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94

## **COVER STORY**

### **Digitization of Process Plants**

K Jayaprakash, Discipline Head C&I, TCE



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**Prasad K Panicker** Director & Head of Refinery, Nayara Energy





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Ravitej PV, Executive Director Refineries, BPCL



**IndianOil Declares** 108 2020 as the 'Year of **Digitalisation'** 



"Management 114 intent in true sense is required for a successful Digital Transformation program"

Manoj Kumar Head of Digitalization, HMEL



"Stakeholder Engagement **Pivotal to** Implement **Effective Digital** Strategy"

Sharad Joshi, Head - Digitalization Smart Manufacturing BASF Chemicals India Pvt. Ltd



**"Digital Transformation: A Change** Intensive **Process**"

Dhruv Jain, Digital and Industry 4.0 Lead, Chemicals Division, Grasim Industries Limited



122

120



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"Solid commitment from all stakeholders and complete executive buy-in is critical"

129



Atul Paranjape, Vice President - Digital & IT, L&T Hydrocarbon Engineering





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**S K Shrivastava (IAS),** Chairman , MPCB, Government of Maharashtra

### In Pursuit of Import Substitution of **135** Agri / Pharma intermediates

Pramod Karlekar, CMD, SFCIPL

## SPECIAL FEATURES

Intelligent Pumps	04
Shankar Jayaram Sr. VP - Sales Development, Grundfos India	
Advance Valves: Top of the League Valves Technology	69
<b>Pranay Garg</b> , Joint MD, Advance Valves	
Fully Equipped to Supply, Support the Customer Demands	73
Claudio Bonafede, MD, Maag Pumps	
Collaborate to Transform New Business Ideas into Products	75
<b>Rajeev Jain</b> , Regional Executive Officer, West Asia & MD, KSB Ltd	
Sealing Solutions for Hazardous Applications	79
Leak-Proof Engineering (I) Pvt Ltd	
Committed to Continually Improve	80
Supporting Valued Customers	
KS Ratra, MD, Norgren India	

## **IMPACT FEATURES**

### McDermott 140 Leading Onshore and Offshore Partner for the Energy Industry **Mettler Toeldo** 143 **Stop Postponing Tank Calibration FEATURES Case Study: Installation of** 36 **SCADA System in North Area Distribution System** Rashid Hussain, Contracts Specialist & Course Director, **3C Corporate Consulting Contracting** Case Studies - Optimizing Duct Layout 50 using Advanced Simulation Technique Amarvir Chilka, Head CFD Modelling, AG Furnace Improvements Ltd **KNOW HOW Selection of Right Fluoropolymer for** 58 **Process Equipment** Firoj A. Mulani MD, Chemitek Process Equipments Pvt Ltd **Five Steps to Effective Predictive** 54 Maintenance Vishal Mehta, Sr.VP- Worley Digital, Pushkar Rao, Head - Worley Data Refinery, Malcolm Werner, Senior Director, **Reliability & Maintenance- Worley NEWS** 16 **PROJECT UPDATES** 34 PRODUCTS 145 **AD INDEX** 48





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## Prestigious George Washington Carver Award Announced for Dr. Pramod Chaudhari



**Pune, India:** Washington D.C.- based Biotechnology Innovation Organization (BIO) announced that Dr. Pramod Chaudhari, founder and executive chairman, Praj Industries, is selected for the prestigious 2020 George Washington Carver Award for Innovation in Industrial Biotechnology and Agriculture. He is the first Indian and second Asian recipient of this global honour

The award is a befitting acknowledgement of Dr. Chaudhari's exemplary leadership and contribution towards building a biobased economy. His entrepreneurial spirit and pioneering endeavours have helped establish a sustainable eco-system in industrial biotechnology. Dr. Chaudhari's tireless efforts in environmental science, bio refining and developing bio-based products that enhance rural economy are seen as furtherance of Carver's legacy.

As awardee, Dr. Chaudhari joins an elite club of renowned industry captains, distinguished professors, accomplished government officials and agri experts around the world. As the highest form of international recognition, it reaffirms India's technology prowess while acknowledging Dr. Chaudhari as the global brand ambassador for the industry.

## Deepak Nitrite Limited recognised as the Best EHS compliant company



Maulik Mehta, CEO & ED , Deepak Nitrite

Vadodara, India: Deepak Nitrite Limited (DNL) was conferred as Best Compliant Company in Environment, Health and Safety (EHS) by Indian Chemical Council (ICC) - the apex national body of the Indian Chemical Sector. ICC announced the prestigious Annual Awards for Excellence in Performance in Various Categories for the year 2020.

Mr. Rajesh Kumar Chaturvedi, Secretary, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Government of India, was chief guest at the virtual event. Mr. Purnendu Chatterjee, Founder & Chairman, The Chatterjee Group, was the guest of honor at the function and presented the award virtually to Deepak Nitrite and all winners.

Awards Selection Committee of ICC studied the nomination received from your organization



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- Chlor-Alkali Industries.
- Phosphoric Acid Plants / Fertilizer Industries.
- Water Treatment, Effluent Treatment / Desalination Plants.

#### **Caustic and Chlor-Alkali Industries :**

*Lebracs Rubber* has from inception been involved in the rubber lining of Equipment's, Pipes, the fittings and other components in Caustic & Chlor Alkali projects.

#### **TYPES OF RUBBER USED:**

Hard Natural Rubber (Ebonite) for HCL Acid Storage Tank, etc., Low Ca, Mg, Si Rubber for Pure Brine Tank, etc., Butyl Rubber for Brine Clarifier, etc.,

#### Fertilizer and Phosphoric Acid Industries:

Rubber lining is widely used in the equipment's in Fertilizer And Phosphoric Acid Industries, where the service conditions Are stringent with elevated temperature of up to 110° C, high Pressure and Vacuum service.

#### **TYPES OF RUBBER USED:**

Triflex Rubber for Flash Cooler, etc., Butyl Rubber for Phosphoric Acid Tanks, etc., Semi Hard Natural Rubber for Pipes, Fittings and Ducts, etc.,

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*Lebracs Rubber* is the only Rubber lining Company in India with a State-of-Art Extruder Machine manufacturing rubber sheet of thickness from 2mm to 10 mm. Extruder rubber sheets have superior properties when compared to Calendared rubber sheets.

*Lebracs Rubber* has over the years been certified under ISO 9001 : 2015 QMS , ISO 14001: 2015 EMS and ISO 45001 : 2018 OHSAS demonstrating the Management's commitment to Quality of product and concern for Environment and Safety.

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for ICC CERTIFICATE OF MERIT for Best Compliant Company for the Codes under RESPONSIBLE CARE for the year 2019. On the basis of the recommendations of the Awards Selection Committee, the Executive Committee of Indian Chemical Council decided to confer the ICC CERTIFICATE OF MERIT for Best Compliant Company for the Employee Health and Safety under RESPONSIBLE CARE for the year 2019.

Speaking on the occasion, **Maulik Mehta**, **CEO & Executive Director of DNL said**: "As a signatory of Responsible Care, Together for Sustainability (TFS) and Nicer Globe, DNL assigns the highest importance of safety, environment and health. Our Company has implemented multiple initiatives to reduce its carbon and water footprint, and has developed value-added chemicals from by-products in its circular economy efforts. With this recognition, we now have greater responsibility towards our people and planet".

## Chembond Water receives 2020 Best Practices Award from Frost & Sullivan

#### Mumbai, India: Chembond Water

Technologies Limited has been recognized by independent global research agency Frost & Sullivan as the "2020 Indian Water Chemicals Company of the Year". With more than 45 years of industry expertise and an extensive product range, Chembond Water Technologies is both a pioneer and a leader in the water chemicals industry of India. With its strong overall performance, Chembond Water Technologies Limited has earned Frost & Sullivan's 2020 Company of the Year Award. The citation goes on to state, "to receive the Company of the Year Award (i.e. to be recognized as a leader not only in your industry, but among non-industry peers) requires a company to demonstrate



Nirmal V Shah, MD, Chembond Water Technologies Ltd.

excellence in growth, innovation, and leadership. This excellence typically translates into superior performance in three key areas demand generation, brand development, and competitive positioning—that serve as the foundation of a company's future success and prepare it to deliver on the 2 factors that define the Company of the Year Award: Visionary Innovation and Performance, and Customer Impact."

"This award energizes us, as it reaffirms our belief in the guiding principles imbibed in our organization by our founder Dr. Vinod Shah. Surely, we owe our success to the support of our valuable customers, and the contributions from our suppliers, partners, employees, shareholders, and directors" states Nirmal V. Shah, Managing Director of the company.

Accepting the award on behalf of the organization, Vinod Deshpande, Director added "We are elated with this recognition as it comes as a result of ongoing research conducted by Frost & Sullivan to identify

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3	Supply Temp. from CT / LTMCS	33°C	30°C
4	Approach to WBT	4°C	1°C
5	ΔT for Chiller	28°C	25°C
6	Chilled Water Compressor Motor Kw		
	for 1200 TR	720	643
7	Energy Saved in %	-	10.7%
8	Energy Saved in Kw	-	77 Kw/Hr
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10	TOTAL POWER SAVED PER ANNUM	-	6,65,280 Kw



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companies that consistently pursue or invest in new technologies, enabling them to serve their customers more effectively and grow above the industry average. This is no ordinary achievement."

## Tata Chemicals awarded for development of indigenous technology

**Mumbai, India:** Tata Chemicals, a leading sustainable and science-led chemistry solutions company, has been bestowed with one of the most prestigious awards in science -ICC Acharya P.C Ray Award for Development of Indigenous Technology for the advancements it has made in nano materials especially, Nanozinc oxide (nZno). This accolade is a science excellence milestone for the Company. Nano zinc oxide is a product of Tata Chemicals' developed with a vision to serve the society through science and offer innovative, scienceled differentiated products and solutions not just to the customers but the nation, at large.

At the virtual felicitation, spoke on the journey of developing the nano-technology, the commercialization and re-directing of the portfolio recently towards the use of nZnO as an ingredient in face masks and PPE's in the fight against Covid-19.

Tata Chemicals' nZnO has been developed using nanotechnology innovations and a patented eco-friendly & sustainable process. The product is free of harmful heavy metal compounds, has antiviral & antimicrobial and UV blocking properties giving required performance at lower dosages which makes it a perfect example of excellent efficiency packed in nano units. Because of its unique properties, Tata Chemicals nZnO is used for industrial, textile and cosmetic applications, including cosmetics, paints/coatings, adhesives, plastics and baby care products.

## Yokogawa Releases CENTUM VP R6.07.10 Integrated Production Control System



## Co-innovating tomorrow™

**Tokyo, Japan:** Yokogawa Electric Corporation announces the release of CENTUMTM VP R6.07.10, an enhanced version of the CENTUM VP integrated production control system. CENTUM VP is a core product of the OpreXTM Control and Safety System family of solutions.

Yokogawa has enhanced CENTUM VP R6.07.10 through the introduction of a unified alarms and conditions server (UACS) that ensures safe and secure operations, even with largescale systems. Based on standard rules, the UACS organizes and consolidates the alarms issued by plant devices so that only the more important alarms are brought to the attention of operators, allowing these personnel to concentrate on monitoring processes and improving overall plant efficiency. Yokogawa has developed the UACS to integrate and manage alarms across large scale systems and thereby ensure that all important alarms are brought to the attention of operators. Enhancements include unified alarm management for large scale systems, Alarm management that drives compliance with IEC 62682 (Ed1, 2014)/ISA18.2-2016 standards

Applications include monitoring of plant operations and management of alarms for automated operations across array of industrial sectors which includes Oil and gas, petrochemicals, chemicals, electric power, pulp and paper, pharmaceuticals, food, iron and steel, water supply and wastewater treatment, non-ferrous metals, metal, cement, etc.

20

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## Grundfos announces organizational changes



Jens Moberg Group Chairman, Grundfos

**Bjerringbro, Denmark:** Grundfos announces the next step in their global transformation to strengthen its position as one of the world's leading water technology companies, pioneering solutions to the world's water and climate challenges and improving quality of life for people.

22

The company is responding to trends in changing customer needs by reorganising for simplicity and speed, and by investing significantly into innovation and digital capabilities. Even though the COVID-19 pandemic has had a significant impact on markets globally in the first half of 2020, Grundfos is making these changes from a position of strength.

The company is organising its sales, marketing, technology and operations functions to serve four different customer segments: Commercial Building Services, Domestic Building Services, Industry, and Water Utility. This creates a more customer centric structure, where the whole value chain is focused on meeting customers' unique needs.

Jens Moberg, Chairman of the Holding Board of Directors, stated: "Our strong performance allows us to make these changes from a position of strength. Now is the right time for us to make the changes to put our strategy into

#### action."

This transformation results in a reduction of approximately 600 employees worldwide. In line with its values, Grundfos will treat its employees with the utmost respect and provide them with support. Jens Moberg, Chairman of the Holding Board of Directors, expressed, "It will be very sad to see some of our colleagues leave us at this pivotal time, and I would like to thank everyone for their hard work and loyalty. We will make sure to care for them as they have cared for us and our customers during their time with Grundfos."

"I am proud of the company we are today, built by Grundfos people on the firm foundations of the Poul Due Jensen family. Since the birth of the business back in 1945 we have changed many times to ensure our success. Now is no different, we are taking these important moves to proactively put our strategy in to action and better fulfil our purpose."

## Stress Engineering Services, Inc. launches new Digital Solutions Group

Houston, USA: Stress Engineering Services, Inc. (SES), the global leader in consulting engineering services and solutions, has launched its new Digital Solutions Group. The aim of the new group is reduce energy industry clients' costs and manage risks through best-in-class digital technologies. By utilizing SES's significant resources in physics-based engineering and subject matter expertise, unique sensor and software technologies will be developed and integrated with existing client Enterprise Resource Planning (ERP) and Product Lifecycle Management (PLM) systems to enable intelligent decision-making.

The Digital Solutions Group will be led by Daniel Kluk, reporting to Kenneth Bhalla,

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and will combine SES's technology portfolio of asset monitoring systems together with predictive data analytics and Internet of Things (IoT)/Industrial Internet of Things (IIoT) ecosystems to provide real-time, physical insight to client operations. The enhanced level of services will benefit energy industry stakeholders responsible for identifying and managing risks and reliability at asset and system levels.

Organic Personal Care Market Size to Reach USD 27,276.5 Million By 2026

According to a new report published by Polaris Market Research the organic personal care market is anticipated to reach over USD 27,276.5 million by 2026. In 2017, the skin care segment dominated the global market, in terms of revenue. North America is expected to be the leading contributor to the global market revenue during the forecast period.

A significant increase in disposable income,
 changing lifestyles, and initiatives by market players to promote natural and organic personal care products drive the growth of this market. Other driving factors include growing inclination towards use of natural and organic products, and increasing awareness regarding use of chemical free personal care products. Increasing demand from developing nations is expected provide numerous growth opportunities to the market players during the forecast period.

There has been a shift towards e-commerce and consumers are increasingly purchasing organic personal care through online platforms. The variety of choices available coupled with ease of purchase offered by online platforms encourages consumers to buy organic personal care products online, supplementing the growth of the market. Improvement in lifestyle due to rise in income level, especially in the developing countries of Asia-Pacific fuels the demand for organic personal care market. Factors such as increase in per capita income and changes in consumer behavior are expected to accelerate the adoption of organic personal care in the coming years.

North America generated the highest revenue in the market in 2017, and is expected to lead the global market throughout the forecast period. The increasing geriatric population in the region coupled with high disposable income drives the market growth. The increasing demand of organic personal care in the region is owing to high consumer awareness regarding the benefits of natural and organic personal care products and rising environmental concerns. Asia-Pacific is expected to grow at the highest CAGR during the forecast period owing to increasing disposable incomes in developing countries of this region, and rising awareness.

The different types of organic personal care products available in the market include skin care, hair care, oral care, cosmetics, and others. In 2017, the skin care segment accounted for the highest market share. Use of organic skin care products offers benefits and reduces the risk of skin irritations and allergies. Growing awareness regarding use of natural ingredients in skin care products is expected to support market growth during the forecast period.

## Thyssenkrupp Inaugurates New Engineering Office in Pune

**Mumbai, India** : The thyssenkrupp group inaugurated its new engineering office in Pune. The new office of thyssenkrupp Industrial Solutions (India) Pvt Ltd, amongst the leading

engineering companies in India for chemical plants and projects was inaugurated by Dr Sami Pelkonen, CEO thyssenkrupp Business Unit Chemical & Process Technologies



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Germany (tkISCPT) and P D Samudra, CEO & MD and Member of Board, thyssenkrupp Industrial Solutions India.

Speaking at the virtual ceremony of the inauguration of the new office, Dr Pelkonen said: 'The thyssenkrupp group is a well-known name in India. Its India operations have been a unique success story over four decades in the chemical process sectors. thyssenkrupp Industrial Solutions India is also the largest subsidiary of thyssenkrupp Industrial Solutions - Chemical Process & Technologies globally, and is playing a very important role for a wide variety of Indian and international projects covering Fertilisers, Polymers, Petrochemicals, Refinery units, Electrolysis, Cryogenic Storages etc. in the Chemical Sectors and Plants for Metallurgical sectors etc. Its track record of 750 plus of large, medium and small size projects in India and abroad coupled with the professional relationship it has with its Customers, makes it a jewel in the crown of thyssenkrupp Industrial Solutions Chemical & Process Technologies. Our ultramodern engineering office will continue to provide world class services to our Indian as well as foreign customers. The new office will accommodate approximately 350 engineers out of the total strength of 1,400 employees of thyssenkrupp Industrial Solutions India.

P D Samudra said, "Today is an important milestone in the history of our organisation. In addition to our initiatives at our Head Office in Mumbai, we had made a small beginning with our Pune operations in 1997 at Bibwewadi on the outskirts of Pune City with less than 50 engineers. This means we are relocating our Pune office after growing steadily over two decades. Our Pune Operations have been independently executing projects with minimum support from our Head Office in Mumbai and have several successfullyimplemented projects to their credit. They have implemented EPCM services as well as EPC projects in the past 20 years. We very much look forward to continuing to serve our valuable Customers from our new set up in Pune."

## CHD Chemicals Announces Excellent Q1 Results

**Chandigarh, India:** BSE listed CHD Chemicals Ltd., a chemicals and dyes manufacturing, trading, and distribution Company has announced excellent unaudited financial results for the quarter ended 30 June 2020, wherein the Company's turnover stood at Rs. 4.74 Cr. and the profit increased from Rs. 12.84 Lakh (Q1 19-20) to Rs. 22.96 Lakh (Q1 20-21), which is an 80% increase. The EPS almost doubled from Rs. 0.12 (Q1 19-20) to Rs. 0.23 (Q1 20-21).

The company had recently announced that it had received a Rs. 56 Cr. export order. The company is expanding its business throughout the region of South East Asia and for the same purpose the company has formed associations with the leading group of the same region. This order can be a game changer for the company. This huge order will help the Company in establishing its foot base in the Global Market and will help in increasing turnover as well as profitability.

The Company is engaged in industrial chemicals and dyes for textiles industry, leather and paper industries and also construction chemicals. The Company offers a range of products, which include Auxiliaries: dyeing; Easy Care Finishing; Finishing; Flame Retardant; Auxiliaries: optical Brightener; Pigment printing; Water Repellent; Acid Dye; Direct Dye; Ink for Digital printing; Vat Dye; Antifoaming Detergent and Basic chemicals.





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## AVEVA Conference Highlights Key Technology Trends

Oil Company (ADNOC), Wood PLC and DCP Midstream participating alongside Craig Hayman, CEO of AVEVA – emphasized how technology is playing a vital role in achieving



real-time optimization and improving decision making, digitally enabling business operations, supported by an often remote workforce to drive substantial cost reductions.

Craig Hayman, CEO of AVEVA, kicked of the panel sessions by emphasizing the massive opportunity for digital transformation for the industrial sector, which has traditionally been underpenetrated by digital technologies. He commented: "Digital Twin, AI and Cloud are improving collaboration

Mumbai, India: Industrial organizations are opting for Cloud, Digital Twin, Artificial Intelligence (AI) and automation technologies to address the complexities of today's challenging macro-economic environment, according to AVEVA, a global leader in engineering and industrial software. At a recent virtual press panel, hosted by the company and moderated by Craig Resnick, Vice President, Consulting, ARC Advisory Group, industry leaders exchanged views on how industrial organizations are innovating using technology to maintain business continuity and drive better supply chain and production planning. This is turning challenges into opportunities to increase productivity and profitability, especially when it comes to improving supply chain inefficiencies and driving sustainability initiatives.

The panel, which comprised senior representatives from three leading energy sector organizations – The Abu Dhabi National and accelerating autonomous projects across the globe. To enable digital resiliency and long-term sustainability, organizations need to bring together the connected workforce with Cloud, Big Data and Edge capabilities. There are new pressures and opportunities, but ultimately one digital imperative."

The need for remote monitoring and control of operations in engineering has driven the uptake of new tools, such as augmented and virtual reality, to supplement the remote experience and connect workers in the field, on-prem and working from home. Digital Twin technologies in the Cloud have witnessed one of the fastest growth trajectories among the transformational tools piloted or adopted during the pandemic, with remote engineering design and build, as well as remote operate and maintain, cited as drivers for this acceleration. The collective group also agreed that while many investments in digital technology may not have had clear-cut business cases pre-pandemic, for example,



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connected workers could have been perceived as a non-essential, and this has all changed. "Organizations that didn't take going digital seriously before, are doing so now," said Dr. Alan E Nelson, CTO at ADNOC.

Craig Hayman, CEO, AVEVA concluded, "As the post pandemic world returns to a new normality, I urge industrial organizations to seize the opportunity to maximize the benefits of creating a more agile, resilient business and exploiting the many advantages that emerging new technologies can offer. Organizations that are waiting for the future need to wake up to today's reality and understand that the future is here now and that digital transformation investments that are made today will determine the continued success of their operations moving forward."

## U.S. based Galata Chemicals invests INR 180 Cr in India

30

Southbury, USA: Galata Chemicals, a leading global producer of plastic additives, has earmarked over INR 180 Crs, as an investment towards the plant, which is spread over 64 acres for its newest Tin Stabilizer production facility commissioned in Dahej. This facility will produce Methyl, Butyl, and Octyl Tin Stabilizers, further expanding the global reach of its Mark® Tin Stabilizer portfolio. With products already commercially approved by several leading PVC and CPVC processors, this new facility is well positioned to serve both the domestic Indian market as well as international sectors. This investment offers a completely Lead-free sustainable solution on sensitive applications like water pipes. These would also support NGT directive to MOEFF to publish draft notification to finalize new standards for PVC Pipes. Tin Stabilizers & Intermediates will be supplied to clients manufacturing PVC and CPVC pipes, fittings, medical film and a wide array of other potential applications where lead is primarily used as stabilizers.

Galata's first plant in India was commissioned

in 2015 at Vapi for the production of Mixed Metal Stabilizers and their clientele includes global leaders in vinyl compounds, topnotch and highly reputed manufacturers of pipes, fittings, cables, medical films, vinyl sheets and artificial leather. "The product validation by our customers was a crucial step in making the decision to forge ahead with capital investment despite challenging market conditions driven by the COVID-19 pandemic. This expansion demonstrates Galata's commitment to the Indian and global Vinyl Markets," said Drew Clock - EVP, Galata Chemicals Global Group. This will be Galata's fourth Tin Stabilizer facility after Taft (Louisiana, USA), Bradford (Ontario, Canada), and Lampertheim, Germany. Additionally, the site will begin production of Tin Intermediates including Tetrabutyltin (TBT), a precursor to Butyl Tin Stabilizers. "Producing the final product is only one part of the story. Backward integration is the keystone to longterm manufacturing and commercial success. This is the next stage of Galata's evolution and will not be the last," said Drew Clock.

Used in a wide range of applications including PVC Pipes and Fittings, Sheet Extrusion, and Injection Molding, Mark<sup>®</sup> Tin Stabilizers have led the industry in quality, value, and performance for decades. The newest investments in India will serve the existing Tin Stabilizer Vinyl markets as well as focus on providing lead-free solutions in order to meet stricter regulatory requirements.

Aspen Technology Begins Journey toward the Self-Optimizing Plant for the Refining Industry

Bedford, Mass: Aspen Technology, Inc. announced the new release of Aspen Unified<sup>™</sup> to deliver the next generation of production optimization solutions that will transform business processes for the world's refineries. The Aspen Unified solution brings planning and scheduling together in one environment to connect and automate isolated processes, maximize the yield of high value products, push closer to limits and drive improved margins. Through a unified and visually



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intuitive flowsheet interface, a refinery's planning and operations teams can easily build and sustain models as well as gain a more accurate view of current performance and plant constraints.

The Aspen Unified solution is built to reduce margin leakage across the different operational silos and to improve consistency in modelling data between planning and scheduling. With AspenTech's dynamic optimization technology—Aspen GDOT<sup>™</sup>— Aspen Unified aligns plant operations with economic conditions to achieve production optimization in real time. Aspen Unified helps operations to better achieve the goals of the refinery, including safety and environmental targets, as well as financial and production KPIs. Aspen Unified is the first step in realizing the vision for the Self-Optimizing Plant.

AspenTech defines the Self-Optimizing Plant as a facility that can automatically respond to changing operating conditions.

32

respond to changing operating conditions. AspenTech is creating industrial applications that can bridge functional silos and adapt to maintain the high levels of efficiency semi-autonomously. A refinery (or refineries in the case of Aspen Unified PIMS with Multisite option<sup>™</sup>) that implements Aspen Unified to align planning and scheduling and with closed-loop automation systems such as advanced process control (APC) and dynamic optimization, can begin to drive higher efficiency from its operations. They will become more capable, more agile, more flexible, safer and more profitable, under all market conditions.

## ARC's 18<sup>th</sup> India Virtual Forum Discusses the Digital Transformation Journey

**Bangalore, India:** ARC's 18th India Forum titled Driving Digital Transformation in Industry and Cities on September 8-9, 2020 was a virtual event and attracted over 300 delegates. The pandemic has dramatically changed how we communicate and collaborate globally. For the last several years, the core theme across all ARC global forums has been digital transformation. And on this journey we've moved to the next level of discussing how digitalization can help industries and cities grow in a secure, collaborative environment.

This two-day virtual forum provided end users, solution providers and decision makers an opportunity to learn from each other and get an overall view of the market and its requirements. Typically, the India Forum attracts a large number of end users. This time too, we had many end user attendees and high profile speakers from companies, such as Reliance Industries, Petroleum Development Oman, DCM Shriram, Tata Steel, Tata Consulting Engineers, Ace Micromatic MIT, Haldor Topsoe, NTPC, and industry bodies like NASSCOM. Speakers from the supplier side brought in their customers, highlighting case studies. The welcome address by G. Ganapathiraman, Vice President and General Manager, ARC Advisory Group, India set the tenor for the keynote presentations.

The success of our forum is largely due to the tremendous support we received from our suppliers, industry association, and media sponsors which included - Platinum Sponsors, Bentley Systems and Uniper; and Global Sponsor Siemens; and ODVA and PLCopen industry association sponsors. And A&D, AutomatedBuildings.com, Chemical Engineering World, Chemical Industry Digest, Chemical Today, Control Engineering, EM, Highways Today, Industrial Automation, Offshore World, Reliabilityweb.com, Uptime, and World of Chemicals as media sponsors

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## IndianOil to Invest Rs 1268 Cr. for Grassroot Needle Coker Unit at Paradip Refinery, in Odissa



New Delhi, India: The IndianOil board
 has cleared the Stage-1 approval to install a Grassroot Needle Coker Unit at Paradip Refinery using IndianOil R&D's in-house technology. The proposed unit will have a Calcined Needle Coke (CNC) production capacity of 56 KTPA. The estimated project cost is Rs. 1268 Crores.

With the production of CNC, IndianOil shall enter this niche product segment for the first time. CNC is used to produce Graphite Electrodes for deployment in the high temperature (2800 degrees Centigrade) electric arc furnaces of Steel Industry.

Mr S M Vaidya, Chairman IndianOil, said "This Needle Coker Unit is yet another significant step by IndianOil towards de-risking the uncertainty in the POL business. The proposed Unit will enhance the Refinery Gross Margin and will also demonstrate IndianOil's capability of supplying indigenously licensed technology in the niche product segments".

Presently the entire Needle Coke requirement of the country (80 -100 KTPA) is met through imports. Production of Needle Coke at Paradip Refinery will reduce import dependency and would contribute to the vision of Atmanirbhar Bharat.

Needle coke is a substitute for natural graphite and offers higher quality consistency. With these technological advancements, Needle Coke is now used to make the carbon anode of Lithium-ion Batteries. As Electric Vehicle (EV) transportation is emerging as a viable option, the production of Needle Coke (Anode for Li-ion battery) would add to the quest for self-reliance in India. This Project can also be replicated, at other Indian Refineries that process low-sulphur-feed in FCCU/RFCCU/INDMAX type of units as a GRM improvement initiative.

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## **Case Study: Installation of SCADA System in** North Area Distribution System

he Contractor shall perform the Services to carry out installation of SCADA System in North Area Distribution System in safe and harmonious condition. The scope of work shall include but not limited to the following:

## **Fresh Water Line Modification**

The Contractor shall perform the installation and operations of SCADA System in North Area Distribution System at specified onshore concession area located in the ex-Neutral Zone between Saudi Arabia and Kuwait. The Contractor to perform final installation and successful training to company personnel accordingly. The Contractor shall perform the Service in cooperation with Client's personnel and its other contractors at the Company site. The above Scope of Service shall include:

**Brief Introduction:** The purpose of this Scope of Work is to outline the general requirements modification and rearrangement of fresh water distribution line system, in Company premises. The intent of this work is to have enough supply of water going to new pump house. The new water supply and related materials shall be constructed in accordance with the approved drawings and applicable Codes and COMPANY Standards and Drawings.

The construction of new 10 inch water supply shall include but not limited to the following:

- New Remote Terminal Unit (RTU) System shall be installed locally at North Area fresh water distribution system for remote control and monitoring of the field instruments associated with the fresh water distribution system at North Area. The new RTU System will be installed indoor in controlled environment within the North Area Fresh Water Distribution System Control Room.
- The new RTU System shall be provided with sufficient number of communication ports for serial


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interface with the other systems.

- Install new Remote Terminal Unit (RTU) System interface with the Supervisory Control and Data Acquisition (SCADA) System at the North Area fresh water distribution system Control Room. Propose an integrated SCADA and RTU System as one fully functional unit that meets or exceed the requirements.
- The new RTU System shall be non-proprietary and supports open standards of connectivity without the need of other additional interface components.
- Installation of new 10" RTR (tie-in 002) from the existing 12" dia. Valve Box going to new 16" Header (tiein 001) and route it near Tank 53. See reference dwg. no. KA-052565 sh.001 rev.B.
- Installation of new 10" RTR from the existing 12" dia. Suction line near water distribution office (tie-in 003) and interconnect it to the new RTR pipe from new 16" header & going to new pump house. See reference drawing nos. KA-052565 sh.001 rev. B
- Excavation, backfilling and restoration works:
  - Project Summary

- General Requirements
- Contractor Responsibility
- Project Management & Control Requirements
- Quality Assurance & Quality Control
- Applicable Documents
- Project Design Documents
- Codes & Standards
- Detailed Engineering & Design
- Construction & Commissioning
- Phase-600 Piping
- Phase-900 Painting and Coating Works
- Codes, Standards, Drawings & Specifications
- Relevant Standard
- Standards & Codes
- Company Engineering Standards, procedures and GI's
- Company Materials System
   Specifications
- Company pre-commissioning forms
- Company Standard Drawings
- Special Requirements
- Test & Commissioning
- Clean-up
- As -Built Drawings
- The necessary Drawings are included to help and assist contractors. Contractor has to develop or acquire additional drawings required to complete the



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project, i.e. fabrication drawings, vendor drawing details, etc.

- The necessary piping material specifications are attached which includes in detail:
  - Introduction
  - Standards & Codes
  - Field Definitions
  - Line Class Index & Class References
  - Line Class Service Conditions
  - Conclusion
  - Branch Connection
  - Necessary Attachments of Drawings
- 40 This document defines the

general data to be used for the Engineering and Construction aspects of the Project including detailed:

- Site Data & Environmental Conditions
- Ambient Temperature for
   Outdoor Equipment
- Ambient Temperature for Indoor Equipment
- Relative Humidity
- Units of Measurement
- Utilities
- Electricity
- Cooling Water System
- Fresh Water

#### The following constitutes the Critical Milestone Dates, as referenced in Schedule "B".

No	Milestone Event	Calendar Days from commencement date (or otherwise stated)
1	Submission of Work Schedule, Organization Chart and Work Procedures	Within 14 days
2	Submission of shop drawings and Technical Submittals	Within 30 days
3	Completion of Mobilization	Within 30 days
4	Start of Construction Activities	Within 30 days
5	Start equipment installation	Within 60 days
6	Test on Completion	Within 240 days
7	Project Time for completion	Within 270 days
8	Completion of Demobilization (if located within Company's premises)	Within 30 days after the expiry of Work period

Note: Bidder shall also add other milestone events considering the payment terms.







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nhause

### Technical Evaluation Summary Sheet of Each Bidder Name of Bidder: XXXXXX

Description	ITB Ref	Criteria	Max.	Breakdown		Result
Decord of		Minimum five (5)		More than 10 years	10	
Experiences	ITB 4.3.7	years of experience in the similar type	10	5 to 10 years	8	
		of projects		Less than 5 years	4	
Mobilization/	ITB	Mobilization period	10	Bidder's Work Schedule	5	
Work Schedule	4.3.6	not to exceed two (2) months.	10	Manpower Histogram	5	
List of Key Personnel	ITB	Subject to	10	List of Key Personnel	5	
	4.3.8	specified in ITB		With attached CV	5	
Organization Chart	ITB	Subject to requirements	5	Organization Chart	5	
	4.3.9	specified in ITB				
				Equipment Listed	5	
List of Equipment	ITB 4.3.10	Subject to requirements specified in Schedule G	15	Equipment Owned	5	
				Model & Age of	5	
				Equipment Owned/hired		
List of Sub	ITB	Subject to	10	Sub Contractors (Below 5)	10	
Contractors	4.3.11	specified in ITB		Sub Contractors (Above 5)	5	
Health, Safety &	ITB	Subject to	10	Health & Safety Plan/	10	
Program	4.4.12	requirements specified in		Environment Plan		
		Schedule D				
Quality Assurance &	ITB	Subject to	10	Quality Assurance Plan &	10	
Quality Control	4.3.14	requirements specified in		Quality Control Plan		
(QA/QC) Plan		Schedule Q				
Summary of	ITB	Subject to	20	Summary of Work Plan	20	
Work Plan	4.3.15	requirements specified in				
		Schedule B				
Total			100			
Result						







Head office and Manufacturing - 1

SHRIDHAN Automation Pvt. Ltd # B-54, KSSIDC Industrial Estate, Kumbalgodu, Mysore Road, Bangalore-560074. India

#### Manufacturing - 2

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Excellent	Of a high quality or standard
Average	Not poor, but not an excellent quality or consistency
Poor	Not of good quality or consistency

The pass mark for the technical evaluation will be set at 70%. The above rating scheme will be used to evaluate the proposals.

Concurrence					
User Manager	Contracts Manager				
XXXXXXXXXXXXXX	XXXXXXXXX				
Date:	Date:				

44

### Summary - Commercial Evaluation Worksheet

ltem	Activity Description	Original Co Estimate (US\$)	Revised Company Estimate (US\$)	Bidder1	Bidder2	Bidder3	Bidder4
A	Total Lumpsum of Item A (Instrumentation)	1,60,187	3,48,597	3,48,597	3,18,731	2,83,426	6,57,894
в	Total Lumpsum of Item B (Electrical Works)	93,654	93,274	93,274	1,81,252	2,80,432	3,11,478
с	Total Lumpsum of Item C (Communication)	34,445	22,734	22,734	24,840	82,147	1,87,621
D	Total Lumpsum of Item D (Piping)	97,714	52,213	52,213	1,64,200	1,79,593	1,82,327
	Net Price items (A+B+C+D)	3,86,000	5,16,818	5,16,818	6,89,023	8,25,598	13,39,32 0
	Sundries		59,982	0	0	0	0
	GRAND TOTAL		5,76,800	5,16,818	6,89,023	8,25,598	13,39,32 0
	% Difference w.r.t Co-Estimate			34%	79%	114%	247%
	Rankings			1	2	3	4





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#### Notes

- TRT observed that the lowest Bidder1 Proposal is 34% more than Company estimate.
- The Company Estimate/Budget was made in the Year 2009 and the issuance of Tender was made in the year 2011; there is a cost impact due to the escalation of Material & Labor cost.
- Bidder 1 is the lowest bidder amounting to USD 516,818.00 which is 34% above Company initial estimate. In order to facilitate contract award, the Authorization For Contract was revised to USD 576,800.00
- TRT recommends contract awarding to the lowest bidder1 with contract price of USD 516,818.00.

User Dept.	Contracts Dept.
Date:	Date:

Aco	counts Dept.
Date:	



### Author

**Rashid Hussain** Course Director, Lead Tutor & Senior Contracts Specialist

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### AD INDEX

Company Name	Page No.
AAA Industries	47
Aanuraj Fasteners Pvt Ltd	
ABSR Engineers & Services Pvt Ltd	
Advance Valves	
Atomic Vacuum Co (Exports)	4
Chemitek Process Equipments Pvt Ltd.	2
DelVal Flow Controls Pvt. Ltd	7
Edwards India Pvt Ltd	5
Fluid Controls Private Limited	
Fluidhydro Systems Pvt Ltd	
GMM Pfaudler Ltd	
Hi-Tech Applicator	Front Cover
Horizon Polymer Engineering Pvt Ltd	14-15
Indo Seals Pvt Ltd	
Integral Process Controls (I) Pvt. Ltd.	27
Komal Scientific Co	
LeBracs Rubber Linings Pvt Ltd	
Mettler-Toledo India Pvt. Ltd	9
Mist Ressonance Engineering Pvt Ltd	
Nord Drivesystems Pvt Ltd	
PROTEGO India Private Limited	
Samson Controls Private Limited	
Shridhan Automation Pvt Ltd	
Unique Dosing Systems	
UNP Polyvalves	41
Vacuum Drying Technology India LLP	21
Vin-Tec Engineers	



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### Case Studies - Optimizing Duct Layout using Advanced Simulation Technique

50

low of flue gas and air is very common in all the Chemical engineering processing units. In general,

circular, or rectangular ducts are widely used for the transport of fluids from one unit to another. The crucial parameter that governing the fluid flow is pressure drop across the duct. It is important to optimally utilize the available pressure such a way that the maximum throughput for the complete system is realized. Centrifugal fans are the most common source for making available the required pressure for the complete system.

Non-uniform velocity profile at the fan inlet reduces fan performance and increases power consumption. It is always recommended by the fan manufacturers to maintain uniform velocity profile at the suction of the fan. A uniform velocity at the fan inlet ensures efficient operation of the fan.

If the fan operates optimally and generates required pressure for the system. Another aspect that needs to be evaluated is the pressure drop across various units and duct sections. If any unit or a duct section consumes higher pressure than design. This will limit the operating capacity of the system. The design of duct layout or manifolds needs to be reviewed to check if the pressure drop is within the allowable limits. These manifolds are used to distribute the flow from one stream to multiple streams. The flow needs to be distributed equally across all the streams.

To optimize design of duct, require the following specific design considerations:

- Achieving uniform flow profile at the fan inlet
- 2. Identify duct sections which could have higher pressure drop
- 3. Achieve uniform flow distribution across all the streams of manifold

Conventional empirical correlations and design standards developed for simple geometries are used to design the duct layout. In many practical situations either due to space limitations or other constraints. Duct layout may not be optimum which leads to higher pressure drop and non-uniform velocity distribution.

The advancement in modelling techniques enables us to design the duct layout and internals. Computational Fluid Dynamics (CFD) is an advanced simulation technique. It is widely used to evaluate and improve designs for Aerospace, Automotive, Chemicals, Pharma, Energy industrial applications. CFD is regularly used to evaluate existing duct layouts and provide recommendations to improve flow and reduce pressure drop.

In this article three case studies are discussed which have been implemented successfully.

## Case Study 1: Uniform velocity profile at ID Fan Inlet

One of our refinery clients had issues with ID fan performance. It was limiting on the capacity for the flue gas throughput. The duct layout at the ID Fan suction was evaluated. There was a sudden 90° bend just upstream of the fan inlet. This caused high pressure drop and non-uniform velocity profile



Pressure contours for Existing and Proposed Duct

at the fan inlet. CFD simulations were carried out to understand the existing duct layout. A sharp 90° bend and the duct connection to fan resulted in non-uniform flow and high pressure drop. Multiple design modifications were evaluated. The duct layout was optimized along with internal turning vanes. A uniform velocity profile and reduction in pressure drop were achieved.

The following images compare the existing and proposed duct layout. The pressure contours show a reduction in pressure drop for the proposed duct layout. There was a reduction of 12 mm WC pressure for the proposed duct.

### Case Study 2: Reducing pressure drop in duct

52

In this project there was a duct connecting to the stack for the exhaust of flue gases. The duct connection had issues in velocity distribution and high pressure drop. With suitable modifications in the duct layout and using internal vanes, the velocity distribution was improved and considerable reduction in pressure drop was achieved. Pressure drop in the proposed duct modification was reduced by 18 mm WC. Below are the images showing velocity distribution for existing and proposed duct configurations.



Velocity contours for Existing and Proposed Duct

### Case Study 3: Achieving uniform Air Flow distribution Across All Burners

This project was for one of our refinery clients. It is a Coker Heater which has multiple cells, burners were placed is rows. Each row has 14 burners. Manifolds were used to distribute air flow across all the burners. In the existing manifold configuration few of the burners were receiving much less air flow. This impacted the burner operation. In this project, some geometrical modifications were done

**FEATURES** 



Comparison of mass flow deviation for Existing and Proposed Ducts. Path lines showing the complete duct configuration

internal in the duct by adding baffle plates.

In the existing configuration, the first burner was receiving less flow. It had about 16% less air flow than the average flow. For the proposed configuration mass flow deviation across all the burners was less than  $\pm 2\%$ .

Below is the image presenting the comparison of mass flow deviation for existing and proposed configuration.

All the above three projects have been successfully executed by Furnace Improvements Services. The performance of the system was enhanced. It allowed to increase the throughput and overall efficiency of the system.





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53

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### Five Steps to Effective Predictive Maintenance

Imagine this. Your maintenance work orders are automated. Unplanned outages have plummeted. And your equipment is telling you what its maintenance and turnaround needs are.

It's the ultimate goal for many operators. And advanced Predictive Maintenance (PdM) like this is now becoming a reality thanks to digital enablers, such as the Industrial Internet of Things (IIoT) and 5G that support massive machine-type communications (mMTC) and Ultra-Reliable Low Latency Communications (URLLC).

But value from PdM doesn't happen instantly. To successfully capture value, organizations must manage its path through three fundamental levels: people, process and data.

To achieve this, organizations can consider a five step process:

#### Step 1: Organize your data

Processes are determined by data. That's why a robust data creation and governance model is critical for advanced PdM. Most organizations have systems in place to record data, but it may not be in the most useful format. For example, the data could be stored in multiple systems, be handwritten or in spreadsheets, or



Figure 1: Five steps to maximize value from advanced predictive maintenance (PdM)

simply not available for analysis.

Integrating data from multiple sources into a single platform – often called a data lake – is what drives digital transformation. For example, real time streaming data from equipment, combined with industrial control systems data and Computerized Maintenance Management Systems (CMMS), can provide insights into failure root causes. It can completely transform organizations who are dependent on traditional linear data and analysis by giving a complete picture of how assets are performing.

Step 2: Bridge the physical-digital divide

Once the data lake has been established,

**KNOW HOW** 

physical assets can be digitized to create a digital model of the physical asset – a digital twin. This integrates asset information into a structured information model spanning engineering, maintenance, operations and the supply chain. It provides an immersive interface for users to access, navigate and engage with asset information.

Digital twins improve the speed and quality of decision making across the organization by providing the right information at the right time.

It can have wide-reaching implications to the way work is managed and delivered. For example, a large energy company recently utilized a digital twin during the construction and commissioning work on its project development in europe. The learnings and insight they gained during this phase is expected to improve future asset support and maintenance scopes. Many tasks historically conducted offshore will be possible to complete onshore, saving both time and cost.

#### Step 3: Prioritize your critical assets

Organizations need to prioritize and determine the right asset maintenance strategy and process for their operation. Creating a PdM for an entire asset is a daunting task. It could even increase the potential for management paralysis, or poor quality of analysis and decision making, as a result of information overload. That's why it's important to identify what's critical and target the equipment could lead to potential catastrophic unplanned outages.

Central to asset management is knowing the current health of an asset and estimating its remaining useful life (RUL). Each asset has a functional specification, which identifies the function that the asset must perform to achieve the desired results. Engineers often look at RUL in terms of the potential failure to functional failure (P to F) curve.

The potential failure curve illustrated below plots condition versus time. As time goes on, without intervention, the costs of repair go up. If a decision is made to repair equipment, this will extend its life. Or, if the equipment is replaced, the P to F curve restarts. This is illustrated below. The goal is to have a predictive system to determine asset health and allow for early intervention before the asset function degrades.

### Step 4: Optimize your maintenance programs

But how do organizations set up a predictive system to monitor asset health? Once a list of assets is created (e.g. an asset registry) in a format that meets the intent of ISO 14224, the criticality and risks for each asset can be determined by performing a Failure Mode Effect Criticality Assessment (FMECA). The FMECA identifies which assets are critical to the success of the plant based on an



Figure 2 - The potential failure curve

56

agreed criteria. For each critical asset, the potential failure modes are identified. Guidelines for risk assessment and asset management are defined by ISO 31000 and ISO 55000.

For the failure modes that can be detected early, the required data and associated sensors are selected. Those that can't be easily detected may require physical inspection or prescribed component replacement.

Maintenance processes can be optimized considerably once PdM is implemented and time to decision and action is much quicker. It's important to ensure that processes are streamlined, and operators are trained to understand the value PdM brings and act on it quickly. The juxtaposition of performance and effectiveness metrics of each equipment and real time streaming data and advanced analytics, provides unique insights that render traditional processes obsolete.

### Step 5: Establish the right network architecture

Most assets have wi-fi networks that operate as a process control network that's local to the asset. However, while keeping the asset data local provides maximum security, it also creates challenges with leveraging the critical PdM technologies like cloud computing, data lakes, native cloud applications and data visualization. Therefore, cybersecurity is an important consideration.

Private Long-Term Evolution (LTE) and private 5G networks are ubiquitous and can achieve this balance. The mMTC and URLLC provide the backbone for connected industries and automation by providing instant information from equipment, while providing unparalleled network uptime and reliability.

In addition, connected assets also provide the opportunity for machineto-machine communications, allowing operators to optimize operations with real time upstream and downstream data, as opposed to looking at equipment and processes in isolation.

# IIoT and the implementation of digital technology can be overwhelming. But, it doesn't need to be.

It's clear that digital technologies promise big changes and opportunities for industry. And with such a prize at stake for those who can effectively embrace them, it's right that organizations should think big.

Determine what success looks like for your operation. Audit your data and core process. And identify labor intensive or hazardous work tasks to paint a clear and honest picture of your current state. If your data isn't good enough for what you need, then invest in building a data infrastructure that's fit for purpose and capable of supporting advanced data uses. Consider your costs: hardware, software, installation and training. Understand your burdened labor cost for technicians and support people. And know the value of your product and on schedule delivery.

Digital technology moves on at a rapid pace and organizations can become overwhelmed, paralyzed or lose touch with the core benefit. Implementing it needs to work with the organization rather than against it. Start small and move fast, but always with the bigger goal in mind.

Digital technology alone only goes so far to help organizations reach the much desired 'future state' of PdM. To capitalize fully on digital technology, organizations should follow a structured roadmap – such as this five-step process – invest in change management and engage with trusted and experienced partners. Failure to do so could cause technology to miss the mark, changes won't stick, and opportunities could be lost. ■

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### Fluoropolymer for Process Equipment

A fluoropolymer is a fluorocarbon-based polymer with multiple carbon-fluorine bonds. It is characterised by a high resistance to solvents, acids, and bases. The best known fluoropolymers are Teflon® PTFE (Polytetrafluoroethylene) & Kynar® PVDF . Fluoropolymers are ideal for processing equipment because of their excellent chemical and thermal resistance. Their molecules have continuous nonreactive surfaces and are compatible



with virtually all chemicals and solvents. These are far more resistant to chemical attacks than conventional chlorinated and hydrocarbon polymers and have far higher service temperatures. PTFE (Polytetrafluoroethylene) is the first Fluoropolymer, discovered by DuPont in 1938. There are several materials in the Fluoropolymer family. Table 1 has generic and trade names of some of the fluoroplymers.

Generic Names	Trade Names
PCTFE	Kel F <sup>®</sup> , Aclon <sup>®</sup> , Voltalef <sup>®</sup> , Daiflon <sup>®</sup> , Neoflon <sup>®</sup> , Aclar <sup>®</sup>
ECTFE	Halar <sup>®</sup> , Vatar <sup>®</sup>
EFEP	Neoflon®
ETFE	Tefzel <sup>®</sup> , Aflon <sup>®</sup> , COP, Neoflon <sup>®</sup> , Dyneon <sup>®</sup> , Hyflon <sup>®</sup>
MFA	Hyflon®
PTFE	Teflon <sup>®</sup> , Fluon <sup>®</sup> , Dyneon <sup>®</sup> , Algoflon <sup>®</sup> , Polyflon <sup>®</sup>
PFA	Teflon <sup>®</sup> , Neoflon <sup>®</sup> , Dyneon <sup>®</sup> , Hyflon <sup>®</sup>
FEP	Teflon <sup>®</sup> , Neoflon <sup>®</sup> , Algoflon <sup>®</sup> , Dyneon <sup>®</sup>
PVDF	Kynar <sup>®</sup> , Solef <sup>®</sup> , Hylar <sup>®</sup> , Neoflon <sup>®</sup> , Dyneon <sup>®</sup> , KF <sup>®</sup> ,
PVDF Copolymer	Kynar Flex <sup>®</sup> , Solef <sup>®</sup> , Dyneon <sup>®</sup>

Table 1: Common trade names

### KNOW HOW



Chemitek manufactures Fluoropolymer moulded pump for Aggressive Chemicals

PTFE is processed through press and sinter technique while other common fluoropolymers like PVDF, FEP, PFA, PCTFE etc. are melt processable.

Chemical structures look similar, but considering each unit is one of 1,000 –12,000, the property differences of each fluoropolymer can be substantial. These differences can cause confusion in material selection, but if properly understood, can allow designers to choose a material of construction that could perform outstandingly in service for over 20 years.

### **Chemical Structure of Some Fluoropolymers:**



Ethylene chlorotrifluoroethylene (ECTFE)



Polytetrafluoroethylene (PTFE)



Polyvinylidene fluoride (PVDF)

Ethylene tetrafluoroethylene (ETFE)



Perfluoroalkoxy copolymer (PFA)



Polyvinylidene fluoride Hexafluoropropylene copolymer (PVDF / HFP)



59

Polychlorotifluoroethylene (PCTFE)



Fluorinated ethylenepropylene copolymer (FEP)

### **Performance Advantage of Fluoropolymers**

Mostly True	Often True	Sometimes True
<ul> <li>Excellent Chemical Resistance.</li> <li>Resistant to sunlight degradation</li> <li>Low flames and smoke characteristics</li> <li>Resistance to fungal growth and bacterial buildup</li> <li>High surface tension</li> <li>High Purity</li> </ul>	<ul> <li>Low permeability to gases and liquids</li> <li>Readily processable and weldable</li> <li>Good cold weather impact strength</li> <li>High abrasion resistance</li> <li>Regulatory approvals in the place for food, water and drug contact</li> <li>Very low coefficient of friction</li> <li>High thermal Stability</li> </ul>	<ul> <li>Excellent mechanical strength at temperatures to 135 degree Celsius.</li> <li>Resistance to large doses of nuclear radiation</li> <li>Resistance to high intensity of UV lamps</li> <li>Excellent hot or cold impact strength</li> <li>Soluble in common solvents</li> <li>Low melting points for bonding</li> </ul>

Chemical Resistance of Fluoropolymers: Chemical failures can be divided into the four categories of :

- Chemical Stress Cracking: Polymer is embrittled by being in contact with the chemical. Polymers can be either suitable for a chemical or not. They do not rust like the metals but they can be eaten away by chemicals that attack their backbone structure.
- **Swelling:** Polymer absorbs enough of the chemical that it changes the dimensions of the component in such a way that it no longer performs its intended use
- **Permeation:** Chemical passes through the polymer to either the atmosphere or to the substrate that the polymer is protecting

• **Dissolving:** Chemical plasticates the polymer leaving it as soft residue independent of its original shape

Softer fluoropolymers like PTFE, FEP, MFA, PFA etc tend to resist stress cracking to about any substance. However, they often have a higher degree of permeation to small non-polar molecules like bromine or chlorine. These soft fluoropolymers are virtually insoluble. Harder fluoropolymers like ECTFE, ETFE, PVDF, PVDF Copolymer etc. have a few substances that can stress crack them, especially at elevated temperatures. However, these polymers typically are more resistant to permeation associated with pressure below 275°F (135 °C). There are some chemicals that can dissolve these polymers. Following parameters must be taken in consideration before chemical resistance assessment

- Concentration of Chemicals
- Nature of Chemicals -Crystalline / Clean
- Operating Temperature
- Slurry Content

- % of slurry content

- Nature of Slurry content-Abrasive / Soft / Corrosive
- Service Continuous / Intermediate
- Other variables like Impact, Vacuum, thermal cycling, radiation, permeation, pressure expectation etc.

Property	Unit	PTFE	FEP	PFA	ETFE	ECTFE	PVDF	PVDF FLEX
Specific Gravity		2.18	2.15	2.15	1.7	1.69	1.77	1.78
Melting Point`	0 <sub>C</sub>	325	260	305	270	245	170	130- 163
Tensile Strength	psi	1700	2500	2200	5000	5000	7500	2500- 55000
Elongation @ Break	%	300	325	300	250	200	100	250- 600
Hardness	Shore D	50	55	60	75	75	78	55-75
Flexural Modulus	x10 <sup>-3</sup> psi	30	90	100	200	240	300	35-170
Tabor Abrasion	Mg loss/ 000 rev	60	75	25	60	7	7	6-20
Oxygen Index	% O <sub>2</sub>	95	95	95	30	64	44-65	42-100
Deflection Temp @ 66psi	0 <sub>C</sub>	120	70	75	105	125	140	50-110
Deflection Temp @ 264psi	0 <sub>C</sub>	55	50	50	75	75	115	40-80

### **Physical & Mechanical Properties of Fluoropolymers**

### Operating Temperature and Strength of Polymer

Mechanical properties of each polymer always change with respect to temperature & pressure. Engineer should consider for strong Structural support & thick polymer component wall thickness to improve the temperature resistance of each component.

### **Temperature and Strength of Polymer**

		Deflection Temp	Deflection Temp
Polymer	Method		@ 204 psi
		( <sup>0</sup> C )	( <sup>0</sup> C )
PTFE	ASTM D648	121	56
PVC	ASTM D648	60	57
LDPE	ASTM D648		40
UHMWPE	ASTM D648	68	43
РР	ASTM D648	107	49
PFA	ASTM D648	73	48
FEP	ASTM D648	70	51
PVDF	ASTM D648	147	113
ECTFE	ASTM D648	116	77
CTFE	ASTM D648	126	75
ETFE	ASTM D648	104	74

### **Gas Permeability**

	Method	Unit	PTFE	PFA	FEP	ETFE	CTFE	ECTFE	PVDF	PVF
Water Vapour	DIN 53122	g/m².d.bar	5	8	1	2	1	2	2	7
Air	ASTM D1434	cm <sup>3</sup> /m <sup>2</sup> .d.bar	2000	1150	600	175		40	7	50
Oxygen	ASTM D1434	cm <sup>3</sup> /m <sup>2</sup> .d.bar	1500		2900	350	60	100	20	12
Nitrogen	ASTM D1434	cm <sup>3</sup> /m <sup>2</sup> .d.bar	500		1200	120	10	40	30	1
Helium	ASTM D1434	cm <sup>3</sup> /m <sup>2</sup> .d.bar	3500	17000	18000	3700		3500	600	300
Carbon Dioxide	ASTM D1434	cm <sup>3</sup> /m <sup>2</sup> .d.bar	15000	7000	4700	1300	150	400	100	60

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### **Purity Application :**

Most of Fluoropolymer in its Natural Form exhibit purity and acceptable for semiconductor and pharma industries. Engineers should consider following factor for selecting Fluoropolymer for High Purity

### Application

- Chemical Resistance
- Mechanical strength
- Temperature
- Regulatory Issue & Industry standards

### **Cost Comparison**



Among the most popular Melt processible fluoropolymers, PFA is most Expensive & PVDF is less Expensive Fluoropolymer. It is always recommended to contact the Fluoropolymer Manufacturers for any application assessment. Arkema , Daikin, Chemours, DuPont, Dyneon and Solvay are the most common fluoropolymer manufacturers.



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### Unlocking the Potential of Intelligent Pumps





**Shankar Rajaram** Sr. VP - Sales Development Grundfos India

he rising challenges linked to population growth, profligate use and climate change are adding to fast paced water

scarcity in the 21st century. Water as an issue, either there is too much of it or too little of it. Recent floods in India and the severe water crisis are the signals that compounds the chronic and major risks that we are marching towards in the future. According to a recent first-of-itskind climate change assessment report for India released by the Ministry of Earth Sciences, there has been a drastic fall in the rainfall pattern in the last 6-7 decades, which has further increased the propensity for droughts in India. The infrastructure today cannot cater to the changing dynamics of water in the country as most of the water infrastructure assets have turned obsolete and are not equipped with technology that meets the requirements. Hence, it is important to relook at them so that the current gap in the water supply and demand can be managed effectively.

Water pumps are a magnificent invention designed to address a lot of challenges when it comes to water management which are used across various applications. With time and dynamic requirements, traditional water pumps have outgrown to become intelligent solutions to meet the challenges in recent times. Digitalization and dynamic requirements demand for intelligent solutions. With effective utilization, intelligent pumps have the potential to play an important role to meet the unparalleled utilities and services to address the growing concerns when it comes to water management.

### Digital Transformation in Pumps Industry

Water pumps are responsible for heating and cooling in industries, treating and distributing water, and generating power, that are often overlooked in conversations around smart manufacturing. Intelligent water solutions can help reduce losses. Governments, development agencies and the private sectors are exploring and implementing solutions to improve access to, and sustainability of water. Innovative technologies have been making positive strides in the water industry - augmenting the existing water infrastructure as well as contributing in improving the water accessibility and recycling while simultaneously reducing consumption and wastage.

To keep pace with rapid digitalization, pump industry is strengthening their capabilities by implementing Industry 4.0 technology like automation, IoT and cloud to unlock its increased reliability and potential. Disruptive innovations are continuously emerging as per the needs and demands of the industries. Smart or intelligent pumps have the capability to understand specific water requirements which leads to saving a good amount of water as well as energy consumption. For instance, in the agricultural sector, deploying an IoT enabled pump can give farmers full control to operate the entire system using mobile phones. All they need to do is set the quantity of water to be pumped and time of watering his field, all the while getting an real-time report of the critical health parameters of the pump system.

Digital technology can play an important part in tackling the climate emergency as well, provided they must be designed and deployed keeping in mind the Sustainable Development Goals. The efficient solutions can help to combat climate change by reducing emissions, strengthening resilience to climate related natural hazards and improving the capacity to function well. For example, Grundfos's digital range, iSOLUTIONS with intelligent and smart technology has acted as a change agent. The solution enables real-time monitoring, remote control, system optimization, fault prediction and preventive maintenance to achieve highest level of performance and savings, both in cost and energy. These smart pumps automate, understand the specific water requirement, optimize the entire system and thus save this critical resource. The concept of cost of ownership is well

exhibited and used by the iSOLUTIONS range of intelligent pumps. You save more money as you run the pump.

### **Role in Energy-water nexus**

Water and energy are fundamental components for all human needs, and they are interrelated. Just how producing energy consumes water, treating and distributing water also requires energy. Water is used in all phases of energy production and electricity generation for various purposes at different levels. Pumps account for 10 per cent of the world's total electrical energy consumption and

up to 90 per cent of them are inefficient. The efficient intelligent solutions have the capability to contribute in energy efficiency by saving up to 4 percent of electrical energy consumption. Grundfos is dedicated to deliver robust energy efficient solutions that accelerate the progress towards achieving the sustainability development goals towards water conservation without causing any harm to the environment.

# Need intelligent pump solutions for Industries

India Inc is an important stakeholder in India's sustainability and growth journey. It also accounts for substantial water use apart from the day to day necessities. Various sectors of the industry are

competing to use limited water resources that put pressure on the available supply of water and groundwater resources. The role of technology and R&D in encouraging the best water conservation techniques cannot be underestimated. The array of pumps and solutions can help to optimize water usage and improve the overall efficiency. Currently, stringent laws and a paradigm shift have allowed industries to optimize their existing processes and set up wastewater treatment plants. This allows water to be used multiple times before being released safely. Alternatively, industries could symbiotically share their treated water with nearby agricultural fields to fulfill irrigational requirements.

Energy efficient pumps can be used to mitigate this excessive consumption by industries without any compromise on the treatment process or quality. Such digitally connected pumps are integral to every stage of a wastewater management process and can communicate with each other seamlessly. As companies look at budget cuts, it is important for the organizations to invest in intelligent pumps which incur low maintenance costs and have longer durability. Digital solutions can be used to analyze industrial water processes and collect real-time data. For example, pumps are fitted with integrated sensors to analyze flow or speed rates and convert them into actionable insights. This enables the solution to understand the

demand and course-correct accordingly, when needed.

Sensor based technology and data analytics can look after predictive maintenance among industrial processes. It can be enabled using data from the sensors to understand if a particular equipment or part is underperforming, needs repair or nearing its end stage. They can also be used to prevent leakages of water or wastewater during the transportation or distribution phase. This also means that water involved in industrial processes can be monitored remotely. Industry technicians are accordingly sent alerts, if and when there is a need for manual intervention.

Grundfos has a range of smart digital, mechanical and complete dosing pumps that can be deployed on the basis of the application. Accurate dosing of chemicals is crucial to successful wastewater treatment processes. Grundfos' SMART Digital solutions can be used for such purposes considering they are precise, reliable and cost-effective in the long run. They can successfully treat the wastewater by dosing it and sending it to the next stage in the treatment lifecycle.

Apart from the dosing pumps, Grundfos AMD-AMG-AFG mixers and flow makers covers small-scale mixers to large-scale flow makers for large tanks. Fitted with propellers, they help in nitrification, denitrification, sludge treatment and disinfection of tanks.

Globally, approximately 19 percent of total water withdrawals are used for industrial purposes. And water reuse and wastewater management remain a challenge for the industries. Some of the industries like textile, beverages, hospitals, etc., consume highest amount of water. It is very much important for industries to get water audit for their plant to identify leakages and losses and then explore avenues for saving water. Industries can opt for sector specific technological improvements to improve water use efficiency within their plant premises.

Apart from crucial industries like chemicals, food processing, textiles etc, water plays an important role in the hospitality industry which includes hotels and hospitals. Each of these industries have different requirements and challenges. For example, hospitals would require uninterrupted supply of water, but a hotel might need large amounts of water only during specific peak hours.

Some of the interventions that industries could adopt are:

 Reducing water footprint of the industry across its entire value chain and to enhance water use efficiency: this can be done by adopting efficient technologies which will also help increase industrial water productivity and thus will make business more sustainable

- Recycle and reuse of wastewater has a huge scope and has already been implemented by many industrial units.
- Institutionalize and undertake mandatory water audits & conservation measures: Water audit is an important tool to identify water losses and leakages and help in identifying avenues for water conservation. Other interventions like rainwater harvesting, artificial recharge of groundwater can help to augment the scarce water resource in the region.

Grundfos as one of the leading water solutions pump manufacturing leaders, continuously work towards delivering a range of solutions to help in maintaining industrial processes, such as liquid composition and integrating individual components in existing systems. An industrial process pump from Grundfos is built to withstand aggressive media and can be used in a wide range of industrial processes.

Through the CSR initiatives industries should undertake interventions on water conservation which includes building check dams, constructing farm ponds, rainwater harvesting structures, artificial ground water recharge injection well. This will help to augment the water resource of the region in which industry is located and also to adapt to the impacts of climate change. This will also help to build a better reputation with local community which are competing users for common resource in the watershed.

#### Conclusion

Intelligent pumps, which is the future of water industry needs to have the ability to cater to all the crucial segments that are directly and indirectly related to the macro economy. These solutions can lead us towards effective water management, with a great focus on sustainability and an all-round circular economy. We are living at a time when our technology and knowhow about water can save lives. Here at Grundfos we will continue to apply our core competency in moving, conserving, cleaning and bringing safe water to where it is needed. In short, to address the global water crisis, one drop at a time. ■

http://www.fao.org/aquastat/en/overview/methodology/ water-use

### Advance Valves: Top of the League Valves Technology



The core engineering team of Petronas RAPID in Kuala Lumpur worked with Advance Valves to replace large number of conventional isolation valves to Triple Offset Valves. "For us plant automation & reliability are the highest priority while dealing with our customers," says **Pranay Garg, Jt Managing Director, Advance Valves** talks exclusively to Chemical Engineering World.

> ell us about the performance of Advance Valves in the last year and impact of pandemic on the business.

The last year, and in fact the last couple of years, have been very valuable as they came after a slump for the industry and Advance Valves has moved even faster. Multiple complex projects with Advance Valves' products came live successfully establishing the consistency of Advance Valves. The footprint of our product spread wider across the globe and covers from the gas fields in Sakhalin Island in Russia to the Copper refining in Chile, extracting Gas from Canada to Australia, from South African mines to the North Sea E&P installations, across the whole of Middle East and establishments in India. The immediate impact with the local lockdowns and larger restrictions across the country and the globe have shifted focus for the organization in the short run. While health and safety has always been top priority for us, lot of effort has gone into administrative compliances and restarting from the significant disruption in operations where we lost of almost one full quarter of the year. Maintaining communication with all employees and full transparency at all times has also connected people better in these times. I must say that the team has responded very well with an in-house team leading as "COVID Taskforce" support by 'volunteers' across all levels. The good side of all this is that alongside the disruptions and losses incurred, the organization has emerged

### SPECIAL FEATURES

as an even stronger family with mutual respect and ownership across all levels. The team is highly engaged with a lot of new initiatives and projects taken up by multiple CFTs. We see that business is shaping up now, and we have to operate with COVID as another disease in the medical vocabulary.

Given the fact that many projects have been delayed or cancelled due to drop in oil prices & pandemic, what kind of opportunities are available for the valve manufacturers in oil & gas and downstream chemical processing industry in the future.

The pandemic hit at the end of the last 70 financial year and did impact the year's closing targets. While things have slowed down, we see that the current year of FY21 is still a stable year since lot of capital had been committed on the table for the projects. However, number of Final Investment Decisions (FIDs) which were scheduled to happen this year, have been shelved. This has been seen more with private owners since their decisions are tied to ROI and shareholder value maximization, while at the same time the government owned entities are trying to speed up investment decisions to support the employment and local economic concerns. The difference in priorities show a clear differentiation on evaluation and decision making, and can be clearly seen in case of India and is an international scenario.



In terms of industry, fossils are here to stay. It's just that the ongoing shift towards cleaner Gas and higher value added downstream products is going to get an even deeper focus. We can see this with even IOCL talking of getting into the textile domain! Integrated Refining and Petrochemicals is also becoming an obvious shift, both for new plants and for expanding plants. Plant Maintenance and technical upgrades are also getting more traction as investments are critically scrutinized.

What is the next level of technologies & intelligent solutions your company offers? Tell us about their demand and how does the company maintain the competitive edge?



Advance Valves Recognized by Bechtel for Supply Chain Excellence



Plant automation and reliability has been a major thrust area over the last few years. With increasing plant complexity the specifications are also getting more and more

complex. Advance Valves has always focused on top of the league technology, focused on providing solutions and not just products. Maintenance free reliable designs, fully automated valves, remotely controlled valves, high safety integrity with SIL 3 certification has been our forte. These capabilities aligned with our business philosophy keeps us at the apex of the competitive landscape, as we generally compete among 2 to 5 manufacturers. Reliability is core for the plants, and core understanding of our products and process controls gives this confidence to clients who then chose to stay with us project after project. An example is endorsement from clients including Supplier Excellence awarded by Bechtel Engineering after have done numerous LNG projects with them globally.

How do you address the challenges in working with the new technologies with the existing and new customers and how do you address these? 71

New technology always entails a learning curve for both the supplier and the customer. Understanding these needs from the customers' experience and interactions, guides us to create solutions. The major commercial barrier is easier to break today, as new technology often tends to be cost effective definitely on a TCO basis, while often on initial purchase cost also. With the volatility in oil prices, customers have embraced many such proposals to optimize their costs. An example in case is where on the recent Petronas RAPID - Refining & Petrochemical Integrated Development, the core engineering team in Kuala Lumpur worked with us to replace large number of conventional isolation valves to Triple Offset Valves in their specification writing stage itself. Such initiatives see success only with joint commitment of Engineering and Procurement. So we have to always deliver solutions with long term value to a customer.

### How are you aligning innovation with business strategy of company?

Innovation has been a core value of Advance Valves' business. We have always chosen valves and allied products which are technology solutions of the future, and been a pioneer in bringing them to the country. This has been kept consistent with us bringing valve products and new solutions with launches every 3 to 4 years. Recently we introduced in the market the high end 100% Non-Slam Axial Check Valves with best in class performance characteristics and highest Cv values. These are most suitable for non-return applications even more valuable in the rapidly spreading gas applications across the globe. Earlier, Advance came up with and today is the largest supplier of Actuated and Remote Operated TOVs at marketing terminals of the Oil tanking industry.

Further, process innovation is the other core focus at Advance always. For instance we have been offering Remote Inspections even before COVID and today the ongoing digital innovations have got further boost.

### What are the future growth plans of the organization?

With a large installed base, we are currently expanding our service network across the globe. We have sent our engineers to as far as Mexico. Now we are certifying shops to provide service at their doorstep further facilitated with technology for remote and immediate support.

This complements our expanding width and depth in the market with wider applications coverage. We have been broadening our reach and both fit in together very well and regularly investing in internal capabilities for the same.
### Fully Equipped to Supply, Support the Customer Demands





**Claudio Bonafede** Managing Director MAAG Pumps

ell us about the performance of MAAG Pumps in the last year and impact of pandemic on the business.

MAAG Group was successfully able to achieve the last year's AOP. A good number of order bookings from refinery & hotmelt projects in Industrial applications from India. Despite the COVID-19 Pandemic, MAAG Team is continuously in touch & is extending all its proactive support to the OEMs & end customers remotely. A slight slowdown is observed with the upcoming projects in Industrial sector. Nevertheless, our planned targets are being reached.

What kind of opportunities are available for the Gear pump manufacturers in oil & gas and downstream chemical processing industry in the future?

Maag's products have a decent scope in the sectors other than oil & gas as well, for instance, In the pharma, hotmelt & specialty Chemical industry sector, MAAG is preferred choice for High Viscous, High Temperature, Suction Under Vacuum and High Pressure applications.

#### SPECIAL FEATURES

## Tell us about the latest innovations developed by MAAG for the industry.

MAAG never ceases to amaze its customers with the product development and innovation to meet the extreme Industry needs and stay way ahead of the competition. The below stated are recent additions to Maag family:

- Maintenance friendly design pumps-FX Series.
- 2. Low capacity, high pressure & highest accuracy dosing pumps- DX Series.

#### What are the major challenges in working with the new technologies with customers (old & new) and how do you address these?

74

At times, we do encounter certain customers with little or no technical knowledge regarding the pumping systems. MAAG Team, with their expertise and experience, conduct Service & operation training sessions on the functioning of the existing/supplied systems along with the updates on newly developed products.

## How are you aligning innovation with business strategy of company?

Product Development and Innovation has been and will be the prime consideration for the Maag business strategy ever since, also because the fast-paced development that its target industry is going through and its eventual demand for easy and quick solutions. Maag never hesitates to meet the extreme needs of the targeted market and offers customized and innovative solutions for that particular customer which makes it a premium supplier for niche applications.

## What are the plans for the future growth of company?

India is an ever-emerging and demanding market. MAAG – Vadodara, India Facility is fully equipped to supply, support the customer demands locally.

### Collaborate to Transform New Business Ideas into Products



75



**Rajeev Jain** Regional Executive Officer, West Asia & MD KSB Ltd

Global Market has moved to more energy efficient and reliable products. **Rajeev Jain, Regional Executive Officer, West Asia & Managing Director KSB Ltd.** talks about the customer centric complete solutions innovative technologies and service friendly products offered to the industry.



ell us about the performance of KSB Pumps in last year & impact of pandemic on business?

In 2019, our business grew considerably as we registered 19% & 14% growth over 2018 in case of Pumps & Valves business respectively and exports segment has contributed significantly to our growth. We started 2020 on a good note but global pandemic has affected the business. Our order intake is 20% lower over 2019. But with focused Government initiatives, we expect market to offer opportunities in coming months.

Yes we have faced a set-back due to the current crisis but we are gearing up to meet the emission norms & other

#### SPECIAL FEATURES

qualifications, relevant to the Oil & Gas Industry which will solidify KSB's presence in downstream petrochemical segment.

#### How do you maintain the competitive edge in the highly crowded & competitive space?

We keep customers at the core of our business & thereby create solutions catering to their peculiar requirements. We use various software & tools enabling us deliver efficient products. KSB boast to be an ideal partner empowering customers increase resource efficiency, optimize usage of materials, improve availability of products & operating reliability.

76

With development of Industry 4.0 solutions, we offer flexibility & reduction of delivery time in our products to the market thereby improving efficiency. We have design tools which predict maximum attainable efficiency of pumps within defined boundaries & evaluate boundaries which can be relaxed to improve pump performance. With CFD simulation, rotating parts like Impeller are designed to effectively convert mechanical energy into hydraulic energy & all hydraulic passages like Diffusers, Volutes are designed to have minimum losses resulting in low energy consumption.

KSB has introduced "Total Pump Management" covering all factors affecting life-cycle cost like on site services, reengineering, maintaining history, condition monitoring, customer trainings, material planning, supply-chain management, consultancy services and supported with digital platforms like:

#### How do you address challenges in working with the new technologies with your customers?

With ever-changing customer requirements, it is essential to have a connection with the market so we engage with our key existing & potential customers so that with their first-hand knowledge, we diligently invest in new technologies.

"Speed" is the new buzzword of every business now & customer expectations have increased tremendously in terms of pace at which they want us to work. They need availability of information about products on fingertips, they need pace in every interaction & transaction. KSB is committed to make differentiation through digitization by delivering better & faster experience to customers for which we are doing away from our traditional mind-set & way of working. The current pandemic has made us open ourselves to new possibilities and virtual world has made us go one step closer towards digitization & thereby surpass customer expectations.

Global Market has moved to more energy efficient products. Preference towards

reliable products is undoubtedly more. There is an increasing trend towards product life-cycle cost & maximum interchangeability of parts & thus service friendly products are preferred. KSB automated assembly lines provide for faster assembly and reduced delivery time to meet customer expectations.

### How are you aligning innovation with business strategy?

At KSB, innovation is always supported by mid & long-term business strategy. Product introductions are preceded by detailed market surveys, customer & business partner interactions & competition mappings. KSB thrives to be energy-efficient in each product and thus continuously improves the hydraulic designs for optimum performance. We collaborate with suppliers & channel partners with a view to transform new business ideas into products.

Our design, engineering, foundry, production & materials development departments work together keeping us abreast of constantly evolving customer demands. For example, we have introduced products like ball valves & butterfly valves which cater to various segments.

Innovative developments & long-standing experience in the fields of materials testing, chemical analysis, failure analysis,

#### Digital Platforms supporting Total Pump Management

- KSB Guard
- Augmented Reality Services
- KSB Sonolyzer<sup>®</sup>
- Automation solutions
- System Efficiency Service Analyser
- PumpMeter
- PumpDrive

casting techniques, anti-corrosion & surface treatments enables us to perfectly match materials of construction & application requirements. Based on our material know-how & latest technical facilities, we can provide a broad spectrum of services, ranging from Research & Development via materials selection, analysis & quality management to failure analysis. Our castings are tested at laboratories to ensure consistent high quality of the materials we deploy. We have a dedicated design centre of KSB group based in Pune "KSB Tech Pvt. Ltd.", having highly skilled & experienced engineers working in close collaboration with design experts from KSB Germany for basic research & innovation, new product development & improvisation in existing products.

KSB has been building pumps for Flue Gas Desuphurisation (FGD) applications since many decades & has more than 35 years of experience in handling these products. Main application in FGD plants is absorbent recirculation pumps which handles corrosive & abrasive slurry. We build extremely hard-wearing & corrosionresistant scrubber pumps used in FGD. KSB has supplied more than 1000 such pumps worldwide in different conventional power plants. Referring to Indian Government's decision to reduce Sulphur emissions, KSB India decided to take a proactive step & become 'Atmanirbhar' for these pumps back in 2018. With continuous focus & efforts, we have completed maximum localisation of these pumps in India as a part of the Make in India initiative.

Another example of innovation is KSB's advance KSB SuPremE® IE5 motor which is world's most efficient magnet-less motor. These IE5 motors not only have eco-balance by achieving considerable energy savings but also contribute to a healthier environment as the motors incorporate zero magnetic materials made from rare earths. The synchronous reluctance motor is operated at variable speed & achieves uniquely stable & high efficiency gains on all load ranges. Some of the benefits of KSB SuPremE® IE5 motor are large efficiency gains, low noise emission, sustainable with very low environmental footprint, robust, fit for future & can easily replace existing IE2 motors."

## What are the plans for the future growth of company?

The company expects the market to grow reasonably & even exports to grow considerably in line with general industrial outlook. With deliberate effort to separate Dealer & Engineered Business through Organizational Restructuring, we intend to focus more on each market area. The key drivers for our future growth will be expansion of product basket, continuous innovation in hydraulics & metallurgy, digitizing its processes & products & reducing our delivery times. With a SupremeServ organization set up, KSB expects to grow in the aftermarket business.

We intend to invest further in our plants & encourage innovations as a driving force to offer advanced & efficient products which are compatible with the requirement of the market. This forward-looking approach has enabled us to maintain a healthy growth rate over last three years & we hope to carry this momentum forward in the coming years.

## Sealing Solution for Hazardous Fluid Processing



Chemical processing is a challenging job while handling a hazardous fluid. Hazardous chemicals can become a significant threat to human

health and the environment; thus, reliable processing equipment is the need to ensure containment.

Mechanical seals for the pumps handling such hazardous fluids, play an essential role to ensure the product containment. Mechanical Seals are the critical element to reduce emissions to the environment while ensuring the equipment reliability at the same time. Technological advancements which paved a path to achieve micro-level machining and continuous quench for the process reliability has led the mechanical seal industry to the development of noncontacting mechanical seals.

Non-contacting seals are designed with different types of face groove patterns. During operation, these grooves generate the hydrodynamic fluid force, which develops the lubrication film at the sealing interface and ensures the seal face separation. This face separation helps noncontacting mechanical seals to overcome the issue of seal face wear and ensures consistent seal performance.

Dual non-contacting mechanical seal designs with barrier fluid plans (such as API Plan 74) can offer a reliable option for hazardous fluids. Industry-wide various



Fig1. Cross section view of Series LPG 900 mechanical seal

designs are available for this configuration, but, when pumps have space constraints, then it becomes even more challenging to design a mechanical seal for a confined space.

Series LPG 900 mechanical seal of Leak-Proof Engineering is a specifically designed for pumps operating with limited space and a hazardous fluid. Spiral face groove pattern of LPG 900 seal improves the seal performance and ensures the process reliability. ■

#### **Article Courtesy**

Leak-Proof Engineering (I) Pvt Ltd

### **Committed to Continually Improve Supporting Valued Customers**



*Kulvinder Singh Ratra, Managing Director, Norgren India (IMI Norgren Herion Pvt. Ltd.)* talks about world-class portfolio of high-performance products, breakthrough engineering solutions in motion control & fluid technology and future plans of organization to Chemical Engineering World



**Kulvinder Singh Ratra** Managing Director, Norgren India (IMI Norgren Herion Pvt. Ltd.)

September 2020

#### Tell us about the engineering solutions offered by Norgren India and the role of Indian operations in the global growth strategy.

A well-respected world leader in motion control and fluid technology, Norgren is ideally placed to unearth Breakthrough Engineering solutions and play an active role in important industry sectors that contribute to the quality and success of everyday life. Norgren offers insight, technical excellence and, a collaborative approach, to help our customers forge a brighter future. Norgren's reputation rests on a world-class portfolio of highperformance products comprising of Buschjost, FAS, Herion, Kloehn, Maxseal and Thompson Valves; and an ability to deliver exceptional local service. Part of the £1.8 billion engineering group IMI plc, Norgren has a sales and service network in 75 countries, technical centres in the USA, Germany, UK, India and China, and manufacturing facilities around the world.

Norgren India (IMI Norgren Herion Pvt. Ltd.) offers solutions for Motion control, Fluid technology & Commercial vehicles for varied industrial applications. In India, we serve our customers in key sectors of Industrial automation, energy (chemical, oil & gas), power, life sciences, rail and commercial vehicles. We add value through our expertise across range of solutions from motion & emission controls to lifesaving & diagnostic equipment. In this current pandemic situation, our Covid-19 warriors worked tirelessly to supply proportional control valves & other components for entire Ventilator industry.

As a specialist engineering company that designs, manufactures and services highly engineered products that control the precise movement of fluids, tell us about some of the breakthrough solutions the organization has developed for demanding engineering challenges.

Our commitment to continually improve how we support our valued customers is at the heart of everything we do. To simplify the way we work with our customers, we are transitioning our customer facing brand globally from IMI Precision Engineering to Norgren.

We have a world-class well-equipped Engineering Centre in our Noida facility where we have developed many breakthrough solutions for different sectors such as Range Shift Inhibitors, Double H Valves, Redundant Valve Manifold Systems & Secondary Air Damper Controls. Specific to Chemical sector, Norgren has developed special motorized valves suitable for high pressure aggressive media for critical applications in the oil & gas industry and high capacity refineries of future.

We have developed the high precision, long life Inline Pump IP4000 for Life Science Diagnostic Applications. With the introduction of some of the world's toughest vehicle emission standards the new China VI and BS6 regulations in China and India, that will become mandatory through 2020/21, is a key factor in the growth of Norgren's Commercial Vehicle business in APAC.

By building on our expertise in the European market and local engineering and manufacturing ability in India and China the emission related products from Norgren have helped solve customer problems with regards to accuracy, repeatability and precise control of the fluids and gases in these new low emission engines.

We have also developed many products globally for critical applications which can be adopted easily for solving key industry problems & emerging applications in India.

## How are motion and flow control sectors growing in India?

The future of the motion & flow control (M&FC) sector continues to be bright.

Emerging mega trends in India & prospects of global sectoral trends continue to create demand tailwind. Emergence of disruptive technologies help companies innovate further. These trends will drive demand in specialized equipment, products & services over and above the continued growing demand conventional pneumatic, electropneumatic and fluids applications.

Government's initiatives such as: Smart cities, Environment protection, Clean energy, Mass Rapid Transit, Direct freight corridors, Water conservation, Make in India & most recent Atmanirbhar Bharat will drive investment in infrastructure, industrial, services & agriculture sector. This in turn will translate into demand in motion & flow control solutions. Automation helps companies address skills gap, moving from manual processes to automation will require companies to invest in long-term solutions. Companies in M&FC sector play a crucial role in transition, possess long-term domain knowledge, and are critically involved.

Industry 4.0, IIoT & Machine learning have completely reshaped market expectations, vastly expanding the amount of connectivity and data the industry requires to make decisions and automate processes. As these

technologies mature, the industrials sector and M&FC companies have the potential to create new internal and external applications hence new streams of value creation. For instance, we have developed EWPS at Norgren India, a highly engineered product saving water and helping the environment for Rail market.

#### Walk us through the latest solutions offered by Norgren India for hydrocarbon & downstream chemical processing industries.

To achieve safety and availability in flow automation, we have developed Valve Manifold Redundant Solutions. The clever design of the Redundant Valve Manifold Systems (RVM) allows the end user to reduce unplanned shutdowns with no compromise on safety. We also offer customized panel solution to improve flow characteristics in the chemical and refinery industry reducing complexity of overall circuit thus improving the performance and response.

#### Tell us about the IIoT enabled products introduced by your organization and response you receive from the industry

We have developed Partial Stroke Testing (PST) function for Emergency shutdown valves used in critical areas of refinery and this has the capability to monitor and store data related to the performance of valve to provide feedback through internet enabled devices. Our Phase-II launch of valve island series i.e; VR10/15 is planned next month. This series is IIoT enabled, with Ethernet communication protocols and IO Link. Other key initiatives address upcoming growth sectors in India considering post COVID situation that include Warehouse Automation, Industrial Gases and Water Management Solutions.

#### How do you create value for your customers and drive sustainable profitable growth?

We at Norgren India are highly focused on solving customer problems and business is completely aligned to deliver exceptional value. Culture of market-led innovation forms a key part of our growth strategy. Having a wellequipped Engineering & Technical Centre & world class talent within our premises allows us to quickly develop new solutions and technologies that create tangible value for our customers and stakeholders. Our organization strongly believes in promoting a culture of enhancing customer experience, boost competitiveness, and optimize financial performance. To achieve commercial

#### SPECIAL FEATURES

excellence, we offer differentiated engineered solutions in the most attractive markets that deliver sustainable value & returns for all stakeholders.

How has the pandemic affected the business of your organization & how have you responded to this crisis?

Most of the industrial sectors are facing short to medium term headwinds due to pandemic driven slowdown. There is a softness in spend in infrastructure, manufacturing & construction industry and drop in oil and gas capital expenditures. Culture of agility in our organization, diversified product portfolio & presence in Life Sciences sector helped us in partially mitigating challenges faced in other sectors in this testing time. We look forward to and remain confident of a return to normal business.

We remained in close communication with key customers around the territories in our control to provide them with our support and expertise, and to minimize misalignment as we progress the year. During COVID our organization has learnt and excelled in alternative ways of communication and best use of digital technology for business continuation. We utilized our digital channels to best communicate our developments to the external world including our customers and suppliers. The BCP helped us ensuring all our customers were well served during lockdown period when many industries were facing issues related to supply chain and other resources.

## What are your priorities when it comes to running your business sustainably?

As I said earlier, the purpose statement of our organization acts as a key binder and holds us accountable. As an organization we follow best practices and have clearly defined priorities that are mandated to be followed globally. These includes taking utmost care in ensuring safety of our employees, delivering value to our customers, operating ethically always, living our values to build a culture of excellence and customer led innovation. We strongly believe that human resources are the strongest asset for an organization. We attract, develop and retain the best people to deliver for our customers and society. Our pragmatic approach towards improvement of **Diversity & Inclusion in Norgren India** and responsibility towards environment society & governance speaks it all.

### Non- compliance is Costlier than Compliance

**S K Shrivastava (IAS), Chairman MPCB,** State of Maharashtra expresses, cleaner manufacturing processes are a pre-requisite to comply with the increasingly stringent standards and tougher implementation of the laws. He emphasizes that competitive advantage in the field should be knowledge and efficiency driven, rather than based on arbitrage in environmental standards. In an exclusive interview with Chemical Engineering World, he shares insights implementation of technologies for real time monitoring of pollution across industrial zones and various other proactive measures taken by the Board to handle the spurt of anticipated growth of chemical industries in the state of Maharashtra.



**S K Shrivastava (IAS)** Chairman MPCB

www.jasubhaimedia.com

**INTERVIEW** 

Since your appointment as the Chairman of MPCB, what initiatives have you taken to address the challenge of pollution control by the chemical industries in the state?

Maharashtra Pollution Control Board is the nodal agency for environmental protection in the State of Maharashtra. I joined the Maharashtra Pollution Control Board as full time Chairman about two years ago in 2018 and was delighted to reconnect very intimately with chemical engineering, which was the subject of my graduate and post graduate studies. From a basic mandate to implement law on prevention and control of water pollution in 1969, the Board now carries the onus of implementing several environmental legislations. With increasing environmental consciousness, more and more areas are being added to the Board's mandate. The board's functioning is completely aligned to the broader goal of sustainable development and the objective that we have set for ourselves is to ensure reduced pollution even as economic activity and employment grows. It has been my endeavor to make the board a knowledge driven organization, to improve predictability and transparency in regulatory action, to have a continuous dialogue with industry - both at the individual and collective

level and to leverage technology towards this end.

Coming to the chemical industry, we need to recognize that the products of the chemical industry are deeply embedded in our day to day lives. Indeed, our surrounding would be pretty drab without the dyes that this industry creates and our illnesses would be much less manageable but for the many medicines that the pharmaceutical industry provides us. Despite all the benefits that this industry confers on us, this industry has the dubious distinction of being termed as 'polluting'.

We have around 530 chemicals units in the state which manufacture paints, varnishes, perfumes, dyes and dyes intermediates, detergents, soaps, specialty industrial chemicals etc. These are located mostly in the coastal industrial areas and range in size with units having output of a few million dollars to units with an output of a few hundred million dollars. These units carry out diverse and often guite complex chemistry using a range of raw materials and solvents such as Acetone, Toluene, Methanol, Methyl Formate, IPA etc. Solvent usage may go up 100 kg/kg of product. Regulatory approval usually requires recovery of more than 98% solvent. Effluent generation can be up to 200 kg/kg of product.

87

We at MPC Board, work closely with chemical Industries with a focus of improving resource efficiencies, E factor, maximum recycle and re-use of Solvents, by-products, encouraging use of innovative Technologies, promoting Best Available Technologies (BAT) / Environmentally sound Technologies (EST) etc.

Most of the chemical industries come under 17 categories of highly polluting industries. We have developed a unique Compliance Module for submission of daily operational parameters of pollution control system in the module which help our officials in verifying daily compliance of the industries; besides it also helps to the management of industrial unit to keep an eye on pollution control system/ norms, continuously and rectify any abnormalities in time.

Board has mandated 17 category industrial units to install Online Continuous Emission Monitoring System (OCEMS) & upload real time data on Board's server which helps the regulator to constantly keep track of pollution parameters in Real Time from the office. Board has also made Hazardous waste (HW) manifest system online for tracking the HW for its sound and scientific disposal. This has eliminated several shortcomings which existed in earlier manual Manifest system. MPCB has been ranked 1st for performance audit of all State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCC) conducted by Central Pollution Control Board (CPCB) in 2019 for taking various path breaking initiatives. Our organization has also been awarded with Best Government Organization implementing information security during "IT Innovation & Excellence Awards 2017" by the Computer Society of India.

#### What is the extent of pollution caused by the chemical industry in the state of Maharashtra across air land & water across the chemical zones in the state?

The chemical process industries are concentrated in the coastal belt of state. The total effluent generated from chemical process industrial units in this belt is around 115 MLD and the organic load of the effluent is more than a 100,000 ton per annum. Further, these units generate more than 4,00,000 ton of hazardous waste every year and the cost of disposal of such waste is close to Rs. 250 crores. Additionally, these units also emit criteria and non-criteria pollutants such as SO2, NOx, Cl2, NH3, HCL, Br, H2S, Particulate matter and VOCs etc.

One of the key issues is the management of highly concentrated effluent with high COD/TDS. The pharmaceutical industry generates the most waste per unit of product between 25 and 100 kg of waste per kilogram of API as compared to bulk chemicals which generate less than 15 kg of waste per kg of product and fine chemicals generate between 5 and 50 kg of waste per kg of product. Recent research has found that on an average, pharmaceutical companies use about 120 kg of material for making 1 kg of API and the majority of waste generated (~80%) is spent solvent /mixed solvents.

## What actions has MPCB taken to control the pollution?

The board prescribes sector specific 88 standards while granting consents to these units. While granting consent, the board also scrutinizes the adequacy of pollution control system & offers advice on some additional studies or advance control system, wherever required. Besides the notified standards of MoEF & CC / CPCB, the Board also prescribes the stringent norms to industries located in critically polluted Areas & Severely Polluted Areas. MPCB shares best achievable benchmarks with the industrial units within the same sectors and encourage them to adopt or achieve the standards.

> MPCB encourages chemical industries to segregate trade high Chemical Oxygen Demand (COD) & Total Dissolved Solids

#### Initiatives of MPCB to support Make in India

- Online consent Applications without physical touch point.
- Reduction in time span of consent granting
- Allowing Third party inspection Report
- Centralized Inspection System- Four Govt Authorities jointly visiting the units (MPCB, Labour, DISH & Welfare), Resulting in total transparency and eliminates discretions thus benefitting all industries.
- Started uploading of visit report on Board's Web Portal within 48 hours
- Scheme of Auto-Renewal of Consent based on self-certification for Red, Orange & Green Category industries- incentivizing complying industries.
- Introduced Web Portal (ecMPCB) for accepting online applications- Savings @ 4,878 man-days/annum.
- Introduced Simplified Consent Application form for Green Category industry (8 pages to 2pages)
- Grant of Renewal of Consent to Operate for a minimum period of 5 Yr for Large/ Medium scale and a minimum period of 3Yr for SSI industries excluding Sugar industries.
- Uniform Integrated Enforcement Policy for Consent Management - First in country
- Enforced online monitoring facility for 17 categories of critically polluting industries.
- Implementation of Blockchain Technology for Consent Grant/Reject copies to ensure it's authenticity.
- Implemented Legal Directions Module which will ensure that all the directions are issued through IMIS system only on the basis of noncompliance.

(TDS) effluent into strong stream and low COD & TDS effluent into weak stream and treat both the effluent streams separately to meet the consented standards and reduce operational cost of treatment system. Industries are mandated to install air pollution control (APC) units including adsorption beds, thermal incinerators for Volatile organic Content (VOC) emissions control as per prescribed standards. MPCB carries out regular vigilance through random field visits for operational and maintenance status of pollution control system.

#### What is the current status of CETPs across the state and what is the approach taken by MPCB and relevant authorities in the state to install additional capacities to treat industrial effluents?

Common Effluent Treatment Plants (CETPs) were introduced with the approach to solve the problems of pollution caused by effluent discharge by the small scale industries. Maharashtra has 26 CETPs with total installed capacity of 144.85 MLD that benefits around 8000 units across various industrial estates.

Most of these industries often lack technical expertise and it is not financially viable for these units to implement and maintain pollution control devises. CETPs enable the industries to address the challenges of cost, lack of trained staff and space to reduce the problems to monitor and organize disposal of treated waste and sludge.

Unfortunately, CETPs have continued to face many challenges .The first one is that capacity addition of CETPs has not kept pace with the increase in effluent generation from expansion of existing units or newly installed capacities. 'Tragedy of Commons' is the second challenge as individual units have not shown ownership and there has been a tendency to discharge substandard effluent into the CETPs. Finally, there has been a marked deficiency in the maintenance and operations of CETPs, often due to lack of proper vigilance of member industries by the CETP managements.

As a result, the CETPs were neither receiving the effluent as per design and capacity nor discharging effluent as per design standards which had a detrimental effect on the future expansion plans of even those industries that complied with the discharged standards. Honorable National Green Tribunal noticed the situation due to several ongoing litigations in the matter and poor Comprehensive Environmental Pollution Index (CEPI) scores of many industrial areas that resulted in more onerous compliance requirements.

INTERVIEW

90

We have adopted the approach to intensify monitoring online, continue to have regulatory dialogue, nudge industry to invest in improving pollution control systems and take stricter action where response is inadequate. Additionally, we have launched a unique compliance module in online monitoring which enables industry as well as MPCB to monitor the operations of pollution control systems in real time. Recently, MPCB has set up the legal module to have regulatory communication with the industry to maintain transparency and predictability of regulatory actions.

Simultaneously, we reached out to Maharahtra Industrial Development Corporation (MIDC) as infrastructure development authority to step in for additional investments to build additional capacities as well for proper operations and maintenance. I am happy to note that there is significant improvement in terms of capacity addition in CETPs in Roha, taloja, Lote Pasrsuram and Tarapur and new CETPs have been proposed to be set up in MIDCs in Satpur, Ambad (Nashik), Hinga (Nagpur) and Jiaisingpur (Sangli) where many engineering Small Scale Industries (SSI) units are operational. MIDC has already allocated the land, set up Special Purpose vehicle (SPV) and is in the process of receiving environmental clearance. We are also in dialogue with

MIDC to set up a common MEE facility and also take up deep sea discharge of treated effluent. The Board has recently approved a scheme to facilitate and assist SSIs with appropriate pollution control equipment.

I think we need to recognize that all of us have a stake in maintaining the environment and have to be conscious of the proactive role Honourable Green Tribunal, Courts and the civil society are playing. The Honourable NGT has already imposed a fine of almost Rs 350 core on units in Tarapur and a heavy fine in quite a few other cases. The key takeaway is that 'though compliance is costly, non-compliance is costlier'.

#### Tell us about the new regulations that have been brought to force to control pollution and also enable the growth of these industries.

MPC Board plays its role not merely as of the regulator but also the facilitator. We have taken proactive measure to make existing procedure for Consent Renewal simpler for the industries who regularly comply with the environmental laws, are not changing the existing product mix as well as pollution load. An application for renewal of such industries would be auto renewed on fast track mode based on self certification provided by an industry for compliance of environmental regulations.

#### This will be helpful in

speedy disposal of application for renewal of Consents and Authorization so as to motivate the compliant industries.

The chemicals market is highly volatile, hence chemical industries are required to change their products based on market scenario; any change in products mix earlier was requiring Environmental Clearance. According to the notification of Government of India on November 23, 2016 for product mix, the Board has constituted a Technical Committee to deal with such cases which exempts Environmental Clearance for change in product within same category without change in pollution load. The Indian Government has recently issued a notification which allows the chemical industries to change the product with additional 50% capacity provided there is no change in existing pollution load. However in order to avail the benefit of product mix cases, industries are mandated to have environmental clearance in place.

Typically it takes 18-24 months for chemical manufacturers to seek permissions from the pollution control board anywhere in the country to set up a new plant or plan capacity expansions. In your view what should

#### be the approach of the regulators & the plant owners to achieve sustainable industrial development?

As per the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981 time span for granting consent is 120 days. However , the Board has reduced the time span up to 60 days under Ease of Doing Business (EoDB) and started to implement. Recently, the Government of Maharashtra implemented concept of "Maha Parvana" under which amended service delivery timeline & timely delivery of service. Accordingly, Board has reduced time span of granting consent up to 30 days for Red category industries and started implementation of the same.

The chemical industries are required to submit the application forms with complete details which includes manufacturing process with material balance and chemical reactions involved to assess the pollution load and technical details of pollution control system which helps us evaluate the proposals and take faster decisions on approvals. I am happy to note that almost all the applications are processed in time but for those with incomplete information the Board is unable to take decision on consent applications which results in delays in granting approvals.

#### How is MPCB gearing up to handle the expected spurt in industrial development in the state?

Industrial growth is desirable as it leads to development as well as employment generation, but this should not be done at the cost of environment. Similarly environment protection cannot be seen in isolation at the cost of completely ignoring the industrial development. We are always looking towards sustainable development in the state of Maharashtra and strive to equitably meet developmental goals of industries and sustain cleaner environment for present and future generations. We continuously encourage the industry to use cleaner technologies which consume less resources, yield more, generate lesser waste and have a lower pollution load.

#### What measures are you taking to strengthen environmental governance, facilities and infrastructure?

As I have already explained, the MPC Board has a full-fledged data center to receive Real Time reports on consented parameters of Effluent stream & Air emissions for all 17 Category of highly polluting industries through OCEM system installed at industries. Beside this, Board has also developed first of its kind Compliance Portal, which will reduce burden on officers to physically inspect the operation and maintenance of pollution control systems. Going forward, the Board envisages taking the initiative to use the mobile applications for industry visits for officers to geo tag the field visit reports and share these with the industries on the spot. The board plans to introduce Redressal portal on the website of MPCB for the citizens to register the grievances.

Even before Covid crisis, Chinese chemical industry had already started to decline because of the tighter environmental regulations. As a regulator, what would you suggest to the chemical manufacturers to avoid getting into such a situation in the future?

The Indian Chemical Industry, with highly diversified chemicals, is currently worth USD 147 billion. Contributing to 15% of India's manufacturing GDP, the industry is critical to the country's economic development and has a potential to grow to USD 225 billion by 2020. Presently, the Indian Chemical Industry accounts for 3% of global chemical market and is the 6th largest by value in the world.

Our competitive advantage in the field should be knowledge and efficiency driven, rather than based on arbitrage

INTERVIEW

in environmental standards. Cleaner manufacturing processes are a prerequisite to comply with the increasingly stringent standards and tougher implementation of the laws. I am happy to note that Indian manufacturers have started investing in R&D and implementing green methods to produce non-toxic chemicals. Industry need to realize the significance of moving towards biodegradable options.

Industry Associations or Larger entities should set-up 'Centres of Excellence' for research in different sectors, focusing on green and sustainable technologies to reduce the hazardous impact of chemicals on the environment. Industry can adopt several measures right from product development phase, essentially the principles of green chemistry i.e.

- Phasing out of Chlorinated Solvent with other less Toxic solvents.
- Promoting Neat reactions, without any solvents, wherever possible.
- Replacement of Organic solvents by Ionic liquids, wherever feasible. (Ionic liquids are mixtures of anions and cations, molten salts with melting point around 100 degree-Celsius, which can be used as alternative solvents in organic synthesis.)
- Replace more hazardous / Toxic

substance with lesser one.

- Design the energy efficient process.
- Use life-cycle approach while developing the process in Laboratory.
- Adopt 4-R Principle- Reduce, Reuse, Recycle and Restore
- Adopt waste minimization techniques

It goes without saying that industry should operate the unit after obtaining necessary approval of all competent authorities; and install & operate pollution control system scientifically so as to achieve the consented norms.

Eventually, it is imperative that all stakeholders work sincerely and diligently together for the shared goals- build competitive advantage in the chemical industry, generate employment and protect the environment.

### **Digitization of Process Plants**



**K. Jayaprakash** Discipline Head – C & I Tata Consulting Engineers Limited

94

In the recent years, paroxysm of mature technological growth has significantly altered the automation cycle in process industry. Traditionally, Control systems in process and power industry were proprietary with vendor specific hardware and software in the early 90's. However, in early 21st century, most of the control system vendors started offering off-the-shelf products with open architecture, adaptability and flexibility in terms of cost and value addition, efficiency and reusability, and - inter-operability with 3rd party systems.

The current generation control systems use various software tools to identify production loss, optimization, maintenance improvement and asset management which support overall equipment availability and operational effectiveness. These management software tools can interface or be a part of Control system and aid the Process industry. Control systems not only control and monitor the process, but also provide functions like Optimization, Asset management and Predictive tools.

## hallenges for implementation in Process sector

We need to understand concept and concern in the industry and purpose for any change required in future. Hence, digitization in Process Industry especially the old plants are to be critically examined in terms of investment and benefit and taken forward. Digital transformation in Process Industry has slowly started and the Major challenges are classified as technical and challenges that arise because of human factors.

#### Technical challenges

Extensive Monitoring: The rapid development of technologies related to Smart instruments, controls, and network allows data capture on real time basis continuously on fast response, so large amount of data is accumulated. In Process industry, various field instruments are capable of monitoring multiple variable parameters, which shall be able describe / create information for analytics to get actionable data. Along with addition of latest technologies, cost of sensors, communication devices etc. have become affordable . Finally, this amount of quality data can be analyzed and can be used for improvement of energy efficiency and Operational efficiency of Process plants.

Industrial Internet of things (IIOT) adoption: This is a common term used for Industry 4.0, hence covers application of

#### **Technical Challenges**

- Extensive Monitoring ,
- Industrial Internet of things (IIOT) adoption,
- Analysis of Large Volume of Data,
- Efficiency and sustainability
- Simulation or Digital Twin models

#### **Human Factors**

- Culture of adoption ,
- Employees Engagement
- Experiential Learning

technology like machine learning, artificial intelligence, big data to exploit sensor data, communication between Equipment and control systems to improve Industrial processes.

In this sector concept of Industry 4.0 is realized by connectivity between all plant smart field instruments with unified automation and information architecture systems powered with extended capacity of data, storage, communication, input data like generation, production, consumption and Equipment efficiency.

**Analysis of large volume of data:** This Industry application involves connecting enormous smart field sensors which increase the challenges of validity and storage of unstructured data parameters

Chemical Engineering World

**COVER STORY** 

of pressure, temperature, volume, flow, speed, etc.

Real problem is to identify valuable and consequential data which could be processed and analyzed to convert into actionable data; Huge volume of valid data at high frequency, storage of unstructured data generating giga byte of process parameters. All data collected from this process are not valid and actionable, sometime due to the limitation of the Instrument used in the specific applications. However, this phenomenon gives rise to development of prediction model based on data collected from typical process operation. Effective Intelligent analytics can be developed by engaging experts in data mining,

by engaging experts in data mining, effective algorithms, machine learning and processing of complex data and extracting useful insights from the data collected for analysis.

High volume data along with latest Computational tools facilitate application of specific technique of artificial intelligence. Later these shall allow prediction of variables and identification of parameters / actionable data in the range of Industrial process. Following development models would play a key role in future IIOTísed automation:

- Prediction Model on Production
   / generation at different levels of generation/ production with variables
- Simulation model for training and

establishing the various mode of operation, which can evaluate / predict effective way of generation with efficiency.

- Model for analyzing the energy efficient processes and to capture the input and output variable with a knowledge of transformation.
- Artificial Intelligence models with large data available.
- Analytical tools with a complex event processing capability is enabling the rapid processing and analysis of real time data and driving timely actionable decisions.

In addition, growth of cloud-based crowd sourcing service is leading to development of new algorithm and improve the existing one at fast rate.

**Efficiency and sustainability:** The main objective behind the investment in Industry 4.0 in process industry is to increase efficiency, competitiveness and effective way of operation .The benefit obtained shall be direct and show the potential which shall be able to establish a virtuous / righteous cycle of investment with result .This may result in reinvestment and more competitiveness results and profit.

Overall - the change is to embrace new technology, increase operational efficiency, energy efficiency, ensure low level of greenhouse emission, improve the way

of working, quality of work and send a positive impact to the community.

Simulation and digital twins' model:

Digital twin technology is emerging in the strategic trends and being adopted especially for Process / Power industry . The digital twin is advanced duplicate of Real-life object model or Process without replacing it. This digital twin of process is created by gathering all inputs / information from IOT system attached to physical twin and from historian for the past data, later this model shall monitor and compare with key performance indicators. Finally, this data is fed into machine learning system that shall alert operator to monitor the parameters or fix the situation. Overall context specific information / details are made available at a right place and right time.

Digital twin is storage place for Integrating important validated inputs / parameters, i.e., information from various sources and during different phases of Life cycle of the plant. Especially most widely accepted and usage is for Integrated engineering, Integrated operation and integrated maintenance.

In Process/ Power industry operational and maintenance information are managed by digital twin, particularly the process data and models provided in a digital twin, real time simulation results help to predict the requirements and improve the design for future. Predictive analytics help the manufacturers and users to calculate the future unforeseen challenges. The concept of digital twin is a key enabler for implementation of Industry 4.0.

The digital twin is a comprehensive physical and functional model for every physical asset. It is also defined as a digital profile of the historical and current behavior of a physical object or process that is used to optimize and improve the efficiency. This model of digital twin is based on accumulation of Cumulative, Real time data measurements.

#### Human Factors

**Culture of adoption:** With the digitization in Process Industry gaining momentum, the change is about people adopting new technology. Culture means values and characteristic set of behaviors which decide how works are performed in an industry. Healthy culture provides an upspoken code of conduct and the individual shall guide and act appropriately and work in such way that organization goals and strategies are met.

The digital culture in the organization shall attract talent and empower people to deliver the results faster. The healthy digital culture in an organization results in a High performing culture. Three important attributes which facilitate the high performance are:

 If employee is engaged well and committed to work, then it leads to meeting organizational purpose and targets.

- Individuals and teams work in such way that they advance the growth of the organization
- Working environment, i.e., leadership, design performance management, people development programs, tools, informal interactions, etc., foster employee behavior and in turn advance organizational strategy.

Employee engagement empowering people: An organization needs to establish practices related to digital way of working. Operating personnel should be provided with a chance to suggest the areas where digitization could be adopted. In such cases, the success rate is likely to be very high, since implementation will be by the personnel who have only generated the ideas.

It is also necessary to adopt digital tools to provide common (similar) information across the organization and also to ensure the tools are accessible to all, especially commonly used day to day usage tools. Standard operating procedures need to be modified through adoption of new technologies. Decision making and interaction tools usage shall facilitate success of digital transformation. Employees should not be forced to learn new tools or techniques; instead the new tools should become a part of work flow for faster adaption.

During the Digital transformation process, clarity in communication is crucial. This is the key to success, i.e., communicating the change process which assists the personnel to understand the end goal, the reason for the changes and why the change is important for the success of the organization or achievement of the end goal. This pattern will lead to successful digital transformation. Subject matter experts should build Intelligent operating models with their own knowledge and available tools and lead by example.

Work force: According to the various surveys, ageing workforce will impact several old plants; young workforce no doubt will bring new skills but the tacit knowledge that resides in experienced operating personal must be captured and channelized into useful actionable data in digitalized form. This may be carried out using data analytics and through implementation of predictive maintenance. Relationship between man and machine needs to be rethought in the context of inclusion / adopting the 4. 0 technology in Process industry.

**Experiential learning:** After digitization and automation of process plant, human input or need may be less, but human interaction is very important at crucial times and context(s). This means that actions by operators become consequential along with skill and operating practices.

The dependence on Digital tools can reduce/ lessen the confidence on an individual's process knowledge but at the same time digital tools may be able to resolve any issues. Plants make digital technologies more accessible and operators can work offline to get familiarity of the process models. Hence generally wherever possible, simulation models are used for these purposes.

In an operating process plant, the knowledge of process is a must, since operating personnel need to intervene when automation fails or digital model malfunctions. The training models should assist to acquire the required competencies which foster digital transformation and bridge the skill gaps in operating personnel.

#### Conclusion

Digital transformation is the order of the day using all available cutting-edge technologies; however, as seen above, few industry specific changes and adoptions are necessary. Technical challenges and Human factors need to be considered before harnessing the Power of IoT, particularly in Power / Process industry. Potential of existing personnel must be harnessed by building their skill sets, mindsets, cultures and motivation towards organizational strategies and goals. ■



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### "Digital will be a strategic enabler in line with our journey from crude to chemicals"



#### Prasad K Panicker

Director & Head Of Refinery Nayara Energy Limited ayara Energy is a new-age downstream company of international scale with a robust foundation of best-

in- class infrastructure and processes and we have an innate desire to deliver excellence every step of the way. The company has adopted conventional digital technologies for plant maintenance, production execution, improving health and safety, enhancing workforce productivity, increasing operational efficiencies, better risk and capital management. As we envision our journey from crude to chemicals, we see digital as a strategic enabler in line with our vision to prime us so we can anticipate and respond to changing marketplace whilst getting maximum margin out of the barrel.

We envision digital transformation as a gateway to top quartile our performance that will translate into profitability. We are looking at digitization beyond just technology transformation but cultural change and making people and processes more agile.

## Translating business goals into digital strategy

Our digital transformation strategy presents an opportunity for us to dramatically improve asset reliability, performance and productivity and workforce effectiveness.

- Geopolitical and market volatility

   As an industry we face geopolitical situations and market risks tough challenge and therefore, there's greater need for digital technology adoption for managing the risks and dynamics of global geopolitical situations.
- Cost Management The cyclic industry is vulnerable in response to market conditions. Improved date-driven decision making is required to reduce organizational inefficiencies. We have, therefore, invested in automation of processes to promote accountability and generate value.
- High cost of safety Dangers such as fire, explosions, falls, vehicle crashes, weather conditions and many more are harsh realities that this sector faces. Therefore, safety is and will continue to be our top priority. Therefore, we have created automation of processes that focus on safety management
- Cybersecurity The range and scale of cyber breaches and data vulnerabilities has resulted

**COVER STORY** 

in even greater scrutiny of our risk management. It is even more us to embrace our technology infrastructure, applications, services, telecommunication systems, etc. through strong controls.

 Talent for the future – For the industry to adopt to changing models, it is pertinent to engage and prepare talent

We are in continuous engagement with the best-in-class service providers and OEMs in the IT industry to bring unmatched technologies into our landscape. Our approach is to bring the cutting-edge technologies at optimum costs.

#### **Creating value for business**

Digital transformation is improving processes, optimizing business models and improving operational efficiencies. As an organization, we are committed to shareholder, environmental and shared value and our digital transformation vision is to maximize value for them. Therefore, it is imperative that we look at it holistically for creating significant value for the business and stakeholders.

Our ability to prevent, detect, and respond to cyber-attacks, has increased as we embraced the National Institute of Standards and Technology (NIST) framework resulting in a cybersecurity maturity score by over 35% in one year. We have also deployed automation in refining, marketing and other related business processes resulting in higher efficiency. In addition to the above, optimization, consolidation, and new capability building has resulted in a reduction in overall IT costs and an increase in efficiency. Our vigilant experts at the Security Operations centre (SOC) monitor the cybersecurity threats 24x7, ensuring zero downtime of the critical business systems due to cyber-attacks.

### "Prevent obsolescence both for employees as well as technology stack"



**Ravitej P V** Executive Director Refineries BPCL

"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change."- **Ravitej P V, Executive Director Refineries, BPCL** reiterates the statement by Charles Darwin that rightly specifies the current digital world scenario.

igitalization has been a boon in the modern era and the corporate culture must be used to develop strength and momentum for digital transformation. World-wide, business landscape is changing rapidly with the advent of the 'Industry 4.0 revolution.' Industries are tapping opportunities to benefit from

emerging Digital technologies. 'Digital' is not new to Refineries. We have a sufficiently mature array of Process engineering and Information systems with a continuous focus on Operational Excellence, Smart Project Execution and Innovation. However, as competitive and regulatory pressures buildup we are prompted to look at futuristic digital

technologies that offer a new window of opportunity for enhancing Refinery performance.

Technologies like machine learning, artificial intelligence, cloud computing, data mining, IoT etc. must be exploited to develop innovative solutions. Tremendously large amount of data is generated everyday across the organizations which can be used in many ways to create useful insights. Initiatives must be thought by keeping the major objectives in mind: reducing costs, increasing revenue, reducing manual interventions, easing of operations and increasing safety.

# Walk us through the digital vision of BPCL for refining business.

Most of the international reports have highlighted that very few refineries have started to embark on digital transformation. I must say, before embarking on a digital change programme, it is essential to have a clear understanding of what our starting point is and the direction in which we need to travel. Creating vision and strategy is an essential part of digital transformation process. This not only enunciates to build up the plan to achieve the end goal but also reinforces activities we carry out daily and act as a guide for digital transformation. Moreover, it helps every employee as well as all the stakeholders to understand and align themselves with the

#### **Co-created vision statements**

- Digitally connected business unit adopting cutting edge technologies for sustained operations and business.
- Intelligent, flexible and adaptive processes across functions
- Leveraging digital for agile and innovative solutions with reduced cyber vulnerability
- Enable a digital culture and equip frontline employees to take smart risks effectively.

digital objectives of the organization.

As a Refinery we developed a strategy and brought employees under one umbrella and co-created a digital vision with an objective to develop a roadmap of specific initiatives for implementation in 5 years horizon. We have taken pragmatic approach to implement digitalization to enhance productivity and increase asset reliability, improve the health and safety standards to reduce operational hazards, run all the operations in a transparent manner to get insights in real time, identify decision points to take timely appropriate action.

# What are the major hurdles for refiners in translating business goals into the digital strategy?

For the refiners to embark towards digital change offers significant competitive



We did not have a dedicated team for digital to conceptualize and deploy solutions when we embarked on our digital journey. However, in the due course we build our team in refineries to strategize and

advantages. This transformation enables them to operate in most sustainable manner, be cost efficient and first to market. Digitalization in refining operations is still in nascent stage hence there were very few relevant cases available in the public domain to refer. Workshops with reputed consultants and knowledge sharing with peers are helpful to understand the journey as well as the pitfalls.

Selection of right technology based on effectiveness and utility of software is very critical and one of the key challenges in this journey. Globally teams follow an approval of Proof of Concept (POC) followed by scale-up for large scale execution. This is a 10-step framework that assist in allocating digital investments with right technology partners across the value chain to maximize impact. Since there are too many vendors who offer the same technology, we based our decision on proof of concept for each used case and successful trial leading to scale up. implement digital across functions, identified the interdepartmental dependencies and developed the governance structure. This was followed by workshops within the business units and across functions to prioritize digital interventions with the ROIs. Despite the expertise in functional knowhow, to enable the operations digitally was a difficult task to achieve. We organized capability building training sessions within the organization for our staff and simultaneously building ecosystem with the vendors, start-ups and the academia.

We engaged consultants for studies and surveys to estimate overall expenditure and with successful trials, we could scale up the budget estimates. We developed and implemented strong cyber security strategy to protect critical operational & information technologies and prevent our systems from any external threats and attacks. Last but not the least, change in culture is pivotal and requires interactions between the stakeholders from within the organizations and partners to adapt to the new ecosystem. We appointed digital champions in each function with support members, organized regular interactions and developed partnerships with the professionals from institutions to go through this transformation.

#### How has BPCL benefited so far from digitalization of refining operations?

See from time to time we have come across many buzzwords that have led the transformation in the industries including the refineries. Currently, like all other industries, refiners are following the mantra to digitally transform for survival of their business. As I have already explained we undertook multidimensional, all-inclusive holistic approach right from the beginning which has enabled us to work more efficiently across different functions in an integrated manner.

We focused on production excellence to establish predictive and near real time business. Using the near real time data and models has enabled us to drive optimization across entire unit through optimization tools. Implementation of Asset Management 4.0 technologies for intelligent plant, prediction of Rotating Machines failure, online corrosion monitoring, Electrical Asset Monitoring App using Machine learning based algorithms has helped to improve mean time between failures for rotating equipment.

#### RIGHT TECHNOLOGY PARTNER 10 STEPS APPROACH

- Conduct a review on revenue and profitability.
- Determine the financial impact,
- Rank areas of importance,
- Assess present state,
- Determine digital capability gaps,
- Determine the right approach,
- Determine the investment required to deploy new digital capabilities
- Build a return on investment (ROI) business case for digital investment linked to desired KPI's
- Prioritize and allocate digital investment based on output of ROI business case analysis
- Test run and align the strategy.

Implementation of rapidly developing technology of robotic process automation (RPA) has improved cycle times of processes by more than 60%. This technology enables creation of soft robots and deploys them for benefit of reducing mundane, repetitive tasks of key personnel. This will also continue to improve productivity so that staff can invest time in



thinking and building better solutions for day to day work.

We have been using advanced automation such as drones to enhance safety & for field productivity as well conducting VR training sessions on critical safety aspects, Digital Turnaround and Digital Start-ups. We have had very good experience seen significant reduction in the risk to the personnel health & safety. This transformation has enabled us to successfully conduct digitally enabled Turnarounds, Start-ups and commissioning of new projects.

#### What are the biggest mistakes that must be avoided while forming the digital strategy?

Assessing the impact of digital transformation is a critical step that can influence the commitment to digital process. In today's day & time, failure to understand the impact of digital age and unwillingness to plan are the biggest mistakes that a company can make. Next I would say is the stakeholder disconnect, where an organization effectively gets stakeholder buy-in from the entire team, but during execution process or contracting, the process gets delayed and kind of disconnect happens between what different people in the organization hope and what finally gets delivered. Last but not the least organizations must Prevent Obsolescence both for employees as well as technology stack. While making investments organizations must consider the latest know how, skills and use of evolving technologies with their life span into consideration.

## Indian Oil Declares 2020 as the 'Year of Digitalisation'



**Gujarat Refinery, IOCL** 

At an enterprise level, IndianOil aims to create a financial impact of somewhere around USD 1 billion through intervention of digital technologies being driven at a large scale. As part of our digital strategy classification, the Digital Startegy team has crafted 10 bold moves, which have been detailed into ~80 initiatives as part of IndianOil's digital roadmap.

September 2020


ndustries around the world are undergoing an unprecedented transformation as digital is creating a new normal in core business areas. This era of digital disruption, as referred to as Industry 4.0, has been driven by convergence of multiple new-age technologies (IoT, AI, ML, Blockchain, etc.). In comparison to

other industries, the oil & gas industry has been taking time to adapt to digitalisation, because of the scale, criticality & enormous complexity of business operations. Having said that, the value and the potential of digitalisation in oil & gas is among the highest across various spectrum of industries. **COVER STORY** 

As IT-OT technologies are maturing and scaling-up, leading oil & gas players globally have started on the digital transformation journey that is expected to harness the hidden potential & its consequent benefits across the entire hydrocarbon value chain. Prevalent trend of digitalisation transformation initiatives like Intelligent Automation (IA) to optimise operations like Robotic Process Automation (RPA) in areas of HR, Finance and Contract Deptt., Machine Learning (ML) for rotary equipment failure prediction, computer vision, Natural Language Processing and Generation (NLP and NLG) for security, data mining & remote inspection of assets are some of the areas where IndianOil has launched its initiatives. The potential of Intelligent Automation goes far beyond curtailing expenses, it helps to utilise

assets effectively & improve production performance, thus boosting bottom lines, improving customer and employee experience, enhancing employee safety and ensuring better compliance.

### The Year of Digitalization.

Realizing the vast potential of technologies, IndianOil declared the year 2020 as 'Year of Digitalisation' with a significant focus on digital initiatives across every part of the organisation. A separate Strategy Team was formed under IndianOil's Digital Readiness & IT Vision Enablement called i-DRIVE project to catapult the implementation of digitalisation initiatives by partnering with IT-Strategy consultants. The multiyear digital transformation journey has been strategised and identified through detailed assessment of IOC's businesses & functions, where digital interventions could help derive maximum potential value.

As part of our digital strategy classification, 10 bold moves have been crafted, which have been detailed into ~80 initiatives as part of IndianOil's digital roadmap. To put more thrust in the digital embarkment, parallelly setting up a Digital Center of Excellence (DCoE) and re-organising the current IT landscape have been taken up. Specific technology interventions have been detailed out to make the enterprise architecture & technology landscape more robust and fortified.

IndianOil is now well into the implementation phase of our digital transformation journey. The DCOE is nurturing specialised teams focused on Advanced Analytics and emerging technologies such as RPA, Mobility, Blockchain, IoT, AI/ML, AR/VR, etc. We have created an effective & efficient framework to facilitate an agile journey of digitalization based on "Think Big, Start Small, Scale Fast". We are designing and

110

deploying multiple initiatives to enable business objectives such as paperless office, next-gen operations, smart maintenance, etc.

### **Benefits of Digital Interventions**

IndianOil's refining business promises larger benefits through digital interventions by way of improving plant availability, enhancing throughput/yield and minimum energy cost and improving & improvising working ambience for all our stakeholders. This journey is being achieved by a fourpronged approach:

- Leveraging existing data and creating forward-looking meaningful insights through Machine Learning techniques leading to improvement in critical performance metrics in process units like CCRU (Continuous Catalytic Reforming Unit), FCC (Fluid Catalytic Cracking Unit) etc., IoTenabled predictive maintenance for consuming and leveraging the vast quantity of data generated through IoT devices and deriving valuable insights, which enables to reduce number of bad actors, heat exchanger fouling prediction, distillation column energy balance, etc.
- Driving technology adoption at scale in refineries through either enhancing the utilisation of existing tools (e.g.

The multi-year digital transformation journey has been strategised and identified through detailed assessment of IOC's businesses & functions, where digital interventions could help derive maximum potential value. Specific technology interventions have been detailed out to make the enterprise architecture & technology landscape more robust and fortified.

APC (Advanced Process Control) utilisation improvement) or creating a structured process of identifying and procuring new tools (Energy Management System for minimising energy consumption, maximising yield, and producing at lowest cost, RTO (Real Time Optimization) for unit-level optimisation, etc.)

 Change/ease work profile using digital technologies like human-machine interface (e.g. smart helmets for remote assistance), connectivity and computing power (e.g. AI-based tools for cognitive search, mobility solutions With the year 2020 as IndianOil's Year of Digitalisation, significant focus on these initiatives is being emphasized across every part of the organisation. A very special focus is being placed on harnessing the power of youth by with events like hackathons, reverse mentoring programmes and 'Young Leaders Conclave'.

like digital logbooks, real-time location tracking, etc.) and digital-physical transformation (e.g. bots and drones for inspection).

 Ensuring safety & improving human capital through knowledge avenues like cloud based dynamic operator simulators, centralised platforms to access unified information across the entire organisation, etc.

These initiatives in IndianOil refineries have been envisioned to integrate disparate technologies, break down information silos and analyse a vast quantity of data at rapid pace. Through the digital intervention, IndianOil refineries are being transformed into a connected ecosystem that enables seamless information flow through use of custom made AI/ML models-led conversation BOTs and search optimisation engines for field operators, which can then assist in decision-making in the plant.

### Identifying Right Technology Partner

Every initiative is delved through all possible options and judicious decisions on "Make vs Buy", in-house development versus getting external support, are being taken depending on vendor landscape, internal capabilities & bandwidth, and strategic areas that should be strengthened to build our capabilities. In addition, we are complementing the implementation of digital initiatives with scalable and robust IT backbone. Initiatives aimed at strengthening IndianOil's enterprise IT/digital architecture, supplementing the current hardware, network and data storage are also being undertaken.

### **Driving cultural change**

This transformation has spanned across business and functions and a robust governance mechanism has been established. Senior management are the sponsors for key initiatives pertaining to individual Divisions/Functions. A vibrant set of Initiative Champions are owning and driving these individual initiatives. A Central Transformation Management Office has been established to ensure seamless co-ordination across Divisions and Functions.

Driving change is the hallmark of every digitalisation transformation exercise and this is the core that fuels our transformation journey. We are complementing our digital strategy implementation with an equally large communication and change management programme. We have had a strong top-down focus on digital awareness and capability building through digital Immersion sessions where we are pushing the digital agenda. With the year 2020 as IndianOil's Year of Digitalisation, significant focus on these initiatives is being emphasized across every part of the organisation. A very special focus is being placed on harnessing the power of youth by with events like hackathons, reverse mentoring programmes and 'Young Leaders Conclave!

All these efforts have already started creating and displaying tangible impact in IndianOil through efficiency improvement (e.g. cost reduction through deployment of advanced analytics solutions in CCRU, RFCCU (Residue Fluid Catalytic Cracking Unit) and COTS tools, increased transparency through efficient dashboarding, HR, Finance & Contracts process improvements through RPA, etc.), stakeholder delight and improved ways of working (higher engagement in trainings facilitated by AR/VR, enhanced customer experience through mobility, workflows to automate manual paper-driven tasks, etc.).

IndianOil is all set to continue the digitalisation journey and keep building on the momentum that has been created so far, to make the organisation a front runner in embracing and deriving benefits from digital transformation. Overall, at an enterprise level, IndianOil aims to create a financial impact of somewhere around USD 1 billion through intervention of digital technologies being driven at a large scale. ■

Article Courtesy: IOCL

### "Management intent in true sense is required for a successful Digital Transformation program"



**Manoj Kumar** Head of Information Technology HPCL-Mittal Energy Ltd

Manoj Kumar, Head of IT, HMEL echoes Benjamin Franklin's words' Failing to prepare, is preparing to fail' that are relevant in the Digital Transformation drive as well. Common pitfalls need to be identified in terms of risks; acceptance issues etc. and strategy should be formulated to overcome these pitfalls. Kumar shares his experience of driving digital transformation with Chemical Engineering World

ydrocarbon, especially the refining industry

is facing new challenges due to volatile crude pricing, dramatically changing geopolitical outlook, and

flattening the curve of future oil products demand caused by advancements in electronic vehicle technologies. Refining and petrochemicals have been open adopters of technologies and digitalization has been identified as an opportunity to stay competitive in business. Digitization has been in supportive roles in the oil and gas industry for many years. To stay competitive in the future, refining needs to have something 'extra' to multibillion dollar physical assets conversion, storage, and separation units. This 'extra' seems to be driven by Digital Transformation initiatives. The oil and gas industry needs to have a digital vision, addressing the context of the organization to avoid the struggle with common issues. This context should be drawn from the current state of the organization based upon a serious gap analysis. Since Digital Transformation is based upon a strong plinth of digitization, a gap analysis should help in understanding the current technology gap and formulate a strategy for the adoption of Digital Transformation initiatives.

The digital vision of downstream organization should be aligned to 'maximizing value' in terms of:

**Enhancing Financial Performance-** The organization's digital vision needs to be focused on enhancing the financial performance of the organization. In downstream industry, focus areas for enhancing performance may be specifically addressed by:

- Enhancing Asset reliability: An oil refinery is asset-intensive and maintenance of these assets is one of the major dependency while optimization of production performance. The organization's digital vision should be focusing upon datadriven maintenance (predictive and prescriptive) enabling reduction in maintenance costs and minimizing unplanned downtimes.
- Enhancing Customer Value: Digital vision should incorporate customer's expectations and should have focused upon facilitating customers who enable the organization to stay in business.

 Enhancing Operational Excellence: Operation excellence is focused upon staying competitive and minimizing wastages in the system Digital vision should be focused upon enhancing the operational performance of the organization

**Enhancing Societal Value:** Safety and the environment are key societal values in the oil industry. Safety and environment are not just because of Oil & Gas industry is highly regulated, rather it is a moral social responsibility. Societal values should be key pillars while defining the digital vision of the organization.

# Translating business goals into digital strategy

Any Transformation is always tough, as well summarized in Mckinsey' s global survey, 'Transformations are hard and digital ones are harder.' Successful transformation should help in achieving business objectives and should be amalgamated in the organization's business processes. However, if not strategized well, Digital Transformation may itself results as another silo in the system. In our experience, challenges, and way to resolve them may be categorized majorly as:

 Digital strategy should be driven by business: One of the best ways to map business goals to digital strategy is that business should be the driver of Digital Transformation. For a successful Digital Transformation program, the organization should focus **COVER STORY** 

upon identifying Digital champions across business functions within the organization. The organization should focus upon the development of a digital culture where business functions are trained across identified digital technologies to overcome mindset limitations and map digital strategy to business objectives. While starting a digital journey, people should be focused to make it successful.

- Continual improvement in Digital Foundation systems: Digital transformation is usually centered on getting the value of data or business processes driven by data in place of personal experience. This means, digital foundation systems (ERP, Manufacturing Execution Systems) hold good always and continual improvement in foundation systems should also be part of the strategy.
- Integration: Organizations develop islands within the organization in silos in a gradual course. The key objective of digital transformation is to remove silos from the systems to enable data flow from one application to another application. The organization should strategize and invest in systems where different applications are talking to each other and enabling more data-driven insights for the business functions. Common integration points across applications need to be identified and implement to make digital initiatives successful. Some

may call it smart warehousing of data, Data Lake or Data pond based upon the context of the organization, integration is a key enabler of Digital Transformation.

- Innovation: On top of the integrated framework of data sources, the innovation layer can be positioned facilitating solutions using innovative technologies. These innovative digital technologies may be bots, robotic process automation for bringing in in automation, mobility to enable work beyond the organizational boundary, Industrial internet of things for predictive and prescriptive maintenance enablement, augmented or mixed reality for real-life simulation training, and advanced analytics across business functions to enable data-driven, foreseen insights, and digitally-enabled solutions to traditional business problems.
- Not all the benefits are tangible: Thinking about ROI is key criteria being in business. Along with, there are certain returns, which facilitate further ROI, e.g. customer satisfaction, may not be immediately looking into Dollar value but required to keep us in business. Intangible benefits are at times prerequisite of tangible benefits e.g. a satisfied employee leads to be a motivated employee affecting production performance. Intangible benefits e.g. Initiatives facilitating

employee satisfaction, customer satisfaction should be part of digital strategy.

### Finding right technology partner

Choosing the right technology partner is not a simple mathematical calculation. It is one of the most tedious jobs. On a lighter note, once a partner is selected and onboarded, 80% project is done. In addition to typical contracting requirements, key considerations while choosing the right technology partner should be:

- Context of the project: Problem statement being attempted has key importance in technology partner selection e.g. established partners for projects involving subject matter expertise and medium/ startup partners where agility is a key requirement.
- Technology partner's organizational footprints: The organizational objectives of the technology partner are one of the key considerations. Technology may be at the core of the deal but ultimately an organization is dealing with another organization and contract performance is solely dependent upon their organizational capacity landscape. Peer and industry networks may be very helpful here especially in the partner's attitude, or management's commitment analysis, which have a real impact on project performance.
- Watching associated risks carefully:

While choosing a technology or technology partner, calculating the associated risks is a critical factor. These risk factors should address at least technology-related risks, the technology partner's support model during tough times, resources proposed by the technology partner, information security, and business continuity practices maintained by the potential technology partner.

 There are no Free lunches: While working towards Transformation, seriousness from technology partners and organization both are required. For game-changing solutions based upon emerging technologies, free proof of concepts, etc. have been things of past times. Serious partners should be on board along with their best possible teams and even proof of concepts should be quantifiably linked with reallife value delivery.

117

 Mutually beneficial relationship with a partner: In Industry 4.0 times, the term 'vendor' is also losing its relevance. You need technology partners in the true sense who understand business requirements not only in project execution sense rather in sustenance as well. This can be achieved from the quality management system's (ISO 9001) 'mutually beneficial relationship' concept where critical success factors are designed in terms of the organization's benefit and taking reasonable care of the partner's interest as well. **COVER STORY** 

# How are digital benefits envisaged

Digital initiatives should result in data-driven decision-making across organizations. Other major benefits envisaged in oil & gas downstream are:

- Enhanced health & safety: Innovative technologies like augmented/ virtual reality are bringing real-time experience in process simulation, troubleshooting pieces of training. Safety training assisted by AR/VR technology is quite effective in the evaluation of the effectiveness of training which is a critical common issue related to training.
- Enhancing Productivity: Wastages can be minimized by the use of advanced analytics and close loop real-time optimization techniques resulting in enhanced productivity of plants. Realtime optimization can help in reducing input costs e.g. Energy by smartly optimizing production and distribution.
  - Enhancing Reliability: Smart digital initiatives facilitating asset performance management, real-time monitoring and advanced analytics assisted prescriptive maintenance can enhance reliability and reduce maintenance costs by optimizing spare inventory, reduce planned and unplanned downtime.
  - Automation initiatives: Technologies
    like Robotic process automation,

Chatbots are bringing change by enhancing process efficiency, reducing turnaround time. Automation necessarily may not be aimed for a reduction in the workforce rather should be aimed towards enhancing efficiency and minimizing errors.

 Enhancing customer/User satisfaction: Decreased errors and turnaround times, 24X7-query resolution through ChatBOT, hassle-free digitally connected logistics, connectivity beyond computer systems through mobility, etc. enhance customer's trust required to keep us in business. Simultaneously, these initiatives enhance employee satisfaction; a key ingredient of enhanced productivity recipe.

# **Biggest possible mistakes & how to avoid them**

Digital Transformation is now a new business imperative, organizations are rushing towards embracing digital. In our experience, there are some common mistakes, which can be avoided. If we count on a scale from our experience, some of the key hindrances to be avoided are:

 Digital will change everything; organizations need not do anything with legacy processes: Digital transformation is not just the application of technology, rather complete overhauling of processes at times.
 Organizations need to dive into the legacy processes and overhaul these processes while trying to transform them digitally.

- Disassociated Governance and lack of digital culture: Management intent in true sense is required for a successful Digital Transformation program, as it cannot be viewed in isolation. The organization's governance committee should be visible in form of dedicating digital leadership across business functions, and in acceptance of genuine failures. On the other hand, digital can solve a traditional problem that needs to be brought into the organizational culture by imparting appropriate pieces of training, team engagements to make digital transformation governed by business functions. Besides, effective communication and training resolve the fixed mindset issues as quoted by Mark Raskino VP 'Gartner analysis' in Symposium 2019, "If you're in HR, you now have to become a digital HR officer. You've gotta do a whole heap of learning, and people aren't always up for that."
- Treating Cyber Security as a retrofit: In the modern age, where even wars are being fought in information space, ignoring cybersecurity is not possible. However, a common mistake is treating cybersecurity as a retrofit e.g., 'we will put a firewall'. This mistake should be avoided and Cybersecurity should be part of the program since inception and should be integrated into processes by design.

- Legacy Infrastructure: While planning for the Digital Transformation, backend support of infrastructure needs to be accounted for in strategy. Most of the time, big initiatives are stalled due to very small reasons and infrastructure has proved commonality several times e.g. advanced analytics or IIOT use case requiring high compute infrastructure at the time of running analytics engine. Adoption of new technologies e.g. cloud may be planned since the inception of the digital transformation program.
- Failing to prepare, is preparing to fail: Benjamin Franklin's words are relevant in the Digital Transformation drive as well. Common pitfalls need to be identified in terms of risks; acceptance issues etc. and strategy should be formulated to overcome these pitfalls.
- Techno centricity should be avoided: Agreed with fact that technology is the enabler and rather a force multiplier, the objective is not to convert the organization in a technology museum, rather drive the business value of it. Technology adoption needs to be prioritized following the magnitude of problems being faced in business.

### "Stakeholder Engagement Pivotal to Implement Effective Digital Strategy"



**Sharad Joshi** Head - Digitalization Smart Manufacturing BASF Chemicals India Pvt. Ltd igitalization is a key differentiator to position us as leading chemical supplier and operator for our customers. Digitalization will be a true part of BASF's DNA that creates new exciting customer experiences and business growth and drives efficiencies in processes

# Challenges to translate business goals into digital strategy

One example of specific challenges we see with respect to implementation is to make the topic digitalization tangible and attractive for our employees based on specific examples. We want to encourage our employees to try out new things, test them directly and be involved in shaping the digitalization of our company.

#### Finding right technology partner

We collaborate with innovative technology providers and start ups in joint projects to gain access to the latest technologies and learn how to smartly apply them. One collaboration, for instance, explores particularly effective technologies that help process managers identify potential problem areas in a plant.

#### Journey so far

We explore within cross-divisional teams attractive opportunities for the intelligent

use of data and digital technologies in different areas along the value chain, test in pilot projects and rollout in the company.

## Biggest possible mistakes & how to avoid them

Digitalization transformation is a change management and can only succeed with involvement of all employees. That's why it is important to bring everyone onboard. Digitalization presents wide range of opportunities to us. As the digital transformation progresses, the focus should be on the need for action and above all the opportunities and options it offers.

Besides providing learning offers for basic digital capabilities, supporting employees through this journey will be key. Leaders in particular will continue to serve as role models and multipliers by being actively involved in the transformation process. However, change can only succeed when the process of digital transformation is supported by all hierarchy level, including top-management and the employee themselves. ■

121

### Digital Transformation: A Change Intensive Process



### Dhruv Jain

Digital and Industry 4.0 Lead, Chemicals Division, Grasim Industries Limited

igital transformation is a journey involving conviction, collaboration, experimentation, and innovation at the organization level. It was the year 2012 when I was first asked to map the business process and superimpose the technology components and propose a holistic technology implementation roadmap. This proposal was poised to improve the operational productivity of the organization by facilitating coordination amongst departments and different business functions. In the year 2014, I was involved in my first IoT project which essentially enabled a remote field operating procedure and heavily leverage azure cloud services and wearables. This project ensured safe remote operations and reduce dependency on the operator's skill for the first time right process execution. Following three years I was involved in projects where-in the ask was to propose and implement technology which can give more granular visibility to physical business process like logistics, manufacturing operations, plant maintenance and deliver more information on mobile devices to the sales workforce for customer engagement. The year 2018 and onwards I was able to connect the dots of my past work and appreciate the need of a holistic approach towards digital transformation which would not only pave a way for a connected business ecosystem but also sweat out the accumulating data

to derive insight and provide stakeholders more than obvious causal factors and influencers to make more informed decisions. Today, the genesis of digital transformation not only arises from the fact that technology is now more accessible and viable; but also, from the fact that the board has visibility to the full spectrum of use cases to get inspired from. Leveraging on the connected ecosystem the fundamental race today is to churn out the cream of insights from data and make more informed decisions to develop a competitive edge. This simply translates to practicing more responsive and flexible scenario analysis and granularity on constraints and influencing factors.

### Connected Ecosystem

Data is the new oil as it has the potential to deliver unique insights and know-how which was never earlier been possible. Digital transformation is a change intensive process that emphasizes not only to be technology-centric but also re-looking at how the business processes are executed, how data flows in the business, how engaged are the suppliers and how close one is to the customers and responsive to their needs. Being more responsive means one has access to unique factors and information which influences their decisions and eventually have the capability to drive their needs. This, if perceived as a whole gives rise to the concept of a connected ecosystem

Connected ecosystem forms the backdrop of a digital strategy and based upon the value levers one can focus on the success metric on the lines of increasing market share, operational efficiency, productivity, safety, and sustainability Today, the genesis of digital transformation not only

where one would want to be at the centerand drive the process of value creation forstakeholders.

The connected ecosystem forms the backdrop of a digital strategy and based upon the value levers one can focus on the success metric on the lines of increasing market share, operational efficiency, productivity, safety, and sustainability. Taking market share as the key agenda, digital transformation can help one connect and engage at scale with more customers and consumers (up to 30% reduction in time to on-board); provide them with exceptional and unique service levels, and drive new engagement models.

### Take Aways

Key themes of digital transformation for improving operational efficiency and productivity can span from reducing the energy intensity (up to 3% reduction), improving process yields, minimizing off-spec product (up to 40% off- spec reduction), process loss minimization, improving asset reliability, improving forecast accuracy leading to optimum capacity utilization, competitive sourcing, and improving one's cash conversion cycle.

Digital transformation for safety and sustainability would mean that the workforce is safe, engaged and motivated, re- skilled/up-skilled on time, reducing safety incidences by enforcing digital checkpoints and controls, stringent control on environmental

compliances, building resilience into the sourcing supply chain by developing internal eCommerce like market place, improving visibility on the delivery supply chain to deliver goods and services(transparent OTIF and upto 20% increased logistic asset utilization) and visibility of gaps to future proof one's business.

In all above, the struggle to find the right technology provider is real because evolution is taking place at an unprecedented pace. The most likely option is to opt for service-based or platform-based architecture and avoid investing in a monolithic stack and long term commitments. Going by the concept of brilliant basics one should consider investing in data-centric platform technologies. Understanding the source and type of data helps to focus on technology selection and pave a way for a connected data-centric ecosystem. The idea to establish a bedrock of data and develop a platform to deliver on- demand business applications. This approach will encourage data democratization and do

away with organizational data silos. Infrastructure and cybersecurity must also go hand in hand as more and more digital you are the more dependency and critical role these components will play.

Digital transformation is about gathering an organizational momentum not only to develop a competitive edge but also to pursue a moon shot. Being technologycentric helps to create a scalable ecosystem for our stakeholders to engage, grow, and future proof business. This can be realized with a solid conviction in the vision and exploiting technology to drive the business performance needle. With this, we are taking a hybrid of aggressive and conservative approach where we are trying to establish brilliant basics, upskill our workforce, nurture start- ups(innovative solution providers), incubate seeds of digital innovation by encouraging to solve a business concern, and develop an organic wave of digital transformation.



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### **Adapt & Transform - Stay Ahead of the Curve**



**Anand Laxmivarahan R** Chief Digital Officer Cairn Oil & Gas Vedanta Ltd

126 Cairn embarked on a project called 'Nirmaan' in 2018-19 which laid out the digital roadmap for the company for 24-36 months. The organization was recognized as the most digitally advanced company in the Indian oil & gas sector. Anand Laximvarahan, CDO, Cairn Oil & Gas shares insights into the digital transformation with Chemical Engineering World.

> ow is digitalization enabling the oil & gas industry in dayto-day operations with less workforce?

The outbreak of COVID-19 has impacted operations across all sectors. As the oil price declined and operations of the oil and gas industry suffered globally, technologies helped the companies stay competitive and maintain business continuity for a rapid impact on the bottom-line. The pandemic highlighted the weakness in the operations of the industry which gave operators an insight into what next they should be looking at, in terms of operational advancement. For instance, Artificial Intelligence (AI), Automation, Cloud Technology and software for remote collaboration are now deployed more than before. At Cairn, we have integrated our existing on-premise infrastructure with Cloud collaboration platforms. The seamless integration between multiple best of breed platforms is ensuring business continuity through remote operations.

### Tell us about digital absorption in the oil and gas sector vis-à-vis other industries?

Digital penetration in oil and gas has been different from industries such as Retail or CPG that have been at the forefront of digital-led change to business models. Typically asset intensive industries such as oil & gas have automated core processes for many years now and have humungous amount of sensor data that can describe asset health and enable production decision. This is different from industries such as Retail and CPG that are creating more cyber-physical 'things' by adding new sensors. Oil & gas companies have in the past few years embarked on leveraging this massive sensor data coupled with transactional data in Enterprise Resource Planning (ERP) and other internal and external unstructured sources to enable optimized decisions.

Particularly in upstream, the focus has been on data-driven subsurface workflow optimization, advance analytics based production optimization such as optimizing water flood and other enhanced recovery methods, optimized field development planning, enhanced HSSE enabled by new aged technologies and leveraging digital in corporate functions such as Blockchain in trade finance , chatbots for employee engagement in HR and Analytics based spend optimization in Procurement. The digital journey will help in better management as well as increase production.

### What are the key digitalization initiatives Cairn has undertaken in business process improvements, and at the workplace?

Cairn embarked on a project called 'Nirmaan' in 2018-19 which laid out the digital roadmap for the company for 24-36 months. The broader ideas behind this move are Digital-led Subsurface and Production optimization, datadriven subsurface workflows automation, Integrated Asset Management, techenabled best-in-class HSSE, and a fully insights driven corporate functions portfolio. These have been accomplished through an integrated platform of best-inclass digital solutions leveraging Internet of Things (IoT), Data Analytics, Artificial intelligence, etc.

We believe that project 'Nirmaan' is already placing Cairn in the league of top digitally transformed oil & gas companies in the world. Based on our own assessment combined with an outsidein perspective from global management consultant firms, Cairn Oil & gas compares very favourably with integrated oil companies and independents globally who have been at the forefront of digitalization in the last few years. Cairn Oil & Gas has had the distinction of winning several national and global awards last year including FIPI's Most Digitally Advanced Company in the Indian Oil & Gas sector.

Cairn has also partnered with the Ministry, other Indian peer operators, and the digital ecosystem to create a National Digital Roadmap for the India E&P sector that will be released publicly shortly.

#### What is the impact of digitization, IOT, automation in the oil & gas exploration and production processes?

Our aim to contribute 50% of India's domestic crude production is aided significantly by the deployment of cutting-edge technology. Within Project NIRMAAN, we have leveraged a variety of digital technologies such as IoT, Automation, AI/ML and Cloud to solve business problems across our Oil & Gas value chain. These technologies have been deployed on key initiatives across Subsurface and Exploration, Capital Projects Management, Production Optimization, Health and Safety, Finance, Procurement, HR and other enabling functions. With Project NIRMAAN, we have been able to make a remarkable impact to our production volumes and operating cost, improve employee productivity and enhance stakeholder experiences.

### What do you think will be the future of oil & gas industry in terms of technological adoption?

With COVID-19 impacting industries across India, technological advancements will make the operations of oil & gas industry safer, smarter and digital, enabling more workforce to operate remotely. Companies will deploy a variety of digital technologies such as AI, Machine Learning (ML) and robotics more than ever for creative business problem solving and to do more with less. This will provide them volumes of data and insights for a radical business impact with a direct impact on the bottom-line. Real-time decision making will enable productivity and efficiency, resulting in faster exploration and production of oil. All this will ladder up to the economic growth of India. As the world advances, it is important for the industry to adapt and transform to stay ahead of the curve.

128

### "Solid commitment from all stakeholders and complete executive buy-in is critical"



### Atul K. Paranjape

Vice President – Digital & IT L&T Hydrocarbon Engineering **COVER STORY** 

&T Hydrocarbon deems Digitalization as a key differentiator in delivering value to customers by dramatically improving progress reporting automation, virtual collaboration, faster & accurate decision-making, and effective execution of projects in increasingly complex environments.

We are implementing Safety through various processes, Solutions in Concurrent Engineering, Smart Vendor Management, Real-time Project Tracking and Pro-active Alerts, Connected Worker and Connected Machines have implemented across all Projects and Locations.

Our Digital focus is on Look-ahead Visualization (in addition to actual Progress Reporting), Robotics (Automating repetitive tasks), IoT (versus manual tracking), and extending Digital footprints in O&M space. 3D Printing (versus Manufacturing of mundane, standard parts) would surely be on future roadmap.

### Challenges in translating business goals into digital strategy

EPC companies are re-discovering themselves in the new world order of Fluctuating oil prices, evolving customer demands, emerging geopolitical forces, and shrinking margins. Disruptive technologies have shown promise for achieving efficiency and cost optimisation.

In Oil & Gas industry, Owner/ Operator Companies are ahead on digital transformation journey due to economic viability and control over their processes, however EPC companies are also accelerating in this direction. EPCs are often lagging other industries in digital transformation space due to following reasons:

- Lack of standardization: EPC companies deal with a variety of construction-specific challenges and "Design-to-Build" environment. Projects span multiple sectors, geographies, and levels of customisation. Rapidly growing project scale and complexity require constant recalibration. Hence Economy of scale & driving faster adoption is a challenge.
- Disparate ecosystems: Data is typically dispersed across project/ location specific legacy platforms including manual records. Collecting and aggregating this data involves multiple touch points, resulting in increased errors, greater security risks, and fragmented decision-making.
- Limited Data Volume: In many cases, data is not available and if available, data quantity and quality are not amenable to Machine-Learning

130

- Incomplete visibility: The lack of holistic visibility makes it difficult to effectively communicate the ROI of large-scale investments. This prevents decision makers from realizing the benefits of digitization across the value chain.
- Development of digital talent: The EPC industry's talent crisis is two-fold. An ageing workforce that is resistant to change and a younger digitally savvy generation that does not favour the EPC sector due to its traditional ways of working.

### **Overcoming Challenges**

EPC Companies can overcome these challenges by following methodology:

- Drive from the Top: For Digital Transformation to take hold successfully, solid commitment from all stakeholders and complete executive buy-in is critical. Conviction and demonstration that Digital Transformation will create exponential value for each and every stakeholder is essential.
- Platform approach: Bridge heterogeneous systems using Standards based connections and establish a "Control Tower" for visibility single truth. This will help in bringing different non-standard entities and applications to a single

platform for faster planning & decision making.

**COVER STORY** 

- Smart Collaboration Tools: Supplier Communities with context based messaging and Informal communication tools such as Chatbots.
- SESA Approach: Do a rigorous "As-is" and "To-be" process mapping in Digital Context using SESA approach. Analyze and Optimize each Process by:
  - Simplify Eliminate Standardize& Automate
- Empower Youngsters: Implementation of Digital Technologies will open avenues for attracting young talent which generally shirks from joining brick & mortar industry. Recruit and involve young talent especially from non-domain areas. They will bring new ideas to the table.

# Approach to find the right technology partner

A right technology partner is one with whom your organization has shared vision and goals. Your ERP partner, your Engineering software partner and Office software partner are good places to start.

A right partner acts as Catalyst and Guide in Digital Transformation Journey. They will not only help you shape the change but will also work with you to measure the outcomes. Partner should be aligned at early stage, possibly, right from formulation of Digital Strategy. The partner incentives should include Success Fee component aligned with ROI of the Digital Program.

# How has the organization benefited so far

We have implemented a range of solutions including the following:

- Real-time Collaboration; Remote Supervision, Troubleshooting & Inspection; AR/ VR for training
- Integrated Project Management
  System: Connecting disparate systems for smart Look-ahead planning and
   Agile decision making
- Smart Supply Chain Management
- Connected Workers & Connected Machines for Productivity & Optimal Resource utilisation

We have started to see Return on Investment made in many of the Digital technologies.

# **Biggest possible mistakes & how to avoid them**

Doing away with "Analogue Thinking" and looking at processes with a "Generic Lens" is the biggest challenge for Digital Transformation. Without this the Technologies appear very exciting but seemingly require lot of customization to apply them to our unique processes. The SESA approach helps in eliminating lot of custom development, thereby making the application deployment faster and more cost effective. In-depth planning and process mapping is crucial before jumping head-long into Digital Implementation.

Most common mistakes... To be avoided and improved upon:

### Running the Implementation as an IT program

- Rather, it should be driven by business owners. The digital transformation process should be viewed as a core company process. A transition from Old to New, with a focus on building Competitive Advantage and getting Future Read.
- Inward Thinking
- Rather, look at what competitors are doing, consider examples from other industries, or countries. Find parallels in within the company to adapt and implement.
- Lack of Executive Sponsor
- Rather, Drive from Top. Setup a Steering Committee. Set clear Goals, KPIs and even performance incentives for the successes of digital transformation. Have structured, monthly reviews by the executive sponsor.

#### Analysis Paralysis

- Rather, develop a lean start-up mentality, encouraging execution and iteration across the company.
- The Next Shining Toy
- Rather, look at cost benefit and most pressing problems that can be solved by the Technology
- Analog Culture (Brick & Mortar Thinking)
- Rather, understand that every industry can implement Digital technologies. The ones adopting first will have the cutting edge and distinct competitive advantage.
- Inability to attract Digital talent
- Rather, Launch Digital Program with lot of visibility and fanfare. Create work environment for Digital talent in line with Technology companies. Use internal communication channels to publish small successes. Youngsters will be attracted to develop, implement, and witness Digital technologies working in real world of manufacturing and construction.



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### In Pusuit of Import Substitution of Agri & Pharma Intermediates

To produce intermediates through outsourcing is a useful methodology to utilize existing chemical plant facilities in MSME sector. Indian Private Enterprises can certainly compete China in high value, Low volume products that are USD 20 per kg and above, by utilizing the existing infrastructure, existing under-utilized plants with nominal incremental investments. **Pramod Karlekar, CMD, Sudarshan Farm Chemicals India Pvt. Ltd (SFCIPL)** speaks exclusively to Chemical Engineering World about his entrepreneurial venture and outsourcing model adopted by the company to produce high value low volume intermediates in leased manufacturing facilities for import substitution



**Pramod Karlekar** Chairman & Managing Director, Sudarshan Farm Chemicals India Pvt. Ltd (SFCIPL)

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For more than 3 decades, you have worked with some of the largest names in the agrochemicals industry. What made you start your own venture?

**INTERVIEW** 

During my tenure with Cheminova, I had the privilege to lead core team of highly experienced professionals across Research & Development, Sales & marketing, Commercial & Plant operations and our business grew from Rs. 150 crore to Rs 1200 crore in a span of 6 years from 2008 to 2014. Post this I was given the responsibility to handle the business in Asia , Australia , Middle East and drive development new products for customers

136

in these regions. In the following year, FMC Corporation acquired the business and the new management entrusted me with the responsibility to lead combined India Business of FMC and Cheminova as the President - India. However, the new management team was not inclined to introduce the molecules developed by Cheminova's R&D team although these products were already proven and had very strong market potential in India as well as the regions for which these were developed.

After a brief period of working for FMC, in the year 2018, I and my colleague, Ajit Inamdar co-founded Sudarshan Farm Chemicals India Pvt Ltd. (SFCIPL). Inamdar is a veteran in the field of finance with more than 35 years of experience and held the positions of CFO & Director Finance in Indian and Multinational companies.

Around the same time, a private equity firm along with our team was scouting for big ticket acquisition in agrochemicals which unfortunately was not moving as planned because of unsuccessful bidding. Subsequently, both the teams decided to acquire a conglomerate of three to four companies, in which Sudarshan Chemicals -Agrochemical business division was one of the targets. The Private equity firm however needed acquisition of all the three companies to happen simultaneously to satisfy their requirement of minimum ticket size. The deal was therefore finalised without the involvement of the private equity firm after discussions between the promoters of Sudarshan Chemicals India Ltd (SCIL) and our team for acquisition of their agro chemicals business. The new company was named as "Sudarshan Farm Chemicals India Pvt Ltd. (SFCIPL)".

The deal included transfer of crop protection formulation business including the entire manpower, all the products, brands, trademarks and Company logo from SCIL to SFCIPL. The transaction also included retention of product suppliers (Tollers), warehouses for distribution, clearing & forwarding agents. We will continue to have Sudarshan in our name and Company logo on the labels of products for a predetermined period. Thus, we are continuing with the reach legacy of sudarshan chemicals business by selling branded products to Indian farmers and in fact are expanding business.

In addition to the business of selling branded products to the Indian farmers, parallelly we have also established synthesis R&D lab for developing to business of supply of chemical intermediates as import substitutes.

The rich experience gained by the Management team in developing unique molecules, will be put to use to develop and commercialise similar molecules in Sudarshan Farm Chemical's R & D Facility. Our Team has already developed and commercially manufactured some unique Intermediate Chemicals through outsourcing model, which are supplied to some of the reputed Companies in the Agrochemical field and many such intermediates are in the pipeline.

How does this project translate Make in India for the chemical industry? Which products does the company plan to offer and how will you maintain the competitive edge?

Pursuit of Intermediate through outsourcing is a useful methodology to utilize existing chemical Plant facilities in MSME segment and putting it to the best use to convert dream of "MAKE IN INDIA" into reality. For India to compete Our outsourcing model is slightly different. We develop the complete technology and get the products manufactured from outside, where as in the bigger companies purchase the intermediates from smaller companies by transferring the burden of developing the intermediates on the smaller companies.

with China in high volume and low value products that are below USD 15/ kg we require substantial support from the Central Government by way of moratorium for investments, anti- dumping duty, Incentives from the government, development of technology parks etc. However, Indian Private Enterprises can certainly compete China in higher value low volume intermediates /products that are USD 20 per kg and above, by utilizing the existing infrastructure, existing underutilized plants with nominal incremental investments.

The high volume low value products are commercially influenced by economy of scale since these also require high investments and due to both these factors it is difficult to compete China. Whereas, **INTERVIEW** 

in high value low volume products the investments and economy of scale are not the determining factor and instead technological expertise is a key success factor where India stands good chance to compete.

There are many Agrochemical & Pharma intermediates which are currently only imported from China fall into this category. We are focusing on this segment and believe many others are doing it as well. Two absolute essential factors that offer the competitive edge are, first technology which is not inferior to anybody's if not superior and second, complete backward integration of manufacturing process.

You follow the model of leasing the manufacturing facilities unlike most of the specialty chemical manufacturers who have their own facilities. Tell us more about the outsourcing model of SFCIPL and the pros & cons of using this approach especially in this field where the quality of product is pivotal for the customers?

The outsourcing model may sound unique for India, however, Arista a global USD 2.5 bn USD company, which was acquired by UPL couple of years ago had built their entire business on the Asset light outsourced model. In fact, I believe that many big companies such as Aarti, Atul, Deepak Nitrite, PI Industries, UPL and various pharma companies do get some of their intermediates outsourced from smaller facilities. However, the value of the outsourced intermediate in their business would be small and hence this model is not discussed much. Further, most of these companies have major business coming out of reasonably high volume products, which require major investment and hence cannot be executed through outsourced model.

Our outsourcing model is slightly different from the examples given above in respect of the technology. In our case we develop the complete technology and get the products manufactured from outside, where as in many of the above cases the bigger companies purchase the intermediates from smaller companies by transferring the burden of developing the intermediates on the smaller companies.

The pros of our model are that it is asset light and gives high flexibility to respond to changing circumstances, and cons are, that one needs to build fall back option for every process step. Also, qualified and trained manpower needs to be retained for ensuring smooth operation of the quality assurance system. However, this model is not workable for high volume, low value chemicals, because, the small

138

margins would not leave adequate room for making profits, by both the Toller and the owner of the process. I believe this method has a potential to be a game changer for providing indigenous supply of large number of high value low volume chemical intermediates currently only being imported into India.

Since the process technology is ours, our end customers do not have to worry about the process secrecy, however, they do have concerns about safety and environment towards which the process owner needs to make financial investments in the outsourced plant. The secrecy can be protected by ensuring that the multiple manufacturing steps required for any intermediates are split into more than one outsourced location.

# What is the criteria for selection of manufacturing partner or leasing the facility?

We select the manufacturing partner based on their previous experience with the type of process involved and also based on suitability of plant equipment and utilities available in the outsourced facility. Our team needs to run the process for the first two months at the Tollers facility to work out a full proof SOP to ensure quality assurance and smooth operations. One supervisor needs to be retained covering one or two plant locations all the time.

Tell us about the human resources you have to run the operations from manufacturing to reaching the product to the consumer.

As you can imagine, that our model focuses on retaining the research part on one end of the value chain and relationship with the customer on the other end of the value chain under our control leaving manufacturing part to outsourcing. We therefore, have retained and need to retain a very experienced and qualified team, the motivation for whom comes from scope given to their creativity, besides giving them stakes in the shareholding.

#### At some point of time do you plan to set up your own manufacturing facility?

We certainly have plans of acquiring manufacturing plant in near future for carrying out critical (from the point of view of technology secrecy and / or safety) manufacturing steps only. We do not want to invest heavily in trying to carry out every manufacturing step inhouse as we believe asset light model is a smart way of doing business.

### Leading Onshore and Offshore Partner for the Energy Industry





McDermott is a vertically integrated provider of onshore and offshore energy solutions working across the energy value chain from concept to commissioning.

cDermott is a premier, fully-integrated provider of engineering and construction solutions to the energy industry. Our customers trust our technology-driven approach to design and build infrastructure solutions to responsibly transport and transform oil and gas into the products the world needs today. From concept to commissioning, our expertise and comprehensive solutions deliver certainty, innovation and value to energy projects around the world. It is called the One McDermott Way. McDermott's locally focused and globally integrated resources include more than 30,000 employees, a diversified fleet of specialty marine construction vessels and fabrication facilities around the world. McDermott has operations in three regions: North Central and South America (NCSA); Europe, Middle East and Africa (EMEA); and Asia Pacific (APAC).

"We consider Asia Pacific—with Centers of Engineering Excellence in India, Australia and Malaysia and fabrication facilities in Thailand, Indonesia and ChinaMcDermott's engine room," said Neeraj Agrawal, McDermott's Country Manager for India. "The multi-office model of project execution we use to run global projects and deliver value for our customers results in more than 80 percent of the work being initiated in Asia Pacific and delivered for projects throughout the world."

McDermott established itself in India in 2006, but has long been a major player from the inception of onshore and offshore oil and gas projects in India. In fact, McDermott installed the first platform and associated pipelines offshore Mumbai in the 1970s.

According to Agrawal, today, McDermott has over 2,000 employees across India—a highly experienced team covering all disciplines with in-house capability to implement concept studies, FEED, PMC, EPCM, EPC and EPCI projects.

"The offices in Gurgaon and Chennai are two of McDermott's largest project execution centers supporting local and global projects, ranging from FEED to EPCI," Agrawal said. "Gurgaon's expertise is primarily onshore projects such as refinery, petrochemical and gas processing, while Chennai specializes in offshore facilities engineering. We are uniquely positioned to address the significant opportunities we see in India in both markets."

#### **A Project Delivery Powerhouse**

McDermott has been performing FEED

and EPC services for the refining and petrochemical industry for more than 100 years and has experience in oil and gas upstream, gas processing, LNG, refining, petrochemicals and modularization. In addition, McDermott has delivered fixed and floating production facilities, pipelines and subsea systems to help customers safely produce and transport hydrocarbons.

McDermott's operations in India support major projects for Asia Pacific, the Middle East, Europe and the Americas. Since 2018, the business has evolved to include a stronger made in India focus, with major EPC projects being executed in the area, including ONGC's 98/2 project and Reliance's KG-D6 project. Last year, in recognition of this expertise in India, the Federation of Indian Petroleum Industry awarded McDermott EPC Contractor of the Year.

"McDermott's differentiators are its worldclass safety performance and vertically integrated approach to projects. The integration of onshore and offshore expertise enables us to deliver lump sum, turnkey EPCI projects," Agrawal said. "McDermott's multi-office project execution provides customers access to a globally experienced team with the added benefit of expertise in local implementation."

The multinational taskforce, Agrawal added, cultivates local talent while promoting diversity and inclusion.

McDermott maintains industry-leading standards. All offices are ISO 9001: 2015 certified, which is the highest international quality management standard; ISO 14001:2015 for Environmental Management Systems Standard; and ISO 45001:2018 for Occupational Health and Safety Management Systems Standard.

#### **Technology-Led Focus**

142

Lummus Technology is McDermott's preferred technology provider with access to a comprehensive, best-inclass technology portfolio of 130-plus technologies and 3,400-plus patents, patent applications and trademarks. Through McDermott's strategic agreement with Lummus Technology, McDermott brings customers technology solutions through the entire plant lifecycle. Lummus Technology is a leading licensor of proprietary petrochemicals, refining, gasification and gas processing technologies, as well as a supplier of catalysts, proprietary equipment and related technical services. These technologies are critical in the gasification of coal into syngas, the refining of crude oil into gasoline, diesel, jet fuel and lubricants and natural gas processing into various chemicals and polymers.

#### **Industry Leading HSE Results**

McDermott's Asia Pacific operations have achieved a Total Recordable Incident Rate (TRIR) of 0.03 year-to-date, which is exemplary given the diverse volume of work being undertaken across the region. To put that into perspective, the International Association of Oil & Gas Producers indicated that the TRIR average amongst our peers in 2019 was 0.19. The International Marine Contractors Association TRIR average for 2019 was 0.26. McDermott has a Taking the Lead program to instill a robust and mindful safety culture, focusing on McDermott Operational Values to ensure a shared culture of safety-based behavior.

"McDermott is a purpose-driven company that chooses to lead by example in all that we do. We push to exceed industry safety standards and entrench best practices across our global footprint," Agrawal said. "While we always aim for zero incidents, these safety results are truly world-class results and it's something that the whole team at McDermott is incredibly proud of and committed to maintaining."

#### **Locally Focused Sustainability**

McDermott's history of sustainable and responsible growth creates value for the communities where we work. McDermott recently contributed substantially to the Prime Minister's National Relief Fund and has also donated to the Indian Red Cross.

At present, McDermott is working on a number of sustainability-driven projects to enrich the local communities where we are present, including training in workforce skills, education and improving access to clean water and renewable energy sources in our local communities.

### **Stop Postponing Tank Calibration**

### This New Method Makes it Easier than Ever





one are the days of timeconsuming and expensive calibration methods with unsatisfying accuracy and traceability results. The new, innovative RapidCaITM method offers economical and fast calibration without using huge amounts of test weights and liquids. This allows you to avoid extended downtime and save costs!

How does RapidCal tank scale calibration work?

Instead of using test weights or material substitution, a downward force is applied with hydraulic equipment.

The loading of the tank scale during RapidCal mimics that of normal operation, taking into account piping influences.

#### Minimum time investment

RapidCal can be performed at any time with a minimum amount of preparation. The calibration is done quickly, thanks to equipment portability. Moreover, the whole calibration process is significantly faster than calibration with test weights. This lowers the effective downtime of your production facilities dramatically over the course of a year to a few hours per calibration. High cost savings are realized by reduced downtime.

### Higher accuracy and assured traceability

With RapidCal, it is possible to reach up to 0.1 percent accuracy by using the force applied to hydraulic cylinders. The reference load cells used are traceable to test-weight standards and provide accuracy and traceability comparable to calibration with physical weights.

#### Saves thousands of dollars

Traditional forms of tank calibration can be very expensive, from test weights which increase in price depending on scale capacity to material substitution calibration which requires a huge amount of purified water. RapidCal helps to maintain traceability at lower costs, increase the efficiency of the calibration cycle, and improve the ecological footprint of your operation.

#### Avoid contamination of tank contents

The tedious emptying and cleaning of tanks during substitution calibration is avoided by applying this new method. For production facilities, the risk of tank contamination is eliminated and disposal costs of contaminated water avoided.

#### Up to 32 ton full capacity

RapidCal is the best method up to 32 tons, where using test weights is timeconsuming and cumbersome. Regular recalibration can easily be scheduled to comply with quality systems. Furthermore, for weights in excess of 32 tons, a material substitution calibration is possible using the calibration technology offered by our service team.

#### About METTLER TOLEDO

METTLER TOLEDO is a leading global supplier of precision instruments and services. The company has strong leadership positions in a wide variety of market sectors and holds global number-one market positions in many of them. Specifically, METTLER TOLEDO is the largest provider of weighing and analytical instruments for use in laboratory and in-line measurement in demanding production processes of industrial and food retailing applications.

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145

## **Intelligent pumps**



Grundfos CRE pumps are the ideal choice for most industrial applications Grundfos CRE pumps offer highly efficient 'E' version motors with a built-in frequency converter, controller and permanent magnet motor with IE5 efficiency. These combine the very best of pump technology with intelligent motors. Grundfos' CRE pumps are largely used in HVAC, cooling towers, pressure

boosting, boiler feed, water treatment and several other industrial applications. One of the best vertical multistage centrifugal pump in the market, Grundfos CR and CRE pumps help to boost the pressure of water equally during demanding times. Advanced simulation-driven design and validation processes have made it possible to optimize the hydraulic design of the new generation of the Grundfos CR vertical multistage inline pump and achieve world-class efficiency along with E-motors.

For details contact: Grundfos Pumps India Pvt.Ltd. Website: http://www.grundfos.in/

## **New ADX Series Stainless-Steel AODD Pumps**



Almatec<sup>®</sup>, part of PSG<sup>®</sup>, a Dover company and premier manufacturer of specialty pumps, is pleased to announce the launch of its new ADX Series Stainless-Steel Air-Operated Double-Diaphragm (AODD) Pumps for industrial applications.

Developed to replace legacy Almatec CHEMICOR AD Series pumps, the new ADX Series incorporates an array of design enhancements that provide simplified maintenance, improved cleaning and increased safety. Engineered to meet the mass requirements of an oscillating pump, the ADX Series' wetted housing parts are constructed from

stainless-steel precision casting while the non-wetted parts are available in three different plastic materials to accommodate a variety of applications and temperatures. The ADX Series is currently available in ADX20 (3/4") and ADX25 (1") sizes and in two variations that meet ATEX requirements.

For details contact: PSG<sup>®</sup>, a Dover company Website: www.psgdover.com R.N.I. No. 11403/1966 Date of Publication: 29<sup>th</sup> of every month. Postal Registration No: MCS/095/2018-20 Posted at Patrika Channel Sorting O ice, Mumbai 400001, on 30<sup>th</sup> of every month. Total Pages No.: 146



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