 to 1.

Load Factor=Average load in a specified time period / peak load during that time period.

For example, for 30days month (720 hours) peak load of the feeder is 10 MW. If the feeder supplied a total energy of 5,000 MWH, the load factor for that month is (5,000 MWh)/ (10MW x 720) =0.69.

Lower power and energy losses are reduced by raising the load factor, which, evens out feeder demand variation throughout the feeder. The load factor has been increased by offering customers "time-of-use" rates. Companies use pricing power to influence consumers to shift electric-intensive activities during off-peak times (such as, electric water and space heating, air conditioning, irrigating, and pool filter pumping).

With financial incentives, some electric customers are also allowing utilities to interrupt large electric loads remotely through radio frequency or power line carrier during periods of peak use. Utilities can try to design in higher load factors by running the same feeders through residential and commercial areas

Transformer Sizing and Selection

Distribution transformers use copper conductor windings to induce a magnetic field into a grain-oriented silicon steel core. Therefore, transformers have both load losses and no-load core losses. Transformer copper losses vary with load based on the resistive power loss equation (Ploss = I2R). For some utilities, economic transformer loading means loading distribution transformers to capacity or slightly above capacity for a short time in an effort to minimize capital costs and still maintain long transformer life. However, since peak generation is usually the most expensive, total cost of ownership (TCO) studies should take into account the cost of peak transformer losses. Increasing distribution transformer capacity during peak by one size will often result in lower total peak power dissipation-more so if it is over loaded. Transformer no-load excitation loss (iron loss) occurs from a changing magnetic field in the transformer core whenever it is energized. Core loss varies slightly with voltage but is essentially considered constant. Fixed iron loss depends on transformer core design and steel lamination molecular structure. Improved manufacturing of steel cores and introducing amorphous metals (such as metallic glass) have reduced core losses.

Balancing Three Phase Loads

Balancing 3-phase loads periodically throughout a network can reduce losses significantly. It can be done relatively easily on overhead networks and consequently offers considerable scope for cost effective loss reduction, given suitable incentives.

Switching off Transformers

One method of reducing fixed losses is to switch off transformers in periods of low demand. If two transformers of a certain size are required at a substation during peak periods, only one might be required during times of low

Technology of Measurement... defined

HPL

Our Metering Product Range

- Digital Panel Meters
- Multi Function Meters
- Load Managers & Demand Controllers
- Single / Three Phase, Whole Current Counter/LCD type meters
- LT Trivector Meters
- Prepaid Metering Solution
- LPR (Zigbee) Metering Solution
- Data Acquisition & Billing Solutions

HPL serves wide range of metering solution with the commitment to modern technology. Offers range of meters with its Digital Panel Meters, Digital Energy meters, Multifunction Meters, Load Managers, Demand Controllers, Power Quality Meters with Metering solutions based on the wired and wireless technology such as Zigbee, GSM/GPRS etc.

Other Product Range

êbrit Range of Digital Panel Meter


Dual Source Multi-function Load Manager

Emfis range of Multi-function Meter


Power Factor Control Relays


LCD Mini


Trivector Meter

ISO-27001:2005

ISO-9001:2008
ISO-14000:2004

IAF ANAB CE

ELECRAMA
we are all about electricity
10-14 MARCH 2018
INDIA EXPO MART
GREATER NOIDA, NCR, INDIA

HPL
Visit us at
Hall No. : 1
Stand No. H1A12, Q6, N5

HPL Electric & Power Ltd
enquiry@hplindia.com, hpl@hplindia.com
Ph.: +91-120-4656300 | www.hplindia.com

Customer Care No.
1800 419 0198

demand so that the other transformer might be switched off in order to reduce fixed losses.

This will produce some offsetting increase in variable losses and might affect security and quality of supply as well as the operational condition of the transformer itself. However, these trade-offs will not be explored and optimized unless the cost of losses are taken into account.

Losses due to metering inaccuracies are defined as the difference between the amount of energy actually delivered through the meters and the amount registered by the meters. All energy meters have some level of error which requires that standards be established.

Other Reasons for Technical Losses

- Unequal load distribution among three phases in L.T system causing high neutral currents.
- Leaking and loss of power
- Over loading of lines.
- Abnormal operating conditions at which power and distribution transformers are operated
- Low voltages at consumer terminals causing higher drawl of currents by inductive loads.
- Poor quality of equipment used in agricultural pumping in rural areas, cooler air-conditioners and industrial loads in urban areas.

Non-Technical / Commercial Losses

Non-technical losses are at 16.6%, and related to meter reading, defective meter and error in meter reading, billing of customer energy consumption, lack of administration, financial constraints, and estimating unmetered supply of energy as well as energy thefts.

Main Reasons for Non-Technical Losses

Power Theft

Theft of power is energy delivered to customers that is not measured by the energy meter for the customer. Customer tempers the meter by mechanical jerks, placement of powerful magnets or disturbing the disc rotation with foreign matters, stopping the meters by remote control.

Metering Inaccuracies

Losses due to metering inaccuracies are defined as the difference between the amount of energy actually delivered through the meters and the amount registered by the meters. All energy meters have some level of error which requires that standards be established. Measurement Canada, formerly Industry Canada, is responsible for regulating energy meter accuracy. Statutory requirements5 are for meters to be within an accuracy range of +2.5% and – 3.5%. Old technology meters normally started life with negligible errors, but as their mechanisms aged they slowed down resulting in under-recording. Modern electronic meters do not under-record with age in this way. Consequently, with the introduction of electronic meters, there should have been a progressive reduction in meter errors. Increasing the rate of replacement of mechanical meters should accelerate this process.

Unmetered Losses for very small Load

Unmetered losses are situations where the energy usage is estimated instead of measured with an energy meter. This happens when the loads are very small and energy meter installation is economically impractical. Examples of this are streetlights and cable television amplifiers.

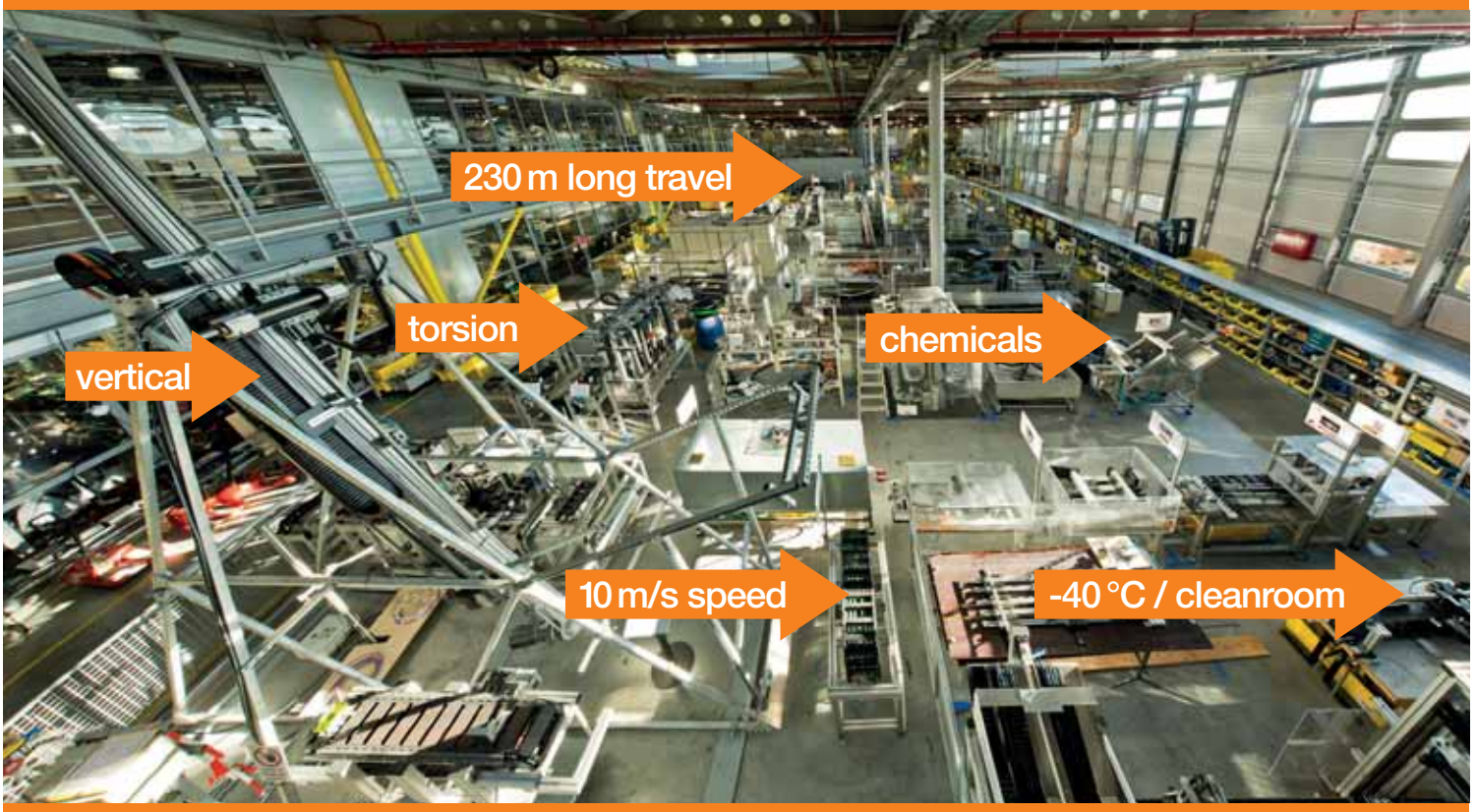
Unmetered Supply

Unmetered supply to agricultural pumps is one of the major reasons for commercial losses. In most states, the agricultural tariff is based on the unit horsepower (HP) of the motors. Such power loads get sanctioned at the low load declarations. Once the connections are released, the consumers increase their connected loads without obtaining necessary sanction for increased loading from the utility. Further, estimation of the energy consumed in unmetered supply has a great bearing on the estimation of T&D losses on account of inherent errors in estimation. Most of the utilities deliberately overestimate the unmetered agricultural consumption to get higher subsidy from the State Government and also project reduction in losses. In other words, higher the estimates of the unmetered consumption, lesser the T&D loss figure and vice versa. Moreover, the correct estimation of unmetered consumption by the agricultural sector greatly depends upon the cropping pattern, ground water level, seasonal variation, hours of operation etc.

Largest Test Lab. Widest Choice. 36 Month Guarantee.

zero

... zero Downtime ... From #1 in moving cables.



Guarantee igus chainflex 36 month guarantee

Zero Downtime solutions for your toughest moving cables:
chainflex® cables are developed and tested in the industry's largest test lab. With 600 parallel tests on 2750 m², 1.4 million electric measurements and 2 billion cycles per year, you find cables that solve your toughest "zero downtime" challenge. And with up to 7 motion quality classes, you find just the right cable for your application - for less money. 1244 cables from stock make chainflex® the largest motion cable range - for torsion, motor, servo, hybrid, control, data, BUS, ethernet and FOC cables. Calculate life online and order today with a 36 month guarantee.

igus®.in
plastics for longer life®

Check out more than 30 test reports here: igus.in/chainflextests

igus® (India) Pvt. Ltd. 36/1, Sy. No. 17/3, Euro School Road, Dodda Nekkundi Industrial Area - 2nd Stage Mahadevapura Post Bangalore - 560048
Phone +91-80-45127800 Fax +91-80-45127802 info@igus.in

Error in Meter Reading

Proper Calibrated Meter should be used to measure electrical energy. Defective Energy Meter should be replaced immediately. The reason for defective meter are burning of meters, burn out terminal box of meter due to heavy load, improper C.T ratio and reducing the recording, Improper testing and calibration of meters.

Billing Problems

- Faulty and untimely serving bill should be main part of non-technical losses.
- Normal complaint regarding billing are not receipt of bill, late receipt of bill, receiving wrong bill , wrong meter reading, wrong tariff, wrong calculations.

Reducing Technical Losses

Converting LV Line to HV Line

Many distribution pockets of low voltage (430V) in town are surrounded by higher voltage feeders. At this lower voltage, more conductor current flows for the same power delivered, resulting in higher I2R losses. Converting old LV (430V) feeders to higher voltage the investment cost is high and often not economically justifiable but if parts of the LV (430V) primary feeders are in relatively good condition, installing multiple step-down power transformers at the periphery of the 430 volt area will reduce copper losses by injecting load current at more points (i.e., reducing overall conductor current and the distance travelled by the current to serve the load).

Large Commercial / Industrial Consumer get direct Line from Feeder

Design the distribution network system in such a way that if it is possible than large consumer gets direct power line from feeder.

Adopting High Voltage Distribution Service (HVDS) for Agricultural Customer

In High Voltage Direct Service (HVDS), 11KV line direct given to cluster of 2 to 3 Agricultural Customer for Agricultural Pump set and employed small distribution Transformer (15KVA) for given these 2 to 3 customer through smallest (almost negligible) LT distribution lines. In HVDS, there is less distribution losses due to minimum length of distribution line, high quality of power supply with no voltage drop, less burn out of motor due to less voltage fluctuation and Good quality of Power, to avoid overloading of transformer.

Adopting Arial Bundle Conductor (ABC)

Where LT Lines are not totally avoidable use Arial Bundle Conductor to minimize faults in lines to avoid direct theft from line (tampering of line).

Reduce Number of Transformer

- Reduce the number of transformation steps.
- Transformers are responsible for almost half of network losses.
- High efficiency distribution transformers can make a large impact on reduction of distribution losses.

Utilize Feeder on its Average Capacity

By overloading of distribution feeder, distribution losses will be increased. The higher the load on a power line, the higher its variable losses. It has been suggested that the optimal average utilizations rate of distribution network cables should be as low as 30% if the cost of losses is taken into account.

Replacements of Old Conductor or Cables

By using the higher the cross-section area of conductor / cables, the losses will be lower but the same time cost will be high. So, by forecasting the future load, an optimum balance between investment cost and network losses should be maintained.

Feeder Renovation / Improvement Program

- Reconductoring of Transmission

TRANSTRON

transforming energy efficiently

- **Established in 1998**
- **Modern Plant 60 Kms from New Delhi**
- **Strict quality Standards**
- **Top Quality Standards**

Product Range:

- Power Transformers
- Distribution Transformers
- Furnace Duty Transformers
- Double Output Transformers
- Custom made Products
- B.I.S. Approved

Leading Manufacturer of Power & Distribution Transformers from India

Products are designed, manufactured and tested strictly as per IS-1180 (2014)/ IS-2026 / BS-11171 / IEC-60076 standards.

TRANSTRON ELECTRICALS PVT. LTD.
(AN ISO 9001: 2008 Certified Company)
A-1 Industrial Estate, Partapur, Meerut- 250 103, India
Tel. : +91-121-2440646, 2440647, 2440838, 6532838
Fax : +91-121-2440646, 2440666
Email: info@transtron.co.in Website: www.transtron.co.in

and Distribution Line according to Load.

- Identification of the weakest areas in the distribution system and strengthening or improving them.
- Reducing the length of LT lines by relocation of distribution sub stations or installations of additional new distribution transformers.
- Installation of lower capacity distribution transformers at each consumer premises instead of cluster formation and substitution of distribution transformers with those having lower no load losses such as amorphous core transformers.
- Installation of shunt capacitors for improvement of power factor.
- Installation of single-phase transformers to feed domestic and nondomestic load in rural areas.
- Providing of small 25kVA distribution transformers with a distribution box attached to its body, having provision for installation of meters, MCCB and capacitor.
- Lying of direct insulated service line to each agriculture consumer from distribution transformers.
- Due to Feeder Renovation Program T&D loss may be reduced from 60-70% to 15-20%.

Industrial / Urban Focus Program

- Separations of rural feeders from industrial feeders
- Instantly release of New Industrial or HT connections
- Identify and replacement of slow and sluggish meters by electronics type meters.
- In industrial and agricultural consumer adopt one consumer, one transformer scheme with meter should be Introduced.
- Change of old service line by armoured cable.
- Due to Feeder Renovation Program, T&D loss may be reduced from 60-70% to 15-20%.

Strictly Follow Preventive Maintenance Program

- Required to adopt Preventive Maintenance Program of Line to reduce Losses due to Faulty / Leakage Line Parts.
- Required to tights of Joints, Wire to reduce leakage current.

Reducing Non-Technical Losses

Making mapping / Data of Distribution Line

- Mapping of complete primary and secondary distribution system with all parameters such as conductor size, line lengths etc.
- Compilation of data regarding existing loads, operating conditions, forecast of expected loads etc.
- Preparation of long-term plans for phased strengthening and improvement of the distribution systems along with transmission system.

Implementation of Energy Audits Schemes

It should be obligatory for all big industries and utilities to carry out energy audits of their system. Further, time bound action for initiating studies for realistic assessment of the total T&D losses into technical and non-technical losses has also to be drawn by utilities for identifying high loss areas to initiate remedial measures to reduce the same.

The realistic assessment of T&D loss of a utility greatly depends on the chosen sample size which in turn has a bearing on the level of confidence desired and the tolerance limit of variation in results. In view of this, it is very essential to fix a limit of the sample size for realistic quick estimates of losses.

Mitigating power theft by Power theft checking Drives

- Theft of electric power is a major problem faced by all electric utilities. It is necessary to make strict rule by state government regarding power theft. Indian Electricity Act has been amended to make theft of energy and its abetment as a cognizable offence with deterrent punishment of up to

HEY!

YOUR SEARCH
| ENDS HERE

WOULD YOU LIKE

to know more about the HVAC and R (heating, ventilation, air-conditioning and refrigeration) industry.

JUST FLIP OVER AND WE HAVE A **SUBSCRIPTION** FORM FOR YOU.

BESIDES MONTHLY MAGAZINE TAKE ADVANTAGE OF THE DIGITAL TECHNOLOGY & READ COOLING INDIA MAGAZINE ONLINE, AS WELL AS FORTNIGHTLY E-NEWSLETTER ON YOUR PC, TABLET OR LAPTOP.

PRIYANKA
022-27777182 / 8652142057
sub@charypublications.in

Chary Publications

Cooling India

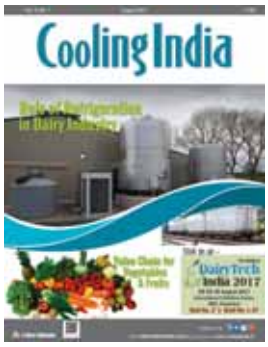
India's foremost Monthly dedicated to the growth of HVACR Industry

YOU CAN ALSO SUBSCRIBE **ONLINE**
www.coolingindia.in

SUBSCRIBE

Cooling India

India's foremost Monthly dedicated to the growth of HVACR Industry



Subscription Offers

Sub. Period	No. of Issues	Subscription Type					
		Print		Digital		Print+Digital	
		Actual Rate	You Pay	Actual Rate	You Pay	Actual Rate	You Pay
1 Year	12	1200.00	1000.00	1200.00	1000.00	2400.00	1500.00
2 Years	24	2400.00	1750.00	2400.00	1750.00	4800.00	2625.00
3 Years	36	3600.00	2500.00	3600.00	2500.00	7200.00	3750.00
5 Years	60	6000.00	4000.00	6000.00	4000.00	12000.00	6000.00
E-Newsletter							
1 Year	24	N. A.		365.00		N.A	

PLEASE SELECT MODE OF DISPATCH FOR PRINT EDITION –
(1). By REGISTERED PARCEL – Rs. 435/- year (2). By COURIER – Rs. 600/- year
KINDLY ADD POSTAGE CHARGES IN SUBSCRIPTION AMOUNT.

Subscription / Renewal Form

To,
The Subscription in-charge
COOLING INDIA
Email: sub@charypublications.in

Are you a Subscriber,
Please submit your Subscription no:

Yes, I would like to Subscribe/renew ☐ **Cooling India** / ☐ **CI e-Newsletter** for _____ years at ₹_____.

PAYMENT DETAILS :

Cheque / DD No. _____ Dated _____ Drawn on Bank _____

_____ Branch _____ in favour of **Chary Publications Pvt. Ltd.**

Bank details for **NEFT / RTGS / IMPS** : **Account Name: Chary Publications Pvt. Ltd.**

Bank Name: Bank of India **Branch: Chembur, Mumbai - 400 071** **Account Type: Current Account**

IFSC Code: BKID0000009 **Bank A/C Number: 000920110000322** **SWIFT CODE :BKIDINBBCHM**

Name: _____

Company: _____ Designation: _____

Address: _____

_____ City: _____ Pin: _____

Telephone: _____ Mobile: _____

Email: _____

Signature: _____ _____
Stamp

Chary Publications Pvt. Ltd.
905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703.
Phones: +91 22 27777 170 / 171 • Email: sub@charypublications.in • **Contact : Priyanka Alugade** • +91 22 27777182 / +91 8652142057

3 years imprisonment. The impact of theft is not limited to loss of revenue, it also affects power quality resulting in low voltage and voltage dips.

- Required to install proper seal management at meter terminal box, at CT/PT terminal to prevent power theft. Identify power theft area and required to expedite power theft checking drives.
- Installation of medium voltage distribution (MVD) networks in theft-prone areas, with direct connection of each consumer to the low voltage terminal of the supply transformer.
- All existing unmetered services should be immediately stopped.

Replacement of Faulty/Sluggish Energy Meter

- It is necessary to replace faulty or sluggish meter by distribution agency to reduce unmetered electrical energy.
- Required to test meter periodically for testing of accuracy of meter. Replacement of old erroneous electromechanical meters with accurate electro static meter (Micro presser base) for accurate measurement of energy consumption.
- Use of meter boxes and seals them properly to ensure that the meters are properly sealed and cannot be tampered.

Bill Collection Facility

- Increase bill's payment cells, increasing drop box facility in all area for payment collection.
- E-payment facility gives more relief to customer for bill payment and supply agency will get payment regularly and speedily from customer.
- Effectively disconnect the connection of defaulter customer who does not pay the bill rather than give them chance to pay the bill.

Reduce Debit areas of Sub-Division

- Recovery of old debts in selected cases through legal, communication and judicial actions.
- Ensuring police action when required to disconnect connection of defaulter Consumer.

Watchdog Effect on Users

- Users must aware that the distribution Agency can monitor consumption at its convenience. This allows the company fast detection of any abnormal consumption due to tampering or by-passing of a meter and enables the company to take corrective action.
- The result is consumer discipline. This has been shown to be extremely effective with all categories of large and medium consumers having a history of stealing electricity. They stop stealing once they become aware that the utility has the means to detect and record it.
- These measures can significantly increase the revenues of utilities with high non-technical losses.

Loss Reduction Programmed

- The increased hours of supply to agriculture and rural domestic consumers have resulted in higher loss levels.

Jignesh Parmar

M. Tech (Electrical)
Technical Writer,
Technical Blogger

Innovative Power Monitoring Devices

Enhanced energy management and power monitoring using sophisticated, contemporary yet, futuristic and highly evolved and reliable Diris Digiware range of plug & play devices from Socomec...

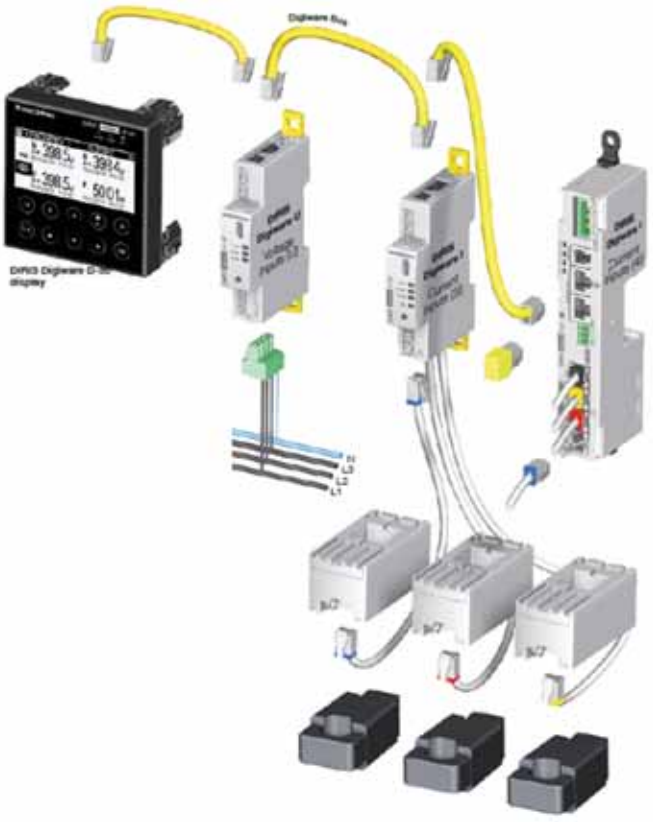
The DIRIS Digiware is a measuring system (PMD*) with modular format. It is designed for monitoring and reporting electrical energy. The DIRIS Digiware offers a range of functions for measuring voltage, current, power, energy and quality. It can be used to jointly analyse the single-phase and three-phase loads. It is an innovative concept based on centralising the voltage measurement and distributing the current measurement close to the loads. The voltage is measured by a dedicated DIRIS Digiware U module and the current by dedicated DIRIS Digiware I modules. The voltage and current measurements are interconnected by the DIRIS Digiware Bus. On the Digiware I modules, three or four current inputs are available, depending on the model, enabling one or several loads to be monitored simultaneously. Several modules may be connected to the Digiware bus. This approach offers the possibility of characterising a high number of loads from a single voltage tap.

Cabling is made simple by a single voltage measurement connection. The connection mode for the current sensors also contributes to quick, easy installation and the automatic identification of the sensor (type and rating) significantly reduces the risk of installation errors. In addition, combining the current sensor with the DIRIS Digiware means the overall accuracy of the DIRIS Digiware + Current sensor measurement chain can be guaranteed for all values measured.

The DIRIS Digiware is configured from its remote display or via the Easy Config software. The measurements can be accessed via the WEBVIEW web server integrating the monitoring function for electrical values (Power Monitoring version) and reporting function for energy data (Power & Energy Monitoring version). WEBVIEW is available on the DIRIS G communication gateways. Due to its intrinsic architecture, the DIRIS Digiware can be easily integrated into an energy management system which requires a large number of loads to be monitored.

The DIRIS Digiware boasts numerous functions, including:

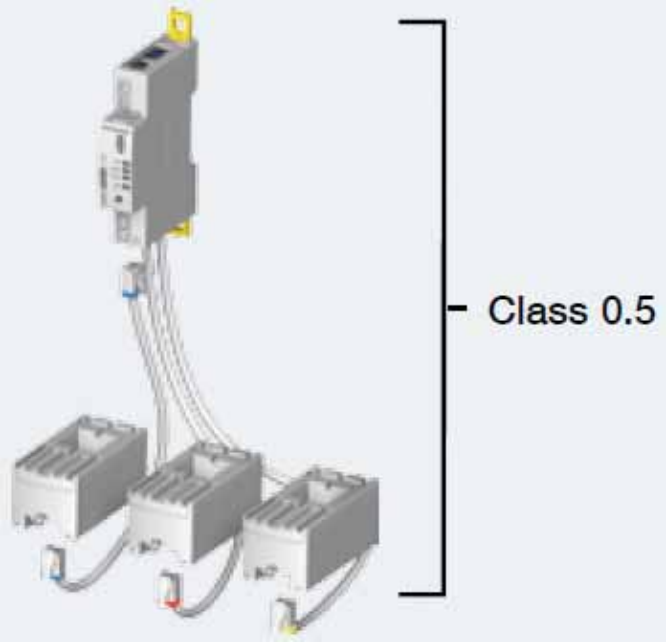
- General measurements
  - Voltage measurement
  - Multi-load current measurement
  - Power, power factor, phi, cos phi and tan phi



*PMD: Performance Measuring and monitoring Device in accordance with IEC 61557-12.

  - Operation across 4 quadrants
  - Predictive power
  - Guarantees the overall accuracy of the DIRIS Digiware + Sensor measurement chain in terms of power and active energy up to class 0.5, as per IEC standard 61557-12
- Quality
  - Direct, inverse and homopolar voltages
  - THD and harmonics up to order 63 for voltage and current
  - Current and voltage unbalance
  - EN50160 events (Uswl, Udip, Uint) and current overloads
- Logging
  - Recording of average electrical values
  - Recording and time stamping of min/max electrical values
- Metering
  - Partial and total apparent, active and reactive energies
  - Load curves
- Alarm
  - Time stamped alarms with boolean combination
- Current inputs
  - Measurement of 3 or 4 currents per current measurement module
  - Current inputs with quick connection and automatic recognition of the current sensors
  - Simultaneous management of several single-phase, two-phase and three-phase loads
  - Connection of solid-core, split-core and flexible sensors
  - Checking of the connection, detection of the CT and auto-configuration of the networks
  - Guarantees the overall accuracy of the DIRIS Digiware + Sensor measurement chain at Class 0.5 in terms of power and active energy as per IEC standard 61557-12
- Communication
  - RS485 communication
  - Association with the DIRIS Digiware D-50 multi-product remote display
  - Measurements available in the WEBVIEW web server of the DIRIS G gateway
  - Time synchronisation by the DIRIS G gateway
  - Auto-addressing in association with the gateway or the remote display.

At the core of an organization's energy efficiency related efforts is to aim for ISO 50001 standard compliance, being the international standard for energy management the strategy is to allow a company to –



  - Develop, supply and uphold an energy policy
  - Establish objectives, targets and action plans

Global standard for Energy management, ISO 50001, 2011

The ISO 50001 standard integrates energy management into the company's daily practices. It is based on the same dynamic continual improvement as other system management standards, such as ISO 9001 (quality management) and ISO 14001 (environmental management), which makes it easier to implement in the company. It is based on the principle of continuous improvement PDCA (Plan-Do-Check-Act).

Challenge to maintain System accuracy under varying load conditions

New approach of DIRIS Digiware ranges

For energy efficiency projects, we need to measure a number of loads on an installation to be able to assess its behaviour.

To this end, Socomec has developed a comprehensive solution called DIRIS Digiware, comprising a multi-point measurement system with a range of associated current sensors.

The DIRIS Digiware measurement system consists of interconnected modules:

Comparision between a standard PMD+CT product and the DIRIS Digiware solution

Current measured	Accuracy of DIRIS Digiware	Accuracy of class 0.5 PMD + CT
2% In < I < 5% In	1%	—
5% In < I < 10% In	1%	1.82%
10% In < I < 20% In	0.5%	1.82%
20% In < I < 100% In	0.5%	1.04%
100% In < I < 120% In	0.5%	0.81%

– A DIRIS Digiware U module dedicated to measuring voltage,
– DIRIS Digiware I modules dedicated to measuring current.

Several types of modules are available depending on the number of loads to measure. Data from voltage measurement U is transmitted digitally to the current measurement I modules to calculate power and energy.

The current sensors use a specific connection type RJ12, allowing:

– A fast connection without wiring errors,
– Detection of current sensors,
– The guarantee of a 0.5 % overall accuracy in the power and energy measurement chain.

Example of a connection between the DIRIS Digiware I-30 with its assigned TE current sensors:

Classification of the DIRIS Digiware solution according to the standard IEC 61557-12

With this approach we can classify the DIRIS Digiware solution and its current sensors in the direct connection PMDs (PMD DD) section according to the standard IEC 61557-12. For a PMD of a C < 1 accuracy class and taking into account Ib = In and Imax = 120 % In, the table of IEC 61557-12 (Section 3) is shown in table above.

Comparision between a "standard" PMD+CT product and the DIRIS Digiware solution

- "Standard" product: Class 0.5 measuring device (PMD) assigned to class 0.5 current transformers (CT) → Class 1 calculated (See above table).
- Digiware solution using TE current sensors → Class 0.5 guaranteed.

On account of its class leading innovative technology, DIRIS Digiware can guarantee 0.5 overall performance class accuracy in power and energy for loading between 2 to 120% of nominal ratings. By comparison, with a 0.5-class measurement device assigned to 0.5-class current transformers, one will only reach an overall performance class of 1.

Thus, the measuring range and performances offered by DIRIS Digiware surpasses the PMD+CT conventional solutions offered on the market that is definitely a key criteria towards ISO-50001 accredited systems and facilities.

For more details, Email: Info.in@socomec.com

ELECRAMA
we are all about electricity

10-14 MARCH 2018
INDIA EXPO MART
GREATER NOIDA, NCR, INDIA

Supported by
सत्यमेव जयते
Ministry of Commerce & Industry, Department of Commerce (For RBSM)
Ministry of External Affairs, Investment and Technology Promotion Division
Ministry of Heavy Industries & Public Enterprises, Department of Heavy Industry
Ministry of New and Renewable Energy
Ministry of Power
GOVERNMENT OF INDIA

Tomorrow's automotives & transportation will have more to do with **electrical engineering** and information technology. Are you ready for the shift?

eTECHnxt

#changethepowergame

find your answers at the transportation track at eTECHnxt

Chair Dr. Jaijit Bhattacharya, Partner, KPMG
Co-Chairs Dr. A. Naikodi, Head – E&E, Mahindra Electric Mobility
Dr. Rahul Walawalkar, Executive Director, IESA
Mr. DVS Subramanyam, Sr. DGM, LARSEN & TOUBRO

- **Digitalisaition of Power Delivery**
- **Energy Storage Systems**
- **IoT, AI & Electricity**
- **eTransportation**
- **Startup Forum**
- **Engineer Infinite Technical Conference**

eTECHnxt partner organisations

IEEE · IET The Institution of Engineering and Technology · IESA · IESA · SMEV · SIAM Society of Indian Automobile Manufacturers · TE GLOBAL

organised by

ieema your link to electricity

MAKE IN INDIA

www.etechnxt.elecrama.com

Smart Maintenance of Power Transformers

State-of-the-art test systems and a smart software solution for diagnostic testing, condition assessment and easy data management help to evaluate the status of a power transformer faster and more reliably than ever before...

Growing energy demand, increasing distributed generation and an aging asset infrastructure are all part of the major challenges facing electric utilities today. Asset and maintenance managers need to ensure the reliability of their assets in an environment which is experiencing increasing cost pressure. Since power transformers are among the most critical and cost intensive components in electric energy networks, life-cycle management programs are becoming more and more common. Thereby, a two-step approach is often utilized to keep the lifecycle management process more cost efficient.

Initial Screening

In an initial screening step, you can evaluate power transformers by monitoring the most critical components and using test methods which can indicate a wide range of problems. The most powerful screening method is the Dissolved Gas Analysis (DGA). Due to the fact that this method can be used to detect a very broad spectrum of problems related to the active part makes it the most widely accepted and used measurement routinely performed on power transformers. If performed frequently, it also allows detection of developing failure modes by trending

Measurement method	Identify failure mode	Confirm with
Dissolved Gas in Oil Analysis	Multiple failure modes in the active part of the power transformer	Electrical test methods based on detected failure mode
Power/Dissipation Factor and Capacitance	Aging, moisture and contamination of bushings or main insulation, breakdown of capacitive bushing layers	Dielectric Frequency Response
No-load Current	Core problems, shorted turns	DGA, for example, indicating high internal temperatures
Leakage Reactance (stray reactance)	Winding deformation	High through-fault currents
Frequency Response of the Stray Losses (FRSL)	Shorted parallel strands	DGA, for example, indicating high internal temperatures
Turns Ratio Test	Short-circuits between windings or turns	Sweep Frequency Response
Winding Resistance (static)	Contact problems, broken or loose connections, broken conductors	DGA, for example, indicating high internal temperatures
Winding Resistance (dynamic)	Contact problems at the diverter switch, broken transition resistors	DGA of Tap Changer Compartment
Dielectric Frequency Response (DFR)	Aging, moisture and contamination of oil-paper insulation	Power/Dissipation Factor, Oil Quality test results
Sweep Frequency Response Analysis (SFRA)	Winding deformation, short-circuit between windings or turns	Turns Ratio Test

over time and evaluating the rate of change of certain gas concentrations.

In many cases, bushings reach the end of their life before the power transformer itself. However, the diagnostic reach of DGA related to bushings is limited. Therefore, power/dissipation factor and capacitance measurements should be included in the screening process as part of the lifecycle management program.

Picture 1: One software for all common chemical, electrical and dielectric diagnostic tests on power transformers.

Based on this condition information, you can assign the probability of a failure to each asset. In the second step, you can conduct a more detailed condition assessment for the high risk assets including diagnostic testing.

Diagnostic Testing

Additional test methods have to be employed to further evaluate the condition and decide on maintenance, repair or replacement measures. In addition to the above mentioned DGA and power/dissipation factor tests, you can use a variety of electrical test methods to diagnose different problems within the power transformer.

As you can see, each type of test gives you another piece of information about the overall status of your power transformer. Comparisons with fingerprints and previous measurements provide additional information.

So, in order to have a picture that is as complete as possible, you need to find a way to make these pieces fit together. In the past this was often only possible by transferring data manually from the individual test devices to one common file. Comparisons and reports also had to be prepared manually.

Picture 2: The PTM software assesses DGA results using interpretation methods such as Duval's triangles or gas ratio methods according to IEEE C57.104 and IEC60599

Therefore, OMICRON developed software that supports users in smart power transformer maintenance.

Primary Test Manager™ – the software for smart maintenance

OMICRON's Primary Test Manager™ (PTM) software is optimized for the initial screening, diagnostic testing and condition assessment of medium and high-voltage assets, including power transformers and associated equipment such as bushings and on-load tap changers (OLTC). The PTM software assists you in testing and assessing your assets according to applicable international IEEE and IEC standards and guidelines, while keeping your testing time to a minimum.

It is, therefore, the ideal software tool for supporting your efforts to complete your transformer diagnostic testing with much greater speed.

One Software for Chemical, Electrical & Dielectric Tests

Meanwhile, the comprehensive PTM software supports you in all common chemical, electrical and dielectric diagnostic tests performed with OMICRON test systems and the corresponding condition assessment, such as the assessment of dissolved gas analysis test data:

- Power factor/dissipation factor and capacitance
- Excitation current
- Short-circuit and zero sequence impedance
- Transformer turns ratio
- DC winding resistance
- Dynamic OLTC Scan (DRM)
- Demagnetization
- Dielectric (frequency) response analysis
- Insulation resistance
- Polarization index and dielectric absorption ratio
- Sweep frequency response analysis
- Gas-in-Oil analysis

So, you only have to get comfortable with one type of testing software, which also means less training effort. Combined with the time-saving advantages of new test systems such as, for example, the 3-phase power transformer test system TESTRANO 600 or the DIRANA for dielectric frequency response analysis, power transformer testing can be done in a fraction of the time needed in the past.

Efficient Data Management

The PTM software provides a well-structured database for managing all power transformer related data to get a comprehensive overview of its condition. You can enter information about the location, as well as nameplate parameters such as serial number, vector group, or voltage and current ratings. Alternatively, you can import data about location or asset from other systems, for example ERP, maintenance or asset management systems. Once the data is entered, it can be re-used for all future tests. You can find the transformer you're looking for with just a few clicks – everything is quick and easy.

The PTM DataSync function guarantees that all test data created in the field is synchronized to a central database. This provides guaranteed access to tests that have already been carried out, plus the associated connection diagrams and test reports, at any time, regardless of whether the tests were carried out by you or any other member of your test team.

Preparation Increases Quality & Saves Time

The testing procedure using the PTM software is

Picture 3: Trend analysis and side-by-side comparisons with reference values or previous results.

THE IMPOSSIBLE IS OFTEN

THE TASKS UNTRIED

BESIDES BI-MONTHLY MAGAZINE TAKE ADVANTAGE OF THE DIGITAL TECHNOLOGY & READ *LIGHTING INDIA* MAGAZINE ONLINE, AS WELL AS FORTNIGHTLY E-NEWSLETTER ON YOUR PC, TABLET OR LAPTOP.

To **Subscribe** & Be Updated
Please fill the form (P.T.O.)
PLEASE TURN BACK FOR THE SUBSCRIPTION FORM.

Come Join us in endevour to bring the lighting industry to you, on the most read media platform of LIGHTING INDIA.

"WE TRAVEL AROUND THE WORLD TO GET NEWS, PRODUCTS & PROJECTS FOR YOU, SO THAT YOU CAN KEEP PACE WITH THE REST OF THE WORLD "

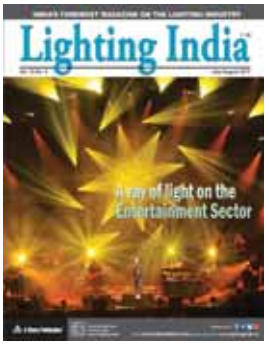
Read and advertise in India's foremost magazine on LIGHTING INDUSTRY.

CHARY PUBLICATIONS PVT LTD.

905-906, THE CORPORATE PARK PLOT NO. 14 & 15, SECTOR - 18,OPP. SANPADA RAILWAY STATION,VASHI, NAVI MUMBAI - 400 703. FOR SUBSCRIPTION PLEASE CONTACT PRIYANKA ON 022-27777182/8652142057 OR EMAIL ON sub@charypublications.in

SUBSCRIBE

Lighting India



Subscription Offers

Sub. Period	No. of Issues	Subscription Type					
		Print		Digital		Print+Digital	
		Actual Rate	You Pay	Actual Rate	You Pay	Actual Rate	You Pay
1 Year	6	750.00		750.00		1500.00	1125.00
2 Years	12	1500.00	1350.00	1500.00	1350.00	3000.00	2025.00
3 Years	18	2250.00	2000.00	2250.00	2000.00	4500.00	3000.00
5 Years	30	3750.00	3000.00	3750.00	3000.00	7500.00	4500.00
E-Newsletter							
1 Year	**24**	**N. A.**		**365.00**		**N.A**	

MAGAZINE WILL BE SENT BY REGISTER PARCEL --Rs.220/YEAR

KINDLY ADD POSTAGE CHARGES IN SUBSCRIPTION AMOUNT

Subscription / Renewal Form

To,
The Subscription in-charge
LIGHTING INDIA
Email: sub@charypublications.in

Are you a Subscriber,
Please submit your Subscription no:

Yes, I would like to Subscribe/renew ☐ **Lighting India** / ☐ **LI e-Newsletter** for _____years at ₹_____.

PAYMENT DETAILS :

Cheque / DD No. _____ Dated _____ Drawn on Bank _____

_____ Branch _____ in favour of **Chary Publications Pvt. Ltd.**

Bank details for **NEFT / RTGS / IMPS** : **Account Name: Chary Publications Pvt. Ltd.**

Bank Name: Bank of India **Branch: Chembur, Mumbai - 400 071** **Account Type: Current Account**

IFSC Code: BKID0000009 **Bank A/C Number: 000920110000322** **SWIFT CODE :BKIDINBBCHM**

Name: _____

Company: _____ Designation: _____

Address: _____

_____ City: _____ Pin: _____

Telephone: _____ Mobile: _____

Email: _____

Signature: _____ _____

Stamp

Chary Publications Pvt. Ltd.

905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703.
Phones: +91 22 27777 170 / 171 • Email: sub@charypublications.in • **Contact : Priyanka Alugade** • +91 22 27777182 / +91 8652142057

based on a four-step concept that covers everything from the preparation stage right through to the test report.

Using PTM, you can make thorough preparations for the testing day and reduce the amount of time spent outside in the field. Thanks to the central database, any test procedures or measured data from previous asset tests can also be accessed during the preparation stage.

Step 1: Customized test plans

Based on the nameplate values entered in the database, PTM generates a customized test plan according to current standards and guidelines for each asset. Thereby, PTM provides you with a comprehensive test plan to thoroughly assess the condition of your transformer. By selecting or de-selecting individual tests, you can tailor the test procedure to your specific needs with minimum effort. At the same time, test plans can be configured in advance to enable fast and effective measurements.

Step 2: Safe and automatic test execution

Clear connection diagrams help the user ensure the test equipment is set up correctly. Not only does this keep errors to a minimum and speed up the testing process, but it also provides protection for the user.

PTM enables you to control the connected test set and to execute the defined test directly from a computer. You are prompted wherever a user interaction is required, otherwise the execution of the tests is fully automatic. All results are displayed as diagrams and tables in real time, and the system also shows the progress of the measurements as well as the tasks that are still remaining.

Step 3: Automatic assessment, comparison and trending

Limit values can be selected according to applicable guidelines or defined based on your individual customized limit profiles. An instant 'pass/fail' assessment of the test results is displayed based on specified limit values. In addition, a tooltip informs you which test parameters should be investigated.

Having said this, often it is not the absolute value that has been measured once that is of importance, but the change of the value over time – the trend. With PTM you can do a trend analysis for power/dissipation factor or DGA values for example. Additionally, you can do side-by-side comparisons with reference assets or sister units.

Step 4: One report for all tests

Once the tests are done, PTM automatically generates a report including all asset related information and test results. This gives you a comprehensive overview of the power transformer that has been tested, the test results and the assessment. You can easily adapt this test report, for example, by choosing from different types of result tables and diagrams and by providing comments on every test.

Reliable and fast transformer diagnostics

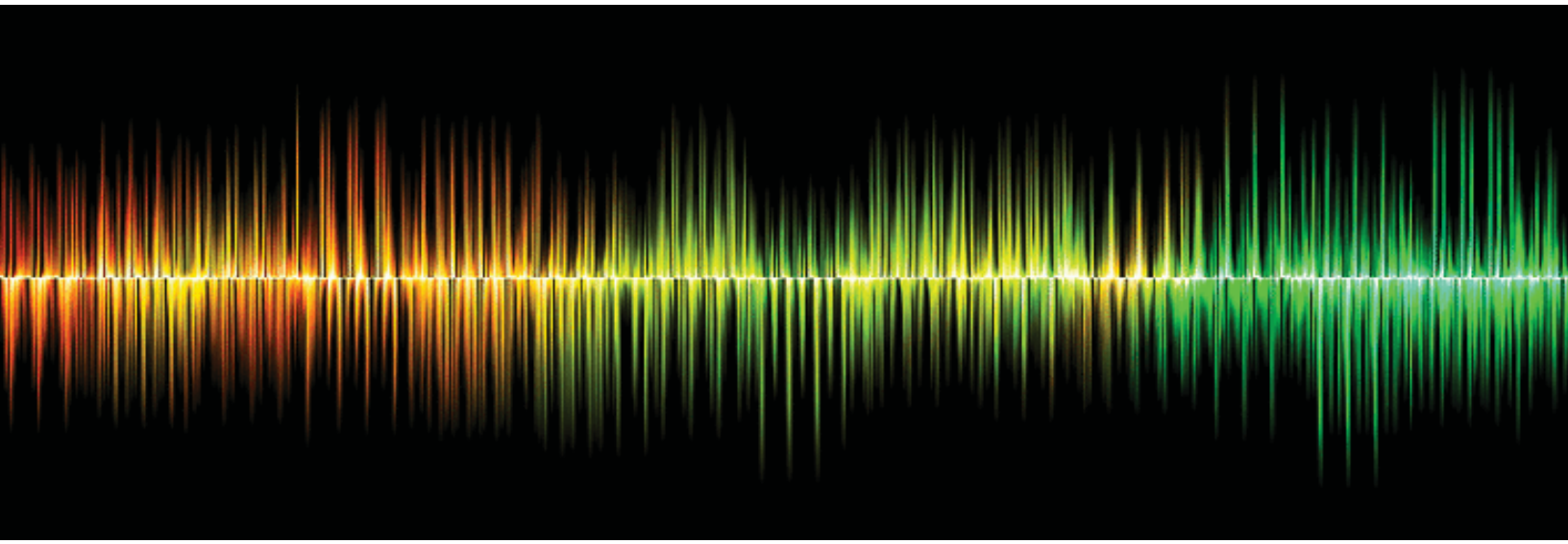
Using the combination of several diagnostic tests helps to get an unambiguous picture of the status of a power transformer and define the required measures precisely. Thereby, state of the art test systems and a smart software solution for diagnostic testing, condition assessment and easy data management help to evaluate the status of a power transformer faster and more reliably than ever before.

Martin Pfanner

Product Manager
Omicron

Harmonics in Power System

The distribution of the harmonic sources requires close monitoring between OEM & users for making a stringent specification in order to minimize voltage-distortion levels are kept to acceptable levels on the overall system considering IEEE 519- standards...



Basically Linear & Non-linear types of loads are being extensively used in any electrical load scenario. Linear load is defined as whose impedance is constant throughout its applied voltage cycle. Resistive, inductive & capacitive loads are coming under linear category. Whereas, non-linear load is defined as whose impedance is continuously varying to its applied voltage cycle. SMPS, electronic equipment, SCR/IGBT devices, UPS systems etc are coming under non-linear category. However, harmonics are distortion of the normal electrical current waveform, generally transmitted

by nonlinear loads that draw a non sinusoidal current from a sinusoidal voltage source. A harmonic current increases power system heat losses, reduces system efficiency. Harmonic currents can have a significant impact on electrical distribution systems and the facilities they feed.

Switch-mode power supplies (SMPS), variable speed motors and drives, photocopiers, personal computers, laser printers, fax machines, battery chargers and UPSs are examples of nonlinear loads. Single-phase non-linear loads are prevalent in modern office buildings, while three-phase, non-linear loads are widespread in factories and industrial plants. Harmonics should not be confused with spikes, dips, impulses, oscillations or other forms of transients.

Power system harmonics is an area that is receiving a great deal of attention recently. The increase in proportion of non-linear load has prompted more stringent recommendations (IEEE Std. 519 & IEC61000-4-7) and stricter limits imposed by utilities.

Sine waves are symmetric about origin. Figure 1 shows various harmonic contents like 3rd, 5th & 7th & the resultant yellow colour appears to be square wave. A square wave is actually combination of infinite series of sine wave harmonics, added together.

Harmonic Effects

All computer systems use SMPS that convert utility AC voltage to regulated low-voltage DC for internal electronics. These non-linear power supplies draw current in high-amplitude short pulses that create significant distortion in the electrical current and voltage wave shape—harmonic distortion, measured as total harmonic distortion (THD). The distortion travels back into the power source and can affect other equipment connected to the same source. Most power systems can accommodate a certain level of harmonic currents but will experience problems when harmonics become a significant component of the overall load. As these higher frequency harmonic currents flow through the power system, it will be having following effects:

- Large load currents in the neutral wires of a 3 phase system.
- High neutral-to-ground voltage often greater than 2 volts
- communication errors, overheating and hardware damage

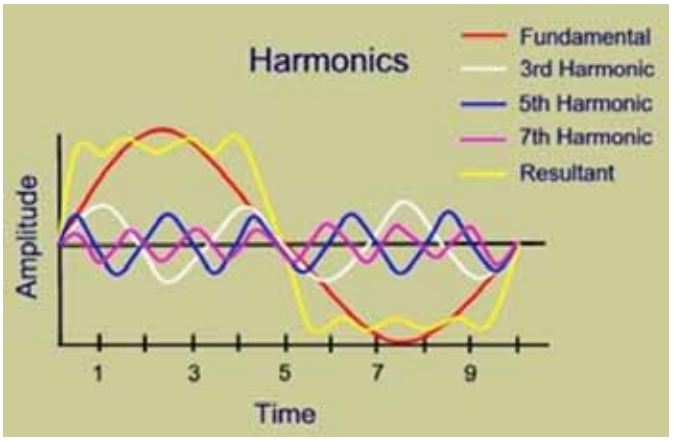


Figure 1: Harmonic waveform from fundamental -7th & resultant

- Overheating of electrical distribution equipment, cables, transformers, standby generators, etc.
- High voltages and circulating currents caused by harmonic resonance
- Generator Hunting
- Electronic Control Clock errors
- Quivering Monitors and CRT displays
- Equipment malfunctions due to excessive voltage distortion
- Nuisance tripping of circuit breakers
- Metering errors needs true metering
- zero-crossing noise
- skin effect
- Reducing system power factor, resulting in penalties on monthly utility bills overloading of neutrals

Basic Theory

The analysis of harmonics is the process of calculating the magnitudes and phases of the fundamental and high order harmonics of the periodic waveforms The Fourier's theorem states that every non-sinusoidal periodic wave can be decomposed as the sum of sine waves through the application of the Fourier series. The resulting series is known as Fourier series. It establishes a relation between a function in the domain of time and a function in the domain of frequency.

Harmonics are a mathematical way of describing distortion to a voltage or current waveform. The term harmonic refers to a component of a waveform that occurs at an integer multiple of the fundamental frequency. The function $f(x) = \sin x$ is an odd function. That is, it is symmetrical about the origin. We have:

$\sin(-x) = -\sin(x)$

The function $f(x) = \cos x$ is an even function. That is, it is symmetrical about the vertical axis. We have: $\cos(-x) = \cos(x)$

If the function is odd then cosine term disappears. If the function is even the Sine term vanishes from expression. For our analysis Sine terms are only considered in the expression.

Fourier theory tells us that any repetitive waveform can be defined in terms of summing sinusoidal waveforms which are integer multiples (or harmonics) of the fundamental frequency. For the purpose of a steady state waveform with equal positive and negative half-cycles, the Fourier series can be expressed as follows:

$$v = a_0 + a_1\cos x + b_1\sin x + a_2\cos 2x + b_2\sin 2x + a_3\cos 3x + b_3\sin 3x + \ldots..$$

$$a_0 = \frac{1}{2\pi}\int_0^{2\pi} f(x)\,dx$$

$$a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos(nx)\,dx$$

$$b_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\sin(nx)\,dx$$

$$f(t) = a_0 + \sum_{n=1}^{\infty}\left[a_n\cos\frac{2n\pi}{T}t + b_n\sin\frac{2n\pi}{T}t\right]$$

f(t) is the time domain function
n is the harmonic number (only odd values of **n** are required)
$\mathbf{a_n}$ & $\mathbf{b_n}$ are the coefficients of individual nth harmonic component
T is the length of one cycle in seconds

THD (Total Harmonic Distortion)

A common term that is used in relation to harmonics is THD or Total Harmonic Distortion. THD is a term used to describe the net deviation of non-linear waveform from ideal sine waveform. Total Harmonic Distortion is the ratio between the RMS values of the harmonics and the RMS value of fundamental. THD can be used to describe voltage or current distortion and is calculated as follows:

$$\mathrm{THD_V} = \frac{\sqrt{V_{2,rms}^2 + V_{3,rms}^2 + V_{4,rms}^2 + \ldots + V_{n,rms}^2}}{V_{1,rms}} \cdot 100\%$$

$\mathrm{THD_V}$ – Total Harmonic Distortion of the voltage
$V_{1,rms}$ – rms value of the fundamental voltage
$V_{n,rms}$ – rms value of the harmonic n

The following equation allows determination of the characteristic harmonics for a given pulse number:

h = kq ±1

where **h** is the harmonic number (integer multiple of the fundamental **k** is any positive integer

q is the pulse number of the converter

This means that a 6-pulse (or 3-phase) rectifier will exhibit harmonics at the 5th, 7th, 11th, 13th, 17th, 19th, 23rd, 25th, etc. multiples of the fundamental. As a rough rule of thumb, the magnitudes of the harmonic currents will be the fundamental current divided by the harmonic number (e.g. the magnitude of the 5th harmonic would be about 1/5th of the fundamental current). A 12-pulse (or 6-phase rectifier) will, in theory, produce harmonic currents at the 11th, 13th, 23rd, 25th, etc. multiples. In reality, a small amount of the 5th, 7th, 17th and 19th harmonics will be present with a 12-pulse system (typically the magnitudes will be on the order of about 10 percent of those for a 6-pulse drive).

ODD & EVEN Harmonics

As name implies that odd harmonics have odd numbers (e.g 3,5,7,9,11,13) & even harmonics have odd numbers (e.g 2,4.6.8,10).Harmonic number 1 is represented to the fundamental frequency component

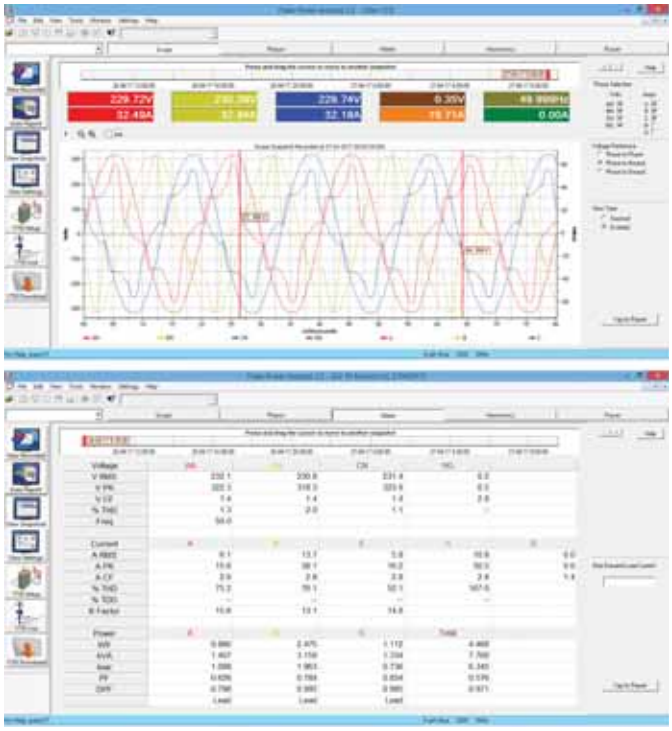


Figure 2: voltage & current waveform having non- linearity in nature

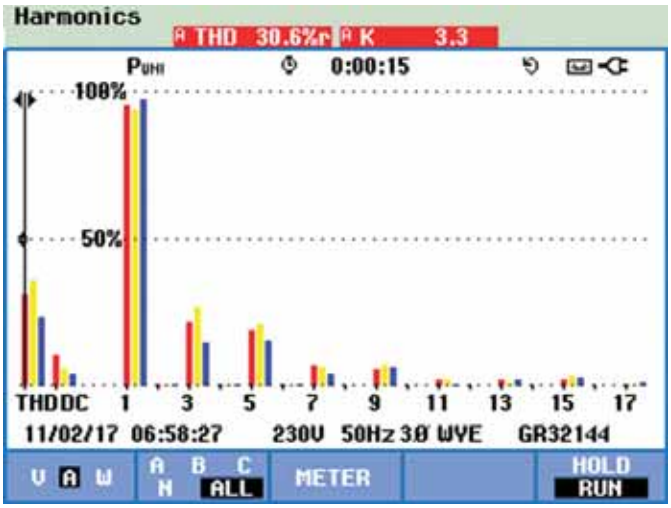


Figure 3: Harmonic current waveform with K factor- measured by Fluke 435 PQA

of periodic wave. Harmonic number 0 is the constant or DC component of the waveform. DC component is the net difference between positive & negative halves of complete waveform cycle. Even harmonics cancels out & majority of non-linear loads produce odd harmonics. Uneven current draw between the positive & negative halves of one cycle of operation can generate even harmonics.

Measurement with Fluke-1750 Power Recorder

The Figure 2 shows the voltage & current waveform having non- linearity in nature recorded at one of our site. Figure 3 shows CF, DPF KW, KVA ,KVAR,V_{THD} & I_{THD} & k factor. These parameters signify the percentage of non-linearity of Waveform & helps in analysis of Harmonic loads.

Harmonics K-factor

A standard transformer is not designed for high harmonic currents produced by non-linearloads. It will overheat and fail prematurely when connected to these loads. When harmonics were introduced into electrical systems at levels that showed detrimental effects are catered by *K-rated transformer*.

K-rated transformers are not used to handle harmonics, but they can handle the heat generated by

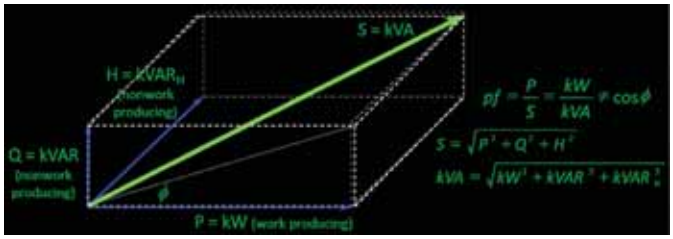


Figure 4: Power Vector Relationship (Non-Linear Loads)

harmonic currents and are very efficient when used under their K-factor value. K-factor ratings range between 1 and 50. A standard transformer designed for linear loads is said to have a K-factor of 1. The higher the K-factor, the more heat from harmonic currents the transformer is able to handle. Making the right selection of K-factor is very important, because it affects cost and safety. The table shows appropriate K-factor ratings to use for different percentages of non-linear current in the electrical system.

Power Factor for Non-Linear Loads

P = Active Power in kW
Q = Reactive Power in kVAR
S = Apparent Power in kVA

For non-linear loads, the power vector relationship becomes three dimensional with distortion reactive power, H, combining with both Q and P to produce the apparent power which the power system must deliver. Power factor remains the ratio of kW to kVA but the kVA now has a harmonic component as well. True power factor (TPF) becomes the combination of displacement power factor (dPF) and distortion power factor (hPF). Displacement PF is still equal to CosΦ, with Φ being the angle between the fundamental current and voltage. Displacement PF can be either leading or lagging. Distortion PF is then true PF (kW/kVA) divided by the dPF. Distortion PF is neither leading nor lagging. For typical non-linear loads, the displacement power factor will be near unity. True power factor, however, is normally very low because of the distortion component. For example, the displacement power factor of a variable speed drive will be near unity but its total power factor is often in the 0.7 – 0.8 range unless harmonic mitigation equipment is applied.

Today, with the heavy proliferation of non-linear loads, low power factor on a power system is often the result of a high distortion reactive power component and not inductive reactive power. Therefore, one can no longer say that low power factor is normally caused by electric motors and other inductive loads. And since the best way to improve a

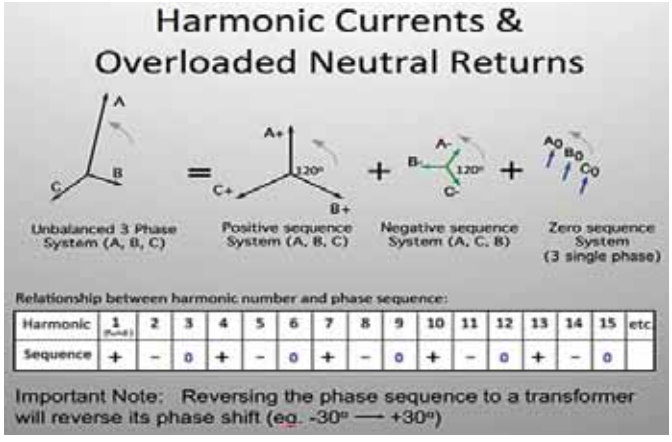


Figure 5: Unbalanced 3 phase Systems with sequence

Harmonic Input Current Waveforms of Different Non-Linear Loads

Type of Load	Typical Waveform	Current Distortion
Single Phase Power Supply		80% (high 3rd)
Semiconverter		high 2nd,3rd, 4th at partial loads
6 Pulse Converter, capacitive smoothing, no series inductance		80%
6 Pulse Converter, capacitive smoothing with series inductance > 3%, or dc drive		40%
6 Pulse Converter with large inductor for current smoothing		28%
12 Pulse Converter		15%
ac Voltage Regulator		varies with firing angle
Fluorescent Lighting		20%

Figure 6: Input current Waveform of Non-linear loads

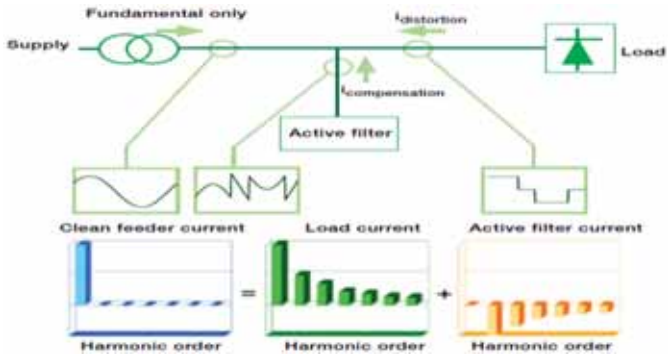


Figure 7: Harmonic mitigation by Active Filter

poor power factor caused by non-linear loads is to remove the harmonic currents.

Harmonic Effects on Phase sequence

In a balanced system, voltage harmonics can either be positive, negative or zero sequencing values. This means that the voltage at that particular frequency tries to rotate the motor forward, backward, or neither (just heats up the motor), respectively. There is also heating from increased losses as in a transformer. Harmonic Sequencing Values in Balanced Systems:

Table 1: Positive, negative & zero Sequence

Sequence	Harmonic Numbers				Effects
Positive	1st	7th	13th	19th	Rotates with Fundamental (Excessive Heating Effect)
Zero	3rd	9th	15th	21th	Does not rotate (Adds Voltages and/or Currents in Neutral Wire causing Heating)
Negative	5th	11th	17th	23rd	Rotates against Fundamental (Motor Torque Problems)

Electrical distribution systems for harmonics

These are recommended ways to wire for the

harmful effects that harmonics cause. However, these recommendations only keep the electrical distribution systems safe. These wiring recommendations do not eliminate or cancel high levels of harmonics.

- Double-size neutral wires or separate neutrals for each phase.
- Dedicated full-size insulated ground wire instead of conduit alone as a return ground path
- Use an isolated ground wire for sensitive electronic and computer equipment.
- Segregate sensitive electronic and computer loads on separate branch circuits all the way back to the electrical panel.
- Installation of comprehensive exterior copper ground ring and multiple deep driven ground rods as part of the grounding system to achieve 5 ohms or less resistance to earth ground.
- Oversize phase wires to minimize voltage drop on branch circuits.
- Shorten the distance on branch circuits from the power panel to minimize voltage drop.

Mitigation of Harmonics

In order to ensure the highest Power Quality for your building or facility, it is necessary to treat harmonics. Harmonic treatment can be performed by two methods: filtering or cancellation. A harmonic filter consists of a capacitor bank and an induction coil. The filter is designed or tuned to the predetermined non-linear load and to filter a predetermined harmonic frequency range. Usually this frequency range only accounts for one harmonic frequency. This application is mostly used when specified for a UPS or variable frequency drive motor in a manufacturing plant.

Harmonic cancellation is performed with harmonic cancelling transformers also known as phase-shifting transformers. A harmonic Cancelling transformer is a relatively new power quality product for mitigating harmonic problems in electrical distribution systems. This type of transformer has patented built-in electromagnetics technology designed to remove high neutral current and the most harmful harmonics from the 3rd through 21st. The technique used in these transformers is call "low zero phase sequencing and phase shifting". These transformers can be used to treat existing harmonics in buildings or facilities. This same application can be designed into new construction to prevent future harmonics problems.

Minimising Harmonic Issues

1. Over sizing & Separate Neutral Conductors: In three phase circuits with shared neutrals, it is common to oversize the neutral conductor up to 200% when the load served consists of non-linear loads. Also, by running separate neutral conductors for each phase conductor. This increases the copper use by 33% & successfully eliminates the addition of the harmonic currents on the branch circuit.
2. Oversizing Transformers and Generators: Due to harmonic currents, total current increases resulting thermal capacity of transformers and generators should be increased. Oversizing is taken into consideration.
3. Active Filters & PF Control: Latest technology to eliminate harmonic injected into the mains supply by non linear loads, as well supplies inductive power demanded by the load, so as to correct input power factor to near unity. The use of active harmonic filters (AHF), power quality devices that permanently monitor the non-linear load and dynamically provide precisely controlled current, helping to prevent distortion in a power network. This current has the same amplitude of the harmonic current but is injected in the opposite phase-shift, canceling out the harmonic currents in the electrical system. As a result, the current supplied by the power source will remain sinusoidal since the harmonics will cancel each other, and the harmonic distortion is reduced to less than 5% THDi, meeting all standards.

   This and the reactive current signal, together are used to generate a reference for the controlled current source connected at the PCC (point of common connection) of source and load. This results in mains supplying only real power for the load and reactive &harmonics being sourced from the Active Filter.This is carried out dynamically,so that any change in the load pattern or its nature is immediately responded without any manual intervention.

   As shown in figure 7, the harmonics are being generated by the load side is mitigated by AHF with 180° phase opposition harmonic order of same magnitude having clean feeder current source.
4. Passive filters: Passive filters are combination of L & C, designed to tune a particular frequency of

harmonics .Passive filters are used to provide a low impedance path for harmonic currents so that they flow in the filter and not the supply.

5. Isolation Transformers: Triple-N currents circulate in the delta windings of transformers The same effect can be obtained by using a 'zig-zag' wound transformer.
6. K-Rated Transformers: Special transformers have been developed to accommodate the additional heating caused by these harmonic currents.
7. True RMS Metering: New "true RMS" meters will sense current up to the kilohertz range. These meters should be used to detect harmonic currents & will give actual reading of harmonic content.
8. Series Reactor: It can be connected in series with Non-linear Loads & harmonics can be minimized.

Conclusion

The way modern power electronic devices are coming up, the harmonic effects & solution for mitigation technique needs to be thought of in our present power system scenario & needs to be reviewed and implemented. The distribution of the harmonic sources requires close monitoring between OEM & users for making a stringent specification in order to minimize voltage-distortion levels are kept to acceptable levels on the overall system considering IEEE 519-standards. It should be also ensured that source side of electrical distribution should not be polluted by harmonic loads & needs an improvement of waveform & power factor by Harmonic mitigation techniques.

S K Pattnaik

Associate Group Director
Power System Division
ITR(DRDO), Chandipur

More than 13,000 footfalls at Intersolar

Despite these consequences of the climate change Intersolar India opened the doors to a total attendance of more than 13,000 solar and energy storage experts, even 10% more than the expected visitor numbers...

Visitors having a look at magazines at Electrical India's stall.

The first time in nine years of existence, Intersolar India had to experience India's unbelievable climate change. Surprising rainfalls accompanied the event during a draught season. Despite these consequences of the climate change Intersolar India opened the doors to a total attendance of more than 13,000 solar and energy storage experts, even 10% more than the expected visitor numbers. 241 exhibitors showcased their latest products and solutions in Hall 1 of the Bombay Exhibition Center. On the opening day government dignitaries expressed their honor to participate in India's largest solar exhibition and conference for the solar industry. The positive development of the Indian solar market was increasingly noticeable at the exhibition. Businesses and investors made the most of the opportunity to network, and numerous agreements and collaborations were initiated. The organizers also reported positively on the conference, where around 800 conference delegates received insights from around 109 conference speakers.

Compared to solar's share of 31.9 percent in the first half of 2017, solar accounted for 39 percent of new installed capacity additions at the end of the third quarter. As long as solar remains cheaper than coal, it will continue to overtake it as the fastest growing energy generation source, bringing with it tremendous environmental benefits. Q4 2017 is a crucial quarter for the solar sector in many ways considering the anti-dumping recommendations due to be released, the uncertain trajectory of module prices, and low power demand. If government regulators focus on the long-term picture and handle the current challenges diligently, there is no reason why solar shouldn't continue to be the most attractive market within the power industry for years to come. Mercom India, a subsidiary of Mercom Capital Group and Intersolar India's official Knowledge Partner, exclusively released a white paper on the drivers and challenges of India's PV market during Intersolar India. The white paper is available on the events website and highlights solar to be the leading new power generation source in India.

The positive market situation created a very optimistic atmosphere on the show floor. More than 13,000 attendees and 241 exhibitors engaged in meaningful conversations about the best approaches for sustained market success. Exhibitors described Intersolar India 2017 as ideal for generating leads, closing business deals and building lasting relationships. With the special exhibitions EES (electrical energy storage) and Power2Drive, Intersolar India has set the next steps for the energy transition in India. Around 50 companies showcased electrical

Exhibitors showcasing their latest products and solutions at the Bombay Exhibition Center.

One of the exhibitors giving information about the company's products and solutions

energy storage solutions on the show floor - highlighting the ever increasing importance of stabilizing the grid in India. In addition battery industry professionals were sharing their views on how to steer developments in India more actively at the Presentation Stage. The intense free of charge program on the exhibition floor provided industry professionals with more than 30 presentations on mini-/micro grid, e-mobility, PV manufacturing, skill council for green jobs forum as well as numerous exhibitor presentations. Various product launches, award ceremonies and the sold out networking event "Solar Power Developers Night" have highlighted the event as an important meeting and business gathering point for the complete solar and energy storage industry in India.

Furthermore the exhibition again was accompanied by the high-level Intersolar India Conference attended by more than 800 attendees and 109 speakers. During the opening ceremony and the welcome notes, key dignitaries expressed their honor to speak at the largest exhibition and conference for the solar industry. Intersolar India's honored guests Upendra Tripathy, Interim Director General of International Solar Alliance and Kuljit Singh Popli, Chairman & Managing Director of Indian Renewable Energy Development Agency Limited (IREDA), Dr R Harikumar, Director of the Agency for Non-conventional Energy & Rural Technology (ANERT), Govt of Kerala and Dr Thomas Reindl, Deputy-CEO of the Solar Energy Research Institute of Singapore (SERIS) welcomed all visitors at the lighting the lamp ceremony and during the welcome notes at the opening day. The conference program was packed with 19 exciting and diversified sessions on the Indian PV market, rooftop systems, project financing, innovative technologies, PV quality assurance, agro-PV, floating PV and many more.

Trainings and workshops have enriched the overall event program. A two day Intensive PV Technical Training course conducted by Sean White from White House Solar, covered basics of electricity and PV technologies, different types of PV systems, EPC contracting and safe installation practices with hands-on PV system demonstration. Furthermore the off-grid workshop organized by the Alliance for Rural Electrification (ARE) focused on current markets and policies, business opportunities, and showcased financial and technical instruments supporting rural electrification projects in India.

SAE International selects Engineer for High Honour

Chief Energy Storage Engineer Ahmad Pesaran has been elected to the distinction of Fellow from SAE International, a U.S.-based association for engineers and other technical experts specialising in automotive, commercial-vehicle, and aerospace industries throughout the world.

Photo by Dennis Schroeder/NREL

Ahmad Pesaran

Established in 1975, SAE's prestigious Fellow designation is the highest grade of membership that recognises and honours long-term members who have made a significant impact on society's mobility technology through leadership, research, and innovation.

Pesaran said, "It is an honour to be elected as an SAE Fellow. SAE publications and conferences provide state-of-the-art information about mobility to many engineers and researchers like me. It's a great feeling to know that SAE recognises my NREL contributions have been useful for others in the electric mobility arena."

Over his last three decades at NREL, Pesaran's impact in the field of mobility includes making key contributions to the first production-feasible hybrid-electric vehicle prototypes, pioneering the use of infrared thermal imaging of cells, modules, and batteries in order to improve lithium-ion battery performance, conducting battery thermal analysis and characterisation studies, leading the development of computer-aided engineering tools for automotive battery applications, and innovating methods for evaluating battery thermal runaway.

His globally recognised expertise and influence has secured NREL's status.

MYSUN's Marketing Head conferred with 'Most Influential Marketing Leaders' title

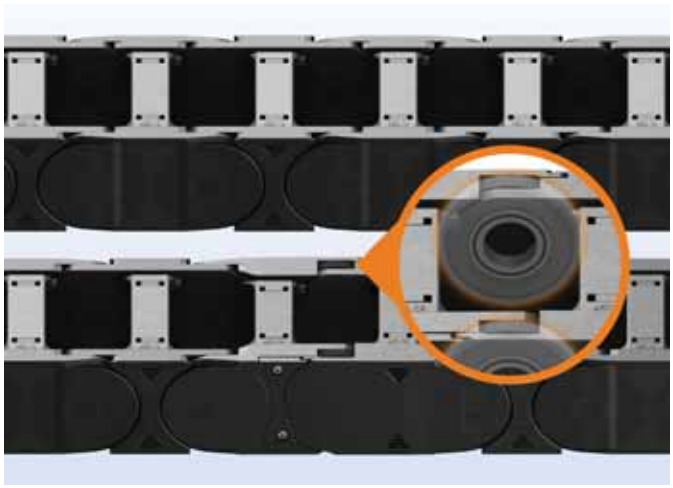
Arpit Verma, who leads Marketing and Product Development at Solar Solutions and Technology firm MYSUN, was cited as one of India's 'Most Influential Marketing Leaders' by the World Marketing Congress. The recognition comes from Arpit's contribution to MYSUN's incredible growth story, which has made it India's leading online rooftop solar platform. Arpit was felicitated at the 4th edition of the World Marketing Congress, held at Taj Lands End, Mumbai, on the 24th and 25th of November, 2017.

Arpit Verma

The conference, entitled 'Purposeful Purpose', focused on purposeful marketing, i.e, the use of marketing to promote commerce of a higher purpose, including sustainable development that caters to the needs of the environment. Arpit has been instrumental in helping MYSUN make significant strides towards a sustainable tomorrow through the use of its web platform and mobile apps, which seeks to educate customers about the benefits of using rooftop solar power as well as make their solar journey easier.

Gagan Vermani, Founder & CEO, MYSUN, said, "Arpit has led the marketing and the development of the www.itsmysun.com web platform, which has been our primary medium of communication with our potential customers and helped us spread the word of going solar throughout India. Arpit's incredible effort in creating the kind of tools and content that have made MYSUN India's leading rooftop solar Power Company is now being recognised externally. We are extremely proud of him."

Gliding or Rolling e-chain Travel – E4.1 Modular System



From gliding to rolling easily – Newly developed links with hollow rollers made of special material reduce vibration and increase the service life of E4.1 energy chains. (Source: igus GmbH)

igus, the motion plastics specialist, now expands its standard modular E4.1 e-chain system by adding new roller links. This makes it especially easy for users to change over from gliding to rolling energy chain systems – The roller links are completely compatible with the entire E4.1 modular system. For example, e-chains for linear robots in the machine tool industry can be easily modified to cope with greater dynamics and, at the same time, reduce the drive energy needed by up to 57 per cent.

For travels between ten and 50 metres, energy chains that glide are usually used. However, more demanding requirements are being placed on these systems – The required dynamics of the systems and the loads that have to be moved by them are continuously increasing, sometimes for existing systems as well. If for example the cycle rates of machines are increased retrospectively and energy chains are moved faster as a result, gliding systems can reach their physical limits. For this reason igus, the motion plastics specialist, now expands the standard modular system of the E4.1 e-chain series by adding new roller links. "The newly developed roller links are separated, so that the roller sits in the middle of the link," explains Michael Blaß, Vice President, Head of Business Division e-chainsystems at igus. "This means that all links effectively have the same pitch, a feature that ensures quieter operation of the system." The main contribution to this is made by the new hollow rollers which produce considerable less vibration and noise when they roll over each other due to a combination of new geometry and material. In many tests lasting several years, igus engineers found the ideal solution with which safe and reliable applications involving speeds of 6 m/s can be implemented.

In order to reduce noise further during movement, the roller links have small ramps in front of and behind the rollers, as a result of which hard impacts are avoided when the upper run of the chains is unrolled onto the lower run. The rollers are not additional components that can be lost but are securely integrated into the links in a manner that is also space-saving.

The "all-rounder modular system" for an extremely wide variety of applications

The new roller links in the comprehensive modular E4.1 system enable users to change from gliding to rolling energy chain systems for their machines and thus save drive energy. Moreover, it is possible to continue using the same through systems, interior separation and mounting brackets as before. Thanks to the modular nature of the series, a very wide range of different sizes and types are possible. No adapter links are needed. The roller links can be fitted on the left and right side of the chain and assembly is therefore easily integrated.

The interior contours of all links of the E4.1 series are smooth and the crossbars and lids are slightly rounded, as a result of which there is less wear on the cables during operation. At the same time, E4.1 chains from igus are very robust and are designed for demanding requirements and very high loads. They can therefore be used in many different applications and industries, from machine tool halls to cranes in sea ports. With the isense products for predictive and plannable reliability, unscheduled machine shutdowns can also be avoided.

SUBSCRIBE
MEDICAL EQUIPMENT AND AUTOMATION MAGAZINE

Chary Publications

HELLO

Are you inquisitive to know,
when you have an ailment and you have been prescribed tests and surgeries.....

WHAT HAPPENS TO YOUR BODY??
HOW DO THE MACHINES WORK??
WHAT DO THE EXPERTS HAVE TO SAY ABOUT IT??

Your search ends here...

To **Subscribe** flip this page and we have a detailed subscription form for you to fill and send to us or To subscribe online simply go to our website : **www.charypublications.in**

SUBSCRIBE

Medical Equipment & Automation

Subscription Offers

Sub. Period	No. of Issues	Subscription Type					
		Print		Digital		Print+Digital	
		Actual Rate	You Pay	Actual Rate	You Pay	Actual Rate	You Pay
1 Year	6	750.00		750.00		1500.00	1125.00
2 Years	12	1500.00	1350.00	1500.00	1350.00	3000.00	2025.00
3 Years	18	2250.00	2000.00	2250.00	2000.00	4500.00	3000.00
5 Years	30	3750.00	3000.00	3750.00	3000.00	7500.00	4500.00

MAGAZINE WILL BE SENT BY REGISTER PARCEL --Rs.220/YEAR

KINDLY ADD POSTAGE CHARGES IN SUBSCRIPTION AMOUNT

Subscription / Renewal Form

To,
The Subscription in-charge
MEDICAL EQUIPMENT AND AUTOMATION
Email: sub@charypublications.in

Are you a Subscriber,
Please submit your Subscription no:

Yes, I would like to Subscribe/renew **Medical Equipment & Automation** for _____ years at ₹_____.

PAYMENT DETAILS :

Cheque / DD No. _____ Dated _____ Drawn on Bank _____

_____ Branch _____ in favour of **Chary Publications Pvt. Ltd.**

Bank details for **NEFT / RTGS / IMPS** : **Account Name: Chary Publications Pvt. Ltd.**

Bank Name: Bank of India Branch: Chembur, Mumbai - 400 071 Account Type: Current Account

IFSC Code: BKID0000009 Bank A/C Number: 000920110000322 SWIFT CODE :BKIDINBBCHM

Name: _____

Company: _____ Designation: _____

Address: _____

_____ City: _____ Pin: _____

Telephone: _____ Mobile: _____

Email: _____

Signature: _____ _____

Stamp

Chary Publications Pvt. Ltd.

905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703.
Phones: +91 22 27777 170 / 171 • Email: sub@charypublications.in • **Contact : Priyanka Alugade** • +91 22 27777182 / +91 8652142057

Arc Guardian™ Pro

Clothing solutions for protection from electric arc flash and fires

This range of PPC has been developed with the most reliable, performance proven, comfortable and environment friendly, permanently flame retardant (PFR) materials. These are available in various colour and styling options, as well as complete kits in different ATPV ratings from HRC I - HRC IV.

NFPA® IEC 61482 EN 11612 EN 11611 ASTM INTERNATIONAL OEKO-TEX® CONFIDENCE IN TEXTILES STANDARD 100

Your safety, our mission

ATLAS® PROTECTIVE PRODUCTS

A brand owned by ACCENT INDUSTRIES LTD.

Corporate Office:
Accent Industries Ltd.
430/B, Kewal Industrial Estate, Senapati Bapat Marg
Lower Parel, Mumbai - 400 013, Maharashtra, India
Tel: (022) 43110120; Fax: (022) 43110114
Email: agp@atlasprotectiveproducts.com
Website: www.atlasprotectiveproducts.com

Exclusively made in India with fabrics from WESTEX® by Milliken

MUMBAI | NEW DELHI | CHENNAI | KOLKATA | BENGALURU | PUNE | VADODARA | GURGAON | CUTTACK

Extech Launches Compact EMF Meter

Extech Instruments, a world leader in test and measurement tools, announced the launch of the EMF510, a single-axis electromagnetic field (EMF) meter optimized for measuring extremely low frequencies (ELF). The compact new meter makes it easy to measure EMFs in the 30 to 300Hz frequency range, making it useful for applications from utilities to product development and engineering.

The EMF510 features an informative, oversized dual display indicating both EMF reading levels and the selected EMF range. Users can measure EMF/ELF levels in either milliGauss (mG) or microTesla (µT) units in two ranges up to 2000mG (200µT) with +/-5% accuracy. Useful data functions include data hold, as well as minimum and maximum readings. A bright backlight adds versatility for testing in dark job sites.

The auto-power-off function preserves battery life and can be disabled for extended monitoring. The pocket-sized EMF510 is always ready for testing by utilities of EMFs found in the generation, transmission and distribution of electricity, with power lines and substations, as notable examples.

Product development and electrical engineers can use the EMF510 to quickly assess EMF levels generated by electrical components such as motors and blowers. Homeowners can use the meter to measure EMFs in household wiring and appliances from vacuums and hair dryers, to electric and hybrid vehicles. A wrist strap is useful for toting while a tripod mount lets users set up the meter with consistent placement to avoid variability in routine measurements (using an optional tripod, TR100). The EMF510 is backed by Extech's one-year warranty and comes with three AAA batteries.

For further information, email: flirindia@flir.com.hk

New Fluke Ti450 and Ti480 PRO Infrared Cameras

When diagnosing problems, capturing and displaying small temperature variances makes all the difference. The new Fluke® Ti450 and Ti480 PRO Series Infrared Cameras have increased thermal sensitivity to capture minute differences and the latest Fluke technology for on-screen clarity to make it easy to visualize issues in the field. With the enhanced measurement accuracy and the wider dynamic temperature range of the Ti450 PRO — upto 1500°C with NETD as low as 25 mK — technicians can collect precise information for making informed decisions that boost the company's return on investment.

The Ti450 and Ti480 PRO feature sharp on-screen images with clear visual color differentiation to speed troubleshooting. They display deviations from standard temperatures using multiple Delta-T markers, allowing users to choose one as a reference point and the others to display a value as a difference. Multiple rectangle markers in-camera identify min/max temperatures for an area of the equipment or an equipment array. The camera distinguishes heat differences more easily with a new palette and a wider array of yellows and greens in the display.

The 320 x 240 resolution Ti450 PRO and 640 x 480 resolution Ti480 PRO also feature improved, more intuitive touchscreen user interface to speed detection and diagnoses of issues. They are compatible with all Fluke infrared smart lenses, which include macro, telephoto, and wide-angle options to capture virtually any target. And Fluke smart lenses are interchangeable between compatible cameras without calibration, making it easy to change and share lenses.

The PRO Series takes focus to a new level of clarity with MultiSharp™ Focus that rapidly takes multiple images and combines them to produce one in-focus image. The advanced focusing system enables users to capture an automated, focused image of multiple targets at once, delivering the image clarity needed by professional thermographers and maintenance managers to produce top-quality results and avoid costly rework.

As part of the Fluke Connect® reliability platform, the wireless Ti450 and Ti480 PRO allow users to upload infrared images from anywhere and combine them with measurement data from multiple Fluke Connect test tools to create and share comprehensive reports from the job site via email and collaborate in real time with other colleagues, increasing productivity in the field.

For further information, visit: www.fluke.com/india

Greenlight Planet launches Next-Generation Solar Lamps

Greenlight Planet Inc., a global leader in solar home energy products across rural Africa and Asia, revealed the launch of a new line of solar lanterns recently: the Sun King Pro 400, Sun King Pro 300, and the Sun King Pico Plus. The new devices are more powerful replacements of the company's existing best-selling solar lamps, boasting dramatic increases in brightness and phone-charging capacity, at lower cost, while retaining popular elements like their famously flexible and indestructible design.

The new line of Sun King lanterns continues the brand's focus on reliability: The products' electronic circuitry is protected with conformal coating, preventing damage in case of occasional exposure to rain (the same water-resistant protection used in the company's previous Sun King Pico model). Specifications of each new model are as follows:

Sun King Pro 400: Shines at 400 lumens (40X the brightness of a kerosene lamp) for 5 hours, or for 100 hours at its lowest brightness setting, after a single day of charging.

Sun King Pro 300: Shines at 300 lumens (30X the brightness of a kerosene lamp) for 6.5 hours, or for 100 hours at its lowest brightness setting, after a single day of charging.

Sun King Pico Plus: Shines at 50 lumens (5X the brightness of a kerosene lamp), or for 72 hours after a single sunny day of solar charging.

For further information, visit: www.greenlightplanet.com

SunnyCal Solar introduces collapsible solar off-grid array

SunnyCal Solar, a solar products company specialising in 'personal solar' products, revealed the first in a series of new products that enable grid-free power.

Collapsible solar arrays can be shipped fully assembled, and can be unfolded to an upright position, producing power immediately. The innovative lightweight structure can include up to 1500W of solar panels, and a unique 'Daylight Inverter', that powers a 120V receptacle whenever the sun shines; no batteries required. A custom designed screw-in anchor system and tamper resistant screws enable secure installation.

For further information, visit: http://sunnycalsolar.com

All India Installed Capacity (in MW) of Power Stations

(As On 30.11.2017)

Region	Ownership / Sector	Modewise breakup							Grand Total
		Thermal				Nuclear	Hydro	RES * (MNRE)	
		Coal	Gas	Diesel	Total				
Northern Region	State	17098.00	2879.20	0.00	19977.20	0.00	8643.55	663.56	29284.31
	Private	22760.83	558.00	0.00	23318.83	0.00	2514.00	11615.59	37448.42
	Central	12630.37	2344.06	0.00	14974.43	1620.00	8266.22	0.00	24860.65
	Sub Total	52489.20	5781.26	0.00	58270.46	1620.00	19423.77	12279.15	91593.38
Western Region	State	21280.00	2849.82	0.00	24129.82	0.00	5446.50	311.18	29887.50
	Private	33385.67	4676.00	0.00	38061.67	0.00	481.00	18514.18	57056.85
	Central	14242.95	3533.59	0.00	17776.54	1840.00	1520.00	0.00	21136.54
	Sub Total	68908.62	11059.41	0.00	79968.03	1840.00	7447.50	18825.36	108080.89
Southern Region	State	18832.50	791.98	287.88	19912.36	0.00	11808.03	512.55	32232.94
	Private	12124.50	5322.10	473.70	17920.30	0.00	0.00	27215.77	45136.07
	Central	13425.02	359.58	0.00	13784.60	3320.00	0.00	0.00	17104.60
	Sub Total	44382.02	6473.66	761.58	51617.26	3320.00	11808.03	27728.32	94473.61
Eastern Region	State	6570.00	100.00	0.00	6670.00	0.00	3537.92	225.11	10433.03
	Private	6225.00	0.00	0.00	6225.00	0.00	399.00	802.21	7426.21
	Central	13876.64	0.00	0.00	13876.64	0.00	1005.20	0.00	14881.84
	Sub Total	26671.64	100.00	0.00	26771.64	0.00	4942.12	1027.32	32741.08
North Eastern Region	State	0.00	457.95	36.00	493.95	0.00	422.00	259.25	1175.20
	Private	0.00	24.50	0.00	24.50	0.00	0.00	26.17	50.67
	Central	520.02	1253.60	0.00	1773.62	0.00	920.00	0.00	2693.62
	Sub Total	520.02	1736.05	36.00	2292.07	0.00	1342.00	285.41	3919.48
Islands	State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	6.85	6.85
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub Total	0.00	0.00	40.05	40.05	0.00	0.00	12.10	52.15
ALL INDIA	State	63780.50	7078.95	363.93	71223.38	0.00	29858.00	1976.90	103058.27
	Private	74496.00	10580.60	473.70	85550.30	0.00	3394.00	58180.76	147125.06
	Central	54695.00	7490.83	0.00	62185.83	6780.00	11711.42	0.00	80677.25
	Total	192971.50	25150.38	837.63	218959.51	6780.00	44963.42	60157.66	330860.58

Abbreviation:- SHP=Small Hydro Project (≤ 25 MW), BP=Biomass Power, U&I=Urban & Industrial Waste Power, RES=Renewable Energy Sources

Note : 1. RES include SHP, BP, U&I, Solar and Wind Energy. Installed capacity in respect of RES (MNRE) as on 30.09.2017
(As per latest information available with MNRE)
*Break up of RES all India as on 30.09.2017 is given below (in MW) :

Small Hydro Power	Wind Power	Bio - Power		Solar Power	Total Capacity
		BM Power / Cogen.	Waste to Energy		
4389.55	32700.64	8181.70	114.08	14771.69	60157.66

A. Capacity added during November 2017 – 187 MW
1. U-2&3 of PULICHINTALA HPS (2*30=60 MW) has been commissioned and added to the State Sector of Telangana.
2. U-1&2 of TASHIDING HPS (2*48.5=97 MW) has been commissioned added to the Private Sector of Sikkim.
3. U-2 of TUIRIAL HPS (30 MW) has been commissioned added to the Central Sector of Mizoram.

B. Capacity retired during November 2017 – 455 MW
1. PATRATU TPS U-4,6,7,9&10 (1*40+1*90+1*105+2*110=455 MW) has been retired from the Central Sector of Jharkhand.

C. Capacity Uprated November 2017 – 11 MW
1. U-1&2 of CHUZACHEN HPS were uprated from 2*49.5 MW (99 MW) to 2*55 MW (110 MW) with effect from 28.09.2017.

D. Net Capacity added during November 2017 – A-B+C – 257 MW
2. MARWA TPS of 1000 MW has been added to State Sector of Telangana and the same has been deducted from Chhattisgarh State Sector as per PPA signed between CSPDCL and TSSPDCL&TSNPDCL.

Investment Scenario of Power Sector in India

Around 293 global and domestic companies have committed to generate 266 GW of solar, wind, mini-hydel and biomass-based power in India over the next 5–10 years. The initiative would entail an investment of about US$ 310–350 billion.

Between April 2000 and March 2017, the industry attracted US$ 11.59 billion in Foreign Direct Investment (FDI).

Some major investments and developments in the Indian power sector are as follows:

- International Finance Corporation (IFC), the investment arm of the World Bank Group, is planning to invest about US$ 6 billion through 2022 in several sustainable and renewable energy programmes in India.
- GE Energy Financial Services (GEEFS) plans to invest US$ 90 million to develop a solar power project of 500 megawatt (MW) in partnership with Rattan India Group.
- Greenko Energy Holdings has raised US$ 155 million from its existing investors, Abu Dhabi Investment Authority (ADIA) and Singapore's sovereign wealth fund GIC, which will be utilised for expanding its clean energy portfolio to 3 gigawatts (GW) from 2 GW at present.
- Private equity (PE) investment firm, Actis LLP, is planning to invest about US$ 500 million in Solenergi Power Pvt Ltd, its second renewable energy platform in India.
- Mahindra and Mahindra Ltd is planning to invest in high-end electric powertrain technology in a move towards the future of mobility as well as for the electrification of its existing and future line-up of products.
- Hero Future Energies Pvt Ltd is planning to foray into the battery storage business and set up solar charging stations for electric vehicles (EV) in India to capitalise on India's emerging EV market.
- The Asian Development Bank (ADB) and the Punjab National Bank (PNB) have signed a financing loan worth US$ 100 million.
- Tata Capital Ltd and International Finance Corporation (IFC) have invested Rs 200 crore (US$ 31.05 million) in their joint venture (JV), Tata Cleantech Capital Ltd (TCCL), to increase its loan book for investing in renewable energy projects.
- CDC Group Plc, a development finance institution, plans to set up its own renewable energy platform in the eastern states of India like Bihar, Odisha and Assam, and other neighbouring countries to focus on developing hundreds of megawatts (MWs) of high-quality greenfield generational capacity.
- Japan's JERA Co. Inc, has acquired a 10 per cent stake in ReNew Power Ventures for US$ 200 million, valuing the company at US$ 2 billion.
- The Indian Railways is looking to award six tenders worth Rs 8000 crore (US$ 1.2 billion), for setting up of a country-wide electricity transmission network, as part of a strategy to reduce electricity bills.
- Renewable energy company ReNew Power has announced securing US$ 390 million debt funding from its existing investor Asian Development Bank (ADB) for developing and expanding capacities of 709 megawatt (MW) across various states of India.
- International Finance Corporation (IFC), along with IFC Global Infrastructure Fund, the private equity fund of IFC Asset Management Company, has announced investment of US$ 125 million equity in Hero Future Energies.

Source: IBEF

Index to Advertisers

Leviton introduces Type A and Type-C USB Charger

Leviton has revealed the most powerful addition to its line of USB Charger Devices. The Type A and Type-C USB Charger/Tamper Resistant Receptacle offers two high powered vertical USB ports, one Type A and one Type-C, delivering a combined total of 5.1A charging current and 25+ watts of power, along with two additional tamper resistant receptacles.

The Type-C port within the receptacle provides up to 59% faster charging power compared to leading competitors based upon tests performed using a Lightning cable and the Type-C port with an iPhone 7, iPad Mini 1 and iPad Pro 9.7. Engineered utilising smart chip technology, the device recognises and optimises the charging requirements of individual devices for faster charging of smartphones, tablets and other peripheral devices that use the Type-C cable.

With a 5-year limited warranty, Leviton Type A and Type-C USB Charger/Tamper Resistant Receptacles are ideal for residential and commercial applications including kitchens, bedrooms, college dormitories, airport lounges, hospitals (hospital grade model available), salons and spas, hotels, meeting rooms, cafes, restaurants and more. Combining functionality with style, the device is available in white, ivory, light almond, gray, black, brown and red, and is compatible with the complete line of Leviton Decora wiring devices, Decora wallplates and Decora Plus screwless wallplates.

For further information: www.leviton.com/usb

Attn: Advertisers

Dear Valued Advertisers,

Effective 1st July 2017 Goods and Service Tax Act (GST) is applicable on

i) Advertisements in Print Media @ 5%

ii) Advertisements on Websites @ 18 %

For any clarification, please contact our accounts department on 022 - 27777 175 or email : accounts@charypublications.in

NEXT GEN
EQUIPMENTS PVT. LTD.
ISO 9001-2015 Certified Company

Visit us at –
ELECRAMA
we are all about electricity
India Expo Mart
Greater Noida, Ncr, India
10-14 March 2018
Stall No. H2, P26

Electrical Test & Measuring Solutions


Contact Resistance Meter 200A


Turns Ratio Meter


Winding Resistance Meter

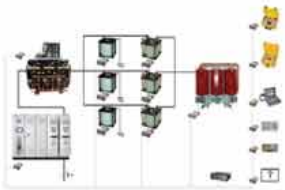

Digital Micro Ohm Meter


Current Transformer Tester

Raytech
SWITZERLAND
M/s Raytech GmbH, Switzerland

M/s Epro Gallspach GmbH, Austria
epro

ETL
PRÜFTECHNIK
ETL Pruftechnik, Germany




75 KV AC High Voltage Test Set


Automatic Transformer Test System


Cast Resin Standard PT


Standard CT


Battery Analyzer


Automatic Portable HV Tester

OUR PRODUCT RANGE

- Winding Resistance Meter
- Turns Ratio Meter
- Digital Microhm Meter
- Contact Resistance Meter
- Current Transformer Tester
- Standard Current Transformer
- Standard Voltage Transformer
- Transformer Loss Measuring System
- Automatic Transformer Test System
- Online DGA
- Static Frequency Convertor (EPS)
- Mobile EPS
- High Voltage PD Filters
- Coupling Capacitor/ HV Dividers
- Online PD Test System
- Oil BDV Test Set
- AC HV Test Set
- AC / DC HV Test Set
- Battery Analyzer

Branch Office: 35-B, Ashiana Duplex, Tandalja, Vadodara – 390012 , Gujarat

Ph : +91 9979888269, +91 9374904404, +91 9811004404 **Email** : info@ngepl.com

Regd. Office : 279-D, Defence Colony, Jajmau, Kanpur -208010, U.P.

Website: www.ngepl.com

Forthcoming Events At A Glance

National

ELECRAMA
Venue: India Expo Mart, Greater Noida, NCR, India
Date: 10-14 March 2018
Website: http://ieema.org/events/

Solar Today Expo
Venue: BIEC Bengaluru
Date: 10-12 April 2018
Website: www.solartodayexpo.com

AUTOMATION EXPO 2018
Venue: BCEC, Goregaon (East), Mumbai
Date: 29 August - 01 September 2018
Website: www.automationindiaexpo.com/

RENEWABLE ENERGY INDIA 2018
Venue: India Expo Mart, Greater Noida, New Delhi
Date: 20 - 22 September 2018
Website: http://indiaexpomart.com/event/renewable-energy-india-2018/

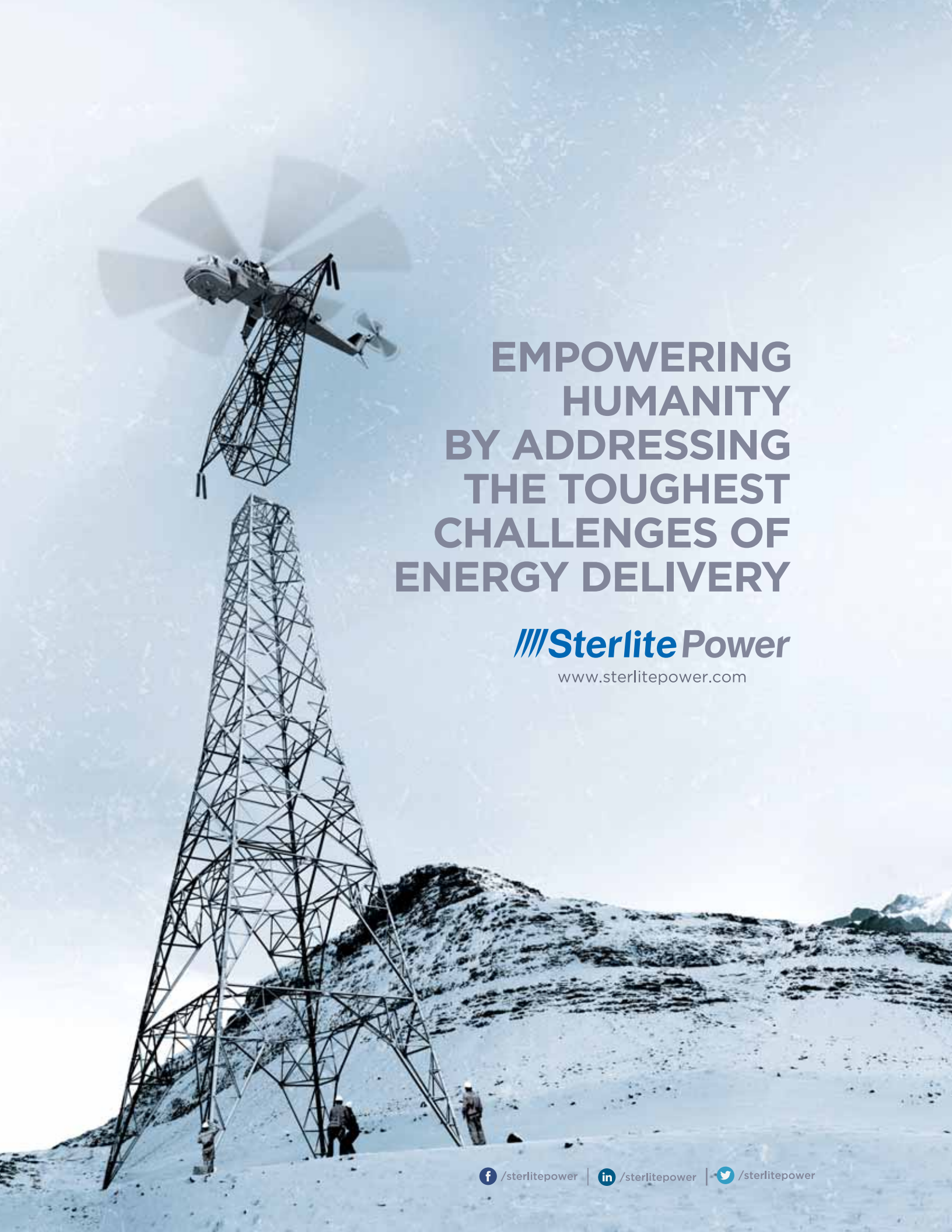
International

Middle East Electricity 2018
Venue: Dubai World Trade Center
Date: 06-08 March 2018
Website: www.middleeastelectricity.com

Oman Energy & Water Exhibition & Conference
Venue: Oman Convention & Exhibition Centre, Muscat
Date: 30 April-02 May 2018
Website: www.energyandwateroman.com

Kenya Power & Energy Expo 2018
Venue: KICC Nairobi Kenya Expo Group, Dubai, UAE
Date: 29-31 May 2018
Website: www.expogr.com/kenyaenergy

POWER-GEN & DistribuTECH Africa
Venue: Sandton Convention Centre, Johannesburg, South Africa
Date: 19-20 July 2018
Website: http://www.wire-southeastasia.com/


EMPOWERING
HUMANITY
BY ADDRESSING
THE TOUGHEST
CHALLENGES OF
ENERGY DELIVERY
Sterlite Power
www.sterlitepower.com
/sterlitepower
/sterlitepower
/sterlitepower

RNI Registration No.: 6226/1961 • Postal Registration No. NMB/183/2018-2020
Published and Posted on 5th of every month at Patrika Channel STG. office, Mumbai 400 001.