CHRONICLING PROCESS INDUSTRY INNOVATIONS SINCE 1966

VOL.56 | ISSUE 1 | JANUARY 2021

CHEMICAL ENGINEERING WORLD

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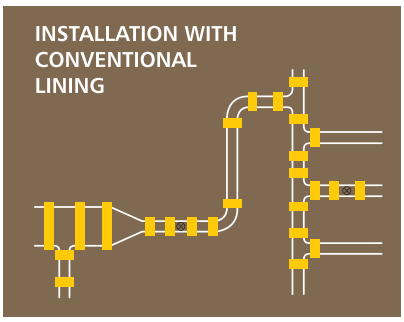

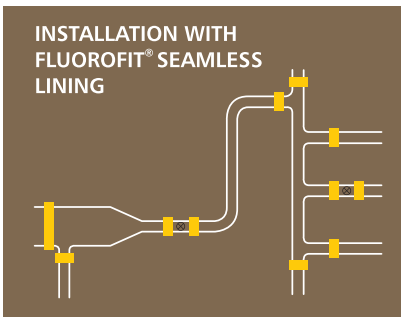

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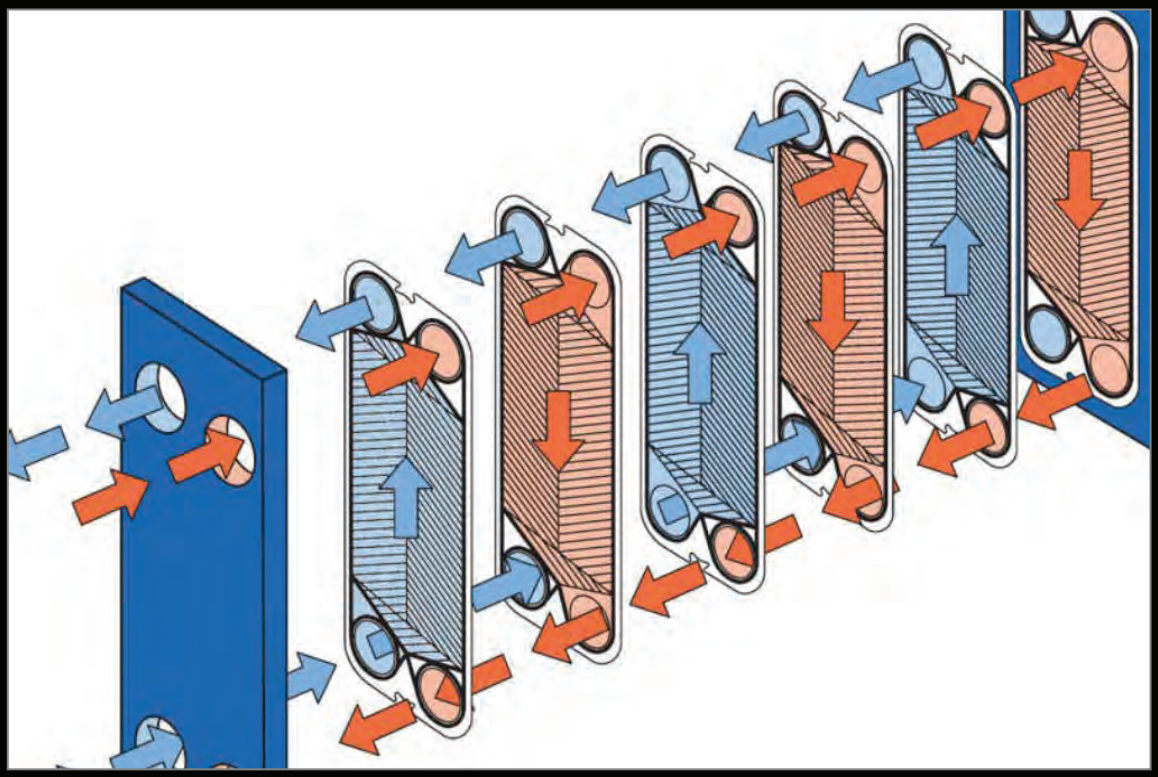

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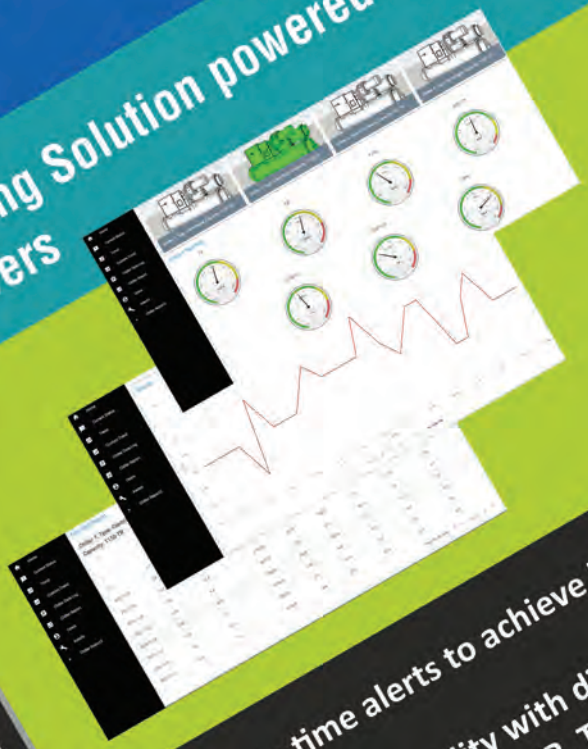

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Bharat Petroleum Corporation Limited Awarded at FIPI Oil & Gas Awards 2020

Mumbai: Bharat Petroleum Corporation Limited (BPCL), a 'Maharatna' and a Fortune Global 500 Company has received four coveted awards at the prestigious FIPI Oil & Gas Awards 2020. The awards were presented by Shri. Dharmendra Pradhan Hon'ble Minister of Petroleum and Natural Gas and Steel, Government of India on Jan 27, 2021.

Bharat Petroleum Corporation Limited was awarded the 'Innovator of the year – Team,' led by Srinivasulu Kaalva, Senior Manager (R&D) of Bharat Petroleum Corporation Limited for developing Divided Wall Column technology for improving the energy efficiency of distillation columns. This technology is successfully implemented in the Kochi Refinery Naphtha Distillation unit and BPCL is the first Indian company to demonstrate Divided Wall Column technology on a commercial scale.

The Company's subsidiary Bharat Oman Refineries Limited (BORL), was conferred with 'Refinery of the Year' (Capacity upto 9 MMTPA)' for achieving significantly higher levels of performance in production, operational efficiencies and energy conservation while meeting the norms of health, safety and environment protection.

BORL was also awarded the 'Sustainably Growing Corporate of the Year' for outstanding contribution in achieving excellence in sustainability performance and care for the environment. D Rajeswari, from BPCL, Mumbai Refinery, received the coveted 'Young Achiever of the Year' award for innovative approaches in capacity expansion of Crude Distillation Unit & strategic extension of pipeline network in Refinery bringing about synergy, benefit and integration of facilities.

On the occasion, P.V. Ravitej, Executive Director (In Charge Refineries), BPCL expressed "We are proud that our efforts have culminated in the receipt of these coveted awards & recognitions from Shri. Dharmendra Pradhan, Hon'ble Minister of Petroleum and Natural Gas & Steel, Government of India at the 'FIPI Oil & Gas Awards 2020. These awards are testament of our continuous pursuit for innovation, excellence and service quality".

FIPI Oil and Gas Awards recognize the leaders, innovators and pioneers in the Oil and Gas Industry, with an objective to celebrate the industry's most outstanding achievements. The applications were evaluated by the Awards Committee comprising of experts from the oil and gas industry.

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H_2SO_4	sulfuric acid	95%	180°C
HBr	hydrobromic acid	100%	200°C
HCl	hydrochloric acid	100%	200°C
H_3PO_4	phosphoric acid	100%	200°C
NH_4Cl	ammonium chloride	100%	200°C
$CaCl_2$	calcium chloride	100%	200°C
$CuCl_2$, $CuSO_4$	cupric chloride & sulfate	100%	200°C
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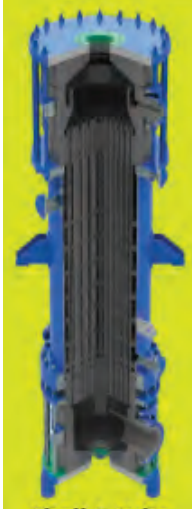
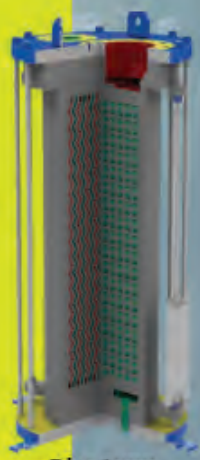


Shell & tube HEX



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L&T Heavy Engineering Flags Off World's Heaviest LC-Max Reactors Ahead of Schedule

Hazir, Surat: Achieving another milestone in the engineering world, the Heavy Engineering business of Larsen & Toubro, has completed and flagged off World's Heaviest LC-Max Reactors ahead of schedule in the presence of M K Surana, Chairman & Managing Director, Hindustan Petroleum Corporation.

The reactors, weighing 2260 Metric Tons (MT) each, will enable India's first Residue Upgradation Facility (RUF) by Hindustan Petroleum Corporation's Visakh Refinery to convert the heaviest oils to high-quality BS-VI diesel, as well as increase feedstock and improve product flexibility. The reactors will sail in 'single piece' directly to Visakhapatnam from Larsen & Toubro's fully integrated, state-of-the-art, digitally-enabled coastal manufacturing facility located at Hazira in Gujarat.

Commenting on the occasion, M K Surana, Chairman & Managing Director, Hindustan Petroleum Corporation said, "L&T has been our valuable partner in our journey to modernize and upgrade our refineries. We thank the L & T team for early delivery of these reactors."

Vinod S Shenoy, Director Refinery, Hindustan Petroleum Corporation, said, "Manufacturing this first of its kind critical equipment with good workmanship and utmost safety is truly remarkable. We are glad that with this early delivery of LC Max Reactors, our Visakh program stands benefitted."

Commenting on this achievement, S.N. Subrahmanyan, CEO & MD, Larsen & Toubro said, "We are delighted to deliver these unique reactors in record time for our esteemed client HPCL. Our heavy engineering shops are the only ones in the country to have consistently dispatched the largest, heaviest, longest and most complex process plant equipment to the global clients ahead of schedule. This track record remains unbroken in the unprecedented pandemic situation or otherwise."

Anil Parab, Executive Vice President and Head, L&T Heavy Engineering said, "We

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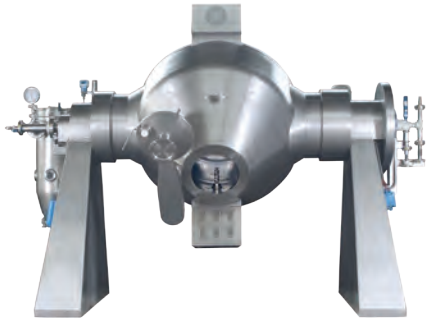

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thank HPCL for their continued faith in us to deliver World's Heaviest LC-Max Reactors and be a part of India's First RUF project. We are proud that we have lived up to HPCL`s expectations and flagged off these reactors ahead of schedule. This is one more example of L&T's contribution to the Honourable Prime Minister's "Atma Nirbhar Bharat" Mission.

L&T Heavy Engineering supplies high technology reactors and systems to global customers in Refinery, Oil & Gas, Petrochemical, Fertilizer and Nuclear Power industries.

Siemens Digital Industries Software Appoints New Managing Director for Asia Pacific

Bas Kuper, Senior Vice President & Managing Director for Asia Pacific, Siemens Digital Industries Software

Siemens Digital Industries Software announced the appointment of Bas Kuper as Senior Vice President and Managing Director for Asia Pacific, who brings in more than 20 years of industry experience to the role. Kuper succeeds Pete Carrier, who will be taking over as Senior Vice President of Global Operations and Go-to-market (GTM) Transformation. In this role, effective immediately, Kuper and his team will leverage Siemen's Xcelerator™ portfolio of software and services to help companies across Asia speed digital transformation.

"Bas has been instrumental in Siemens's continued global success, and under his leadership in Asia Pacific, Siemens will continue to foster close partnerships with our customers here, helping them pivot to a software-driven approach to manufacturing, and unlocking new efficiencies and opportunities in the global market," said Bob Jones, Executive Vice President of Global Sales and Service, Siemens Digital Industries Software. "The Asia-Pacific region shows strong growth potential for Siemens, even amid a global pandemic, and I congratulate Bas on this new role."

Kuper has held various leadership positions in his tenure with Siemens Digital Industries Software over more than 13 years and is recognized throughout the industry for his experience and thought leadership. Previously, he served as Country Manager for Belgium and Luxembourg and later as Vice President and Managing Director for Benelux and the Middle East/Africa region. Kuper will be based in Hong Kong with responsibility for Asia Pacific markets.

CVR Energy, Inc. subsidiary selects Haldor Topsoe's HydroFlex™ technology for revamp to renewable diesel production

CVR Energy, Inc. subsidiary will base a revamp of its Oklahoma, US, refinery on the HydroFlex™ technology to produce

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Photo Caption: The HydroFlex™ technology converts a wide variety of renewable feedstocks into transportation fuels.

approximately 100 million gallons of renewable diesel per year. Topsoe will deliver basic engineering, license, proprietary equipment and catalyst for its HydroFlex™ technology. The construction work has begun for the US$ 110 million project, which is scheduled to be completed in July 2021.

The project will convert an existing hydrocracker for the production of low-carbon renewable diesel from soybean oil, resulting in a reduction of greenhouse gas emissions compared to hydrocarbon diesel. The renewable diesel is expected to meet the ASTM D975 diesel specification and qualify for programs such as the California Low Carbon Fuel Standard.

"By leveraging assets already in place, particularly the existing hydrocracker unit and underutilized hydrogen plant at our Wynnewood refinery, we believe we can deliver one of the lowest-cost renewable diesel projects in the industry," says Dave Lamp, CEO & President of CVR Energy, Inc.

"We are very proud that CVR Energy, Inc. has chosen HydroFlex™ for this significant revamp project. This proven technology is the preferred choice for refiners leading the industry adaptation of renewable fuels, and it is a privilege to add yet another US project to our portfolio in line with Topsoe's vision to be recognized as the world leader in carbon emission reduction technologies by 2024," says Henrik Rasmussen, Managing Director of Haldor Topsoe, The Americas.

Topsoe's HydroFlex™ is the industry-leading technology for production of renewable jet and diesel. This commercially proven technology provides refiners with lower CAPEX and OPEX, and better carbon intensity (CI) score. HydroFlex™ can be deployed in both grassroots units and revamps for co-processing or stand-alone applications.

Nouryon Appoints Former CFO of Eastman Chemical Company to Board of Directors

Nouryon, a global specialty chemicals leader, announced the appointment of Curtis Espeland to its Board of Directors, effective January 18, 2021. Espeland will also chair the Company's Audit Committee.

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Curtis Espeland joins Nouryon's Board of Directors

Noelle Walsh, Corporate VP of Cloud Operations & Innovation, Microsoft

"Nouryon is extremely pleased to welcome Curt to our Board of Directors. As the former CFO of Eastman Chemical Company, Curt brings highly valuable strategic and operational experience leading a Fortune 500 company within the global chemical industry, as well as substantial experience in all aspects of financial management in a public company environment," said Charlie Shaver, Chairman and CEO of Nouryon.

"The high caliber of Curt's leadership skills is an ideal complement to the existing makeup of our Board members, and we look forward to his contribution in helping us realize our ambitious growth goals in the coming years," said Shaver.

Espeland brings more than 25 years of experience in leadership roles with Eastman Chemical Company, most recently as Executive Vice President and CFO, and prior to that, in the business consulting and audit services sector. He currently serves as lead director and member of the finance and audit committees of Lincoln Electric Holdings Inc.

Espeland's appointment follows that of Noelle Walsh in January 2020 to the Board and to the Company's Audit Committee. Noelle Walsh is Corporate VP of Cloud Operations & Innovation at Microsoft. She has strengthened the Board with a high-performance mindset and strong operational background in leading global teams in manufacturing, supply chain and customer service. She builds on 25 years in the chemicals industry with The Dow Chemical Company, as well as valuable experience working with other Boards.

With the appointments of Espeland and Walsh as independent Directors, the Nouryon Board of Directors now comprises 11 members with complementing backgrounds and experiences, including Shaver and representatives of the Company's investment firm owners, The Carlyle Group and GIC.

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Global Oilfield Chemicals Market To Touch US$35.08 Billion by 2026

The global oilfield chemicals market is anticipated to reach USD 35.08 billion by 2026, according to a new study published by Polaris Market Research. The moderate increase currently and expected boom in the near future of crude oil prices are expected to bring about increases in demand for oilfield chemicals that are used in well drilling & completion, hydraulic fracturing and EOR operations.

The revival of drilling operations in the existing wells owing to increase in crude prices to a feasible level and the rise in drilling of unconventional wells for pilot projects and also for production especially in the North American and North Sea regions will add to demand for these products. The enhanced technologies currently utilized for developing shale gas and tight oil resources have evolved as a major trend over the past years. This will include the ongoing trend towards fracturing fluids for slick water and also high-performance drilling mud chemicals.

Development of several chemical formulations that can address environmental concerns will have an important impact on its market, promoting to added demand for high quality environmentally friendly chemicals, including less toxic biocides and biodegradable shale inhibitors. Offshore operations are anticipated to stay a vital contributor for the market globally and the necessity for environmentally compatible chemicals and fluids will be leading in the offshore environments.

Projections for raw materials used for the development of oilfield chemicals are entrenched in the finished products outlook in which these are used. Polymers and acids used in such stimulation chemicals are expected to register higher growth, driven by constant expansion of the well stimulation technologies. However, clays along with other commodities used in the drilling fluids are anticipated to decline moderately early over the forecast period.

Increasing concerns for pollution of groundwater and the environment are some of the major concerns for the industry participants. Companies have been investing significantly in R&D operations to constantly upgrade their products and offer novel chemicals to the upstream sector that satisfy every aspect of environmental regulations thus enhancing the required parameters of operations.

North America is expected to be the largest market by the end of the forecast period. The U.S. market is anticipated to grow at a CAGR of around 4 per cent from 2018 to 2026. After a short term decline in demand for these products in the country, the growing exploration and production from unconventional wells have played a major role boosting its demand again. Hydraulic fracturing is anticipated to be one of the major application segments globally. Despite the low crude prices, an increase in average volume of chemicals used per well during 2017 was a primary factor driving the market.

Some of the leading industry participants currently operating are Clariant, Solvay, NALCO, Croda International Plc, Baker Hughes, Kemira, Halliburton, Schlumberger Limited, Stepan Company, Akzo Nobel N.V., The Lubrizol Corporation, BASF SE and Dow Chemical Company.

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Oil India Limited Bags the Federation of Indian Petroleum Industry (FIPI) Awards 2021

Sri Tarun Kapoor, Sect. P&NG handing over FIPI Excellence in HRM - Company of the Year Award to Sri Sushil Chandra Mishra,CMD alongwith Sri Biswajit Roy, Director (HR & BD)

Hon'ble Minister P&NG and Steel, Shri Dharmendra Pradhan handing over the E&P Company of the year award to Shri S.C Mishra, CMD and Dr. P. Chandrasekaran, Director(E&D)

Oil India Limited (OIL), India's second largest National Exploration & Production Company, won the coveted Federation of Indian Petroleum Industry (FIPI) Award 2021 in the category Exploration & Production- Company of the Year and Excellence in Human Resource Management, in the glittering FIPI Awards ceremony held at New Delhi, on 27th Jan, 2021.

Sri Tarun Kapoor, Sect. P&NG handing over FIPI Excellence in HRM - Company of the Year Award to Sri Sushil Chandra Mishra,CMD alongwith Sri Biswajit Roy, Director(HR & BD)

The award was presented by Hon'ble Minister of Petroleum and Natural Gas and Steel, Shri Dharmendra Pradhan and Secretary (P&NG), Tarun Kapoor in the august presence of eminent personalities from the Industry and academia, to Shri Sushil Chandra Mishra, Chairman and Managing Director, OIL along with members on the Board of OIL including Sri Biswajit Roy, Director (Human Resources & Business development), Dr. P. Chandrasekaran, Director (Exploration & Development) and Shri Harish Madhav, Director (Finance).

Hon'ble Minister P&NG and Steel, Shri Dharmendra Pradhan handing over the E&P Company of the year award to Shri S.C Mishra, CMD and Dr. P. Chandrasekaran, Director(E&D)

The award is in recognition of Oil India Limited's leading performance in exploration, development and operational efficiencies in exploration and production for oil and gas, and path breaking initiatives & partnerships with other business functions undertaken under Human Resource Management (HRM) for achieving strategic goals for the company.

AVEVA's Third Digital Conference Brings Together Environmental Sustainability Experts to Discuss How Technology Can Help Lower Carbon Footprint

Mumbai, India: AVEVA, a global leader in engineering and industrial software announced its third World Digital (AWD) conference, themed 'Accelerate Your Digital Intelligence' which took place on 26 to 28 January 2021. AVEVA's World Digital Conference convened industry leaders to discuss emerging trends, meeting sustainability and business goals, and the role of the connected workforce in accelerating the digital journey.

The online event explored how leading companies are embracing innovation and applying intelligent software to reshape their industrial operations. It demonstrated how emerging technologies such as AI, Cloud, Digital Twin, Visualization and data & analytics are supporting advancements in sustainability, and enabling organizations to make significant changes to improve the environment.

Technology is playing a vital role in achieving real-time optimization, improving decision-making, and digitally enabling business operations, supported by an often-remote workforce to drive substantial cost reductions. Furthermore, with COVID-19 exposing pressures on the industrial sector, sustainable business strategies have come to the forefront with CTOs now seeing sustainability as part of the transformation imperative. As a result, organizations are adopting real-time environmental monitoring to reduce the carbon emissions of heavy industries. Visualization, Digital Twin, Machine Learning and AI are technologies that are helping to manage these priorities.

Craig Hayman, CEO, AVEVA commented, "Digitalization and sustainability are two sides

of the same coin. AVEVA's industrial software solutions support sustainable outcomes by plumbing our broad and deep specialist capabilities into the scale and scope of the Cloud, enabling our customers to deliver diverse environmental benefits via optimized engineering, operations and performance. As more of our customers demand it, we are working with them to innovate to drive sustainability. A clear digital strategy drives environmental outcomes, social improvements, and ethical governance, which ultimately enhances culture and improves long-term business sustainability."

The most Ambitious AWD Yet

With more than 50 training sessions as well as live networking, AWD attendees received in-depth insights into how to transform operations, level up digitalization, and stay competitive. An Interactive Virtual Expo provided a forum for live chat with AVEVA experts through 10 strategic demo success stories across Asset Performance, Unified Engineering, Value Chain Optimization, AVEVA Connect, Edge to Enterprise Operations, industrial AI, the connected worker, and more.

As recently, AVEVA also joined the United Nations Global Compact and the UN Global Compact Network UK — a voluntary leadership platform for the development, implementation, and disclosure of responsible business practices. With this announcement, the company joined thousands of other companies around the globe committed to taking responsible business action to create a more sustainable world.

On joining the UN Global Compact, CEO of AVEVA, Craig Hayman commented, "It cements our existing commitment to align our business with the Ten Principles, and provides an exciting platform for learning and collaboration with other members. AVEVA's key focus will initially be on areas where our social and environmental contribution can be greatest, including addressing the climate crisis and expediting the transition to a more circular global economy."

Launched in 2000, the UN Global Compact is the largest corporate sustainability initiative in the world, with more than 12,000 companies and 3,500 non-business signatories based in over 160 countries, and 69 local networks. Its aim is to mobilize a global movement of sustainable companies and stakeholders to create the world that conducts business responsibly by aligning its strategies and operations with Ten Principles on human rights, labor, environment and anti-corruption; and takes strategic actions to advance broader societal goals, such as the UN Sustainable Development Goals, with an emphasis on collaboration and innovation.

Steve Kenzie, Executive Director, UN Global Compact Network UK, added, "The core of the United Nations Global Compact's mission is to support companies doing business responsibly by aligning their strategies and operations with ten universal principles on human rights, labor, environment, and anti-corruption. We also support business taking actions to advance the Sustainable Development Goals. We are delighted and encouraged by AVEVA's endorsement of our initiative." ■

What is E-Contracting? Can Contract Terms be Standardized?

Contract lifecycle management automation is a vast study, as it involves many well-defined protocols and standards for contract administration, along with automation and executive support. Rashid Hussain, is an Advisor & Certified Professional Contracts Specialist, and Commercial Arbitrator with over 35 years of experience working for oil, gas and EPC giants such as Exxon-Mobil, Dodsal and Aramco during his career span. In this article, he takes us through the steps of contract lifecycle management automation, implementation of e-contracting and analyses if standardization of contracts can be made possible.

Economic uncertainty and regulatory requirements have put contract management on enterprises' strategic agendas. Contract lifecycle management automation delivers measurable improvements in financial and operational performance. Leading contract management programs use standard contract language and well-defined protocols for contract administration coupled with automation and strong executive support.

Faced with lingering economic uncertainty and heightened regulatory requirements, businesses are under ever-increasing pressure to develop and execute strategies to continuously improve performance, mitigate risk, and ensure fiscal accountability.

To identify contract lifecycle management as a primary lever for achieving these objectives, Contract lifecycle management is the process of systematically and efficiently managing contract creation, execution, and analysis for maximizing financial and operational performance and minimizing risk.

Thus, there is substantial positive impact contract management automation has on revenues, costs, compliance, and operations. To better understand the strategies required for contract management success, it has clearly been found that effective contract

management requires enterprises to employ a holistic approach to creating and managing trading and partnership agreements.

1. In addition, manual compilation of tender schedules lack proper and system documentation and its storage which includes Information to Bidders, Forms of Agreement, General Terms & Conditions, Detailed Scope of Work & its attachments (drawings, specs, data sheet etc.), Various commercial Bid Forms, Health, Safety & Environment, Requirements, Settlement of Disputes, Arbitration & Choice of Law, Taxes, Duties & Related Obligation, Quality Assurance & Control Inspection & Testing, Material Tools & Equipment, improper Contract Administration & ineffective Project Management. Lack of coordination, cooperation and discrepancy arising between company representatives and contractors as there are missing addendums, amendments, monitoring of progress reports, noncompliance of instructions, issuance of equipment, materials and tools etc until close-out of the Contract.

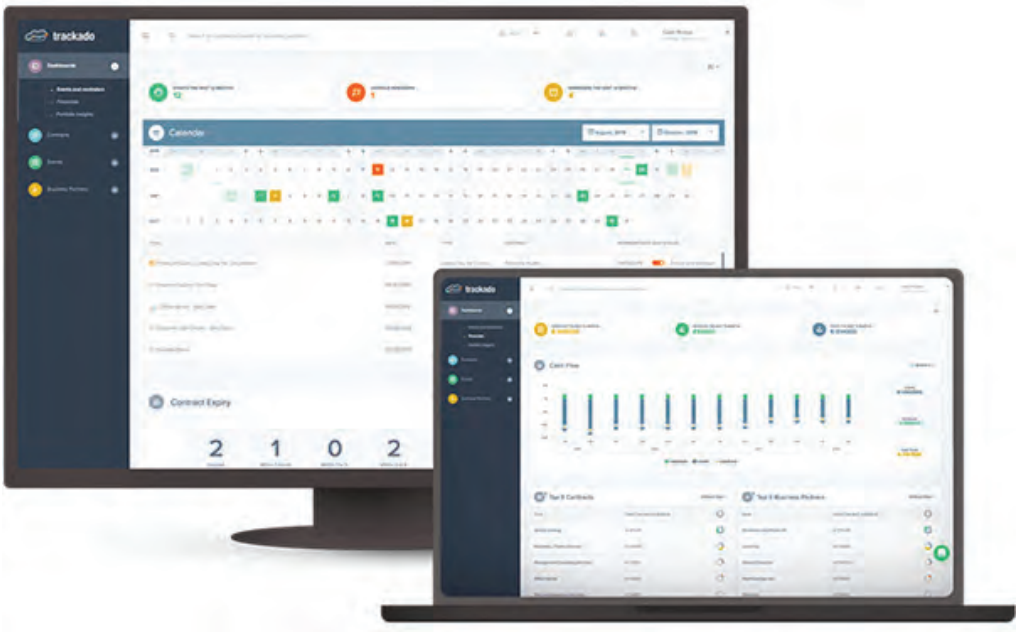
2. Most times due to these inaccuracies and shortcomings a 'Claim' is often raised which is an unhealthy practice and not conducive for completion of contracts and project management of contract. Company is compelled to increase the budget of a particular contract and also at times a contractor is obligated for substantial losses too. Claim entails hiring of external legal assistants and reworking on documentation from initiation to closing of the contract, which is not only time consuming but additional burden on exchequer and enormous delay in close-out procedure.

3. Apart from the budgeted original 'Contract Amount' for every new contract initiated, the company has to make further additional provision of 20% to 45% over and above the total contract value towards litigation expenses and claims settlement payment to contractor.

4. Contractor too faces peculiar and uncomfortable situations incurring additional litigation expenses, delay in completion of project and keeps fingers crossed, sometimes burning midnight lamps to receive the claim amount, if awarded in their favour.

Automated solution to Contracts Lifecycle Management

When businesses commit to an automated solution to Contracts Lifecycle Management, they improve visibility, reduce risk, and, more



importantly, simplify and speed up the entire process from start to finish following these steps:

Step 1: Know your business

Start by:

- Understanding and documenting your pain points, and prioritizing your needs
- Knowing how you would want your contracting business to function before implementation
- Laying out all requirements that have to be met
- Determining what success looks like and how you'll measure it
- Finding the individuals in your organization who will directly benefit from the project and involving them at the outset

Once configuration is underway, make sure you're continuing to meet all requirements all the way up to the rollout, including database configuration, document rules, and alert templates.

Step 2: Use solid project management practices with a phased implementation approach

A pilot program using a phased implementation approach and rollout—by functionality, organization, or both—accomplishes a few things:

- Ensures efficiency and effectiveness
- Eliminates the need for rework
- Helps you realize immediate and sustained benefits from the software
- Ensures a smoother transition by gradually introducing system functionality, while adding incremental value to your business with each phase

Step 3: Provide training and support

For all its magic, automation software isn't worth much if people don't know

how to use it. That's why it's imperative to provide targeted, role-based training to all your users, along with ongoing support to encourage greater adoption and continued proper use of the system.

Step 4: Create and distribute targeted, effective reports

There's a wealth of data and insights locked into your contract information. Untapped, it does nobody any good. But the right reports can do wonders, assisting management with budgeting and decision-making, and keeping the organization aware of—and onboard with—the value of your contract system.

Step 5: Perform regular audits

Use standard system reviews and reports to regularly audit the software. And if you find an issue, act quickly and communicate clearly on the problem areas. When the system is being used consistently and correctly, the higher the quality of data you will have at your fingertips.

Step 6: Actively manage your system

After go-live and through your steady state, make sure you're getting the most value from your software:

- Use a change control board to evaluate and update your system
- Stay current with new functionality provided in regular system updates
- Close the loop on communicating updates, new features, and new use cases so everyone stays on the same page

Better management, better contracts

These days, contract lifecycle management is hardly optional. Just like with child rearing, you have to dutifully manage everyday measures to see overall results.

But not just any management system will do. Conga's automated technology gives businesses the keys to rein in chaotic contract processes, streamline workflows, and drastically reduce manual effort, while improving communication, data-sharing, organizational insights, accuracy, and speed.

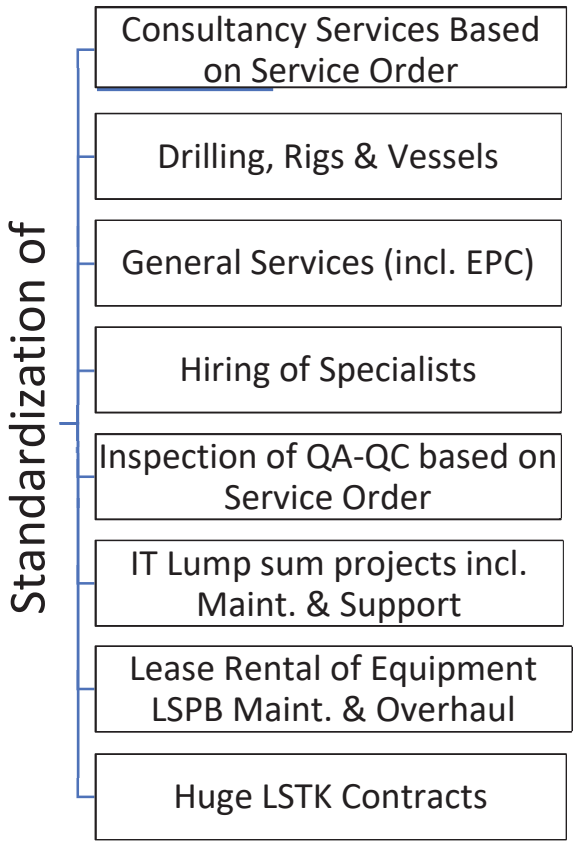
Details on Implementation of E-Contract

A steering committee will draft standardized templates of Contracting Terms and selection of appropriate Contracts Live Management Software. All Contracts Management, Project Management and decision-making authorities of an organization are requested to confirm their participation in forming this Committee.

In this connection I would like to quote an example where Rashid Hussain was a team member of the Steering Committee which had Americans &

European experts to interpret templates for different forms of Contract for the biggest Oil & Gas Company, a few years before.

Few excerpts of standardization done were as follows:



Due to varying scope of work and its attachments which demand additional terms and conditions, and which are not a part of the standardized template a special schedule of additional terms and conditions are included as part of the Contract Documents, and issued as a part of the tender documents.

These are issued through the company portal of Contracts Management Software which follows transparency, open and bid submission, contract awarding and contracts management/ project management. These are smoothly and cohesively possible through software portals which result in smooth awarding, execution and close out of the project on time.

This enhanced compiled tender document helps the company save time and money by nearly 20 per cent to 40 percent of the budgeted amount as well as time is saved, since claims are limited to nil.

Contractor completes the project and the close out happens on time resulting in no claim at all. Contractor receives his full and final compensation and completes the contract.

There are no synonyms and no standard precedence of contract with contracting terms being followed with majority of the companies around. Each organization has their own terms & conditions to follow.

In India there is no uniformity as well as no enforcing and regulatory authority who insists on contractual terms for each of the industry segments. Both Government, Semi-Government and multinationals in India have their own templates for Contractual terms but it varies from entity to entity and further the concurrent repercussions can also be seen with external service providers.

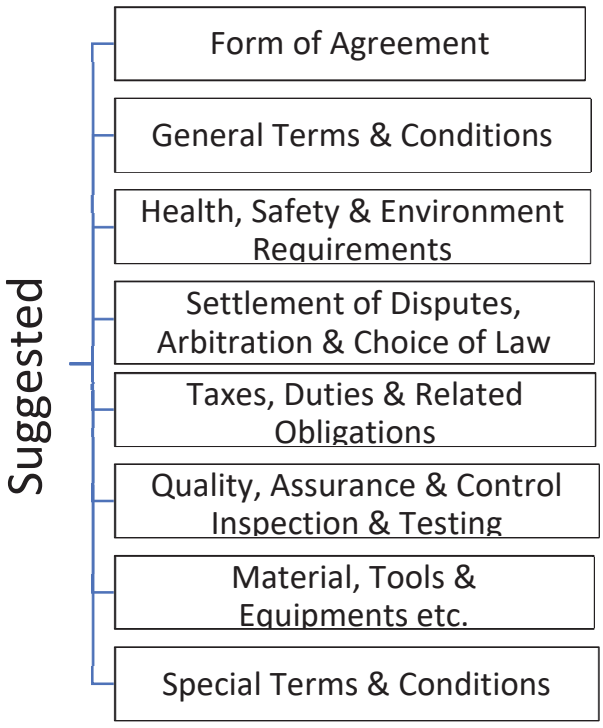
In most cases, E-Contracting is not fully implemented with standardized templates.

Summing Up

Therefore, in order to standardize the templates in a contract, it is suggested that management of each organization (Multinational, Private or a Public Sector) should take a formal initiative to form:

- A steering committee allocated from various business lines viz. finance, legal, subject matter expert, contracting, project management and others within their organization.
- Set-up & Prioritize Terms of Reference
- Choose, Select & Prioritize CLM (Contracts Live Management) Software
- Formulate a defined term of reference to standardize terms & conditions which includes FIDIC contracting terms in all types of forms of contract and particularly addressing:

This will have a substantial impact within the organization's work process movement and will entail savings of 20 per cent to 40% in their outputs/ outages and increased efficiency as well as performance of the workforce to the highest. Litigation cases shall be minimised or not raised at all. ■



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The Pre Start-up Safety Review

Before introduction of material or energy in the system, Pre Startup Safety Review (PSSR) is mandatory especially for Chemical industries in particular. It is applicable not only for capital projects but also during the operation phase as well for Management of Change.

PSSR activity must be carried out by multidisciplinary team of qualified people from the plant and the organization. Depending on the scope, the authority forming the PSSR team must include members from different disciplines. In general team of operations, maintainance, safety, projects covers the requirement. The new set up, plant must be offered for PSSR only after completion of construction as per scope & ensuring availability of necessary documentation. It must be understood that sufficient time and resources are provided to the PSSR team by the respective authorities for preparation and execution of PSSR. General he focus points for PSSR must include:

Permits / Statutory Clearances

- Verification of availability of all applicable Permits and Regulatory permissions

Plant Documentation

- Compliance of SHE Review recommendations
- Availability of all documentation like Safety concept, Process descriptions
- As built drawing (e.g. PID, ISO Metrics, Layout)
- Equipment design details
- Safety valve relief summary
- Standard operating procedures and Emergency procedures
- Inspection and test records (e.g. Equipment, Piping loops)
- System readiness records
- Cause & Effect diagram
- Interlocks testing records, Alarm management

- Organogram with responsibility
- Procedure on approvals in case of deviations

Training

- Training of relevant plant members about the Set-up and Responsibilities
- Hazards involved in the Operations and Control measures
- Emergency response
- Training records
- Interview with people about Awareness verification

Field Round

- Housekeeping , quality of construction
- Safety signages, Displays on Do's & Don'ts
- Ergonomic issues, Measures against fall/slip/trip issues, Sharp edges, Head bumps
- Equipment and Piping labelling
- Equipment access, Access for Operations/Maintenance
- Status of Fire Fighting/ER set up, its Installations and Accessibility
- Sample Verification of construction with respect to as Built drawings and Construction quality
- Machinery protection, protection from Electrical hazards, Machine guarding, protection from Hot surfaces
- Spill control aspect, Dyke conditions, Secondary containments
- Readiness of Maintenance workshops, Warehouse, Control room, Electrical substations

- Installation of Relief devices and Relief location
- Safe routing of Equipment vents and stacks
- Area lighting, Emergency lighting
- Communication set-ups
- Drainage system

Fire Prevention & Emergency Response

- Design basis, verification of emergency communication set up, spill control tools
- Fire-fighting , Gas detectors installation and Spill control tools
- Readiness of Emergency control centre and Medical facilities
- Wind socks, assembly points and its accessibility
- Communication tools (Sirens, Walkie – talkie)
- PPE inventory

The observations out of PSSR must be documented with clear cut responsibilities and targeted dates. Ideally it is always good to address all the actions from PSSR before the start up activity, however, taking practical view into consideration, the observations can be segregated into minimum two categories.

First one is about observations, which MUST be addressed before the start-up of unit. Generally these are observations which have direct bearing on safety performance, on regulatory front or related to operations and quality. The other category is about the actions which can be addressed even after the start up and do not have any impact on safety or regulatory aspects.

Similar kind of exercise should be carried out after a turnaround activity as well as start of the unit after a long gap. The area of focus may be different than what has already been listed above and specific checklists need to be developed as applicable to ensure following points are addressed:

- Flushing, inertizing, leak testing of system
- Interlock testing
- Functional tests of control systems
- Testing / Trials of rotary equipment and Inspection of Static equipment
- Readiness of emergency response systems
- Storage conditions of hazardous raw materials
- Refresher training to all operating staff

Author

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Responsible Care -South Asia
BASF India Ltd

Service is Central to Our Value Proposition: IPCO India

IPCO is owned by FAM AB, a part of the Wallenberg Group. The history of the company dates back to 120 years with local service capability today in more than 30 countries and annual sales in excess of €200 million. Customers can count on the management of IPCO group for stability, reliability and effective performance of products with timely service support and assistance when needed.

In conversation with **Ulrich Nanz, Sales Manager Sulphur & Chemicals, IPCO** *we decode the company's growth philosophy, strategies in place to realise the Make in India vision, the impact of Covid-19 on both Indian and global businesses, post-pandemic recovery plan, the challenges and opportunities that lie ahead for IPCO in India in the not-so-distant future.*

Ulrich Nanz
Sales Manager Sulphur & Chemicals, IPCO

Can you tell us how has the pandemic impacted IPCO, both in India and globally? How has the company managed to serve customers during the times of lockdown?

Engineering Procurement Construction (EPC) customers account for the majority of our refinery projects. While Covid had some impact here, it was generally limited to technical meetings and commercial negotiations having to take place online, something we've all got used to. Other than that, EPCs have to respect delivery times for orders already placed with them, so work has to carry on by following WHO guidelines and adhering to local restrictions.

For contracts where we were in direct contact with the end-customers, it was more difficult. We did see a number of projects either delayed or cancelled. This was the case across the board for both refinery and non-refinery projects, in India and elsewhere.

In terms of maintaining support, IPCO has the major advantage of being a company with a global footprint. We have local service capability in more than 30 countries. So, even when international travel was not possible, our locally-based colleagues have been able to provide relevant expertise.

And of course we have embraced new ways of working in the form of Zoom or MS Teams meetings. We've been able to offer video streaming of system trials from our productivity centre in Fellbach, Germany to our customers.

How do you see the post-pandemic recovery and demand for your company's products in India and globally?

A major impact of the pandemic has been to create doubt and uncertainty and this applies as much to businesses as it does to individuals. People therefore want to make the decisions of minimal risk and, we believe we are in a good position to support them.

We are a well introduced mid-size company, and as an independent member within the Wallenberg Group, we have very solid owners. This sense of stability and reliability has always been one of our strengths. Our heritage stretches back 120 years and customers can trust us to be here in the future.

Looking at the situation in India in particular, we have been a trusted supplier to more than half of India's refineries for decades, and this has created strong partnerships with our customers. Beyond this, I go back to our on-the-ground support. Unlike our competitors who are limited by international travel restrictions, our Indian service team – currently eight strong – can meet all requirements for service support and spare parts.

How important is India in terms of IPCO's global operation?

India is one of the world's fastest growing economies and represents an important

market for every global business. For us, the importance of the Indian market is comparable with those of America and China, mainly due to the refinery sector and demand for solidification and handling solutions for sulphur, asphaltenes and paraffin wax.

We have built long-term relationships with our customers and invested in the infrastructure necessary to support them. This means that service personnel are available to provide on-site support at short notice.

The IPCO India team is made up of 15 people, more than half of them work in the service department. Their high levels of training, skills and knowledge of English means they can also make a valuable contribution to business operations beyond India's boundaries.

What kind of growth do you anticipate over the next 4-5 years for IPCO?

Short term projections are extremely difficult due to the unknown course of the coronavirus, but we know for sure that there will be interesting projects in the refinery sector in the coming years. There are a number of driving factors including ever stricter global environmental legislation and accelerating market demand for refined products with reduced sulphur content.

For instance, bunker fuel is no longer allowed as a fuel for ships, but solid fuel is permitted in power plants with the appropriate filter technology. Refineries are therefore looking towards Residue Upgrading Technologies – the production of solid energy material from refinery residue such as SDA pitch – to produce more value-added refined products with optimized investment.

So would you say that changing markets bring in new opportunities?

Yes, this is definitely the case. Challenges and opportunities are two sides of the same coin. As I just mentioned, changes in the market are focusing attention on bottom of the barrel products such as asphaltene and SDA pitch, and driving demand for relevant solidification and film casting solutions.

The need to handle ever greater volumes of sulphur extracted as a by-product of refinery processes has led to the development of our new SG drum granulator ranges, with capacities up to 2000 tpd. We've recently installed our first system in Europe and are confident that others will follow.

Beyond these traditional markets, we see further opportunities for our granulation processes in GMP (Good Manufacturing Practice) applications requiring high standards of hygiene, particularly chemicals used in cosmetic products such as sun tan lotion, shampoo and epilating wax.

Another important market for us is film casting, where our systems are used to

produce membrane technology used in filters for liquids and gases – a niche in which we are already the world market leader.

What have been the biggest challenges for IPCO in India?

We are exceptionally proud of the work undertaken by the team at IPCO India but it is a relatively small team when you consider the scale of the orders handled here. We therefore need reliable external partners too, i.e. local sub suppliers, with whom we can work on a regular basis.

Another challenge is that many customers want to do business with us in local currency. Since we have close collaboration with locally-based manufacturers and suppliers, at least part of the order amount can be invoiced in local currency. This is an attractive differentiation as far as some customers are concerned and one that gives us a competitive edge over other suppliers in the business.

Tell us about the overall value proposition of your organization.

I think our key message to customers is that by choosing IPCO they get German engineering, western quality equipment, and local service. I know I keep mentioning service but this is central to our value proposition. We don't just install a machine on a customer's site and say goodbye; we offer support throughout the lifespan of the equipment, covering everything from easy access to spare parts and upgrades, to inspection and preventative maintenance and the reassurance of a rapid, locally-based response to any urgent requests for support. The strong service presence we have in India underpins everything else.

As a multinational corporation, how is IPCO enabling realization of the vision of Make in India?

Indian companies provide both complex and simple solutions and we make full use of both.

In terms of complex solutions, locally-based companies have competencies in areas such as control systems and software that put them ahead of the Western companies. They have a much greater understanding of the control philosophy of Indian refineries than we have, so it makes absolute sense to order these locally in India.

If we then look at what might be termed as simple solutions, large steel parts such as silos and silo platforms, we can be confident of receiving good quality, well-engineered equipment at a reasonable cost from local manufacturers. So again, these orders will frequently be placed in India in support of the 'Make in India' nation-building project. ■

IPCO: A WORLD-CLASS ENGINEERING GROUP

Video: https://youtu.be/HssYFXRYV9Y

IPCO is a high technology engineering group providing customized process equipment solutions to customers across a number of industrial sectors to include oil and gas, chemicals, pharmaceuticals, automotive, aerospace, construction and food.

IPCO is an independent company owned by FAM AB, part of the Wallenberg Group, it has 600 employees, more than 30 sales and service offices and annual sales in excess of €200 million. Joining the Wallenberg group in 2018, IPCO gained the stability of being part of a business with approx. 600,000 employees and more

than €140 billion in total annual sales of holdings.

The company's network of regional offices enables it to provide local, on-the-ground expertise backed up by a global service organisation with the ability to support customers in any location around the world.

Overall, this means customers have the reassurance of dealing with a stable multinational business, but one with all the advantages of a mid-sized entrepreneur company: flexibility, the ability to act faster, and a genuine focus on meeting customer needs.

The company's engineering expertise extends from steel belts used in conveying and processing applications to systems for the production of composite materials, but the area of most relevance to the chemical and refinery industries is IPCO's granulation and solidification technology.

ROTOFORM: MARKET LEADING PASTILLATION TECHNOLOGY

Rotoform is IPCO's flagship solidification system is so successful with proof of more than 2,000 lines being installed since its first introduction in the early 1980s.

At the heart of the system is a heated cylindrical stator which is supplied with molten product via heated pipes and filter. A perforated rotating shell turns concentrically around the stator, depositing drops of the product across the whole operating width of a continuously running stainless steel belt.

The rotational speed of the Rotoform is synchronized with that of the steel cooling belt to allow the liquid droplets to be deposited onto the moving belt in a uniform shape and size. Heat released during cooling and solidifi¬cation is transferred via the steel belt to cooling water sprayed underneath, thus resulting in controlled solidification and the production of consistently sized pastilles.

This process offers a number of environ¬mental advantages. The cooling water never comes into direct contact with the chemical and so there is no risk of cross contamina¬tion. And as solidification takes place as soon as the product is in contact with the steel belt, emission values are low.

While the core principle – direct-from-the-melt solidification on a steel belt cooler remains unchanged, Rotoform technology has undergone significant advances over the years.

In 2013, the company introduced the 4G (Fourth Generation) Rotoform, the foundation of an entire family of models designed to meet specific process requirements. These include the

granulation of abrasive and sedimenting materials (such as catalysts and suspensions), melts requiring a high feed temperature (e.g. bitumen, resins), and the pastillation of subcooling melts in supercooling plants (e.g. antioxidants for the tyre industry).

The latest models include the Rotoform HP (High Performance) designed for handling high viscosity products such as resins and hot melts at higher volumes.

Today, Rotoform has become the default solidification solution for hundreds of chemical products including base chemicals, fine chemicals, specialty chemicals (e.g. pharmaceutical and cosmetic products), waxes and oleochemicals.

SULPHUR HANDLING & SOLIDIFICATION SOLUTIONS

While Rotoform has literally hundreds of applications across the wider chemical industry, its first and largest market lies in the processing of sulphur.

More than 800 Rotoform-based sulphur granulation systems have been installed to date, and the recent development of the Rotoform HS, a high speed model with a capacity of upto 350 t/d, has taken the performance of the system to new levels.

For operations with even greater needs, IPCO's SG rotating drum technology can process up to 2000 tonnes a day, the highest capacity solution available for the sulphur processing industry.

Seed or nuclei particles of solid sulphur are generated externally by freezing sprays of liquid sulphur in a water bath at controlled pressures to form the desired size range. These particles are then augured into a slowly rotating drum with appropriately placed flights attached to its inner surface.

As the nuclei particles travel along the drum, they are progressively enlarged to the required size by means of sulphur sprayed from a bank of nozzles running the length of the drum. The temperature in the drum is moderated by the evaporation of water from spray nozzles located inside the drum. This is a fully automated process delivering high productivity 'once through' performance and a uniform end product of a definable size.

IPCO's expertise, gained through nearly 70 years' close involvement with the oil and gas industry, extends to the design, supply and commissioning of complete end-to-end systems covering everything from receipt of molten sulphur to storage and loading of solid materials. ■

Accelerated digitalization speeds towards sustainability

2020 was not a normal year as the pandemic slowed industrial activity, reduced urban traffic and cut most non-essential air travel. The stresses and awareness raised by this health crisis impacted operations and markets for energy and chemicals companies and has accelerated digital transformation and is driving a renewed focus on sustainability in India and Asia.

As 2021 begins, the focus continues on accelerated digitalization, and energy and chemical companies are working towards more aggressive sustainability goals. European companies, such as BP, Shell, Equinor, Repsol and Eni, have announced aggressive renewable energy and net zero carbon targets. Global chemical giants Dow, LyondellBasell, Braskem and Sabic have strongly committed to the circular economy. Post-pandemic projections see Asian markets, such as India and Southeast Asia, recovering faster than the rest of the world although the growth may depend on how companies and governments proceed with sustainability and circular economy goals.

New normal for the industry

A recent survey conducted in collaboration with energy consultant Crystol Energy, three key trends emerge – such as an increased sense of urgency for strategic business priorities amidst a more challenging global environment. Digitalization has accelerated and skills shortage is a high priority beyond the next five years. In fact, this greater need for digital transformation will address the current situation where nearly 80% of data scientists are on the job for less than three years across major energy and chemical companies. This means companies need to leverage technology, flatten the organization and evolve business priorities towards the self-optimizing plant for process companies.

Energy and chemical companies are likely to focus on reducing costs and carbon footprint. There will also be a shift in the production mix in refining towards chemical feedstocks, as growth in chemicals is expected to account for half of the oil demand growth in the coming years. As economies and middle-class growth resumes momentum, projects such as the proposed Indian RRPCL mega project integrating refining and chemicals will address growing and shifting market demands. The industry evolution from oil to gas consumption will continue, especially with respect to chemical feedstocks and power generation. Demand for electricity will grow and natural gas will meet this need.

For EPC and owner operators, concept design is critical as early design is the most important phase of the plant asset lifecycle. It is essential to leverage AI and high-performance computing to finetune designs with a significantly broader set of data. These decisions can significantly impact capital and operating costs, as well as the overall fit for the plant's intended purpose. Hybrid models are also required to solve complex problems more accurately and easily. For capital projects, estimating transparency across the project team and C-suite is critical to unlock value. It is vital to visualize, analyze, benchmark and share data to increase speed and certainty, while managing project risk more effectively. The result is a more agile, collaborative and informed estimating process with fewer surprises for executives.

Sustainability targets in play

The industry is in the midst of a transition to more sustainable production and processes. Societal drive towards resource efficiency will result in greater innovation and investment. The largest energy players in India and Asia will follow industry early movers for the most promising technology approaches to carbon capture and reduction in the energy value chain. Sustainability targets may lead to growth opportunities – for example, chemical companies may have new market opportunities as they design new products and adopt more efficient processes that generate less emissions and waste.

Industrial AI is central to this endeavour, enabling better understanding of how

Innovation strategies are fundamental for chemical companies to progress toward Circular Economy goals, and digital technologies will be critical to accelerating this effort.

process conditions influence product quality by helping engineers predict emissions and reduce waste. Solutions, such as AI-enabled hybrid models can be used to optimize operations, create soft sensors, design new equipment or integrate asset-wide processes like crude-to-chemicals. Such insights can aid in the development of new high-performance products and help companies progress in their sustainability targets. In adopting the latest innovations, chemical companies can allow human and autonomous decision-making work in tandem to achieve the most profitable and sustainability-focused outcome. Companies can respond more effectively to market changes and reposition for new opportunities demanded by the circular economy.

Embedding Industrial AI functionality in our software solutions helps companies compete better in an increasingly competitive marketplace. Industrial AI combines data science and AI with first principles in chemistry and physics, while capitalizing on domain expertise to deliver comprehensive business outcomes for specific needs of the process industry. Aspen Hybrid Models technology is well positioned to drive process innovation/intensification, techno-economic optimization and accelerating scale-up. For example, Technology Center Mongstad pushes the boundaries of what is possible with carbon capture using modeling products to validate results in their demonstration plants. The world's leading researchers in algae-to-fuels conversion have used AspenTech's

modeling, energy and economics tools to achieve breakthroughs in energy balance and economics. Researchers are also developing next generation process technology for hydrogen economy, fuel cells, CO2 to chemicals and pyrolysis use of the company's tools, as staples in the innovation process.

The circular economy for chemical companies

According to ARC, most global chemical companies have sustainability initiatives in place and view digital technologies as crucial to progressing their work. Indeed, the pandemic has heightened the necessity to emphasize and renew the focus on sustainability. The collective health of communities and our planet, as well as the interconnected nature of climate, ecology and social crises, all became clearer in 2020. Corporate resilience and long-term survival are common discussions these days in boardrooms and investor events.

The sustainability challenge for most companies typically unfolds across two different timelines: short-term efficiency improvements to help reduce carbon emissions, water use and waste production for current operations, and longer-term efforts to develop new energy sources and products for the Circular Economy. Resource Efficiency improvement remains an important immediate activity area for manufacturers who could see as much as a 30% reduction in energy use according to the International Energy Agency (IEA). And the IEA is urging countries to link pandemic recovery funds and energy efficiency improvement to encourage progress.

Developing solutions to address the challenge of the Circular Economy exacts particular demands for the chemical industry. This concept takes the broad view that products and processes must be completely redesigned to cut emissions and waste, while also working to extend material use and regenerate natural systems.

The targets are ambitious, and businesses have a long way to go.

Innovation strategies are fundamental for chemical companies to progress toward Circular Economy goals, and digital technologies are critical to accelerating this effort. Innovative supply chain solutions are already helping companies to better integrate post-consumer materials into their value chains while advanced process control technologies are helping to lower energy use and waste generation in production processes.

For longer-term product and process development, process simulations help researchers quickly screen a variety of alternatives to select the most viable and cost-effective option, whether for new polymer production or for chemical recycling processes, while also comparing the energy demand and CO2 emissions for each alternative. And these simulations are even more accurate and accessible using Aspen Hybrid Models, which combine artificial intelligence (AI) with

At AspenTech, we work closely with our customers to help accelerate the digital transformations that are necessary to thrive in the environment of the future.

first-principle model design and domain expertise. Engineers can now build enriched process models faster using machine learning to leverage simulation or plant data, integrating application knowledge including first principles and engineering constraints, without requiring deep process or AI expertise.

The Self-Optimizing Plant

At AspenTech, we work closely with our customers to help accelerate the digital transformations that are necessary to thrive in the environment of the future. We deliver the advanced technology that is becoming integral to sustainability, competitive and innovation strategies and unlocks the potential of new business models.

To do this, we are creating industrial software solutions that span functional silos and that are increasingly self-learning, self-adapting and self-sustaining - powered by Industrial AI. This set of software technologies work together to anticipate future conditions and act accordingly, adjusting operations within the context of the enterprise. This enables new levels of insight and operational guidance, elevates the scope of agility and automation that is possible and is moving the industry towards the vision of the Self-Optimizing Plant, a facility that can automatically respond to changing conditions during operation.

The seamless integration possible with the Self-Optimizing Plant with enable companies to meet economic and sustainability objectives, delivering safety and reliability with highly efficient and agile operations to meet the future challenges of new markets and business models. ■

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GAIL (India) Limited

GAIL (India) Limited

GAIL (India) Ltd. is a Central Public Sector Undertaking (PSU) under the Ministry of Petroleum and Natural Gas, with the mission of accelerating and optimizing the effective and economic use of Natural Gas and its fractions for the benefit of the national economy.

GAIL, having started as a Gas Transmission Company during the late eighties, has grown organically by building a large network of Natural Gas pipelines covering over 13000 km; two LPG Pipelines covering more than 2,000 km; six Gas Processing plants for production of LPG and other liquid hydrocarbons, with a combined production capacity of around 1.3 MMTPA GAIL has a Petrochemical plant in North India with a capacity 810000 TPA, North-east India with a capacity of 2,80,000 TPA and western India with capacity of 140000 TPA. The company has integrated upstream into the business of Exploration & Production with participating interests in 11 E&P Blocks, including 2 blocks in Myanmar. GAIL has also integrated downstream into the high growth retail City Gas Distribution business both in India and abroad. GAIL is today an integrated energy company in the hydrocarbon sector with focus on gas and beyond.

GAIL has overseas presence in five countries. The Company has a wholly owned subsidiary, GAIL Global (USA) Inc. (GGUI) in USA, which has formed a JV with Carrizo Oil & Gas Inc. to acquire stake in its Eagle Ford Shale acreage. Further, the company has booked 2.3 MMTPA capacity in Dominion Cove Point LNG liquefaction project and also signed a Gas Sale and Purchase Agreement (GSPA) with WGL Midstream Inc. for procurement of corresponding volume of Natural Gas.

GAIL has another wholly-owned subsidiary company viz. GAIL Global (Singapore) Pte. Ltd. based in Singapore for trading in LNG & Petrochemicals and for undertaking overseas investments. GAIL has around 4.2% equity partnership in South East Asia Gas Pipeline Company (SEAGP) which is transporting gas from Myanmar to China from these blocks. GAIL has made investments in two companies in downstream business in Egypt and one in China.

GAIL has executed a long-term LNG Sale and Purchase Agreement with Sabine Pass Liquefaction LLC for purchase of 3.5 Million Tons per Annum (MMTPA) of LNG from Sabine Pass Liquefaction terminal project, USA and also signed a long-term agreement with Gazprom Marketing

and Trading Singapore for supply of 2.5 MMTPA of LNG from Russia.

GAIL has also signed a GSPA to source 38 MMSCMD of natural gas through transnational pipeline from Turkmenistan. GAIL is now an equity partner of TAPI Pipeline Company Ltd. (TPCL) which has been formed for the transnational pipeline project from Turkmenistan.

With an aim to ensure cleaner and quality energy in Eastern India at an affordable Price, Government of India (GoI) aggressively promoted the execution of 2655 Km Jagdishpur – Haldia & Bokaro – Dhamra Natural Gas Pipeline Project (JHBDPL), popularly known as the Urja Ganga of Eastern India. JHBDPL is being taken up at an investment of Rs. 12940 crore and is scheduled to be completed from 2018 – 2020 in Phases. JHBDPL caters the energy requirements of five states, namely Uttar Pradesh, Bihar, Jharkhand, Odisha and West Bengal, covering 49 Districts and 2270 Villages. This is being further extended from Barauni to Guwahati by laying additional 727 km pipeline.

About GAIL's Hawa Badlo Initiative

GAIL has been playing a vital role to build a mass movement for accelerated energy transition towards a cleaner mix. With the primary aim to sensitize people on the harmful effects of air pollution, GAIL has initiated the Hawa Badlo (Change the Air) campaign, an independent people's movement, the first of its kind in India. During its awareness journey, it also came to light that while people are aware of the harmful effects of polluting fuels, they are ignorant of solutions to address the problem. The campaign further adapted to build awareness of the energy alternatives available and galvanize them into adopting natural gas for a cleaner and sustainable lifestyle.

To ensure maximum reach, Hawa Badlo was digitally launched with exciting posts, teasers and videos featuring people from all walks of life, from Indian cinema celebrities to people at large, including school and college students. Short videos and clips of different durations were carefully planned for multiple platforms and consumer touch points such as digital and radio. This was followed by on-ground consumer engagement activities such as tie-ups with resident welfare associations, school associations, and tree plantation drives.

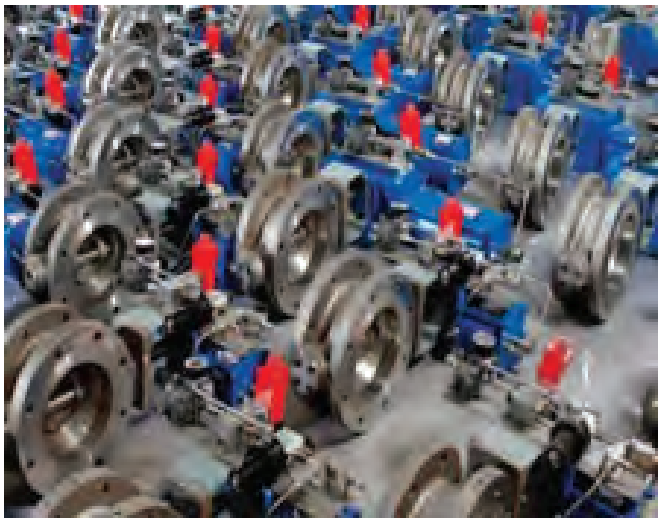
The campaign has digitally touched more than 100 million lives enabling people to make a direct link between their energy consumption patterns and the impact on their health and environment, and motivating them to voluntarily switch to the more economic and environmentally friendly 'natural gas'. The campaign helped in building the narrative towards cleaner air through a gas-based economy. ■

Advance Valves

With about 35 years of manufacturing experience out of India, Advance Valves has established itself globally as a distinct and significant vendor for its product range. Being pioneers in technology for its Dual Plate Check and Triple Offset Butterfly Valves, Advance Valves has been providing technological and cost-effective solutions to EPCs and Asset Owners thereby catapulting it into a position of leadership today.

Our wide manufacturing range includes:

- Dual Plate Check Valves
- Axial Flow Check Valves
- Butterfly Triple Offset Valves
- Butterfly Concentric Valves
- Butterfly Double Offset Valves
- Actuated On/Off Valves - motorized and pneumatic
- Control Valves



Full Range of Automation

For years now, we have been considered to be a value added vendor by all our customers. We believe in high-end-solution approach to fulfill the needs of our customer and offer:

- Exotic metallurgies including Haste Alloys, Aluminum Bronze, Duplex SS, superior Nickel alloys, Titanium and many more.
- Sizes between 50 mm (2") to 3000 mm (120").
- Up to ANSI # 2500.
- Cryogenic applications down to -196°C (in-house testing up to 64").
- Fire-Safe applications up to 850°C.
- Complying with Fugitive Emission norms as per ISO 15848, TA Luft & API 641
- UL Listed Valves for Fire-Water Service.

88" Zero Leakage Triple Offset Valve

Valve up to 25" #2500 including fully cladded

- Triple offset butterfly valves with SIL 3 Capability.
- Regional regulatory compliances - CE Markings, CU TR, CRN.
- Fully Robotically cladded valves.

Our wide product range along with vast metallurgy options make us specifically suitable for all petrochemical, sour, and seawater services, as well as for power, chemical, oxygen, desalination, fertilizers, LNG, mining, and oil & gas industries with their very demanding applications and extreme conditions of temperature, pressures, and corrosive atmospheres.

We hold multiple patents for our products and have launched the best-in-class Axial Flow Check Valve with the highest performance characteristics. Our butterfly valves are complemented

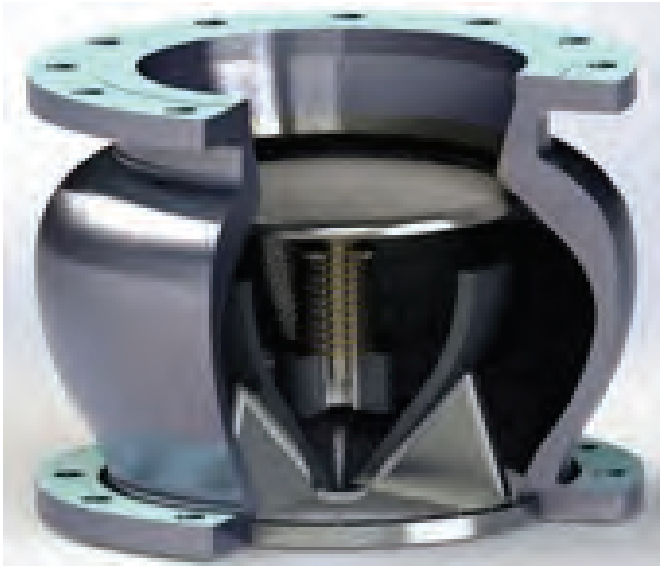
with a fully-equipped automation centre for all on-off throttling and control application.

Quality Management & Design Capabilities

Advance Valves' Quality Management System incorporates requirements of API Q1, API 594, API 609, API 6D, ISO 9001: 2015; CE PED and IEC 61508:2010 Standards and have strong HSE practices.

Advance Valves deploys sophisticated and advanced techniques of 3D Modelling for product development complemented by stringent design validation and Quality Control. Design capabilities include Surge Analysis, Computational Fluid Dynamics, Finite Element Analysis, Thermal & Transient Analysis.

We have a large team of engineers which helps us in understanding the intricacies of the products and continues to ensure that as a company we learn, evolve and develop. We believe in investing in technology, latest software and modern tools for our employees to work effectively and have the right quality systems.



Axial Check Valve up to 48"
(DN 25 – DN 1200)

MANUFACTURING STRENGTHS:

Advance Valves today has four modern plants covering about 400,000 sq ft of manufacturing area which has modern machining centers, robotic welding, fully automated test facilities, setup for fluid flow study, large size material processing and handling equipment. Our plants are further complemented by global servicing infrastructure, representatives and stocks for providing support to our customers.

In addition to having standard hydro and pneumatic testing facilities we also provide:

- High-pressure hydrostatic testing (up to 1000 bar)
- High-pressure pneumatic testing (up to 800 bar)
- Cryogenic testing with helium down to –196°C (per BS 6364)
- Fire safe testing (per ISO 10497)
- Helium leak detection
- High-temperature testing up to +550°C
- Fugitive emission testing (per ISO 15848)
- Oxygen cleaning
- Cyclic Testing

With a commitment of creating value and providing solutions we are proudly serving our customers in more than 50 countries today and are ready to take on new and technically-driven challenges everyday! ■

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Sustainable Water & Waste Water Treatment Solutions

ION EXCHANGE
Refreshing the Planet

Ion Exchange is a pioneer of water treatment in India with a legacy spanning over five decades. With sales, production and service footprints across the world, Ion Exchange is today considered a premier company in total water and environment management. We are one of the very few companies worldwide with a complete range of solutions for water, waste water management, solid waste management and waste to energy. Our comprehensive technologies, products and services, enable our multidisciplinary teams of experts to cater not just to industries and municipalities but also to communities, institutions and homes.

IEI designs, engineers and supplies standard and customized water, waste water treatment, zero liquid discharge and waste to energy systems. We have over 1,00,000 installations worldwide in core sectors including over 1000 in large industries & communities. We undertake developmental projects for drinking water supply schemes and distribution systems, sewage treatment & disposal, sea water intake and desalination and solid waste management including waste to energy projects for the much needed integration between energy and the environment.

Our state-of-the-art manufacturing facilities are spread across five states in India (Patancheru in Andhra Pradesh, Verna in Goa, Hosur in Tamil Nadu, Ankleshwar in Gujarat and Rabale in Maharashtra) and internationally in Sharjah, UAE and Bahrain Investment Wharf, Bahrain. Our facilities are committed to built-in quality achieved by quality assurance systems, advanced manufacturing processes and continuous training in manufacturing practices, safety and quality. Our manufacturing facilities are ISO 9001, 14001 and 45001certified.

Our first R&D centre was established in 1965, (the oldest in the water segment in India) and has since then developed a host of products & technologies that have enabled us to retain our leadership in innovation & quality. We have over 100 new products developed/launched and many patents in the water treatment domain. We also have a rich history and continue to form technical partnerships with the world's leading technology companies. Our R&D Centers are located in Maharashtra (for engineering production development), Andhra Pradesh (for chemicals, resins and membranes) and Gujarat (for resins).

Ion Exchange pioneered the production of

resins in India with the country's first resin manufacturing unit at Ankleshwar, Gujarat which is ISO 9001 certified and is also the first in India with an FDA (India) approval for manufacturing pharmaceutical grade specialty resins. Our industrial chemical plant at Patancheru was also the first in the water treatment chemical sector to obtain an ISO 9001 certification. Ion Exchange introduced the Reverse Osmosis (RO) concept in the country and was the first in India to manufacture RO membrane elements at Halol Kalol in Gujarat.
We manufacture High Performance Membranes (HYDRAMEM) which belong to the latest generation of membrane technology for industrial, institutional and domestic applications. Our state-of-the-art integrated Reverse Osmosis membrane manufacturing facility was inaugurated at Verna, Goa in 2017. We also recently inaugurated our R&D centre in Patancheru, Telangana which will develop new resins, membranes, polymers and specialty chemical technologies related to water, waste water treatment, process separation and purification, specialty process application and catalysis.

Ion Exchange's Zero B tap attachment marked IEI's foray into the home water purification space. From this small unit, the Zero B brand has now evolved into a total home water solutions provider, delivering products at every price point and category: household, urban and rural as well as institutional segments.

We serve our markets with a sustained focus on customer satisfaction, technological innovation and dedicated service through our service division. Like ion exchange resins and membranes, we have pioneered design and supply of water, process liquid, waste water treatment, water recycle plants - packaged, pre-engineered and custom-built, on turnkey BOT and EPC basis.

The chemical industry is one of the largest consumers of water. Water is used in most of the chemical processes. Water is not just part of the production process but also forms part of the product itself in most of the chemical industries. While non-negotiable disposal norms are important for the environment, they can pose a huge challenge for the chemical industry. Ion Exchange brings you total water solutions that not only solve your water & waste water challenges but also gives you a good payback on your investment. Our treatment systems ensure the requisite quality of water whether for process use, drinking water, cooling water, rinse water or boiler feed. Our wide offerings benefit the customers in compliance with pollution control board regulations, lower discharge of effluents, saving on freshwater cost, superior price-performance ratios & process efficiency etc. Some of our solutions include:-

- Wastewater treatment & unique processes for effluent recycle to achieve zero discharge
- Pretreatment/process treatment and high purity water systems

- Cooling and boiler water chemical treatment programmes
- Supply of consumables like ion exchange resins, membranes, water treatment chemicals and antiscalants and critical spares
- Comprehensive O&M for all water systems and utilities and BOT contracts
- 24 X 7 service support

OUR SOLUTIONS

1) INDION Zero Liquid Discharge Systems

Currently pollution & increased demand had made good quality water Scarce. Water Scarcity has increased the direct cost of the water & also had directly impacted plant economies & product quality with existing unsuitable water. Meanwhile, the disposal norms has become stricter & their enforcement stricter. Ion Exchange can help effectively and economically solve water scarcity problems by conserving vast volumes of water and protecting the environment by reducing discharge while generating substantial savings for you. Our recycle systems are combined with specialty water treatment chemical programs that substantially reduce water discharge (for example, cooling tower blowdown); and state-of-the-art effluent treatment plants are integrated with Zero Liquid Discharge (ZLD) processes. These are backed by comprehensive operation and maintenance services for high-performance continuity.

Many Industries & customers that have installed our effluent treatment, recycle and ZLD systems have gained excellent payback on their investment through:

- Assured availability of water for process needs as well as low end uses.
- Less requirement of freshwater. Therefore, considerable savings in freshwater costs.
- Additional savings through the recovery of valuable by-products for reuse in the process.
- Compliance with pollution control regulations and a clean environment through reduced/ zero effluent discharge.

Glimpse of our offerings to customers:-

- A leading fertilizer company in North India has installed a recycling plant - design capacity 128 m3/h. Cooling tower blowdown and regenerant waste from the demineralization plant are recycled and reused in process.
- Several engineering component manufacturers have installed state-of-the-art membrane systems for recovering emulsified oil & water thereby recovering by-product, water & minimizing discharge.

- For a textile major, a 30 MLD sewage recycle plant & 2.4 MLD effluent recycle system have been installed as alternate sources of water.
- Leading automobile companies have installed effluent recycle & zero liquid discharge plants for total water & environment management as part of brown field & green field expansion project.
- A refinery in Jamnagar, installed a 48 MLD effluent treatment & recycle plant that is designed to contain and treat all internal process/utility waste water and storm/fire water, with the objective of zero liquid discharge.
- In keeping with their eco-vision, a premium hotel installed a zero liquid discharge system that recycles over 800 m3/d waste water.
- A speciality paper manufacturing company invested INR 300 lakhs to recycle its white water effluent. The benefits- uninterrupted and good quality water supply of 500 m3/h, recovery of fibres worth INR 6.3 lakhs a month and compliance with disposal regulations.
- A multinational cement company in North India installed a complete zero liquid discharge system that recovers 85% of the waste water for reuse.
- A synthetic rubber company in Panipat, installed a complete zero liquid discharge plant to meet the challenges of availability, cost and quality of water.
- A leading synthetic fibre manufacturer in Silvassa has installed a complete zero liquid discharge system to meet environmental compliance regulations.
- Leader in the brewery industry have installed a complete zero liquid discharge plant to meet PCB compliance & augmented needs of water in various locations.
- Leading FMCG company in Haridwar, installed a complete zero liquid discharge plant.

2) INDION High Purity Water Systems

INDION High purity water systems are designed to meet the stringent requirements of the industries and have been developed after consultations with expert engineers and end-users. The net result is a fully pre-validated system that is compliant with the current good manufacturing practices (CGMP) and Good Automated Manufacturing Practices (GAMP) and FDA compliant. These are skid-mounted units with minimal footprint, easy installation & commissioning. The system includes water softener and microfiltration for preconditioning the process feed water. The multipurpose tank of SS construction is designed to minimize microbial contamination and provide for water shortage, hot water sanitization and chemical cleaning capabilities. It also

includes Ultrafiltration system to remove endotoxins and bacteria from the product to produce highly purified water. Some more solutions under INDION High Purity Water Systems include:

a) INDION Swift plus Demineralizer

The latest INDION Swift range comprises a family of automatic twin-bed deionizers incorporating state-of-the-art counter-flow ion exchange technology. The operational cycle of these rapid regeneration, packaged units is controlled by volume throughout, which is pre-programmed in PLC according to the type of feed water. The ion exchange resins are never fully exhausted ensuring optimum deionized water production at all times. Regeneration takes just 35 minutes – after a minimum service cycle of two hours – minimizing the need for both, a standby plant and storage of large volumes of water. As the regeneration of the cation and anion beds is simultaneous, the effluent streams are largely self-neutralizing, reducing waste disposal costs and environmental impact. INDION Swift is exceptionally compact and skid-mounted on a corrosion-resistant frame which also accommodates a stainless steel multi-purpose pump. In addition to optimizing the performance of the plant during service and regeneration, the pump provides several recirculation options to maintain the high quality of water in the treated water tank. INDION Swift running cost is low because no additional regenerant chemicals are required and no extra effluent is produced which reduces the treated water storage cost.

INDION SWIFT PLUS DEMINERALIZER

b) INDION RO EDI Systems

Purified water, high purified water, pyrogen-free water for injection are critical to the pharma industry's processes. Technological expertise and R & D capabilities combined with our close association with the industry enables us to deliver customized, speciality systems to meet stringent requirements for high purity water generation & distribution

3) INDION Speciality Water Treatment Chemicals- INDION Cooling and Boiler Water Treatment Chemicals

We offer speciality Chemicals for Utility and Process applications that effectively address challenges associated with scaling, corrosion, microbiological fouling while ensuring consistency of the treatment programs.

We have demonstrated capabilities in boiler water treatment programs that require consistent and reliable management of steam purity. Our chemical program include scale and corrosion control, inproved boiler operation / steam generation, sludge conditioning and foam prevention

INDION BOILER WATER TREATMENT

Our cooling water treatment solutions benefits include - arresting corrosion, prevention of scaling, scale and deposit removal, protection against microbial growth, pH control, high COC operation for reducing water requirement and capability to handle highly contaminated system.

Our operations are supported by Indion

INDION COOLING WATER TREATMENT

Autochem Ultima system for real-time monitoring, analysis and control of the treatment program leading to greater performance efficiency, cost optimization and environmental, health & safety compliances.

INDION AUTOCHEM ULTIMA

4) INDION Resins

INDION ion exchange resins manufactured in an advanced and automated facility are characterized by exceptional physical stability and exchange capacities. These are available as Gaussian and Uniform Particle Size beads in dry and moist forms with varying surface areas, porosity and

matrix as suitable for different applications.

Our complete range of INDION cation and anion resins are widely used for water and waste water treatment as well as a host of speciality applications such as softening, dealkalization, demineralization, excipients, catalyst, chelating, heavy metal removal and as adsorbants - for removal of colour, odour and organics. In addition, we also offer arsenic, fluoride, iron and nitrate removal selective resins.

5) HYDRAMEM Membranes

HYDRAMEM complete range of high-performance Reverse Osmosis (RO), Nanofiltration (NF) and Ultrafiltration (UF) membranes are manufactured in a state-of-the-art, completely integrated and automated membrane manufacturing plant and belong to the latest generation of membrane technology.

HYDRAMEM RO membranes are broadly offered under four categories - low pressure, brackish water, fouling resistant membrane and sea water elements. HYDRAMEM UF membranes available in different configurations and molecular weight cut-offs, produce treated water free from particulate colloidal and microbiological contaminants making them suitable for requirements that need lower footprint and high flow rates as compared to conventional processes.

HYDRAMEM Nano Filtration Elements (NFE) are designed with hard outer shell for industrial applications providing high stability for temperature and pH. They offer higher rejection and are used for bivalent ion removal, brackish water softening, dye desalting, treating textile brine & chemical salt recoveries.

ION EXCHANGE HYDRAMEM MEMBRANE MANUFACTURING FACILITY GOA- CASTING & COATING SECTION

6) INDION Coagulants, Flocculants and Membrane Antiscalants and Cleaners

Complementing our product range in utility applications, we manufacture a wide range of Indfloc synthetic cationic, anionic and non-ionic organic coagulants and flocculants. These are available in liquid, solid and dispersion forms in a range of molecular weights and ionic charges suitable for clarification, filtration, heavy metal and color removal from most water, wastewater and process fluids.

INDION antiscalants are available in a wide range of product formulations for enhancing the performance of reverse osmosis and multi-effect evaporator systems against soluble and insoluble impurities that cause excessive scaling

and fouling resulting in rapidly and in many cases irreversibly deteriorating the performance of the system.

INDION range of multi-formulation cleaners enhances the performance of membrane and evaporator systems with efficient and cost-effective cleaning of fouled surfaces thereby maintaining the system performance.

7) INDION Easytest kits

Frequent analysis of water is essential for the maintenance of raw water, potable water, boilers, cooling towers, softeners and demineralisers, which is important for the operations of almost all the process industries. We offer a complete range of INDION Easy test kits water quality products such as individual outfits, combination kits and refills to accomplish this task. The INDION Easy test Water quality products replace analytical procedures such as titrimetric, colorimetric/spectrophotometric by simple drop test and standard color comparison methods. They are specially designed for on the spot analysis of make-up water, boiler water & cooling water. These can be carried out by the operators themselves, making monitoring & preventive action very quick and convenient. Our existing combination kits include:

- INDION Cooling water analysis kit.
- INDION Boiler water analysis kit.
- INDION Cation conductivity column
- INDION Water portability test kit
- INDION RO water test kit
- INDION Product Residual test kit
- INDION E-coli test kit

8) Operation and Maintenance

We provide comprehensive customized solutions & operations and maintenance (O & M) services for total water & wastewater management to our customers, following international standard quality norms. We offer the entire gamut of 24 X 7 value-added services that include supervision, training, maintenance, troubleshooting, multi-point vendor coordination, water audits, up-gradation and automation (rehabilitation) of existing plants and supply of critical spares and consumables ensuring consistent, continuous supply & quality of treated water, superior price-performance ratios, production efficiencies and most importantly cost-effective use of capital employed.

Our solutions enable us to cater to the requirements of not just the domestic market but also to our wide global customers. With an aim to maintain our leadership position in the industry, we bank on our strongest assets - our technological expertise, our manufacturing capabilities, our superior innovations, our strategic foresight and most importantly our employees and work towards achieving our vision - to be the leader in our business which is so vital to people's lives and the environment. ■

Complete supply chain and value added products are strength of the Taiwanese chemical industry: Bowei Lee

Hitting off the conversation on a colloquial note, exchanging pleasantries and discussing the Covid-19 situation in Taiwan vs India, the dialogue took a serious twist later focusing on the speciality chemicals and petrochemical business in Taiwan, ASEAN, China, India and other global markets. Offering assurance to participate in the Specialty Chemicals Forum next year, ***Bowei Lee, Chairman, LCY Group & President Taiwan Chemical Industry Association*** *talks to* ***Mittravinda Ranjan****, shedding light on the chemical industry in Taiwan, challenges to collaboration with India and strategies that could help build a collaborative environment for both countries to facilitate trade talks and open access to markets.*

Bowei Lee
Chairman, LCY Group & President
Taiwan Chemical Industry Association

How has the pandemic affected the Taiwanese chemical industry?

The effect was quite dramatic in the first half of the year, as you know the oil price went down to negative, so most of our suppliers had to deal with the gyration in the oil price. At the same time, in the petrochemical industry, such as our company had to deal with the gyration of the raw material coming from the crack of it. So I will say the second quarter has probably been the worst quarter for us. For example, one of our important products Thermoplastic Elastomers based on butadiene. The price of butadiene went down as far as USD 500 and before that, it was at USD 1000. Now it's back up to USD 1400. You see the gyration of the raw material has hurt the petrochemical industry in Taiwan and also the chemical industry.

However, starting the third quarter, the market has come back specially because China was not affected as much at least that's doing quite well. But we are also affected because the shipping costs have gone up tremendously and the Taiwan economy as a whole and the chemical industry in particular are very much export oriented. For example, the container shipping costs from Taiwan to India has gone up 3 times and we heard it will go up 2 more times. This means eventually the shipping costs go up 6 times so that's affecting us. Other than that, the market is quite good, the demand and overall growth is good. But affected by these gyrations, so indirectly it's affecting us quite dramatically. 2020 was in slightly positive territory for Taiwan and given the Covid-19 situation, that is remarkable.

What is the market size and potential of the chemicals and petrochemical industry in Taiwan?

The size or revenue of the chemical industry in Taiwan is USD 128 billion and the petrochemical is USD 700 billion. We have approximately 17,000 companies and employee strength of 450,000 (about half a million) and this accounts for 25 per cent of the Taiwan GDP. Basically the backbone

Taiwan has a well-integrated supply chain of chemical industry from oil refinery to cracker downstream petrochemicals and intermediates and also have a chemical cluster in Taiwan. In the last ten years, we have strengthened our capability to develop high value added products.

of the chemical industry is based on two cracker companies namely - Taiwan CPC, government-controlled enterprise and Formosa Plastics Corporation, Taiwan. So two of them together have ethylene capacity crossing 4.1 million tonne, ranking no 11 in the world which is very similar to India's ethylene capacity that's about 4 million tonnes. But the export and import in the domestic market is 50 per cent each. The main market for exports contributing to the majority 45 per cent is China and only 5 per cent is India, which we intend to increase.

Taiwan has a well-integrated supply chain of chemical industry from oil refinery to cracker downstream petrochemicals and intermediates and also have a chemical cluster in Taiwan. In the last ten years, we have strengthened our capability to develop high value added products. For example, in the polypropylene business, we are number one medical grade supplier in Asia. We used to have 80 percent of market share to supply this product in China but due to the free duty regime in Asia, Thailand took over 30 percent of share in this market, but we are still leaders in supplying and we supply 50 percent.

Other than China and ASEAN region, what are the other markets for these products? How do you see the demand growing in the future from these markets?

Japan and the US are very important, but in the near future more commodity product companies from China and also from India could take over some of the market share. To stay competitive in the changing market dynamics Taiwanese chemical industry strengthened the focus to develop high value products to move up in the value chain. For example, we have a product called Isopropyl alcohol and we can make ultra-pure isopropyl alcohol for use for manufacturing semiconductors. In comparison with the normal industrial-grade isopropyl alcohol, the price differentiator is three times essentially. We are number one in the world for semiconductor grade isopropyl alcohol and sell to the top 5 semiconductor makers in the world and have only one competitor from Japan.

Post the pandemic, how have you seen change in demand-supply situation for Taiwanese chemical products and how is the industry planning to diversify?

Overall, we still depend quite a bit on the Chinese market as we export almost 45 percent of products to China. However, the Taiwanese industry is now trying to diversify its presence and looking at other markets as well for sustainable

future growth. We encourage and push diversification in China and Indonesia for commodity products, but for the high-value product, the government encourages us to stay in Taiwan.

Based on 30-40 years of commodity chemicals manufacturing, chemical industry in Taiwan will further move along the value chain to produce high value products. The strategy of our Government is that the high volume commodity product should move overseas, but high value-added products should stay in Taiwan. Taiwanese government is encouraging the industry to invest in R&D by providing incentives through building state of the art R&D centers to provide infrastructure at reasonable cost to the industry.

The main reason to retain manufacturing of high value products in Taiwan would ensure no breaches in securing the technology and high-value products can afford to pay for the freight during exports, however for the commodity products we cannot afford to pay for the freight especially when the freight cost is going up.

What role does TCIA play for the growth of chemical industry?

Like most of the parts of the world the perception of chemical industry is negative in Taiwan. It also and faces a bit of opposition from the general population. There is significant amount of pressure on chemical industry to meet the compliance norms and the industry is getting inclined towards the best practices for Sustainability & Responsible Care. While large size companies like ours have been quick to adopt these new trends, we are also helping out the smaller companies to help them to implement responsible care.

Taiwanese environmental regulation is probably the most stringent in the world and has iintroduced Carbon Tax and mandated major electricity users to draw 10 per cent of their electricity from green energy source. We as TCIA

Due to small domestic market size, manufacturers cannot completely depend on domestic market alone and thus international collaborations become important for the industry. Companies are looking for partners who can provide market access, help to navigate the new environments as well understand the regulations and policies.

help our colleagues to negotiate with the Government about the speed of implementation. While regulatory compliance is critical but it is also equally important for the Government to balance environment & economics.

Tell us about the MSME sector in Taiwan and the challenges for growth?

In terms of capacity, petrochemical companies are much larger as compared to the non – petrochemical or pure chemical producers that are typically mid-size or as we say here middle stock companies. Taiwan is a small country with total population of around 22 million. It hence offers limited opportunities to the indigenous industry. While manufacturing in Taiwan is good enough but due to protectionism and high volatility in the freight rates, it is a challenge for the mid-size companies to sell in the overseas market and set up the manufacturing facilities in other geographies. The mid-size companies sometimes need help in terms of planning & implementing the growth strategies and they also seek collaborations.

How is Taiwanese chemical industry strengthening its position in the global supply chain?

See, Taiwan has no indigenous oil and natural gas resources and depends completely on imports. However there are other industries that have evolved and are enabling the growth of the specialty chemicals in Taiwan. For example, Taiwan has a very strong semi-conductor industry to supply. For example, most of the parts you find in Tesla are made in Taiwan. So a lot of chemical companies are moving towards supplying to the semiconductor companies, the electric vehicle manufacturing tier-I or tier-II companies. Many of Taiwanese chemical companies are also major suppliers of chemicals to Apple & Foxconn. As these companies are establishing their manufacturing facilities in India we expect some of the suppliers for electronics chemicals will also follow manufacturers.

Chemical companies in Taiwan face challenges to expansion in Taiwan because the land is limited and there is lot of pressure on sustainability in the environment. Moreover due to small market size, manufacturers cannot completely depend on domestic market alone and thus international collaborations become important for the industry. There is a pressure on companies to do R&D, upgrade their product and move them to overseas markets. Companies are also looking for partners who can provide market access, help to navigate the new

environments, understand the regulations and policies.

Considering lot of changes are happening, how is Taiwanese chemical industry looking at India as a growth opportunity?

I think for Indian industry to partner with Taiwanese chemical companies would be perfect. In the last 2 years, Indian economy has grown at around 7 per cent which is a very attractive market for our member companies.

Investment in Indian Synthetic Rubber Ltd. was the first investments by Taiwanese company in India. Initially there were few hiccups & the learning curve was longish, but we understand the company is making good profits. Taiwanese chemical companies are looking at collaborations in India. CPC Corporation is already in talks with Taiwan with Adani Infrastructure to build an Ethylene Plant and petrochemical industrial pipeline in Gujarat.

Though Taiwan supplies chemicals to India, some of the products that are currently being exported are categorized as the 'dumped products.' Taiwan does not have an FTA agreement with India. The duty structure and high freight rates lead to an increase in the price which makes it difficult for us to compete in the highly price sensitive Indian market. For example, one of our important products Thermoplastic Elastomers (TPE), we are number one in the world in terms of capacity and in terms of the value, but our friends in Korea enjoy duty-free tariff, where we are supposed to pay duty. We still export to India in spite of the duty because we are more competitive by essentially giving a markup of 15 per cent profit to the Koreans. Addressing the issues like FTA, freight rates & dumping duty would make India an attractive market for the Taiwanese chemical industry.

Though there has been some progress between the industries of both the countries, still India is very foreign to a lot of our companies. I think it's important for the Indian and Taiwanese companies to get to know each other. Mutual exchange of ideas and mutual understanding is important because most of companies that have gone to China feel the ease due to the same language and culture, which is very different from India. It is critical to have a local partner, become familiar with Indian market regulation and understand the navigating the landscape. Learning from each other essential . ■

How can AI and the cloud deliver innovation for oil and gas companies in India?

The pandemic has disrupted businesses operations, delayed essential maintenance, interrupted supply chains and impacted demand in the oil and gas sector. Technology can come to aid in these times of uncertainty. By leveraging artificial intelligence and the cloud in tandem, Indian oil and gas companies can thrive in the post-pandemic economy, says ***Jim Chappell, Global Head of AI and Advanced Analytics at AVEVA.***

Jim Chappell
Global Head of AI and Advanced Analytics at AVEVA

The current pandemic has shown the oil and gas sector how dependable enterprise operations can be upended almost overnight. Workforce routines at extraction sites and refineries have been disrupted, causing unplanned outages, as we saw at the Sharara oilfield. With supply chains interrupted, parts manufactured in traditional source markets could not be delivered on time, delaying essential maintenance. Border closures and an unprecedented drop in demand have further constricted already tight economic operations.

Not only do these conditions look set to continue over the short term, but other challenges loom over the foreseeable future. A supply glut and a depressed outlook for hydrocarbon prices have been forecast over the medium term, and over the long-term, oil demand could peak within two decades as fuel demand drops and pressure to act on climate change mounts.

To thrive in this brave new world, oil and gas players must respond with transformative action, taking inspiration from the industry's bold, pathbreaking history. At AVEVA, we have made it our mission to help companies capitalise on current opportunities, while striving to protect lives and livelihoods for the companies and communities we serve.

Success in a post-pandemic world will require innovative thinking and action at scale. Here, two transformative new technologies will shape a sustainable future for oil and gas and its partner industries, and for the world around us. These are artificial intelligence, or AI, and cloud computing.

AI is enabling better decisions

AI has been with us for over six decades. As it becomes more sophisticated, with wider use cases, it allows organisations to improve productivity. With unified smart analytics that bridge complete data stacks, teams can leverage mathematical thought processes across all their activities. Individuals are thus afforded scale and capacity that would otherwise have been unavailable: knowledge, data-led intelligence, and the capacity to recognise new opportunities. AI enables people to make better decisions – and even recommends courses of action – that enhance the capabilities of human staff. Overall, McKinsey predicts that AI will drive a 2 per cent growth in manufacturing and energy for the next decade – or $1 trillion every year.

At AVEVA, we have been using AI to enhance the value chain over the past 15 years, with specific applications for predictive analytics in the maintenance

and asset performance space. Aramco, for example, uses AI and advanced analytics solutions to help eliminate unplanned downtime across its diverse operations.

The cloud offers connected insights

Leverage the cloud here and we are able to integrate standalone products, linking AI modules together into a broader intelligence for more efficient performance. With integrated systems comes integrated analysis. AI can produce increasingly more complex insights and recommendations for human workforces quicker and with less chance of error. If AI underpins better decision making, cloud is the glue that binds it all together.

The cloud helps scale the benefits of AI across the entire range of enterprise operations as opposed to the past, when narrow AI was infused into various products. This broader AI leads to general artificial intelligence – the ability to make complex decisions using combinations of different types of AI, to learn something in one place and apply it elsewhere. The development of general AI is very much a continuum, and the potential benefits are enormous. Lessons from the resource extraction operation could very well be applied to another division.

With the shift to digital business models following COVID-19, the trend has gathered speed, and we are now partnering with clients worldwide to leverage those benefits.

About AVEVA

AVEVA Group plc provides innovative industrial software to transform complex industries such as Oil & Gas, Construction, Engineering, Marine, and Utilities. AVEVA's software solutions and platform enable the design and management of complex industrial assets like power plants, chemical plants, water treatment facilities and food and beverage manufacturers – deploying IIoT, Big Data and Artificial Intelligence to digitally transform industries. For more details contact Ms. Srilakshmi Lakshmanan, AVEVA India Marketing at Srilakshmi.lakshmanan@aveva.com or visit www.aveva.com. ■

From the Idea to Turnkey Production, Glatt Accompanies its Customers Along the Entire Value Chain

Traversing from ideation to implementation of international projects, to include expansion and modernisation of existing production sites, and construction of new plants, Glatt Ingenieurtechnik brings in expertise of professional engineering and best-in-class innovative technologies for phosphorus recovery, pioneering fluid bed and spouted bed technology for granulation and coating. Read on to understand how Glatt supports customers across the entire value chain.

Glatt Ingenieurtechnik engineers, designs and implements international projects, from the expansion or modernization of existing production sites to the construction of completely new plants. Throughout its activities, the company combines professional engineering and in-depth technology expertise with self-developed and patented technologies such as PHOS4green, our innovative technology for phosphorus recovery, powder synthesis in a pulsating gas stream as well as fluidized bed and spouted bed processes for granulation and coating.

The projects focus on innovative processes around particle design for the development, optimization, functionalization and production of bulk materials such as powders, granules and pellets for ingredients and additives in food and pet food or detergents, fertilizers, pesticides, industrial salts, battery materials, paints, coatings, ceramics, catalysts, active pharmaceutical ingredients (API), and many others from the chemical and fine chemical industries.

As a pioneer of fluid bed and spouted bed technology and patented powder synthesis in a pulsating hot gas stream, we have many years of experience in pioneering process solutions for drying and spray granulation of liquids containing solids, for instantization by spray agglomeration of powder, for micro- and matrix encapsulation of active ingredients, for synthesis of novel powder systems by spray calcination and for coating / core-shell of nanoscale particles up to particle sizes in the millimeter range. Also in high temperature processes, we operate our own unique technology center for this purpose. At our technology centers, we offer the opportunity to test products on the technical feasibility with our processes to optimize the process according to customer-specific requirements. Our customers receive tailor-made production facilities or contract manufacturing according to their needs.

As your skilled technology partner, we collaborate closely with you. You bring your ideas, expectations and the product know-how, we provide our cumulative knowledge in process technology and our long-standing expertise in plant engineering. All this to jump-start your entry in the market with solutions for innovative products.

Integrated into the international Glatt Group, Glatt Ingenieurtechnik has a global network of around 3,000 employees. ■

For more information please visit www.glatt.com/ptf

Pioneers in Renewable Resources Technology

India Glycols Limited (IGL) is a leading company that manufactures renewable resources technology based bulk, specialty and performance chemicals including green glycols, green ethoxylates, green glycol ethers and green surfactants. These products are manufactured in compliance with stringent global standards of plant operations, quality and safety.

Using the renewable agricultural resources 'green route', the company is the only one of its kind in the world. The company started commercial operations in 1989. Since then, IGL has brought together cutting-edge technology, innovation and an unflagging commitment to quality.

India Glycols manufacture performance green surfactants for following market segments

- **Home & Personal Care -** Polyethylene glycols (PEG), Specially formulated products, Sodium lauryl sulphate (SLES), Acid thickener, Betaines
- **Health & Hygiene –** Hand Sanitizers, Disinfectants
- **Pharmaceuticals –** PEGs, Polyoxyethylene alkyl ethers (Cetodets), Extra neutral alcohol
- **Paints & Emulsions –** Surfactants, Emulsifiers, Defoamers, Dispersants, Solubilizes, Glycol ether and acetates
- **Textiles –** Glycols & Ethoxylates, Spin finish oil, Peroxide stabilisers, Sequestering agents, Neutralising agents, Levelling agents, Washing-off agents, buffers, Dye fixers, Softeners, Lubricants, Desizing enzyme, Mercerizing agent, Stain remover, Viscose additive, Polyester printing
- **Agriculture –** Emulsifiers, Wetting & dispersing agents, Eco-friendly surfactants, Adjuvants, Spreaders
- **Oil and Gas –** Demulsifiers, Pour point depressants (PPD), Glycol ethers, EO/PO block copolymers, Corrosion inhibitor, Polyols (Clouding Glycols), Non-emulsifiers, Scale inhibitor, Surfactants, SMO (Sorbitan Mono Oleate), Biocides (Quaternary ammonium compound), De-Oiler
- **Automotive –** Brake fluids, Anti-freeze coolant, Brake fluid components
- **Construction –** APEGs, HPEGs, TPEGs, Green Surfactants. ■

Website : www.indiaglycols.com

Process Optimization & Efficiency:

Above-ground Pipeline Survey using Integrated Indirect Inspection Technology (IIIT) with a brief Case Study

Oil and gas pipelines are an important asset for a nation's economy, making raw material / fuel readily and safely available for all. Case in point, the current times – when only essential items are allowed to be moved across the country, the pipelines remain operational! What better than pipelines in-lieu of road transportation risking the health of a human-being?

Hydrocarbon pipelines are generally externally coated and buried underground. Traversing through various kinds of soil, an environment that can change based on the local geography and geology. In combination with time, these natural environmental forces could work in tandem to constantly degrade the primary protection provided to the pipeline itself, the external coating.

Once the primary protection layer gives away, even at localized small sections, the elements does not take too much time to create entropy of the carbon steel back to its original component i.e. leading to rust. For this very reason, hydrocarbon carrying pipelines are provided with a complementary secondary layer of protection – cathodic protection (CP).

To ensure a CP system (secondary system) along with the coating (primary system) are protecting the pipeline at all times against the forces of nature – it is inevitable that routine inspections are performed. Performing aboveground pipeline survey using Indirect Inspection Technologies (IIT's) is one such methodology. Although, there are multiple IIT's available – traditionally in many cases this has resulted in numerous redundancies leading to multiple sources of error, as these surveys had

to be conducted separately. This article articulates the advantages to a pipeline owner (Operator) when an Integrated-IIT (IIIT, per-se) approach is utilized for the purpose.

For the purpose of assessment and monitoring the health of the primary and secondary layer of protection of these pipeline systems, the types of IIT available are:

- CIPS – Close Interval Potential Survey
- DCVG – Direct Current Voltage Gradient survey
- ACVG – Alternating Current Voltage Gradient survey
- ACCA/CAT - Alternating Current-Current Attenuation / Current Attenuation Test
- DOC – Depth of Cover survey
- Interference survey

After applying the traditional IIT (aka legacy) survey techniques for decades, industry has highligted some of the drawbacks with these surveys. Few of them are:

- Tracing authenticity of the surveys and whether data has/has not been collected for the correct pipeline, as multiple runs are required over the same pipeline.
- No recording of raw waveforms of survey conducted to verify authenticity and any indications missed on field.
- Difficulties in integrating the various surveys in field and the collected data. This process of aligning the different surveys is time consuming and more often than not leads to alignment issues.
- Multiple survey runs conducted over the same pipeline is time consuming and may take months to perform all surveys on a single pipeline stretch which may be hundred's of km's long, when performed individually.
- Non encrypted data reports are provided for the obtained results which can be tampered and highly subjective.

This article takes the opportunity to bring forth to the user how an integrated-IIT (IIIT) have been developed and practiced in the recent times, to overcome the multifarious concerns of the industry in regards to legacy IIT. The particular IIIT, focussed within this article is known as the pipeline Spectrum eXternal Line Inspection (XLI) with OEM as PureHM Inc., Canada.

The XLI IIIT has the capability to "automatically" collect upto ten (10) different data-sets in a single pass of the pipeline which would otherwise require multiple passes if legacy IIT were used. This allows for lesser human interaction with the public environment (safer when considered to todays' run of things in the

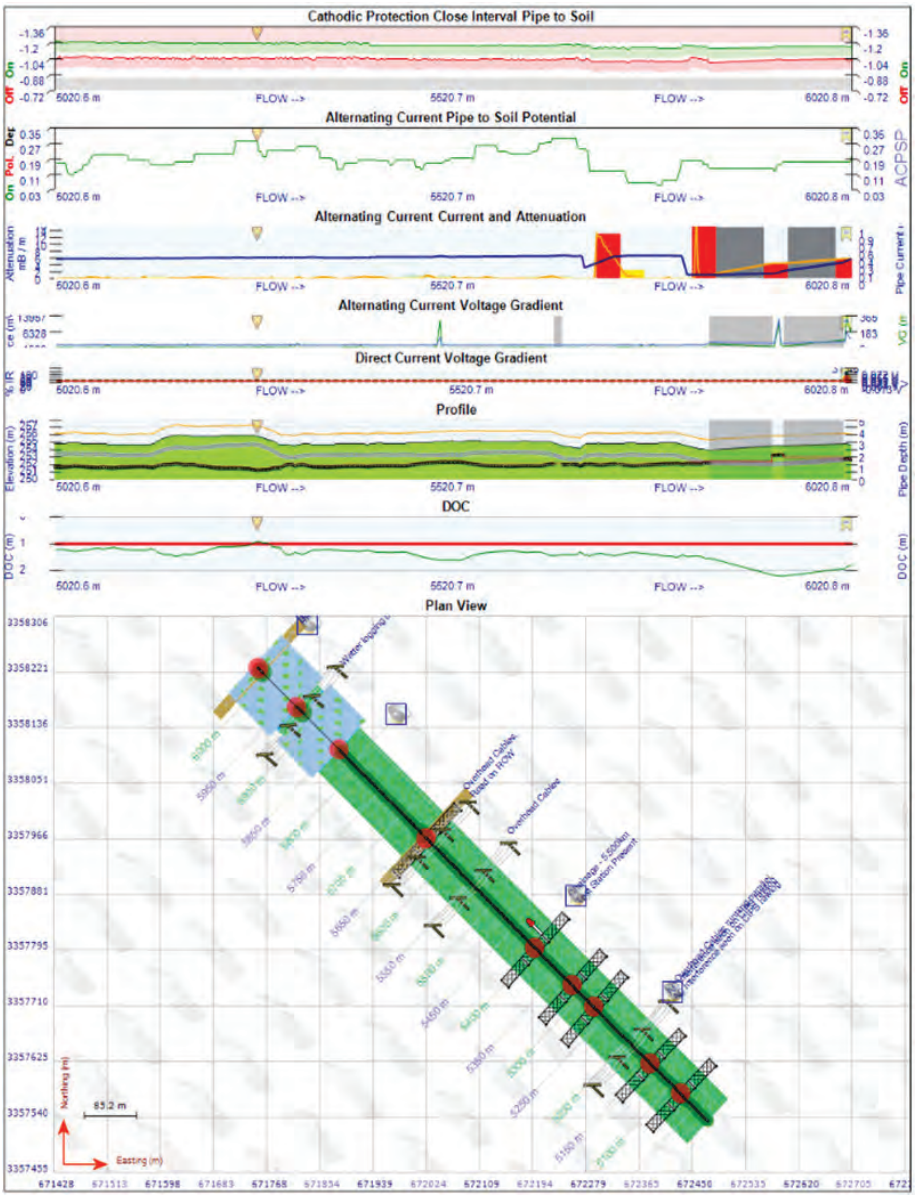

Figure 1: Integrated data of multiple surveys as seen on software

world), yet allowing the cognitive abilities of the technology itself to collect the most accurate verifiable data providing useful information to the Pipeline Integrity Manager. This will allow for better decision-making at the quickest possible turn-around.

XLI IIIT comes with its own proprietary data acquisition, analyses and display software commonly known to the industry as 'Falcon'. With the softwares' highly field-intelligent algorithms along with the brainpower of the in-built 'G2' data processing unit allows for automatically aligning all the on-field survey data into a single visualization platform along with the visibility of the encryted raw logs as shown in below Figure-1.

Authenticity of survey data is maintained by trackability of the surveyor via any GIS / Google Earth based satellite mapping system. It is one of the few technologies in the market that also provide superior data encryption along with the raw logs with time-stamp, ensuring tamper proof data is provided to the pipeline owner as shown in Figure 2. It has been realized that this feature is highly appreciated in the industry due to the intensive data-secrecy laws within any country / oil & gas operating company.

After collecting all the survey data (in one pass) of a subject pipeline, the data is analysed by trained analysts – going

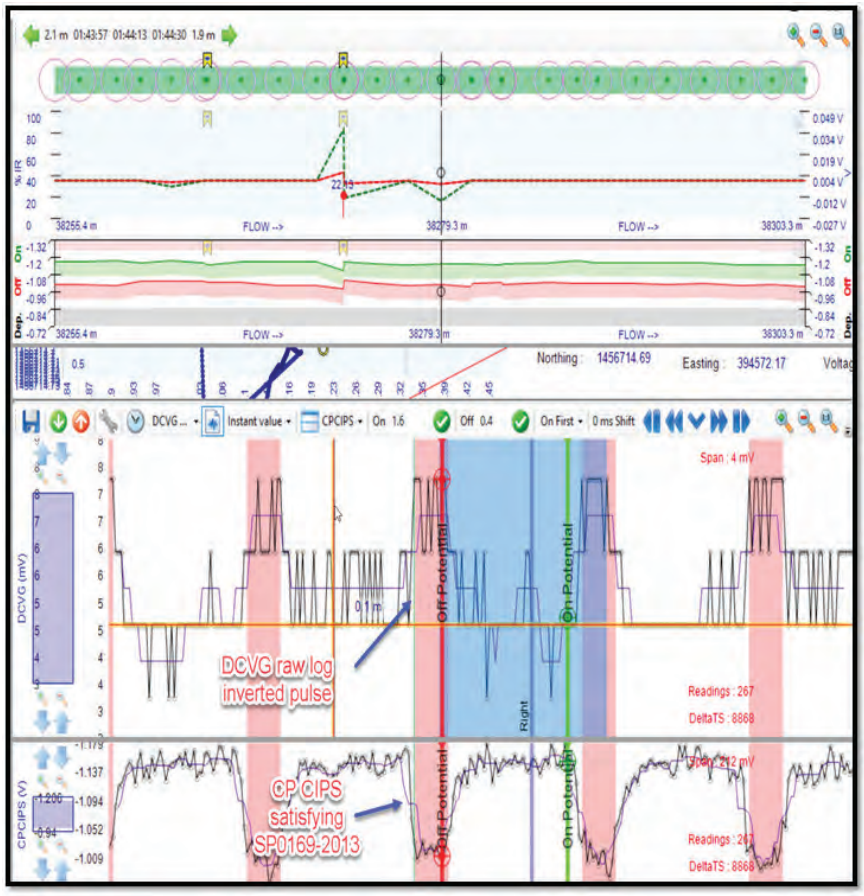

Figure 2: Encrtyted Raw Logs with Time Stamp for Each Survey on software

Figure 3: Complex network of pipelines

through various levels of analysis (Level-I, II or III). The data analysis ensures false-positive or false-negative indications do not inadvertently make it to the Pipeline Owner records. Moreover, the software package allows complete autonomy to the user to be able to extract /print-out any kind of reports (PDF / Excel / GIS-based etc.) to enable optimized decision making.

Such IIIT's have been utilised over the past decade in North America and in the last couple years, have been introduced in Middle East and India with 2,500+ km of authentic IIIT surveys performed. The acceptance of the technology has resulted in multiple technical paper publications by Pipeline Owners themselves.

XLI based IIIT– An Oil India Limited (OIL) Perspective

Oil India Limited (OIL), whose fore-bearers Burmah Oil Company (UK) was the first to strike oil in Asia (1889) own a vast network of carbon-steel pipelines in the Upper Assam districts of

Figure 4: Complex network and difficult to navigate right of way

Tinsukia, Dibrugarh, Sivsagar etc.

Taking into consideration the legacy of the pipeline assets owned by OIL and the intense complexity of their network (Figures-2 & 3 below are sample photos) – the technical excellence team from OIL's OGPL Office eschewed industry peer pressure in utilizing legacy IIT, instead proactively opting for the advanced proven new-age IIIT.

These pipelines which were historically laid with a lot lower human population in the vicinity, as expected due to urbanization, have a completely different population density and access challenges in the present times. Today, these lines are exposed to house-hold dwellings and gradual population growth along with being in the vicinity of Assam's famed tea gardens (a GI2 product). In any instance, wherein humanity exists in vicinity to energy roadways such as pipelines -> the onus of risk assessment and thereafter routine monitoring is always on the Owner of the pipeline. In this case, it was OIL. Their technical excellence team was not satisfied with the drawbacks of IIT, which may result in sub-par data that cannot be converted to usable information and therefore opted for IIIT.

IIIT is planned for assessing the external integrity of sixty-one (61) pipelines, out of which assessment for two (2) pipelines – were completed in all aspects. Figure 5 shows the IIIT survey ongoing for OIL pipelines.

The final results coordinated very well with the survey results from the IIIT deployed. This allowed for the operator to obtain and calculate accurate remaining life for the pipelines as well as provide fitness for service for it to be continually operated without any downtime. Apart from assessing the external integrity

Figure 5: IIIT survey of XLI being perofrmed for OIL pipeline network

utilizing the IIIT, it also helped obtain an accurate and continuous pipeline profile which enabled the owner to have performed assessment for the time-dependent threat of pipeline internal corrosion as well.

Legacy surveys have been in practical use for decades, however their efficient application for optimal detection and prioritization depends on various untraceable factors, which may result in inferior on-field verifications. This has led to extensive financial resources and time utilization with compromised results.

The overall goal of utilizing newer technologies in the field of pipeline integrity assessment for OIL (or any other pipeline owner) is to optimize the process by reducing overt conservativeness. This can only be achieved by utilizing latest proven know-how and technological methodologies such as the Spectrum XLI IIIT. ■

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Resuming Operations in the New Normal

Girish Kotbagi
Vice President – HSEQ, Total Oil India Pvt. Ltd.

As the world moves towards acceptance and starts coming to terms with the ongoing global health crisis, we see momentum in the manufacturing sector begin to return to pre-pandemic levels. Enforcement of different phases of lockdown has predominantly been significant in saving lives of millions across the world today. Even with the relaxation on mobility and commercial restrictions during the unlocking phases, the objective of flattening the curve by instilling the virtue of good hygiene and other measures like wearing of masks and physical distancing has been successfully embraced by the people. Having said that, the socio-economic impact versus public health benefit of these measures needs to be scrutinized closely. Keeping in mind the demographic diversity of the Indian population, the need of the hour is to customize and tailor future interventions to en-sure better economic outcomes while safeguarding against the ills of unemployment, hunger, and extreme poverty that was engendered due to the pandemic.

Government guidelines

The government has also inspection of all equip-ment as per the safety protocols during the restart phase. While the government's ap-proach is perhaps unique to the Indian landscape, success sto-ries from other countries as well as adopting newer and safer technologies can be a game changer.

The National Disaster Management Authority (NDMA) recently came out with precautions to be observed while re-starting the manufacturing units post the easing of restriction on the lockdown. The government has suggested, that organizations consider the first week as a trial period, ensure all safety protocols;

The government has also suggested inspection of all equipment as per the safety proto-cols during the restart phase. While the government's ap-proach is perhaps unique to the Indian landscape, success sto-ries from other countries as well as adopting newer and safer technologies can be a game changer.

and not try to achieve high production targets, while restarting the unit. This will ensure a smooth resumption of operations post the trial period. When it comes to sanitization, to minimize the risk it is important that employees who work on specific equipment are sensitized and made aware of the need to identify abnormalities like strange sounds or smell, exposed wires, vibrations, leaks, smoke, abnormal wobbling, irregular grinding or other potentially hazardous signs which indicate the need for an immediate maintenance or if required shutdown.

The government has also suggested inspection of all equipment as per the safety protocols during the restart phase. While the government's approach is perhaps unique to the Indian landscape, success stories from other countries as well as adopting newer and safer technologies can be a game changer. It can help in containing coronavirus and simultaneously restarting economic activ-ity which can be a useful roadmap as India strives to balance both concerns.

Safety is the new normal

Organizations today are at critical crossroads as they navigate a phased shift from remote work to restart operations

and support their people to return to the workplace, all within the requirements of the new physical distancing norms. Gradually scaling back to work with temporary measures is the need of the hour. Manufacturing facilities also need to focus on maintaining a strategy to quickly implement temporary measures in case of a new outbreak. Safety is not just a priority but a core value for us at Total. Hence safety of our employees, our partners and contractors is para-mount for us in view of restart of operations. In accordance to this, we have put in place an Epidemic Response Plan including various measures the organization would adopt to respond to rapidly developing events. Total India's important LPG facilities have been operational throughout the lockdown period, as LPG is classified as an essential commodity, supporting the flow of this vital commodity for the PSU oil companies. We have now resumed full operations in all the segments in which we operate after getting mandatory approvals from the government authorities. The operational facilities now include the lubricant blending plant at Mahape, bitumen plant in Jodhpur, and sixteen LPG bottling plants spread across South India.

Here are the most important pillars of safety precautions we implemented

that could be useful for any organization planning to restart.

- **Making remote working usual**

  Where remote working has proved possible, successful and productive, organizations should consider extending this approach to lighten the pressures on transport, services and to drive social impact in communities, where more onsite working maybe required by oth-er organizations. Employees who are required on ground, need to be educated and equipped to handle the temporary normal of

maintaining physical distance, wearing appropriate PPE and ensuring hygiene at all times.

- **Protocol development**

  Apart from government suggested guidelines, organizations need to develop in-house protocols that serve best for their facilities and their workforce on ground. It is imperative that organizations integrate hygiene and wellbeing into the daily schedule by encouraging hand-washing breaks and organize periods for people to go outside the premises for fresh air. People working off-site should have access to decent and appropriate PPE, toilet and hygiene facilities, as any contrast between offices and operations in the field is to be avoided. At our premises, arrangements for recording body temperature twice a day, alcohol based rubs at various places, deep cleaning and disinfection of premises including common facilities in buildings and segregation of shifts at the operating sites have all been implemented. Also, at our facilities, the heavy goods vehicles and tankers are disinfected thoroughly when they arrive. As a general

protocol all facilities are disinfected every day. We have also carried out simulation programs at all our sites to increase team-preparedness. At operating sites, where we have implemented segregation of manpower between shifts and within shifts, cleaning of equipment has been made compulsory.

- **Honest, Clear and Creative communication**

  Communicating internally and externally is very important. Selecting the most appropriate channels and tools to communicate on topics that are health-related, addressing behavioral expectations and informing about regulations becomes an everyday process. For all em-ployees, Total India has ensured that there is regular communication on the developing situation and accurate information, posters on best practices using visual designs and illustration about cleaning hands using soap & water, regular use of sanitizers and masks. Additionally, the entire staff, contract workers & security staff have downloaded 'Aarogya Setu' health tracking app as directed by the Govt.

  As a creative communication method, organizations can conduct

webinars and challenges which helps keep your employees engaged and interested. We have conducted webinars for the drivers in regional languages addressing the ways of tackling the current pandemic. We saw participation of more than 90 truck drivers for the webinars. We are also sharing training videos related to transport through WhatsApp groups to utilize the free time of these drivers. Moreover, our Smart Driver App helps these truck drivers to follow guidelines and shares reminders of basic protective measures and specific instructions through notifications.

- **Physical distancing**

  Establish and apply a rule of physical distancing that conforms to government requirements. This is especially important at 'pinch points' like on stairs, elevators and in passageways where clear rules and possibly a one-way system would aid distancing. In addition to physical distancing, separating people by time can also achieve the same objective. For example, defining breaks and meal times for certain departments or shifts, and limiting time spent in the canteen, while extending the overall time during which food will be served will eliminate 'busy times' and facilitate physical distancing. Total India has implemented alternate seating arrangement, contactless sanitizing stations, scheduled timings in the canteen, restrictions on assembly of people and virtual meetings as measures for safe distancing.

Conclusion

As we get accustomed to the current state of affairs, it is important to understand the necessity of safety measures and adhere to the guidelines suggested. The transition from life-saving response to regenerating the economy is rapid, dynamic and unprecedented. It is therefore imperative to have conversations and share the lessons that have already been learned and to provide practical guidance on managing a sustainable restart for businesses around the world. ■

Pipeline Integrity:
Out of Sight does not Mean Out of Mind

Integrity of pipeline is now a major focus which may be attributed to a couple of factors, which include new legislation, technical advancements, strict penalties for accidental leakages, environmental concerns , ageing of pipelines and also considering the impact of pipeline related incidents have proven to be fatal. All elements of integrity are important since we know that the weakest part determines the strength of the entire system.

Pipelines are the energy veins of the world. Much of the world runs on pipelines. From the time we get up in the morning until we go to bed at night, it's difficult to find a moment when we haven't used energy transported by a pipeline. Crossing the landscape largely buried, pipelines traverse quiet wilderness and bustling communities, providing the safest and most efficient method of hydrocarbon transportation in the world today. Out of sight does not mean out of mind. Integrity of pipeline is now a major focus which may be attributed to a couple of factors, which include new legislation, technical advancements, strict penalties for accidental leakages, environmental concerns , ageing of pipelines and also considering the impact of pipeline related incidents have proven to be fatal. All elements of integrity are important since we know that the weakest part determines the strength of the entire system.

What should be the objective of a pipe integrity management program?

A pipeline integrity management program should Identify threats to pipeline integrity, potential consequences to the public and the environment in the event of a release, Rank segments of the pipeline system according to the risk each poses, Provide for assessment of the integrity of each segment in a timely manner based on identified threats and the risk to minimize

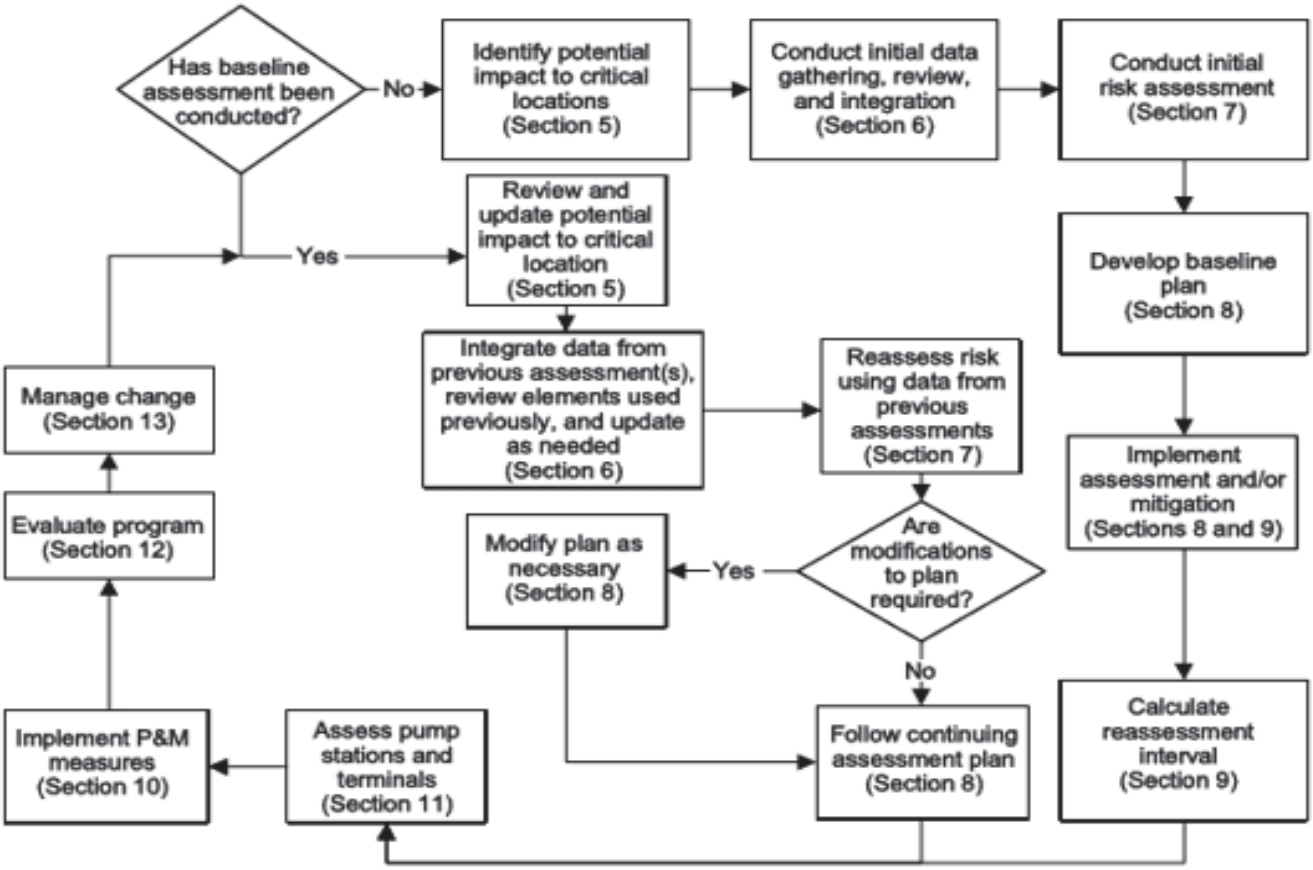

Fig. 1 Typical Process Flow for Integrity Management Programme
Source: - API 1160, 2013 version

the possibility of a release, Specify repairs or mitigative actions to carry out in a timely manner to prevent releases, Establish reassessment frequencies, Define preventive and mitigative measures to address relevant threats including those not covered by integrity assessments, Use the findings of integrity assessments to update and Improve the integrity management process.

What are the threats for pipeline integrity?

Pipeline Integrity threats are mainly categorized to be Time Dependent, Stable and Time Independent. Reassessment of the integrity a pipeline segment subject to a time-dependent anomaly growth mechanism should be carried out at appropriate intervals to minimize the risk of a pipeline failure caused by an anomaly that was too small or was under the reporting size criteria detected in the last assessment growing to a size that would fail at maximum calculated surge pressure or 1.1 times MOP.

Accurate corrosion growth rates are needed to predict pipeline availability as a function of time, to identify the need for

and timing of field investigations or repairs and to determine optimum re-inspection intervals. The consequences associated with using wrong corrosion growth rates range from the inefficient use of resources (time, people and money) on unnecessary repair/inspections to unexpected pipeline failures. The identification of where corrosion is active on a pipeline and how fast it is growing is a complex process which is understood in the general sense but is highly variable

There are various approaches that can be used to define corrosion growth rates for use in pipeline integrity assessments. The major advantage of using repeat ILI data to derive corrosion rates over other methods is that the ILI can provide growth rate information on the whole detectable corrosion distribution density giving visibility of what is happening along the entire pipeline. Further XYZ mapping plots the infrastructure and population density for risk assessment. Fingerprint ILI is warranted for the above to establish the initial pipeline health assessment post commissioning. In specifying a 'fingerprint' inspection the pipeline operator should consider why the inspection being is done, as this will affect the probability of detection (POD),probability of Identification (POI) , defect reporting levels, assessment method and acceptance criteria that should be used.

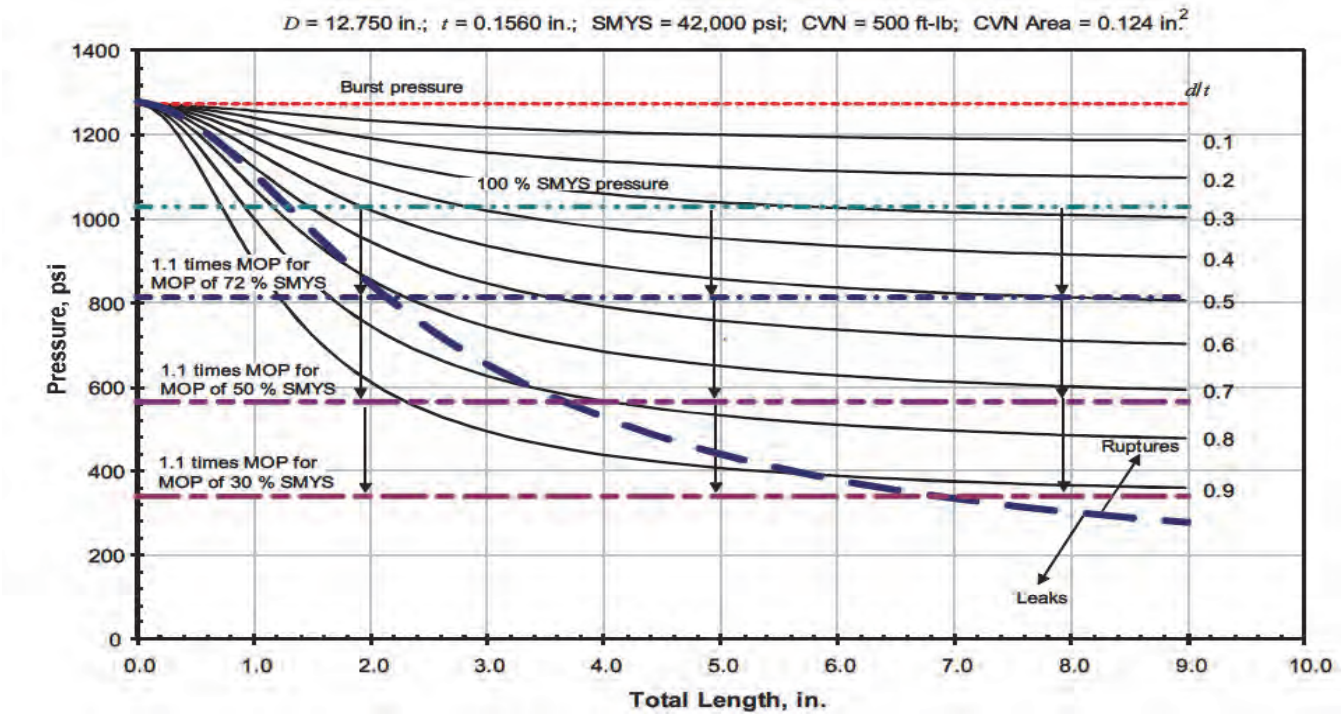

Fig. 2 Typical Reassessment Intervals Based on a Specific Failure-pressure-vs-anomaly-size Mode
Source: - API 1160, 2013 version

The application of fixed rates can be very conservative and will lead in many cases to unnecessary repairs or if the rates are too low to an unsafe assessment of the future integrity of a pipeline. Using location specific (variable) growth rates (both scenarios of applying the maximum rate per pipe joint and defect specific rates) has been found to provide more realistic and targeted predictions of repair needs. The location specific growth rates give accurate predictions of the corrosion severity over time. With the benefit of this hindsight, the predictive analytics employed for evaluating and applying ILI based corrosion rates can be further improved and refined to give more accurate predictions of the future pipeline condition, the response schedule and optimized timing of re-inspections.

Time is now to review multiple-data-set ILI results from several pipe joints with simulated defect locations from ILI surveys. The same has been implemented on BPCL pipelines as for ageing pipelines corrosion growth rates have been derived and very useful in aligning the reassessment intervals. Further the Fingerprint inspections have been implemented on our new pipelines creating a baseline data for the future advanced inspections. BPCL has established stringent inspection criteria at 0.95POD and 0.90POI to establish quality data for analysis. The ILI runs and subsequent signature analysis and data treatment have been very useful in uprating of pipelines and remaining life estimation.

Time is now to convert data to information to add value to the initiatives being taken and the amount being invested towards data gathering. The information gathered over time has to be translated into effective corrosion mitigation/control programs. Reviewing from a deeper understanding of information from corrosion monitoring and other sources is required. For effective corrosion control it is important to understand “where, when and why” pipeline damage takes place – the proactive and investigative approach as discussed shall be of great use and the inputs derived shall have a positive impact on the pipeline integrity matters. ■

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Case Studies - Optimizing Duct Layout using Advanced Simulation Technique

Flow 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:

1. 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

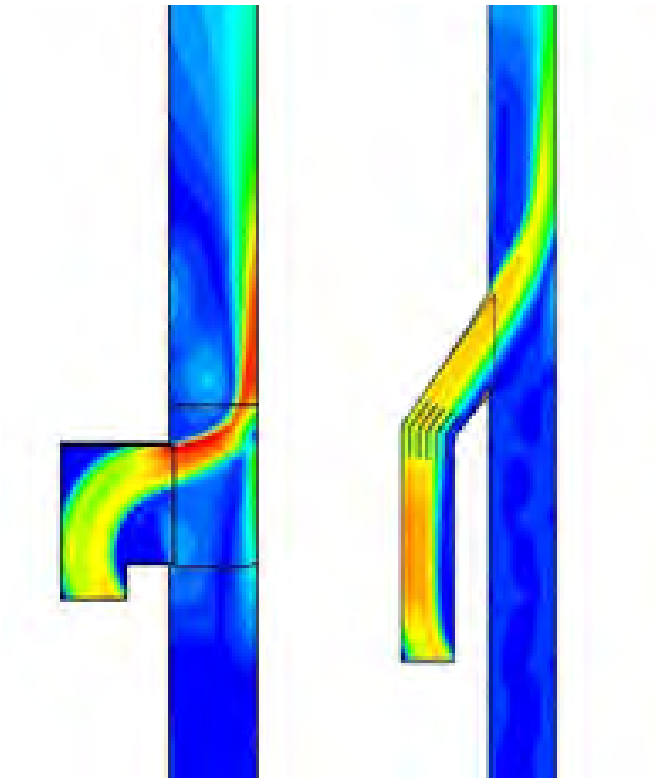
Pressure contours for Existing and Proposed Duct

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

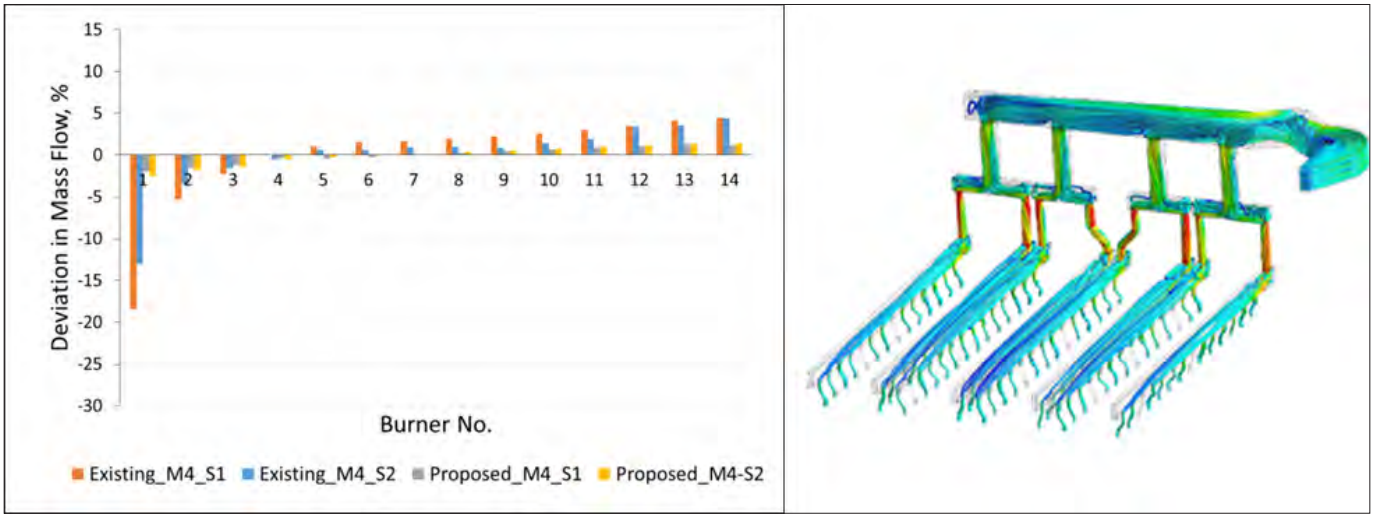
In this project there was a duct connecting to the stack for the exhaust of flue gases. The duct connection had issues in velocity distribution and high pressure drop. With suitable modifications in the duct layout and using internal vanes, the velocity distribution was improved and considerable reduction 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



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 ± 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.

Based on accurate simulations, the root cause analysis is performed. Possible design modifications are evaluated to estimate the improvements in performance. CFD is a viable and reliable simulation technique for these applications. ■

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New Technique from Hiden Isochema to Accelerate Materials Development for Gas Separations

In an exciting new advancement, a team of scientists from Hiden Isochema Ltd (Warrington, UK) and Cleveland State University (Ohio, USA) have developed a new way of analyzing materials for separating gases. Although gas separation using porous materials is an established technology, analytical techniques for assessing the performance of materials tend to be slow and laborious. The new Integral Mass Balance (IMB) method is faster and more accurate than existing techniques, and promises to accelerate new materials development for gas separation technology.

Industrial gases affect many aspects of daily life. They are used to carbonate fizzy drinks, preserve food, and even to inflate balloons. Purified natural gas, meanwhile, is used across the globe as an energy source, for household cooking and heating.

Pure gases can be produced using porous materials that either extract the desired gas from a mixture or remove unwanted contaminants. For this purpose, understanding how materials interact with different gas mixtures is a crucial, but surprisingly difficult, task.

“Scientists and engineers have been working on these types of measurements for decades, but most current techniques are very time-consuming,” says Dr Darren Broom, Product Manager for Hiden Isochema. “A simple set of data can take weeks to measure. By combining two different methods, in a unique way, we have been able to speed up the process significantly.”

As a result, more materials can be analyzed, and a detailed understanding of how each material behaves under different conditions can be achieved. This is significant because chemists developing new porous materials for

gas separations need to know how well a material performs. Often, they rely on models, which can be inaccurate, but the IMB method can rapidly and precisely assess new materials, helping to identify the best candidates for a given gas separation.

Industrial developers of gas separation processes, meanwhile, typically rely on relatively limited amounts of gas mixture data. Gas separation technology, such as Pressure Swing Adsorption (PSA), has been very successful and is used around the world to separate and purify gases. But the new technique will allow far more data to be collected in a practical timeframe, allowing chemical engineers to further optimize processes and improve efficiency.

Professor Orhan Talu, of the Department of Chemical and Biomedical Engineering at Cleveland State University, explains, "I have been making these kinds of measurements since the 1980s and they are very laborious, often taking weeks. With the IMB method, we have been able to make the same measurements in a matter of hours. The improvement in performance is impressive."

To demonstrate the technique, the team has made measurements on a zeolite. Zeolites are porous materials with a range of uses, perhaps most notably in washing powder, but they are also particularly good at separating and drying gases. The reported measurements relate to oxygen (O2) production from air, by separating O2 from N2.

In medicine, where purified O2 is widely used, this technology is vital. Whilst small-scale and portable medical O2 generators are widely available for personal use, larger PSA O2 generators, filled with zeolites, have been installed at emergency field hospitals constructed to cope with the current coronavirus crisis, where reliable O2 supplies have been critical for treating patients.

"We chose these measurements because Professor Talu published similar data, measured on the same sample in two different laboratories, around 25 years ago," said Broom. "However, we also wanted to do something of practical interest. As zeolites are currently used in commercially available medical O2 generators, this seemed an ideal choice."

Now the team wants to explore the technique's range of applicability. "Having shown that the IMB method works for air separation using zeolites, we'd like to apply it to other important separations," said Broom. "Capturing CO2 from power plant flue gases, for example, is of great interest, as this will help tackle the difficult and serious problem of climate change due to increasing greenhouse gas emissions."

"The IMB method can provide reams of accurate data quickly," added Professor Talu. "This will help accelerate the development of new materials and processes for such applications."

Other future targets include separations used for natural gas upgrading and biogas purification, as well as hydrogen (H2) production and purification. Both H2 and natural gas are important for the transition to a low carbon energy future, in which fossil fuel use will be gradually phased out.

Brüel & Kjær Vibro Launches VIBROSTORE 100 for Cost-Effective Machine Health Monitoring

DARMSTADT, Germany: Brüel & Kjær Vibro (B&K Vibro), one of the leading worldwide independent suppliers of condition monitoring solutions for rotating machinery, has launched VIBROSTORE 100, a palm sized device that provides vibration level and bearing wear monitoring for balance-of-plant machines at the push of a button.

The lightweight device can be used single-handedly and enables even untrained personnel to take vibration measurements and assess a semi-critical machine's overall vibration condition. The instrument is equipped with a pre-set cable-connected high-quality B&K Vibro acceleration sensor. Once the type and size of the machine based on ISO 10816 and its running speed are entered, a one-button push can perform the measurement.

A traffic-light display immediately indicates the severity of the vibration based on the built-in ISO 10816 alarm limits (velocity in mm/s or in/s). The main screen also shows the rolling-element bearing condition in bearing damage units measurement (BDU) and total g (RMS acceleration). The display of the vibration level in frequency ranges indicates the most common machine faults, such as imbalance, misalignment or looseness.

Florian Endres, commercial platform leader, B&K Vibro, said, "Whereas critical and semi-critical machinery is usually equipped with an online protection system to avoid catastrophic damages, it

is often too difficult and costly to install an online condition monitoring system on every semi-critical machine. With a combination of B&K Vibro quality and extremely competitive pricing, the VIBROSTORE 100 fills the gap in detecting the most common machine faults and delivers quick, reliable and cost-efficient machine health monitoring for semi-critical and balance-of-plant machines."

VIBROSTORE 100 is available either as stand-alone or packaged with the B&K Vibro Report & Route Manager software, a powerful and highly functional route editor and analysis software.

Special Centrifugal Pumps from Bungartz Now Sold in the PumpSelector on impeller.net Online

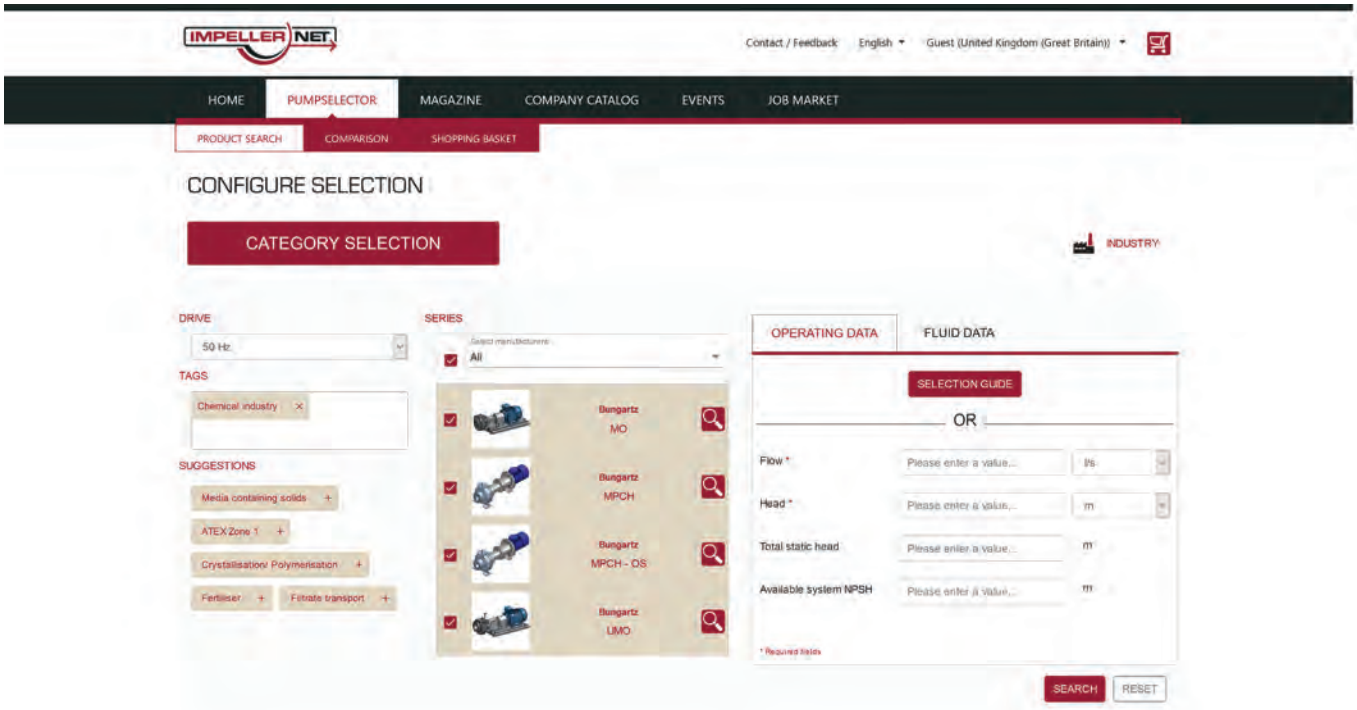
Düsseldorf, Germany: A selection of special centrifugal pumps by Bungartz has been included in the impeller.net PumpSelector now. The successful pumps for the individual industrial sectors are available for selection, configuration and customer requests. This exceptional delivery program significantly expands the range of centrifugal pumps on offer. Moreover, the latest release has brought along further functional enhancements to the Internet portal.

The special centrifugal pumps manufactured by Bungartz are in worldwide use. The dry-run safe pumps are applied for difficult and complex pumping tasks that cannot be handled by standard pumps. Typical application areas include the chemical and petrochemical industries as well as power plant engineering and environmental protection. The pumps' key features in handling toxic, explosive or boiling liquids are outstanding safety, increased availability and favourable life cycle costs.

Dipl.-Ing. Frank Bungartz, who manages PAUL BUNGARTZ GMBH & CO. KG in the third generation, welcomes the new sales channel and remarks: "By offering this possibility for pump selection, we meet customer requirements. Since the sizing of the hydrodynamic seal can only be individually adapted to the process, it is advisable to involve our sales partners."

The MOR/UMOR (with hydrodynamic sealing) and MPCH (with dry-running magnetic coupling) series are already included in the selection program and can be selected with immediate effect.

"We are pleased to have won Bungartz also for our cross-manufacturer PumpSelector on impeller.net,"



comments Jens-Uwe Vogel, Managing Director of VSX - VOGEL SOFTWARE GmbH, the operator of the impeller.net Internet portal. “Our companies have had an extremely successful business relationship in the field of Spaix pump selection software for many years, characterized by joint cooperation to optimize the program for special pumps. I am therefore all the more pleased that we are now expanding and deepening this relationship, and providing further added value for users of the impeller.net PumpSelector.”

Apart from that, the latest release of the Internet portal has brought out the upstream category selection, which allows for different parameters for pump selection depending on the area of application. Currently, pumps from the areas of heating, water supply and irrigation, wastewater and sewage transport, drainage and industry are available. ■

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