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VOL.55 | ISSUE 12 | DECEMBER 2020

CHEMICAL ENGINEERING WORLD

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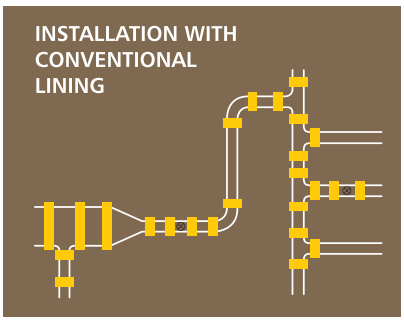

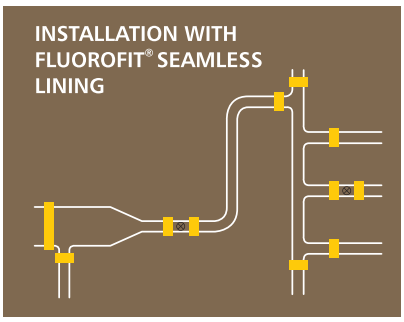


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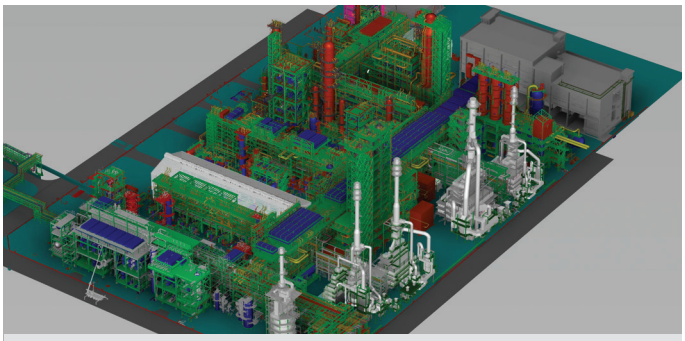

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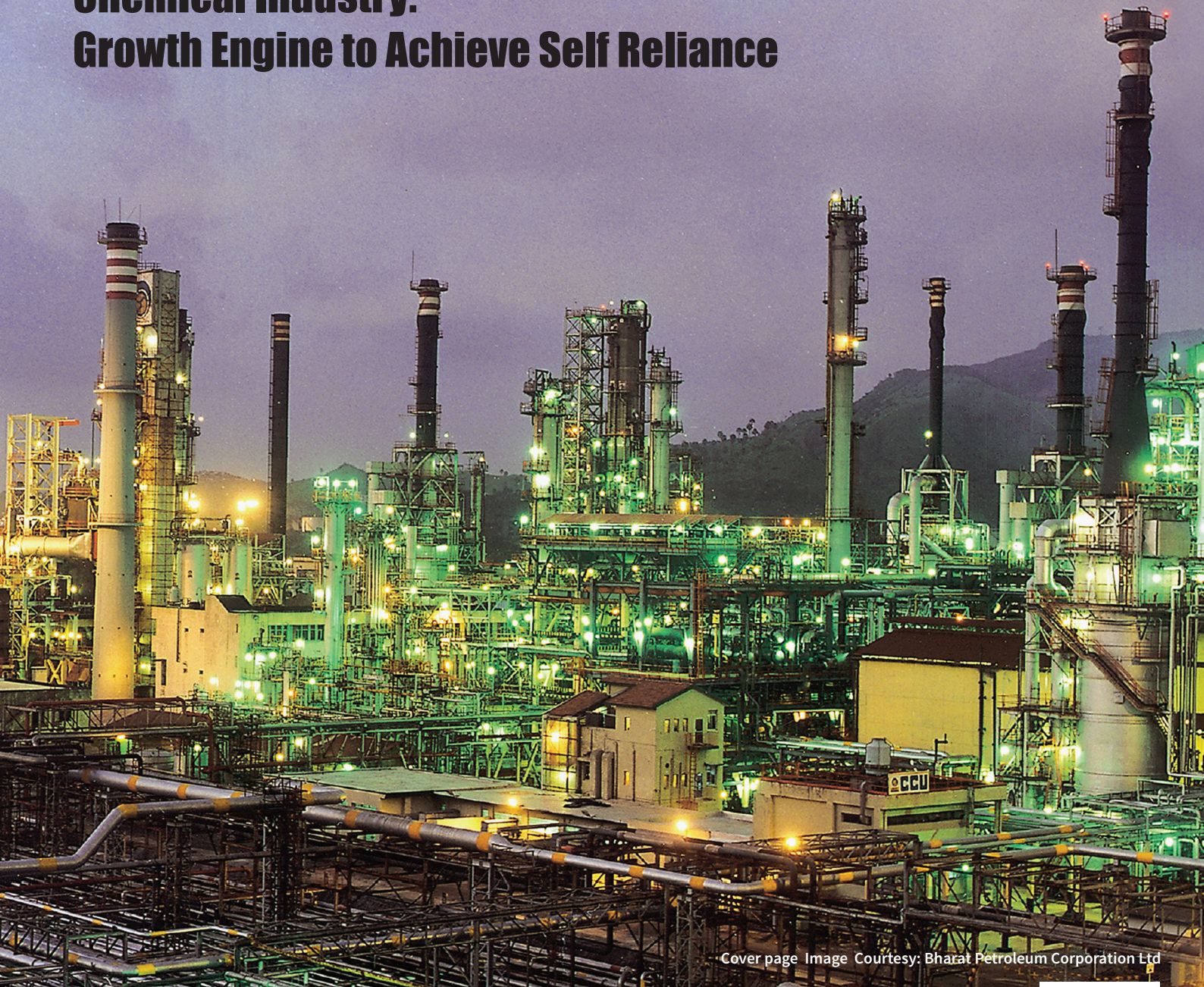
Chemical Industry: Growth Engine to Achieve Self Reliance



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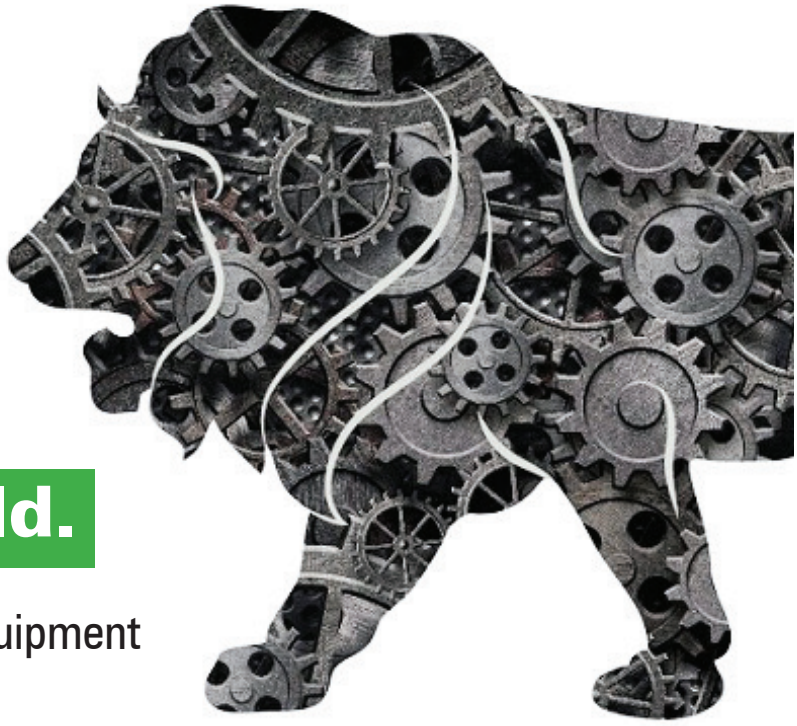

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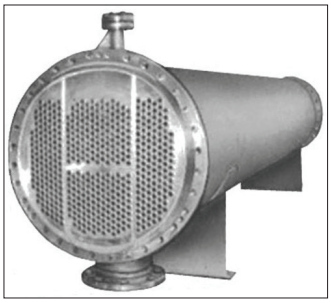

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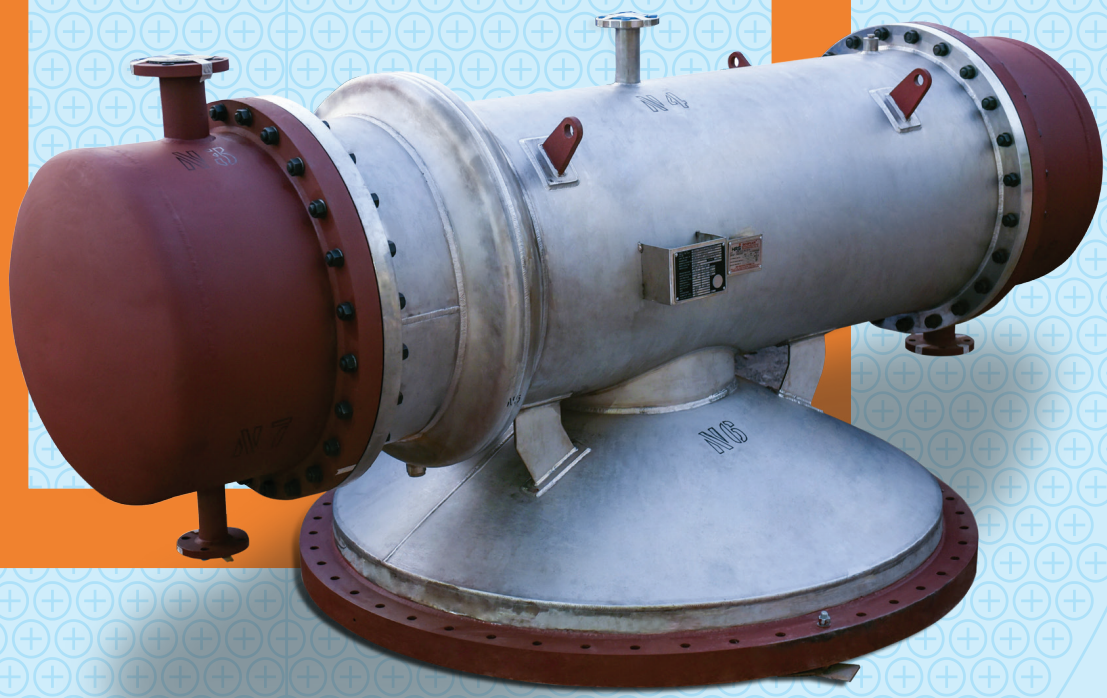

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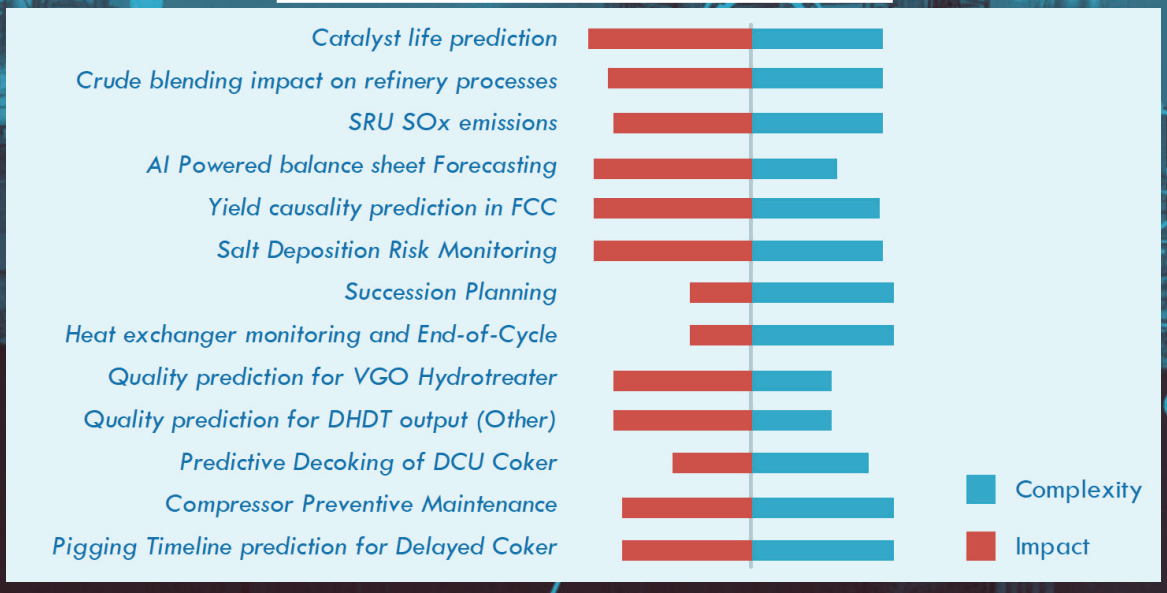

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IndianOil Pioneers India's Hydrogen Economy Efforts

SM Vaidya, CMD, IndianOil

New Delhi, India: To give a fillip to India's push to usher in hydrogen-based mobility solutions ecosystem, IndianOil, the country's largest refiner and fuel retailer, is inviting bids to procure 15 Polymer Electrolyte Membrane (PEM) fuel cell buses. This project is the first-ever attempt in the country to address all the aspects of hydrogen-based mobility as the ultimate green option.

S M Vaidya, Chairman, IndianOil said, "IndianOil has been pioneering the hydrogen efforts in the country and this exercise is a part of a bigger project which aims at addressing all aspects of the hydrogen value chain." Mr Vaidya also informed that this venture is being supported partially by the hydrogen corpus fund of the Union Ministry of Petroleum & Natural Gas.

Dr SSV Ramakumar, Director (R&D), IndianOil informed that the fuel cell buses would be evaluated in collaboration with the selected OEM partner through a wide-scale field validation exercise in Delhi-NCR on a structured scientific format. One of the key ingredients of this project is that the fuel cell stack/system technology would be indigenously developed and manufactured in the spirit of AatmaNirbhar Bharat, thus accelerating the creation of a local ecosystem to support further activities in the hydrogen energy domain.

To facilitate the hydrogen supply for refuelling these buses, IndianOil is also setting up demo units for different pathways to produce hydrogen of approx. 1 ton per day production capacity, at its state-of-the-art R&D Centre in Faridabad.

Reliance and bp announce first gas from Asia's deepest project

Mukesh Ambani, CMD, RIL

Mumbai, India: Reliance Industries Limited (RIL) and bp today announced the start of production from the R Cluster, ultra-deep-water gas field in block KG D6 off the east coast of India. RIL and bp are developing three deepwater gas projects in block KG D6 – R Cluster, Satellites Cluster and MJ – which together are expected to meet ~15% of India's gas demand by 2023. These projects will

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Bernard Looney, CEO, bp

utilise the existing hub infrastructure in KG D6 block. RIL is the operator of KG D6 with a 66.67% participating interest and bp holds a 33.33% participating interest.

R Cluster is the first of the three projects to come onstream. The field is located about 60 kilometers from the existing KG D6 Control & Riser Platform (CRP) off the Kakinada coast and comprises a subsea production system tied back to CRP via a subsea pipeline. Located at a water depth of greater than 2000 meters, it is the deepest offshore gas field in Asia. The field is expected to reach plateau gas production of about 12.9 million standard cubic meters per day (mmscmd) in 2021.

Mukesh Ambani, Chairman and Managing Director of Reliance Industries Limited added, "We are proud of our partnership with bp that combines our expertise in commissioning gas projects expeditiously, under some of the most challenging geographical and weather conditions. This is a significant milestone in India's energy landscape, for a cleaner and greener gas-based economy. Through our deep-water infrastructure in the Krishna Godavari basin we expect to produce gas and meet the growing clean energy requirements of the nation."

bp Chief Executive Bernard Looney said, "This start-up is another example of the possibility of our partnership with Reliance, bringing the best of both companies to help meet India's rapidly expanding energy needs. Growing India's own production of cleaner-burning gas to meet a significant portion of its energy demand, these three new KG D6 projects will support the country's drive to shape and improve its future energy mix."

The next project, the Satellites Cluster, is expected to come onstream in 2021 followed by the MJ project in 2022. Peak gas production from the three fields is expected to be around 30 mmscmd (1 bcf/d) by 2023 which is expected to be about 25% of India's domestic production and will help reduce the country's dependence on imported gas.

L&T Opens 'Planet L&T', a world-class Corporate Experience Center

Mumbai, India: Larsen & Toubro, India's leading engineering, procurement and construction projects, manufacturing, defence and services conglomerate, opened the doors to 'Planet L&T', its sprawling new digitally-enabled corporate experience center. Located at its newly-built 'A.M. Naik Tower' in Powai, Mumbai, the center is spread over close to 10,500 square feet.

The 'Planet L&T', a mesmerising peek in the L&T's World, offers visitors an immersive experience of eight decades of

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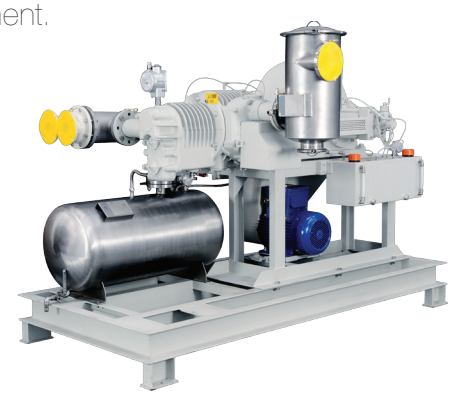

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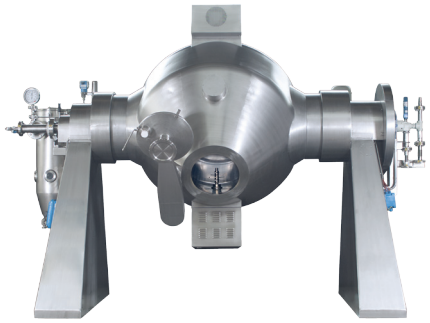

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S.N. Subrahmanyan, CEO & MD, Larsen & Toubro

the organization's history and a glimpse into how technology is shaping its future. From robot guides to holographic images, giant touch screens, and a multi-surface projection 'Immersive Zone, 'Planet L&T' is geared up to engage its business visitors and VIP guests like never before, with innovation at its core.

Commenting on the momentous occasion, S.N. Subrahmanyan, CEO & MD, Larsen & Toubro, said: "Planet L&T' is a testimony to the legacy the group has built over the past eight decades and the way it is redefining its future. It is aligned with our continued focus on digitalization, and adoption of futuristic, disruptive technologies. It will play an important role, in helping narrate L&T's stories that have shaped our nation and the world. It will also allow us to engage with our partners in meaningful ways, demonstrate the impact in our shared communities, and inspire current and future generations by promoting L&T's way of life."

The experience center is divided into twelve key zones, enabling visitors to take the grand tour or focus on specific aspects of L&T's past, present, and future. The focus on technology is demonstrated upfront in the entrance lobby where 'Elle' and 'Tee', robotic hosts, greet and guide visitors to the first zone – the Welcome Dome. A short film played on a mini-planetarium styled screen welcomes guests to Planet L&T and showcases the ethos of the experience center.

Baghjan Blowout Well finally abandoned

Duliajan, India: Consequent upon uncontrolled flow of Natural Gas and Blowout at Baghjan well No 5 on 27th May, 2020, OIL declared Emergency Situation for its internal control purposes. Today, after final abandonment of the well, the Emergency Declaration has been withdrawn with immediate effect. All the jobs pertaining to capping, killing and final abandonment of the well was successfully completed in the evening hours on 3rd December 2020.

OIL management acknowledges the tremendous support received from all stakeholders during this period, especially the team from M/s Alert, CMT personnel from ONGCL, Indian Army, Indian Air Force, Tinsukia District Administration, Assam Police, NDRF, SDRF and all Oilindians, who were directly or indirectly involved throughout the control operations. OIL Management is indebted to the constant guidance and support received from the Government of Assam, Central Government and the Ministry of Petroleum and Natural Gas (MoP&NG) in particular.

OIL Management expresses its gratitude to the brave Oilindians who laid down their lives

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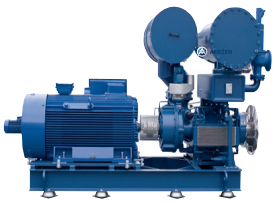

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while performing their duties at Baghjan. OIL Management expresses its gratitude to all the residents of the nearby areas around the blowout site for their patience and support to OIL during this period. We can assure all stakeholders that OIL will remain a people's company with support of the residents of its operational areas. Meanwhile, OIL has already deposited the requisite amount to the office of Deputy Commissioner, Tinsukia towards compensation to all concerned as per the interim order of Hon'ble NGT and advice of DC, Tinsukia.

H-Energy committed FSRU contract to Höegh

Höegh Giant

Mumbai, India: H-Energy through its wholly owned subsidiary Western Concessions Private Limited ("H-Energy"), is pleased to announce that it has entered into a binding commitment with Höegh LNG Holdings Ltd. for the supply of its Floating Storage and regasification Unit ("FSRU") Höegh Giant under a 10-year agreement, for deployment at its LNG regasification terminal project located at Jaigarh Port in Ratnagiri district of Maharashtra, India. The FSRU will be delivered to H-Energy's Jaigarh project in the first quarter of 2021.

The 2017 built Höegh Giant has a storage capacity of 170,000 m3 and has a peak regasification capacity of 750 mmscfd (approximately 6.0 MMTPA). The FSRU will deliver regasified LNG to the 56 km Jaigarh-Dabhol pipeline connecting to the National Gas grid and will also deliver LNG onshore for LNG truck loading facilities. The FSRU is also capable of reloading LNG onto other LNG vessel's for providing bunkering services.

Upon the delivery of the FSRU H-Energy will commission its Jaigarh LNG regasification terminal project in March 2021. This LNG terminal will become India's first FSRU based LNG regasification terminal.

H-Energy's Jaigarh LNG terminal is also constructing truck loading facilities to deliver LNG through trucks to its customers. H-Energy further plans to develop L-CNG stations across India to enhance the utilisation of LNG and CNG as transportation fuel, contributing to the environment in line with the policy of the Government of India.

Announcing the agreement and the commission date for the Jaigarh project the Chief Executive Officer of H-Energy, Mr. Darshan Hiranandani stated "We are very happy to have partnered with an experienced player like Höegh, this will enable the Jaigarh project to start delivering first gas by March 2021. The Government of India and the Petroleum and Natural Gas Regulatory Board have taken several positive steps recently including unified tariff and city gas distribution open access which will result in a multi-fold increase in the utilization of natural gas in India. We are confident that H-Energy will establish its presence as an efficient,

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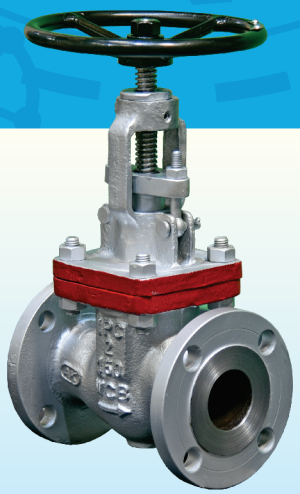

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economic and customer focussed LNG value chain player in India."

Artificial intelligence to make chemical industry faster and smarter

Sucheta Govil, CCO, Covestro

Germany: Covestro is driving forward the use of artificial intelligence (AI) in the company as well as throughout the entire chemical industry. As part of these efforts, the Leverkusen-based materials manufacturer is conducting several pilot projects across different divisions to investigate how digital technologies can make processes more efficient and sustainable.

"With the help of artificial intelligence, we will be able to find digital solutions across departmental boundaries in the future that were not possible before. This opens up completely new possibilities to achieve greater sustainability with improved resource utilization and thus to serve the needs of our customers even more precisely," says Sucheta Govil, Chief Commercial Officer of Covestro.

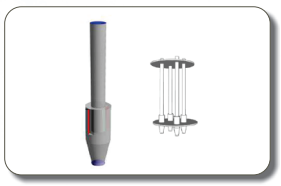
At its Dormagen production site, Covestro is testing how the manufacturing process for polyesters can be optimized. Polyesters are needed for the production of polyurethanes. The use of artificial intelligence in the processing of the company's comprehensive process data is intended to create free production capacities and minimize energy consumption. Digital technologies are also used in Dormagen and at the Leverkusen and Krefeld-Uerdingen sites to predict the peak steam consumption of production plants. In this way, energy consumption and costs can be reduced in the long term.

Another project deals with the digital customer experience. Machine learning is used to help to identify potential customers for Covestro at all digital touch points on the Internet and social media. The aim is to win them over as customers in the long term through consultation and information. Artificial intelligence will also be used in Covestro's purchasing department in the future. Faulty invoices can then be identified with less effort, making the invoicing acknowledgement process much more efficient.

"AI is a fascinating opportunity for Covestro worldwide. The ongoing projects show that data and its proper use not only make the entire industry smarter and faster, but can also contribute to the bottom line," says Nils Janus, Head of Advanced Analytics at Covestro. To make optimum use of data-based findings in the future, the materials manufacturer has developed the Covestro Analytics Platform (CAP), a platform for data scientists. It collects raw data from production plants, research results, and business processes and supplements it with external databases to perform analyses and train machine learning models. In this way, Covestro is taking another important step towards digitalization and data-driven business management.

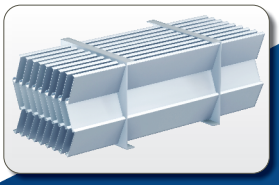
Separator and Mass Transfer Internals for
Oil & Gas Industry


Axial Cyclones

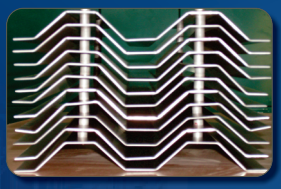

Multi-Cyclones

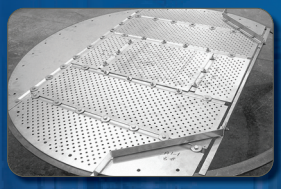

Structured Packing


Vane Inlet Device


Vane Pack


Wiremesh Mist Eliminator


Chevron Type Mist Eliminator


Double Skin Perforated Baffle


Sand Jet Assembly

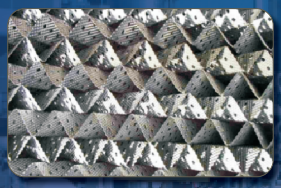
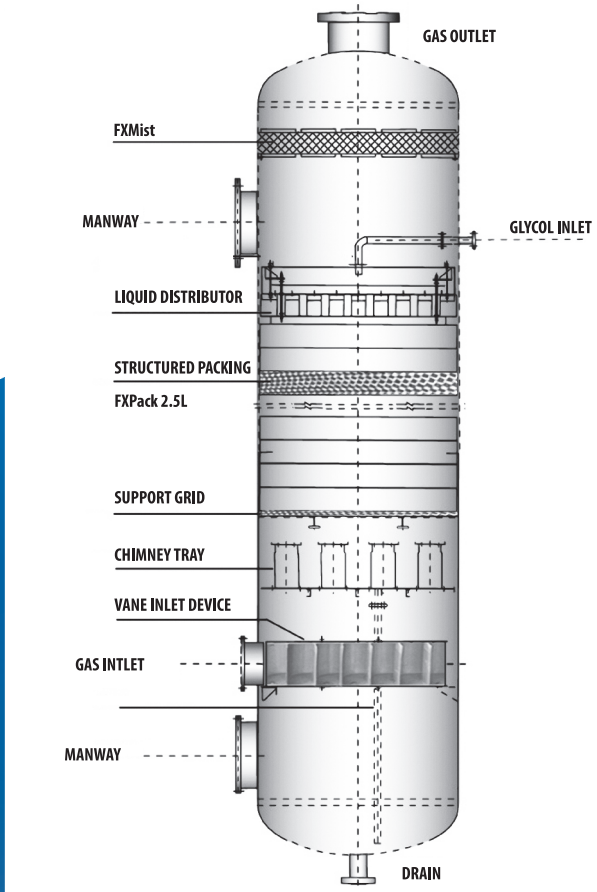


Plate Pack



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Clariant's MegaMax® 800 catalyst set production record at Baofeng Energy's methanol plant

Munich, Germany: Clariant's methanol synthesis catalyst, MegaMax 800, has demonstrated its excellent performance at the methanol synthesis plant in the by-produced coke oven gas to olefin project of Ningxia Baofeng Energy Group Co; Ltd. The 1.5-million-metric-tons-per-annum methanol unit was loaded for the first time with the MegaMax 800 catalyst in June 2018. The superior catalytical performance enabled Baofeng Energy to increase the plant load to 117% design capacity producing 3.7 million metric tons of MTO (Methanol to Olefin) grade methanol in total. This resulted in an increased methanol yield of 160,000 metric tons compared with previous operation performance.

Stefan Heuser, Senior Vice President and General Manager at Clariant Catalysts stated, "We are very proud that MegaMax 800 performed so extremely well in Baofeng's methanol synthesis plant in the by-produced coke oven gas to olefin project. We had promised to help Baofeng Energy improve their process efficiency through our innovative solution, and we delivered."

The MegaMax 800 catalyst exhibited excellent activity at low operating temperatures. The average inlet temperature was 19°C lower at the same steam drum pressure. It also outperformed in carbon efficiency; both inlet and outlet carbon monoxide concentrations were lower by 4-6 points while using similar make-up gas. Chaoshan Yi, Chief Engineer of Baofeng Energy Group, added, "We were very pleased with the results of the catalyst's performance, especially the high activity which sets the foundation for the higher yield of the methanol plant. This is the most important reason why we decided to continue with MegaMax 800 and reordered the catalyst for our new load this year."

Danish partnership sets out to build world's first commercial-scale green ammonia plant

Green ammonia, produced from renewable energy, is an excellent fuel and fertilizer that can potentially replace significant volumes of fossil fuels and help accelerate the transition to a world powered by renewable energy. A partnership of industry leaders now announces an ambition to realize this potential as soon as in 2022 with the world's first green ammonia plant at the commercial scale of 10 MW power.

The project has been developed by Skovgaard Invest, supported by Vestas, the global leader in sustainable energy solutions, and Haldor Topsoe, a global leader in catalysts, technology, and services for the chemical and refining industries. The plant will be located in Western Jutland, Denmark, and

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will produce more than 5,000 ton green ammonia from renewable power annually. This production will prevent 8,200 tons of CO2 from being emitted into the atmosphere every year. 12 MW existing V80-2.0 MW Vestas wind turbines and 50 MW new solar panels will power an electrolyzer unit that will produce hydrogen which will subsequently be processed into ammonia. Such processes are commonly referred to as "Power-to-X".

Green ammonia has huge potential in the global effort to substitute fossil fuels with sustainable alternatives. It has been highlighted as a superior green fuel for international shipping that currently accounts for around 2% of global energy-related CO2 emissions. Already today, ammonia is used as fertilizer globally and the production from fossil fuels accounts for around 1% of global CO2 emissions. The cost of green ammonia is currently significantly higher than that of comparable ammonia from fossil fuel. To improve the business case and increase the attractiveness of green ammonia as a substitute for fossil fuels, Haldor Topsoe and Vestas are developing a dynamic, scalable and cost-optimized solution.

Haldor Topsoe will design the plant's fully dynamic ammonia technology to secure optimal production and adapt to the inherent fluctuations in power output from wind turbines and solar panels. The ammonia plant will interface to a green hydrogen solution developed by Vestas, integrating electrolysis with wind and solar in one smart control system. In addition, the renewable energy generation will be connected directly to the national grid so surplus power can be sold to the grid.

When in operation, this lighthouse project will deliver proof of concept and experience that can pave the way for larger Power-to-X projects in the future. The project has been specifically designed to provide the necessary know-how and operational experience in order to upscale the dynamic ammonia plant in new projects. The partnership will jointly invest in the project and has applied for public co-funding.

Bentley Systems Becomes Founding Member of Digital Twin Consortium

Dr. Richard Soley, ED, Digital Twin Consortium

Exton - Pa, USA : Bentley Systems, Incorporated the infrastructure engineering software company, has elevated its participation in the Digital Twin Consortium by becoming a founding member. Having been a groundbreaker member since day one of the consortium's launch in May of 2020, Bentley will deepen its collaboration as a founding member and become a member of its steering committee.

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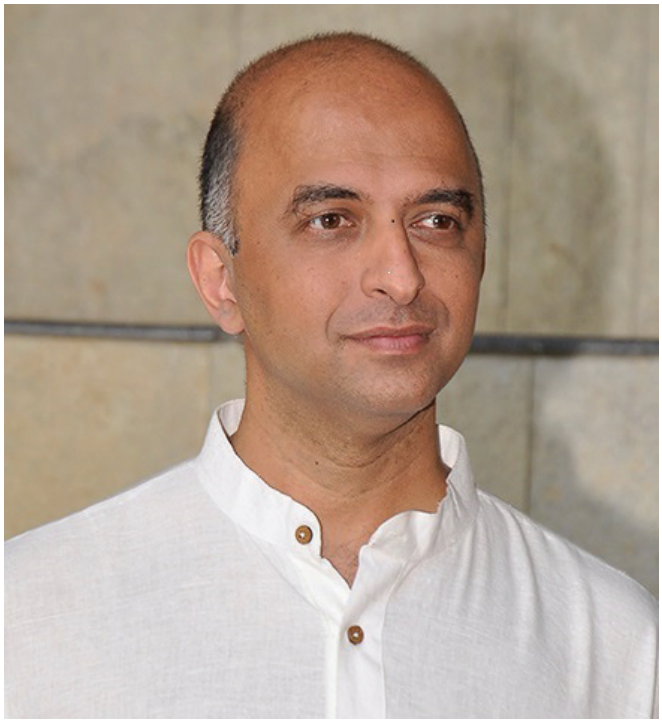
One way that Bentley is helping advance the Digital Twin Consortium's mission is through defining the terminology used to describe digital twins. Casey Mullen, distinguished architect, strategic technologies at Bentley Systems, has contributed his expertise as a lead author of the Digital Twin Consortium's definition of a digital twin. Mullen helped unveil the new definition during a panel discussion at the IOT Solutions World Congress held in December 2020. "I've enjoyed collaborating with representatives from diverse industries in the consortium's Technology, Terminology, and Taxonomy Working Group to develop a set of practical definitions to inform those who are acquiring or implementing digital twins," said Mullen.

As a founding member, Bentley is also contributing its advice and technology expertise to the Digital Twin Consortium's steering committee. Adam Klatzkin, vice president, iTwin Platform, at Bentley Systems, and Mullen are helping advance the Digital Twin Consortium's strategic roadmap, working groups, and governance as members of the consortium's steering committee. "We are delighted that Bentley is a founding member of Digital Twin Consortium and is also a member of our steering committee," said Dr. Richard Soley, executive director, Digital Twin Consortium. "The consortium looks forward to high-level guidance on digital twin technologies and continued contributions based on Bentley's experience and knowledge of the infrastructure industry."

Godavari Biorefineries Ltd. Expands Its Ethanol Production



Samir Somaiya, CMD, Godavari Biorefineries Ltd

Mumbai, India: Godavari Biorefinery Ltd., one of the pioneers in the manufacture of alcohol-based chemicals in India has increased its ethanol manufacturing capacity from 320,000 liters per day to 400,000 litres ethyl alcohol per day. The company is targeting to divert 40% of its sugar in cane to make ethanol using sugarcane juice and B Heavy molasses. With this development, the company will have a capacity of over 100 million liters of ethyl alcohol in a single location.

Sugar, a low carbon source of energy, is not just an environmentally friendly source to produce ethanol but also drives the rural economy. The livelihood of a significant number of small farmers in rural India depends on the farming of sugarcane, production of Ethanol using sugar will support the growth of such farmers.

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Samir Somaiya, Chairman and Managing Director, Godavari Biorefineries Limited, said, "Since the inception of the company, we have worked towards building an environmentally friendly eco-system in our company. With the increase in capacity of production of Ethanol, we are not only growing our business but also helping the entire ecosystem flourish."

While the world is moving towards sustainable practices to reduce carbon footprints, governments all over the world are promoting policies/programs to encourage companies/ industries to incorporate green practices. One of such programs introduced by the Indian government is the Ethanol Blending Program, which sought to promote the use of alternative and environment-friendly fuels and to reduce import dependency for energy requirements. The Government expanded the size of this programme by allowing the use of

sugarcane juice/syrup and more recently other feedstocks.

Godavari biorefineries Ltd., one of the first companies to associate with the expanded program and supplied a large quantity of ethanol to the Ethanol Blending Program last year.

Earlier this year, the company delivered 38 million liters of ethanol to the program. Godavari Biorefineries pioneered the use of sugarcane syrup for making ethanol by diverting almost 30% of sugarcane directly following the Brazilian model. This year, the company is contracting to deliver more than 70 million litres for the ethanol blending programme. In the future, the company plans to produce more than 100 million litres in a single location.

Use of biofuels needs to increase: Gadkari

Pune, India: "The use of biofuels needs to be increased to reduce the strain caused by fossil fuel on our country's economy, and the growing pollution menace arising from it," said Nitin Gadkari, Union Minister for Road Transport & Highways and the Minister of Micro, Small and Medium Enterprises. He was speaking at publication ceremony of the special edition of the book "Ek Hota Carver" by Veena Gavankar. Jointly organized by Rajhans Prakashan and Praj Industries, the special edition of the book commemorates the prestigious 2020 George Washington Carver Award conferred by Biotechnology Innovation Organization (BIO) on Dr. Pramod Chaudhari, founder and executive chairman of Praj Industries. The award is the highest recognition in the field of industrial biotechnology. Shrikant Vaidya, Chairman, Indian Oil Corporation was the chief guest at the event.

The Union Minister said, "The use of a wide variety of biofuels should be encouraged to curb both oil imports and pollution. These readily available, economical & pollution-free products has the potential to create

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new opportunities by harnessing bio-waste from our country's agricultural sector while generating employment and providing alternative income to farmers. I congratulate Dr. Chaudhari on the work he is doing to not only boost the country's agro-based rural economy, but also save the country at least Rs 2 lakh crore in foreign exchange. He truly embodies the spirit and purpose of George Washington Carver". He promised that the central government would take steps to continue promoting biofuels and that as the Minister of State for Home Affairs, he would speed up the process.

Presenting a comprehensive view of IOCL, S M Vaidya said, "We are striving to ensure that Indian Oil is not only a seller of petroleum products, but also an energy company in the future." He expounded on the company's vision to provide clean, environmentally friendly and efficient alternative fuels. "Industrial biotechnology will soon become an all-encompassing sustainable alternative to everyday life" said Dr. Chaudhari. In addition to providing fuel options for transportation by road, water and air, Praj has entered the field of renewable chemicals and materials. Praj is developing technologies that can be used in sectors such as agriculture and food processing, automotive industry, textile manufacturing, etc. He said the technology, which uses carbohydrates instead of hydrocarbons, is in line with Carver's mantra of agricultural development. He added that the purpose of this special edition was to convince youth that the rural economy can be boosted if agriculture and agribusiness are linked to industry.

LANXESS increases black pigment capacity

Cologne, Germany: Specialty chemicals company LANXESS has expanded its capacity for black synthetic iron oxide pigments at its Krefeld-Uerdingen site by more than 5,000 metric tons per year. "The increased demand from the construction industry, in particular for our unique black pigments to color concrete, can be even better met with the debottlenecking measures that have now been completed," says Holger Hüppeler, head of the Inorganic Pigments business unit at LANXESS. The company is thus continuing the systematic expansion of its production capacities for synthetic iron oxide pigments. LANXESS is the only supplier worldwide to produce these pigments using the Laux process.

In architecture and landscaping, the black coloration of concrete has been a trend for some time now. Concrete is a creative material, which provides a multitude of possibilities to building material producers, architects, and building contractors. With the use of suitable pigments, this applies not only to the architectural design of concrete, but especially to its coloration. "Thanks to

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their up to 15 percent higher tinting strength and reliable color consistency, our Bayferrox 330 and Bayferrox 340 black pigments are the preferred choice for coloring high-quality cement-based building materials – for example not only in manufacturing concrete paving stones and roof tiles, but also in architecture," explains Hüppeler. In addition, these special iron oxides from LANXESS offer further clear benefits. The pigments produced using the Laux process are the only synthetic iron oxides that are specially certified by an independent testing institute for safe use in ultra-high-strength concretes (UHPC). UHPC is used in construction projects where, for example, high load capacities and very lightweight, customized structures are required. And these high-quality pigments are also impressive when it comes to their sustainability credentials. They are certified for their high content of recycled raw materials by SCS Global Services, one of the leading companies for audits and independent certifications worldwide.

In Krefeld, LANXESS operates the world's largest plant for manufacturing synthetic iron oxide pigments. The global importance of this site is confirmed every year by its extensive investment in capacity expansion and process optimization, as well as the continuous expansion of environmentally friendly production technologies.Specialty chemicals group LANXESS has set itself an ambitious climate protection target. By 2040, the group aims to become climate-neutral and reduce its greenhouse gas emissions from the current level of around 3.2 million metric tons of CO2. By 2030, LANXESS aims to cut its emissions by 50 percent to around 1.6 million metric tons of CO2 compared with today.

Natural Gas Monetization Binds Africa and Mozambique's Oil and Gas Industries

Johannesburg, South Africa : For many years, and as it was pursuing ambitions to become a global LNG exporter, Mozambique has struggled to generate enough energy for its domestic market. We are now about to see an energy revolution thanks to great gas discoveries made by international investors over the past decade. While international technological innovation and skillful know-how will be driving such projects, we must all push for a transfer of knowledge throughout the development of Mozambique's LNG projects.

The need for more collaboration and shared experience among African energy experts is going to be critical for Mozambique as it pushes towards monetizing massive gas discoveries. Similarly, recognizing that the state and the private sector need to play a role in the development of critical energy infrastructure to pave the way for domestic gas utilization will be key to Mozambique's development and also solving energy poverty issues.

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EVAPORATORS : ■ Falling Film Evaporator ■ Forced Circulation Evaporator ■ Agitated Thin Film Evaporator Mixers ■ Paddle Mixer ■ Ribbon Blender ■ Nauta Mixer ■ Conical Mixer ■ Screw Conveyor

ALLIED EQUIPMENTS & SYSTEMS : ■ Hot Air Generator (Oil & Gas Fired) ■ Coal Fired Hot Air Generator ■ Wood Gasifier ■ Air Polution Control System ■ Rotary Disc Atomizer ■ Rotary Air Lock Valve

TURNKEY PROJECTS : ■ Microcrystalline Cellulose Powder Plant ■ Sulphur WDG Plant ■ Starch and Derivatives Plant ■ Detergent Powder Plant ■ Milk Powder Plant ■ Instant Coffee Powder Plant ■ Nutraceutical Plant ■ Fruit & Vegetable Powder Plant

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Phone : +91 7972332396 / +91 9665036923 ■ sales@technodrysystems.com, www.technodrysystems.com

"Mozambique can learn from the success and struggles of other African countries on the critical role of gas in our development," stated Florival Mucave, President of the Mozambique Oil & Gas Chamber, who firmly believes that increased collaboration between upstream and downstream players across the value-chain will benefit Mozambique.

Mozambican stakeholders from the public and private sector recognize that the country is at a crossroad in its development. In this context, building the right energy mix while taking into consideration climate issues is key for the country. The African energy industry is capable of embracing climate concerns and at the same time continuing to develop its natural resources to benefit the poor, create jobs and promote an inclusive economic development.

Mozambique's LNG is important to the world and will act as a bridge to other sources of energy, and local businesses should be ready to participate in this development. Local content and jobs must not be catch phrases, they must be real. African businesses and entrepreneurs have a role to play and must push for an enabling environment that will spur investment, entrepreneurship and growth. "The government and energy companies have recognized the amazing opportunity that gas offers to change our economic ambitions, and there is a clear intent to monetize these resources for the benefit of Mozambicans. This will be possible only through an increase in investment into infrastructure," added Florival Mucave. ■

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Mob. No. +91 8007991794

PALGHAR WORKS : Plot No. 8,
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Nandore Road., Opp. Vinod Cookware,
Palghar (East) - 401 404. (Maharashtra) INDIA.
Mob No.+91 8007991729

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30 KL Limpeted Reactor

RANGE OF PRODUCTS

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  Capacity from 1 Sq Mtr. To 150 Sq Mtr.
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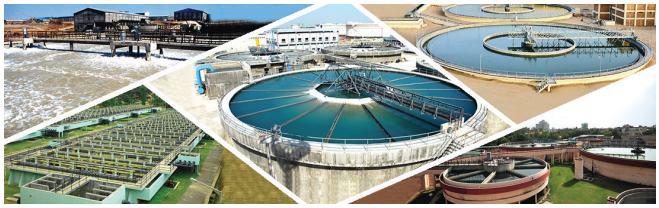
- **Storage Tanks**
- **Self Stiffened Storage Tank**
  Capacity upto 95 KL.
  Available with SS Limped, Insulation and SS Cladding. Polished upto 400 Grit Mirror for Food Grade.
- **Twin Shaft Dispersor**
- **High Speed Mixers**
  Ranges from 0.5 KL To 20 KL.
  Operates at 1440 RPM.
- **Continuous Nitration Systems**
  Nitration Systems
  Operates continuously for 24X7

10 KL Twin Shaft Dispersor

25 KL SS 904L Reactor

62 KL Limpeted Storage Tank

L&T Construction Awarded Contract for its Water & Effluent Treatment Business



Mumbai, India: The Water and Effluent Treatment business of L&T Construction has secured an EPC order involving Design, Engineering, Supply & Installation of Plant and Equipment to lay 135 km of Slurry Pipeline and Water Pipeline Systems between Bacheli and Nagarnar and associated facilities in the State of Chhattisgarh.

L&T is already executing a pumping facility as part of another package for the same client in the same area that involves the supply of positive displacement pumps and the construction of a slurry pump house.

Equatorial Guinea Intensifies E&P Activities in 2021

Malabao, Equatorial Guinea: Equatorial Guinea will see three exploration wells drilled in Trident Energy-operated Block G in 2021, along with refurbishment and well intervention works across other assets, according to the Ministry of Mines and Hydrocarbons. Trident Energy will drill three wells

in Block G in 2021 – each of which is expected to take 33 days to complete – with an estimated start date in April. Located 15 km offshore Equatorial Guinea, Block G is home to the Ceiba and Okume fields, and is set to yield new development opportunities following the company's acquisition of 4D seismic in the first quarter of 2020.

Noble Energy will conduct refurbishment work on its Aseng floating production storage and offloading (FPSO) unit over a period of 10 days, with the objective of maintaining safety, reliability and productivity of the infrastructure, as well as complying with regulations of the ABS (leading U.S. offshore classification society). Intervention works will also be carried out in wells 5P and WI-1.

Meanwhile, maintenance works will be conducted on the Zafiro, Jade and Serpentina infrastructures, with execution planning activities carried out ahead of well repairs on the Jade Platform by 2022, along with optimization of production and management of inactive wells. Serving

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Refreshing the Planet

as the country's most prolific asset, the ExxonMobil-operated Zafiro field was producing 90,000 barrels per day (pre-COVID-19) via the Jade fixed production and drilling platform and Serpentina FPSO.

Excel Industries gets consent for expansion

The Ministry of Environment Forest & Climate Change has recommended for grant of environmental clearance for proposed expansion of Excel Industries facility in MIDC Dhatav in Maharashtra. The company plans to increase the unit capacity from 91,338 TPA to 183,272 TPA located in MIDC Dhatav, Raigad, Maharashtra. Total cost of project is estimated at Rs 291.37 crores. After completion of expansion program, Phosphorus trichloride (PCl3), Thio Phosphoryl Chloride (PSCl3), Phosphorus Pentasulphide (P2S5), Diethyl/Dimethyl Di Thiophosphoric Acid [DTA (E)/(M)] and other chemical products will be produced in this unit.

L&T Technology Services bags USD 100 million order

L&T Technology Services (LTTS) has been selected by a global O&G major to be the primary engineering partner to support two of their integrated refining and chemicals manufacturing facilities in USA. This multi-year engagement has potential value of more than USD

100 million and LTTS will provide multi-discipline plant engineering activities including site sustenance, discipline engineering and control automation support for both facilities. LTTS will leverage its in-house digital engineering tools and new age technology & solutions to optimize project execution and drive efficiency improvements for the customer. The two sites covered under LTTS' scope are integrated refining, chemical and polymer complexes and are currently among the top 10 biggest downstream sites in the U.S. ■

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LINED VALVES

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SIZE RANGE : ½" - 24"

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MUMBAI

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inhouse

McDermott is Ready for the Future of EPCI

Challenges brought on by the oil price crash and the COVID-19 pandemic have put businesses across the world—particularly in the energy industry—to the test. New business models, energy transition and digitalization will play a vital role in bringing about change and recovery. ***Neeraj Agrawal, Country Manager (India) for global EPCI contractor, McDermott,*** *sat down with Chemical Engineering World to discuss McDermott's future plans, key projects and the role its India and Asia Pacific business plays for the global entity.*

Neeraj Agrawal
Country Manager (India)
McDermott

How has the current pandemic affected the projects of McDermott, how are you managing with project delays?

In 2020, due to the COVID-19 pandemic, the oil and gas industry is experiencing its third price collapse in twelve years. The industry rebounded from the first two shocks, but this year there was a lethal combination of supply shock with an unprecedented demand drop. While this crisis' depth and duration are uncertain, the best solution was to adjust to the situation and get accustomed to new ways of working.

All of our employees in India are equipped with laptops. When the pan-India lockdown was announced, moving our employees from office to home was quite manageable. Our employees quickly adapted to the new processes and procedures of their working-from-home environment, which helped minimize a loss of productivity. We enhanced our IT infrastructure, enabling the project teams and departments to coordinate and communicate with each other regularly and seamlessly. However, given the global pandemic, our physical and mental well-being was affected. Key factors that we adopted to mitigate COVID-19 risks at McDermott's workplaces included several educational campaigns to help enforce best practices while keeping the business active. To cope with the situation, we leveraged our Employee Well-being and Assistance Program, to offer counseling support to employees and their families. As most of our employees are still working from home, we also organize regular virtual townhalls to encourage joint participation and create an open space for employees to engage in conversations, share important information and promote collaborative teamwork.

We have been very active in reaching out to our customers to communicate the changes we have made and understand the effect of the market on their investment plans. We have experienced some project delays, but there have been no cancellations——and thanks to effective safety measures, many projects have continued progressing well even in the face of this. We feel that we are well positioned for the market post-COVID-19 and I am confident in our ability as a company to operate in diverse geographic

McDermott is uniquely positioned in India to address the significant opportunities due to our technology-driven, vertically integrated offering in both onshore and offshore.

markets globally, offering a wide range of project services to the upstream and downstream sectors of the industry.

In your view, what are the biggest challenges the EPC players need to address?

The major challenge for the EPC sector is the bidding process. Firstly, the qualification criteria changes frequently. Secondly, the bidding schedule is very stringent and, owing to these time constraints, it can put pressure on a comprehensive bid. Proposal preparation includes—interacting and dealing with internal teams, sub-contractors, local bodies, clients and vendors. Inadequate time can impact the final proposal which is not the best outcome for the customer or the contractor.

Contract terms and conditions can also be challenging for EPC contractors. To reduce risk, risk committees have to analyze the project to understand the prospective challenges associated with the bid or the project to put in a robust process of risk mitigation throughout the project's lifecycle. Many customers want a single-way contract, which leads to shifting the risk paradigm to the EPC contractor.

What are the new models for business and contracting the industry should adopt for risk mitigation and building resilience? Tell us about the steps taken by Mc Dermott in this direction?

The first model could be a model of risk and reward, where the terms and conditions are a bit more neutral. The volatility in the oil and gas market is significant and could ripple throughout the global economy. These events serve as another reminder of the importance of proactively assessing and managing contractual risk or opportunity in a quickly changing environment.

Another model is FEED competition or late conversion of projects into EPC. These models are not the norm in India because of the public sector's rules and regulations in FEED competition. The industry should ensure they have the right commercial numbers and a solid understanding of the risks associated with the project. This contracting style saves cost and, most importantly, can lead to the omission of the bidding process at the EPC stage—where the selected contractor will be responsible for their design, whilst being fully deployed with little to no cost variations.

The third one could be the Licensing Engineering Procurement and Construction (LEPC) model, which is followed in some process units like hydrogen and sulphur. A similar model

ONGC Offshore Installation by McDermott

can be implemented in some of the petrochemical prospects as most of the multinational companies have a technologically driven EPC approach. This process will help contractors become more competitive in the market and flexible in the project-execution approach.

In India, especially in the onshore segment, we are bidding for major projects based on our competencies. We are also empaneled with Indian Oil Corporation Research and Development. We have robust systems and processes in place for selecting the bids in which we will participate with competitive rates.

To be successful, we have built a team of pioneers who have implemented smart solutions for our customers. McDermott has more than 2,000 employees across India—a highly experienced team covering all disciplines with in-house capability to implement concept studies, FEED, PMC, EPCM, EPC and EPCI projects. Our offices in Gurgaon and Chennai are two of McDermott's largest project execution centers supporting local and global projects. Gurgaon's expertise is primarily onshore projects such as refinery, petrochemical and gas processing. Chennai specializes in engineering and EPCI for offshore facilities. We are uniquely positioned to address the significant opportunities we see in India due to our technology-driven, vertically integrated offering in both onshore and offshore.

In recognition of McDermott's commitment in India with a strong Make in India focus, McDermott's President and CEO, David Dickson, participated in Prime Minister Modi's roundtable discussion with U.S. energy companies in Houston in September 2019, where they discussed the company's future growth prospects in India.

This year McDermott joined the Hydrogen Council which has the

mission of scaling up hydrogen solutions. Tell us about McDermott's plans, work carried out so far and how much time may it take for making these solutions commercially viable?

McDermott sees hydrogen as a key enabler of the energy transition. We are leveraging our experience in designing and building hydrogen production facilities and our leadership in hydrogen storage solutions to support our customers across the hydrogen value chain. We believe hydrogen, both blue and green, will increasingly play a vital role over the next ten years as technology and carbon pricing potentially scale up and will be key to net zero ambitions. McDermott offers engineering and construction solutions for green and blue hydrogen, combining carbon capture, gas processing, storage and power expertise. Our hydrogen production (steam methane reforming technology), liquid hydrogen storage and liquefaction experience, combined with large-scale EPC capabilities, has made McDermott appealing to customers and partners specializing in hydrogen production and distribution. McDermott's CB&I Storage Solutions has already established itself as a leading provider of hydrogen storage. It specializes in field erected spherical cryogenic hydrogen storage with capacity ranging from 10,000 gallons to 1.25mm gallons and is currently building the largest hydrogen sphere in the world for NASA.

McDermott is continuing to work with new and established technology companies to scale up the solutions, a key factor to bring down the cost of clean energy alternatives and new technology. iO Consulting, a JV between Baker Hughes and McDermott, is a strategic consultancy focused on the early front end of projects, bringing specific expertise integrated with access to technology and execution expertise from its parent companies to enable projects with a higher certainty that the outcomes identified can be delivered. iO Consulting has recently completed a feasibility study for NewGen Energy green hydrogen production facility in Trinidad and Tobago and is also engaged in carbon capture, utilization and storage (CCUS) projects to support power decarbonization and other industries.

To date, we have provided EPC services to more than 200 hydrogen and syngas plants globally.

What are the key projects you are currently working on across Asia Pacific?

McDermott has three geographic areas and a corporate headquarters in Houston.

In Asia Pacific, we work on projects for our counterparts in the other areas, including North, Central and South America (NCSA) and Europe, Middle East and Africa (EMEA). In addition, we undertake major EPCI projects for our customers in Asia Pacific (APAC). Our current projects include the largest subsea project ever awarded in India, ONGC's 98/2 project, Inpex's Ichthys project, Posco's Shwe Phase 2, Reliance's KG-D6 project, Gorgon Stage 2 fabrication, Scarborough FEED and Ichthys 2B feed.

Anyone trying to construct, fabricate and move materials during COVID-19 has had to be flexible and adaptable. We have adjusted to the needs of our customers and the requirements of the projects including completing three offshore campaigns in the middle of COVID-19 in the Bay of Bengal.

Walk us through the digital roadmap of McDermott. How does the company plan to implement this across the organization, partners and for customer interface to improve project management efficiency?

Market dynamics and an accelerating pace of innovation within our industry create a challenging environment for companies to navigate. Our most senior executives recognize that, to excel, we must be innovation leaders—not followers. That's why our Digital and Analytics group was tasked with developing strategies and initiatives that harness the immense potential of our collective creativity. Digital and Analytics' primary focus areas are: delivering value; embedding a digital-ready culture; and driving digital project delivery. McDermott fosters a culture of innovation and has an idea-sharing platform that allows employees to submit their ideas and be a part of ideation and implementation. We also digitalize processes to develop solutions that improve project safety, certainty and profitability.

McDermott is currently exploring digital opportunities across our entire value chain. One of our flagship initiatives

In recognition of McDermott's commitment in India with a strong Make in India focus, McDermott's President and CEO, David Dickson, participated in Prime Minister Modi's roundtable discussion with U.S. energy companies in Houston in September 2019, where they discussed the company's future growth prospects in India.

is our GeminiXD digital collaboration platform. This platform allows our project teams to make quicker, well-informed decisions using data and analytics instead of documents. We are creating pilot programs where we use Artificial Intelligence (AI) to develop engineering material estimates. In addition, QR-code-based material tracking has been implemented to improve supplier-to-shop delivery and logistical performance. McDermott is a leader in this space and we continue to demonstrate this commitment through our innovations and digital solutions.

In 2018, we launched our first Digital Innovation Center in Pune, India, to develop and utilize innovative digital solutions to lead the transformation in offshore oil and gas projects. It serves as a technology epicenter to support McDermott's growth plans in India, as well as support McDermott's global digital initiatives.

How is McDermott aligning its future growth with the energy transition across the portfolio of services offered across the oil, gas and power industries?

As demand fluctuates, the energy industry works to meet consumption needs. McDermott combines innovation with more than a century of engineering and construction experience to deliver the building blocks of the energy transition. We are actively developing sustainable solutions that support the energy transition, including: sustainable engineering to design and build lower carbon facilities; green and blue hydrogen; liquefaction and storage; carbon capture utilization and storage (CCUS); and offshore wind.

McDermott also has a partnership with 8 Rivers Capital, Exelon and Occidental, known as NET Power, which works toward the development of a novel power system that produces low-cost, reliable and flexible electricity from natural gas—while generating no atmospheric emissions, including CO2 capture and no NOx production.

Recently, McDermott was awarded a pre-FEED contract from Tata Steel for Project EVEREST (Enhancing Value by Emissions Reuse and Emission Storage) in IJmuiden, the Netherlands.

Through eliminating waste and the continual use of resources, we are also focusing on the circular economy, which creates a closed-loop system by minimizing the use of resource inputs, waste, pollution and carbon emissions. Our solution includes waste to chemicals, petrochemical innovation, waste management studies and lifecycle impact assessments.

We understand the challenges our customers and communities face as they navigate the energy transition and strive to meet demand shifts while reducing emissions. Hence, we provide solutions for our customers to build a more sustainable future together.

Tell us about the future plans of McDermott over the next 4-5 years, key projects and the role of India as Centre of Excellence in the global growth strategy?

Asia Pacific is known as the engine room of the organization because of how we support the work for the other areas to deliver multiple office project execution for our customers. The Gurgaon and Chennai offices, as Centers of Engineering Excellence, support major projects for Asia Pacific (APAC), Middle East, Europe and Africa (EMEA) and North, Central and South Americas (NCSA).

McDermott is already executing two major projects in India in the Krishna Godavari Basin; ONGC's 98/2 project and Reliance's KG-D6 project. These projects demonstrate our EPCI project delivery capabilities in India. We also want to establish ourselves as a key EPC player onshore by replicating our offshore success in the onshore sector, something we already do all over the rest of the world.

Prime Minister Narendra Modi, in an address at the India Energy Forum by CERA in October 2020, announced that India might see $206 billion investment in oil and gas in the next eight to ten years—with $80 billion of investments in the downstream segment, including marketing, refinery expansions and new refinery plans, like Vizag, Barmer, Paradip and Ratnagiri. This move will give considerable impetus to the sector.

With our existing offshore experience in India, an excellent team and the drive to succeed with our technology-driven approach onshore we are looking forward to helping our customers solve the energy challenges they have today and the in the future too. ■

Gujarat Fluorochemicals

Video: https://youtu.be/uAS5lv9F9rM

An ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, IATF 16949:2016 and SA 8000:2014 certified organisation, Gujarat Fluorochemicals is a leading producer of Fluoropolymers, Fluorospecialities, Refrigerants and Chemicals for applications in varied industries. We're part of INOX Group of Companies that has diversified business segments comprising Chemicals, Fluoropolymers, Cryogenic engineering, Entertainment, Industrial gases and Renewable energy. Since its inception in 1989, GFL has grown from being a largest Refrigerant producer in India to a multi-million USD global Chemicals company with diverse portfolio of Fluoroproducts.

GFL derives its strength from expertise in Fluorine Chemistry, vertical integration from natural minerals to Fluoropolymers and strong R&D, enabling it to provide one of the best quality products meeting all regulatory compliances, to our clientele globally.

The year 1989 marked commencement of Company's commercial operations with India's largest Refrigerant manufacturing unit at Ranjitnagar, Gujarat, India. The site was further expanded to produce Fluorospeciality products catering to the growing demands in global agriculture and pharmaceutical industry. Foraying into new avenues in 2007, with one of the world's most integrated facilities at Dahej, India, GFL now has a diverse portfolio of Fluroropolymers comprising PTFE, PFA, FEP, FKM, PVDF and Fluoropolymer Additives.

GFRC (Gujarat Fluoropolymers Research Center), at Dahej, India is a dedicated research facility which is at the forefront of product & application development activities and serves as an essential bridge between market requirements and manufacturing operations. GFRC, a team of research scientists & product specialists, is equipped with state-of-the-art application development laboratory including DCS operated pilot reactors. It has collaborated with renowned research institutes globally to work on the areas of new product development & sustainable manufacturing technologies.

GFL is well-recognized as a global Fluoropolymers supplier with our products being at par with the other Fluoropolymer manufactures in global markets. We have a high customer retention rate which talks about the value we deliver to our customers. We create value through product stewardship & compliance to global regulations such as EPA, ECHA, METI, Stockholm convention, OECD making us long-term partners for our customers across geographies.

Product Profile

GFL holds domain expertise in four major product verticals: Fluoropolymers, Fluorospecialities, Refrigerants and Chemicals. Our steadfast focus and attained expertise in Fluorine Chemistry enable us to develop, manufacture and

commercialise Fluorine-based products complying with key pertinent regulatory requirements. Our vertically integrated operations and access to key raw material has facilitated us to become one of the major players in wide range of Fluoropolymers and Speciality chemicals for varied applications.

Fluoropolymers

We are one of the leading producers of Fluropolymers in the world, delivering a diverse range of products suitable for our global clients belonging to sectors such as automotive, aerospace, semiconductors, electronics and common household appliances. Our ability to rapidly meet evolving needs with innovative products has enabled us to capture a large market share globally. Owing to our backward integrated operations, we have established a strong base in PTFE, FKM, FEP, PFA and PVDF, with our products finding applications across twenty industries. Our Fluoropolymer portfolio is represented by following brands.

Fluorospecialities

Our Fluorospeciality intermediates address the growing needs in niche applications such as pharmaceutical intermediates, pesticide intermediates in pharmaceutical, agrochemical, pesticide and fungicide industry. Over the past few years, we have

INOFLON®

FLUONOX®

INOLUB™
Fluoropolymer Additives

INOFLAR™

stepped up efforts to develop Fluoro-intermediates through our in-house processes at our state-of-the-art R&D Centre at Ranjitnagar. GFL manufactures HF based, TFE based, KF based and Chloroform as its range of Fluorospeciality products.

Chemicals

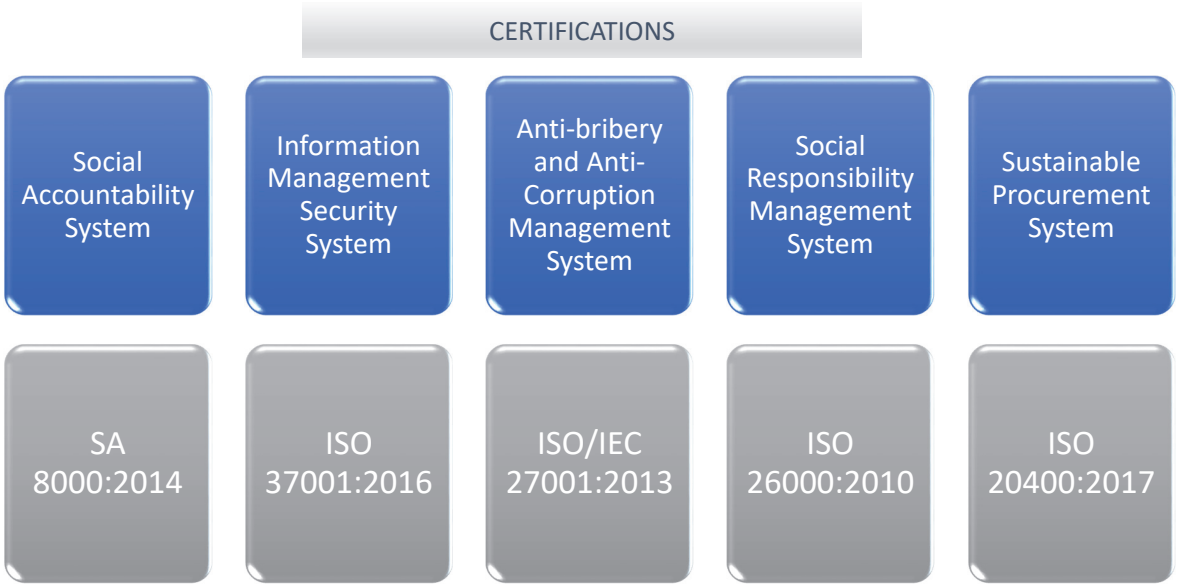
GFL is a leading manufacturer of industrial and essential chemicals for sectors such as pharmaceutical, agrochemicals and plastics. We offer our customers an array of commodity chemicals including Caustic Soda Lye, Methylene Chloride, Hydrogen Gas, AHCL (Anhydrous Hydrochloric acid), HCL (Hydrochloric Acid), H_2SiF_6 and H_2SO_4. Going forward, we aim to continuously improve capacity utilization while driving cost synergies.

Refrigerants

Equipped with new generation manufacturing and stringent quality control backed by adequate storage facilities, GFL's Chlrofluorocarbon range of Refrigerants are marketed under the "REFRON" brand. We have retained our position as the largest manufacturer of HCFC 22 in India since our inception. We are a preferred supplier for leading OEMs & service partners globally. Over the years, we have strived to deliver the finest quality products that meet the growing demands of the pharmaceutical, air conditioning and cold warehousing industry. To keep up with changing industry dynamics, we are strategically shifting from HCFC refrigerants to a new generation of 400 series blends.

Sustainability

Our Sustainability goals are interwoven with the way we do business all along our value chain. Embracing sustainable technologies for safer products, we're developing processes that use greener alternatives. Lowering the global warming potential (GWP) of our Refrigerants along with breakthrough technologies like PFOA-free Surfactants and DPMP (Directly Polymerised Micropowders) resonate with our commitment to Green Chemistry. The company is signatory to the United Nations Global Compact



(UNGC), Science Based Targets Initiative (SBTi), and CDP (Carbon Disclosure Project) as a part of our commitment to sustainable operations.

Product Stewardship

- No use of PFOA and PFOS in manufacturing of Fluoropolymers
- All products compliant with REACh regulations and Stockholm convention Persistent Organic Pollutants directive of European Commission (EC 2019 1021 on restriction of PFOA and PFOS)
- All products are compliant with proposed restrictions on C 9 C 14 PFCA, PFHxA and PFHxS (<25 ppb)
- Development of new nontoxic, non-bio accumulative and REACh compliant surfactant system
- Introduction of PTFE Dispersions with the new surfactant system
- Products compliant to global food contact (example US FDA, EC 10 2011 GB 9685 2016 and application based regulations(example: USP Class VI, RoHS, WEEE, A3, WRAS, UL)

Ethics & Compliance

GFL is committed to social, environmental and economic sustainability through responsible processes, practices and greener initiatives not only in our products but also in our principles While consistent operating results and strong financial performance are a business imperative, treading towards the success keeping Health and Safety as paramount, remains one of our enduring values The Company measures the impact of its business operations through 3 key pillars of Sustainability, namely People, Planet Profit. ■

For more information

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Striking Balance between Sustainability & Performance

Gujarat Fluorochemicals Ltd. is an established player in Fluoropolymers and chemicals markets globally and caters to automotive, healthcare, electronics, construction and chemical processing industries. GFL has always worked upon ideas, which are value-added in nature and foresees good growth over the next few decades, because of high entry barriers in the product range manufactured by the company. In an exclusive interaction with Chemical Engineering World, Kapil Malhotra, Senior Vice President – Marketing, GFL shares insights into the performance and future plans of company.

Kapil Malhotra
Senior Vice President-Marketing
Gujarat Fluorochemicals Ltd (GFL)

How has the current pandemic affected the demand of products across GFL's key business verticals of chemicals, fluoropolymers, fluorospecialties & refrigerants? What are the major challenges company has been facing since the lockdown & how have you addressed these?

The global economic slowdown because of the COVID-19 pandemic resulted in setback for the many industries resulting in huge losses because of lower requirements, turbulent supply chains and other inter- dependent activities. Gujarat Fluorochemicals also got impacted in many ways, however, safety measures taken by the management and appropriate SOPs followed pertaining COVID-19 as prescribed by the Government of India, we recommenced the production at a much faster pace to deliver goods and services to our customers across the globe.

Some of our fluoropolymers and fluorospeciality products which cater to pharma industries are necessary ingredients in sanitizers and medicines which have been in much higher demand during the current pandemic. Therefore, we made sure that production was not disrupted. Due to comprehensive precautionary measures such as PPE kits, sanitization of machinery and personnel, temperature checks and roster duty plans, there were much less number of people getting affecting by the pandemic which resulted in higher productivity and uninterrupted workflow at our offices and manufacturing sites.

GFL has integrated operations because of which we did not confront any major challenges in terms of raw materials. Meticulous advance planning enabled us to handle problems related to supply chain, which were handled very efficiently.

The recent slowdown is expected to weigh on medium and long-term growth potential. How is GFL preparing to handle the impact of slowdown and minimize risks for the business in India & overseas?

We are witnessing encouraging signs for the revival and growth of global markets post-COVID. Production-linked incentives by Government under the "Atma-Nirbhar" drive for API manufacturing in pharma sector and specialty chemical sector will surely boost the requirements in the coming years. The global arena is witnessing a paradigm shift in the automobile and telecom sectors, with requirements of Lithium ion batteries for electric vehicles and 5G networking for communication. We anticipate a high consumption of Fluoropolymers and Fluorospecialty chemicals in the above applications.

GFL has integrated operations, which reduce the requirement of external raw material to a large extent and GFL has a trusted base of suppliers who provide quality raw material at a very competitive cost, thereby reducing the total input costs for the company. Since our team proactively does all planning for the supply chain, we benefit from last minute price surges. This is one of our competitive advantages in domestic and international markets.

GFL has always worked upon ideas, which are value-added in nature and we foresee good growth over the next few decades, because of high entry barriers in the product range that we manufacture. Due to the same reason, GFL is the leading manufacturer of Fluoropolymers and Fluoro Specialty chemicals in India today.

Between 2013- 2019, GFL significantly expanded the monomer & polymer capacity and introduced 5 products across the portfolio of polymers, elastomers & additives. How has the demand of these products panned out so far and expected to perform in the future? Which industries will drive the demand of the products offered by GFL? What is the of purpose investment in surfactants technology?

The high performance Fluoropolymers market is segmented across North America, Europe, Asia Pacific, Middle East & Africa and Latin America, with respect to regions. We are expecting a higher demand for new generation Fluoropolymers in APAC due to an increased demand for their wide applications in different end-use industries owing to huge demand of vehicles in the region. North America accounts for the second largest share in the market. The global high performance Fluoropolymer market size is forecast to reach USD 5 billion by 2025, growing at a CAGR of 7% during 2020-2025. Electronics and electrical is the largest end-use industry for Fluoropolymers, where they are preferred for usage in cable and wire insulation, jacketing, lithium ion batteries, and semi-conductor applications. Technological advancement has led to the demand for products with superior tensile strength and high thermal stability and Fluoropolymers are therefore preferred around the world due to its useful properties.

Other end-use industries, where we are expecting good demand are coatings for all weather apparel and non-stick cookware, chemical plants and semiconductor parts. The excellent performance of Fluoropolymers in extreme conditions and its usage in demanding applications act as a major driver for the Indian as well as global Fluoropolymers market.

Tell us about the initiative of GFL in the direction of: Driving sustainability and enabling the customers to create value through green chemistry and Embracing digitalization & adopting other cutting edge technologies across the functions

With global environmental regulations becoming more stringent and end consumers' consumption pattern shifting towards commitment to sustainable products, it is imperative to strike a balance between sustainability and performance. We are committed to 'Green Chemistry' and offer environment-friendly products by embracing sustainable technologies for safer products and developing processes that use greener alternatives.

We are an established supplier of Fluoroproducts - fully compliant with relevant global regulations such as EPA,

ECHA, METI, Stockholm Convention, OECD and many more. Lowering the global warming potential (GWP) of our Refrigerants along with breakthrough technologies like PFOA-free Surfactants and DPMP (Directly Polymerized Micropowders) resonate with our commitment to Green Chemistry.

Our extensive R&D for product developments and IP protection consistent with the environment and Green Chemistry enable us to comply with the environment directives and facilitate our customers to choose greener products manufactured by sustainable technologies. We have also incorporated principles of Responsible Sales and Marketing, Sustainable Procurement, Corporate Social Responsibility and comply with the standards such as UNGC, ISO 26001 etc. With changing dynamics of Refrigerants markets, necessitated by Montreal Protocol to gradually reduce uses and phase out of HCFC refrigerants, GFL has ventured into new generation 400 series blends to replace HCFC. GFL has always believed that the environment is a major constituent of everyone's existence; therefore it should be protected and preserved for generations to come.

What are your thoughts on India being considered as the next sourcing destination & how do you intend to leverage this opportunity?

We are observing a transformation in the attitude of global businesses when it comes to reliance on Chinese manufacturing industry for their raw material and supply chains. The preferential position that China has enjoyed for few decades seems to be on a decline now. Global companies are now trying to move their manufacturing units from China and this pandemic situation has played an important role in that. GFL is already building its investment plans and production capacities keeping in mind the global sourcing pattern.

How is GFL positioned to cater to Indian as well as global markets? Tell us about the future plans of organization w.r.t the key business verticals of chemicals, fluoropolymers, fluorospecialties & refrigerants & growth strategy in the horizon of next 4-5 years?

GFL is an established player in Fluoropolymers and chemicals markets globally. With respect to end-use industries, Fluoropolymers cater to Automotive, Healthcare, Electronics, Construction and CPI. Industrial processing and healthcare industry are one of the hot zones for Fluoropolymers, propelling our growth in all major global markets such as EMEA, Americas and Asia. Further increased use of Fuoropolymers in comparatively recent applications such as waterproof clothing, dental ware etc. will have a tremendous positive impact on demand. Dynamic technologies in both the automobile (Lithium Ion Batteries) and telecom sector (5G network) are the next big thing for Fluoropolymers and Fluorospecialty products. ■

Case Study: Hydrodynamic Cavitation Technology and its Use in Industrial Wastewater Treatment

4 HC reactors of the total 9 reactors at NIA-CETP

Nandesari Industries Association (NIA) operates a Common Effluent Treatment Plant (CETP) at GIDC, Nandesari. The operational capacity of the CETP is 12,000 m3/day. The Industries discharging wastewater to the CETP are varied in nature and comprise dyestuff and dyestuff intermediate units, pharmaceutical and pharmaceutical intermediate units, synthetic organic chemicals, pesticide units, inorganic chemical units, etc. Manufacturing units vary in size, from small scale industries to amongst the largest producer of bulk drugs like Paracetamol..

Treatment Philosophy

The wastewater generated from these industries varies in volume, quality and in organic matter content. Due to a low

BOD:COD ratio, biological treatment was found to be ineffective in treatment of this wastewater prior to its final discharge. This challenge called for either an extensive, space consuming and expensive treatment process, or an innovative approach to solving the treatment paradox. NIA opted for the latter and, under the guidance of its Chairman and industry veteran Shri Babubhai Patel, the R&D and analytical laboratory of NIA developed and adopted an innovative technology based on Hydrodynamic Cavitation (HC) to treat wastewater. In HC, oxidation of the organic matter is achieved by calcium hypochlorite and hydroxyl ion generated in-situ. The process was developed and perfected over a period of 6 years and has been running successfully for the past 4 years at NIA-CETP. NIA-CETP has also provided this technology to its member industries and at present about 60 industries are using this technology to pre-treat the wastewater before sending to CETP as per the inlet norms. NIA-CETP has also carried out treatability studies for about 150 industries in Gujarat and Maharashtra, who wish to adopt more efficient technologies for wastewater treatment.

How Hydrodynamic Cavitation (HC) Works

At a low flowrate, water everywhere is free

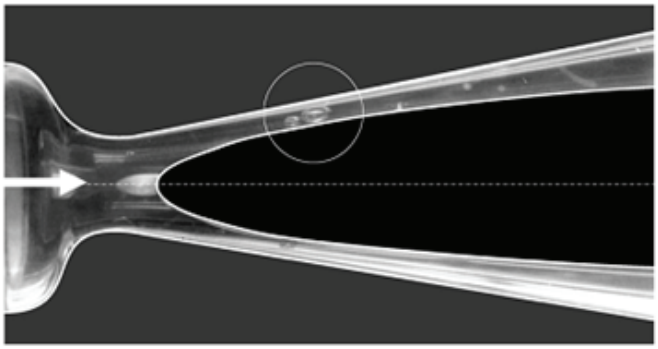


Fig: 1: Bubbles in upper part of the Venturi

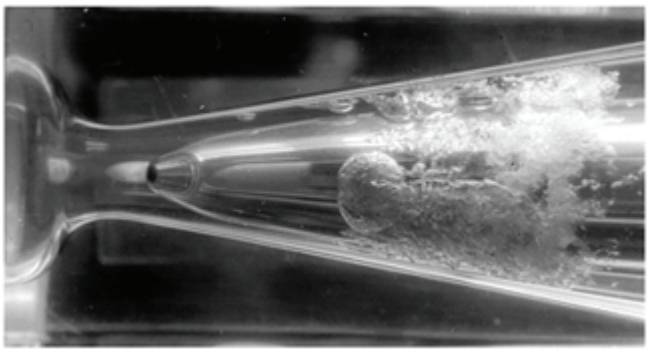


Fig 2: Increase in bubbles with increasing extent of cavitation

of cavitation. Velocity is maximum in the section of minimum area and pressure is then minimum. When the flow rate is progressively increased, the minimum pressure decreases and there is a critical flowrate for which the vapour pressure is obtained at the throat. At this operating point, cavitation appears in the section of minimum area. In Fig. 1, two bubbles are clearly visible in the upper part of the Venturi. This is the start of the cavitation state. If the flow rate through the Venturi is further increased, the extent of cavitation increases (Fig. 2). At this point Calcium Hypochlorite (generated in-situ) will oxidise the organic matter in the exploded

bubble due to the large surface area available.

The process of bubble generation, and the subsequent growth and collapse of the cavitation bubbles, results in remarkably high energy densities at significantly high temperatures and pressures at the surface of the bubbles for a very short time. The overall liquid medium environment remains at ambient conditions.

HC Applications

Controlled cavitation can be used to enhance chemical reactions due to disassociation of vapours trapped in the cavitating bubbles. This principle is used in the mineralization of bio-refractory compounds which otherwise would need extremely high temperature and pressure conditions. Using this technology, treatment of difficult wastewater generated from dye intermediate and pharma intermediate units has been made possible with phenolic compounds and ammoniacal nitrogen found to be below detectable limits post HC treatment. HC has demonstrated its usefulness in food processing, extraction of valuable products, biofuel synthesis, emulsification, and waste remediation, including broad-spectrum contaminants such as pharmaceuticals, bacteria, dyes, and

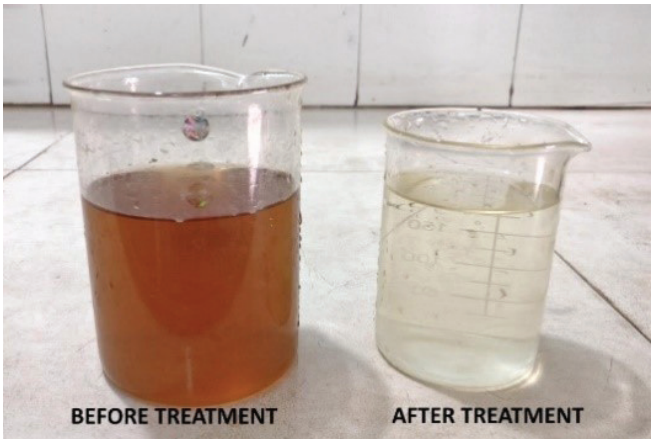


Fig 3: Wastewater before & after treatment

Fig 4: Chlorine Vaporiser

organic pollutants of concern. Following the requirement of a specific process, HC has been implemented either alone or in combination with other process-intensifying steps, for example, catalyst, surfactant, ultraviolet (UV), hydrogen peroxide (H2O2), and ozone (O3), for better performance.

Validation

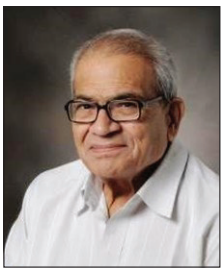
To validate the findings and to gain authentication for the process as an advanced method of treatment for wastewater bearing recalcitrant organic

matter, NIA sponsored a project at National Environmental Engineering Research Institute (NEERI), Nagpur, India, which confirmed the findings.

Advantages of adopting this technology

- ▪ There is no limitation on the levels of TDS concentration. Generally, biological systems cannot accept TDS concentration > 8000 mg/L.
- Any concentration of Ammoniacal nitrogen and phenolic compounds can be treated.
- The equipment based on this technology has a significantly small footprint, thereby enabling 5X throughput in same area compared to conventional systems.
- Wastewater treatment is carried out at ambient temperature and at slight pump pressure.
- Hydrodynamic cavitation treatment requires about 6~8 hours (can be adjusted to suit the conditions) whereas biological treatment calls for aeration tanks that provide (96~120 hrs) residence time.
- Cost of treatment is negligible (Rs. 0.08 to 0.14 per litre) as compared to Multi Effect Evaporator treatment where the cost is in excess of Rs. 2.50 per litre (Rs. 2.50 to Rs. 7.50 per litre)
- The treated wastewater is like sea water with TDS Concentration of 25,000 to 35,000 mg/L, which can be subjected to recycle by adding on a RO desal unit following HDC.
- The sludge generated from HDC based treatment is sent to cement industries for co-processing as CaO forms about 70~80% of the sludge content. ■

Authors



Babubhai Patel
Chairman
Nandesari Industries Association

Sudhir Verma
Chief Technology Officer
Nandesari Industries Association

Case Studies: Column Performance Enhancement with Improved Mass Transfer

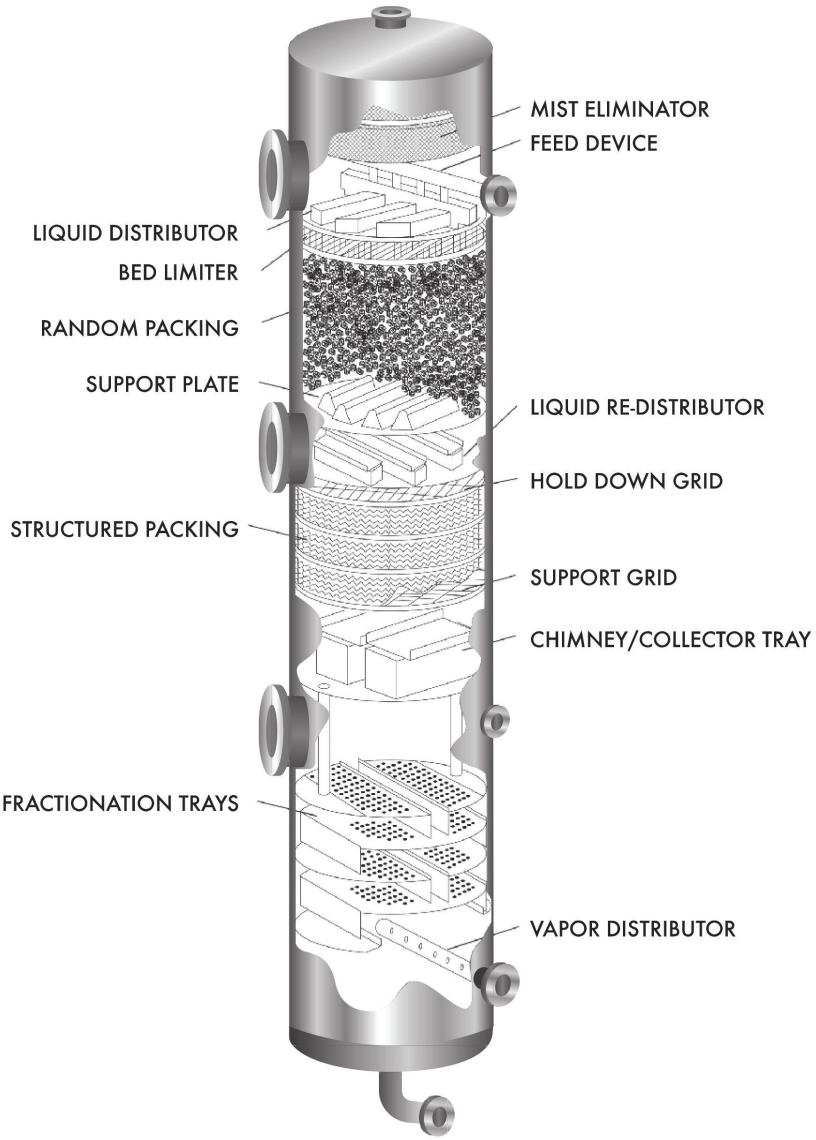
There are definite strategies for revamping towers for improving Mass transfer to attain higher efficiency/higher capacity. This needs a multi-disciplinary approach blended with industry expertise. Avoidance of pitfalls in the design, engineering, fabrication & installation demand hands on experience for trouble-free startups and optimum tower performance. At Munters, experienced Engineers apply their practical knowledge to help the client make sure that their tower will work as expected.

In spite of the abundant technical literature readily available on the subject, critical issues affecting the tower performance are never too far. To tackle these issues a careful analysis is required. Few such things to list would be, the Liquid-Vapor Flashing Feed Distributor design, Integral Bed Limiters with Redistributors, necessity of Hold Down Grid, non-standard Tray Downcomer, Weirs, Baffles, Seal Pan installation - prevention of vapor bypassing & liquid re-entrainment, Reflux entry & Pump-around/Re-boiler return, appropriateness of the supports, achieving revamp objectives without hot work inside the tower, safety considerations etc.

The subsequent part of the article projects few of such cases where Munters has thrived for improving Mass transfer.

Case Study 1: Revamp of Paraffin Recovery Unit in LAB plant

PROBLEM: To maximize recovery of LAB by limiting the prevailing slippage of around 15% to lesser than 5 percent. Improve acid color index (ACI) to a range of 20 to 25 [ACI is the measure of purity of LAB. LAB is mixed with 98 percent H2SO4 and the color index of the LAB Sulfonate is measured], which



Munters' Offered Tower Internal

was 30-35, even reaching to 60 at some instances.

MUNTERS' SOLUTION: After detail analysis, it was observed that the existing packing, Pall rings had performance limitations; moreover, the liquid distributor and re-distributors were found to be inadequate for the desired flowrates and distribution quality. The LAB plant was then hydraulically re-rated using high performance Medal-Pak®. Optimum Distributor and Re-distributor along with other Internals were designed, manufactured, supplied & installed.

RESULT: With Munters' technical contribution, plant capacity was increased by 20 percent leading to LAB slippage being reduced to less than 5 percent and with improvement in the ACI as desired.

Case Study 2 : Design of DCC & Vaporization Cooler

SCOPE: For a leading ASU designer in India (the End User is a leading Steel plant) comprehensive design & optimization of Vaporization cooler in order to achieve close temperature approach at cold end.

MUNTERS SOLUTION: Munters performed vigorous heat-mass balance and hydraulic calculations. High performance packing, Omni-

Pak® was selected and height that will achieve customer's requirements of temperature was determined. Heat transfer calculations were carried out to simulate & confirm the output flow rate conditions. Hydraulic rating of tower was carried out to confirm minimal pressure drop. Mechanical designs and drawings of the Internals were done and the same were manufactured and supplied.

RESULT: The Column is operating satisfactorily till date with Munters' guaranteed chilled water outlet temperature and the flow rate.

Case Study 3 : Revamp of Naphtha Stabilizer of CDU with High capacity Trays

SCOPE: Revamp the existing CDU Naphtha stabilizer in order to increase its processing capacity by 33% to split all un-stabilized Naphtha by replacing existing trays.

MUNTERS SOLUTION: Existing Naphtha Stabilizer was studied and rated. The Tray design was optimized using High capacity Trays (KHV® valves). Modifications in the existing design were proposed and implemented. Trays were designed,manufactured ansd supplied to give minimum pressure drop.

RESULT: With Munters' meticulously designed high capacity Trays, Capacity was increased from 3900 and MTPD. The guaranteed reduction in pressure drop was achieved.

CONCLUSION

These cases are typical of many applications where Munters' expertise made a difference. Such better results can be achieved for a wide variety of applications in the chemical process industries. ■

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Digitalization to Improve Water & Wastewater Processes

India is at the precipice of an unparalleled water crisis. With its four reservoirs running dry, the country's sixth largest city, Chennai witnessed the brunt of this crisis last year. This disruption to lives and livelihoods forced a sharp focus on the country's existing water resources and processes.

According to a report by NITI Aayog in 2018, approximately 600 million Indians are dealing with high-to-extreme water stress and over 200,000 people die every year due to inadequate access to safe drinking water. With climate change aggravating existing conditions and the water table expected to deteriorate further, the demand for water is expected to surpass available supply by 2050.

Wastewater treatment has emerged as one of the primary alternatives to improve water availability without adding to the existing stress on fresh water. However, according to a 2015 report released by the Central Pollution Control Board, India currently treats only 37% of its existing wastewater . While water treatment has improved in the recent years, large scale adoption of wastewater processes has still not become a norm in the country.

Additionally, water leakage, uneven distribution of water resources, lack of accessibility and inter-state dynamics have put a damper on the effectiveness of existing water management processes.

A robust water management strategy will have to account for all these challenges to create tangible solutions to combat these challenges and mitigate some of the risks involved. This strategy should be able to address water management at a micro and macro level. While individuals must work towards improving their awareness and optimizing their water utility in their homes, organizations and the government should work towards tackling water management in a more holistic manner. The strategy must also include elements of flexibility that allows it to adapt to changing times, dynamics, socio-economic scenarios and technologies in order to stay relevant.

Impact of digitalization on the water industry

Digitalization and technologies such as Big Data, Artificial Intelligence (AI) and Internet of Things (IoT) have been revolutionizing industries across the globe, they have been able to successfully

improve the efficiency of a process or a product while minimizing risks or other external issues.

While these technologies were introduced in the last decade, they are expected to be the driving force of this new decade. Companies are also witnessing a paradigm shift by embarking on a vision to digitally transform themselves and streamline processes in order to stay relevant.

The water industry is also not immune to this revolution and can use relevant technologies to address challenges. Globally, governments are working with each other and other private companies to leverage their digital knowledge to improve water availability and scarcity.

Successful digital transformations would require the right knowledge transfer, public-private partnerships and forward-looking investments.

Challenges hindering digital adoption

While digitization has the capacity to revolutionize industries with the use of the right technologies, the transformation itself faces several challenges.

Organizations fear that digital transformations might require significant overhaul of existing processes and incur heavy costs during the process. On the other hand, government bodies and local bodies need to enhance their knowledge of these new technologies.

However, several steps have been taken proactively towards improving the rate of adoption. For example, India is collaborating with countries like Israel to leverage the country's knowledge and technology related to water and wastewater. Municipalities are also working closely with technology centric startups and companies to synergize their competencies.

While digitization and the adoption of the new-age technologies have built-in costs for implementation, their benefits outweigh these initial costs in the long haul. Such technologies are also imminent for growth and development in the future.

Advantages of digitization in the water industry

Digital technologies can not only enhance the efficiency of a pump but also the entire manufacturing process of a pump. Also, it can be used to provide insights for the entire water process. Globally, they have proven extremely useful in detecting leakages, phasing out aging equipment and extending the lifecycle of its newer counterparts, preventing abnormalities, monitoring water quality and ensuring the reliability of water supply among other utilities.

- **Understanding customer requirements through data**

analytics: Intelligent technology provides the opportunity to analyze water processes to understand consumption patterns and catch disruptions ahead of time. Through efficient sensor-based technology, the flow, speed, temperature and pressure of water in a pipe can be understood and converted into actionable insights. Intelligent pumps will be able to further use these insights to successfully meet customer expectations / demands.

For example, traditional pumps transport water at a fixed rate and speed. This could lead to increased electricity and maintenance costs as energy is wasted and the additional pressure might cause higher leakages apart from wear and tear. On the hand, intelligent pumps can use integrated sensors to understand the demand requirement and adapt accordingly. This enables significant energy and water savings. Such solutions are particularly beneficial for hotels, hospitals, office complexes and other commercial buildings that have fixed peak and lean hours.

Data analytics is also used in wastewater processes. Big data tools can analyze the data and provide technicians with relevant insights on a daily basis. This will help customers further improve the resilience of their wastewater systems.

- **Maximizing performance:** Digital solutions such as intelligent pumps can run for long periods of time at maximum efficiency, with minimal human intervention. In spite of the initial costs, their efficient motor ensures longer lifecycle by reducing wear and tear and result in cost effectiveness.

  Pumps are a critical element in most wastewater processes. They are involved in many stages which includes transportation of water, processing and treating of hard effluents etc. For the success of any wastewater process it requires a pump to be intelligent so that it can work optimally.

  In addition to this, excessive pressure on the pipelines during times of low demand is inefficient and can lead to water leakage. A smart demand-based distribution system will be able to understand the flow and utilization rate to predict expected demand. This ensures that there is constant pressure in the pipeline with minimal wastage.

- **Improving energy efficiency:** Energy and water are two intricate, inter-connected resources. The dependency on water has a proportional influence on the dependency of traditional energy. Considering this, it is important to improve the energy-efficiency of water and wastewater processes.

Intelligent pumping solutions are capable of using very minimal energy to produce unmatched results. They can also manage energy optimally on the basis of demand to minimize wastage and operational costs subsequently.

- **Predictive maintenance:** Sensor based technology and data analysis has been driving predictive maintenance in the water industry. Sensors can detect abnormalities, leakages in pipelines or potential failures of parts. This helps customers provide maintenance before there is actual downtime, thereby improving the cost efficiency of the entire operation.

  Such technologies are being adopted by local municipalities across the country to prevent water leakages during the distribution stage. In India, 40-70% of the water is lost during this transportation phase. With the help of intelligent solutions, this number can be brought down to 20%.

- **Real time monitoring:** Intelligent solutions will be able to monitor flow, speed, temperature and pressure of water processes on a real time basis. They can also enable necessary interventions during emergencies by alerting technicians and engineers. This minimizes the need for manual intervention and also enables remote working by sending these alerts to phones and monitors.

Trends in digitalization

The increasing democratization and affordability of digital technologies along with the increased demand for integrated solutions is directly proportional to the increase in pace of adoption.

The water industry is currently witnessing early stages of digital adoption and will be able to significantly benefit from the utility of these technologies. AI, IoT and other technologies are expected to become a mainstay for comprehensive solutions that can address the water challenges in the country. This growth needs to be aided by positive policy outlook and an open-minded approach towards digitization. ■

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Polyethylene – Emerging Scenario in Five Years in India

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Polyethylene or PE is by far the most important thermoplastic by volume. Its per capita consumption is a kind of parameter used for measuring economic advancement of a country. PE capacity is poised to increase by about half from current 5.5 MMTPA to 7.75 MMTPA in a matter of five years by 2025. This trend will penetrate in to industrial and hence economic activities across India by creating opportunities for new investments, revenue generation and employment. This article is intended to briefly capture the emerging PE scenario in India in next 5 years and expectations by 2030.

Polyethylene or PE is by far the most important thermoplastic globally by volume. PE has become integral part of our daily life through its versatile applications. PE is produced in three different types namely High Density Polyethylene (HDPE), Linear Low Density Polyethylene (LLDPE) and Low Density Polyethylene (LDPE). The consumption of thermoplastics in general and PE and PP in particular has become a kind of economic parameter for the progress of a country.

Ethylene is the main raw material for producing PE and sourced from upstream

plants which are of following types:

- Naphtha Cracker – the most conventional source or Gas Cracker or Dual Feed or Multiple Feed Cracker
- Petro Fluid Catalytic Cracker or Petro FCC or Petro Residue FCC
- Deep Catalytic Cracker (DCC)
- Dehydration of Ethanol

The proportion of Ethylene used for producing PE has been consistently dominated by Ethylene Crackers that is Naphtha Cracker or Gas Cracker or Multiple Feed or Dual Feed Cracker. Ethylene produced from DCC or FCC forms a relatively very small proportion but has been on increase since 1990's. Ethylene produced in FCC or DCC is typically called Refinery Ethylene. The Ethylene produced irrespective of source as raw material for manufacturing PE resin is called Polymer Grade Ethylene since it has to meet stringent specifications required for Ethylene polymerization reaction using either Ziegler-Natta (ZN) based or Chromium based or Metallocene based catalysts. Typically polymer grade Ethylene is 99.90 % V/V purity as minimum and more generally these days is of 99.95 % purity. Ethanol Dehydration route to manufacture Ethylene has attracted attention of late which is also called Green Ethylene because of renewable source. However, the spread has remained restricted to countries like Brazil which are rich in sugar industry.

Indian Scenario – Current & Emerging

In India, Ethylene has been produced either by Naphtha Crackers or Gas Crackers including Refinery off Gas Crackers. As of 2020, operating PE capacity in India is approx. 5.5 Million Metric Tonnes Per Annum (MMTPA) as compared to about 110 MMTPA globally which means about 5.0 % of global.

Table 1: Emerging Polyethylene Capacities in India in KMTPA
(Kilo Metric Tonnes per Annum)

Company	Location	State	Capacity	Technology Licensor
HPCL Rajasthan Refinery Limited (HRRL)	Barmer	Rajasthan	1000	Univation
Hindustan Mittal Energy Limited (HMEL)	Bhatinda	Punjab	800	Univation
Hindustan Mittal Energy Limited (HMEL)	Bhatinda	Punjab	450	Chevron Phillips Chemicals
Total Capacity			**2250**	

Many Refiners in India have already initiated plans to foray in to petrochemicals to improve upon Gross Refining Margin (GRM). They are integrating refinery with PE along with PP and other Ethylene or Propylene derivatives in different combinations.

The emerging PE capacities in India as per the information available in public domain are as shown in Table 1:

Thus total of 2.25 MMTPA PE capacities are progressively expected to be commissioned starting from 2022 to 2024. Therefore let us assume that by 2025, PE capacity in India will increase from current 5.5 MMTPA to 5.5 + 2.25 = 7.75 MMTPA against expected global capacity of about 160 MMTPA that is about 4.8 % which is just keeping the pace with the global capacity, however much less than expected.

This can be summarized in following manner:

Year	PE Capacity, MMTPA	%
2020	5.50	100
2025	7.75	140

Thus PE consumption in India which was thus far constrained by supply, will find additional capacity to engine the growth of PE consumption from approximately 4.2 kg per capita to about 6.0 kg per capita in 5 years.

As can be noted from the Table 1, these capacities will also spread in the areas which have not witnessed such growth hitherto. It will promote industrialization and benefit states like Rajasthan and Punjab which did not have such plants so far. Thus states like Rajasthan and Punjab are likely to share a significant growth in their areas which will boost the state economy in terms of investment, revenue and employment.

Similarly, another noteworthy aspect is that the two most popular global PE technology licensors namely Univation (Fluidized Bed Gas Phase) and Chevron Phillips Chemicals (Loop Slurry Phase Polymerization) will have their significant presence in India through these new plants.

Beyond 2025

The Indian refining capacity is expected to surge from current about 250 MMTPA to about 450 MMTPA by 2030 as per intentions announced by the government. Thus it is estimated that PE capacity will also enhance by double to about 15 MMTPA by 2030. Companies like BPCL, Nayara Energy or Haldia Petrochemicals have already announced the intentions to expand further in to PE and PP though firm plans are awaited. The rise in PE capacity beyond 2025 is expected to and should include some of the varieties not considered so far by the polymer producers. These can be LDPE (so far Reliance Industries Limited is the single manufacturer), Ethylene Copolymers like EVA (Ethylene Vinyl Acetate), Ethylene Copolymers with Acrylates namely EMA (Methyl Acrylate), EEA (Ethyl Acrylate), EBA (Butyl Acrylate) and similar. There can also

be speciality PE products like UHMW PE (Ultra High Molecular Weight PE).

Applications of PE

The typical applications of PE resin are mentioned in the Table 2

These PE applications have become inevitable part of our daily life style. While the products from all these licensors are well established in India to a large extent; the respective resin producers will have good competition among themselves to hard sell their products in emerging markets along with established existing players. The consistency in product quality and some uniqueness or differentiation or innovativeness in product range will be the key challenge for the new producers.

The healthy competition will compel the producers to not only meet the highest product quality standards demanded by the market but also scout for speciality applications which they can serve.

Raw Materials for Manufacturing PE

Table 2: Typical Applications of Polyethylene

Type	Typical Applications
HDPE	
Injection Moulding	House Wares, Thin Wall Food Containers, Caps, Closures, Crates
Film	Carrier Bags, Garment Bags, Grocery Bags, General Purpose Packaging
Blow Moulding	General Purpose Packaging Containers, Containers for Chemicals, Pesticides
	Jerry Cans, Medium & Large Heavy Containers for Chemicals
Raffia & Monofilament	Tapes for Woven Fabrics, Tarpaulins, Nets & Ropes
Pipes	Medium & High Pressure Pipes for Water, Effluent, Chemicals and Gas, Agricultural Pipes & Sprinklers
LLDPE	
Film	Speciality Films including Metallocene Films, Liquid Packaging, Heavy Duty Packaging, Lamination Film, General Purpose Films, Cling Films, Stretch Films
Roto Moulding	Water Tanks, Loft Tanks, Chemical Storage Tanks, Septic Tanks, General Purpose Tanks
Lamination	Lamination, Coating on Woven Fabrics and Tarpaulin
Injection Moulding	General Purpose Packaging, Housewares, Thin Walled Food Containers, Master Batches
LDPE	
Films	Shrink Film, General Purpose Packaging Film, Heavy Duty Packaging Film, Carrier Bags, Green House Films
Injection Moulding	Caps & Closures, Toys, General Purpose Thin Wall Containers
Blow Moulding	Dispensing Bottles, Wash Bottles, Medical & Food Application
Cable & Wires	Power Cables, Insulation Cables, Cable Sheathing

Typically any such polymer plant requires three types of input raw materials.

- The major raw materials by volume are of course supplied within the complex for example Ethylene, Hydrogen, Butene 1 and Hexene 1 etc.
- The second category of input chemicals are of proprietary nature for example main polymerization catalysts which are supplied by the Licensors.
- Third category of input raw materials are chemicals which are called co-catalysts for example aluminium alkyls and polymer additives. These are high value speciality chemicals which are imported as well as purchased locally.

Polymer additives form approximately 1% of the main resin that is 2.25 MMTPA of additional PE will need 22,500 TPA of polymer additives. This offers a great opportunity to manufacture these chemicals locally to a large extent thus providing challenging opportunity to existing producers as well as new entrants. Indigenous production of such chemicals will also take the clarion call of "Atmanirbhar" further.

PE Downstream Industry

Higher production capacity is also expected to translate in to large number of new plastic processors or plastic convertors who are first hand customers of PE resin producers. Small to medium scale plastic processors form the bulk of the plastic industry in India. No doubt the existing processors will aim to enhance the capacity but nevertheless a large number of new plastic processing units are expected to come up or rather surge across India which will be a boost to the Indian economy. One can imagine that such plastic converters will be in excess of 5000 units across India.

Plastic Waste

With capacity increasing substantially, the problems arising out of plastic waste are also expected to rise. However, the problem is not because of plastic by itself but because of inadequate plastic recycle and disposal mechanism. Manufacture of Polyethylene is practically pollution free industry which is a great advantage. It is possible to think of installing incinerators on cooperative basis wherever possible for efficient disposal of plastic waste as is practised in the West. This can be alternate to plastic waste which cannot be recycled.

Conclusions

Polyethylene production is scheduled to increase from current 5.5 MMTPA to 7.75 MMTPA by 2025. This capacity surge will boost the consumption pattern of PE across the country by significantly penetrating the rural India. PE capacity is further estimated to enhance to 15 MMTPA by 2030. It will thus facilitate to boost the economy by investment, revenue generation and employment in addition to improvement in quality of everyday life. ■

Nitration and Sulfuric Acid Recovery: Effective Reaction Control and Efficient Acid Recycling for Economic Production

Nitration of aromatic organics is one of the key processes of modern chemical industry. It produces various precursors of chemicals and products (i.e. nitrobenzene, nitrotoluene or chloronitrobenzene). The nitration is performed with a mixture of sulfuric and nitric acid which is brought into contact with the organic compounds by intensive mixing. Therefore, the process involves the handling of corrosive acids as well as potentially hazardous, toxic and explosive organics. Downstream of the nitration unit a product washing and separation is required (see Figure 1).

The design and operation of nitration plants requires a balancing of various design aspects. Those aspects can be expressed by a tension triangle (Figure

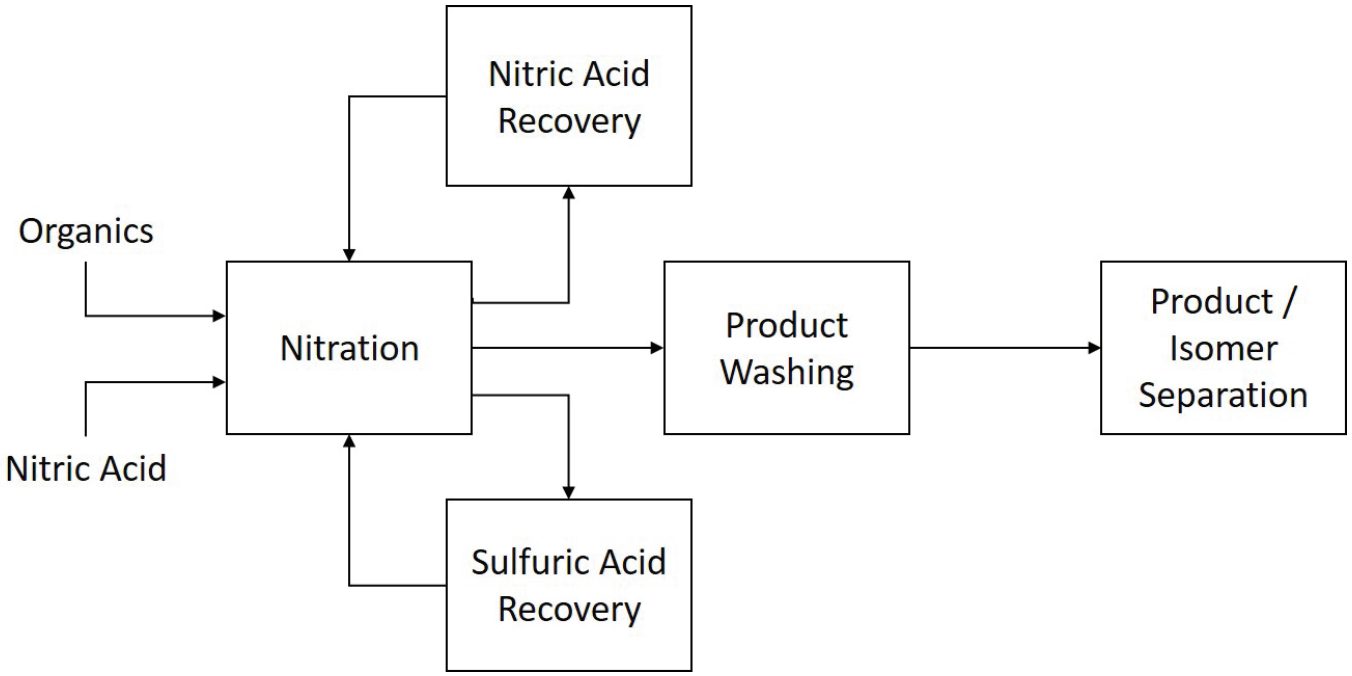

Fig 1: Overview of the nitration process with acid recovery and product purification.

2) where safety, CAPEX and OPEX are located on opposite sides. The main driver for the investment cost of nitration plants is the requirement to use corrosion resistant materials like glass-lined steel, fluoropolymer-lining or tantalum for the major part of the nitration process. Instrumentation required for a safe and reliable operation further increases the CAPEX. An efficient recovery of acids (sulfuric & nitric acid) and an efficient reaction control to achieve high product yield allows to optimize OPEX. By applying advanced processes with optimized (tubular) reactors as well as optimized downstream processing of the product mixture all design aspects can be considered.

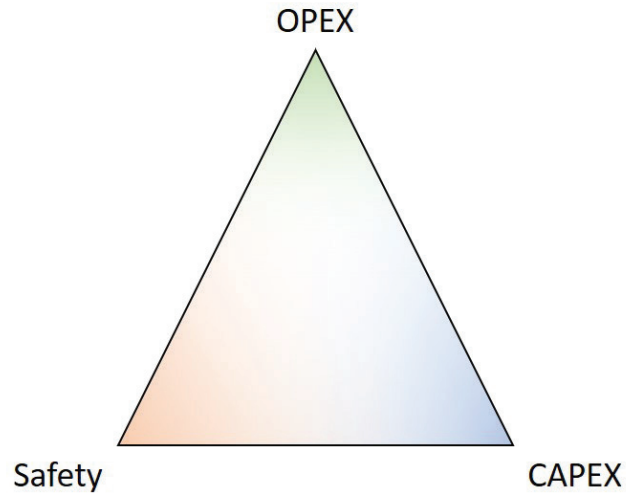

Fig 2: Tension triangle for the plant design and operation

Nitration Reaction

Nitration describes the addition of one or more nitration groups to an aromatic compound involving a reactive mixture of sulfuric and nitric acid (so called nitration acid). The sulfuric acid is used as dehydration agent and promotes the formation of reactive nitronium ions (Eq. 1). The nitration as addition of the nitronium ion to the aromatic compound occurs in the aqueous acid phase. Thus, the reaction rate is determined by the mass transfer rate between the organic and the acid phase (Figure 3). An increase of the surface area and therefore dispersion of the organic phase in the acid phase is required for an efficient reaction. This can be achieved by intensified mixing. The overall nitration reaction (Eq. 2 as example for benzene) is exothermal, consumes nitric acid and dilutes the sulfuric acid with the produced water.

$H_2SO_4 + HNO_3 \rightarrow HSO_4^- + H_2O + NO_2^+$	**Eq. 1**
$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4} C_6H_5NO_2 + H_2O + heat$	**Eq. 2**

Nitration reactions can be realized in isothermal and adiabatic reactors. Isothermal reactors provide the opportunity to effectively control the reactor conditions in terms of temperature, acid concentrations and stirring speed. However, relatively large heat exchange areas are required for the nitration reactors to maintain the isothermal conditions. Furthermore, the recovery of the sulfuric acid requires a subsequent heating and evaporation of the produced mixture. Adiabatic reactors, as developed and successfully commercially applied by KBR, allow for an efficient use of the reaction heat released by the nitration (Eq. 2).

With this type of systems, heat is utilized to flash the excess water and recover the sulfuric acid under vacuum conditions. Furthermore, adiabatic tubular reactors provide the possibility to efficiently disperse the organic phase by applying shear forces on the organic droplets within the acid phase without use of stirrers. An improved dispersion reduces the formation of byproducts and increases the yield. For that reason, tubular reactors are commonly used for the adiabatic nitration of benzene [1].

A further transfer of that reactor concept to other aromatic compounds is possible and still ongoing. In many cases intensive screening studies are required to determine the necessary operation conditions of the tubular reactor (acid concentrations, temperature, flow rates). Such studies can be performed in small tubular reactors as done for benzene, chlorobenzene and toluene [2].

Although the control of adiabatic reactors is more challenging, they integrate all design aspects by combining an efficient use of the reaction heat (reduced OPEX), the integration of two plant units in one (reduced CAPEX) and reliable transfer of the reaction heat (increased safety). By achieving a high yield and a complete conversion of the nitric acid, the costs for product purification and acid recovery are reduced.

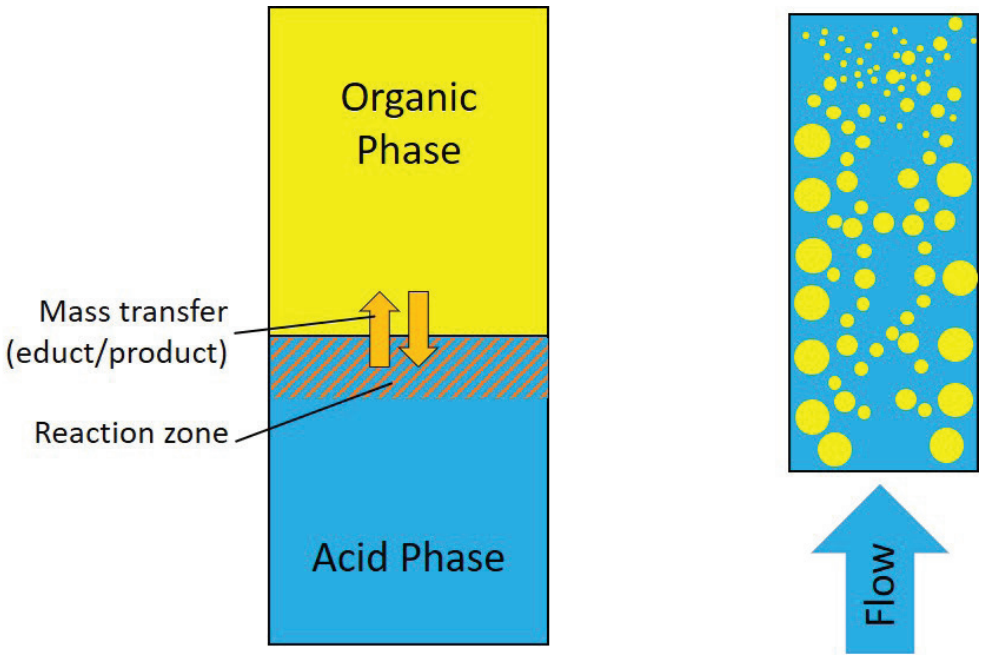

Fig 3: Scheme of the nitration reaction as sequence of mass transfer between immiscible phases and the reaction (left side). The mass transfer is promoted with the application of tubular reactors which increase the dispersion of the organic phase in the acid phase (right side)

Acid Recovery

Traditionally the sulfuric acid recovery is an addon to the isothermal nitration (e.g. in the case of mono- and dinitrotoluene production). For those plants several waste streams consisting of spent sulfuric acid and washing liquid (yellow water) must be treated which contain residual nitric acid, sulfuric acid

and organics. An efficient separation in the sulfuric acid recovery is required to return valuable compounds like acids and organics to the nitration process. Various processes involving stream stripping (denitration) and acid concentration are available to recover the acids and organics from those waste streams.

For adiabatic nitration plants the sulfuric acid recovery is directly integrated into the process and the same building (see Figure 4). These systems allow an efficient use of the reaction heat to evaporate water in the acid recovery step. Sulfuric acid, that is separated from the organic products, is discharged to glass-lined evaporators operating under vacuum conditions to flash the water and recover the sulfuric acid. To achieve higher sulfuric acid concentrations two or more evaporation steps equipped with tantalum heat exchangers can be used. The concentration of the sulfuric acid is adjusted by a combination of temperature and vacuum.

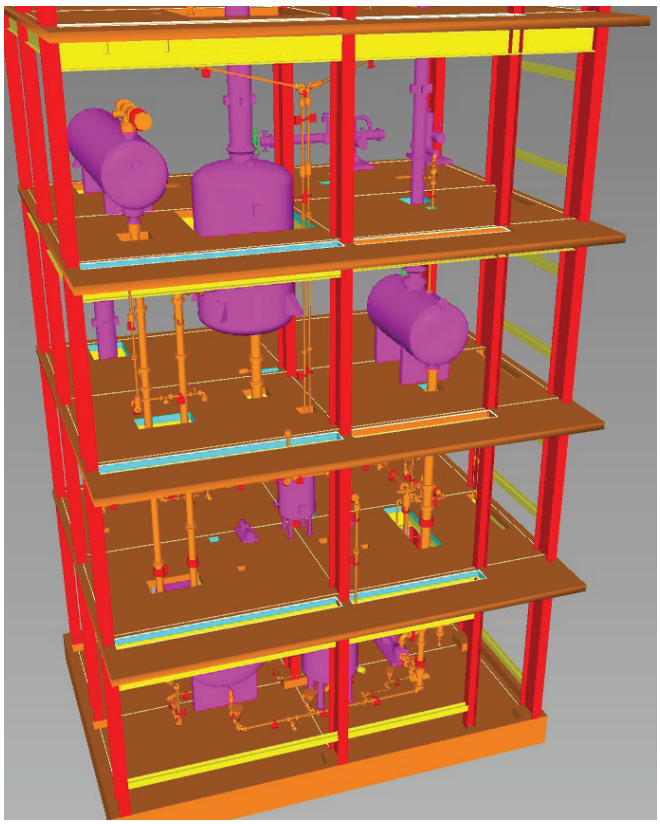

Fig 4: 3D model of a typical adiabatic benzene nitration (70'000 tons per year) with integrated sulfuric acid recovery. Equipment is indicated in pink and process pipes in orange.

Although nitration processes target a complete conversion of the nitric acid and a high yield, some nitrogen oxides are formed in all nitration reactions. Effluent gases can be treated by catalytic reduction or alkaline washing to remove nitrogen oxides. However, such off-gas treatment techniques destroy a valuable source of nitric acid. Pressure absorption is an established solution to recover nitric acid from nitration off-gases. Similar to nitric acid production, nitrogen monoxide is oxidized and absorbed into water. For nitration plants the use of liquid ring compressors allows an efficient absorption within the compressor and the absorption column equipped with cooled trays.

Fig 4: 3D model of a typical adiabatic benzene nitration (70'000 tons per year) with integrated sulfuric acid recovery. Equipment is indicated in pink and process pipes in orange.

Product Purification

The product separated from the sulfuric

acid after the nitration reactor contains residual sulfuric acid, nitric acid, nitrogen oxides and other byproducts like nitrophenols in case of benzene nitration. With optimized reaction conditions, the formation of byproducts can be reduced but not eliminated. Therefore, acidic substances as well as unwanted byproducts must be removed before a further use of the product. Additionally, many nitration processes operate with an excess of the educts, which must be separated.

The purification of the crude nitration product is a sequence of two or more steps like washing to remove acids and phenolic byproducts, rectification or stripping to remove the unreacted organics, and the separation of the product's isomers. The washing process includes various steps of acidic, alkaline and neutral washing [3]. Removing the acid compounds, transfer the weakly acidic phenols into the aqueous phase and lowering the temperature, allows a change of the construction material. Stainless steel as material of construction instead of corrosion resistant glass- or fluoropolymer-lined steel reduces the investment costs for the purification step, significantly. Accordingly, the various washing steps allow for a purification in a rectification or stripping column without corrosion problems.

Conclusion

Nitration plants combine various challenging process steps. Their design and operation require detailed knowledge of corrosion resistant materials, advanced reaction technology and the integration of the various processing steps. Adiabatic nitration systems, as offered by KBR, provide the most efficient design in terms of optimized CAPEX, OPEX and plant safety. ■

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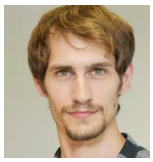

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Trade is About Right shoring

Pankaj Bajaj
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"No nation has ever been ruined by trade – not even the most disadvantageous ones"

-Benjamin Franklin, c. 1774

Back in the early 19th century, Frederic Bastiat, a French economist, busted myths regarding trade and protectionism, citing humorous examples from the royal court in his path breaking book "Economic Sophisms." It's an out-and-out political satire that takes all these myths head-on. Bastiat showed how protectionism led to scarcity of jobs.

Let us consider a few examples from the French Revolution of 1848.

- Back then. Scheming courtesans asked the king to block the sunlight from entering the palaces, so that the candle makers 'business-and in turn, their own business –will boom.
- There were suggestions from the ministers that nobody should work with their right hand, because working with only left hand led to more work for everyone.

The manipulation was clearly done to brain wash the people's minds. But truth to be told, trader creates opportunities and gives everyone a fair pedestal to stand on. Protectionism causes a rift in-between and comes in the way of fairness. Centuries later, these path-breaking thoughts are still relevant.

Ironically, as the world globalized rapidly in the decades of 90s & 2000s, Offshoring became the buzzword. Communication Technology & Containerized Shipping

allowed goods & services to be outsourced with main beneficiaries being Countries of Asia. In the recent years with some attempts to bring the jobs back new variants of Offshoring have emerged:

Reshoring: With the advent of AI & advanced Industrial Automation, it was possible to create automated manufacturing lines in consumption countries. Initially the impact of this was rather limited due to the high capital investments & difficulties in integrating such lines with human workers. However in the recent years the tide seems to be turning & a big enabler of Reshoring is the increasing trend of consumers for customization & localization. For example in apparel Industry:

- Customers are opting for large customization in fits & sizes leading to greater localization
- Large returns by customer due to advent of E- commerce means companies must invest in Automation & localization in the last mile to remain profitable.
- Time to market needs to be reduced as distribution by E commerce gathers pace.

Near Shoring : This is an interesting variation of Onshoring particularly gathering pace between US – MEXICO as well as South East & East Asia /China. It can be understood in consonance with Global value chains between neighboring countries having highly integrated trade.

There is a crisis crossing of components across borders several times before the final goods is manufactured in the most efficient way. For example in order to produce air conditioners in Mexico for the US market, critical components like Compressors have to be imported from US. It is estimated that in the final assembly of such Air conditioners, the components have crossed US borders 10s of times. Very often Near shoring is much more integrated since it is accompanied by flow of capital, technology transfers as well as movement of labor from the consumption countries.

Right Shoring: The final & the most classic variant of Onshoring & the one which leads to a pick & choose approach with regards to Globalization of trade. The localities & countries for manufacturing operations are chosen based on the right mix of cost & efficiency parameters. In effect right shoring is a combination of Off shoring , Near Shoring Two Shoring & Multi shoring.

Automobile & Electronics Industry have supply chains all over the world & these are biggest beneficiaries as the world went this way. With right shoring came:

- Massive investments in IT & communications
- Subcontracting having deep tiering of supply chains up to 4 or 5 levels.

In the words of Adam Smith," Every man lives by exchanging."

And to sum up, as C J Cheeryh has said, "Trade isn't about goods. Trade is about Information. Goods sit in the warehouse until information moves them." ■

Building Self-reliant Beauty Industry for Self-care, Happiness & Well- being

Kajal Anand
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President, All India Cosmetics Manufacturers' Association

2020 has impacted the consumers demand more than ever. It has accelerated the focus on sustainability, clean and clinical beauty and wellness to name a few. As a brand it is imperative to adapt to these demands and quickly reprioritizing and pivoting to digital and e-commerce are a must in this safety first new world we live in.

From the business point of view the fair activity continuous with a very positive business perspective, the great challenge at every moment is to be close to the market in which it acts, with a very well defined purpose and a strategy of short and long term actuation, influencing and acting on the constant transformation that the market imposes us.

Consumer attitudes "use" product attributes, including functions, ingredients, packaging, fragrance materials, and even price, to influence purchase behavior. Green purchase attitudes suggest that the performance of green purchase behavior can be evaluated either positively or negatively. Environmental awareness and price sensitivity significantly mirrors the level of green purchase attitudes. Knowledge can influence the entire decision-making process of consumers. Knowing green products often comes right before green purchase intent. Green trust and green purchase intent have a connection, positively influenced by perceived price. Higher perceived price results in higher trust from the consumer

in the case of green products, therefore, has a higher effect on purchase intent as well.

Environmental protection and green marketing trends resulted in the change of consumer demand and behavior. Consumers are more and more interested in an environmentally friendly lifestyle, since they not only consider environment protection perspectives, but also want personal advantages from green products. We can see green initiatives on various areas, such as green energy usage during production and manufacture, or the appearance of environmentally friendly, zero waste packaging. Aware consumption prefers natural, and biologically degrading packaging instead of plastic packaging, which in the capacity of their nature as waste, cause environmental damages and load.

The cosmetics industry needs to search for sustainable solutions in order to increase bio-efficacy and keep the circular economy basics. Their research mainly focuses on naturally and biologically degrading polymers. Increasing environmental awareness in society serves as an incentive for consumers to use green cosmetic products. The fastest growing industry on the global market is the market of green skincare products, as opposed to other green cosmetic products.

Consumers love to personalize their cosmetic products, this has become a widespread tendency. They wish to select the ingredients within the products according to the specific needs of their own skin or hair, since they consider personalized products more efficient than the products found on the store shelves. Based on the literature sources, we can assume that the palette of green cosmetics (ingredients, active ingredients, packaging, and technological solutions) is expanding continuously. Legal regulation can also serve as guarantee for safety, and environmental protection which is becoming more apparent within the cosmetic industry.

Changing Consumer Behavior

In a survey, Researchers found that…..

- 70% of the participants wish to buy natural cosmetics.
- 56% of them wish to buy brands which are new comers on the cosmetics market.
- 78% of the participants tend towards following a healthy lifestyle, whereas, 68% of participants tend towards buying bio-foodstuffs.
- 86% of participants are influenced in their decisions by environmental awareness.
- 70% of the participants are willing to pay extra for a natural cosmetic made of natural ingredients.

- 68% of participants are similarly willing to pay extra for a cosmetic in packaging made of natural material.

In terms of a given cosmetic's effectiveness, 57% of participants choose a less effective natural cosmetic instead of a normal cosmetic.

Based on the research, there are consumers who buy natural cosmetics, even if those are more expensive than chemical cosmetics, since they consider conserving both their own health and the environment an important factor. Other consumers believe in the traditional, long-time guaranteed brands, but among them are those that are more open for both new products and new brands.

The consumer behavior towards cosmetics can be approached in a variety of ways. Consumers won't use natural cosmetics, if they're not as effective as their chemical counterparts. Environmental and health awareness, and preference for natural cosmetics also don't necessarily produce an associative link. Furthermore, different age groups also don't find the importance of natural cosmetics to be the same. Health and environment-aware consumers are more motivated to buy natural cosmetics, but will still choose the intensity of purchase in light of knowledge and information at hand.

Perfect time to Reset and Focus

Go back to basics and truly understand the brands' DNA. Focus on communication and understand that in every adversity there are opportunities that will come out of it. As the saying goes, 'Cream rises to the top.' For as difficult as it may be, now is the time to think ahead.

Facing limitations of physical customer interaction, one needs to innovate to bring in stores experience online. Hence, accelerate digitization processes.

Intact sustainability goals by not making false claims, unethical sourcing , child labor, use of harmful ingredients, no animal testing, avoidance of unnecessary packaging & printing, define which ethical concepts to support, acceleration of green & sustainable concepts, holistic approach to health and beauty, Sustainable developments will eventually pay back economically.

Conclusion

'Purpose over Profit': The impact on consumer choices increases on a daily basis. There is a need to reduce the prices of sustainable products. In times of financial crisis, consumers often opt for cheaper, less sustainable alternatives. Consumers prefer companies who act ethically during the crisis. Companies prioritize on the environment. Consumer

preference to stay at home resulting in better air quality. A low carbon economy could have many public health benefits. Rising consumers demand towards 'Purpose over profit'. Tap local traditional medicine to educate consumer that bio diversity is key. Creating more ecological production and distribution leads to positive economic impact.

Sustainability followed by Collaborations: We need to increase networking between companies and regions. Sharing of best practices. Create Positive dynamics together to create the products of tomorrow. Engage in regular communication with the concerned associations. Work with multinationals to promote resource sharing amongst the manufacturers. Update oneself with the Government regulatory authorities. Bring more agility by collaborating together. Respect of cultural differences. Look for solutions that are valid for all of us. Respect and understand local differences in order to define a shared vision in the best interest of the beauty industry.

Accelerate innovation: If the beauty industry takes into consideration consumers' need in the coming decade, we can all benefit.

The world needs beauty industry for self-care, happiness and well- being!! ■

"Indian colorant industry is poised for significant growth to meet domestic & international demand"

Janak Mehta
President, The Dyestuffs Manufacturers Association of India (DMAI) & Chairman, Asia Dyestuff Industry Federation (ADIF)

Colours are an integral part of human perception and life, which add to the very existence and intrinsic value of human life. Natural and vegetable colors were in use for centuries in India prior to invention of synthetic dyestuffs. The well-developed textile industry in India soon started use of synthetic dyes. India slowly emerged as an exporter of dyestuffs and intermediates, particularly in Reactive, Acid, Direct & Vat Dyes and some key intermediates.

Colour has an inherent element of value addition to a wide variety of products like textiles, leather, paper, food products, cosmetics, plastics, paints, inks etc. and thereby is a key ingredient, very vital for the growth of the Indian manufacturing sector.

During the last few decades, there has been a notable transition in the global arena in the manufacturing base of colorants with a marked shift in production from Europe, USA and Japan to Asia viz. China, India, Taiwan, Thailand, Indonesia etc. There has been an appreciable transition in the global market in the manufacturing base of colorants with an apparent shift in production to Asian countries. In this context, China and India are now preferred destination for supply of the colorants in the global market. There are about 950 units in our country of the dyestuff industry comprising 50 units in the

large and organized sector and 900 units in SME sector.

Market Dynamics

The world market for the colorants comprising dyes, pigments and intermediates is presently estimated at USD 37 Billion. The industry has been growing at an average rate of 2-3% p.a. of the global trade during the last decade. In the prevailing context of focused concern for Safety, Health and Environment (SHE) and other regulatory measures like REACH, banning of hazardous substances etc., there is much scope for the Indian Dyestuff Industry to excel and increase the quantum in the world market. A consorted effort from all concerned in this direction is the need of the hour.

Colorants Industry in India

Presently, Indian colorants industry is one of India's leading foreign exchange earners. It accounts for almost 16% of the colorants' global market, whereas India's overall share in the global trade is about 1%. The size of the Indian colorants industry is almost USD 5.2 Billion. We have estimated our target that the colorant industry must achieve 25% of the global market in the next few years. Though there was an enviable growth over the last few years, it was unfortunate that due to the COVID pandemic and consequent lock down measures in many parts of the country, the production and growth of the colorant industry was much hampered over the last few months. In fact the exports dropped to USD 0.23 Billion for the last 4 months of the current fiscal. It is estimated that there could be a contraction of 40% of the turnover during the current fiscal. This aberration will be overcome once normalcy is restored post pandemic times.

As far as the colorant industry is concerned, demand for the domestic consumption is more or less met from the local manufacturing. Imports are very much restricted, as domestic production is to a great extent self-reliant for meeting the same. The thrust is now more for promotion of exports.

The intermediates manufacturing activity is also to be encouraged and strengthened, as substantial share of intermediates are now imported. In the Atmanirbhar

The world market for the colorants comprising dyes, pigments and intermediates is presently estimated at USD 37 Billion. Presently, Indian colorants industry is one of India's leading foreign exchange earners. It accounts for almost 16% of the colorants' global market, whereas India's overall share in the global trade is about 1%. The size of the Indian colorants industry is almost USD 5.2 Billion.

Bharat Abhiyan, domestic production of intermediates will significantly reduce imports and encourage indigenous production and save much forex.

Accelerating Growth & Innovation

There is much room for the industry to invest in the field of research and development on an ongoing basis. Since fashion and preferences change almost every day, the industry has also to adapt to the changing trend in the production of colorants. Having understood the need for development of the colorants based on the latest technology all over the world, DMAI has, since 2005, been organizing Convention on Colorants jointly with the Institute of Chemical Technology, (ICT) Mumbai and supported by the Government of India on an biennial basis. Eminent scholars and research experts from all over the world are invited to deliberate and share their knowledge in the field of technology so that the industry will be able to cope up with the changing trends to capture maximum mileage. Nonetheless, upgradation of R&D on a regular basis is a must so as to maintain the undisputed destination of colorants from the Country.

The Industry has taken many steps to reduce pollution. Industry also recognizes the importance of this and many responsible forward looking and socially concerned manufacturers have started the process of reducing pollution both at the manufacturing stage and at the end of the pipeline. Even the CETPs have improved their performance to a great extent in this regard.

Green Chemistry is another area, which the industry considers as a paramount one towards protection of natural resources from destruction and saving the future generation from the ill effects. Towards this end, DMAI has been organizing Seminars at frequent intervals with the support of the Government of India. In fact, two such seminars were already conducted in Mumbai to educate our members by adopting Green Chemistry in their manufacturing process, wherever possible. In COC too, these issues are given their due importance and accordingly a couple of sessions are dedicated to the same.

In the above context, the colorant industry is poised for significant growth in the coming days with the support and co-operation from the Government, as the industry is self-reliant not only in meeting the local demands, but also catering to international demands through exports. ■

Guiding principle for a Sustainable World

The Chemical and Plastics Industry as Drivers of the Circular Economy

Markus Steilemann
Member of the Board, Chief Executive Officer
Covestro AG

There are shocks like the Corona pandemic that make us realize, suddenly and most forcefully, the fragility of our existence. And there are the quiet, creeping developments, barely noticeable, but no less dangerous to the survival of mankind: sea levels rising at an annual rate of around four millimeters; 150 species disappearing from the earth forever per day; and emissions of CO2, the invisible greenhouse gas, increasing year after year to reach the new record of almost 37 billion tons in 2019.

Few deny that we are close to destroying our natural livelihoods. Yet there is no lack of appeals, conferences, initiatives, programs to stop, if not reverse, the treacherous trends and achieve a truly sustainable world - environmentally sustainable, safe, just, smart, livable. With the 2015 Paris Agreement and the United Nations Sustainable Development Goals adopted in the same year, there are crucial points of reference in the global coordinate system.

But implementation has been lacking for years. Much has fallen by the wayside, particularly at the political level. That could change now. I see how the Corona crisis has shaken people up. We have become more aware that all civilization's achievements will be undone if the environment and climate

collapse. Numerous actors in society, politics, business and science are now hoping for a fresh start, a "green recovery". Recent signals from the world states are hopeful: more and more governments are announcing long-term goals to make their countries climate neutral.

Ideal way in a climate neutral world

The right ideas and technologies are also in place. Moreover, there is an ideal way that could halt climate change, environmental degradation, and the depletion of our limited resources. These are also pressing issues in India which is set to be the most populous country in the world. This has consequences for material consumption in India: it is expected to grow to 14.2 billion tons per year by 2030. At the same time, action is needed on climate protection, as India is the world's third largest CO2 emitter with about 2.600 million tons in 2018.

The ideal way that India and essentially the whole world should take, in my opinion, is the concept of the circular economy.

Circular economy means abandoning the traditional linear economy, with its consumption and production patterns geared towards one-off use. Manufacture, consume, throw away - this only leads deeper and deeper into a dead end. In particular, India, which wants to become one of the largest production centers in the world, now has the chance to be at the cutting edge and take a different approach. Truly sustainable action means using goods for long and multiple times, avoiding waste and understanding inevitable waste as a resource.

For consumers, this means breaking with habits and changing their behavior decisively - certainly not an easy undertaking. The challenge for the economy is to change its supply chains, production methods and products. First and foremost, carbon from fossil sources such as oil must be abandoned. And the fossil-based carbon we still need must be circulated without entering the atmosphere.

Circular economy means abandoning the traditional linear economy, with its consumption and production patterns geared towards one-off use. Manufacture, consume, throw away - this only leads deeper and deeper into a dead end. In particular, India, which wants to become one of the largest production centers in the world, now has the chance to be at the cutting edge and take a different approach.

This approach is also evident from an economic perspective. Because the circular economy offers very significant economic opportunities. Consumers are increasingly demanding products that not only contribute to sustainability when used, but must also be produced in an environmentally friendly way. The Corona crisis has increased the awareness of "ethical consumption", according to a global survey by the consultancy Accenture.

In the capital markets as well, we see a rising trend towards sustainability. For example, Larry Fink, head of the world's largest asset management company BlackRock, called for sustainable action in his annual letter to the world's corporate executives in early 2020 – action which could well be linked to growth and prosperity.

Chemical industry contributes to transformation

Our sector, the resource-intensive chemicals and plastics industry, can and will contribute much to this "green" transformation. After all, it represents around seven percent of global greenhouse gas emissions. In addition, there is a spillover effect, because the plastics industry indirectly influences the carbon footage of many other sectors that rely on plastics: automotive, construction, electronics, medical technology, to name but a few.

A lot will be gained if our sector manages to use the circular economy to produce in a climate-neutral way and offer sustainable products based on this approach.

Yet the plastics industry still uses mostly fossil raw materials, which release CO2 when being processed and used. Plastic production accounts for six to eight percent of global oil consumption, and demand could grow to 25 to 30 percent by 2050 as production grows.

But alternatives to crude oil do exist - and are increasingly being used. Biomass, for example, has proven to be a renewable source of carbon. Currently, about one percent of global plastic is based on it while the market is growing at about three percent annually.

Technologically, for example, it has been possible to produce important building blocks for car and furniture varnishes, whose carbon content is up to 70 percent from biomass. And researchers are working to scale up a new process to synthesize the important basic chemical aniline entirely from plants. That would be an absolute novelty.

Alternative raw materials to replace crude oil

Another carbon source and alternative to crude oil, CO2, is also increasingly coming into this discussion. According to experts, the waste gas is already used as a new raw material in more than 60 companies

and projects worldwide. The first CO2-based products are already being sold – foam for mattresses, glue for sports floors and components for car interiors such as headliners and seat covers. Textile fibers based on CO2 are made almost market-ready and could be used to manufacture socks for example.

Then there is a third great way to produce without fossil fuels: the recycling of waste materials, which is still very much under-utilized. Currently, more than 40 percent of plastics are made, used once, and then thrown away.

As a result, plastic waste has become a global environmental challenge. Nearly five billion tons of plastic ended up in landfills or in the environment between 1950 and 2015. Every year, an average of eight million tons of plastic waste enters the oceans.

It is quite clear that something must change very urgently and very consistently. Above all, used plastic must be understood and used as a valuable resource. We need to recycle plastic waste systematically and effectively. There is still a lot of potential: only an estimated 14 to 18 percent of global waste was recycled in 2014. After all, this is an increase of five to nine percent compared to the average of the years from 1950 to 2015.

The prospects are good for the rate to continue to rise. Industry is working hard on new recycling processes that are promising, including chemical recycling in particular, which is about breaking down materials into their molecules and then making new products from them. This means the carbon is circulated in the same way that nature does when composting biomass.

But the concept of circularity not only applies when products have reached their end of life. It must start at the beginning, in product design. In the future, plastics should be designed much more from the outset so that they last long, can be used often and eventually be optimally recycled.

This of course only partially helps if the global disposal systems and waste

According to experts, the waste gas is already used as a new raw material in more than 60 companies and projects worldwide. The first CO2-based products are already being sold – foam for mattresses, glue for sports floors and components for car interiors such as headliners and seat covers. Textile fibers based on CO2 are made almost market-ready and could be used to manufacture socks for example.

management are not consistently extended and improved. In many areas of the world, including India, there is still work to be done. It is also important to raise people's awareness of the issue and to put them in a position to make a difference on the ground.

Fortunately, there is momentum here.. For example, a global initiative - the Alliance to End Plastic Waste (AEPW) - has been driving social education and infrastructure development since the beginning of 2019. This goes hand in hand with the further development of recycling technologies and many small and large projects to rid the environment of waste. In India, for example, the AEPW is supporting the Renew Ganga project to clean up the river from which at least 100,000 tons of plastic waste is dumped into the sea each year.

Plastics as part of the solution

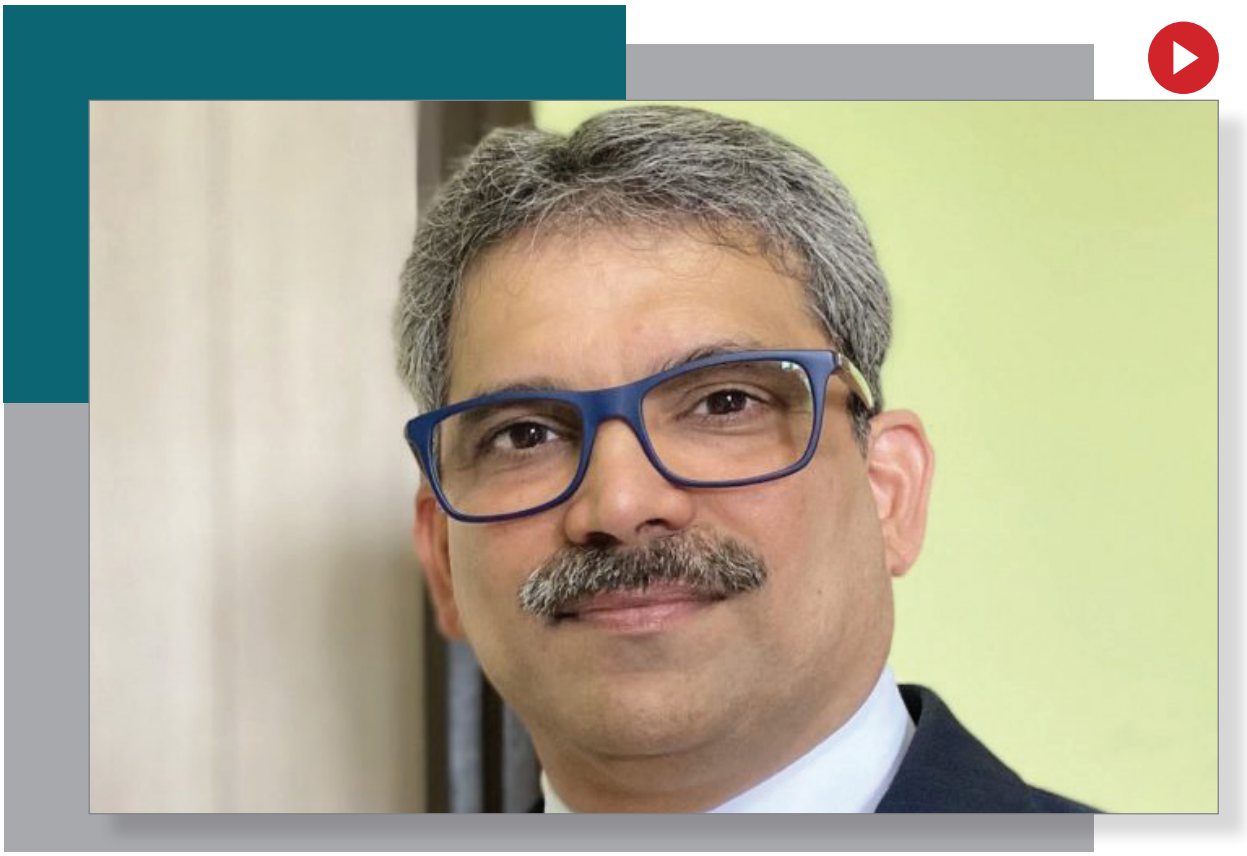
Everyone must realize that plastics can no longer be thrown away carelessly, that they are a valuable resource and a source of molecules. At the same time, however, we also need to be aware that plastics are absolutely part of the solution and make a big contribution to sustainability. Just three examples: plastics make cars lighter, which saves fuel in conventional drives and compensates for battery weight and increases range in electric vehicles; plastics insulate buildings and thus reduce the energy demand for heating and cooling; and they are driving the use of renewable energy, for example, by making wind turbines more productive and cost-effective.

But one thing is clear: the circular economy, as a major global project, can be realized only if everyone pulls together. India for example needs to adopt a robust roadmap with the central, state and local governments being responsible stakeholders. Corporate participation is equally important with industry-specific roadmaps. We must also promote cross-sectoral and cross-border cooperation. As an example from Europe, the steel, energy and chemical industries are closing ranks in order to produce innovative and environmentally friendly components for plastics using CO_2 from steel production and green electricity.

We should also not waste time improving the necessary framework conditions - for example, ensuring that in the long run the large amounts of renewable energy needed for climate-neutral production and a resource-efficient circular system are available.

In short, we need to make the circular economy a matter of our heart so that this brilliant idea becomes a new global guiding principle and the key to a climate-neutral world. ■

"Dow has renewed the multi decade targets towards building sustainable planet"



Video Link: https://youtu.be/qQmhAYHFsPo

Chandrakant Nayak
Country President & CEO, Dow India

Dow has been leading the path to meet world sustainability needs through continued commitment since 1995. Recently we renewed our multi decade targets towards building sustainable planet with key focus on three things viz. Climate protection, Circular Economy & Safer Materials. The organization has shown strong commitment across business right from manufacturing to end of life of products and receiving lot of support from customers for fully recyclable plastics packaging design which helps them meet their EPR obligations. Chandrakant Nayak, President & CEO Dow India articulates, "In an energy intensive industry such as ours, we are leveraging multiple partnerships & avenues to lead & accelerate the dialogue for circular economy." ■

"Sustainability & long-term business success are two sides of the same coin"

Vinod Paremal
President & Managing Director
Evonik India

How are you aligning the business plans to further consolidate the position of your organization chemicals value chains across the globe?

Evonik has identified growth fields and we continue to manage our portfolio in line with them. Evonik continues its focus of balanced growth both through organic and inorganic routes. The recent acquisitions of Peroxychem, and Porocel strengthen our active oxygens and catalysts businesses significantly. Likewise, our ongoing investment in Polyamide production in Germany will support the future growth of our high-performance polymer business. Evonik continues to evaluate potential opportunities in India as well.

Tell us about the initiatives taken by the organization to address sustainability challenges.

Sustainability is a central element in our purpose, "Leading Beyond Chemistry". Evonik is striving to provide innovative solutions that help make our lives more sustainable, more healthy, and more comfortable. As a specialty chemicals company with a presence throughout the world, Evonik sees sustainability and long-

term business success as two sides of the same coin. That is reflected in the rising demand from our customers for products and services that demonstrate a good balance of economic, ecological and social factors. Sustainability has developed into a growth driver for Evonik.

To reduce Evonik's carbon footprint even further, we are continuously optimizing our processes along the entire value chain. We use alternative raw materials and biotechnological methods wherever this is possible and makes sense. Sound sustainability management does not begin with our own products and production processes. Our purchasing volume has a significant impact on society and the environment. As a founding member of the industry initiative "Together for Sustainability", we are driving forward transparency and sustainability along the supply chain.

Evonik's target now is a 50 percent reduction in absolute scope 1 and 2 emissions by 2025, compared with the level in 2008—the first full year after the establishment of Evonik. This affirms our commitment to the Paris Agreement on Climate Change. At present, we assume an average reduction in climate-relevant emissions of 3 percent a year. The relatively short period up to 2025 reflects our view that it is not currently possible to predict technological and regulatory developments beyond this date with enough certainty. In addition to this, by 2025 we intend to reduce the scope 3 emissions related to our raw material "backpack" by 15 percent (reference base: 2020).

One approach is to develop Low carbon footprint technologies and offer circular economy solutions. Evonik is working to lower its carbon intensity and is developing products and solutions for the circular economy. Evonik is also focusing on sustainable raw materials for its products. Evonik has been developing additives, catalysts for better recyclability and processing of plastics. Evonik is also working with partners for better utilization of carbon dioxide into valuable chemicals. Through its products and development efforts, Evonik is also enabling sustainable plastic applications.

What are the available opportunities & how do you plan to leverage these?

Post COVID-19, there is potential for shifting value chains and India can be a potential manufacturing hub to deliver supply chain stability for global companies. Also, with recent supportive government policy, there is the likelihood of significant strengthening of the domestic manufacturing base across value chains. Evonik sees India not only as strategic growth market, but also as a potential footprint for our future growth.

We are continuously on the lookout for opportunities to grow and are focused and investing our resources for this.

Tell us about your expectations from the Government to enable the industry to achieve the desired growth.

The Government of India has made efforts to significantly boost domestic manufacturing in India. The Government's recent announcement of production linked incentives for key sectors certainly boost domestic manufacturing and further strengths key manufacturing value chains. In the same way, the specialty chemistry sector is also eagerly looking forward to government policy support. In addition to these, the government can also catalyse low carbon intensive technology adaption and promote the circular plastic economy. Along the same lines as Performance Linked Incentives, the government can consider sustainability linked incentives, so that it incentives companies who are willing to invest in low carbon intensive and circular economy driven businesses. ■

"We cannot be successful in a world that fails around us".

Govind Khetan
President & CEO
Imkemex India Pvt. Ltd

I believe that the Indian chemical industry has reached an inflection point from where it is poised to assume global leadership in innovation and value creation. The inherent strengths of Indian entrepreneurship and enterprise are often under-rated and the time has now come to recognize and acknowledge that the future holds enormous promise. We invest in all our businesses based on our confidence in the growth potential of Indian marketplace.

For decades, the Indian specialty chemical industry has been held back due to non-availability of critical feedstocks. While some of the challenge still remains, it can be effectively neutralised by out-of-the-box solutions that enable value discovery, creation and retention within the country.

"We cannot be successful in a world that fails around us". Sustainability is a key theme that influences and guides all that we plan and do. We owe it our succeeding generations to leave for them

For decades, the Indian specialty chemical industry has been held back due to non-availability of critical feedstocks. While some of the challenge still remains, it can be effectively neutralised by out-of-the-box solutions that enable value discovery, creation and retention within the country.

an ecosystem that is plentiful. It is our responsibility to conserve and preserve scarce natural resources by assuming responsibility for what we utilise today. Intelligent methods of reducing and recycling would go a long way in creating a 'circular economy' that we can all be proud of. I believe that there are ample growth opportunities all around. Each enterprise should map these closely and collaborate effectively with like-minded partners to leverage the complementary strengths that build long-term, sustainable value. The recent pandemic has created global supply chain disruptions that no one could have imagined. To my mind, the Indian chemical industry, with its inherent agility, is uniquely positioned to convert some of these upheavals into opportunities to build global scale and stature that would not have been envisaged earlier.

The Government, on its part, has been facilitating and supporting initiatives through its pragmatic fiscal and monetary policies. The relentless focus on creating world-class infrastructure will help to further enhance the competitiveness of the Indian chemical industry. I think the key is to foster win-win partnerships between the industry, academia, research, regulatory and government agencies to build meaningful, profitable collaborations going forward. ■

"Indian pharma sector is an important component of the global healthcare infrastructure"

Satish Wagh
Chairman
Supriya Lifescience Ltd.

How are you aligning the business plans to further consolidate the position of your organization chemicals value chains globally & initiatives taken to address sustainability challenges?

Covid-19 has impacted the business badly as the manufacturer and buyer both are impacted. Due to recent supply chain disruptions during Covid pandemic, it was realised that we are totally relying on one supplier (i.e. China) for our raw materials, so organisations have diversified their supply sources of raw materials so that there is no supply chain disruption in future and production continues.

Owing to movement restrictions, it's important for organisations to leverage on technology to remain in touch with the buyers and also suppliers. Our organisation also invested in technology & virtual medium to be in close contact with the buyers and suppliers so that business is not impacted.

Please share insights into the Indian Pharma industry & growth of this sector.

The Indian pharma sector is the third-largest in the world. It manufactures almost 60 per cent of the vaccines used globally, including important ones, such as those against diphtheria, tetanus, and

pertussis required by the World Health Organisation (WHO). Furthermore, the country meets 90 per cent of the global demand for the vaccine against measles.

Millions across the world use generic drugs produced by Indian drug manufacturers. More than 250 factories in the country have been approved by the US Food and Drug Administration (FDA) as well as the UK Medicine and Healthcare Products Regulatory Agency (MHRA). These manufacture drugs for overseas markets, including the US and the UK.

India's active pharmaceutical ingredient (API) industry is expected to generate USD 6 billion in revenues by the end of 2020. Currently, generic drugs are playing a crucial role in the fight against COVID–19. India has been meeting more than 20 per cent of the world and almost 50 per cent of the US's generic drug requirements. Unfortunately, Indian manufacturers rely heavily on China for key starting materials (KSMs), intermediate and APIs with China catering to nearly 70 per cent of Indian pharma companies' requirements. The Indian pharma sector is an important component of the global healthcare infrastructure and is instrumental in saving millions of lives every year. However, like all other sectors, it too has been affected by COVID–19 that has brought about various changes.

How has Covid 19 affected this industry?

The COVID–19 pandemic has disrupted supply chains across the world. Every sector, including pharma, is suffering from supply chains coming to a grinding halt. Prices of raw materials have shot up amid limited supply, production schedules have been interrupted, factories have been shut down and shipping costs are sky-high in most countries. The impact on the Indian pharma sector is typically evident, given that most raw materials are procured from China, the epicentre of the outbreak.

With the movement of people and goods restricted amid lockdowns, manufacturers of generic drugs are unable to launch products or conduct clinical trials. As a result, timelines for drug filings have got stretched. Furthermore, cash flows from new generic drug launches have either been wiped out or delayed. Indian drug manufacturers face other challenges as well. An Indian pharmaceutical facility can sell drugs in the US only after it has been inspected and approved by the US FDA. With the ban on international travel, inspection is naturally out of question, rendering it impossible for Indian drug companies to sell in the US and other overseas markets. The pandemic has also forced generic drug manufacturers, both contract and captive, to delay their plans for new product launches.

When product launches and clinical trials by large global pharma companies are delayed, the drug companies from which they source materials face the heat. Low sales, therefore, pose another major concern for Indian drug manufacturers supplying to international pharma giants.

Some Indian pharma facilities had to be shut as workers tested positive for COVID–19. Plants that are operational are producing less due to manpower crunch amid lockdown and social distancing measures. In short, production timelines have changed drastically.

What are the available opportunities & how do you plan to leverage these?

Indian pharma industry has really emerged as a shining light during Covid-19 pandemic supplying sanitizers bulk drugs etc. to the world. Hopefully, shortly India will also play an important role in vaccination of not just our country but other developing/ under developed countries to eradicate the scourge of Covid.

Tell us about your expectations from the Government to enable the industry to achieve the desired growth

Government of India has also floated the Atmanirbhar Bharat program to become self-reliant which is laudable. Inclusion of pharma industry under PLI is welcome. However, chemical sector must also be included. Further, Government must resolve environment related issues of the exporters so that they are able to take advantage of cyclical demand. Also issues related to pre-import condition, MEIS, Risky exporter must be settled with the exporters which will be a big relief. ■

Expertise in Design and Manufacturing Heat Exchangers in Exotic Materials

Fig. 1: HRS Heat Exchanger for Fertilizer Industry

Fig. 2: HRS Heat Exchanger for Chemical Industry

HRS Process Systems Ltd, is part of the UK based HRS group, an established name in the field of innovative heat transfer solution. HRS Group is globally known for providing energy efficient range of heat exchangers and heat exchanger based systems. HRS PSL is fully equipped with state-of-the-art manufacturing facility near Pune, Maharashtra with mechanical and thermal design expertise to manufacture heat exchanger in exotic materials. Exotic material heat exchangers are widely used in pharmaceutical, chemical, agrochemical, petrochemical, water desalination, oil & gas, steel, power, ORS processing, food and beverages and other allied industries. Exotic material heat exchangers are generally used to avoid corrosion and gives better life to processes. It is not only use for liquid application but also used for gas condensations in specific processes. The biggest advantage using heat exchangers in exotic materials is their compatibility with high temperatures and pressure applications.

HRS PSL has technical proficiency to understand and provide product and services as per the standard norms. Another reason to believe is HRS's corrugated tube technology that sets HRS apart from competition in the market and makes preferred choice of decision makers for the process industries. Because of corrugated tube technology heat exchangers that made with exotic materials becomes compact and energy efficient which is beneficial for buyer in terms of price and transportation.

HRS has proficiency to design and manufacture heat exchangers in materials like all grades of stainless steel, Titanium, Tantalum, Duplex, Super Duplex, Alloy 20, Copper, Cu-Ni Alloys, Inconel, Monel, SMO, C22, C276, C2000, AL6XN and other special material required for critical heat transfer processes. ■

For more information

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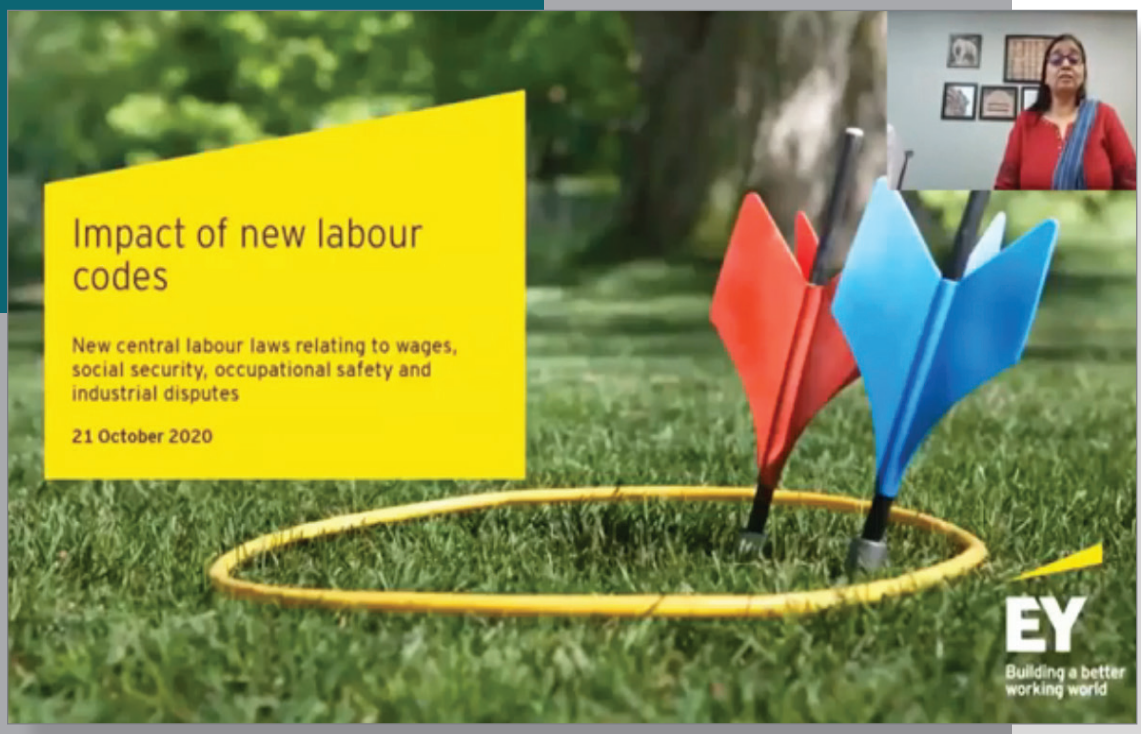
Website : http://www.hrsasia.co.in

Podcast : New Labour Codes & its impact on Organizations in India

Video Link: https://youtu.be/Ql_aKEoePiU



Podcast about the Code on Wages, 2019 and its likely impact on business at the below link, presented by EY. This also includes a brief discussion on how an organization needs to prepare to 'go live' with the upcoming labour codes.

The Central Government is in the process of implementing four labour codes in India which will replace current multiple central labour laws. The first of such labour codes - The Code on Wages, 2019 has already received Presidential consent and is expected to come into force soon. Other 3 labour codes viz The Code on Social Security, 2020, The Occupational Safety, Health and Working Conditions Code, 2020 and The Industrial Relations Code, 2020 were approved by the Parliament recently and are awaiting assent from the President

The Code on Wages, 2019 and the draft rules will impact all functional areas of an organisation and will need action to ensure organisations are future-ready.

For instance, the following will need be considered (illustratively):

- Whether the employee compensation structure is compliant with the new definition of 'wages' under the Code? What is the impact of the new definition of 'wages' on the overall cost structure of the organization?
- Whether the time and leave management system of the Employer organization is compliant with the new norms relating to a regular working day, rest day, substituted rest day and overtime pay under the Code? Whether the current time management systems could fasten a liability on the Employer to pay overtime pay?
- Whether the process of recovery of employee loans and advances will need to be changed adhere to the proposed threshold for maximum deduction from the employee's wages?
- Whether there is a need to review compliance required in relation to contracted employees or third party staff?
- Review the payroll process for full and final settlement to be completed within 2 days of employee's exit (as required under the Code)?
- Changes needed to the ERP System for the new formats prescribed for wage register, employee master register and payslips? ■

"Safety is our core belief and is of paramount importance"

Ravi Prasad
General Manager, PSG India

Tell us about the role of Dover PSG India in the global growth strategy of PSG group.

Dover PSG® India is continuously aligned with our global growth strategy & thriving by localization of several projects and "in-country presence" in terms of local manufacturing, engineering, projects, on-demand after-market for various pump & compressor technologies.

What is the market size of pumping solutions offered by Dover India Pvt. Ltd.? Tell us about the competition, challenges & solutions offered by your organization for the oil & gas and downstream chemical processing industries.

As PD pumps are growing rapidly in India, we serve in various markets including Chemicals & Speciality Chemicals, Paints & Coatings, Pharma & Biopharma, Oil & Gas and LPG, Water & Wastewater and this consistently contributes to the growth of our business year on year. We encourage healthy competitions and create an unparalleled value propositions to provide the latent needs of the customers and excel customer satisfaction. We provide end-to-end solutions in Oil & Gas sector and skid packaging for various critical & super-critical applications in Neptune.

Walk through us the manufacturing operations of company in India.

We feature a state-of-the-art manufacturing facility in India (Chennai) by incorporating various Global PSG operational practices like Lean, 5S, and Kaizen. We are ISO 9001, ISO 14001 and ISO 45001 certified company. Our product skids customization and end to end solutions distinguish us from our competitors. Our objective is "We build, what we bid!" and our entire team is aligned to delight our customers. We are proud to say that our TRIR is "Zero" for last 8 years and we continue to maintain stringent standards with an even sharp focus on cleanliness and social distancing during the pandemic situation.

Which are the latest products & innovations that your company has to offer for the industry?

Our recent product launch, Quattroflow QF2500 series with both Multiple-Use and Single-Use Pump having a maximum flow rate of 2,500 lph and has wide range of application in Biopharma such as Chromatography, TFF, virus filtration, sterile filtration, depth filtration applications. At present for COVID-19 vaccine development, we are providing our Quattroflow solutions both globally and locally as we are committed to Pharma Industries for wellbeing of the society.

We have recently launch the MAGNES pump from Blackmer® that introduces a leak free magnetic drive pump to the vane technology portfolio. This solves some critical legacy operational challenges for our customers including sustained dry run and cavitation.

Dover PSG has newly acquired em-tec which has become the part of the PSG business unit under Dover's Pumps & Process Solutions segment. em-tec has products for non-invasive flow measurement using the ultrasound transit-time principle and which can deliver superior measurement results relative to competing solution offerings.

Our Dover India Innovation center (DIIC) at Bangalore is a multi-competence center providing end-to-end solutions to the stake holders. It is a trusted business partner leverages a powerful blend of the best industry-proven practices and leading standards, refined business acumen and deep market understanding, profound technical skills and extensive hands-on experience to meet the toughest challenges that our customers face.

How are you translating digital transformation across the functions in your organization and products?

In today's world, Digitalization is driving the business across the globe. In 2018, we

opened our new digital labs center in the greater Boston area. The facility serves as the company-wide hub for our digital initiative. We believe that our Dover Digital Labs will enhance the effectiveness of our products and fuel our commercial growth strategy by significantly advancing digitization opportunities, machine learning, artificial intelligence, and digital commerce capabilities. In India, we are embracing digitalization by conducting virtual trainings to all stake holders, implementing virtual inspection for projects and establishing virtual site services to support the customers & end clients.

What are your thoughts on Make in India and how do you see the market for your sector to pan out in the years in the near future? How does the company plan to maintain your competitive edge?

"Make in India" is an excellent initiative by GOI which provides opportunity for Global companies like us for manufacturing their products in India. We have leveraged this initiative and manufacture few of our global brands in India such as Wilden® (Founder of AODD), Blackmer® (Reliable technologies for extreme conditions) and Neptune™ (Your single source solution provider). Furthermore, we have networked our channel partners all over India for incremental customer responsiveness by providing curated offerings & articulated diagnostics of customer's needs.

How have you handled the impact of pandemic to keep the business steady? Tell us about the future of organization.

We focus more on localization for better availability of global products in India and provide our customers subject matter expertise. Safety is our core belief and is of paramount importance. We achieve this by following stringent safety protocols and advanced safety operating procedures laid down by our Dover Corporate & Local Government. By adopting Global Strategies, we create new markets & applications by leveraging our global brands reliability and local availability, we are expecting to grow at the pace of double digits every year." ■

For more information

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ABSR Engineers & Services Pvt Ltd.

Vision: To become a sustainable engineering conglomerate by building bridge between Indian Industry and World Class Technological Innovations and Best Practices being followed Worldwide.

We started the journey in 2013-14 with a vision to be a sustainable engineering conglomerate by building bridges between Indian Industry & World class technological innovations & best practices from across the world. We believe in long term partnership with our stakeholders including business partners, customers & employees. We believe in sharing knowledge with our stakeholders to make the World better for all of us.

Focus Areas

- Power Generation
- Refinery & Petrochemicals
- Steel
- Cement
- Fertilizers

Custom Solutions

All our products and services are tailor made for specific applications based on the customer specific needs. With years of field experience and application knowledge, we provide end to end solution including pre-sales, engineering & after sales support to ensure customer value realization.

Quick Response

We ensure immediate response, pre-sales engineering assistance, submission of bid proposal for end to end solution

with detailed bill of material based on site requirement. We take complete responsibility to provide customer a total solution.

After Sales Services

As a guiding principle, after sales services are our key focus. Beginning with proper order execution support we provide installation, commissioning, user training and emergency break down services through our well trained service engineers.

ABSR Product Profile

Flame Ignition & Monitoring System

- **BFI Automation -** flame scanners for Oil, Coal, Gas, H2S & BFG burners and any combination of above fuel application. (www.bfi-automation.de)
- **Tesi S.P.A Ignition Systems -** High Energy ignition systems, electrodes, and spark plugs. Portable/Fixed/ Retractable. (www.tesigroup.com)
- **VisionTIR- Multispectral Thermography Systems** for industrial non-contact temperature measurement, process monitoring, quality control and early fire detection. (www.visiontir.com)

Combustion Optimization System

- **Airflow Sciences Equipment LLC, USA** - flow measurement of fluids - gases, liquids, or both - in and around a wide variety of equipment and products. (www.airflowsciencesequipment.com)
- **Greenbank Terotech Ltd. UK** -Boiler tube leak detection system, Carbon in ash analyzer & coal flow measurement & control system. (www.greenbankgroup.com)
- **Wave Impact Heat Management AB** - Infrasound cleaning & soot blower optimisation systems. (www.heatmanage.com)

Mission Statement

We will Engineer & provide Advance Business Solutions & Resources to Indian Power & Process Industries through our carefully selected product and service range to the satisfaction of our esteemed customers and we will achieve this by empowering people to grow in environment friendly way with optimal usage of natural resources.

Control Valves & Actuator

- **PRUSS – Waldemar Pruss Armaturenfabrik GmbH -** precision control valves for power plants, oil, gas, iron and steel industry as well as petrochemicals. (www.pruss.de)
- **KÜHME Armaturen GmbH -** specialized valves for fluid control (www.kuehme.de)
- **SERVOVALVE S.p.A. -** heavy duty pneumatic and hydraulic actuators for industrial valves. (www.servovalve.it)
- **PIBIVIESSE S.r.l -** manual and automated On/Off and Control Ball valves. (www.pibiviesse.it)
- **W&Z Rohrsystem-Technik GmbH** – Shut-off valves, control valves and non-return valves. (www.rohrsystemtechnik.de)
- **ZS Zylinderbau & Service GmbH** - special hydraulic cylinders and hydraulically operated special machines and devices. (www.zs-zylinder.de)

Expansion Joints

- **DEKOMTE de Temple Kompensator-Technik GmbH -** expansion joints technology for Conventional steam boilers, CCGT power plants, steel plants, oil& gas installations and more. (www.dekomte.de)

Unmanned Aerial Inspection

- **FLYABILITY –** Drones for indoor inspection and confined space. (www.flyability.com)

Fasteners

- **VOSSLOH, Germany –** specialised on turned parts, milled parts, screw locking, spring washers and connecting elements suitable for engineering & structural segments. (www.vossloh.info). ■

For more information

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Stop Postponing Tank Calibration

This New Method Makes it Easier than Ever

METTLER TOLEDO

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

How does RapidCal tank scale calibration work?

Instead of using test weights or material substitution, a downward force is applied with hydraulic equipment. The loading of the tank scale during RapidCal mimics that of normal operation, taking into account piping influences.

Minimum time investment

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

cost savings are realized by reduced downtime.

Higher accuracy and assured traceability

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

Saves thousands of dollars

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

Avoid contamination of tank contents

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

Up to 32 ton full capacity

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

About METTLER TOLEDO

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

For more information

Call us Toll Free -1800 22 8884 /
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Email-sales.mtin@mt.com

Industry Revolution 4.0 & Beyond ... Converting Challenges into Opportunities

Our country is recovering from Covid-19 slowdown, while at the same time, the world has seen the real face of expansionist communist China. The US-China trade war is still in progress, while many countries have decided to pull out their manufacturing and other activities from China. To achieve quality and cost competitiveness, India needs to move quickly to Industry 4.0 and beyond. Industry 4.0+ aims to enable businesses to make quicker, smarter decisions while minimising costs and with least human interventions.

Industry 4.0 will revolutionise manufacturing around the globe, as did the first three industrial revolutions. With global supply chains and highly interactive markets, this revolution will be vastly different from the previous ones: being much faster and generating previously unexpected results. It will highlight that small changes in one area of the manufacturing ecosystem will create significant ripples throughout the ecosystem, due to connectivity throughout the supply chain and the speed at which information propagates. Furthermore, Industry 4.0 will enable information to flow from manufacturer to product, but between producers, products and, most importantly, customers. The ability to embrace Industry 4.0 and use the opportunities that will rapidly (and, in many instances, unexpectedly) present themselves will be the key to success in the new global market. Enabling innovation to proceed from a concept to a mass-produced product will be critical for success; ensuring a talent pool in the manufacturing workforce that can move those innovations rapidly forward will be equally important.

Integrating Industry 4.0 with Make in India

According to IBEF, India's Government has set an ambitious target of increasing manufacturing output contribution to 25 per cent of Gross Domestic Product (GDP) by 2025, from 16 per cent currently. There is no escape from integrating principles of Industry 4.0 with the "Make in India" initiative if Indian manufacturing has to win against global competition. India has a unique opportunity to pave its own road to Smart Manufacturing innovatively. Industry 4.0 ++is expected to transform manufacturing in India by bringing

operational efficiencies to manufacturing industries.

The role of the government as a facilitator is to extend support to the manufacturing sector and take reformative steps to encourage wider adoption of technologies. Taking cues from countries such as Germany, the government could propose a proper regulatory framework, develop competitiveness, and form a conducive policy environment to enable an I4.0 ecosystem in the country. The government can also play a crucial role in encouraging employment and bridging the skill gaps for successful implementation of I4.0. There is a heightened for the government in making sure that I4.0 is accessible to the MSME segment – the segment of India Inc. that comprises some 60 million enterprises and contributes to 45 per cent of the country's total manufacturing output.

Market Disruptions

I4.0 is likely to create widespread disruptions in the labour market. The key stakeholders — the government, industry, and academy institutions — have to rethink the way the education system functions and encourage re-skilling to make employees competitive. The stakeholders need to change the skill map and take remedial actions to accommodate fast-paced technology trends. While I4.0 promises the significant potential to maximise output, it does pose operational challenges which would call for pre-emptive actions by businesses, governments and employees.

Change is buffeting the industrial manufacturing industry comprising the most disruptive innovations that would address its pain point. However, there is no one-size-fits-all strategy that suits all industries. A clear understanding of the trends would enable a successful transition from traditional manufacturing into the Industry 4.0. The first step for transitioning is developing a comprehensive strategic road-map that carefully evaluates the end-to-end process of the manufacturing value chain and the cost and benefits associated with each step.

Therefore the Indian government should adopt a structured plan to enable and act as a catalyst for Indian industry transition from the present state to Industry 4.0+. ■

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Ultrasonic Reactor System for Effective Biodiesel Production

The discipline of chemical engineering is undergoing a major transformation. A new paradigm of borderless chemical engineering sciences is emerging. The demands from the society on cleaner technologies rather clean-up technologies, the emergence of performance chemicals and materials, etc. are driving the profession towards achieving a symbiotic relationship with other disciplines. The need for more efficient, environmentally cleaner, and cost-effective processes had led to a growing interest in innovative processes which can be the best alternative for conventional processes.

The biggest problem in our country is the growing population and fossil fuel depletion with steep hikes in the price of fossil fuels and environmental concerns. These are driving researchers and scientists to search for efficient alternative fuels to fulfil the growing energy demand. Biodiesel is one of the best available sources to meet the world energy demand.

To fulfil the world energy demand the best alternative available source is Biodiesel. Being environmentally beneficial, biodegradable, non-toxic, and low pollution emission makes biodiesel suitable for consumption. Various methods have been reported for biodiesel production such as micro-emulsification, pyrolysis and transesterification. The main problem of this traditional/conventional approach in biodiesel production are long residence time, high operation costs and energy consumption, and low efficiency. Ultrasonication, a favorable alternative process that directly converts oils into biodiesel in a single step. Ultrasound transesterify oils very efficiently due to increased mass/heat transfer phenomena. Thus chemical and energy consumption process is reducing compare to conventional biodiesel production processes.

Thus the importance of the topic at the global level and our earlier exposure

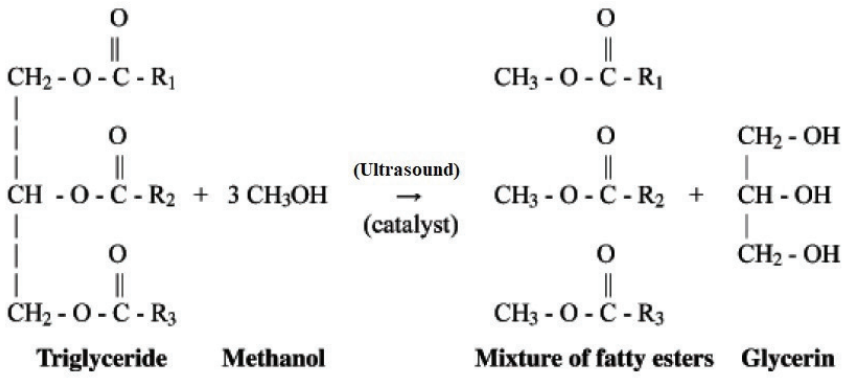

Figure-1: Transesterification reaction

to ultrasonic applications to other areas has encouraged us to carry out research in biodiesel production. The transesterification reaction as shown in Figure-1.

Design & Development of Ultrasonic Reactor Systems

The system consists of a reactor having shell 530 mm x 210 mm x 3 mm with an ultrasonic liquid processor. The total volume of the reactor is 5 liters and the actual working volume is 3.5 liters. SS 316 material was used for the fabrication of the reactor. The reactor in which the ultrasonic probe is immersed has an inlet for the feed and an outlet for the product. The probe with the frequency of 20 kHz is connected to the transducer which in turn is controlled by the ultrasound generator. A thermocouple is inserted into the reactor to measure the inside temperature which is displayed on the generator. An overhead condenser is provided to the reactor to condense back methanol vapors formed if any.

All the parameters like reaction time and temperature can be set on the generator. The whole setup is kept inside a wooden box that acts as a sound shield. The ultrasonic reactor design involves the use of PVElite for mechanical thickness calculation, Solidworks for 3D modeling, AutoCAD for fabrication drawing, and the reactor design fundamentals. Following this, the design parameters shall be applied in fabricating the ultrasonic reactor system for laboratory-scale biodiesel production. Figure-1 shows the designed and fabricated ultrasonic reactor system for biodiesel production.

Fig-1: Designed and fabricated ultrasonic reactor system for biodiesel production

HIGHLIGHTS OF THIS RESEARCH WORK:

- The findings of this research work will have significant applications, due to their economic impact, and little or no environmental pollution, ultrasonic processes have become more and more energy-efficient.
- These processes are used in place of

Fig-1: Designed and fabricated ultrasonic reactor system for biodiesel production

conventional processes in order to lower production costs or to increase the purity of the products.

- With ultrasonic's, the amount of catalyst required for the transesterification of oil to biodiesel is substantially reduced.
- Designed ultrasonic reactor system has improved the performance of the transesterification process by obtaining higher biodiesel yields typically around 96-98% within shorter reaction times.
- Ultrasonic processing is fast, usually minutes, compared to one hour or more using conventional batch reactor systems.
- Time required for glycerin phase separation is greatly reduced - typically 1 to 2 hours.
- Therefore it is concluded that the designed ultrasonic reactor systems is an effective way of converting crude oils (Different feedstock's) into biodiesel. ■

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