

# CHEMICAL ENGINEERING WORLD

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MANAGEMENT**

# Technology For High Vacuum Processing

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Available  
At Works*

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(Centrifugal and wiped film types)

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- Flavours, Essential Oils, Fine Chemicals.



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- Approved by Central Road Transport Corporation – Pune
- Meeting the requirements of Ministry Of Environment
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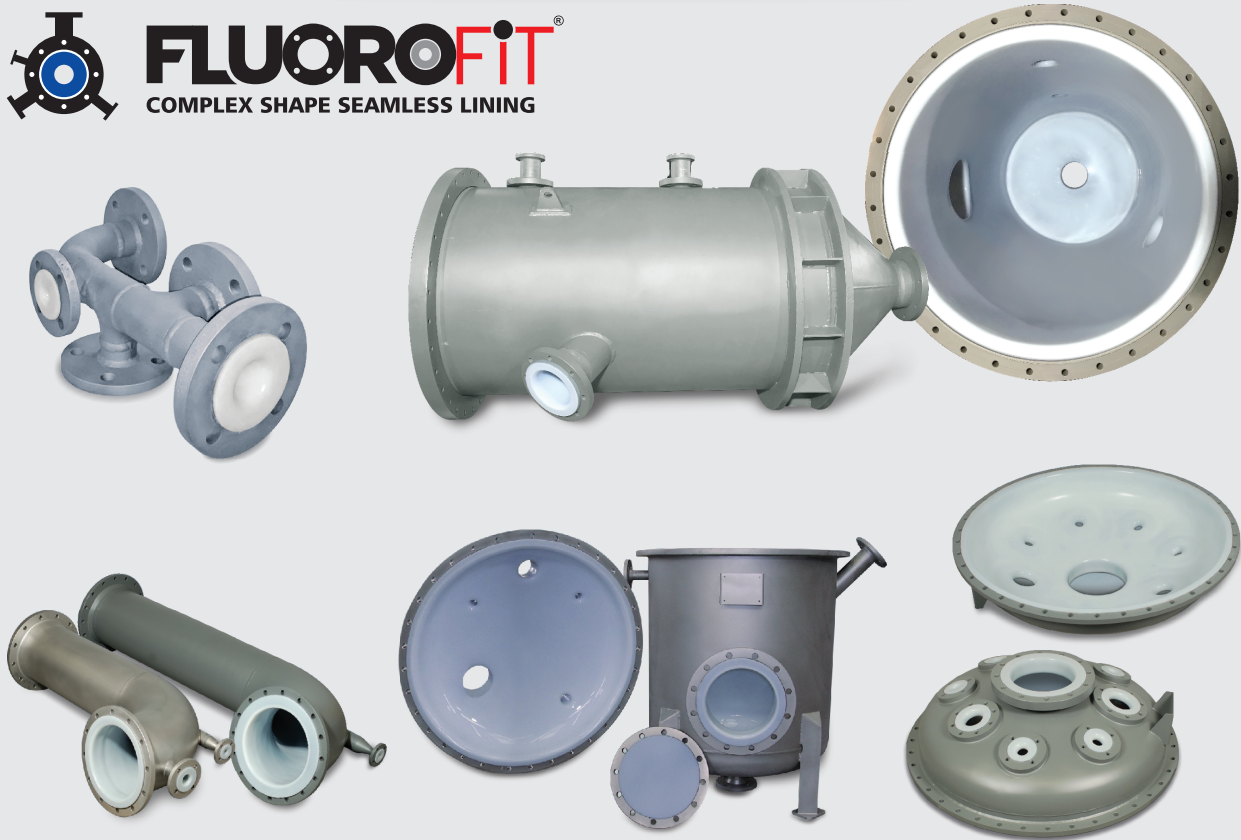
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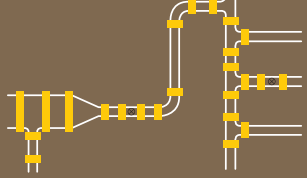
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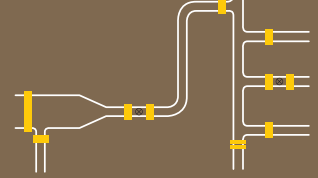
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**Chairman** Maulik Jasubhai Shah  
**Publisher & Printer** Hemant K. Shetty  
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**EDITORIAL**

**Editor** Mittravinda Ranjan (mittra\_ranjan@jasubhai.com)  
**Deputy Editor** Sujatha Vishnuraj (sujatha\_vishnuraj@jasubhai.com)  
**Sub-Editor** Jayati Mukherjee (jayati\_mukherjee@jasubhai.com)  
**Sub Editor** Bernard Rapose (bernard\_rapose@jasubhai.com)  
**Editorial Advisory Board** D P Misra, N G Ashar, Prof. M C Dwivedi  
**Contributing Editors** P V Satyanarayana, Dr S R Srinivasan, R B Darji, R P Sharma  
**Design Team** Arun Parab, Shankar Joshi

**Subscription Team** Dilip Parab  
**Marketing Co-ordinator** Brenda Fernandes  
**Production Team** Prakash Nerkar, Arun Madye

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210, Taj Building, 3<sup>rd</sup> Floor, Dr. D. N. Road, Fort, Mumbai 400 001,  
Tel: +91-22-4037 3636, Fax: +91-22-4037 3635

**SALES**

**General Manager, Sales** Amit Bhalerao (amit\_bhalerao@jasubhai.com)  
Prashant Koshti (prashant\_koshti@jasubhai.com)

**MARKETING TEAM & OFFICES**

**Mumbai** **Godfrey Lobo / V Ramdas**  
210, Taj Building, 3<sup>rd</sup> Floor, Dr. D. N. Road, Fort, Mumbai 400 001  
Tel: +91-22-4037 3636  
Fax: +91-22-4037 3635  
E-mail: godfrey\_lobo@jasubhai.com, v\_ramdas@jasubhai.com

**Ahmedabad** **Vikash Kumar Sharma**  
64/A, Phase 1, GIDC Indl Estate, Vatva, Ahmedabad 382 445  
Tel: +91-79-4900 3702, Fax: +91-79-2583 1825  
Mobile: +91 72380 38888  
E-mail: Vikas\_sharma@jasubhai.com

**Vadodara** **Paritosh A. Pathak**  
202 Concorde Bldg, Above Times of India Office,  
R C Dutt Road, Alkapuri, Vadodara 390 007  
B: +91 265 2337 187/189  
Mobile: +91 98980 61072  
E-mail: paritosh\_pathak@jasubhai.com

**Bengaluru** **Princebel M**  
Mobile: +91 94447 28035  
E-mail: princebel\_m@jasubhai.com

**Chennai / Coimbatore** **Princebel M / Yonack Pradeep**  
1-A, Jhaver Plaza, 1st floor, Nungambakkam High Road,  
Chennai 600 034  
Tel: +91-44-43123936  
Mobile: +91 94447 28035 / 91769 63737  
E-mail: princebel\_m@jasubhai.com, yonack\_pradeep@jasubhai.com

**Delhi** **Priyaranjan Singh**  
803, Chiranjeev Tower, No 43, Nehru Place, New Delhi – 110 019  
Tel: +91-11-4674 5555, Fax: +91-11-2642 7404  
Mobile: +91 98181 48551  
E-mail: pr\_singh@jasubhai.com,

**Hyderabad** **Princebel M / Sunil Kulkarni**  
Mobile: +91 94447 28035 / 98234 10712  
E-mail: princebel\_m@jasubhai.com, sunil\_kulkarni@jasubhai.com

**Kolkata** E-mail: industrialmags@jasubhai.com

**Pune** **Sunil Kulkarni**  
Suite 201, White House, 1482,  
Sadashiv Peth, Tilak Road, Pune 411 030  
Tel: +91-20-24494572, Telefax: +91-20-24482059  
Mobile: +91 98234 10712  
E-mail: sunil\_kulkarni@jasubhai.com

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- Cooling
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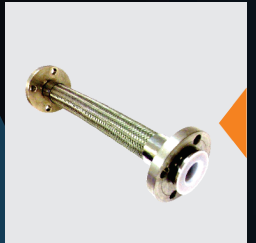
201/202, Karan Selene, 851, Bhandarkar Institute Road, Pune - 411 004. India  
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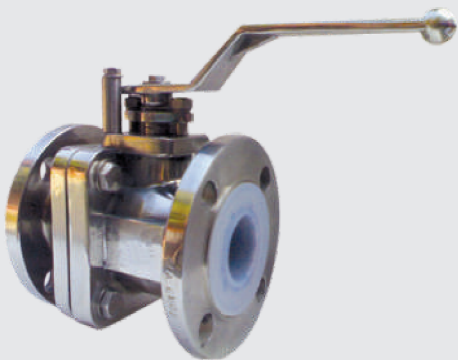
PTFE Bellows



FEP/PFA Lined Ball  
Check Valves



PFA/FEP/PVDF  
Lined Ball Valves



PP/PVDF/FEP/PFA  
Double Window  
Sight Flow Indicators



## Horizon Polymer

Lined Piping Systems | Lined Valves | Sight Flow Indicators |  
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Chemours Co FC LLC – Delaware appoints Horizon Polymer as  
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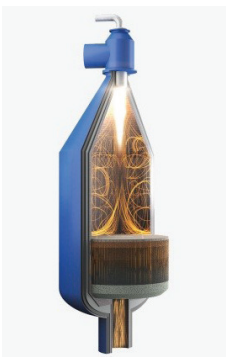
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Horizon Polymer Engineering Pvt. Ltd.: 204, Sumer Kendra, Pandurang Budhkar Marg, Worli, Mumbai - 400018. India.

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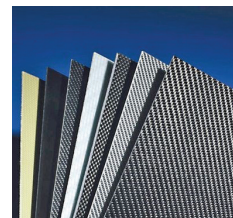
## Gaz Sintez Chose SynCOR Methanol™ for Plant near Saint Petersburg, Russia

**Leningrad, Russia:** Gaz Sintez has nominated Haldor Topsoe as the licensor of its methanol plant in the Leningrad Region, Russia. The plant will produce 1.6 million tons per year of AA grade methanol based on Topsoe's SynCOR Methanol™ technology. Gaz Sintez has been developing the methanol plant project at the port of Vysotsk in the Leningrad Region of Russia. As announced earlier, Hyundai Engineering has started the development of the FEED-package, and NIIK has been awarded the Russian general designer contract. The plant is expected to be completed in 2023. SynCOR Methanol™ features single-stage oxygen reforming, a methanol synthesis loop and rectification. It is the most cost-efficient large-scale methanol technology in industrial operation today. Capacities can be up to 10,000 tons per day of methanol. It also offers considerable environmental advantages, leaving a smaller CO<sub>2</sub> footprint, and lower water consumption compared to traditional licensed technologies. Based on 70 years of experience within synthesis gas, all SynCOR™ solutions offer more than 99 percent availability and unsurpassed economy of scale. SynCOR™ solutions are suitable for large-scale grassroots ammonia, methanol, hydrogen, CO, TIGAS™, and gas-to-liquid (GTL) plants, as well as syngas hubs producing multiple products.



## Tepex Dynalite from LANXESS for Innovative Lightweight Design Project

**Cologne, Germany:** The endless fiber-reinforced thermoplastic composite material Tepex dynalite from LANXESS has made a major contribution to the success of the FuPro project of the Federal Ministry of Education and Research (BMBF). At the international trade fair for mobility 4.0 "eMove360 Europe" in Munich, Germany, the project received the Gold Materialica Award in the "Surface & Technology" category. The abbreviation FuPro stands for "Design and process development for functionalized multi-component structures with complex hollow profiles".



Seat back rest with structural component made from Tepex dynalite: In the research project's innovative fiber composite modular system, organic sheets, fiber composite hollow sections and injection molding compounds were combined to form highly integrative multi-component structures. Using the case of a belt integral backrest the high application potential of the technology was demonstrated. The organic sheets used here are made from the semi-finished product Tepex dynalite 102-RG600 based on roving glass fabric and a polyamide 6 matrix. The LANXESS subsidiary Bond-Laminates in Brilon, Germany, manufactures these very lightweight yet highly resilient fiber composite semi-finished products. The Materialica Award was already presented in 2014 and 2017 for products in which the innovation leader Tepex was used. In both cases, the corresponding components are now being employed in series production.

The FuPro project: Within FuPro, an interdisciplinary team from industry and science developed a novel technology that integrates continuous fiber composite hollow profiles into hybrid organic sheet metal injection molding structures. The project involved the Institute for Lightweight Engineering and Polymer Technology (ILK) at Dresden Technical University and Brose Fahrzeugteile GmbH & Co. KG as well as the companies Arburg, AUMO, DITF Denkerdorf, Elring Klinger, GK Concept, gwk, Schmalz, PHP Fibers and Werkzeugbau Siegfried Hofmann.

The objective of the FuPro research project was to develop and analyze a novel, large-scale production process for multi-component structures made from complex fiber-reinforced plastics (FRP) hollow profiles, organic sheets and injection molding compounds. The aim is to achieve a level of process, structural and functional integration that goes far beyond classic design methods and thus to achieve significant weight reductions in vehicle structures.

Lightweight design as a key technology: Lightweight design is a key technology that is an essential prerequisite for resource-efficient mobility. Highly integrative multi-component engineering methods – i.e. a combination of torsion- and flexurally rigid hollow profiles, flat construction elements and complex node structures – are particularly promising for the realization of highly loadable lightweight structures. In addition, the use of FRP allows the individual components to be optimized according to the force flow. Thermoplastic FRP are predestined for mass production applications in the automotive industry, since cycle times of less than one minute are usually achieved in component production.

LANXESS is a leading specialty chemicals company with sales of EUR 7.2 billion in 2018. The company currently has about 15,400 employees in 33 countries and is represented at 60 production sites worldwide. The core business of LANXESS is the development, manufacturing and marketing of chemical intermediates, additives, specialty chemicals and plastics. LANXESS is listed in the leading sustainability indices Dow Jones Sustainability Index (DJSI World and Europe) and FTSE4Good.

## Azelis Reinforces Its Whole-hearted Commitment to Innovation through Formulation

**Mumbai, India:** After globally launching the new Azelis tagline 'Innovation through formulation' and corporate video in July 2019, Azelis Asia Pacific has recently unveiled its own video, which describes the forces Azelis has experienced behind its strong growth in the region over recent years. The newly released video has also been a reinforcement of the company's continuous investment in formulation. Azelis creates value with and for its partners by turning ideas into market-leading solutions that drive growth. The company routinely provides its customers with innovative formulations that address the most stringent market requirements and consumer trends. This is made possible through its 25 application laboratories in Asia Pacific, along with its experienced and market-focused sales teams.

The new video for Asia Pacific builds on the global Azelis brand movie, and has been created to reflect the unique culture and structure embraced by Azelis across the region. In the video, the Azelis Asia Pacific management talks about the opening of new labs, achievements in the different market segments, the growth of the 300-strong team, work-life balance, and equal opportunities for all Azelis employees.

Laurent Nataf, CEO Azelis Asia Pacific, comments: "We are proud of what the Azelis team in Asia Pacific has accomplished in the past few years – it's a true testimony of the passion and dedication our team has. We have seen significant growth and have built solid partnerships with both customers and principals. Having our region-specific video now enables us to present ourselves to current and future business partners even better and to showcase the business growth and professionalism we succeeded to establish over the past couple of years".

## Clariant Partners to Bring New Biotransformation Technology in India



The team at the signing ceremony with Shri P. Raghavendra Rao, Secretary, Department of Chemicals & Petrochemicals. (Photo Courtesy: Clariant)

**Mumbai, India:** Clariant (a focused and innovative specialty chemical company) and Polymateria (a company developing a new standard in biodegradation of plastics) have recently signed a multiparty partnership agreement with the Central Institute of Plastic Engineering & Technology (CIPET), Department of Chemical and Petrochemical, Ministry of Chemicals & Fertilizers, Government of India. This partnership entails bringing Polymateria's Biotransformation technology to market in India through Clariant's Masterbatches.

Clariant's Masterbatches and Polymateria will work with CIPET's world class testing facilities to apply the biotransformation technology to the local brands and packaging companies, who want to validate solutions for the most highly littered forms of plastic.

At the signing ceremony, Shri P. Raghavendra Rao, Secretary, Department of Chemicals & Petrochemicals, said, "India has world leading ambitions to tackle plastic waste. With new innovations such as Biotransformation emerging, we can work with the industry to address these issues."

Niall Dunne, CEO of Polymateria, said, "This partnership agreement reflects that the only way to solve global problems is to accelerate the impact of disruptive technology through meaningful collaboration."

Sambit Roy, Head of LBL India, BU MB, Clariant, said, "We are happy with this agreement and keen to support our clear strategy towards Sustainability. Clariant has an important role to play in creating solutions for recycling and now with this new technology we will also be able to offer biodegradation solutions for fugitive plastics which are left over in recycling stream. This agreement gives us access to the global technology from Polymateria to bring the biodegradation capabilities to the Indian market; while working with CIPET's testing facilities".

## Ultra-compact Industrial PC Series Expanded by Device with Intel® Core™ i U Processor C6025

**Verl, Germany:** The ultra-compact Beckhoff C6025 Industrial PC is designed to deliver the high computing performance of the Intel® Core™ i series in a fanless, small-form-factor device. The new Intel® Core™ i U processors, with exceptionally low power requirements, have made this possible.



Measuring just 82 x 127 x 40 mm and combining high computing performance with a fanless design, the new C6025 IPC is an ideal choice for demanding control applications where green, sustainable IT is also a requirement. It is built around the Intel® Core™ i U processors that deliver Core™ i performance capabilities yet consume significantly

less power than other processors of the same series. The 8<sup>th</sup> Gen Intel® Core™ i U processors used in the C6025 also offer an advantage which is typical of evolving PC technology: higher performance at the same price point. With this new addition, the Beckhoff portfolio of industry-ready and long-term available Industrial PCs now spans five CPU performance classes – from ARM through to Intel® Xeon® – for maximum scalability.

The IPC's energy-efficient Intel® Core™ i U processors, in combination with an advanced cooling design, enable fully passive heat dissipation via a heat sink on one side. Housed in an aluminum and zinc die-cast enclosure, the C6025 offers a feature set that includes the following:

- up to four CPU cores
- 4 GB DDR4 RAM (expandable to 8 GB)
- 40 GB M.2 SSD with 3D flash memory
- 1 x DisplayPort video connector
- 4 x USB 3.0 ports
- on-board Ethernet controller with 3 x 100/1000Base-T ports
- operating temperature range of 0 to 50°C

The power-efficient, ultra-compact C6025 Industrial PC expands the broad IPC portfolio from Beckhoff with a device that offers a performance level situated between the entry-level devices with Intel Atom® CPUs and those with high-performance Intel® Core™ i-series processors. With this addition, the product portfolio better addresses the growing trend toward compact, fanless Industrial PCs while supporting applications with highly intensive computing requirements.

## Rockwell Automation to Acquire Avnet to Expand Cyber Security Expertise

**Milwaukee, USA:** Rockwell Automation Inc has recently announced its signage of an agreement to acquire privately held Avnet Data Security Ltd, an Israeli-based cybersecurity provider with over 20 years of experience providing cyber security services. Avnet offers a full set of IT/OT cyber services and solutions ranging from assessments, penetration testing, network & security solutions, and training to converged IT/OT managed services.

"Avnet's combination of service delivery, training, research, and managed services will enable us to service a much larger set of customers globally while also continuing to accelerate our portfolio development in this rapidly developing market," said Frank Kulaszewicz, Senior Vice President, Control Products & Solutions at Rockwell Automation.

Cybersecurity is one of the fastest growing parts of Rockwell Automation's services business. As the manufacturing industry has evolved and become more connected than ever before, legacy physical security strategies are no longer enough to protect production operations. To help our customers develop, maintain, and evolve proactive cybersecurity strategies, Rockwell Automation provides a comprehensive set of services and solutions. The extensive knowledge and experience of the Avnet team will support Rockwell Automation's strategic objective to achieve double digit growth in Information Solutions and Connected Services by expanding our IT/OT cyber and network expertise globally.

"We are excited to join Rockwell Automation to further expand their already robust cyber offering," said Igal Cohen, CEO of Avnet. "We are continuing to serve our existing clients while expanding our reach to service a much broader range of customers. Our passion and mission have always been to help as many organizations as possible secure their data from internal and external threats." The transaction is expected to close in early 2020 subject to customary approvals and conditions, and it is not expected to have a material impact on Rockwell Automation's 2020 financial results.

## LANXESS Joined World Business Council for Sustainable Development

**Cologne, Germany:** LANXESS has recently taken an initiative to enhance its commitment towards sustainability. This speciality chemical company joined the World Business Council for Sustainable Development (WBCSD) on January 1, 2020.

The WBCSD is a global, CEO-led organization working together to accelerate the transition to a sustainable world. At the core of the network are its six work programs, for example on climate and energy or circular economy, targeting the realization of the United Nation's Sustainable Development Goals (SDGs). The WBCSD's approximately 200 member companies represent 19 million employees and USD 8.5 trillion in sales.

Sustainability bolsters business objectives : LANXESS CEO Matthias Zachert says, "Sustainability bolsters our business objectives in many different ways – whether by ensuring greater resource efficiency, good relationships with our stakeholders, greater risk awareness or long-time beneficial cost structures. I am delighted to have joined the World Business Council for Sustainable Development where, together with other member companies, we will be able to make a business case for sustainability."

Peter Bakker, President and CEO of the WBCSD: "WBCSD is pleased to welcome LANXESS as our newest member. We are dedicated to working towards a transformation of the key systems across society, and LANXESS – as a provider of sustainable solutions for a wide range of areas – will strengthen the collaboration we aim for and help accelerate the transition to a sustainable world."

In the last few months, LANXESS has focused its business activities even more on sustainability. The speciality chemicals company announced in November 2019 that it will become climate neutral by 2040. In December, LANXESS linked the interest rate terms of its main revolving credit facility to sustainability criteria.

## IndianOil Inked Agreement with Cummins Technologies India Pvt Limited

**Mumbai, India:** IndianOil has recently signed an agreement with Cummins Technologies India Pvt Ltd for bulk dispensing of IndianOil's Diesel Exhaust Fluid (DEF), branded as IOC ClearBlue, in their advanced engines with SCR (Selective Catalytic Reduction) systems. Mr. Subimal Mondal, Executive Director (Lubes), IndianOil, and Ms. Anjali Pandey, Vice President (Engine Business Unit and Component Business), Cummins India, signed the agreement at Mumbai today.

On the occasion, Mr. Subimal Mondal said, "With this collaboration, IOC ClearBlue is recommended for use in all diesel vehicles that have Cummins engines or any other engines with Cummins SCR technology. IOC ClearBlue adheres to the highest quality standards by meeting IOC 22241 and AdBlue certification", he added

Ms. Anjali Pandey, Vice President (Engine Business Unit and Component Business), Cummins India said, "At Cummins, we understand the need of the market. With this initiative, IndianOil's innovation in a diesel exhaust fluid - IOC CLEARBLUE - delivers superior results that ensure emissions controls. In the new emission era of BS-VI, all diesel vehicles would require IOC CLEARBLUE and the right quality would extensively help in controlling the NOx emitted. Also,

the easy availability of genuine high-grade IOC CLEARBLUE at the fuel stations will ensure availability and consistent quality across the country."

India will shift to BS-VI auto fuel emission norms from 1<sup>st</sup> April 2020. The automobile companies are effecting several technical changes in diesel vehicles such as provision for fitting diesel particulate filter, selective catalytic reduction (SCR) and exhaust gas recirculation (EGR). The SCR systems shall require DEF, an aqueous urea solution, for effective reduction in Nitrogen oxide emissions.

Bulk dispensing of DEF is in line with global trends and offers better cost viability to truck and bus owners, as compared to packed products. The technical knowledge of Cummins combined with the bulk dispensing expertise of IndianOil shall help offer a world-class product to the customers across the country.

## World's Largest ATR-based Methanol Plant has been Put into Successful Operation by Haldor Topsoe



**Copenhagen, Denmark:** Recently Topsoe has announced the official opening of the world's only natural gas-to-gasoline complex in Turkmenistan. The complex includes the world's largest methanol plant based on autothermal reforming (ATR), using Topsoe's SynCOR Methanol™ solution, with methanol production capacity of 5225 MTPD.

In the Turkmen gas-to-gasoline complex, the SynCOR Methanol™ solution has been combined with a gasoline synthesis loop to produce synthetic gasoline. This concept is named SynCOR TIGAS™.

Over the last two years Topsoe has signed five license agreements of similar capacity based on the SynCOR™ technology. These projects are in various stages of development.

Global demand for methanol is increasing. Accordingly, investors and producers plan for larger plants with improved energy efficiency to achieve economy of scale. This has made SynCOR™ the preferred technology for production of synthesis gas in many of today's world-scale projects because it maximizes single-line capacity, while significantly reducing capital as well as operating costs. When combined with a Topsoe methanol synthesis loop, the result is SynCOR Methanol™, the most cost-efficient large-scale methanol technology in industrial operation today. Capacities can be up to 10,000 tons per day of methanol.

Apart from the obvious financial benefits of the SynCOR™ technology, it also offers considerable environmental advantages, leaving a smaller CO<sub>2</sub> footprint and lower water consumption compared to traditional licensed technologies.

Based on 70 years of experience within synthesis gas, all SynCOR™ solutions offer more than 99 percent availability and unsurpassed economy of scale. SynCOR™ solutions are suitable for large-scale grassroots ammonia, methanol, hydrogen, CO, TIGAS™, and gas-to-liquid (GTL) plants, as well as syngas hubs producing multiple products.

## LANXESS Completes Sale of Chrome Chemicals Business to Brother Enterprises

**Cologne, Germany:** Specialty chemicals company LANXESS has recently completed the sale of its chrome chemicals business. The buyer is Brother Enterprises, a Chinese leather chemicals producer.

All relevant antitrust authorities have given the necessary approvals for the transaction, which was announced in August 2019. Upon completion of the transaction, LANXESS has received cash proceeds of approximately EUR 80 million.

With this transaction, Brother Enterprises has also taken over the Newcastle site in South Africa with around 220 employees from LANXESS. At the site sodium dichromate is produced, some of which is processed into chromic acid. In Merebank, South Africa, LANXESS will continue to manufacture chrome tanning salts from sodium dichromate exclusively for Brother Enterprises on a contract basis, presumably until 2024.

## Nord Drivesystems Expanded Facility in Pune



Mr. PL Muthusekhar MD Nord Drivesystems along with Chief Guest Vikram Kumar (IAS) Metropolitan commissioner of PMRDA and Ms. Jutta Humbert - Managing Partner of NORD DRIVESYSTEMS at the launch

**Pune, India:** Nord Drivesystems, India's leading manufacturing facility, has acquired an installed capacity of 42000 Geared motors per annum plus a 22000 Electrical Motor Assembly with a utilization factor between 75 to 80 percent. These requirements are served through two of our NORD production plans, one in Hinjewadi MIDC Phase II started in Nov 2007 and the second facility in Hinjewadi MIDC phase I which was established in the year Oct 2017. Considering the consistently growing Indian market and NORD India consolidating its presence further, the Management has taken a decision to further increase its production capacity especially for the Large gearboxes & IGU. (Industrial Gearbox Units)

The newly acquired plant expansion is just adjacent to our existing NORD DRIVESYSTEMS plant with a connecting road in between. It is spread on an area measuring 7211sq.mtrs whilst the building area is 3213sq.mtrs.

This will be NORD India's third facility in row. NORD India plans to use this new available space for the production of the large gearbox assemblies whose demand is continuously increasing in the domestic market. It will also accommodate a bigger warehouse to support the proposed large gearbox production, making way for more production space in the existing building for medium size geared motors.

Last year NORD India Motor production facility had also got approved by BIS, Quality governing body under Govt. of India for ISI marked Motor production which recently has being enhanced further to include all Motor ranges up to 55KW ratings.

Further with time, NORD India plans to include new Gearbox variants into its production portfolio like Industrial Gearbox Units (IGU) production along with specialized paint shop facility. With full commissioning of this new facility, NORD India would be covering almost 90percent of the offered NORD catalogue products locally from Pune for the Domestic market as well as SAARC countries.

Growing at about 20percent CAGR for last 8 years and making in India & making in Maharashtra for last 14 years.

## Cook Compression Names Authorised Service Partner for Poland

**Ellesmere Port, UK:** Cook Compression® has recently announced their signage with Krio-Serwis Ltd as its exclusive authorised service partner for the gas sector in Poland.

Backed by more than 100 years of service to the gas compression industry, Cook Compression applies extensive technical expertise and application knowledge, together with high-performing products, advanced material capabilities and expert repairs, to improve reciprocating compressor performance around the globe.

Cook Compression trains and certifies Authorised Service Partners to provide expert repair and reconditioning for compressor valves and packing cases in localized service centers. These partners have passed a rigorous audit of their processes and equipment, are held to strict quality standards, and guarantee their work for warranty periods established by Cook. Authorised Service Partners also have access to Cook Compression expertise to partner with customers on analysis, upgrades and additional reciprocating compressor components and services.

Krio-Serwis, based in Odolanow, Poland, is a well-established service provider in the country's oil & gas industry. Krio-Serwis specializes in the maintenance, overhaul, repair, reconditioning, retrofitting and control systems of gas engines, integral engine-compressors and natural gas reciprocating compressors. The company has a workshop dedicated to comprehensive gas engine head regeneration and provides expertise in a wide scope of diagnostics and measurement, including vibration and shaft deflection. Krio-Serwis can also provide prefabrication and installation of technological and processing equipment, such as vacuum insulated pipelines (VIP), with its team of qualified experts.

As a Cook Compression Authorised Service Partner, Krio-Serwis adds repair and refurbishment of gas compressor valves, pressure packing cases and oil wiper packings to its capabilities, backed by specialized equipment and original Cook Compression parts.

"We are pleased to add Krio-Serwis to our network of Authorised Service Partners and provide our combined expertise to reciprocating compressor operators in Poland." said Dean Lewis, Cook Compression VP Aftermarket, Europe & Russia.

Cook Compression now has six Authorised Service Partners across Europe, Africa and the Middle East, delivering compressor optimization through quality local partners to help customers minimize downtime of critical equipment.

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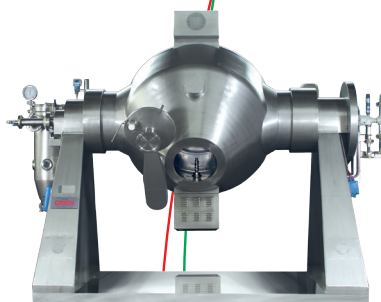
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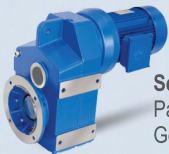


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# Correct Process Configuration: Pivotal to Energy Optimization and Conservation

Attaining energy efficiency is a big concern for process plant owners as they capture a large share in the operational expenditure pie. Here in this article, the author, narrates how energy efficiency can be achieved through implementation of proper measures starting from the design stage itself.

**E**nergy management is one area where the industry has seen a constant growth. In today's world with growing challenges in terms of high energy cost, depleting resources, and ever-increasing energy footprints, it is vital for any industry not only to monitor, but also to evaluate the optimum energy balance within the complex. A large share of the OPEX is usually the energy costs. With ever increasing tightening of margins and knowing that there is nothing much to play around with the feedstock price, the real game changer can be the energy cost.

## Role of a Technology Licensor

A common misconception about energy management and optimization is: it

its optimization at a later stage during the energy audit or energy study in plant life cycle. This is where a technology licensor plays a key role.

Energy conservation issue(s) can be addressed at various phases of plant life cycle in order to have a positive impact in bigger magnitude. However, to sum up broadly, those issues can surface & be worked upon either during the project phase for a new chemical process plant or during the operational phase of an existing process plant.

When a new process plant is designed, the role of the process plant owner has equal importance to that of technology licensors. It is of note that the process design basis

For an instance, a standard steam of methane reforming a hydrogen plant can have its configuration either with excess steam production due to export steam credit, or without excess steam production owing to no / minimum export steam credit.

In one of the process configurations, condensate lifting devices are installed in order to pump a high amount of continuous condensate (from reboilers) with insufficient condensate system pressure, which – by using high pressure motive steam – can push the condensate at required destination vessels. This upshots the pumps to avoid their usage and therefore consequently leads to huge electric consumption on a continuous basis. This is another instance of process configuration overarching the whole chemical complex utility balance and the utility prices.

In one of the recent projects at Linde, for an acid gas processing plant using Linde's process technology, a process configuration was adopted to reduce the overall plant footprint, energy footprint, and thus leading to the unit's CAPEX and OPEX reduction. An acid gas removal unit can be broadly subdivided into an absorption section and a solvent regeneration section. The unit had two separate absorption sections

**A large share of the OPEX is usually the energy cost. With ever increasing tightening of margins and knowing that there is nothing much to play around with the feedstock price, the real game changer can be the energy cost.**

comes as an exclusive scope of the plant owner. Although partly correct, this does not reveal the full picture. As a technology licensor, it is important to offer sustainable solutions and processes for their customers (i.e. process plant owners) in the industry. Sustainability can only be achieved if the given process configuration allows the customers to sell the end-product at a competitive rate and with the desired profit margin. Any reduction in energy cost can give a boost to position a production company better in the market. The energy saving prospect is much higher when it is inherently designed, rather than based on

defines the overall feed, fuel, and utility requirements. Any process technology can have various configurations which are adopted and tailor-made to suit the customer needs, local site conditions, and the overall chemical complex. The price, availability, and reliability aspects of utilities viz steam, cooling water, and power – along with feed and fuel prices – are critical in deciding the correct process configuration.

**A common misconception about energy management and optimization is: it is an exclusive subject of the plant owner. Although partly correct, this does not reveal the full picture. As a technology licensor, it is important to offer sustainable solutions and processes for their customers (i.e. process plant owners) in the industry.**

with different feed compositions. Generally, it calls for two separate regeneration sections considering various plant operational cases given by the customer. However, a common regeneration section was selected without compromising on the clients' requirements in terms of various phase wise startup – operational as well as maintenance-based, and also in terms of other operational requirements. Such

A technology licensor can also aid their customers at this stage wherever and whenever deemed fit. At Linde, we understand that most plant operators are keen to increase as well as to maintain the plant's uptime and performance. Having said that, at the same time, plant managers are under growing cost pressure and therefore need to exploit the efficiency enhancement measures. Such challenges can be met onsite as well as

**Energy conservation issue(s) can be addressed at various phases of plant life cycle in order to have a positive impact in bigger magnitude. However, to sum up broadly, those issues can surface & be worked upon either during the project phase for a new chemical process plant or during the operational phase of an existing process plant.**

innovative and sustainable solutions can help customers to reduce the energy cost drastically during its design stage.

Key aspects during the project stage can be, but not limited to:

- Detailed analysis of the client requirements
- Site conditions, utility balance, and an inclination towards energy conservation
- Innovative yet sustainable solutions that will keep pace with tomorrow's challenges
- Review of the plot plan with respect to process design
- Selection of equipment and components for energy loss reduction
- Adaption to process controls for process performance optimization and fine tuning
- Experience and implementation of lessons derived from past experience

Moving on to the operational phase of a process plant, it is vital that the process plant owner does carry out regular energy audits and tracks the plant's performance. There can be various recommendations and /or action items emerging out of such energy audits and which can fall under short-term, medium-term, or long-term measures basis the estimated payback period.

through remote audits either by revamping the components or modernizing control equipment, or by carrying out feasibility study in order to weigh the best foot forward aiming to match the customers' expectations.

**Conclusion**

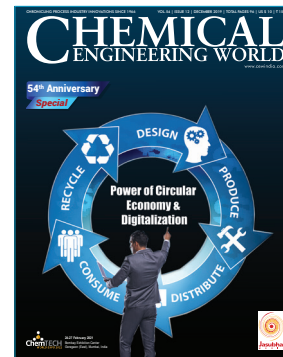
Thus to close the discussion, it is of note, any amount of effort put towards process configuration optimization at the design stage of a plant has a better pay off than that of the operational stage. For a technology licensor as well as for a plant owner, it is therefore vital to review thoroughly, to share expectations, and to think about innovative, sustainable, and energy efficient processes. ■

**Author Details**



**Jinal Sevak**  
Sr Executive Engineer  
Systems Engineering  
Linde Engineering India

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Thank you,  
Regards,  
**Mittravinda Ranjan**  
Editor  
Jasubhai Media Pvt Ltd  
T : +91-22-40373636  
D : +91-22-40373615)  
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## ■ Case Study

## Process Set-up Revisit and Realignment: Reap the Benefits



The technology provided by the renowned process licensors to produce ammonia and urea has undergone sea changes ever since their commercial production began in the bygone days. The state-of-the-art technology provided by the process designers has limited the scope available to reduce specific consumptions of ammonia and urea. Still fertilizer units present cross the globe leave no stone unturned to attain the lowest possible energy consumption level.

Fertilizer industries are in the midst of a transformation with regulation tightening by energy regulators like BEE, FAI, etc. Companies around the world have clamped down on costs and are exploring new ways to improve efficiency. Chambal Fertilisers and Chemicals Limited (CFCL) also strive to ensure that its energy consumption remains low. The present article gives some insights into one such successful in-house effort made by the company.

CFCL envisioned and implemented dual drive provision in the urea cooling tower (UCT) pump in its Gadepan-II urea unit by installing a new high tension (HT) motor. The UCT pump was formerly driven by steam turbine. However, the new motor is coupled with the same pump shaft but at the other end of the pump. Now, there is an option to drive the pump either through turbine or through motor, as the need arises. The pump is mostly driven by motor and the turbine is taken in line only during power shortage/outage.

Project identification, pre-engineering, bids floatation, vendor selection, detailed engineering were some of the pre-works involved. Challenges encountered before and after the modification with lucrative ROI offer interesting take away from the project.

Chambal Fertilisers and Chemicals Limited (CFCL) is one of the largest private sector fertilizer producers in India. CFCL has three hi-tech nitrogenous fertilizer (urea) plants located at Gadepan in the Kota district of Rajasthan. These plants deploy state-of-the-art technology from Denmark, Italy, United States, and Japan.

The first plant was commissioned in 1993, the second plant in 1999, and the commissioning of the third one was completed in 2019. With the commercialization of the third plant on 1st Jan 2019, annual urea production has touched 3.4 MT, making Gadepan India's largest single location producer of fertilizer. The additional capacity is of great significance to India as it results in the urea import reduction.

**Project Pre-works**

Provision of an additional electric drive along with a new pump requires clarification and pre-engineering in order to analyze the existing drive train, power requirement, foundation, and process control system to check feasibility and to calculate the return on investment (ROI).

Company's Gadepan-II unit is principally designed to run major drives on steam turbines. The power requirement is fulfilled by two Gas Turbine Generators

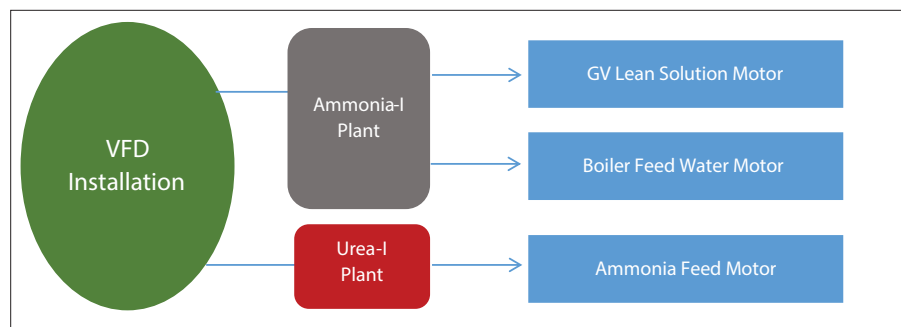


Fig-2: VFD's Installations in the plant

(GTG). One GT always remains in operation with the other in tandem. The two GT-s are of 21MW capacity each and use natural gas as fuel. In GTG-1, inlet air cooling is achieved through VAM machine and therefore during summers GTG-1 remains in line while GTG-2 runs predominantly in cool ambient conditions.

Out of the 21MW GT output, Gadepan-II unit consumes merely 4-5 MW while the remaining power is consumed by

Gadepan-I unit. Ammonia and urea plants run at 125 percent of design capacity, therefore GTG runs at its maximum capacity with only around 0.50 MW power margin. This margin (0.5MW) was not enough to commission any additional motor drive. This led to in-house brainstorming to increase the power margin in hand.

Deliberations then zeroed in onto reduce the overall complex energy. The committee mooted several ideas and one such idea was to install Variable Frequency Drives (VFD) in GV Lean solution motor & Boiler Feed Water (BFW) Motor drives in Ammonia-I plant and in Ammonia feed pump motors in Urea-I plant. In subsequent years,

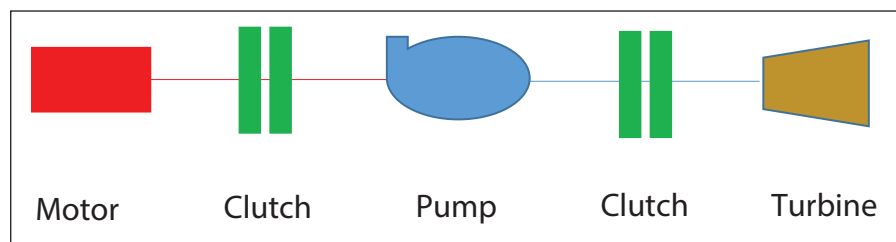


Fig-3: Pictorial representation of the modification

VFD was procured and installed in the above identified Ammonia-I & Urea-I plants, refer figure-2 for details of VFD installations in the Gadepan-I plant.

Through VFD's, the available power margin increased from 0.5 MW to 2.0 MW. With power margin (2.0 MW) at hand, the next challenge was to identify the drive which may be driven through motor without comprising operational flexibility, plant reliability, and safety aspects. In the entire complex, we could hardly identify any drive which may be driven through motor in entirety. Removing steam turbine was not a reliable solution as it would put

plant reliability at stake during power outages.

**Idea Evolution**

It was then an idea evolved wherein it was decided to consider dual drive provision in Urea Cooling Tower pump in Gadepan-II plant. This UCT pump, erstwhile driven by steam turbine alone, now has a new motor (Rating: 1250 KW) coupled with the pump shaft at the other end of the pump as shown in the pictorial representation figure-3. With dual drive provision in place, flexibility to run the pump – either through turbine or through motor – has been enhanced. However, the pump is mostly driven by motor and only during power shortage / outage, the turbine is taken in line.

Parameter	Value	Unit of measurement
Motor Power Rating	1250 / 1676	KW / HP
Pole	8	
Voltage	3.3	kV
Full Load Current (FLC)	270	Amps
Motor Frame	TPC 500G	

Table-1: Motor Technical Data:

**Challenges before execution**

As every good move or intention is opposed by challenges, this modification was also not an exception. Some of the challenges CFCL faced during its execution are as under:

- 1. Space Limitation:** Prime hurdle in the way of job execution was additional area required for motor foundation. The space available at the site was already limited and carving out additional area was a challenge with respect to free movement of cranes to address maintenance issues. The concern

was brought to the notice of the motor vendor as well. Detailed engineering of the project identified and demarcated around 7.0 M2 area for the motor base frame and its foundation to suitably handle 8250 KG motor. Refer to Table-2 for motor static and dynamic loading.

Static and Dynamic Loading			
Motor Weight	Parameters	Normal Running Condition	Push Pull Condition
8250 KGs	Horizontal Force per bolt in KG	475	5712
	Vertical Force per bolt in KG	----	2793
	Vertical Force per foot pad in KG	2467	6918

Table-2: Motor Static and Dynamic Loading

**2. Assigning safety interlock and alarm configuration:**

Defining new pump interlocks was not too demanding; however their seamless integration with the existing system was challenging. Nonetheless, the team’s relentless efforts successfully countered every challenge in its way. Motor full load current (270 Amps) was defined to prevent the motor from overheating and subsequently burning up. Related alarms were also configured into the DCS for alerting the operator beforehand in case of any technical glitch.

**3. Downtime requirement:**

For meeting Urea-II plant cooling water needs, three pumps are there and all three of them are steam turbine driven. Two turbines at a time used to remain in line, while the third one remained as emergency standby. For installation of motor along with pump downtime requirement was to be minimized. During the installation period, the turbine in tandem remained unavailable. And in case any of snag in the running turbines, plant capacity utilization had to be compromised. Given the criticality of the machine, downtime requirement for its commissioning was tried to minimize and in spite of that it took 17 days to complete the project. Please refer to annexure-I for the detailed scheduling of activities.



Fig-4: Actual image of the modification

**Challenges after execution**

The challenges after the project execution were of miniscule nature, given the savings and benefits the modification brought along. However it is necessary to highlight the issues Chambal faced upon its completion.

**1. Change in operation strategy:** Prior to this modification, there were three steam turbine driven pumps. Amongst three, two pumps always remained in operation while the third one remained in tandem. With dual drive provision in the third pump, the operation strategy was later changed. And since then, the third pump with motor always remains in service alongside another pump

whenever it is required to take turbine in service, it is clutched with the pump whereas motor is declutched. This is one-of-kind activity which is required only in case of any maintenance on the motor.

**Savings and benefits**

**1. Tangible Benefits:** The modification brought in energy savings of around 0.026 Gcal/MT Urea with payback period of nearly six months. This is almost equivalent to savings of ₹ 1.56 Lacs per day. Table-3 illustrates in detail the benefits accrued after the project implementation.

S.No.	Description	Value	Unit
1	UCT-II turbine power	1.14	MW
2	Steam consumption (Medium Pressure)	8	TPH
3	Eq. steam consumption (High Pressure)	6.6	TPH
4	Saving in Energy due stopping of turbine	5.6	Gcal/hr
5	Power consumption of Motor	1.25	MW
6	Additional power Energy due to running of Motor	2.5	Gcal/hr
7	Net Energy Saving	3.14	Gcal/hr
8	Net Sp. Energy Saving	0.025	Gcal/MT Urea
9	Savings considering 6 months running of motor	0.013	Gcal/MT Urea
10	<b>Total cost of installation of Motor</b>	<b>180</b>	<b>Lakhs</b>
11	<b>Annual Savings due to Installation of Motor</b>	<b>330</b>	<b>Rs Lakhs</b>
12	<b>PayBack Period</b>	<b>0.55</b>	<b>Years</b>

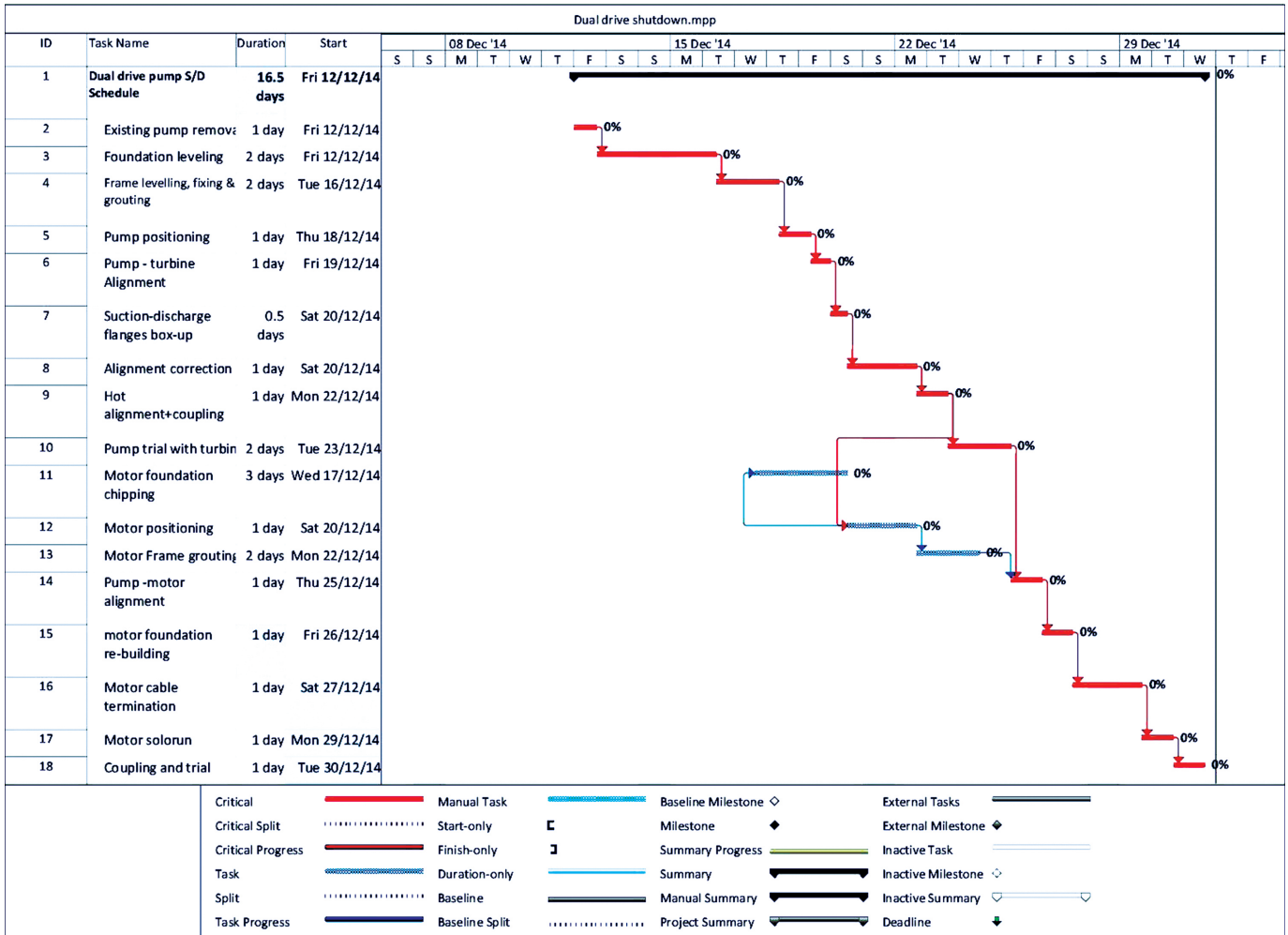
Table-3: Savings and ROI

to meet the Urea-II plant’s cooling water needs. This change in the operational strategy demanded training as well as change in mind-set for the operators.

**2. Turbine declutching:** As both pump and turbine are clutched with the same pump shaft therefore the turbine always remains declutched with the pump and

**2. Intangible benefits:** In general, motors offer higher overall efficiency, optimized start and stop conditions, and more flexibility for operation.

**a. Higher efficiency:** Chambal could achieve higher efficiencies with commissioning of dual provision for the pump. It is a known fact that steam turbines are less efficient, compared



- to electric motor drive systems due to intrinsic heat losses from steam turbines.
- b. Lesser maintenance:** As earlier said, efforts are made to keep motor in operation and in general it is understood that motors, as compared to steam turbines, require lesser maintenance due to their simple & robust design and lesser ancillaries.
- c. Reduced OPEX & enhanced reliability:** Original steam turbine used to have more planned shutdowns due to its significant number of moving parts. The maintenance cost has been reduced gradually over the period.
- d. Eliminating steam constraints:** Using electric motor to drive the cooling water pump eliminated the steam dependency and the need for finding a high quality source. This improved availability and reduced both maintenance and resource costs.
- e. Lower Emissions:** As global emission standards became tougher, electrification

contributed to a decarbonized energy future. A smaller footprint and less necessary auxiliaries made it possible to preserve the plant layout in more constrained environments and allow smooth plant integration.

Confederation of Indian Industries (CII) recognized the effort and declared CFCL as the Winner in the “2nd CII National Energy Efficiency Circle Competition” organized by CII in New Delhi. Contenders for this award were renowned technology providers, manufacturing giants, and institutions who showcased their success stories.

**Conclusion**

In order to successfully integrate the drive system into the process control, – careful coordination, planning, and combined efforts are the primary requirements. Chambal studied the economic advantages of electric drive systems meticulously, which resulted into significant operational flexibility, maintenance, and savings. Experiences

so gained can also be directly used for similar retrofit applications.

Howsoever robust or well established a system is, there is always a scope for further improvement provided frequent system revisit & realignment happens to present day conditions meeting reliability, operational flexibility, and safe margins. ■

**Author Details**



**P.C. Srinivasan**  
GM Technical  
Chambal Fertilizers and Chemicals Limited



**Rohit Shukla**  
DM-Technical Services  
Chambal Fertilizers and Chemicals Limited

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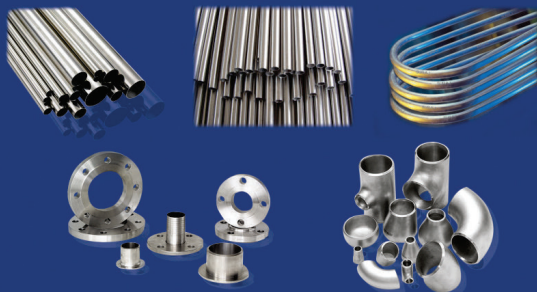
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# Better Carbon Footprint Surety & Project Execution Plan Formulation with Cost Based Analysis

In construction industry, project execution formulation process has got various priorities. The authors in this article present an innovative finding which not only generates a cost economic solution, but also does ensure an improved carbon footprint.

**G**lobal warming is a major issue causing unprecedented impact on our planet. Appropriate measures, in all aspects of our life, are to be taken up to combat against it and also to reduce the carbon footprint. There are many methods such as the sustainable recyclable material usage, focus on non-conventional energy resources, water conservation, and many more. However, it had been conceived that the most successful approach shall be those which will bring the commercial benefits as well, so that more and more groups will be eager to quickly adopt the same for getting direct benefit and also to ensure the intangible result of carbon footprint reduction.

The uttermost reason why most developers refrain from using green construction materials in place of the traditional ones is: sustainable construction comes with a premium price. However, all we need is the right approach, pointing towards the possibilities, for carbon footprint reduction of a project using smart design(s) and without any cost increment. It is possible to replace the traditional concrete with green concrete by increasing the GGBS or fly ash usage in concrete – either by adding it separately or by adding as a cement which includes these materials. Similarly, recycled steel, cross-laminated timber (CLT), low-carbon insulation, and bio-insulation can significantly reduce the overall greenhouse gas emissions associated with the various construction activities.

From the above chart, it can be deduced that about 40 percent of the carbon dioxide emissions come from the industry operations and construction activities.

To increase the sustainability of a building structure, it is important to improve the

operational efficiency with a target to reduce the overall energy usage. There are two kinds of carbon footprint for a structure in its lifetime, operational carbon emission and embodied carbon. Embodied carbon can sometimes account for almost half of the total carbon footprint.

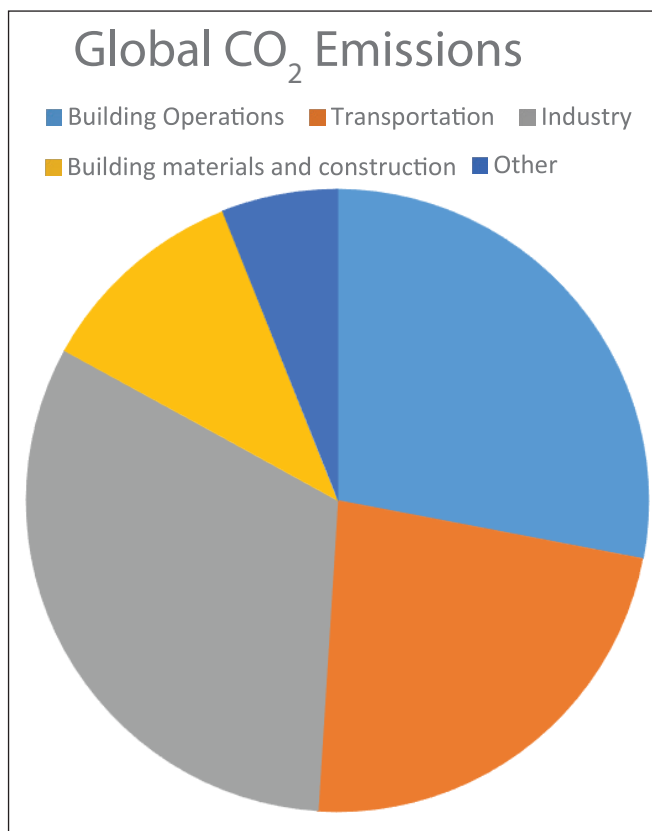
However, in a retrofitting work, possibility to improve operational carbon emission is very less, while attempt may be made to optimise the embodied carbon footprint.

Therefore, a more structured approach has been developed for the restoration of very old assets which are running with primitive technology to reduce its carbon footprint. The restoration process of the old assets is known as Asset Integrity Management.

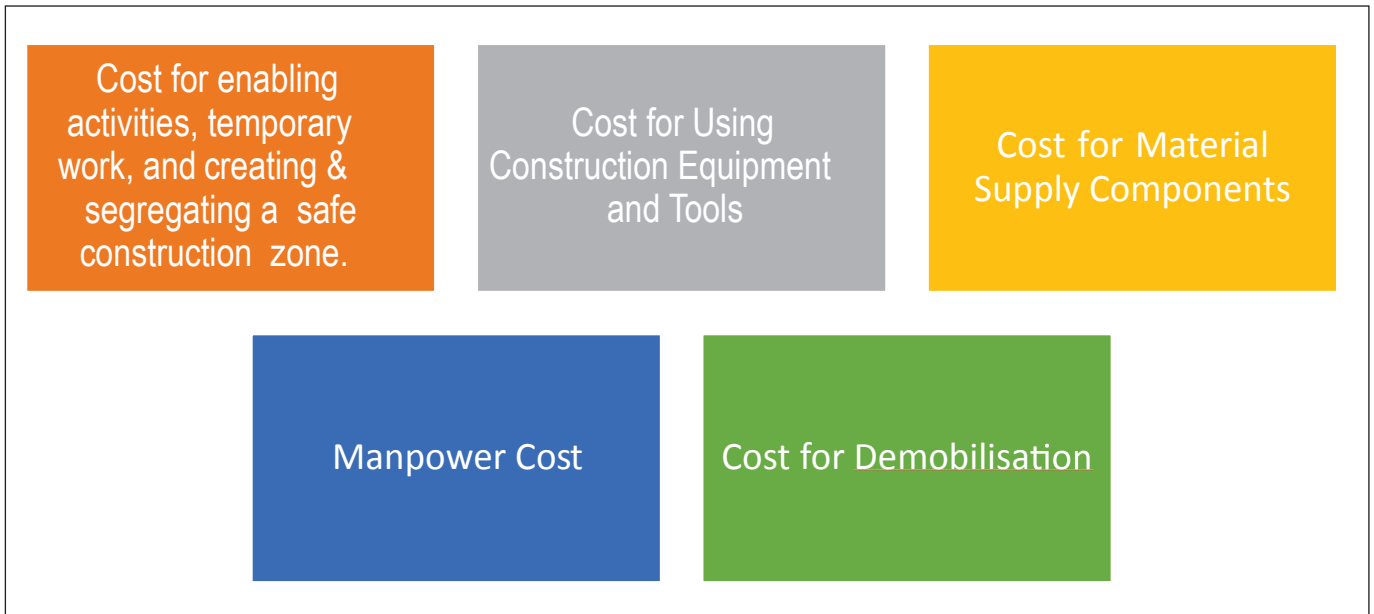
A recent study report on business trend analysis at the present industrial scenario reveals that investments are limited towards Capex domain and the focus is more towards OPEX business for improved energy efficiency & increasing residual life improvement. This report is more focused on OPEX domain in the construction process of Asset Integrity Management.

As cost is an important driver for any new project or for the rehabilitation of a project, project

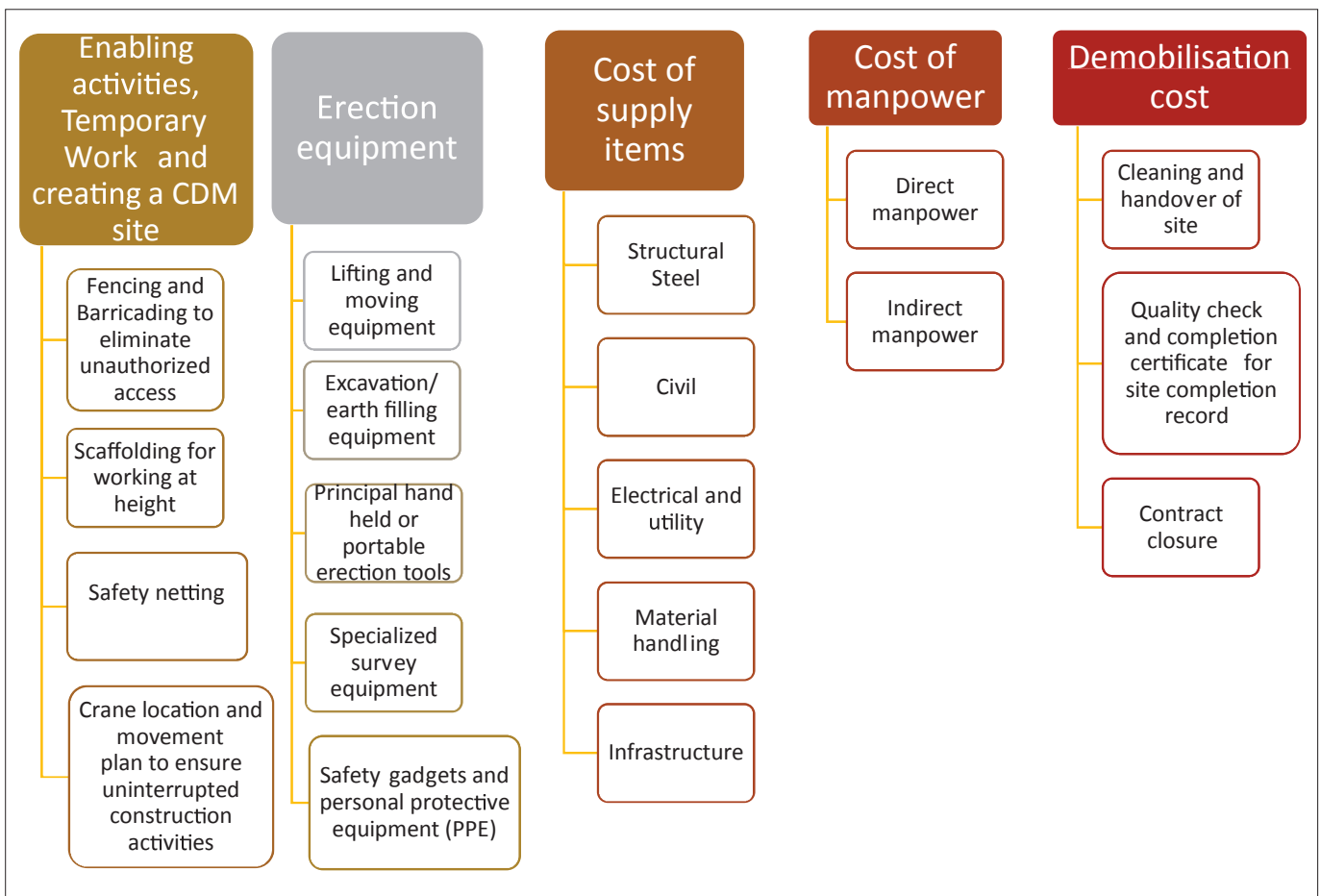
execution methodology is required to have more sensitivity towards cost optimizing approach. Considering Industry 4.0 as the driver for digital transformation and as the connector of supply chain mechanism with construction as well as the other project execution processes, the cost based approach should be integrated with all the work processes for risk free, safe, and sustainable execution. To address all the diversified risks, project execution model had taken a top down approach to stay competitive in the present business scenario. Apart from other key performance indicators (KPIs), cost plays the most vital role in formulating a process to ensure a sustainable execution model.



**Broad Classification of Project Execution Cost**



**Detailed Classification**



**About 40 percent of the carbon dioxide emission comes from the industry operation and construction activities. To increase the sustainability of a building structure, it is important to improve the operational efficiency with a target to reduce the overall energy usage.**

To ascertain the impact of the various project components on the overall project cost, individual cost analysis has been carried out in various executed projects and the study has been summarized and presented herewith in the chart. After carrying out the above analysis, it evolved that while working in foreign shore, the dominating cost bearing components, are the ones predominantly for human resources and for hiring of specialized construction equipment including tools & tackles and safety gears. While the material cost had the impact to some extent, an attempt to reduce the same will create a very small influence on the overall cost. This triggers to create new methodology for project execution.

To address the above issues, the required primary consideration is to optimize the project timeline during project planning at engineering stage, which will have significant impact both on indirect human resource cost as well as on the construction equipment hiring charges.

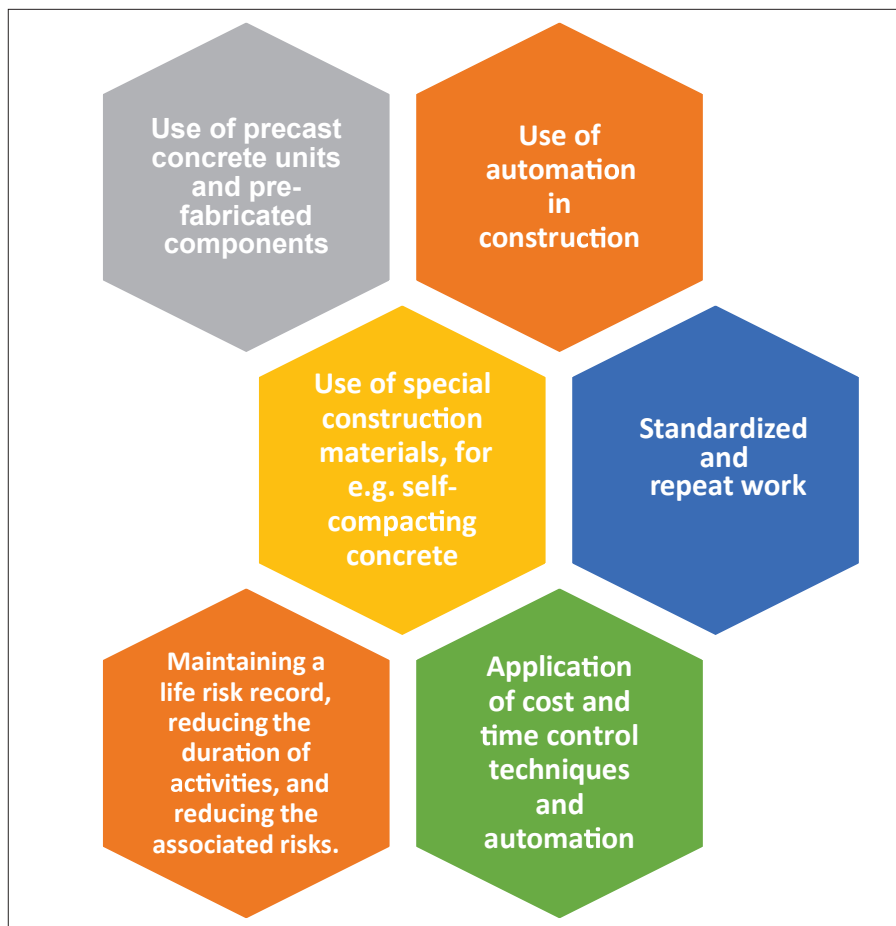
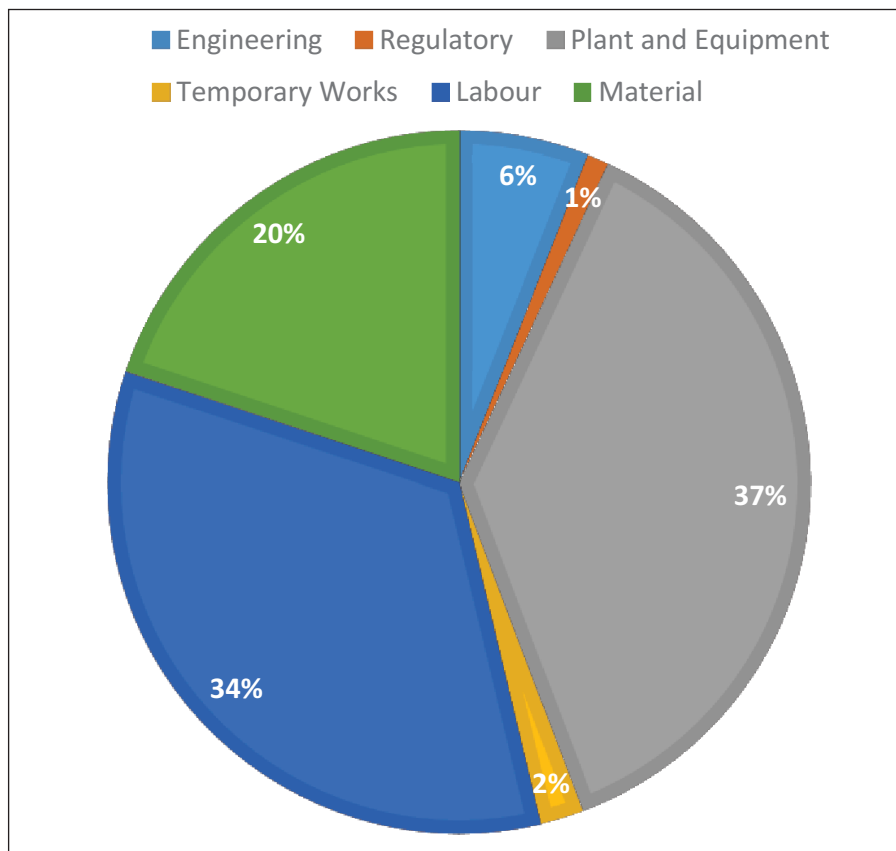
A detailed analysis and experimentation with various methodology resulted with the following outcome.

By adopting the above methods, an improvement on project timeline, cost, safety, and better environmental impact can be evolved. Various other methodologies are being tried to further improvise and to generate a more cost-effective project timeline.

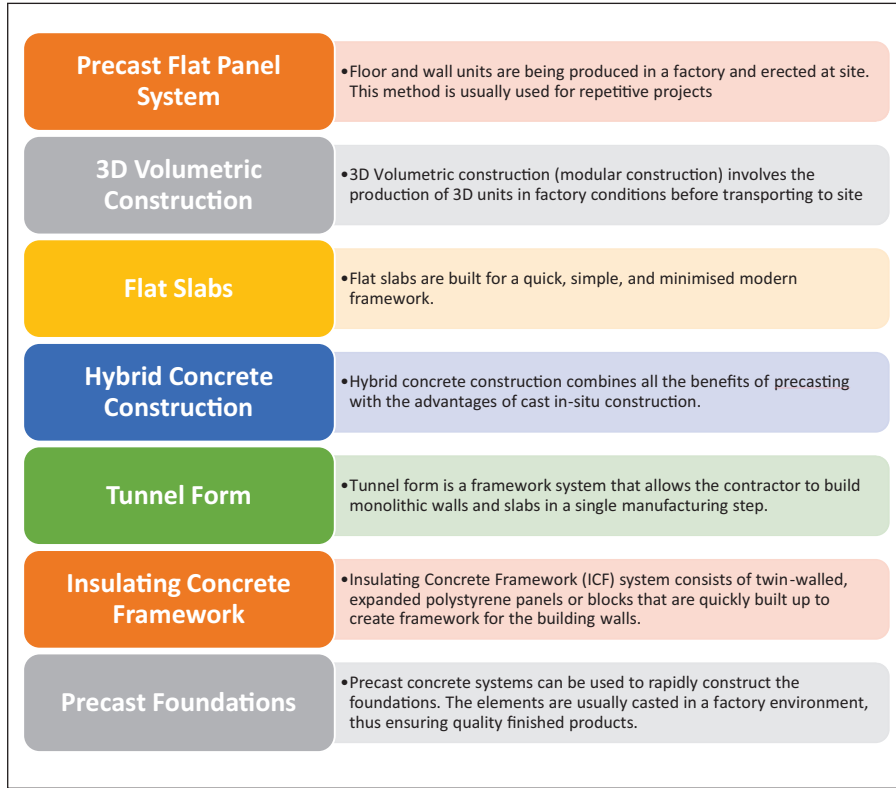
**Project Scheduling**

As seen in the above diagram, micro scheduling is of utmost importance to ensure the smooth running of a project. To

**The uttermost reason why most of the developers refrain from using green construction materials over the traditional ones is: sustainable construction comes with a premium price. However, all we need is the right approach, pointing towards the possibilities, for carbon footprint reduction of a project using smart designs and without any cost increment.**



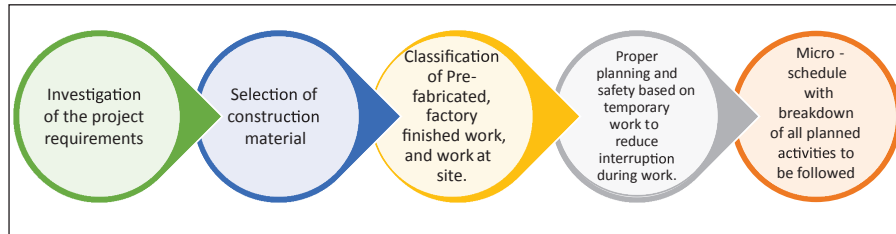
**Modern Methods of Construction to Reduce Construction Time and to Promote Sustainable Development**



**Conclusion**

The focus on carbon footprint reduction during project execution has recently gained momentum in the industry. Usage of existing buildings, Green Building Certification Schemes for new buildings, and having regulations & policies for decarbonization in place are a few of the measures being undertaken to ensure the same. However, its popularity can only be increased if stakeholders across the construction industry come together and share their stories of successful project executions and work towards demand creation as well as a favourable market for low carbon materials and processes. ■

**Methodology to Reduce Time**



facilitate that, it is required to finalize the project implementation process. Once that is done, a work breakdown structure of all the site activities and daily work schedule is prepared as well.

Before the commencement of the construction activities, the following checks need to be carried out:

- i. Availability of front
- ii. Safety

- iii. Regulatory compliances
- iv. Parallel opening of front
- v. Impact on running plant

After the standard checks and procedures are in place, it is necessary to check if there is any possibility for the project implementation schedule improvement. Then the corrective measures for the project implementation plan optimization will be developed and taken care of, from the inception stage itself.

**A study report on Business trend analysis at the present Industrial scenario reveals that investments are limited towards Capex domain and the focus is more towards OPEX Business for improved energy efficiency & increasing residual life improvement in the construction process of Asset Integrity Management.**

**Author Details**



**Sugata Bandyopadhyay**  
Engineering Manager (AIM)  
Tata Consulting Engineers Ltd



**Moumita Deb**  
Assistant Manager (Civil)  
Tata Consulting Engineers Ltd

# Future Proof Your Assets with Digital Twinning

In today's business world, implementation of artificial intelligence (AI) is no longer an option, rather a mandate. The author, here in this article, has given a very comprehensive account of how AI empowers digital twinning to future-proof the plant assets. His narration encompasses many different aspects of plant facilities to achieve sustainability and operational excellence through efficient prediction and monitoring.

**T**he debate has ended. Not implementing artificial intelligence (AI) is no longer an option. Every company should have an effective AI strategy in place, as the pace of innovation accelerates and presents increased opportunities to change businesses. Big data is the bedrock of AI. AI gains momentum via machine intelligence and insights by employing business and operational data streams. Currently, companies have only been utilizing a fraction of the data collected. This provides a huge opportunity for the implementation of a digital twin, which is nothing but the virtual copy of company's assets and business information. A digital twin can unlock the potential of the massive data mountain in each company.

In 1984, "Neuromancer" – a scientific fiction novel, authored by William Gibson – captured the imagination of readers as a prelude to the world of AI. Gibson envisioned the massive value & power that digital twins can bring, and how they can change the world. Today's technology has surpassed what writers, in the past, could only dream of. More than three decades later, Gibson's vision materialized in the enterprise world. Virtual copies of physical locations provide an insightful way for companies to harness the true value of data, as AI helps human beings to access this massive world of multi-dimensional data. Turnkey solutions for digital twins lie in the power of AI and the interconnected industrial world to extract critical insights via data mining and leveraging domain expertise.

## No longer dream time

The future has arrived with advanced technology, available on demand.

Now the golden question is: Where to Invest as digital twins transform asset-intensive businesses, especially the ones from energy and chemical sectors. In today's volatile, uncertain, complex, and ambiguous (VUCA) marketplace – the deployment of digital twins can help companies to achieve sustainability and operational excellence. Digital twinning technology is a business necessity that can greatly impact the industry. It provides a valuable model of the physical asset to help plants explore "what-if" scenarios safely and provide forecasting capabilities, therefore advises on degradation, asset failure events, and more. Digital twins also function as business models to optimize various business scenarios.

Based on models and real-time data, the digital twin is an evolving digital profile of the behavior of a physical object or process that optimizes business performance. This provides important insights into system performance, which in turn, leads to actions in the physical world. The digital twin takes advantage of asset data to stay updated and is increasingly made more intelligent by AI agents. First, the digital twin ensures that the process plant is modeled vigorously using engineering models, enhanced via AI techniques with embedded cost and risk models. Second, the operational digital twin ensures that plant operations are modeled and viewed virtually as planning, scheduling, controlling, and utility models. Areas covered include

planning and scheduling, demand models, distribution models, energy demand and supply, as well as control and optimization. Third, the operational integrity digital twin provides tactical and strategic decision guidance around prescriptive maintenance and real-time decision-making to maximize uptime, adjust production, minimize environmental impact and production losses, and also to prioritize safety. The digital twin also covers asset condition and sustainability. Overall, companies need future-proof digital reference architecture to structure the implementation of digital twins supporting collaboration and integration across business functions.

## Powered by business value

Boston-based LNS Research conservatively estimated that more than 1,000 digital twin models may be required to model the operations of a typical refinery. The scale of digital twins will deliver value for the enterprise. For example, unit level models can deliver very high value returns for digital twins – involving process, asset condition, and the control & optimization of online models. Energy and utility models, refinery and bulk chemical planning, specialty chemical scheduling, debottlenecking and de-risking, as well as emissions are very high-value opportunities for plants to adopt digital twin models. As a new but important area, enterprise-level digital twins enable rapid analysis of available enterprise profit opportunity options and effectively present actionable information at the executive level.

**Turnkey solutions for digital twins lie in the power of AI and the interconnected industrial world to extract critical insights via data mining and leveraging domain expertise.**

Examples of how digital twins can add value to businesses:

- A Bolivian upstream company, YPFB Andina, has increased yield via an asset-wide digital twin model.
- A major US-based international refiner has adopted machine learning digital twins to improve refining uptime and margins, saving money in the process.
- Abu Dhabi National Oil Company (ADNOC) via Equinox, has constructed an asset-wide twin with a visualization dashboard to achieve better decision-making and sustainability milestones.
- Sustainability is a key business driver for Bharat Petroleum (BPCL).

**Digital twins transform asset-intensive businesses, especially the ones from energy and chemical sectors. And the golden question that arises for the businesses is: Where to Invest.**

This resulted in the deployment of an integrated digital twin to optimize sulfur recovery – encompassing software, such as AspenTech's self-diagnosing adaptive process control and engineering software models to improve contaminant removal, as well as visualization and key performance indicator (KPI) dashboard. Within six months, the implementation resulted in 90 percent reduction in sulfur emissions and economic value from the recovered sulfur for sale.

- A service provider in Alberta oil fields, Process Ecology, mitigated costs in fine payments via online digital twin models, in the area of compliance and permitting.
- Via a digital twin, Momentive Specialty Chemicals optimized their supply chain daily, in the area of order fulfillment and working capital.
- Forbes has also reported that AspenTech's customer – Perstorp – one of the leading global specialty chemicals manufacturers, has a model that contains 1.5 million variables and 500,000 constraints. Perstorp has been reportedly evaluating demand-supply scenarios

based on marginal contribution impact and plans to have the whole company in a unified model.

- A polymer producer implemented data analytics digital twin, principled on a multivariate analysis, to manage a wider range of specialty chemical applications where product quality is the key and often problematic.

**Conclusion:** Companies have been progressing with new and advanced technologies, as it is necessary to be strategic and to have a roadmap to get ahead. As companies invest in digital twins, it is critical to observe (at a high level) how this technology

will help businesses to overtake the competition. Beyond technology, companies should also take note of their organizational change and evolution. The organization's ability to adopt, as well as the level of enthusiasm and readiness should be managed regularly, as the value creation in business is the key driver for technology. ■

#### Author Details



**Ron Beck**

Marketing Strategy Director  
Aspen Technology Inc.

E-mail: ron.beck@aspentech.com



**Sunil Patil**

Solutions Consulting Director  
Aspen Technology Inc.

E-mail: Sunil.Patil@aspentech.com

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Editor  
Jasubhai Media Pvt Ltd  
T : +91-22-40373636  
D : +91-22-40373615  
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# Cyber Security: Its Importance and Impact on Industrial Control Systems

In today's volatile, uncertain, complex, and ambiguous (VUCA) business world, cyber security is a mandate against the digital threats. The author, here in this article, very comprehensively provides an account on ways to secure cyber security for plant or Industrial Control Systems (PCS / ICS) including but not limited to – Distributed Control Systems (DCS), Programmable Logic Controllers (PLC), and Supervisory Control and Data Acquisition (SCADA) systems to address their unique performance, safety requirements, and reliability.

**F**ortification of electronic / digital data or statistics against modification and unauthorized disclosure, or destruction, or transfer – be it accidental or be it intentional – have been increasing at an alarming rate these days. To mitigate these threats, Cyber security plays a pivotal role in today's business world.

Three important concerns, with regard to this, are:

- **Governance** – This is to ensure proactive implementation of appropriate operating technology (OT) security mission in a cost effective manner, while managing evolving OT security risks.
- **Operations** – This one is to ensure a safe infrastructure setup by implementing appropriate security control and an in-depth defensive design concept for the network infrastructure.
- **Infrastructure** – It is to continuously monitor the system's performance to ensure the consistency with agreed security requirements, and also the incorporation of needed system modifications.

Security is a journey, not a destination. Organizations, who embrace adequate and appropriate measures, are better equipped to mitigate cyber security risk. Business and technology both are needed to be dynamic in order to respond to internal as well as external events. And it's also of note that risk factors do undergo frequent changes. Cyber security programs should continuously look for new potential risks, and periodically review the past decisions

to determine whether new information affects their assessments and the actions are being taken. Collaboration has to occur in order to truly cover all the bases when it comes to cyber security; engaging the OEMs and the service providers is very essential. Organizations should also therefore seek guidance from their peers, third parties, experts, and authorities in their cyber journey.

## Cyber Security Governance

Number of mandatory as well as voluntary standards, regulations, and guidance have been developed and well documented by one or more corporations, associations, standard organizations, or regulatory bodies. Such work – for example the compliance support – improves the risk management, and outlines the recommended procedures related to cyber security. However, it is important to know, which ones are mandatory and/or advisable for an organization. The organizations are to leverage this information to best fit their business model. To name a few framework / regulatory bodies,

- Cyber Security Framework by The National Institute of Standards and Technology (NIST)
- IEC 62443 series from International Electro-Technical Commission (IEC)
- Indian Computer Emergency Response Team (ICERT)

They provide guidance for improving & maintaining the cyber security; and also

to take proactive measures for advanced implementation.

## Cyber Security Information Sharing

Information sharing is one of the key activities that organizations should engage with, to optimize their efforts in mitigating cyber security challenges. The aim of these connected organizations is: to coordinate between government and industry across multiple sectors, thus allowing information, knowledge, and expertise to be shared. Organizations like The Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) instituted the Industrial Control Systems Joint Working Group (ICSJWG), AISA (Australian Information Security Association) etc to stay up-to-date with select information about what relevant to their industry, as well as to the connected companies & agencies.

In order to achieve its objective, following sections will cover the ways to secure cyber security for plant or Industrial Control Systems (PCS / ICS) with a mention of Distributed Control System (DCS), Programmable Logic Controller (PLC), and Supervisory Control and Data Acquisition (SCADA) system. These shall also address their unique performance, safety requirements, and reliability.

Initially PCS was built as a stand-alone system and wasn't interconnected; therefore they had only little for security protections. The all-pervasive internet

**Security is a journey, not a destination. Organizations, who embrace adequate and appropriate security measures, are better equipped to mitigate the cyber security risk.**

protocols and associated networks have prompted to design PCS with control network(s) extended to corporate networks for higher level supervision and monitoring. These design improvements often allow the PCS to be potentially available to the skilled and malicious antagonists over internet.

Even today PCS is not secured, conferring to the fact that they are certainly susceptible even after assessing the cyber security measures. Hence cyber security needs to be considered as a process instead of a project. Generally PCS undergoes repetitive tests, because most of PCS-s are being manufactured from mass produced hardware and customized open source software exposed to operating systems and 3rd -party software available in the current open market. The repercussions of such weakness to PCS domain are not obvious, but are visible to a cyber-security assessment if carried out.

Typically IT security system solutions are designed to incapacitate such security issues; therefore additional precautions must be taken prior to introducing these security solutions tailor made for PCS environment.

In order to discuss about establishing a secure PCS, it's of note that control systems like DCS, SCADA, & PLC are utilized for controlling, monitoring, and protection of plants in industrial sectors. Industrial sectors include power, oil and natural gas (ONG), transport, water, sewage, paper, chemicals, drugs, food & beverage, etc and also to some extent in discrete manufacturing areas viz aerospace, automotive, consumer goods, etc.

- PCS and DCS are used for mass production of components / systems in localized manufacturing sections & monitored / controlled from remote

central location in a factory.

- Geographically distributed assets uses SCADA systems, which are used for controlling purpose, and also utilizes them for central data acquisition system & supervisory controls.
- For sequential or binary regulatory controls, as required for specific applications, PLCs are used.

PCS and Control system architecture help in identifying the threats and associated vulnerabilities to the above listed control systems, thus enabling the recommendations for the countermeasures in security and associated risk mitigation.

#### Few risk-arising reasons in PCS are

- Proprietary solutions have been replaced by cheaper Internet Protocol (IP) devices, which have increased the possibility of cyber security incidents / proneness.
- Corporate business systems connectivity is promoted by using the IT solution with PCS designed to ensure remote monitoring and control capabilities, implemented by using available IT infrastructure viz industry standard computers / laptops, network protocols for interface and operating systems (OS), etc. These are similar to typical IT systems. These new IT capabilities are supported by these integrations, however provides significantly less isolation from the outside systems to PCS in comparison to stand-alone predecessor system. Hence, there is a greater need to protect these control systems.

#### The risk-consequences in PCS

Even though characteristics of both are analogous, certain features of PCS

are different from those of conventional information processing system. Such differences arise from the fact that logic execution in PCS directly affects the physical plant world. Even though these characteristics are only a few in number, they impose significant risk to the – health and safety quotient of human beings, serious environment damage as well as the issues like production loss, compromise in proprietary information, etc. Cyber security programs for PCS are always a section of comprehensive program on safety, reliability at both sites of industry as well as process plant, and the enterprise-level cyber security programs. This is predominately so in context of cyber security, because of safe and reliable modern plant operation is critical as well as required.

#### A Few Implementations of Security Objectives in PCS

- To have logical access to PCS network and restricted network activity.
- To have physical access restriction for PCS network and devices.
- To protect individual PCS items from exploitation.
- To restriction the unauthorized data modification in PCS.
- To detect security incidents and events.
- To maintain the functionality during adverse conditions.
- To restoration the system after an incident.
- To attack the surface of the OT network
- To convert the external connections to one-way connections for monitoring purpose.

No single methodology or technology can fully secure industrial automation and control systems. An in-depth security approach is required for protecting the PCS assets. Balanced industrial network security framework must address both the technical & non-technical elements.

The successful security implementation method to a PCS is to collect all the recommended industry practices and to engage in a proactive and collaborative management effort in alignment with expert control engineers from OEM and IT group.

**Number of mandatory as well as voluntary standards, regulations, and guidance have been developed and well documented by one or more corporations, associations, standard organizations, or regulatory bodies. The organizations are to leverage this information to best fit their business model.**

**Some special considerations are listed below for considering security for ICS:**

Category	Information Technology System	Industrial Control System
Performance Requirements	<p>Consistent non real-time response. High throughput.</p> <p>Accepted with a high delay and jitter condition. Interaction of Critical emergency is less.</p> <p>Tightly restricted access control is implemented to achieve the required degree of security.</p>	<p>Response of Real time is always very time-critical. A Modest throughput is adequate.</p> <p>Delays and/or jitters are unacceptable. Individual responses and other emergency interaction responses to be considered as critical.</p> <p>Controlled access to PCS, but same shall not interfere with human-control system monitor interaction.</p>
Availability (Reliability) Requirements	<p>Systems Rebooting are accepted.</p> <p>Deficiencies on availability are often tolerated, which depends on the operational requirements of the particular system</p>	<p>Because of process availability requirements, responses to rebooting are not accepted.</p> <p>In few cases availability requirements shall force or may recommend redundant systems .</p> <p>Outages are usually planned and also scheduled in days or weeks in advance.</p> <p>Detail pre deployment testing conducted to ensure high availability.</p>
Risk Management Requirements	<p>Data maintenance, Management of data integrity and confidentiality.</p> <p>Importance is low to fault tolerance; Momentary downtime of control system is not deliberated as a major risk</p> <p>Delay in business operations is only the major risk impact .</p>	<p>Human safety, Control of physical world is on priority followed by relevant process protection.</p> <p>Fault tolerance is always mandatory and momentary downtime is not accepted .</p> <p>Noncompliance of Regulations, impact on environment, equipment loss, loss of production &amp; life are the major risk impacts.</p>
System Operation	<p>Typical operating systems are used in system. Automated deployment tools are used for Up-grades</p>	<p>Different proprietary operating systems are generally offered without built in security capabilities. Software changes are done by software vendors/OEM's, by means of special control algorithms and since modified hardware and software are involved</p>
Resource Constraints	<p>Specified system resources to support third-party applications like security solutions.</p>	<p>These systems are exclusively and explicitly designed to support only intended plant process and shall not have extra /additional memory and computing resources, which may be required to support other security capabilities in addition .</p>
Communications	<p>Standard communication protocols localized wireless capabilities with Primarily wired networks</p> <p>Typical standard IT networking practices .</p>	<p>Standard / proprietary communication protocols Various methods of communications media used with a dedicated wire or wireless (satellite and radio) . Expertise of control engineers is required for complex networks.</p>
Change Management	<p>Software updates or changes take place as per security policy and procedures in a planned timely fashion . Sometime these procedures are automated.</p>	<p>To ensure the integrity of the control system, the Software changes are completely tested and utilized incrementally in the complete system. Outages of PCS are planned and scheduled days or weeks in advance using look ahead planning. Sometimes PCS shall use OSs that are obsolete or no longer supported actively.</p>
Managed Support	<p>Can be done using diversified serviced support.</p>	<p>Single/proprietary vendor service support.</p>
Component Lifetime	<p>Generally 3 to 5 years lifetime after order placement</p>	<p>Generally 10 to 15 years lifetime after order placement</p>
Components Location	<p>Components are available locally &amp; easy to access.</p>	<p>Extensive physical effort/ procedure to be followed to gain access to them, however components can be isolated.</p>

To improve cyber security, partitioning of PCS into separate security domains is being done to separate the PCS from other IT networks, e.g. corporate network. The Purpose of network segmentation and segregation is to ensure that the organization shall continue to operate effectively & also to reduce the unauthorized access to sensitive information.

Network segmentation and segregation is implemented at the gateway between the domains. PCS environments are always the well-defined multiple domains, such as LAN networks, DMZs (demilitarization zone), as well as the gateways to non-PCS and less trustworthy domain such as the Internet and corporate LAN. While implementing the network segmentation and segregation, they minimize the access method and level to very sensitive information.

**PCS Security Capabilities and Tools**

Based on the network architecture and configuration, technologies and methods that used to improve the security capabilities include :

**Data Diode**

A data diode is a unidirectional gateway, unidirectional network, or deterministic one-way boundary device in a network device, which allows the data to travel only in a single direction with guaranteed / validated information security or protection of critical digital control systems, like PCS from inbound cyber-attacks. These devices are generally used in defence area, which is high security environment and where they serve as an interface between two or more networks of different security classifications. This technology is generally used to enforce one-way communication to the critical digital control system & to transmit the data from untrusted networks.

**Encryption**

Encryption maintains the data confidentiality by encoding the data and thus ensuring that it can be decoded only

by the intended recipient. In the market, specifically designed encryption product for the intended PCS application are used.

**Firewalls**

Firewall is a commonly used technique & component to segregate the networks and also to isolate & protect the PCS. These are implemented by using freely available firewalls in market having a focus on application layer protocols and Internet by corporates. Now, few of these are equipped to handle the PCS protocols.

**Intrusion Detection and Prevention**

Well-known cyber-attacks are detected on networks and PCS components by deploying plant intrusion detection systems (PIDS) and plant intrusion prevention systems (PIPS). PIDS monitors the network traffic. Various detection techniques are being used here to compare the traffic portions with the earlier known-attack-signatures.

On the host server, requisite software is installed for host intrusion detection with the loading of specific attack-signatures to monitor the ongoing events, and also the necessary data to diagnose the possible exploitation on these systems. Such intrusion detection along with PIPS products further automatically act by detecting the exploitation and consequently by attempting to stop them. In today’s information security industry, even though PIPS is in commonplace, they are very resource intensive. These systems automatically and speedily reconfigure on any intrusion attempt. The automated reaction is designed to prevent such intrusion / exploitation threats. However, the automated tool could be used by an antagonist to affect the PCS operation adversely because of the network or server segment shutdown.

**Antivirus / Malware Software**

Antivirus software can be used on almost all of the PICS components. However, for PICS, special considerations to be taken into account for selection, installation, configuration, operation, and

maintenance procedures. PICS vendors should always be consulted by PICS end-users before using the antivirus software.

**In brief , steps to be followed are**

**Ability to –**

Identify – Organizational comprehensive security program & Cyber security audit.

Protect – Harden all hardware & software configurations & to apply permissions and security policies to complete ICS environment.

Integrate - Update and patch management.

Follow - Network segmentation.

Detect - Continuous vulnerability assessment and remediation, intrusion detection and prevention i.e. actively monitoring the sources like CERT , vendor & industry websites, etc.

Respond – Incident response program i.e. to plan & to communiacate.

Recover – Having realtime backup & restoration plans.

Comply – To conduct Traning@ programs & certifications

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**Author Details**



**K Jayaprakash**

Discipline Head (C &I)  
Tata Consulting Engineers Ltd  
Tel: +91-80-66226303  
Email: kjayaprakash@tce.co.in

# Industry 4.0 and Water Infrastructure Management

Within the two decades of 21st century, the prospects of system integration and internet have revolutionized the economic sectors. Industrial sectors have already developed innovative strategies to thrust their performance and to excel in being more sustainable through appropriate technology adaptation. Even though pivotal, water infrastructure has lagged in adapting to innovation primarily due to continuous external stresses. The author, here in this article, showcases a comprehensive profile of water infrastructure management under the prolific influence of industry 4.0 technologies.

**G**rowing inclusion of technology in our lifestyle has been impacting on our socio-economic structure at an increasing and rapid pace. Industry 4.0 ideologies encourage the businesses to constantly improve by adapting to the technology, innovation, and digitalization. Industrial products have become smarter; more customization is now available to integrate them into the invisible cyber physical systems. IoTs and other similar platforms are being relied upon to evolve the business strategies in order to make a greater impact.

Water industry, including wastewater, also needs similar adaptation for such paradigm shift to happen. With the global scarcity thrust at fresh water resources and also with the unavailability of viable alternatives, to sustain for the longer term, the industry has to strive very hard for finding new solutions and cost optimization. Such transition shall face a variety of challenges viz. transformation of the water supply system into an interactive digital system, a shift in organizational behavior as well as in adapting the big data culture, and last but not the least – the market readiness for smart predictive informatics for onward data analysis to carry out with. Water supply organizations – with an exposure to the evolution of business sustainability on one hand, and with the new technology & associated opportunities on the other – must adapt such behavioral patterns to the evolutionary level.

**Water Infrastructure Management:** One of the prime challenges water treatment & distribution organizations have been facing these days is: to strike a balance between the infrastructural network efficiency and the economic resource optimization efficiency, needed for instituting business sustainability. Although a number of innovative technologies have increased the prospects in this sector, the issues related to efficiency & sustainability of the water

infrastructure are still being considered as global problem.

Water supply organizations, in their efforts to improve their business, adapt to different approaches that are concentrated around failure reduction and necessary repair in order to curb water losses or to achieve an efficient anthropogenic water circle. In spite of that, it has been realized that water management has the maximum impact if implemented in overall sustainable package backed with a long-term strategy. Infrastructure operations & maintenance are pivotal to own such a future.

A number of innovations have already made our data collection improved in the water and waste water sector. By digitizing the water system with ICT technologies viz auto-actuators, pressure meters, flow meters, and consumption meters, the water management system has got a complete new dimension. Real-time monitoring and control are the key strategies that current water infrastructure organizations must imbibe to address optimal water utilization at the every stage in water cycle.

We further explore how the ICT technologies have been offering the potentiality in solving some of the very significant risks:

## 1. Aging infrastructure & increasing asset management cost

The current infrastructural utilities strive to develop an economic value chain that shifts the organizational vision from operable maintenance to efficient maintenance. Currently, as our systems and infrastructure age, operational availability gets reduced and more maintenance is required. The domino effect of such infrastructure maintenance

drains the economic viability for any major upgrading.

**Suggested Mitigation:** Advanced automated processes allow the water sector organisations to improve their asset operations & maintenance by adapting to preventative maintenance, thus deriving the maximum value out of it. Integration of such processes with technology – such as IoT enabled sensors, data analysis, and analytics – enables the utility companies to move a step beyond the mere predictive maintenance.

TasWater in Tasmania has developed a predictive modelling technique by leveraging its historical data. This has the capacity to detect any municipal blockage, even before 13 hours of any complaint registration. Thus, it not only provides adequate warning to the operators in preventing spillages, it also does save the reactive maintenance resources by enabling faster response.

## 2. Economic Value Chain Management and the Rising Energy Sourcing Price

The low economic viability in water infrastructure has primarily driven by rising energy sourcing price. The processes and current methodologies of abstracting, treating, supplying, and collecting are all energy intensive in nature. Lack of monitored pricing mechanism coupled with increasing non-revenue water do also appear as key challenges along with surging energy cost and higher economic risks.

**Suggested Mitigation:** Current utilities have been much adaptive to mitigate the energy cost through alternative renewable resources. Adaptation to

**Water supply organizations – with an exposure to business sustainability evolution on one hand, and with the new technology & associated opportunities on the other – must adapt to the behavioral pattern at the evolutionary level.**

ICTs and Industry 4.0 technologies shall empower the utilities in addressing demand responses such as automatic load shifting, surge prevention, load saving based on weather, and efficient collection through spot pricing.

**3. Rapid Urbanization and Stretched Rural Services**

The migration of population from rural to urban areas has observed unprecedented challenges, post modernisation of communication and transport infrastructure. While the urban water utilities face challenges of source stressing, increasing demand, and maintaining quality in supplied water, – the rural water utility services have been facing challenges due to scarce population density at rural areas, stretched assets, & associated disbursements. In effect, the industry must do more with less.

Suggested Mitigation: For urban context, provisioning for alternative fresh water sourcing viz desalination, Industry 4.0 conceptualization, and ICT advancements can immensely upgrade the supply, demand, and consumer database management. Demand management system can integrate asset data and ensures the real time monitoring, forecasting, and consistent availability of water loops. Remote metering and dashboard integration have developed the concepts of Intelligent metering to provide the users an increased visibility into their usage patterns and also suggest actions to improve their efficacies.

For rural areas, the concept of IoT and the advancements in ICT are best suited within remote sensing and monitoring. Initiatives like WatScan of CII–Triveni Water Institute have already been developing integrated maps to study various aspects of the underground water.

**4. Environment and Sustainability**

The changes in the climatic patterns have also stressed the water industry in recent decades. The design standards have become obsolete and issues such as sewer spillages, flooding, water pollution, etc have increased the risks associated with the water & utility sector. Closely

associated with the health of masses, the water industry must find ways to improve their efficiencies in delivering quality water and in mitigating the risks of storm water pollution.

Suggested Mitigation: IoT has been making it easier and cheaper for the utilities to monitor the previously unmonitored water sites in real time. With a better visibility, agencies are now able to react quickly to mitigate the issues from occurring at the very first place. This capability also provides more asset data that can be utilised in programs to eliminate the risk of storm-water pollution and the associated environmental impact.

**5. Unskilled and Ageing Workforce**

As per the Water Report published by Australian Industry Standards in 2018, the technological changes will increase the demand for specialist skills including data analysis and data literacy, network security, and also the higher-order skills which incorporate creative & critical thinking, problem-solving, and inter-personal communication skills in the workforce.

Suggested Mitigation: Current workforce planning focuses on workforce capacity building. Up-skilling the maintainers and operators with requisite digital literacy skills, remote sensing & monitoring technologies, and also with domain speciality skills in data analysis as well as utilities can diminish the skill-gap by leveraging 3<sup>rd</sup> party companies or by rooting the consultants to implement and / or to maintain new systems.

**Conclusion**

Industry 4.0 and the IoT offer untapped opportunities in water asset management. Technologies do enable the real-time remote monitoring, intelligent water metering, and preventative maintenance driven by automatic alarming. Apart from reducing the maintenance cost throughout the entire life-cycle, technological integration also represents opportunities to improve environmental response time, community response services, and communication to ensure consistent water supply to remote and urban areas through reliable monitoring.

Such capabilities will not only help the water industry to meet various new demands, but also to better manage the assets, services, and operational costs all the while providing faster and better customer experience. Water industries and public agencies are striving for sustainability in the overall system which is already facing immense external risk. The influence of data driven technological strategies, based on Industry 4.0 concept, provides efficient and long term solutions. Only quick and effective response to these challenges will give the water supply organizations a chance to act responsibly and to initiate a sequence of unavoidable measures, as an inroad to business efficiency improvement during the O&M stages.

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**Author Details**

**Ashish Mathur**

Advisor, Public Sector Advisory  
Grant Thornton India LLP, Noida, India

**Mridul R. Singh**

Manager, Public Sector Advisory  
Grant Thornton India LLP, Noida, India

**Real-time monitoring and control are the key strategies that current water infrastructure organizations must imbibe to address optimal water utilization at the every stage of water cycle.**

## ■ Case Study

## PT. Indochemical Citra Kimia : A Breath of Fresh Air

Indochem Discovers the Best Way to Optimize Production Rates and Air Consumption in Solvent



Over its 30-plus years of operation, PT. Indochemical Citra Kimia, better known as "Indo Chem," has grown into a recognized leader in solvent, glue and ink production for use in 3 major industrial markets in Southeast Asia.

Founded in 1997, the Asia Pacific Petrochemical Co., Ltd., is headquartered in Bangkok and Thailand; has rapidly grown into one of the leading importers, exporters and distributors of hydrocarbons, oxygenated solvents and monomers for use in industrial-manufacturing operations in the Asia-Pacific region.

Representing the group in Indonesia is PT. Indochemical Citra Kimia, is widely known as "IndoChem". Based in Jakarta, Indonesia, IndoChem was founded in 1982 and is a recognized leader in solvent production for use in the Indonesian paint and coatings market, and also a significant producer of glues and inks for various industrial applications. IndoChem's solvent-manufacturing business consists of three plants located in Indonesia. These plants have holding tanks that can accommodate up to 45,000 liters (11,888 gallons), and are constantly being filled and emptied depending on the facility's manufacturing and delivery needs. In all, IndoChem produces and handles a total of 300 million liters (79.3 million gallons) of solvents per year at its three production facilities.

### QUICK FACTS

- Company** : PT. Indochemical Citra Kimia
- Location** : Jakarta, Indonesia
- Market** : Solvent Manufacturing
- Distributor** : Winston Engineering Indonesia, Jakarta, Indonesia
- Challenge** : IndoChem needed to optimize the loading time, energy efficiency and product containment of its solvent-handling pumps
- Solution** : Pro—Flo® SHIFT AODD Pumps deliver enhanced loading times with leak-free operation and optimized air consumption

## Growing Pains

As IndoChem's customer base has increased, several operational challenges have begun to hamper its ability to reliably and efficiently meet its production quotas:

- The time needed to fill one holding tank with a capacity of 45,000 liter has approached seven hours, which is unacceptable for IndoChem's clients.
- The capacity of IndoChem's air-compressor unit has been maxed out and it is not possible to add another compressor from both an economic and available-space standpoint.
- Perhaps most importantly, the solvents produced by IndoChem are highly flammable, and some of them self-spark, so it is important from a safety standpoint that they are contained adequately.

"Our current transfer time is approximately three hours for transferring input and three hours for transferring output, plus 30 minutes for mixing and 30 minutes for preparation," said Erwin Juardi, General Manager of Operations for IndoChem. "Since we're planning on some improvements, we wanted to add more pumps, but we want to stay with the same air-compressor capacity. I'd love to see whether it's possible that I can save air even though I'm adding pumps and getting more pumping capacity."



*Installing the revolutionary PRO-FLO-SHIFT ADS on a Wilden Bolted Series AODD Pump for its solvent handling operations*

To facilitate the transfer of solvents, Juardi utilizes a total of 60 pumps between his three manufacturing facilities. He had been strictly relying on a single brand of AODD pump, but over time he had come to find the pumps unreliable and costly to operate.



*An on-site, head-to-head test at the IndoChem facility unequivocally that a Wilden SHIFT ADS shortened the loading time while cutting air consumption (competitor pump shown).*

"They have a high cost of replacement parts, and I have a hard time getting diaphragms; I'm fed up with these pumps," he said flatly. "The diaphragms don't hold up and it's hard to work on them. It takes two guys to simply change a diaphragm and I don't want manpower wasted on pump maintenance. We needed a simpler, more reliable, higher-performing alternative".

In the search for a better solution, Juardi turned to Winston Engineering Indonesia, Jakarta, Indonesia. Since 2005, Winston Engineering Jakarta, which is an operating company within Singapore-based Winston Engineering Company (PTE) Ltd., has been a pump distributor specializing in pump technology designed for use in general industrial-pumping applications, including the handling of solvents, glues and inks.

## Seeing is Believing

Juardi worked with Peter Koh, Regional Product Manager for Winston Engineering, who was quick to suggest the new Pro-Flo® SHIFT AODD Pump from Wilden®, Grand Terrace, CA, USA. Company founder Jim Wilden invented AODD pump technology in 1955. The Pro-Flo SHIFT is an AODD pump air distribution system (ADS) that can deliver as much as 60 percent savings in air consumption when compared to other brands (see Sidebar).

"Winston Engineering has a long relationship with Wilden and PSG, and we have been selling their products for more than 20 years," said Koh. "With the latest Pro-Flo SHIFT technology it is bringing Wilden to the next level. This pump really, really has an edge when it comes to energy savings".

But rather than simply have Juardi take his word for it, Koh arranged to have an on-site test and demonstration of the Pro-



Erwin Juardi, General Manager of Operations for IndoChem is convinced that he has been found the solution to his solvent handling needs with the Wilden PRO-FLO-SHIFT AODD Pump.

Flo SHIFT technology done at one of IndoChem's facilities. The test involved three separate trials in which both a Wilden Pro-Flo SHIFT pump—specifically, a 51-mm (2-inch) PS800 Bolted Series a competitive model would pump 200 liters (52.8 gallons) of water, with all pumping done at a pressure of 4 bar (58 psi). Measured would be the time it took to pump the water along with the amount of air that would be required to complete the pumping process.



The sheer volume of solvents that IndoChem handles annually made the need for more.

## Optimizing Air Consumption in AODD Pumps

Throughout its history, air-operated double-diaphragm (AODD) pump manufacturers have been working to find a reliable solution to the technology's one blind spot: the "overfilling" of the air chamber during the period from the end of each stroke to the completed shift of the valve without any corresponding displacement of fluid, which is nothing more than wasted air that is vented to the atmosphere. To combat this overfilling, Wilden® Pump & Engineering Co., Grand Terrace, CA, USA, has long been an innovator in air distribution and while its Turbo-Flo™, Pro-Flo™ and Pro-Flo SHIFT™ ADS models undeniably advanced the capabilities of the technology, the industry was still waiting for that ultimate "Eureka!" moment in ADS development.

That moment arrived in 2013 when Wilden completed the development of the Pro-Flo® SHIFT ADS. Described as a "true game-changer" and "significant



breakthrough in energy efficiency" in AODD-pump operation, the mechanically actuated Pro-Flo SHIFT ADS restricts air flow into the air chamber near the end of each pump stroke through the incorporation of an air control spool that automatically meters the air to prevent overfilling with no corresponding reduction in product yield.

This means that an AODD pump outfitted with the Pro-Flo SHIFT ADS—which is available on Wilden's Original™ (clamped) and Advanced™ (bolted) Series AODD Pumps—can achieve up to 60 percent savings in air consumption while costing 50 percent less to operate than pumps that feature an electronically actuated ADS. An additional benefit is that the Pro-Flo SHIFT is mechanically actuated, which is a critical consideration when the pump is handling hazardous or flammable liquids. Electronically actuated ADSs, on the other hand, cannot be used with flammable or explosive liquids since the electric charge can cause sparking which could ignite the liquid and result in a deadly explosion.

"Having this Pro-Flo SHIFT pump means I can save air and won't need to add compressors, which means less electricity use, and that I can also increase my productivity," said Edwin Juardi, General Manager of afford to buy any more air compressors".



Knowing that a Wilden® Pro-Flo® SHIFT AODD Pump will fill a 45,000-liter capacitated tank in 78 less minutes and while consuming 2,164 fewer standard cubic feet per minute of compressed air than a competitive model has put a collective smile on the faces of the IndoChem engineering team.

Pictured from left to right: Rob Cheng and Peter Koh of Winston Engineering.

Extrapolating the results for one of IndoChem's standard 45,000-liter tanks, the test results showed that the Wilden pump would be able to fill the larger tank in 78 minutes less than the competitive model, while needing 2,164.08 fewer standard cubic feet per minute (SCFM) to complete the transfer process.

Juardi was easily convinced. "I know that Wilden pumps are very reliable," said Juardi. "We've had one here for more than 20 years and we haven't found any problems with it. So, I'm thinking, let's change the old pumps to Wilden. What we're learning from the old Wilden pump is that it has been here forever, but with no problems. I was also looking for air savings because I cannot afford to buy any more air compressors".

In addition to the air-consumption improvements that the Pro-Flo SHIFT ADS can provide to the Advanced Series AODD Pumps, there are a number of operational benefits that IndoChem will be able to take advantage of.

The bolted configuration of the pumps ensures total product containment, a key consideration with the hazardous materials that IndoChem creates and handles. Additionally, the Advanced pumps have a redesigned friction-reducing liquid path that contributes greatly to their ability to deliver maximized flow rates. In fact, the PS800 (51 mm)

pump can achieve flow rates as high as 704 L/min (186 gpm), while the larger PS1500 (76 mm) model has flows to 1,045 L/min (276 gpm).

A variety of elastomer options, including PTFE, Wil-Flex® (Santoprene) and Neoprene, are available to meet abrasion, temperature and chemical-compatibility concerns. Wilden's newest diaphragm option is the innovative Chem-Fuse Integral Piston Diaphragm (IPD). The design of the Chem-Fuse locates the piston within the diaphragm material, which eliminates a notorious leak point and further helps to guarantee leak-free product containment. In addition to the air-consumption improvements that the Pro-Flo SHIFT ADS can provide to the Advanced Series AODD Pumps, there are a number of operational benefits that IndoChem will be able to take advantage of. The bolted configuration of the pumps ensures total product containment, a key consideration with the hazardous materials that IndoChem creates and handles. Additionally, the Advanced pumps have a redesigned friction-reducing liquid path that contributes greatly to their ability to deliver maximized flow rates. In fact, the PS800 (51 mm) pump can achieve flow rates as high as 704 L/min (186 gpm), while the larger PS1500 (76 mm) model has flows to 1,045 L/min (276 gpm).

A variety of elastomer options, including PTFE, Wil-Flex® (Santoprene) and Neoprene, are available to meet abrasion, temperature and chemical-compatibility concerns. Wilden's newest diaphragm option is the innovative Chem-Fuse Integral Piston Diaphragm (IPD). The design of the Chem-Fuse locates the piston within the diaphragm material, which eliminates a notorious leak point and further helps to guarantee leak-free product containment.

### Conclusion

Too often, the easy suggestion when a manufacturing facility has reached the limits of its operational capacity is this one: Find a bigger facility. In the case of IndoChem, though, that was not a feasible solution. So, that meant the solvent manufacturer needed to find a way to optimize its productivity in terms of time, air consumption and energy usage while operating from the same footprint.

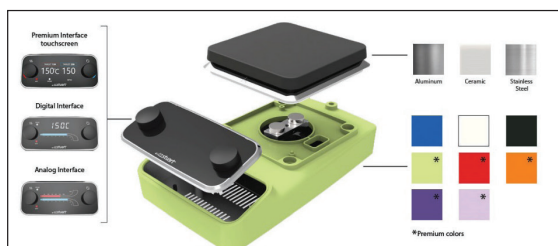
IndoChem found the answer in the new Bolted Series Pro-Flo SHIFT AODD Pump from Wilden, which will enable it to simultaneously improve both its fluid-transfer times and energy savings while working out of the same facility with the same air compressor.

"The unique features of Wilden pumps are very easy for maintenance, portable and with a very unique high-efficiency ADS, which is the heart of the pump," said Koh. "Every part is replaceable, even for pumps that have been in the factory for more than 10 years. That's part of why customers stay with the Wilden brand. Wilden is the unique market leader in diaphragm pumps." ■

### For More Details

**Dover India Pvt. Ltd. - PSG**  
[sales.psgindia@psgdover.com](mailto:sales.psgindia@psgdover.com)  
[service.psgindia@psgdover.com](mailto:service.psgindia@psgdover.com)  
[www.psgdover.com](http://www.psgdover.com)  
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## Customizable Hotplate Stirrers



For the very first-time, and with the use of an online configurator, customers can customize their own colorful, sleek and technology rich Stuart Hotplate Stirrer. Cole-Parmer, a leading manufacturer and supplier of laboratory and industrial products, instrumentation, and supplies offers their newest Stuart customizable hotplate stirrers. Individuals can select from a variety of parameters including model type, interface, surface and colour. Each unit can be designed to unique specifications, built for its specific application and is personal to the owner.

The range comprises three versions: hotplate, stirrer or hotplate stirrer, and three interfaces to choose from analog, digital and premium, with the latter boasting enhanced versatility. The former two are available in white, black and blue, while the premium is supplied in an additional five colours: pink, avocado, tangerine, red and ultraviolet.

All three versions offer minimal storage and footprint, accommodation for a retort stand to receive an external temperature probe, while an independent hot light LED clearly shows when instrument temperature is over 50 °C, making it safe even when the unit is unplugged. These latest additions mean researchers have even greater control over their experiments and processes, while making their lab safer.

Each unit is robust and has a host of user-friendly features that will keep individuals safe including chemically toughened glass interface, glass ceramic or ceramic-coated aluminium hotplate, and an independent hot-warning light. They also have temperature sensor compatibility, programming with built-in timer (Premium version only) and 50 to 2000 rpm.

For details contact:

Cole-Parmer India  
403, A-Wing, Delphi  
Hiranandani Business Park, Powai  
Mumbai 400 076  
Tel: 022-61394444, 61394410  
Fax: 91-022-61394422  
E-mail: response@coleparmer.in

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## Horizontal Paddle Vacuum Dryer



To offer the highest levels of productivity, while minimizing energy consumption, Italvacuum - international manufacturer of vacuum pumps and vacuum dryers – has realized Planex System.

Planex System is a patented horizontal paddle vacuum dryer with eccentric agitator featuring two independent movements, allowing it to simultaneously revolve around its own axis and to rotate tangentially to the drying chamber. Planex System is ideal for the production of APIs, fine chemicals and intermediates. The combined rotations of the agitator and its small size ensures perfect mixing and allows consuming at least three times less energy than conventional paddle dryers. This means a three-fold reduction in mechanical and thermal stresses on the dried batch. As a result, even the most delicate products are treated with maximum care. But there is more. Planex System control software allows to

automatically command agitator movements with Stop & Swing Program. In this way, the agitator swings back and forth, thus remaining all the time immersed in the product, and guaranteeing its continuous mixing. This approach is particularly effective when processing small batches.

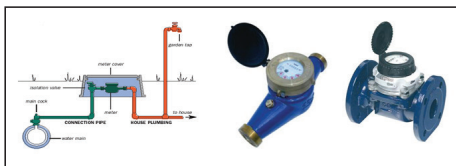
Planex System, thanks to its agitator's ZeroFriction planetary movement, also prevents the product from being rubbed against the chamber walls and thus heating up due to friction, a typical problem in conventional systems. In addition, the rotation of the paddles tangentially to the chamber walls conveys the product into the small clearance between the agitator and the chamber surface, preventing lumps formation and guaranteeing an even more effective drying and a controlled final particle size distribution.

For details contact:

Italvacuum Srl  
Via Stroppiana 3  
Borgaro T.se, Italy  
Tel: +39 011 4704651  
Fax: +39 011 4701010  
E-mail: marketing@italvacuum.com

or Circle Readers' Service Card 02

### Water Meter

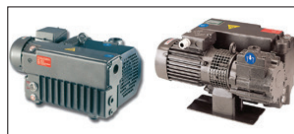


Toshniwal provides a comprehensive residential meter portfolio to meet the world's water utility requirements. Toshniwal Series continues to be in the water industry standards. Their quiet, rugged and reliable apartment and domestic water meters achieve ultra low flow measurement and meets or exceeds all standards. It is a perfect measuring technic for cold and warm water, simple and easy to install even on existing pipelines, and calculates your water consumption. It is a perfect solution for property owners and peace of mind for water management. The ISO Standard assures you that Toshniwal has achieved the highest possible standards for both manufacturing and customer service quality.

For details contact:  
 Toshniwal Hyvac Pvt Ltd  
 267 Kilpauk Garden Road  
 Chennai 600 010  
 Tel: 044-26445626, 26448983  
 E-mail: sales@toshniwal.net

or Circle Readers' Service Card 03

### Oil-lubricated Vacuum Pumps

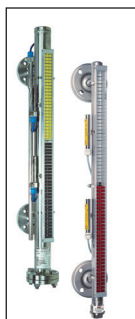


Toshniwal supplies oil lubricated vacuum pumps. This oil lubricated vacuum pumps of the TMS Series are single stage, oil-lubricated rotary vane vacuum pumps with oil re-circulation system. The lubricant system is rated for continuous operation of high intake pressures so that the pump may be used in a versatile manner in most rough vacuum applications. The pumps are used for suction of air also in presence of water vapour and for continuous industrial use. TMS Series pumps are made from high quality materials, has economical features which matches together to achieve: high pumping speed over the range of absolute pressure 1,000-0.5-mbar; high water vapour tolerance and low noise level; no pollution; air-cooled: built-in anti-suckback system. The pumping capacities available are: 17-m<sup>3</sup>/hr, 35-m<sup>3</sup>/hr, 65-m<sup>3</sup>/hr, 100-m<sup>3</sup>/hr and 150-m<sup>3</sup>/hr.

For details contact:  
 Toshniwal Instruments (Madras) Pvt Ltd  
 267 Kilpauk Garden Road  
 Chennai 600 010  
 Tel: 044-26448983, 26448558  
 E-mail: sales@toshniwal.net

or Circle Readers' Service Card 04

### Level Indicators



Visual level indicators combine up to three functions in one instrument: level indicator, level switch and level transmitter. The display that can be read even over large distances works without energy and automatically as a result of the physical law of liquids in communicating vessels. The WEKA visual level indicators are characterized by their compact design and the wide range of applications.

Operating pressures can range from a vacuum up to 500 bar as well as calculation pressures for the float standpipe up to the nominal pressure PN 630. Liquid densities >0.27 g/cm<sup>3</sup> as well as a temperature range from 77 K to 673 K (-196°C to 400°C) allow use in applications for cryogenic liquid gases as well as in water hydraulics and steam boilers. Hermetically sealed floats for condensing media are available up to a max. operating pressure of 320 bar.

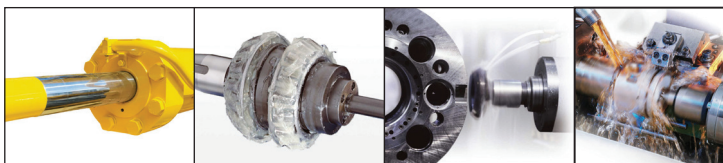
Flexibility through choice of suitable materials - standard materials: 316/316L 1.4435/1.4404, group A4 stainless austenitic steel. Other possible stainless austenitic steels: 304/304L 1.4301/1.4306, 1.4571, 321, 1.4541.

The WEKA visual level indicator is ideal for the commissioning of systems. The display works without energy and automatically as a result of the physical law of liquids in communicating vessels. Independent of a controller - and thus also independent in the event of a power supply failure - visual level indication on site is ensured. The wide, red- and silver-colored flag indicator system is easily and clearly readable, even from over large distances. The fully transparent flag indicator system made of polycarbonate (PC) also ensures readability from the side. The liquids, which are not always unproblematic and sometimes also hazardous, are safely enclosed in the dense and pressure-tight float standpipe and separated from the indicator. As described, WEKA visual level indicators offer the ideal solution for almost all operating conditions. For most applications, you will find a suitable device from our standard program. Again and again, however, customized solutions are also required for special operating conditions. Many designs can, for example, also be used in hazardous areas according to ATEX or IECEx. (ATEX is a widely used synonym for the ATEX guidelines of the European Union) The designation ATEX is derived from the French abbreviation for atmosphere explosibles. Toshniwal instruments can thus also be used in potentially explosive atmospheres. It finds application in explosion-proof plants, mechanical and plant engineering, water management, ship-building, energy, space, research, etc.

For details contact:  
 Toshniwal Hyvac Pvt Ltd  
 267 Kilpauk Garden Road  
 Chennai 600 010  
 Tel: 044-26445626, 26448983  
 E-mail: sales@toshniwal.net

or Circle Readers' Service Card 05

## Lubricants



Lubricants are indispensable in industry. Greases and oils perform critical functions, ensuring that engines and machines run perfectly smooth. They extend the service life of machines, protect them from corrosion, cool them by dissipating process heat, act as a seal and prevent the formation of deposits. Depending on the application,

lubricants must possess a specific performance profile. For instance, hydraulic oils are subject to different specifications than heat treatment fluids. Lubricant manufacturers use specific additives to obtain these properties in their lubricants. These active ingredients are added to lubricants in order to achieve new, desirable properties and/or to eliminate unwanted ones.

LANXESS's Additives business unit are lubricant additives and synthetic lubricants for industrial applications such as in metal-working, power generation and aerospace. From synthetic lubricant base fluids to individual additives and additive packages, their high-performance products lubricate engines, machines and transport vehicles of all kinds. Additive packages are combinations of additives carefully selected to perform several tasks. They meet special customer and OEM requirements and comply with today's strict industrial standards. Additive packages facilitate the production of high-quality lubricants, reduce development time and development cost at their customers and simplify inventory management. Whether to protect engines or drive-trains from wear or to extend the service life of machines, LANXESS develops products for specific purposes so that they meet the most stringent specifications and performance standards. Lubricant Additives offers an extensive product line under the brand names Additin, Lobase, Calcinate, Hybase, Naugalube and Durad. The brand names Hatcol and Synton stand for synthetic, high-performance base fluids. Reolube hydraulic fluids are used in special applications which not only require good lubrication, but also impose max demands for fire resistance.

For details contact:

LANXESS India Pvt Lrd

LANXESS House

Plot No: A-162, A-163, A-164, Road No: 27, Wagle Estate

Opp: ITI College, MIDC, Thane (W)

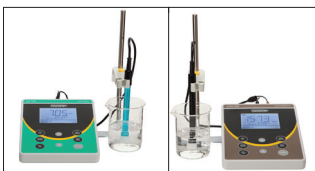
Maharashtra 400 604

Tel: 022-25871000

Telefax: 91-022-25826742

or Circle Readers' Service Card 06

## pH Meter & Conductivity Meter



Cole-Parmer offers the new additions in the Oakton family of water testing and analysis products. The new additions in the Oakton family are compactly designed and economical meters for benchtop pH and conductivity measurement. These small meters provide precise measurement of pH and conductivity, offering high-quality at a low price, without compromise. The meters have IP54-rated housing which is dust- and spill-proof, whilst connectors are protected by silicone seal caps. Both meters have the capacity to automatically recognize NIST and USA calibration solutions and can store and recall up to 50 groups of data. What's more, these meters have a warranty of up to 3 years. The PH 550 benchtop pH meter features a microprocessor chip which provides automatic temperature compensation, data storage, parameter setup, and Max/Min reading display. The meter offers a pH range from 0 to 14 and a three-point automatic calibration. The advanced digital processing technology improves meter response time and measuring accuracy. A stable reading display icon appears when the measuring value is stable. The 3-in-1 combination pH electrode measures pH and temperature simultaneously. The compact meter includes a detachable electrode holder and three bottles of pH buffer solution.

The CON 550 benchtop conductivity meter features a microprocessor chip which provides automatic calibration, automatic temperature compensation, data storage, parameter setup, and Max/Min reading display. The meter reads 0 to 200 mS/cm across four ranges and the four-point conductivity calibration. The advanced digital processing technology improves meter response time and measuring accuracy. A stable reading display icon appears when the measuring value is stable. A conductivity electrode with temperature sensor measures conductivity and temperature simultaneously and allows for automatic temperature compensation. The compact meter includes a detachable electrode holder and three bottles of conductivity calibration solution.

For details contact:

Cole-Parmer India

403, A-Wing, Delphi , Hiranandani Business Park,

Powai, Mumbai 400 076

Tel: 022-61394444, 61394410 , Fax: 91-022-61394422

E-mail: response@coleparmer.in

or Circle Readers' Service Card 07

### Variable Speed Drives



Full control with precision Emotron VFX 2.0 variable speed drives optimises your process and prevents damage and downtime. The combination of direct torque control, accurate speed controls and efficient vector braking makes it the ideal

solution for all dynamic applications such as cranes, crushers, mills, mixers and centrifuges. Direct torque control reacts extremely quickly and eliminates disturbance due to abrupt load changes. Integrated vector braking ensures quick and controlled stops, increasing productivity and safety. Detachable control panel with own memory means it is easy to transfer or copy setting. Robust certified IP54 metal construction as option (up to 132-kW) offers cost-efficient installation close to the application.

For details contact:  
 CG Power and Indl Solutions Ltd  
 Drives and Automation  
 Plot No: 9, MPAKVN, Phase 2  
 New Indl Area, Mandideep  
 Madhya Pradesh 462 046  
 E-mail: drives.mktg@cgglobal.com com

or Circle Readers' Service Card 08

### Float Level Transmitter



Stem carrying series of reed switches and resistors forms a potentiometer circuit, which extends to the full indicating length of the transmitter. As the float travels through the indicating distance, the magnet located within it tap off the reed switches thereby varying the resistance fed to the electronics, which in turn converts the change in resistance to industry standard analogue output.

It finds application in diesel tank, solvent tank, hydraulic tank, water tank (RO, DM, soft, raw), acidic and alkaline tank, STP tank, etc.

For details contact:  
 Filpro Sensors Pvt Ltd  
 No: 130, 10<sup>th</sup> Cross  
 Pete Chennappa Indl Estate  
 Kamakshipalya  
 Magadi Main Road  
 Bengaluru, Karnataka 560 079  
 Tel: 080-23286463  
 E-mail: sales@filprosensors.com

or Circle Readers' Service Card 09

### Mass Spectrometer



AMETEK Process Instruments has broadened its line of process mass spectrometers to include the StreamPro, a field-proven system for critical process analysis and control applications. Because mass spectrometry is a very rapid analytical method that allows for the analysis of multiple components in seconds, the StreamPro quickly provides the user with actionable data.

Applications for the StreamPro include monitoring for any number of analytes (C1-C8, H<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CO, O<sub>2</sub>, VOCs, and other components m/z 1-200 amu) in a broad range of markets: pharma, hydrocarbon processing, research and design, and process development.

Real-time process monitoring of multiple components is straightforward with the StreamPro's Process 2000 software. Complex overlapping spectra are handled automatically, with data output provided directly in concentration units. Different calibration and analysis methods can be assigned to each sample port. The software also provides an easy setup and operation, with advanced alarm and automation capabilities.

Autocalibration maintains the performance and accuracy of the system for quantitative analysis. The on-board computer activates the auto-start to prevent data loss or process interruption during a power failure. The analyzer has a streamlined, economical footprint, simplifying the installation.

With the StreamPro, there is no need for expensive service contracts that are typical with most process mass spectrometers. The system's self-diagnostics and modular design ensure ease of maintenance by on-site personnel for servicing or replacing key components, with remote support available for additional factory diagnosis and troubleshooting.

For details contact:  
 AMETEK Process Instruments  
 150 Freeport Road  
 Pittsburgh, PA 15238, U.S.A.  
 Tel: 412-828-9040  
 Fax: 412-826-0399  
 E-mail: sales.ametekpi@ametek.com

or Circle Readers' Service Card 10

## Dry HCl Gas Generation Plant



Commercial Hydrochloric acid in the market is available as 30 per cent aqueous solution and is widely used in industry in large quantities. However, for certain application, such as hydrogenation reaction and in bulk drug/pharma industries, HCl is required in gaseous and anhydrous form.

Different processes for HCl gas generation from commercial grade HCl acid are offered based on customer requirement. These processes are as follows: concentrated sulphuric acid route, distillation or boiling route, and calcium chloride route.

HCl gas generation plants are normally available from 5 to 250 kg/hr capacity. Large capacity plants can also be provided on request.

Ablaze has a long and successful record of design and supply of several engineered systems for HCl gas generation. Being manufacturer and PTFE-lined components, Ablaze is well qualified to handle such systems, as these are the major material of construction (MoC) used in such systems, Ablaze also has in-house capabilities for instrumentation and automation, which is necessary for reliable and safe operation.

It finds application in chemicals, petrochemical, electronics and textile, steel and metal, pharma and biotechnology industries.

For details contact:

Ablaze Glass Works Pvt Ltd

E-52 Sardar Estate, Ajwa Road

Vadodara, Gujarat 390 019

E-mail: srshah@ablazeglassworks.com

or Circle Readers' Service Card 11

## Smart Probes



Vaisala offers six new smart probes for its Indigo product family, optimized for demanding industrial applications. New options for dew point and moisture in oil measurements bring more possibilities for industries to save energy, optimize processes, and improve product quality.

The new probes will improve customers' process efficiencies by providing accurate and reliable measurement data for their industrial processes. The capabilities of the new probes are based on next-generation sensor technologies.

The new Vaisala DRYCAP Dew Point and Temperature Probes DMP5, DMP6, DMP7, and DMP8 are optimized for low humidity and high temperature or pressurized environments. Dew point measurements are particularly important in various industrial drying applications, eg, in ovens and compressed air systems. The dew point probes include Vaisala's DRYCAP sensor, which is immune to particulate contamination, water condensation, oil vapour, and most chemicals. Its fast reaction time gives it unmatched performance even in dynamic and low dew point applications, and the sensor's outstanding stability enables a long two-year calibration interval.

The Vaisala HUMICAP Moisture in Oil Probe MMP8 extends the Indigo product offering to include heavy industry applications such as measuring moisture in transformer or lubrication oils to protect engines from wear and shutdown. Also, Vaisala HUMICAP Humidity and Temperature Probe HMP3 is a general-purpose remote probe suitable for duct mounting in non-pressurized applications with moderate temperatures. The probe structure allows the sensor to be replaced in the field without tools, providing maintenance flexibility in demanding applications that might require periodic sensor replacement, such as paint booths. The HMP3 and MMP8 both include Vaisala HUMICAP thin-film capacitive humidity measurement technology, which has become the industry standard in humidity measurement.

All six new smart probes complement Vaisala's existing Indigo product family. The digital Modbus RTU connection enables both easy integration into other systems and standalone usage. The probes are also plug-and-play compatible with Indigo 200 transmitters, which offer various additional benefits such as a display for data visualization, easy access to probe configuration, and more options for connectivity, supply voltage, and wiring. For on-site configuration, diagnostics, and self-calibration, the Indigo probes can be connected to the Vaisala Insight PC software.

For details contact:

Vaisala Oyj

Vanha Nurmijärventie 21

FI-01670 Vantaa, Finland

Tel. +358 50 555 4420

E-mail: comms@vaisala.com

or Circle Readers' Service Card 12

### Submersible Dewatering Pumps



MBH dewatering pumpsets are portable pump units with pump below and motor above construction. The motor is submersible squirrel cage, induction type and dry type with Class F insulation and IP-68 enclosure fitted with ball-bearings and mechanical seals. It is rated for 415 +/-10 per cent c/s AC supply.

The pump motor unit of close-coupled and jacketed construction design provide effective water cooling of the motor by

liquid flowing around the motor casing up into the discharge main.

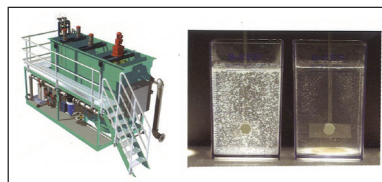
It can pump out liquid from the lowest level; submersible installation, hence no need of foundation or pump house; cuts civil cost by nearly 50 per cent; can be installed in collection well; and being portable, it can be shifted/handled easily.

For details contact:

MBH Pumps (Gujarat) Pvt Ltd  
 Plot No: 14, GIDC, Naroda Indl Estate  
 Ahmedabad, Gujarat 382 330  
 Tel: 079-22823066, 22821018  
 E-mail: marketing@mbhpumps.com

or Circle Readers' Service Card 13

### Ballasted Flocculation



The WesTech RapiSand ballasted flocculation system is a high rate clarification process using rapid mixing

and multi-stage flocculation, followed by sedimentation. RapiSand sedimentation is extremely fast and can be applied in a wide variety of suspended solids removal applications. RapiSand's typical uses include expanding plant capacity, minimising plant footprint, providing fast start-up capabilities and providing great performance characteristics. RapiSand can be the answer to your suspended solids process needs.

It finds application in NTU/TSS removal, tertiary phosphorous removal, TOC removal, colour removal, CSO treatment and algae removal.

For details contact:

WesTech Process Equipment India P Ltd  
 E 155 Classic Apartment  
 Plot No: 11, Sector 22, Dwarka  
 New Delhi 110 075  
 Tel: 011-45621097  
 E-mail: info@westech-inc.in

or Circle Readers' Service Card 14

### Explosion-proof Sensors



Often operators come to their limits when they are looking for an inline analyzing system that measures highly precise under harsh process conditions. SensoTech is a specialist for those measuring tasks and supports many applications that cannot be measured with standard solutions. Every branch has its own demands and SensoTech GmbH offers a variety of solutions for special applications. Especially in the chemical

and pharma industry is a high demand of small and robust inline analyzing devices. To solve these applications also in hazardous areas the LiquiSonic explosion-proof sensors are now available in a smaller dia. A perfect fitting solution for every application even under difficult installation conditions: free choice of the length of the sensor, of the material and of process connection. The sensors are certified as FM, ATEX, IECEx and NEPSI. Under harsh process conditions it is hard to find a robust inline measurement system. In the fields of phase separation, concentration measurement and reaction monitoring the sonic velocity measuring devices from SensoTech GmbH are setting standards for decades. The maintenance-free LiquiSonic measuring devices record the absolute sonic velocity, a traceable and proven physical quantity, as well as the temperature and determine the temperature-compensated concentration of fluids with high precision. A special electronic housing made of stainless steel was developed for harsh process conditions, as in off-shore applications with a constantly high-concentrated salty atmosphere. Commonly used housings made of aluminium are normally not allowed here. Furthermore, the housings of the LiquiSonic sensors can be manufactured with a separated electronic. This housing is tailored for customers with difficult installation conditions especially in chemistry, off-shore, mining and semi-conductor industries.

For details contact:

SensoTech GmbH  
 Steinfeldstr 1  
 39179 Magdeburg-Barleben, Germany  
 Tel: +49-39203 514100  
 Fax: +49-39203 514109  
 E-mail: info@sensotech.com

or Circle Readers' Service Card 15

## Wireless Communication for Level Measurement



AMETEK Drexelbrook offers an extensive line of wireless communication products for level measurement, level switches, floating roof tanks and other field instruments providing encrypted data transfer for distances of up to 32 km line of sight.

For this, Drexelbrook has teamed up with Phoenix Contact. By doing so Drexelbrook is now able to provide ideal wireless level measurement communication for industries such as oil and gas, chemical, and general industrial process plants. This new product line is

the ideal communication option, especially for large plants where signal wiring can be prohibitively expensive.

The advantage of acquiring both wireless communication products and level measurement instruments from Drexelbrook is that Drexelbrook ensures that the data transfer works as intended and that the communication hardware will be covered by a comprehensive Drexelbrook warranty.

The new Series of 900 MHz communication transceivers, I/O modules and antennas are available for indoor (DIN rail) as well as outdoor (NEMA4) mounting. Various I/O modules enable the engineer to set up the necessary support of analog and digital communication, secured by 128-bit encryption, and adjustable bit rates up to 500 kbps and signal gain up to 12 dBi.

For details contact:

AMETEK Drexelbrook

205 Keith Valley Rd

Horsham, PA 19044, U.S.A.

Tel: +1 215-674-1234, +1 215-293-4185

Fax: 215-674-2731

E-mail: [drexelbrook.info@ametek.com](mailto:drexelbrook.info@ametek.com) / [bob.irving@ametek.com](mailto:bob.irving@ametek.com)

or Circle Readers' Service Card 16

## Intelligent Submersible Pumps



Grundfos offers excellent and robust dewatering solutions with its pumps and systems. DPK and DWK are submersible dewatering, draining pumps by design. These pumps can handle a particle size up to 15-mm and can be installed in the basements to manage the situation. They are an ideal solution as reliability and modularity are key elements required in critical situations. These pumps are highly useful in flood prone areas, construction sites and can also help to manage the critical situation.

These drainage or dewatering pumps are equipped with a semi-open or enclosed impeller with a robust cast iron construction to improve their durability. They are intended for submersible use in underground collection tanks in and around buildings for cost effective run-off management. They also have flexible installation options as they can be free-standing on a ring stand or be permanently installed on an auto-coupling system. The DPK.V range of pumps is designed with a state-of-the-art super vortex impeller to transfer sewage to make run-off management efficient. DPK.V pumps have a particle handling capability of 65-mm (or) 80-mm, hence they can be put into operation where there are coarse particles floating in the water. With the super vortex impeller, the design minimizes clogging. This makes DPK.V ideal to transport wastewater.

The DWK pump range is primarily used for dewatering in construction sites. Their corrosion resistant components protect them from the harsh environments of a construction site. The primary differentiator between a DPK and DWK pump is in their discharge arrangement style. The discharge is placed on top and does not require any additional support to be placed. This will allow pumps to be put through the smallest manholes to displace water.

It finds application at construction sites, run-off management, excavations, tunnels and drainage pits. The durability, modularity and efficiency of these pumps make them the perfect dewatering and drainage solution at commercial establishments and construction sites.

For details contact:

Grundfos Pumps India Pvt Ltd

118 Rajiv Gandhi Salai

Thoraiakkam

Chennai 600 097

Tel: 044-45966800

Fax: 91-044-45966969

E-mail: [oneoffice.india@sales.grundfos.com](mailto:oneoffice.india@sales.grundfos.com)

or Circle Readers' Service Card 17

### PVC Fabric Hangar Door



The fabric hangar doors leaf is made of two layers of very strong vinyl-coated polyester fabric, separated by metal intermediate sections. Fabric hangar door manufacturers make side guide rail and bottom sections from reinforced steel materials. These can also be made from aluminium for easy spare part replacement. Fabric hangar doors have very strong sealing on the two sides with a specially-designed guide and fabric position

All gearbox and motor system are specially chosen for maximum efficiency. In addition, their specially designed side drum and folding systems provide extra safety and speed.

For details contact:  
 Avians Innovations Technology Pvt Ltd  
 Gat No: 60/61  
 Dehu-Moshi Road  
 Chikhali, Pune  
 Maharashtra 412 114  
 Tel: 020-71400600  
 Fax: 91-020-71400654

or Circle Readers' Service Card 18

### Control Systems



Ross control and data acquisition systems offer unprecedented accuracy and flexibility in the mixing and blending process. Their systems monitor an array of process parameters while they control essential mixing parameters as mixing time, speed, temperature and vacuum/pressure. Windows-based software allows manual or automatic operation, with simple cycle programming. Ross offers a variety of choices in control designs from simple relay-operated units to pre-fabricated pulpit-style PLC control rooms with graphical user interfaces. Ross Systems & Controls is a member of the NFPA. The company can also provide UL-listed systems for both hazardous and non-hazardous locations.

For details contact:  
 Ross Process Equipment Pvt Ltd  
 Plot No: D-233/3, Chakan Indl Area  
 Phase II, Village: Bhamboli  
 Tal: Khed, Dist: Pune  
 Maharashtra 410 501  
 Tel: 02135-628400, 628401, 628402, 628403  
 E-mail: mail@rossmixers

or Circle Readers' Service Card 19

### Electronic Pressure Monitoring



SUCO offers wide range of electronic pressure switches, which are available as normally open (NO) or normally closed (NC) versions. An electronic pressure switch converts the medium pressure, which is present at the measuring cell into a digital, electrical switch signal (On/Off). An electronic pressure switch is more complex than a mechanical pressure switch, and thus generally more expensive. As an electronic pressure switch has no moving parts (relative to each other), it usually has a much prolonged service life and provides a higher level of precision (depending on application). The hysteresis can be set over a wide range and virtually independently of the switching point. Electronic pressure switches can also be equipped with additional functions, such as optical displays and menu control.

Electronic pressure switches from SUCO do comply with all important industrial EMC Standards. The basis for the standards is the stricter thresholds for transient emissions in residential environments (EN 61000-6-3) and immunity for industrial environments (EN 61000-6-2).

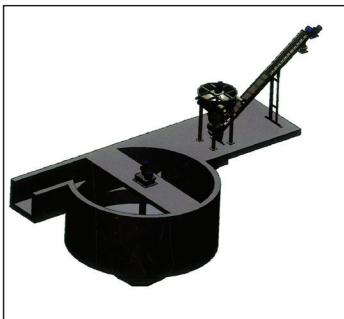
SUCO uses different sensor types to offer a perfect fit to your application.

The different sensor technologies are ceramic thick film/measuring cell and oil filled sensors. Though, the jewel of their sensor technologies is the Silicone on Sapphire Technology (SoS-Technology) used in the premium 053x-range which offers excellent temperature and long term stability in combination of a high overpressure safety of 4 time. Thus, this range is an excellent choice for rough conditions in mobile hydraulics.

For details contact:  
 Bedaflow Systems Pvt Ltd  
 W-7, Sector-11  
 Noida, Uttar Pradesh 201 301  
 Tel: 0120-43299 - 90  
 Fax: 91-0120-43299 - 20  
 E-mail: info@bedaflow.com

or Circle Readers' Service Card 20

## Grit Removal System



Grit consists of sand, gravel, cinders or other heavy materials that have specific gravities or settling velocities considerably greater than those of organic particles. In addition to these materials, grit includes eggshells, bone chips, seeds, coffee grounds and large organic particles.

Vortex grit basins have been used since the early Twentieth Century for grit removal from wastewater. Some of the advantages include low power requirements and odour potential especially compared to aerated grit chambers, low head loss and compactness. As a result, vortex grit basins are often favoured, especially for large installations.

The spiral of the screw transporter with the angle of 35° is made of wear-resisting carbon steel; other parts are made of SS-304 or SS-316 on customers demand. The grit chamber is a cone-shaped tank with inclined transporter for removal of the precipitated grit.

The grit chamber operates on the vortex principle. The stirrer maintains rotational velocity allowing grit to settle while holding organics in suspension. Sloped transition between upper chamber section(s) and grit well promotes grit settling to well. Grit transferred from grit well to tangential grit conveyor via pump where the grit is washed intermittently. Grit is agitated by the mixing device to improve grit washing process. The grit is discharged into the storage container or on to the transporter.

Ideal for wastewater treatment plants with lesser footprints.

For details contact:

Eurotek Environmental Pvt Ltd  
 GKC Projects Bldg, Survey No: 9  
 Hitech City, Land Mark: CIL Green Bldg Lane  
 Kondapur, Kothaguda  
 Hyderabad, Telangana 500 084  
 Tel: 040-48577301  
 E-mail: info@eurotekindia.com

or Circle Readers' Service Card 21

## Analyzers



AMETEK Process Instruments has broadened its line of Thermox WDG-V Series flue gas analyzers to include the WDG-V UOP/RP for oxygen measurement in continuous catalyst regeneration (CCR) platforming/catalytic reforming processes. Building on the legacy of performance and high reliability of its predecessor, the WDG-IV UOP/RP, this analyzer uses industry-proven zirconium oxide technology, incorporating the latest WDG-V electronics and an improved enclosure for servicing.

By leveraging the WDG-V electronics platform, the analyzer offers advanced diagnostics, predictive maintenance algorithms, proactive alarms and digital communications. Designed for SIL-2 safety systems, the upgraded electronics provide an additional layer of safety to ensure reliable operation. The electronics also connect to the AMEVision HMI Host Display for an easy-to-navigate graphical user interface and additional digital communications. In addition, the WDG-V UOP/RP is designed with an

enhanced enclosure for improved ingress protection and easier servicing. The refined design uses floating hinges on the doors to give end-users more accessibility for servicing and increased sealing for ingress protection.

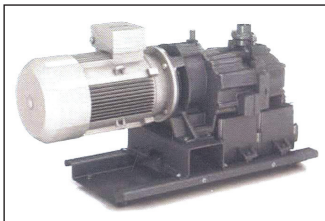
Building on the field-proven design of its predecessor, the analyzer brings upgraded electronics and enhanced ingress protection for robustness, reliability and serviceability in the challenging CCR platforming/reforming process. This latest version is now available for European and International projects with ATEX and IECEx Zone 2 area classification requirements with CE marking and RoHS compliance.

For details contact:

AMETEK Process Instruments  
 150 Freeport Road, Pittsburgh  
 PA 15238, U.S.A.  
 Tel: 412-828-9040  
 Fax: 412-826-0399

or Circle Readers' Service Card 22

### EDC Dry Claw Vacuum Pumps



With pumps up to 360 m<sup>3</sup>/hr and the ability to be driven by a proven variable speed drive (VSD) technology the EDC claw pumps afford you complete flexibility, efficiency and control over your process. These machines designed with robustness, durability and superior materials of construction and technological advanced to give you a trouble-free solution to your specific application.

It is based on proven compressor and screw vacuum pump design for long trouble-free life even in the harshest applications. It is ideally suited for replacement market, compressor house installations and OEM machinery.

Allows you to optimise the energy you use to maintain your process duty point. The lowest possible flow will be delivered to match your required duty point or speed – nothing is wasted.

For details contact:  
 Edwards India Pvt Ltd  
 T 97/2, Bhosari MIDC  
 Opp: Saint Gobain  
 Pune, Maharashtra 411 -26  
 Tel: 020-40752222

or Circle Readers' Service Card 23

### Mechanical Vapour Recompessors



Everest mechanical vapour recompessors are the latest and first of its kind recompression blowers in India. These specially designed blowers are meant to handle steam vapours across itself which can further be reused to recover the latent heat of vaporisation, in-turn providing

heavy savings in energy. Being positive displacement type of compressors, the different temperature and pressure that can be achieved across Everest MVRs is high, resulting in improved process results.

Due to the increasing cost of steam (boilers) and allied problems related to the same, there has been a growing demand of mechanical vapour recompessors. These act as a very energy efficient and pollution-free alternatives. MVRs can typically even be termed as energy recovery equipment. Available in flow rates 200 to 6,000 kg/hr of water vapour.

For details contact:  
 Everest Blowers Pvt Ltd  
 B-44, Mayapuri Indl Area, Phase 1  
 New Delhi 110 064  
 Tel: 011-45457777  
 E-mail: enquiry@everestblowers.com

or Circle Readers' Service Card 24

### Multi-functional Leak Detector



The SeCorrPhon AC 200 is a multi-functional leak detector offering three functions in one: prelocation, pinpoint and correlation. The clever combination of these processes in one system allows you to confidently locate the leak regardless of the ambient conditions. With just a few finger strokes, you can quickly and easily switch between the various applications.

The water escaping from the leak causes the material in the pipeline to vibrate. These vibrations travel along the pipe and can be picked up as structure-borne noise, even at distant contact points, eg, fittings. The vibrations also travel through the ground up to the earth's surface as ground borne noise, albeit heavily muted. The SeCorrPhon system is your perfect assistant for detecting leaks because it makes the vibrations audible to the human ear and also records and displays the volume and frequency spectrum as a graph.

Place carrying rod TS 200 and the connected touch microphone TM 200 on fittings along the pipeline and evaluate the volume. By evaluating the noise intensity, you will be able to identify the section of pipeline where the leak is likely to be.

It evaluates the volumes in the identified section of pipe using ground microphone BM 200 (for paved surfaces) or BM 230 (for unpaved surfaces). Connect carrying rod TS 200 to a ground microphone and move over the pipeline in short intervals. The acoustic signal and the visual display of the intensity make it easy to find the maximum. The leak is then located with sufficient accuracy to allow confident excavation.

For details contact:  
 Hermann Sewerin GmbH  
 Robert-Bosch-StraBe 3  
 D-33334 Gutersloh, Germany  
 Tel: +49 5241 934-0  
 Fax: +40 5241 934-444  
 E-mail: info@sewerin.com

or Circle Readers' Service Card 25

## Ozone in Bottled Water



In bottled water treatment process, ozone plays a major role as a powerful disinfectant. It is hard to imagine a water bottling plant without ozonation process. Ozone improves the quality, consistency, aesthetics and shelf-life period of water. Ozone disinfects not only bottled water, also disinfects bottles, caps and bottling equipment.

Ozone enables environmentally-friendly clean treatment process. Ozone is a natural product formed by treating the oxygen in the air. It provides final treated drinking water which is safer, cleaner, colourless, non-standing, odourless, palatable and oxygenated. Ozone is very effective against essentially all taste and odour causing organic materials and oxidisable inorganic such as iron, manganese and sulphide ions. Ozone does not produce any undesirable secondary effects (generation of disinfectant by-products) like other oxidants. Ozone is effect over a wide pH range and inactivates

micro-organisms such as bacteria, fungi, viruses, protozoa, bacterial and fungal spores in water.

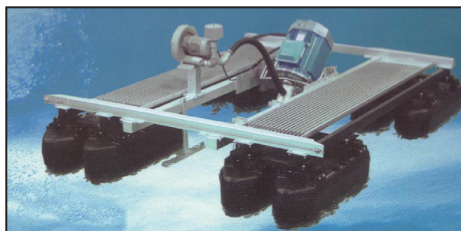
Ozone enables rapid treatment and control of colour which affects the quality and safety of water. Residual ozone sterilises bottles in which the water is being packaged. Half-life of ozone pure water is 20 minutes.

For details contact:

Faraday Ozone Products Pvt Ltd  
106/4-A Revenue Nagar, Saravanampatty  
Coimbatore, Tamil Nadu 641 035  
E-mail: sales@faradayozone.com

or Circle Readers' Service Card 26

## Process Aerator/Mixer



Aerobic wastewater treatment processes are dependent upon effective and efficient aeration systems that provide the necessary oxygen to micro-organisms, making the process work. Optimal efficiency and treatment effectiveness are achieved when the aeration system not only provides oxygen in a form used by the micro-organisms, but also is able to intimately mix and disperse that oxygen throughout the aerated basin.

Taking the best features of these different systems results in the formation of an ideal aeration system that combines dual functionality, fine bubble aeration, horizontal mixing, minimal maintenance, total cost of ownership and small footprint. Aeration industries' R&D efforts successfully blended these most desirable aeration features. The result is the AIRE-O<sub>2</sub> TRITON aerator/mixer.

AIRE-O<sub>2</sub> TRITON aerator/mixer optimises the combination of hydraulic and aeration efficiency necessary to accomplish higher oxygen transfer, superior mixing and allow unsurpassed control of the activated sludge process environment. Biological nutrient removal processes are easier to regulate and more cost-effective by combining mixing and aeration in one compact unit with independent aeration control.

Air is pressurised using a high efficiency regenerative blower. The air is forced down a hollow shaft into the proprietary PowerMix propeller/Saturn ring design. The Saturn ring sheers the air into fine bubbles and enhances the nitrification process while the PowerMix propeller forces the air into a downward direction, dramatically increasing bubble residence time and increasing oxygen transfer.

When the blower is turned off, the PowerMix propeller maintains velocities without the introduction of air. This allows for power savings when loads decrease, maintaining the dissolved oxygen concentration for optimal process conditions and ensures uniform solids suspension in the basin at all depths.

For details contact:

Eurotek Environmental Pvt Ltd  
GKC Projects Bldg, Survey No: 9  
Hitech City, Land Mark: CIL Green Bldg Lane  
Kondapur, Kothaguda  
Hyderabad, Telangana 500 084  
Tel: 040-48577301  
E-mail: info@eurotekindia.com

or Circle Readers' Service Card 27

## Energy Saver



Emotron FDU 2.0 helps you to save energy and draw max efficiency from your processes. Emotron FDU with modular concepts allows cost-optimisation and is a perfect choice for tailor-made requirements. It offers simplicity in its most advanced form, which makes it easy to program and is user-friendly.

Operation parameters can be set in your process units. Robust and certified IP54 metal construction as standard (up to 132-kW) offer cost-efficient installation close to the application. One Emotron FDU can control up to seven units without external control system. Speed controlled fans assures less noise, a more even drive temperature and higher efficiency. 6 pulse and 12 pulse configurations are also available.

For details contact:  
 CG Power and Indl Solutions Ltd  
 Drives and Automation  
 Plot No: 9, MPAKVN, Phase 2  
 New Indl Area, Mandideep  
 Madhya Pradesh 462 046  
 E-mail: drives.mktg@cglobal.com

or Circle Readers' Service Card 28

## Rotary Piston Blowers

Beta blowers conform to the relevant parts of API Standard-619 (2<sup>nd</sup> Edition Mast 1985 Reaffirmed, May 1991) the International Standards for Refinery Services however, can be supplied in compliance with other National or International Standards.

Beta rotary piston blowers are precision machines designed and manufactured for use in different field of applications, such as petrochemicals, fertilisers, cement, steel, etc.

It is also used in negative or positive pressure conveying of materials in bulk carrying vehicles, gas transportation equipment, pressurise aeration, digesting, gas supply of an effluent and sewage treatment plants. Some of the other utilities include: filter cleaning, backwashing and aeration blowers in water works, especially ordered/made high vacuum pumping station and rotary drum or belt filters used for toxic, aggressive and hazardous industrial gases.

Normally, beta blowers are tested in accordance with BS-1571 Part II but can be tested in accordance with ASME PTC-9 or DIN 1945 depending on customer's requirements.

For details c radesh 201 305  
 E-mail: info@betablowers.in  
 sales@betablowers.in

or Circle Readers' Service Card 29

## Centrifugal & Electromagnetic Clutches & Brakes



SUCO offers a wide range of centrifugal and electromagnetic clutches and brakes. Centrifugal clutches and brakes are used when input and output side should be separated during a standstill and the output side should work speed-dependents. Advantages of centrifugal clutches are load-free starting and slip-free torque transmission at operating speed. Centrifugal brakes are often used as emergency braking system. They can lower or slow down loads at a defined speed.

Additionally SUCO has developed a safety brake which can reliably protect small wind turbines against storm damages due to excessively high wind speeds. Based on the principle of a centrifugal brake, a purely mechanical, dependable brake was developed that, in the case of a severe storm, enabled the rotor to safely come to a standstill without any need for an external power supply.

Electromagnetic clutches and brakes from SUCO are notable for straightforward design and ease of installation. Like centrifugal clutches, electromagnetic clutches and brakes can only be used for dry running. Reliable torque transmission without residual torque is guaranteed.

SUCO designs and manufactures individual, customer-specific solutions when standard models cannot be used. Their engineers check enquiries to make sure they are practicable, and as far as possible, the design of the product complies with the customer's wishes.

For details contact:  
 Bedaflow Systems Pvt Ltd  
 W-7, Sector-11  
 Noida, Uttar Pradesh 201 301  
 Tel: 0120-4329990  
 Fax: 91-0120-4329920  
 E-mail: info@bedaflow.com

or Circle Readers' Service Card 30

**NATIONAL****Clean India Show****Dates:** 13-15 February 2020**Venue:** Bombay Exhibition Centre, Goregaon, Mumbai

**Event:** The premier exhibition for the cleaning industry and professional cleaning segments in India, Clean India Show creates avenues for enhancing cleaning business. The Expo provides opportunities for international players to understand the Indian market potential, explore business opportunities and find the right business partners for manufacturing, marketing, distribution and sales. New product launches and demos act as catalysts to the growth of the Cleaning Industry.

For details contact:

Virtual Info Systems Pvt Ltd  
231, Master Mind-1, Royal Palms  
Mayur Nagar, Aarey Colony  
Goregaon, Mumbai 400 065

**Renewable Energy Expo****Dates:** 13-15 February 2020**Venue:** Chennai Trade Centre, Nandambakkam, Chennai

**Event:** The 2<sup>nd</sup> Edition of this event will be held in Chennai. The scope of this exhibition is to stimulate the growth of renewable in the region through collaboration of technology and product sharing. This event will be bringing together businesses, sustainable energy industry trade associations, government agencies, and energy policy research organizations to showcase the status and potential of the cross-section of renewable energy (biofuels/biomass, geothermal, solar, wind) and energy efficiency technologies. The expo is proclaimed at the right time when there is a paradigm shift in the global trend towards massive deployment of solar power and other renewables along with investments worth billions of dollars in technology and green energy.

For details contact:

Water Today Pvt Ltd  
3D Bhagheetha Residency  
125 Marshalls Road  
Egmore, Chennai 600 008

**Chemspec India****Dates:** 16-17 April 2020**Venue:** Bombay Exhibition Centre, Goregaon, Mumbai

**Event:** The Fine and Specialty Chemicals Exhibition features exhibits of organic and fine chemicals, active pharma ingredients, drug intermediates, dyes and pigments, agrochemicals, contract and toll manufacturing, coatings, cosmetic chemicals or ingredients, pigments and solvents, surfactants, laboratory chemicals and a host of specialty chemicals.

For details contact:

Chemical Weekly  
602, Godrej Coliseum, B-Wing, 6<sup>th</sup> Flr  
B/h Everard Nagar, Off Eastern Express Highway  
K J Somaiya Hospital Road  
Sion (E), Mumbai 400 022  
Tel: 022-24044477, Fax: 91-022-24044450  
E-mail: corporate@chemicalweekly.com

**INTERNATIONAL****Energy from Waste Conference****Dates:** 04-05 March 2020**Venue:** America Square Conference Centre, London, UK

**Event:** The Energy from Waste Conference, the event is the premier conference in the UK and Europe driving new technology discussion, operational efficiency, best practice and compliance in the global energy from waste sector. Designed to support your professional learning and global network development, this programme is packed with policy updates, expert advice and market opportunities from a lineup of renowned international speakers on Energy Waste Management. It drives the new technology discussion, operational efficiency and best practices.

For details contact:

Mark Allen Group  
St Jude's Church  
Dulwich Road  
London SE24 0PB  
U.K.

**Corrosion Conference & Expo****Dates:** 15-19 March 2020**Venue:** George R Brown Convention Center, Houston, USA

**Event:** Corrosion Conference & Expo showcase your newest products in front of customers, prospects, partners, and influencers; generate leads efficiently and effectively; build relationships with key players and decision-makers; bolster the global influence and reach of your company's product or service; and expand your reach and tap into new markets meeting new potential buyers and suppliers.

For details contact:

Nace International - The Corrosion Society  
Houston, U.S.A.  
Tel: +1 281-228-6411  
E-mail: tiffany.krevics@nace.org

**Analytica****Dates:** 31 March-03 April 2020**Venue:** Exhibition Munich, Munich, Germany

**Event:** Analytica provides the attendees with the opportunity to explore the areas of laboratory technology, analytic and biotechnology.

For details contact:

Messe Munchen India Pvt Ltd  
INIZIO 507 & 508, Cardinal Gracias Road  
Chakala, Andheri (E), Mumbai 400 093  
Tel: 022-42554700  
Fax: 91-022-42554719  
E-mail: info@mm-india.in

## New Contracts/Expansions/Revamps

The following list is a brief insight into the latest new projects by various companies in India.

### CHEMICALS

**Tata Chemicals**, the world's second largest soda ash manufacturer, has received green nod for expansion of its soda ash plant in Gujarat at an estimated cost of ₹ 1,042.07-crore. The proposal is for expansion of its soda ash plant located in Devbhumi Dwarka district from 10.91 to 113.16-lakh TPA and enhance captive power plant capacity from 84 to 125-MW.

The proposal was first vetted by a central government constituted green panel and based on its recommendations the Union Environment Ministry has given the environment clearance (EC) for the expansion of soda ash plant in Gujarat.

According to the EC certificate issued to the Tata Chemicals, the green signal to the proposed project has been given subject to compliance of certain conditions and prior clearance from the wildlife angle, including clearance from the standing committee of the national board for wildlife.

As per the proposal, the expansion will be carried out within the existing plant premises of 231-hectare (including cement plant). The cost of the project is pegged at ₹ 1,042.07-crore and will be completed in two years.

Soda ash, an important part of Indian inorganic chemical industry, is the common name given for the technical grade anhydrous sodium carbonate ( $\text{Na}_2\text{CO}_3$ ). It is a high volume, low-value product and finds application mainly in the production of detergents, glass, chemicals, sodium silicate, water treatment and pulp/paper.

India has the advantage of abundance of raw materials, ie, limestone and salt and growing domestic demand that favours the establishment of soda ash plants. The proposed expansion of soda ash plant will meet the increased domestic and industrial demand, the company said.

**Insecticides (India) Ltd** has announced a ₹ 200-crore expansion plan to increase its capacity in the next three years. In the first two years, it would spend about ₹ 100-crore, followed by an investment of ₹ 100-crore in 2020.

The firm is planning to set up an Export Oriented Unit in Gujarat with an eye on increasing export component of the business. Exports contributed about ₹ 35-crore in the total turnover of ₹ 1,109-crore in 2017-18. The firm has a share of about 5 per cent in the ₹ 18,000-crore crop protection market in the country.

**Tata Chemicals** has completed the acquisition of the silica business of Allied Silica for ₹ 123-crore. The company entered into a business transfer agreement to acquire Allied Silica's precipitated silica business on a slump sale basis. The deal was part of the ₹ 295-crore investment approved by the Board in February 2017, towards this specialty business. The acquisition includes a manufacturing facility in Tamil Nadu, which will produce highly dispersible silica.

The specialty chemical product represents a downstream value addition to Tata Chemicals soda ash business, where it ranks among the top manufacturers globally. R Mukundan, Managing Director, Tata Chemicals, said the next focus would be to enhance the operational readiness of the plant to maximise throughput of product portfolio, while meeting the requisite safety and quality specifications. Precipitated silica is a versatile product with applications in many industries including rubber, oral care, coatings and agrochemicals. The acquisition also offers the possibility to make value added silica for applications that demand high performance.

**Songwon Industrial Co Ltd** a specialty chemicals company of South Korea has launched its new pilot plant in Panoli (Gujarat), thereby strengthening the organisation's overall specialty chemicals development capability. Built on Songwon's Indian site with all the necessary main unit operations, the new plant is equipped with the most up-to-date technologies and materials for producing a wide range of chemicals for a broad spectrum of applications - from one kilo up to several hundred kilo samples. To reinforce the organisation's position in existing areas of business and enhance its ability to enter new areas, the new pilot plant will be supported by the Songwon's strong local R&D team in Panoli, as well as its central technology innovation center located in Maeam, Korea.

### MINING

**Universal Autofoundry Limited** (539314/UNIAUTO) has opened a new unit (UNIT-II) with installed capacity of 1,800-MT per month to manufacture CI/Ductile Iron Castings at B-51, SKS Industrial Area, Reengus, District Sikar, Rajasthan. The company has made an investment of ₹ 40-crores (approx) raised from banks to set up this new unit.

Universal Autofoundry Ltd is a world class manufacturer and exporter of Grey Cast Iron and Ductile Iron which has now made expansion by setting up a new manufacturing unit in the name of UNIT-II at B-51, SKS Industrial Area, Reengus, District Sikar, Rajasthan with installed capacity of 1,800-MT per month which is just double as compared to the existing capacity of the Company.

**MOIL** said production at its Parsoda manganese mine is expected to begin soon. The mine will be operated by open cast mining method. MOIL has been granted mining lease of Parsoda manganese mine near village Parsoda, 46-km from Nagpur in the year 2016. The lease extends for 50 year period, ie, from April 22, 2016 to April 21, 2066 and the project cost is estimated to be ₹ 19.54-crore. MOIL, under the Ministry of Steel, operates around 10 mines, including six in Maharashtra and four in Madhya Pradesh. Balaghat mine is its largest, which produces top quality manganese ore.

**Hindustan Copper Ltd (HCL)**, on 2<sup>nd</sup> February, 2019, held a groundbreaking ceremony at Ghatsila Unit of HCL for construction of concentrator plant at Rakha, initiating Chapri-Sidheswar mine, a new mine development and Rakha mine re-opening projects. CMD informed that considering the opportunity to further increase the resource base of copper mineral in the State has finalized plan to undertake depth exploration up to 1,000-meter from surface in its existing lease area in next two years. HCL, in its Unit located at Ghatsila planned to implement total five mine expansion projects to increase the mine capacity from current 4.0 to 72.0-lakh tonne. Successful implementation of the project will also reduce country's dependence on imported copper concentrate.

**NTPC Ltd** hopes its captive coal production will reach 100-million tonne as soon as its five coal blocks commence operations, aided by faster regulatory clearances and the part-privatization model of Mine Development and Operator (MDO). The success of the plan would determine fuel security of the operations of India's largest power producer.

**CIL, ONGC** to produce coal-bed methane from 10 new mines: support SAIL in one more. The Coal Ministry has identified 11 mines to produce coal

bed methane (CBM). Initially, ONGC will harness the gas and then CIL will extract coal from them. In addition to the mines with CIL, the two (ONGC and CIL) will also help develop SAIL's Parbatpur coal block (Jharkhand). Here too, ONGC will first harness the CBM. SAIL had surrendered the Sitanala and Parbatpur coal mines. SAIL had engaged MECON to prepare a techno commercial viability report, which declared the project unviable.

**JSW Energy**, part of the Sajjan Jindal-led JSW Group, is believed to be in the race for buying out the thermal power assets of Monnet Power and Jindal India Thermal Power Ltd (JITPL) in Odisha. Monnet Power's 1,050-MW coal-based power plant near Angul was in advanced stage of commissioning. Monnet Power's parent company, Monnet Ispat & Energy had won the Mandakini coal block in Odisha in competitive bidding, it surrendered the block later on grounds of economic unviability.

Besides Monnet Power, JSW Energy is also eyeing takeover of BC Jindal controlled JITPL's 1,200-MW coal-based plant at Derang near Angul. The first unit (600-MW) of the 1,200-MW plant had begun commercial operations and started power supplies to the Odisha grid. This project has been completed at a cost of ₹ 7,537-crore which includes a debt component of ₹ 5,900-crore. JITPL has power purchase agreements (PPAs) with Odisha's Gridco Ltd, Kerala State Electricity Board and Tata Power Trading Corpn. Apart from JSW Energy, JITPL also had competing offers from Adani Power and Singapore's SembCorp. The valuation of the prospective deal is not known.

NLC India (formerly Neyveli Lignite Corporation) which is in the hunt for buying out power assets is understood to have shown interest in the 700-MW Odisha plant of Hyderabad-based Ind-Barath Power Infra Ltd (IBPIL). The power plant located at Sahajbahal, near Jharsuguda, has commenced commercial operations. In August last year, NLC India had floated an EoI from companies owning coal and lignite-based power projects, for a possible acquisition. NLC India's installed thermal power capacity is 3,240-MW. It runs a 10-MW solar power unit and wind power assets with a capacity totalling 37.5-MW.

**Western Coalfields** has received the environment clearance for its ₹ 263-crore expansion project in Nagpur district, Maharashtra. The proposal is to enhance the production capacity of the Gokul open cast mine to 1.875-million tonnes per annum (MTPA) from the existing 1-MTPA. The mine, located in 767.17-hectare, has a mineable reserve of 14.50-million tonnes. The clearance to the project is subject to certain conditions. Company has been asked to get 'Consent to Operate' certificate from the State Pollution Control Board for the existing production capacity of 1-MTPA and also the 'Consent to Establish' for the proposed capacity of 1.875-MTPA prior to enhancing the production capacity.

## OIL & GAS

**Brahmaputra Cracker and Polymer Limited (BCPL)**, Lepetkata in Dibrugarh, foundation stone for HPG 2<sup>nd</sup> Stage Plant was laid by The Union Minister for Chemicals and Fertilizers, D V Sadananda Gowda.

The proposal for setting up a Butene-1 and second Stage Hydrogenation of Pyrolysis Gasoline (HPG) plant at Lepetkata at a cost of ₹ 386-crore, has been approved by Government of India. In the first phase, BCPL shall set-up an HPG 2<sup>nd</sup> Stage plant at a cost of ₹ 125.99-crore. This project having the capacity of 52,000-TPA will produce a value-added product which can be blended with motor spirit.

In the current financial year, the plant is operating at above 100 per cent capacity. Company has made remarkable progress in the last fiscal, achieving its maiden profit and is witnessing a consistent increase in its market share of Polymer, the release said.

**Cairn Oil and Gas**, which is part of the Vedanta Group, has drawn up plans to spend over \$ 1.1-billion in coming 18 months to improve the crude oil production from the Mangla, Bhagyam and Aishwarya fields in Barmer.

The announcement comes at the heels of Cairn Oil and Gas completing a decade of operations at the Mangla Processing Terminal in Barmer recently. With implementation of Alkaline Surfactant Polymer (ASP) enhanced oil recovery, we aim to increase the recovery factor from 36 per cent to over 50 per cent. This means that we will be able to extract more than half the crude oil present in the fields said Ajay Kumar Dixit, Chief Executive Officer of Cairn Oil and Gas.

In September last year, the Cabinet had approved the policy framework to incentivise enhanced recovery (ER)/improved recovery (IR)/unconventional hydrocarbon (UHC) production methods/techniques to improve recovery factor of existing hydrocarbons reserves for augmenting domestic production of oil and gas. The policy proposes systemic assessment of every field for its ER potential, appraisal of appropriate ER techniques and fiscal incentives to de-risk the cost involved in ER projects to make the investment financially viable.

The current production from the Mangla, Bhagyam and Aishwarya fields is to the tune of 135,000-140,000 barrels of oil equivalent per day (kboepd).

Cairn Oil and Gas currently produces a fourth of India's total domestic oil production and targets an immediate production of 300-kboepd by 2020-2021. The target by financial year 2021-22 is to have a production of 500-kboepd.

**Essar Exploration & Production Ltd (EEPL) and ENI**, the Italian oil major, have discovered the presence of gas and condensates in the Ken Bau prospect at Block 114, Song Hong Basin, Offshore Vietnam.

ENI Vietnam is the operator of the block with 50 per cent participating interest while EEPL holds the remaining 50 per cent.

Confirming the discovery, ENI in a statement said, "Its exploration well located at Block 114, Song Hong Basin, Offshore Vietnam, has proven the presence of gas and condensate in the Ken Bau prospect. The well result indicates a significant potential of the hydrocarbon accumulation."

The exploration well Ken Bau 1X has been drilled at a depth of 95-m below water level, and reaches a total depth of 3,606-m, encountering several intervals of gas and condensate sandstone interbedded with Miocene age shale, with an estimated net reservoir thickness in excess of 100-m.

Ken Bau 1X well was plugged and abandoned ahead of the original plan due to certain technical issues, prior to reaching deeper levels that could hold significant additional resources.

"ENI is already planning to start a drilling campaign early next year to fully assess the substantial upside of the discovery," said the statement adding that Ken Bau 1X results represent a significant breakthrough for evaluating the exploration potential in the Song Hong Basin.

Mauritius-based EEPL has so far invested over \$1.1-billion in the exploration and production business in Vietnam, Nigeria and India.

Company's unconventional Hydrocarbon acreages in India are through wholly-owned subsidiary Essar Oil and Gas Exploration and Production Ltd (EOGEP).

EOGEP's Raniganj CBM asset in West Bengal is the first CBM asset in India to cross the threshold of 1-million cubic metres per day of gas production.

**Hindustan Petroleum Corpn Ltd (HPCL)** has informed that there are no roadblocks in setting up the 9-MMTPA refinery-cum-petrochemical complex at an approved cost of ₹ 43,129-crore at Pachpadra in Barmer district of Rajasthan.

In addition to motor spirit and diesel, the refinery envisages production of major products like Ethylene and Propylene derivatives. These derivatives are used as feedstock in various ancillary industries, viz, packaging, textile, petrochemical industry, etc.

**Vedanta Ltd** announced an oil discovery in its Krishna Godavari basin block in the Bay of Bengal. The block previously had a gas discovery in the very first well drilled. Vedanta holds 100 per cent participating interest in the block. Multiple reservoir zones were encountered in the well H2 within the Mesozoic sequence between the depths of 3,310 to 4,026-metres with hydrocarbon indications during drilling and downhole logging, it said. The zone from 3,403 to 3,431-metres was tested through conventional well testing (Drill Stem Test) and flowed oil to the surface. Further appraisal will be required to establish the size and commerciality of the oil discovery. The first exploration well A3-2 drilled in the block was a gas discovery. Cairn India, the company Vedanta bought and merged with itself, had in June 2010 won the KG-OSN-2009/3 block in the 8<sup>th</sup> round of New Exploration Licensing Policy (NELP). It had committed to drill six exploratory wells on the block. These were expandable to 10. The KG basin is a proven basin where there have been many hydrocarbon discoveries. The company acquired around 1,000-sq km of 3D seismic data based on which it drilled two wells. KG-OSN-2009/3 offshore block in the Bay of Bengal was originally spread over in an area of about 1,988-sq km which was later reduced to 1,298-sq km due to exclusion of area within firing range. It is located in the shallow waters of the Indian Ocean along the East coast of India, approx 1.5-km from the Indian coastline.

**Haldia Petrochemicals (HPL)** plans to deploy an innovative technology for its project that seeks to convert crude oil into chemicals and petrochemicals directly. As opposed to the customary production of refined petroleum products, HPL's plant will concentrate on higher output of petrochemicals. They will be setting up the refinery to produce chemicals and petrochemicals. The direct conversion of crude to petrochemicals will be the first of its kind in the country unlike other refineries, which are producing petroleum products. Such technologies are used widely in China. HPL is setting up an integrated refinery with aromatic complex for production of paraxylene and purified terephthalic acid (PTA) units in the first phase. The production capacity of paraxylene unit will be 1.6-million tonne per annum (MTPA) and PTA will have 2.5-MTPA capacity. The first phase of the HPL project approved is expected to be operationalised within five years of allotment of land. HPL has committed an investment of ₹ 28,700-crore (\$4.05-billion) in the first phase on its Odisha project. Recently, the High Level Clearance Authority (HLCA) in Odisha headed by Chief Minister Naveen Patnaik gave its nod to the proposal, which HPL submitted on March 1. Official sources have touted HPL's proposal as the country's single-largest domestic investment in the last 12 months.

**Vedanta Ltd** has received environment clearance for the expansion of its oil and gas operation in Rajasthan that would entail an investment of ₹ 12,000-crore. The proposal is to expand onshore oil and gas production from the existing 3,00,000-BOPD (barrels oil per day) to 4,00,000-BOPD and 165-MMSCFD (million standard cubic feet per day) to 750-MMSCFD from the 'RJ-ON-90/1' block located in Barmer and Jalore districts, Rajasthan. The environment clearance (EC) is, however, subject to compliance to certain conditions. The estimated project cost is ₹ 12,000-crore. The company aims to implement the project in a phased manner during seven years. The project involves oil augmentation to produce up to 4,00,000-BOPD and 250-MMSCFD of associated gas from the oil field and natural gas augmentation to produce up to 500-MMSCFD.

Total area of the oil and gas block is 3,111-sq km. Out of it, the project presently covers an area of 1,501.7-hectare in Barmer and Jalore districts. Additional 150 hectare of land in Barmer district will be used for the proposed expansion. The 'RJ-ON-90/1 block' comprises of Vedanta Ltd and State-run ONGC for hydrocarbon exploration, development and production activities in the block, while Cairn Oil and Gas division (part of Vedanta Group) is the operator of the block.

**BPCL-Kochi Refinery** is going ahead with its second petrochemical project to produce polyols at an investment of ₹ 11,300-crore. An import substitute, polyols are used in the production of polyurethanes used in diverse products such as automotive seats, mattresses and shoe soles.

The project is expected to go on stream by 2022. BPCL is in talks with various global firms to finalise the technology for six different products. There is a huge demand for polyols and it is growing at 10 per cent per annum providing good scope for MSMEs to set up units in the complex. The first petrochemical project of BPCL-KR constructed at a cost of ₹ 5,500-crore is all set to commence operations. It will produce acrylic acid, acrylates and oxo-alcohol that are used in the manufacture of paints, super absorbent polymers, detergents, adhesives, sealants and solvents. The technology has been sourced from Mitsubishi, Air Liquide Global and Johnson Mathey Davy. The two projects will facilitate ₹ 13,000-crore forex savings per annum for the country. With the completion of the second petrochemical project, BPCL-KR is expecting around 16 per cent increase in its turnover in three years. BPCL-KR is slated to complete its fuel upgradation project to comply with BS-VI norms by February next year. The project cost is around ₹ 3,300-crore.

**Tokyo Gas and Centrica LNG Co** will be co-purchasing 2.6-million tonnes per annum (MTPA) of natural gas from ONGC Videsh-partnered Rovuma Offshore Area 1 project in Mozambique.

The agreement with the Tokyo Gas and Centrica LNG Co will be effective from the date production begins to the early 2040s. This takes the long-term sale tie-ups from the project to more than 9.5-MTPA, OVL said in a statement. The development plan for the project was approved in February 2018. Under the existing agreements, CNOOC Gas and Power Singapore Trading & Marketing have a commitment to procure 1.5-MTPA over 13 years. Shell International Trading Middle East has an agreement to procure 2-MTPA over 13 years.

Bharat Gas Resources, a wholly-owned subsidiary of Bharat Petroleum Corporation will get 1-MTPA of gas over 15 years. State-owned oil and gas company of Indonesia, Pertamina has an agreement for 1-MTPA of gas over 20 years. The Mozambique Rovuma Offshore Area 1 project will be developed initially as an onshore LNG plant consisting of two LNG trains with total nameplate capacity of 12.88-MTPA to support the development of the Gofinho-Atum field located entirely within Offshore Area 1.

ONGC Videsh presently holds 16 per cent net interest in the Mozambique Rovuma Area-1 Offshore Project out of which 10 per cent Participating Interest (PI) is held directly by ONGC Videsh and another 6 per cent is held through its 60 per cent shareholding in Beas Rovuma Energy Mozambique Ltd (BREML). The remaining 40 per cent shares in BREML are held by Oil India Ltd. Anadarko Petroleum Corporation is the operator of this project with 26.5 per cent PI. The other partners are: Mitsui (20 per cent), ENH (15 per cent), BPRL (10 per cent) and PTTEP (8.5 per cent).

**Chennai Petroleum Corpn Ltd (CPCL)** the Indian Oil Corpn's (IOC's) group company is planning to set up a greenfield refinery at Nagapattinam in Tamil Nadu, at a cost of ₹ 27,460-crore. The products, including motor spirit (MS)

and high speed diesel (HSD), which will be produced from the refinery will help meet the latest BS-VI specification in the southern States. The new refinery will be part of the Government of India's plan to set up a petroleum, chemicals and petrochemicals investment region (PCPIR) in this region. The boards of CPCL and IOC have accorded in-principle approval for the 9-million metric tonne per annum (MMTPA) refinery at CBR at an estimated investment of ₹ 27,460-crore, plus or minus 30 per cent. The investment includes ₹ 2,800-crore for setting up a polypropylene unit of around 500 thousand metric tonne (TMT) per annum capacity. The refinery is expected to be operational by 2023-24. The products from the refinery will meet the latest BS-VI specifications. CPCL's new refinery complex will come up with the latest technology and it will include a polypropylene unit to maximise value addition from the complex. It will produce valuable products, including liquefied petroleum gas, petrol, diesel, aviation turbine fuel, polypropylene, etc, besides petrochemical feed stocks. The petrochemical complex will also feed stocks to downstream industries, including pharma, paint and lacquer, printing inks, adhesives, coatings, chemicals, automobile lubricants, and PVC, among others. CPCL operates two refineries with a total capacity of 11.5-MMTPA (10.5-MMTPA at Chennai and 1-MMTPA near Nagapattinam) in Tamil Nadu. The company's crude throughput increased to 10,789-TMT in 2017-18, from 10,256-TMT in 2016-17. Its profit after tax stood at ₹ 913-crore in 2017-18, as compared to ₹ 1,030-crore in 2016-17.

**ONGC** will pump in ₹ 6,000-crore in drilling 200 wells over the next seven years in Assam in order to increase the output from the State. The investment will take place in Sivasagar and Charaideo districts of Upper Assam. All statutory clearances are being obtained. The investment will lead to increase in production from the State.

**Bharat Petroleum Corporation Ltd (BPCL)** will invest as much as \$800-million as equity in a liquefied natural gas (LNG) project in Mozambique where it holds a 10 per cent stake, as the project moves closer to the final investment decision (FID) stage. The Maharatna PSU paid \$703-million (\$800-million is over and above this) to buy the 10 per cent participating interest in the Rovuma Offshore Area 1 concession in the Cabo Delgado province in northern Mozambique where about 75-trillion cubic feet of natural gas was discovered, positioning it as a strategic global LNG supplier.

Anadarko Petroleum Corporation, USA is the main operator of the gas field with a 26.5 per cent participating interest. The Area 1 consortium is developing an initial onshore LNG project consisting of two LNG trains with total nameplate capacity of 12.88-million tonnes per annum (MTPA).

The partnership has concluded the legal and contractual framework with the signing of the marine concession agreements with the Mozambique government. It has signed long-term SPAs for 1.2-MTPA of LNG and is in advanced negotiations with several buyers, including BPCL, to secure the remaining volume of 9-MTPA to reach FID.

Currently, the partners are discussing the terms and conditions of project funding which will largely depend on the quantity and rate at which the gas is sold. The entire 9-MTPA is expected to be tied-up by the soon. Out of the \$20-billion project cost, BPCL will have to contribute equity of some \$800-million as its share of the 10 per cent participating interest when the FID is closed.

**CPC Corp** of Taiwan is planning to invest \$6.6-bn in petrochemical project in Paradip, Odisha. In this regard, delegation led by CPC president Shun-Chin Lee met the Indian Minister for Petroleum & Natural Gas to discuss the proposal. With an annual production capacity of 15-million tonnes, the Indian Oil Corpn's (IOC), Paradip Refinery was selected to host the

new project, which will utilise the refinery's feedstock. It will have many downstream units for the production of a wide range of end-products and petrochemical intermediates.

**Vedanta Ltd** plans to expand its alumina refinery at Lanjigarh in Odisha to 6-million TPA by 2021 using alternate bauxite resources as it looks beyond.

The firm believes there are enough alternate resources of bauxite available to feed the expansion and has moved beyond the previously pursued high-quality bauxite beneath the pristine Niyamgiri hills. The Lanjigarh plant produced around 1.2-million tonnes of alumina last fiscal and has a current capacity of 2-million tonnes. While the plant currently imports 2.5-3 million tonnes of bauxite and sources almost an equal volume from domestic mines, the expansion project would need a total of 18-million tonnes of bauxite annually. Vedanta had intended to supply the refinery with bauxite extracted from the Niyamgiri hills by a mining company owned by the State government, which backed the project. Odisha has 700-million tonnes of known bauxite reserves, of which Niyamgiri holds an estimated 88-million tonnes. Odisha has 70 per cent of India's total bauxite reserves, the world's 5<sup>th</sup> largest. Currently, costly bauxite is imported from as far as Brazil and Guinea at a port in neighbouring Andhra Pradesh before being moved by trains 275-km to Lanjigarh. Vedanta has environmental and other clearances in place for the expansion and does not need any new land.

**Indian Oil Corpn (IOC)** plans to invest ₹ 20,000-crore in city gas distribution (CGD) projects in the next five to eight years. IOC, which owns a third of India's oil refining capacity identifies compressed natural gas (CNG) replacing some of the petrol and diesel consumed in vehicles today and LPG replaced by piped cooking gas in households. The company plans to invest at least ₹ 20,000-crore for the CGD business in those projects won during the ninth round of bids. The investment will mainly include setting up of CNG dispensing stations as well as laying pipelines in cities to transport gas to households for cooking purposes and industries for commercial use. According to oil ministry figures, India needs to invest an estimated \$100-billion in natural gas infrastructure by 2022, including setting up a gas grid across 228 cities.

**Oil India Ltd** has signed an agreement with five PSU JV Partners in Guwahati in connection with construction of North-East Gas Grid Pipeline project. The gas grid project will connect eight North-Eastern States, viz, Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim. The proposed JV Company will have equal equity contribution from all the five PSU JV Partners.

## FERTILISERS

**Talcher Fertilizers Ltd (TFL)** has awarded a lumpsum term key contract to Wuhuan Engineering Co Ltd, China. The deal is for implementing the coal gasification and ammonia/urea packages of TFL. This contract has been awarded to augment the domestic urea capacity and revive closed fertiliser units of Fertilizer Corporation of India Ltd (FCIL).

TFL is a joint venture company of nominated public sector undertakings namely Rashtriya Chemicals and Fertiliser, Coal India, FCIL and GAIL. With an estimated investment of ₹ 13,277-crores, the project shall produce 1.27-million TPA of Neem coated Urea through the gasification of a mixed feedstock comprising of high ash Indian coal and pet coke.

TFL has been allotted northern part of North Arkhpal mine as captive one for meeting its coal requirements. The pet coke will be sourced from Paradip Refinery of IOCL. The likely commissioning of this project is around the third quarter of 2023, the statement added.

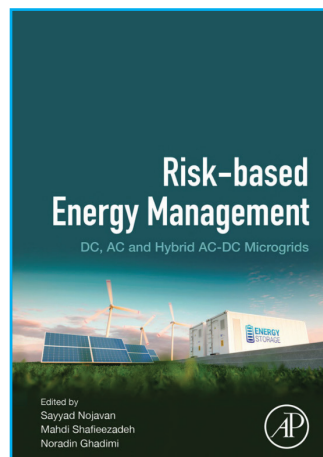
## Risk-based Energy Management

**Editors:** Sayyad Nojavan, Mahdi Shafieezadeh and Noradin Ghadimi

**Price:** \$115.50

**No of pages:** 294 pages (Paperback)

**Publisher:** Academic Press (1<sup>st</sup> Edition)



**About the book:** Risk-based Energy Management: DC, AC and Hybrid AC-DC Microgrids define the problems and challenges of DC, AC and hybrid AC-DC microgrids and considers the right tactics and risk-based scheduling to tackle them. The book looks at the intermittent nature of renewable generation, demand and market price with the risk to DC, AC and hybrid AC-DC microgrids, which makes it relevant for anyone in renewable energy demand and supply. As utilization of distributed energy resources and the intermittent nature of renewable generations, demand and market price can put the operation of DC, AC and hybrid AC-DC microgrids at risk, this book presents a timely resource.

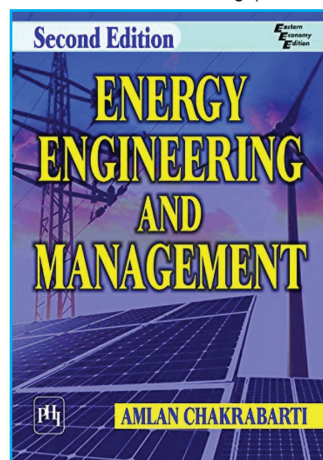
## Energy Engineering And Management

**Author:** Amlan Chakrabarti

**Price:** ₹ 465.00

**No of pages:** 570 pages (Paperback)

**Publisher:** PHI Learning (2<sup>nd</sup> Edition)



**About the book:** The textbook is designed for B.Tech students of Electrical/Mechanical/Industrial Engineering and M.Tech students of Power System/Energy Engineering/Energy Management. It will also be useful for MBA courses on Energy Management conducted by some universities through distance education mode.

The book, now in its Second Edition, offers an exhaustive discussion of the energy analysis methodologies and tools to optimize the utilization of

energy and how to enhance efficiency during conversion of energy from one form to another. It illustrates the energy analysis methods used in factories, transportation systems and buildings highlighting the various forms of use. It also discusses the thermodynamic principles of energy conversion and constitution of energy balance equation for such systems.

The book examines the energy costs in our everyday life in terms of energy inputs in food cultivation. It also discusses similar energy costs of using fuels, other goods and services in our daily life

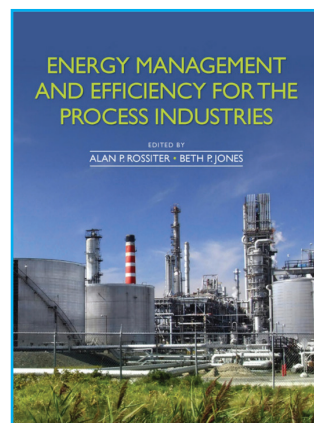
## Energy Management and Efficiency for the Process Industries

**Editors:** Alan P Rossiter and Beth P Jones

**Price:** \$92.06

**No of pages:** 400 pages (Hardcover)

**Publisher:** Wiley-AIChE (1<sup>st</sup> Edition)



**About the book:** Lays out the underlying management and technical issues that drive successful industrial energy management programs.

Energy efficiency is highly visible in industry in the US and around the world. Many engineers and managers are assigned energy management roles at some point in their careers, but few have a clear understanding of either the

scope of the opportunity or the available methodologies to capture savings.

Energy Management and Efficiency for the Process Industries is a “go-to” source for engineers and managers who are designing and implementing policies and programs for energy management and energy efficiency. It introduces a framework for an industrial energy management program, provides illustrations, and discusses the basic principles that lead to robust and sustainable improvements in energy performance.

Through contributions from leading experts in diverse fields, Energy Management and Efficiency for the Process Industries provides a unique overview of industrial energy management informed by the technologies and issues that drive energy efficiency in the process industries.

Divided into two sections, the book provides both management and technical recommendations. The management section offers guidance on how to design and implement energy management programs, with advice on the organizational design, human interaction, and technical aspects of energy management. Management topics include program goal setting, benchmarking, strategies, priorities, tools, the roles of energy management personnel, and case studies from three successful energy programs.

The second section deals with more technical aspects of energy management and energy efficiency – things that you might consider traditional chemical engineering. Technical experts provide advice on proven options for understanding and enhancing the energy efficiency of the plant systems and equipment items with the highest impact on process energy efficiency success.

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- Packaging Solutions
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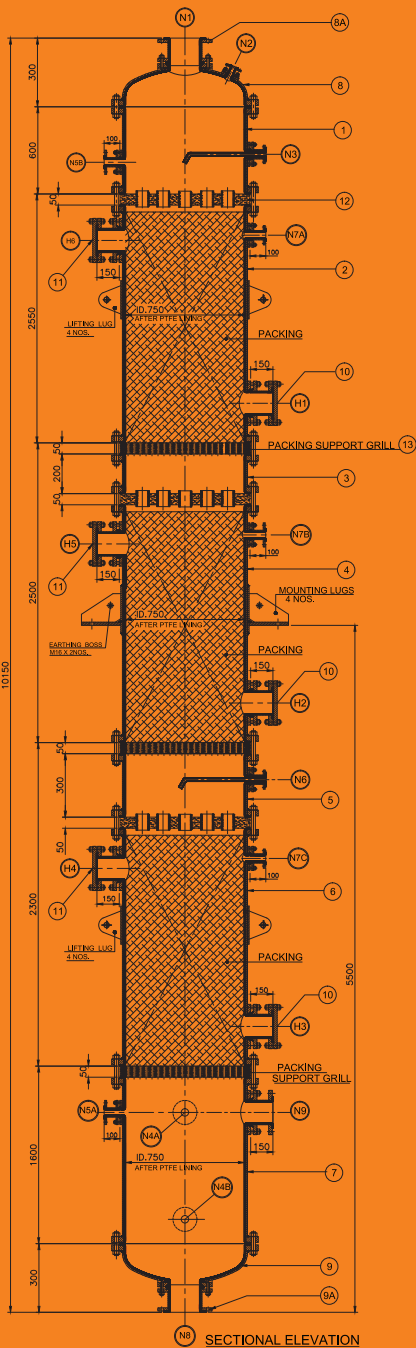
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