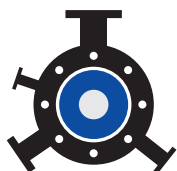


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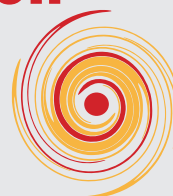
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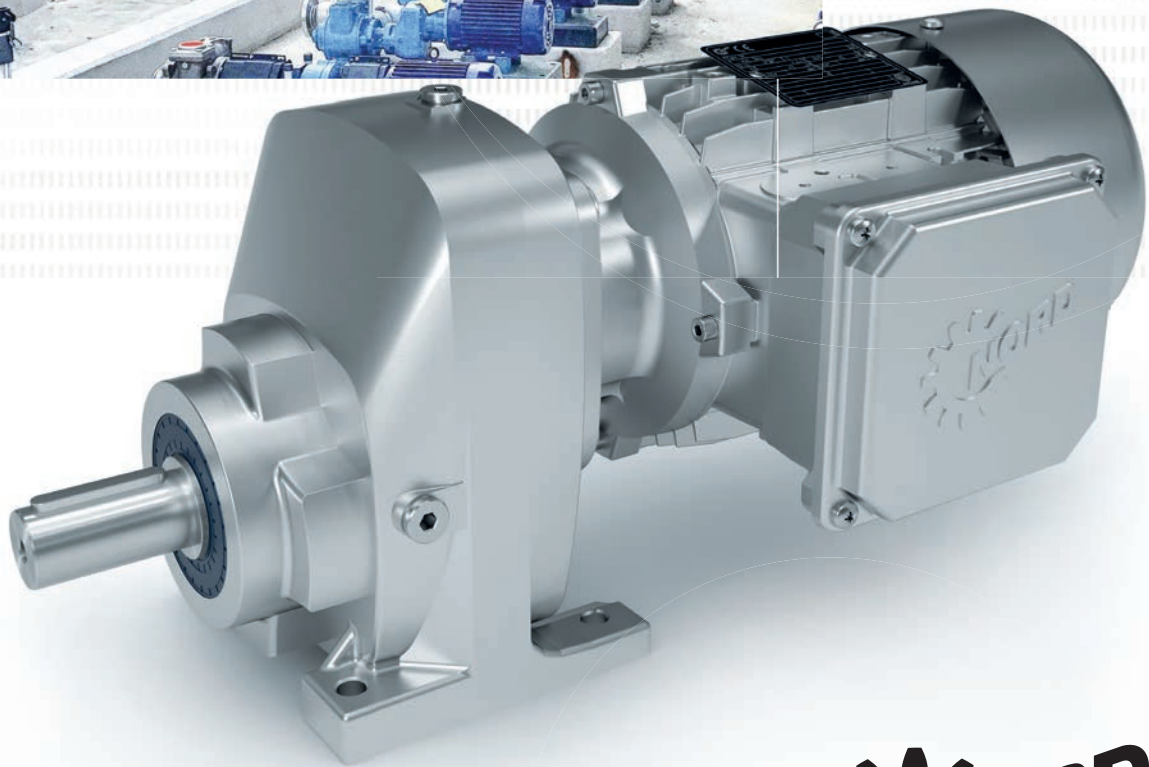
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Director
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Coromandel International to set up ₹ 1,000 crore fertiliser plant in Kakinada

Andhra Pradesh, India: Coromandel International, a leading player in the fertiliser industry, has unveiled plans to establish a state-of-the-art fertiliser plant in Kakinada, Andhra Pradesh, with an estimated investment of ₹ 1,000 crore. This ambitious project marks a significant stride towards bolstering India's self-reliance in fertiliser production while fostering economic growth and employment opportunities in the region. The proposed facility will feature a cutting-edge 650-tpd phosphoric acid unit, leveraging advanced dihydrate attack-hemihydrate filtration (DA-HF) process technology and automated DCS system. This strategic move aims to reinforce Coromandel's backward integration capacity, substantially reducing the country's reliance on imported phosphoric acid by more than 50 percent. Once operational, the new plant, boasting a capacity of around two million tonnes, will rank as India's second-largest phosphatic fertiliser facility, contributing approximately 15 percent to the nation's NPK fertiliser output. Additionally, plans are underway to establish a 1,800 tpd sulphuric acid plant, catering to captive needs in phosphoric acid manufacturing and enhancing power generation through waste heat utilization. Coromandel's recent agreements with esteemed technology partners including Prayon from Belgium and MECS from the USA underscore the company's commitment to leveraging cutting-edge solutions. Moreover, a contract with thyssenkrupp UHDE for detailed engineering of both phosphoric acid and sulphuric acid projects signifies a meticulous approach towards project execution.

Evonik India's Innovation Hub: A beacon of progress

Mumbai, India: Evonik, a global leader in specialty chemicals, inaugurated its state-of-the-art office and R&D premises in Thane, India, this April. The event, graced by the Consul General of the Federal Republic of Germany in Mumbai, Dr. Achim Fabig, alongside Evonik global management representatives, and members of the Evonik India team, marked a pivotal moment for Evonik's growth trajectory in India. The newly christened Evonik India Research Hub (EIRH) signifies a major milestone in Evonik's journey in India, reflecting its steadfast commitment to fostering innovation and sustainability in the Indian market. Spanning an impressive 100,000 square feet, the new headquarters boasts cutting-edge labs catering to diverse industries, from pharmaceuticals to textiles, and beyond. Additionally, plans for launching new labs this year underscore Evonik's dedication to addressing emerging market needs. Designed to facilitate collaboration and innovation, the modern workspace features collaborative workspaces, advanced technology infrastructure, and amenities aimed at enhancing productivity and employee well-being. With approximately 850 employees currently employed across its entities in India, Evonik aims to create more job opportunities with the launch of EIRH, further bolstering its presence in the country.

Rajesh Kumar Srivastava Appointed MD & CEO, Sajjan India Limited



Rajesh Kumar Srivastava assumes the role of Managing Director & CEO at Sajjan India Limited, bringing over 36 years of experience in specialty chemicals. His tenure at Jubilant Ingrevia Ltd, where he served as MD & CEO, underscores his expertise in driving global leadership and business transformation. With a focus on sustainable growth and operational excellence, Srivastava aims to lead Sajjan towards further success. Amit Soni of CVC Advisers (India) Private Limited expresses confidence in Srivastava's ability to drive progress, while Anurag Surana, Chairman of Sajjan, emphasizes his collaborative leadership style as pivotal for the company's expansion. Sajjan is affiliated with Sona Company Pte. Ltd, under CVC



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CRISIL ESG Ratings receives SEBI approval, commits to India-Specific ESG Framework

Mumbai, India: CRISIL ESG Ratings & Analytics Ltd, a wholly owned subsidiary of CRISIL Ratings Ltd, has been granted approval by the Securities and Exchange Board of India (SEBI) to provide environmental, social, and governance (ESG) ratings. Positioned as a Category 1 provider, CRISIL ESG Ratings will employ a proprietary, India-specific framework to advance the ESG agenda for all stakeholders. Amish Mehta, Managing Director and CEO of CRISIL Ltd, emphasized the company's commitment to sustainable growth, stating, "It is our stated aim to grow sustainably, and we are excited to have a license that reinforces our stewardship of this space." The approval arrives at a crucial juncture, amidst improving ESG disclosures and growing recognition in financial markets of the necessity for independent ESG ratings to guide decision-making and promote sustainable growth in the Indian economy. This approval follows SEBI notifications amending regulations to include provisions on ESG Rating Providers (ERPs). In compliance, CRISIL ESG Ratings was incorporated, building on CRISIL's 37-year legacy as a pioneer in credit ratings in India. Gurpreet Chhatwal, Managing Director of CRISIL Ratings, highlighted the significance of CRISIL's ESG ratings, which are based on a unique India-specific framework. The process entails analyzing over 500 unique data points across environmental, social, and governance aspects for each company.

Ohmium and Tata Projects forge partnership to Advance Green Hydrogen missions

Mumbai, India: Ohmium International, a leading green hydrogen company specializing in Proton Exchange Membrane (PEM) electrolyzers, announces a strategic partnership with Tata Projects, a prominent EPC company in India. This collaboration aims to accelerate green hydrogen projects in India by combining innovative technology with proven engineering excellence.

Ohmium's modular interlocking PEM electrolyzers, featuring advanced power electronics, offer added value for various commercial and industrial applications. With dynamic ramping capabilities and scalability, these electrolyzers are designed to pair seamlessly with renewable electricity, contributing to a sustainable energy future. Tata Projects will oversee the entire EPC process, including engineering, design, integration, and optimization. Arne Ballantine, CEO of Ohmium, highlights the partnership's goal of driving the adoption of green hydrogen in India. Vinayak Pai, MD and CEO of Tata Projects, expresses their commitment to supporting India's transition to clean energy through this collaboration.

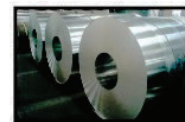
Anil Kumar Jadli Appointed Director (HR), NTPC

Anil Kumar Jadli is slated to take on the role of Director (Human Resource) at NTPC Limited, following a recommendation by the Public Enterprises Selection Board (PESB). Currently serving as Chief General Manager (HR) within NTPC, Jadli emerged as the preferred candidate from a pool of 12 contenders during PESB's selection meeting. Upon his appointment, he will join NTPC's Board of Directors, reporting directly to the Chairman and Managing Director. In his new capacity, Jadli will oversee human resource development, personnel policies, industrial relations, and administrative control across the organization.

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Rockwell Automation expands Manufacturing Footprint in India

Chennai, India: Rockwell Automation, a leader in industrial automation, is strengthening its presence in India by building a new 98,000-square-foot manufacturing facility in Chennai. This expansion aims to improve the company's supply chain resilience across the Asia Pacific region and globally. The facility will be located near Rockwell's existing CUBIC facility, allowing for collaboration and efficiency gains. "We strategically chose this location to leverage our existing infrastructure and boost regional productivity," said Dilip Sawhney, Managing Director for Rockwell Automation India. The new facility is expected to open in the first half of 2025 and create approximately 230 new jobs by year-end. This investment highlights Rockwell's commitment to India's growing industrial market.

Expected to commence operations in the first half of 2025, the Chennai facility is projected to employ approximately 230 workers by the end of the year. This expansion underscores Rockwell Automation's commitment to leveraging local talent and resources to drive innovation and excellence in industrial automation. By investing in India and strengthening its manufacturing footprint, Rockwell Automation aims to optimize its global manufacturing operations, enhance supply chain resilience, and create additional career opportunities for employees. The new facility signifies Rockwell's proactive approach to meeting the evolving needs of its global customer base while fostering economic growth and sustainability in India and beyond.

Privi Specialty Chemicals demonstrates strong financial performance in Q4 FY24

Mumbai, India: Privi Specialty Chemicals Limited has released its consolidated financial results for the quarter ended March 31, 2024, exhibiting robust performance. During Q4 FY24, the company recorded a consolidated net profit after tax (PAT) of ₹ 31.02 crores, a significant increase from ₹ 28.76 crores reported in the previous quarter ended December 31, 2023. Simultaneously, total income surged to ₹ 491.93 crores during Q4 FY24, compared to ₹ 409.43 crores reported in the preceding quarter, indicating strong operational performance and effective revenue management strategies.

In comparison to the corresponding period in the previous fiscal year, Privi Specialty Chemicals achieved notable growth. For the financial year ended March 31, 2024, the company reported a total income of ₹ 1,778.53 crores, a significant increase from ₹ 1,629.24 crores reported in the previous fiscal year. Additionally, the company's net profit for FY24 soared to ₹ 94.90 crores, compared to ₹ 22.21 crores reported in FY23. This impressive financial performance underscores Privi Specialty Chemicals' resilience and agility in navigating market challenges and seizing growth opportunities. The company's steadfast commitment to operational efficiency, innovation, and strategic investments has positioned it for sustained success in the dynamic chemical industry landscape.

Former NTPC Director Ramesh Babu V Appointed as Member of CERC



Ramesh Babu V, former Director (Operations) NTPC, has been appointed as a Member of the Central Electricity Regulatory Commission (CERC). Taking oath, administered by Union Minister for Power and New & Renewable Energy RK Singh, Babu brings over 33 years of experience at NTPC, specializing in managing power stations, operations, maintenance, and efficiency improvements. Holding an M Tech Degree in Thermal Engineering and B Tech in Mechanical Engineering, his expertise will contribute to CERC's regulatory

DroneAcharya Aerial Innovations secures contract for ADNOC project

Pune, India: DroneAcharya Aerial Innovations has been awarded a work order valued at ₹ 53 lakhs from Alter Dynamics & Artificial Intelligence. The project involves the use of drones for inspecting piles above water, meeting the stringent requirements of the Abu Dhabi National Oil Company (ADNOC). This collaboration signifies a crucial integration of Advanced Drone Tech with Conventional Industries, particularly in offshore assets.

The deployment of drones equipped with high-resolution sensors offers a comprehensive, expedited, and intelligent inspection solution. Prateek Srivastava, Founder and Managing Director of DroneAcharya, expressed his enthusiasm, stating, "This milestone signifies a significant entry into the relatively untapped drone survey market in the Middle East. Leveraging our extensive experience and domain expertise, we are poised to deliver professional, high-quality services to the Architecture, Engineering, and Construction (AEC) industries with unparalleled efficiency."

India aims for Urea Self-Sufficiency by 2025

New Delhi, India: India targets to cease urea imports by 2025, asserts Chemicals and Fertilisers Minister Mansukh Mandaviya. Highlighting the significance of fertilizers in agriculture, the government promotes nano liquid urea and DAP as alternatives to enhance crop and soil health. To attain self-sufficiency, a dual strategy is adopted: reviving closed urea plants and boosting domestic production capacities. Presently, the country requires 350 lakh tonnes of urea annually, with domestic

capacities increased to 310 lakh tonnes from 225 lakh tonnes in 2014-15. Despite progress, a gap of 40 lakh tonnes between production and demand remains.

Commissioning the fifth plant aims to replace 20-25 lakh tonnes of conventional urea with nano liquid urea. Mandaviya aims to eliminate import dependency by 2025, with zero import bills. Import data shows a decline in recent years. Government schemes like PM-PRANAM incentivize states to promote alternative fertilizers, ensuring availability through subsidies. Urea Subsidy Scheme and Nutrient Based Subsidy Policy maintain reasonable fertilizer prices. Urea imports are government-controlled, while others operate under commercially viable terms.

AVEVA opens new Hyderabad Customer Experience Center



AVEVA Team inaugurate Customer Experience Center

Hyderabad, India: Industrial software giant AVEVA inaugurated a new Customer Experience Center in Hyderabad, India, showcasing its commitment to the country's digital transformation. This center, one of six globally, houses over 1200 technologists and features advanced R&D labs." India is crucial for AVEVA's global business," said AVEVA's Chief Commercial Officer Sue Quense. The center will demonstrate how digital innovation fosters sustainable growth, aligning with India's Viksit Bharat vision.

Heikki Malinen appointed President and CEO, Neste Corporation



Neste Corporation has named **Heikki Malinen** as its new President and CEO, effective November 2nd, 2024, or earlier. Currently serving as President and CEO of Outokumpu Corporation, Malinen brings a wealth of leadership experience to Neste. He will step down from his position on Neste's Board of Directors to assume his new role. With a focus on sustainable fuels and renewable solutions, Malinen aims to steer Neste towards further growth and innovation in the industry.

Visitors can experience the power of connected ecosystems using AI and digital twins for sustainable business practices. Immersive demonstrations showcase centralized command and control, R&D services, cloud solutions, and technical support. The center also features a sustainability-focused Innovation Lab.

AVEVA displayed its industry-specific software solutions for sectors like energy, chemicals, manufacturing, and mining. The showcased solutions include AVEVA CONNECT, Unified Operations Center, E3 Design, PI System, and Process Optimization. With significant investment in R&D, AVEVA has 10 global centers, 43% located in India. This new center joins their network of Customer Experience Centers in London, San Leandro, Lake Forest, Houston, Beijing, and now Hyderabad.

Honeywell's NEP Technology: A Revolution for Energy Efficiency in Petrochemicals

Dubai, United Arab Emirates: Honeywell has unveiled a transformative solution poised to revolutionize the petrochemical industry: the Naphtha to Ethane and Propane (NEP) process. This innovative technology promises to enhance the efficiency of light olefin production while significantly reducing carbon emissions. Essential feedstocks for ethylene and propylene production, ethane and propane take center stage in this groundbreaking advancement. Through NEP technology, regions worldwide can bolster profitability and decrease the carbon intensity of olefin production.

The NEP process ingeniously converts naphtha and/or LPG feedstocks into tunable amounts of ethane and

propane. These valuable outputs are then directed to ethane steam cracking and propane dehydrogenation units, respectively, amplifying the yield of high-value ethylene and propylene while minimizing the production of lower-value byproducts. Moreover, Honeywell's NEP-based olefins complexes demonstrate remarkable environmental stewardship by reducing CO₂ intensity per metric ton of light olefins produced by up to 50%. Matt Spalding, Vice President and General Manager of Honeywell Energy and Sustainability Solutions in MENA, emphasized the technology's role in meeting the escalating demand for ethylene and propylene while simultaneously curbing carbon emissions. This groundbreaking solution represents a pivotal addition to Honeywell's Integrated Olefin Suite technology portfolio, setting a new standard for efficient petrochemical solutions and reinforcing Honeywell's commitment to sustainability and innovation in the energy sector.

Tamilnadu Petroproducts partners with EY Parthenon for Carbon-Neutral initiative

Chennai, India: Tamilnadu Petroproducts Limited (TPL), a prominent petrochemical manufacturer based in Chennai, has joined forces with EY-Parthenon, a renowned strategy consultancy firm, to drive its ambitious carbon-neutral initiative and sustainability goals. With a 40-year legacy in industrial intermediate chemicals production, TPL seeks to leverage EY-Parthenon's expertise in sustainability strategy development to craft an integrated carbon-neutral roadmap aligned with its long-term objectives. Ashwin Muthiah, Vice-Chairman of TPL and Founder Chairman of AM International, Singapore, expressed the company's commitment to sustainable manufacturing, emphasizing the collaboration's role in advancing environmentally conscious practices. Kapil Bansal,

Sakchai Patiparnpreechavud named CEO, SCG Chemicals



SCG has appointed **Sakchai Patiparnpreechavud** as the new Chief Executive Officer & President of SCG Chemicals (SCGC), effective from May 1, 2024. With over 35 years of experience in the petrochemical industry, Sakchai brings extensive expertise to his new role. He has previously held significant positions within SCG and SCGC, including Chief Commercial Officer, Executive Vice President – Vinyl Chain, Chemicals Business, and Country Director – Vietnam at SCG. Sakchai has also served as Managing Director of SCG Performance Chemicals Company Limited and held directorships in various subsidiaries and joint ventures within SCGC.

Partner and Leader of Industrial Decarbonization at EY Parthenon India, highlighted the partnership's focus on assisting TPL in achieving emission reduction targets while driving cost efficiency and impactful change within the industry.

As part of the collaboration, EY-Parthenon will aid TPL in comprehending and addressing greenhouse gas emissions, establishing internal reduction targets, and devising emission reduction plans. By implementing interventions like clean energy substitution and process efficiency improvement, TPL aims to progress towards carbon-neutral manufacturing, setting standards for sustainable industry operations. This partnership underscores TPL's proactive stance in tackling environmental challenges and underscores its commitment to embracing sustainable manufacturing practices in line with contemporary requirements.

IGX launches Contracts for Small-Scale LNG delivery

Mumbai, India: The Indian Gas Exchange (IGX) launched small-scale Liquefied Natural Gas (ssLNG) contracts on its platform, aiming to expand gas access beyond the national pipeline network.

This initiative caters to industries and city gas distributors lacking pipeline connections. They can now procure LNG via tankers under daily, fortnightly, or monthly contracts at competitive rates. Initially available at Dahej and Hazira terminals, the service will expand to other locations in the future. "Small-scale LNG is a cornerstone for expanding our gas-based economy," said PNGRB member Anjani Kumar Tiwari. "PNGRB is committed to supporting the growth of ssLNG in India."

With traditional pipeline limitations, ssLNG serves as a solution for remote areas. "We envision IGX providing marketplaces for transparent price discovery," said IGX

CEO Rajesh K Mediratta. "Our initiative will optimize costs for city gas distributors, industries, and LNG dispensers." Natural gas demand via trucks is projected to rise significantly in the coming years. ssLNG contracts offer a win-win situation for both buyers and sellers, facilitating larger LNG volumes and a secure trading environment.

Best Agrolife strengthens portfolio with Sudarshan Farm Chemicals Acquisition

New Delhi, India: In a move to bolster its position in the agrochemicals market, Best Agrolife Ltd. (BAL) announced the acquisition of Sudarshan Farm Chemicals India Pvt Ltd. (SFCL) for ₹ 139 crore. This strategic acquisition grants BAL access to valuable resources and expertise.

The primary benefit lies in leveraging SFCL's proficiency in developing cost-effective methods for producing off-patent molecules. This aligns with BAL's goals and strengthens their overall production capabilities. BAL will also gain significant synergies in research and development (R&D). SFCL boasts a robust R&D department with a 40-year legacy of innovation. They hold an intellectual property (IP) portfolio of 10 patents (applied), granting BAL access to valuable technical expertise and new product development opportunities. Furthermore, the acquisition expands BAL's brand portfolio. Popular SFCL brands like "Sutathion" and "Suphos" will be integrated, boosting BAL's presence in central and southern India. Additionally, SFCL's established network of over 2,500 dealers strengthens BAL's distribution channels and aligns with their plans for capacity expansion.

This acquisition signifies BAL's commitment to growth and solidifies their position as a key player in the Indian agrochemicals industry.

Anshum Jain appointed as VP, Global Supply Chain, Schneider Electric, India



Anshum Jain has been appointed as Vice President, Global Supply Chain at Schneider Electric India. With 27 years of experience in manufacturing and operations, including roles at Daimler and Bosch, Anshum aims to enhance supply chain practices and drive growth. Deepak Sharma, Zone President, Schneider Electric, Greater India, welcomed Anshum, emphasizing the company's commitment to innovation and sustainability.

Asahi India Glass and INOX Air Products sign Green Hydrogen Partnership



Subir Ganguly, Head - On Site Business Development, INOX Air Products with Rupinder Shelly, COO - Architectural Glass, Asahi India Glass Ltd.

Gurugram Haryana, India: Asahi India Glass Limited (AIS), a prominent player in India's glass manufacturing sector, has joined forces with INOX Air Products (INOXAP) in a pioneering initiative to revolutionize sustainable glass production. The collaboration entails a 20-year agreement for the off-take of Green Hydrogen at AIS's Chittorgarh plant, marking a significant milestone in India's renewable energy landscape. Under this agreement, INOXAP will spearhead the design, engineering, installation, and operations of India's first Green Hydrogen Plant for the Float Glass industry. With a capacity to generate 190 tons of Green Hydrogen annually, the plant, powered by solar energy, will commence operations by July 2024.

In the initial phase, AIS will receive 95 tons per annum of Green Hydrogen, driving a substantial reduction in carbon emissions by approximately 1250 metric tons annually and 25,000 metric tons over the 20-year period. Rupinder Shelly, COO-Architectural Glass at AIS,

highlighted the company's commitment to sustainability, emphasizing the pivotal role of Green Hydrogen in realizing a greener future for India's manufacturing sector. Siddharth Jain, Managing Director of INOX Air Products, expressed pride in pioneering India's first Green Hydrogen plant for the Float Glass sector, aligning with India's ambitious decarbonization goals and reinforcing the nation's commitment to green growth. This landmark partnership underscores AIS and INOXAP's shared vision for a sustainable and eco-friendly manufacturing ecosystem, heralding a new era of renewable energy adoption in India's industrial landscape.

Yara Clean Ammonia, AM Green inks pact for renewable ammonia supply

Andhra Pradesh, India: Yara Clean Ammonia, distributor of ammonia, and Greenko ZeroC, the green ammonia production arm of AM Green, have inked a term sheet for the supply of renewable ammonia from AM Green's facility in Kakinada, Andhra Pradesh. This term sheet and the subsequent offtake agreement encompasses the long-term supply of up to 50 percent of renewable ammonia from the first phase of AM Green's facility. The mega green ammonia project will start with a production capacity of one MTPA, with plans to ramp up the capacity to five MTPA by 2030. Yara will use green ammonia from Greenko to produce low-emission fertilizers as well as contribute towards low-carbon emissions in industries such as shipping and power. The renewable ammonia and other sustainable fuels from AM Green's platform will comply with EU RFNBO and Renewable Energy Directive requirements. In India, AM Green is developing production capabilities for green molecules including green hydrogen, green ammonia, biofuels, e-methanol, sustainable aviation

Sunil Nair Appointed CHRO, Rossari Biotech



Rossari Biotech Limited announces **Sunil Nair** as Chief Human Resources Officer, tasked with overseeing HR and corporate communications. With a strategic approach, Nair aims to align HR initiatives with organizational objectives across diverse operational units. MD Sunil Chari expresses confidence in Nair's extensive 26-year career, particularly his tenure as Head of HR at Ashok Leyland Limited. Nair's experience spans various sectors, demonstrating adaptability and expertise. An alumnus of IIM Kolkata, Nair holds a Bachelor's degree in Computer Science. His appointment signifies Rossari Biotech's commitment to talent management and organizational growth.

fuels and various downstream high-value chemicals for decarbonisation. Yara Clean Ammonia operates the largest global ammonia network with 15 ships and has access to 18 ammonia terminals and multiple production and consumption sites across the world. AM Green sees it as an opportunity to drive the transformation of various industries and OECD economies, by providing global clean energy transition solutions based on hydrogen, ammonia, fuels, and chemicals.

Anupam Rasayan Reports FY24 Financial Results

Surat, India: Anupam Rasayan India Ltd. (BSE: 543275, NSE: ANURAS) announced its financial results for the quarter and year ended March 31, 2024. For Q4FY24, the company reported a total revenue of ₹4,130 million, an 18% decline compared to ₹5,042 million in Q4FY23. EBITDA, including other income, stood at ₹1,047 million, down 26% from ₹1,416 million in the previous year, translating to a 25% EBITDA margin. Profit after Tax for the quarter was ₹405 million, marking a 44% decrease from ₹726 million in Q4FY23.

For the full fiscal year FY24, Anupam Rasayan reported a total revenue of ₹15,053 million, a 7% decrease from ₹16,105 million in FY23. EBITDA, including other income, was ₹4,109 million, reflecting a 7% decline from ₹4,399 million in the previous year, with a 27% EBITDA margin. The company's Profit after Tax for FY24 was ₹1,674 million, a 23% decrease from ₹2,168 million in FY23.

Managing Director Anand Desai commented on the resilience of Anupam Rasayan amidst industry challenges, highlighting the company's ability to maintain a 27% EBITDA margin. He noted the success of their strategic diversification into pharmaceuticals

and polymers, with pharma revenue increasing from 4% to over 9% in FY24. The company introduced 17 new molecules and added four new multinational clients. Desai anticipates continued growth in these segments, expecting double-digit revenue shares next year. Despite ongoing headwinds, he is optimistic about FY25, emphasizing a strategic focus on the polymer and pharmaceutical markets.

Epsilon Carbon Awarded SA8000 Certification for Social Accountability



Vikram Handa, Managing Director of Epsilon Group

Mumbai, India: Epsilon Carbon Pvt Ltd., a prominent player in the carbon industry, has achieved the SA8000 certification from Social Accountability International (SAI), making it the first Indian carbon black manufacturer to receive this accolade. The certification honours Epsilon Carbon's

commitment to social accountability and worker welfare, positively impacting over 1,800 workers and their families at its township in Vijayanagar. The SA8000 certification highlights Epsilon Carbon's dedication to ethical business practices, fair wages, good housing, and a clean environment for its employees. The company also engages in community-building activities, providing comprehensive logistic support for migrant workers to settle smoothly in the township.

Vikram Handa, Managing Director of Epsilon Group, expressed pride in receiving the certification,

Harsh Baweja appointed Director (Finance), REC Limited



Harsh Baweja has taken charge as Director (Finance) of REC Limited, effective May 10, 2024, following approval from the Appointments Committee of the Cabinet (ACC). Previously serving as Executive Director (Finance) at REC, Baweja brings over 33 years of extensive experience in financial and business operations. A seasoned Chartered Accountant, he was selected for the role by the Public Enterprise Selection Board (PESB) from a pool of 11 candidates. In his new position, Baweja aims to secure low-cost borrowing, promote growth, and position REC as a leader in renewable energy financing, striving for zero NPA by the fiscal year's end.

emphasizing the company's commitment to social accountability and employee well-being. He stated, "The SA8000 certification reflects our continuous strive to make a positive impact through fair labour practices and proactive community engagement." Pratish Koparkar, Chief Human Resource Officer, highlighted the company's employee-centric approach, noting that the certification underscores efforts to create a sustainable and inclusive environment. Epsilon Carbon's township offers various facilities, including a health centre, child crèche, and playground. Developed by SAI, the SA8000 Standard is a leading social certification program recognizing organizations that uphold high standards in social accountability and worker welfare. Epsilon Carbon's achievement of this certification marks a significant milestone, showcasing its unwavering commitment to ethical practices and social responsibility.

Reliance Industries Partners with Nel ASA for Electrolyser Manufacturing

Mumbai, India: Reliance Industries Ltd. (RIL) has announced a technology licensing agreement with Nel Hydrogen Electrolyser AS, a subsidiary of Nel ASA, for the manufacturing of electrolyzers in India. This pact grants RIL an exclusive license for Nel's alkaline electrolyzers within India, allowing RIL to utilize and manufacture these electrolyzers for global captive purposes. The collaboration will enable RIL to leverage Nel's advanced technology platform, enhancing its manufacturing capabilities. Both companies will work together on future performance improvements and cost optimization through research and development (R&D), value engineering, standardization, and modularization to boost the competitiveness of the alkaline technology platform. Additionally, Nel will have the option to procure equipment from Reliance for its own projects, benefiting from a revenue stream in a rapidly expanding market. However, Nel will continue to serve the Indian market with its other technology platforms not covered by this agreement. RIL is constructing the Dhirubhai Ambani Green Energy Giga Complex in Jamnagar, Gujarat, spread over 5,000 acres. This complex will house various giga factories, including an electrolyser manufacturing unit for green hydrogen production. Earlier this year, RIL was allocated a 300 MW capacity under the government's production linked incentive (PLI) scheme for electrolyser manufacturing. RIL aims to transition from grey/blue hydrogen to green hydrogen by 2025, meeting cost and performance targets in the process.

DOMO Chemicals expands TECHNYL Polyamide production in China with new €14 Million Plant



Latest production plant in Haiyan, Jiaxing, Zhejiang, China

Zhejiang, China: DOMO Chemicals, a global leader in engineered technical materials, has inaugurated its latest production plant in Haiyan, Jiaxing, Zhejiang, China, representing a €14 million investment. This milestone underscores DOMO's commitment to meeting the surging demand for TECHNYL polyamide-based solutions in the Chinese market. The new plant, covering 40,000 square meters, marks a significant expansion of DOMO's capacity in China. Initially capable of increasing production from 25,000 to 35,000 tons of Technyl polyamides, the facility has long-term plans to reach 50,000 tons, responding to the growing needs of key sectors such as automotive, electronics, energy, industrial, and consumer goods.

Yves Bonte, CEO of DOMO Chemicals, highlights the company's customer-centric approach to innovation, emphasizing strong partnerships in sectors like e-mobility and green energy in the Chinese market. He affirms DOMO's global mission of engineering sustainable polyamide solutions that benefit both the planet and its inhabitants.

With robust growth experienced since 2016, marked by a 20% increase in annual sales, DOMO's expansion efforts in China reflect its commitment to meeting customer demands. Denny Meng, Operations Manager, underscores the depth of DOMO's relationships with local and global customers, highlighting plans to establish an Asia-Pacific application development center to strengthen its presence in emerging Asian industries and markets. This investment not only signifies DOMO's dedication to quality and innovation but also its commitment to safety and responsible employment practices, reinforcing its position as a trusted partner in the Chinese market and beyond.

Richard Geiss GmbH Achieves 25% Energy Savings with “Waste to Energy” Concept

Offingen Germany: Richard Geiss GmbH, a Bavarian solvents specialist, has made significant strides towards CO₂-neutral solvents by completely converting its in-house rotary kiln. This “Waste to Energy” initiative thermally recycles distillation residues, reducing gas consumption by approximately 25% and lowering the company’s CO₂ footprint by 1,482 tons annually. The family-run company invested €2.1 million in this project, doubling its incineration capacity from 3,000 to 6,000 tons per year. Managing Partner Bastian Geiss highlighted that this modernization not only enhances the CO₂ balance of their products but also reduces logistics and transportation needs, eliminating around 300 truck loads annually. Additionally, Richard Geiss GmbH produces 65% of its electricity through hydropower and solar energy, significantly contributing to its sustainability goals.

The company processes up to 50,000 tons of used solvents annually into high-purity distillates, with the upgraded rotary kiln now providing a quarter of the energy required for the distillation process. Richard Geiss GmbH’s commitment to a circular economy and renewable energy is further emphasized by its environmentally friendly transport strategies and employee mobility initiatives, including rail transport, hybrid vehicles, and bike leasing. Bastian Geiss reiterated the company’s dedication to a climate-neutral industry, aligning with German and EU targets for 2045 and 2050, respectively.

Aramco and Rongsheng explore new downstream partnerships in KSA and China

Riyadh, Saudi Arabia: In a strategic move to expand their presence in the downstream sector, Aramco and Rongsheng Petrochemical Co. Ltd. are exploring collaborative opportunities in Saudi Arabia and China. A cooperation framework agreement has been inked, indicating Rongsheng’s potential acquisition of a 50% stake in the Saudi Aramco Jubail Refinery Company (“SASREF”) and envisioning a joint venture for downstream investments.

The agreement lays the groundwork for significant investments in both the Saudi and Chinese



Pictured, from left, at the cooperation framework agreement signing ceremony are Xiang Jiongjiong, Zhejiang Rongsheng Holding Group Vice Chairman and Rongsheng Petrochemical CEO; Li Shuirong, Zhejiang Rongsheng Holding Group Chairman; Wang Hao, Zhejiang

petrochemical sectors. It outlines plans for a liquids-to-chemicals expansion project at SASREF, aiming to enhance downstream capabilities. Furthermore, Aramco is considering acquiring a 50% stake in Rongsheng affiliate Ningbo Zhongjin Petrochemical Co. Ltd. (ZJPC) and participating in ZJPC’s expansion project.

Mohammed Y. Al Qahtani, Aramco Downstream President, expressed enthusiasm about advancing their liquids-to-chemicals strategy with Rongsheng, emphasizing the ambition to attract new investments to the Saudi downstream sector while expanding in a key geography like China.

This collaboration follows Aramco’s earlier acquisition of a 10% interest in Rongsheng, demonstrating a deepening partnership between the two entities. Rongsheng’s ownership of ZJPC, which operates an aromatics production complex, further solidifies the relationship. The signing ceremony for the cooperation framework agreement witnessed the presence of key figures from both Aramco and Rongsheng, reflecting the commitment to fostering mutual growth and development in the downstream industry. ■

Reliance Gets Government's Nod for Investment to Boost KG-D6 Gas Output

Andhra Pradesh, India: Reliance Industries has secured government approval for an additional investment aimed at boosting gas production in its KG-D6 block in the Bay of Bengal. The new investment is expected to increase capacity by four to five million standard cubic meters per day (mscmd), enhancing current output. Reliance, in partnership with BP, currently produces around 30 mmscmd from the KG-D6 block, which accounts for approximately 30 percent of India's total gas production. During an investor call announcing Q4 earnings, it was confirmed that the government has approved the development plan for this incremental production.

The KG-D6 block, identified as KG-DWN-98/3, has been instrumental in augmenting domestic gas production, achieving a multi-year high of 99 mmscmd. The gas produced is used for electricity generation, conversion into CNG for automobiles, and piped gas for cooking. Reliance holds a 66.67 percent stake in the KG-D6 block and operates it, while BP holds the remaining 33.33 percent. Since production commenced in April 2009, Reliance has made 19 gas discoveries in the block. D-1 and D-3 were the first to be brought into production. The new investment aims to sustain and further enhance the significant contribution of the KG-D6 block to India's domestic gas output.

ReNew Energy and JERA Partner for Green Ammonia Project

Odisha, India: ReNew Energy Global has entered into a strategic partnership with JERA, Japan's largest power generation company, to develop a green ammonia production project in Paradip, Odisha. Spearheaded by ReNew's subsidiary, ReNew E-Fuels, the project will utilize approximately 500 MW of high-capacity utilization factor (CUF) renewable energy to produce green hydrogen, a crucial feedstock for green ammonia. By 2030, the project aims to achieve an annual production capacity of nearly 100,000 tonnes of green ammonia, with JERA securing the right to off-take this product for Japan. This collaboration will combine ReNew's expertise in renewable energy development with JERA's proficiency in establishing value chains. The project supports India's National Green Hydrogen Mission and Japan's clean energy transition goals, contributing to a cleaner future. India's ambition to produce five million tonnes of green hydrogen annually by 2030 underscores its commitment to sustainability

and affordability. ReNew Energy and JERA recognize the country's vast potential in solar and wind power, positioning India as a key player in the global transition towards green energy.

BASF Expands E-Coat Manufacturing Facility in Mangalore

Mangalore, India: BASF's coatings division has revealed plans for expanding its e-coat manufacturing facility located at the Mangalore site. E-coat, known as electrophoretic or cathodic dip coating, plays a crucial role in protecting car body surfaces, edges, and cavities from corrosion. Moreover, it efficiently smoothens pre-treated metal surfaces, establishing an optimal foundation for subsequent paint layers. The expansion initiative is propelled by the escalating demand for e-coat solutions from local automotive OEM customers in India, as well as clients in the South Asian and ASEAN markets. With the upgraded e-coat manufacturing facility in Mangalore, BASF will be equipped to produce the latest generation of e-coat products, including 'CathoGuard 800 RE,' which promises reduced consumption, enhanced efficiency, and heightened reactivity tailored for electric vehicles.

Mr. Patrick Zhao, Senior Vice President of Global Automotive OEM Coatings at BASF, expressed optimism about India's burgeoning automotive market, citing the vast opportunities it presents. He emphasized BASF's commitment to leveraging its expertise to cater to the diverse needs of both international and local car brands, in alignment with evolving consumer behaviors. Established in 1996, the BASF site in Mangalore has evolved into the company's largest production facility in South Asia. In 2022, the coatings division expanded the Automotive Coatings Application Centre, harnessing global resources to introduce advanced expertise and methodologies to the market.

Nitta Gelatin Initiates Collagen Peptide Expansion Project in Kerala

Kerala, India: Nitta Gelatin India Ltd (NGIL), a joint venture between Nitta Gelatin Inc. of Japan and the Kerala State Industrial Development Corporation Ltd (KSIDC), has commenced a collagen peptide expansion project in Kerala. The ground-breaking ceremony took place in April 2024 at the Kakkanad factory near Kochi. With an investment of ₹460 million, the project aims to increase collagen peptide production capacity from 600 to 1,150 metric tons per year by its expected completion in July 2025.

This initiative is part of a larger ₹200-crore investment commitment made by the Japanese multinational in Kerala, following discussions during the visit of Kerala Chief Minister Pinarayi Vijayan to Japan. Mr. Koichi Ogata, President of Nitta Gelatin worldwide, emphasized the company's strong relationship with Kerala and credited the state's industry-friendly policies and skilled labor pool for facilitating further investments. Nitta Gelatin, a leading gelatin producer globally, has been operating for 103 years and will mark 50 years of operations in Kerala in 2025. Collagen peptides, utilized in dietary supplements, healthcare products, and pharmaceuticals, are witnessing increasing demand worldwide for their joint health and beauty benefits. NGIL Managing Director, Mr. Sajiv Menon, highlighted the forthcoming launch of a variant targeting diabetes management, affirming the expanded capacity's ability to meet evolving market demands.

Himadri Speciality Chemical to Expand Carbon Black Capacity with ₹220 Crore Investment

Kolkata, India: Kolkata-based Himadri Speciality Chemical Ltd announced a ₹220 crore investment to expand its speciality carbon black capacity in a brownfield project at Singur, Hooghly district, West Bengal. This expansion aims to meet rising demand from Europe amid the impending EU ban on Russian carbon black imports. The project, set to be operational within 18 months, will be funded through internal accruals. The additional 70,000 tonnes per annum capacity will increase Himadri's speciality carbon black output to 1.3 lakh tonnes annually, boosting the company's total capacity from 1.8 lakh tonnes to 2.5 lakh tonnes. Anurag Choudhary, CMD & CEO, highlighted that the expansion would enhance profitability by increasing the proportion of high-margin speciality carbon black in their product mix. He projected export contributions to grow from 25% to 35% of turnover over the next three years.

Upon completion, the expansion will position Himadri as the world's largest speciality carbon black producer at a single site. The company, operating seven facilities across India, reported a net profit increase of 49% in the March quarter, reaching ₹115 crore, with annual revenue of ₹4,185 crore for FY'24. Himadri also focuses on energy storage applications, promoting high-performance carbon blacks for lithium-ion batteries and setting up India's first commercial lithium-ion phosphate cathode active material facility. The company has

partially acquired stakes in Invati Creations and Sicona Battery Technologies to enhance its lithium-ion battery materials production.

SAIL Secures Approval for ₹1 Lakh Crore Expansion Plan

New Delhi, India: The Steel Authority of India (SAIL) has received board and ministerial approval for a ₹1, 00,000 crore capital expenditure plan aimed at increasing its production capacity by approximately 75% to 35 million tonnes per annum (MTPA) by 2030. The expansion plan includes both greenfield and brownfield projects. A notable greenfield project is the expansion of the IISCO Steel Plant in West Bengal, which will increase its capacity from 2.6 MTPA to 4 MTPA. The new mill will produce high-grade hot rolled coil (HRC) and API-grade steel for the oil and gas sector and automotive components, with completion expected in four years.

Additionally, pre-feasibility report studies and the appointment of a consultant for the detailed project report have been completed for the Bokaro Steel Plant expansion. At the Durgapur Steel Plant, a brownfield expansion and modernization plan has been submitted, which includes a new 1.4 MTPA TMT mill. Part of the capex will be dedicated to introducing new technologies aimed at reducing carbon emissions in steelmaking. SAIL has already achieved a 20% reduction in its first phase of decarbonization and aims to lower CO2 emissions to less than 2.3 tonnes per tonne of crude steel by 2030-31. This expansion and decarbonization strategy underscores SAIL's commitment to sustainable growth and enhancing its production capabilities.

SPIC Unveils ₹970 Crore Expansion Plan Including Green Ammonia Plant

Thoothukudi, India: Southern Petrochemical Industries Corporation (SPIC) has announced a ₹970 crore capital expenditure plan aimed at enhancing its urea production capacity and establishing a 150 tonnes per day (tpd) green ammonia plant. The expansion includes revamping the existing urea plant to increase its capacity from 6.24 lakh tonnes to 9.12 lakh tonnes annually. The revamp focuses on improving plant stability and efficiency, reflecting SPIC's commitment to boosting production capacity, diversifying operations, and driving sustainable growth. The transition from naphtha to natural gas as a raw material has already improved plant efficiency, and the company now has a sustainable supply of natural gas, being included in the

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gas pool mechanism since the beginning of May 2024. SPIC's move to gas-based manufacturing is expected to drive significant growth in both revenue and profitability. The new green ammonia plant will further position SPIC as a leader in sustainable fertiliser production, leveraging environmentally friendly technologies.

Attero Plans ₹8,000 Crore Investment for E-Waste, Battery Recycling

New Delhi, India: Attero, an electronic waste and battery recycling company, has announced plans to invest ₹8,300 crore over the next five years to expand its recycling capacity. The investment will be sourced from debt, equity, and non-dilutive forms of capital. Attero is currently experiencing 100% year-on-year growth and is gradually increasing its capacity. Presently, Attero can recycle up to 1, 44,000 tonnes of electronic waste (e-waste) and 15,000 tonnes of lithium-ion batteries annually. The company is developing a greenfield facility in India, with potential locations in Andhra Pradesh or Jharkhand. This expansion will boost its e-waste recycling capacity to approximately 4, 15,000 tonnes per annum (tpa) and battery recycling capacity to around 50,000 tpa within a year. Additionally, a greenfield facility is underway in Poland, where construction has already begun.

Attero aims to achieve revenue of USD 2 billion (about ₹16,500 crore) by 2027. The company reported ₹440 crore in revenue for FY24 and anticipates surpassing ₹1,000 crore in the current fiscal year. With a current market share of 25%, Attero projects growth to 35% next year, bolstered by its claim of having the lowest operational expenses (opex) globally.

GAIL India to Invest ₹ 50,000 Crore in Petrochemicals Expansion

Madhya Pradesh, India: GAIL (India) Ltd. has announced plans to invest up to ₹ 50,000 crore to establish a 1.5 million tpa ethane cracking unit in Sehore, Madhya Pradesh. This significant capital expenditure aims to meet the rising domestic demand for petrochemicals. The new facility will nearly double GAIL's existing 810 KTA petrochemicals capacity at its Pata plant near Kanpur, Uttar Pradesh. The project, currently in the planning stage, is expected to be operational within the next five to six years. Engineers India is preparing the detailed feasibility report for the project. GAIL plans to import ethane as feedstock, transporting it via its pipeline systems

to various demand centers. In March, GAIL signed a tripartite memorandum of understanding (MoU) with ONGC and Shell Energy India to explore import opportunities and develop evacuation infrastructure at Shell Energy Terminal in Hazira. Additionally, GAIL is expanding into the polypropylene business to diversify its petrochemicals portfolio. The move comes as India's annual petrochemical consumption is projected to nearly triple to 80 million tonnes by 2040. Other Indian refiners are also increasing their production capacities, with Bharat Petroleum Corporation (BPCL) investing nearly USD six billion to develop an ethane-fed cracker at its Bina refinery in Madhya Pradesh.

Nayara Energy to set up two ethanol plants at ₹ 600-cr outlay

Gujrat, India: Rosneft-backed Nayara Energy plans to invest ₹600 crore to set up two ethanol manufacturing plants in the country. Each plant will have a production capacity of 2,00,000 klpd, and will use broken rice and maize for feedstock. These units will come up in Naidupeta, Andhra Pradesh and Balaghat in Madhya Pradesh, and are slated for commissioning by 2026. Overall, the company plans to have five ethanol manufacturing plants. By 2025, it intends to blend 20 percent ethanol, along with 100 percent sourcing. Nayara Energy operates a 20 million tonne capacity oil refinery at Vadinar in Gujarat, and is investing ₹ 6,000 crore to set up a petrochemical unit with annual capacity of 4,50,000 tonne in the same facility. It is also investing ₹ 4,000 crore for modernisation of the refinery to improve its lifespan and reliability. These investments will be made till 2026. Further, the company plans to significantly grow its fuel retail footprint from 6,600 outlets to 10,000 in three to four years. Nayara Energy's vision is to diversify its product portfolio and lead in the high growth petrochemical industry while also catering to domestic energy needs. In its endeavor for clean fuels, the company is also studying the prospect of venturing into sustainable aviation fuel (SAF) business as well as integration with a refinery.

DCM Shriram expands Caustic Soda Capacity in Bharuch

Gujrat, India: DCM Shriram Ltd. has successfully commissioned its groundbreaking caustic soda expansion project, adding 850 tons per day (TPD) to its chemical complex in Jhagadia, Bharuch District, in Gujarat. With this addition, the company's total installed capacity in Bharuch now stands at an impressive 2225 TPD, further solidifying its position in the chemical industry. The expansion project propels the company's annual caustic capacity across both locations in Bharuch (Gujarat) and Kota (Rajasthan) to 1 million metric tons per annum (TPA). DCM Shriram regards the Bharuch Chemical Complex as the single largest caustic soda facility in the country, marking a significant milestone in its growth journey. This expansion aligns with the company's commitment to India's growth story under the flagship "Atmanirbhar Bharat" program, promising significant economies of scale. The company stated, "We are the 2nd largest caustic soda producer in the country and are bullish on the long-term sustainable growth and profitability of our chlor-alkali business segment."

SJVN inaugurates India's First Multi-purpose Green Hydrogen Pilot project



Himachal Pradesh, India: Satluj Jal Vidyut Nigam (SJVN) marked a significant milestone with the inauguration of India's pioneering multi-purpose green hydrogen pilot project at the 1,500 MW Nathpa Jhakri Hydro Power Station (NJHPS) in Jhakri, Himachal Pradesh. The innovative project, a first of its kind in India, integrates combined heat and power capabilities. It serves the dual purpose of meeting the high-velocity oxygen fuel (HVOF) coating facility's combustion fuel requirements at NJHPS and generating electricity through a 25 kW capacity fuel cell. Utilizing renewable energy from

SJVN's 1.31 MW solar power plant in Wadhal, Himachal Pradesh. The plant employs an alkaline electrolyzer with a capacity of 20Nm³/hr. to produce hydrogen gas by splitting hydrogen and oxygen from water.

Operating for eight hours daily, the pilot project is poised to produce 14 kg of green hydrogen, stored in six storage tanks, for utilization in HVOF coating of turbine underwater parts.

Aligned with the National Green Hydrogen Mission, this project is a stride towards advancing green hydrogen production infrastructure in the power sector. Additionally, the inauguration also encompassed the centralized operation of the 1,500 MW NJHPS and 412 MW Rampur Hydro Power Station (RHPS), underscoring SJVN's commitment to sustainable energy initiatives.

GPS Renewables, SAF One Partner to Launch Sustainable Aviation Fuel Facility in India

Madhya Pradesh, India: GPS Renewables, a specialist in clean fuels, has announced a strategic partnership with Dubai-based SAF One to establish a sustainable aviation fuel (SAF) facility in India. The collaboration aims to produce 20 to 30 million litres of SAF annually, utilizing lignocellulosic waste feedstock, which consists of residual dry plant matter. This initiative aligns with India's plan to mandate SAF blending in aviation fuel, starting with a one to five percent blend by 2027.

This venture is set to boost the production of SAF in India, contributing significantly to the country's green energy goals. GPS Renewables, known for its expertise in biofuel technology and project development, has previously established over 100 biogas plants, including Asia's largest renewable natural gas (RNG) plant based on municipal solid waste (MSW) in Indore, Madhya Pradesh.

The partnership leverages GPS Renewables' extensive experience in green energy projects and SAF One's expertise in sustainable fuel to transform the aviation sector. The collaboration promises to enhance the availability of sustainable fuel alternatives and support India's environmental sustainability efforts. EY acted as the exclusive M&A investment banker for GPS Renewables in this significant transaction. ■



The ESG Imperative for the Indian Specialty Chemicals Industry



DR. DEEPAK PALEKAR
Director, STEP-EBP India



NEHA LAKDAWALA
Sustainability Professional
STEP-EBP India

The Indian specialty chemicals industry, a key segment within the nation's chemicals and petrochemicals market, is experiencing significant growth, now valued at USD 35-38 billion. **Dr. Deepak Palekar, Director and Neha Lakdawala, Sustainability Professional, STEP-EBP India.,** explore the industry's rise, the increasing importance of Environmental, Social, and Governance (ESG) compliance, and the challenges and opportunities that come with it. By examining innovations in waste management, energy consumption, and product lifecycle, the article highlights how the industry can leverage ESG practices to enhance sustainability and global competitiveness.

Overview of the Indian Specialty Chemicals Industry

The Indian specialty chemicals industry, representing around 20-22% of the nation's chemicals and petrochemicals market, has shown remarkable growth, and is currently valued at USD 35-38 billion. This sector, contributes over 50% to chemical exports, and has benefitted significantly from global supply chain shifts and the 'China plus one' strategy after Covid, enhancing India's role as a manufacturing alternative to traditional hub namely China. Strategically, India is poised to capitalize on its skilled manpower, robust engineering capabilities, and competitive manufacturing costs. Enhanced by favourable policies and significant improvements in ease of doing business, India's specialty chemicals sector is set to thrive globally, driven by increased capacity and strategic governmental support.

In the last few years, Environmental, Social and Governance (ESG) compliance is gaining significant importance in this industry. Global challenges such as climate change, social inequality, and the need for transparent governance are driving investors, regulators, and consumers to demand more responsible corporate behaviour, in the specialty chemicals industry, where environmental and social risks are significant.

What is ESG?

ESG stands for Environmental, Social, and Governance. These three pillars form the framework through which companies can assess and report on the broader impacts of their business activities beyond just financial metrics. The aim of ESG is to identify non-financial risks and opportunities that companies face in their daily operations, helping them manage resources and relationships more effectively.

Environmental: This aspect evaluates company's environmental impact, considering factors like carbon emissions, waste management (solid and liquid), pollution (air and water), and overall contribution to climate change.

Social: This pillar covers how a company manages relationships with employees, suppliers, customers, and the wider community, focusing on labour practices, human rights, community engagement, and customer satisfaction.

Governance: Involves assessing the company's leadership, financial strengths, ethical standards, shareholder rights ensuring transparency, accountability, and fair business practices.

Growing Importance of ESG

The specialty chemicals industry is increasingly under scrutiny from investors and stakeholders to enhance its ESG performance. The key issues for ESG are listed below.

Shift in Investor Priorities: Investors are playing a pivotal role in driving ESG initiatives. Traditional investment strategies primarily focused on financial returns; the new breed of investor's namely, Private Equity, Mutual Funds etc. are pushing companies for ESG compliance. Based on the ESG reports of companies outside of India, it is seen that companies with robust ESG practices have better long-term financial performance and can mitigate risks more effectively. For instance, companies that proactively manage their environmental impact may avoid future liabilities/ legal actions associated with environmental clean-ups.

Regulatory Drivers: Indian government has mandated Business Responsibility and Sustainability Reporting (BRSR) for top 1000 listed companies. This requirement compels companies to provide detailed disclosures on their ESG practices. Indian companies are publishing annual Sustainability Report, which gives an idea of their ESG footprint.

Stakeholder Activism and Public Scrutiny: There is a growing awareness and activism among various stakeholders — consumers, employees, local

Global challenges such as climate change, social inequality, and the need for transparent governance are driving investors, regulators, and consumers to demand more responsible corporate behaviour, in the specialty chemicals industry, where environmental and social risks are significant.

communities, and even governments — regarding the environmental and social impacts of corporate activities.

For specialty chemicals companies, which often handle hazardous materials and processes, and with 50+ reported accidents in last 4-5 years leading to death of workers, the potential for negative impact is high, making them targets for public scrutiny. Products developed with safer processes, reduced waste or improved energy efficiency appeal to eco-conscious buyers, affecting purchasing decisions and brand loyalty.

Supply Chain and Operational Risks: Large companies now require their suppliers to adhere to ESG criteria to minimize their own indirect environmental and social footprints. This trend has led smaller Indian companies to seek EcoVadis certification to fulfil customer demands in Europe and USA. Operationally, companies with no/ low ESG performance may face disruptions or inefficiencies in operations, lead to resource scarcities or workforce discontent due to safety issues.

Reputation Risks: Companies that fail to meet ESG standards or that are perceived as lagging in sustainability efforts can experience serious brand damage and customer attrition. The market may avoid companies that neglect environmental responsibilities or social ethics. For instance, chemical spills/ accidents in plant can lead to negative publicity, consumer boycott, and loss of investor confidence.

ESG Challenges

Sustainability Accounting Standards Board (SASB) provides a framework that assists companies across 77 industries, including the chemical sector, in disclosing sustainability information pertinent to investors. These standards pinpoint the sustainability-related risks and opportunities that are likely to influence a company's cash flow, financing accessibility, and cost of capital. Additionally, they specify the disclosure topics and metrics that are considered most beneficial for investors, helping chemical companies identify and communicate their material sustainability issues effectively.

Environmental Challenges

The specialty chemical industry is known to be one of the major waste generating industry. The E-factor for specialty chemicals industry, defined as kg of waste generated per kg of end product, ranges from 10 to 100. It is known to be water-intensive, and produces a large amount of hazardous waste. Many SMEs operate their plants with limited regulatory and safety compliances. This not only poses serious environmental risks but also exposes companies to legal and financial penalties. Some of the key issues to overcome these challenges are elaborated below.

Waste Management Innovations: Companies are exploring green chemistry, efficient reactors to reduce waste generation and recover chemicals from effluent streams, showcasing an effective model of sustainable

Some of the key issues under SASB

Relevant Issues (10-26)

Environment	Social Capital	Human Capital	Business Model and innovation	Leadership and Governance
GHG Emission	Human Rights & Community Relations	Labour Practices	Product Design & Life cycle Management	Business Ethics
Air Quality	Customer Privacy	Employee Health and Safety	Business Model and Resilience	Competitive Behaviour
Energy Management	Data Security	Employee Engagement, Diversity and Inclusion	Supply Chain Management	Management of the Legal & regulatory Environment
Water & Waste Water Management	Access & Affordability		Materials Sourcing and Efficiency	Critical Incident Risk Management
Waste & Hazardous Materials Management	Product Quality & Safety		Physical Impact of Climate Change	Systematic Risk Management
Ecological Impacts	Selling Practices & Product Labelling			

SASB Disclosure Topics for Chemical Industry

development & waste management. We have developed processes for a specialty chemical company to recover acetic acid, DMSO and copper from effluent streams. Two of these processes are being commercialised. One of the authors has worked on recovery of ammonia from effluent stream, and converted phosgenation operation to produce chloroformates from batch to continuous thereby reducing by-product formation & waste generated.

Energy Consumption: Energy consumption is another key issue. Waste heat recovery to reduce overall energy requirements, is a step towards mitigating this challenge. Converting batch to continuous process, improved agitator design for batch reactors, etc. have helped companies to reduce the energy usage. In one of the partial oxidation reactions by a well-established company, significant heat generated is recovered and used to produce steam.

Product Design and Lifecycle Management: Due to the hazardous nature of chemicals, by focusing on the entire product lifecycle—from raw material to end-of-life disposal, companies can reduce their ecological footprint and create safer, more sustainable products using green chemistry/ technology approach. This practice not only minimizes the adverse impacts on human health and the environment but also positions companies as industry leader in innovation, sustainability and open up new business opportunities.

Social Challenges

Socially, the industry is grappling with health and safety issues; with regular accidents and gas leakages, which has killed people or affected the workers & neighbourhood population. Despite regulations like the Factories Act and Chemical Accident Rules, compliance varies significantly, especially among SMEs. These companies are often vulnerable to business interruptions and liability risks due to inadequate safety measures, poor handling of hazardous materials, unskilled workers operating the plants etc. Companies must enhance their governance structures to include robust annual safety audits, emergency planning, and comprehensive health and safety assessments that align with global standards.



Governance Challenges

The governance issues underscore the importance of strategic management and adherence to regulatory standards to promote sustainable development and maintain competitiveness. Indian chemical companies are increasingly embedding sustainability into their operations, influenced by leadership commitment and organized governance, with comprehensive ESG measures reported in accordance with Indian and international sustainability standards such as SASB and Global Reporting Initiative (GRI). Key actions reported by a couple of companies in their sustainability reports are listed below:

Environment

Deepak Nitrite: Installed Mechanical Vapor Re-compression and Multi Effect Evaporators, complemented by Reverse Osmosis resulting in zero liquid discharge, 100 KLD of water saving and recycling over 420,000 KL of wastewater. Waste segregated, labelled, and transported as per Hazardous and Other Waste Rules, 2016. As a result, 86% i.e. 45,158 MT of waste generated sent to recyclers to create value-added products, and 19,033 MT of co-processing waste utilized as alternative fuel in a third-party cement plant.

Navin Fluorine: Implementation of 'Clean Development Mechanism' project that aims to reduce GHG. It employs a thermal oxidizer, an advanced unit that effectively decomposes hazardous waste gases at high temperatures, including the high global warming potential gas R23. Over the last four years, it has cut emissions by 5271 TCO₂. Low carbon fuel and renewable energy initiatives have significantly cut

reliance on coal by using natural gas and solar power, reducing GHG emissions by 19.62%.

Social and Governance

Privi Organics: ISO 45001 certified sites with regular third-party audits to ensure occupational health and safety; Tailored guidance provided by Learning Management System (LMS) on reporting and investigating work-related incidents, identifying hazards, and assessing risks for corrective action; Regular employee consultation forums held like safety committees at each facility. These measures have resulted in zero lost-time accident frequency rate.

Navin Fluorine: Over 30% of raw materials procured from ISO 9001, ISO 14001 certified and socially responsible suppliers. Spent 52% of the procurement budget on local suppliers to enhance community development.

ESG Integration into Operations and Supply chains

To effectively integrate ESG principles into their operations, specialty chemical companies in India should concentrate on a few key strategic areas as illustrated below.

Enhance Research and Development: Investing in R&D and Green Chemistry is essential for developing sustainable products and processes, which reduce or eliminate hazardous substances. This not only meets regulatory requirements but also positions companies as leaders in innovation. For instance, companies can focus on developing bio-based chemicals or improving process efficiency to reduce waste. Since 2011, DuPont has allocated USD 879 million towards R&D specifically targeting products that offer measurable environmental advantages. From these initiatives, DuPont has generated annual revenues of USD 2 billion from products that lower GHG emissions, and an additional USD 11.8 billion from products that utilize non-depletable resources.

Implement Sustainable Sourcing: Sustainable sourcing involves procuring raw materials in a way that minimizes environmental impact and supports social welfare. This means choosing suppliers who adhere to strict environmental standards and who implement ethical labour practices. MNCs and large companies have started working with their suppliers

to adopt & adapt sustainable chemicals manufacturing processes.

Advance towards a Circular Economy: Transitioning to a circular economy involves redesigning processes and products to minimize waste, ideally enabling the continual use of resources. Few Specialty Chemicals companies have started recovering chemicals/solvents from the waste stream & reuse them. This not only helps in reducing the cost of effluent treatment but improves the profitability by recycling the recovered raw materials and selling the by-products recovered. Companies have also been recycling water by segregating various streams e.g. boiler blowdown, and treating them appropriately. This approach reduces the load on ETP and helps the company to improve carbon footprint and profitability

Conclusion

To drive these strategies forward, specialty chemical companies should establish dedicated sustainability team tasked with integrating ESG goals into corporate strategies and operational protocols. This team can leverage advanced analytics to monitor sustainability metrics and ensure compliance with global ESG standards. Additionally, fostering a culture of sustainability within the organization through employee training and engagement programs can enhance adoption of these practices across all levels of the company. By concentrating on these strategic areas, companies can not only adhere to evolving global standards but also leverage ESG compliance as a competitive advantage, fostering innovation, enhancing operational efficiencies, and building a sustainable business model. ■

Opportunities to increase usage of non-metallic materials in Process Piping

Recent times have seen rise towards use of non-metallic materials in piping across various industries including chemical processing, oil and gas, metals and mining, and wastewater treatment. Major reasons for this trend are unique benefits of using non-metallic materials like excellent resistance to corrosion and chemical attacks, high strength to weight ratio, lower total cost of ownership, low coefficient of friction with smooth surface finish and low carbon footprint. **Nirav Bhatt, Manufacturing & Technology / India, Bechtel India & Bagesh Kumar, Manufacturing & Technology / India, Bechtel India** provide an in-depth overview of the potential applications of non-metallic materials, focusing on key factors such as maximum operating temperature, yield strength, UV resistance, corrosion resistance, availability of sizes, ease of installation, joining methods, carbon footprint, recyclability, and average costs.

Non-metallic materials have two main categories—Thermoplastic and Thermosetting. The key difference between them is their behavior when exposed to heat. Thermoplastics can be repeatedly softened by heating and hardened by cooling, whereas thermosetting are infusible and insoluble after cured by heat. Industry has seen extensive usage of both type of materials primarily in water and corrosive waste related services in underground for many years. However, recent trend across all industries has been to replace conventional steel pipes to non-metallic pipes wherever possible. This paper overviews its possibility by briefing across following key areas: Maximum Operating temperature, minimum yield and UV resistance, corrosion resistance against certain fluid services, availability of sizes, ease of installation and joining methods, carbon footprint throughout life cycle, recyclability, and average costs.

Based on popularity, market availability and application, this paper focuses on below materials:

- High Density Polyethylene (HDPE) and Polypropylene (PP-H) - Polyolefins thermoplastic family
- Poly Vinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) – Vinyl thermoplastic family
- Polyvinylidene Fluoride (PVDF) – Fluorinated thermoplastic family
- Glass Fiber Reinforced Plastic with Epoxy Resin (GRE) – Thermosetting composite family

There are other materials like Polytetrafluoroethylene (PTFE), Ethylene chlorotrifluoroethylene (ECTFE), Perfluoro alkoxy (PFA) which demonstrate excellent resistance to chemicals and can be used at elevated temperatures. However, these materials have higher costs, and are usually identified as liner materials to metallic pipes. Hence, they are excluded from consideration for pressure pipe materials in this paper.



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Introduction of Materials

Below is a summary of the non-metallic materials discussed in this paper.

Polyethylene (C₂H₄)_n : Polyethylene is a type of polymer, composed of long chains of repeating ethylene monomers. There are several types and variations of polyethylene, including Low-Density Polyethylene (LDPE), Medium-Density Polyethylene (MDPE), High-Density Polyethylene (HDPE), Linear Low-Density Polyethylene (LLDPE), Ultra-High Molecular Weight Polyethylene (UHMWPE) as well as Cross-Linked Polyethylene (XLPE). HDPE is widely used and popular among them.

Polypropylene (C₃H₆)_n : Polypropylene, also known as polypropene, is a thermoplastic polymer made from the polymerization of propylene monomers. PP-H and PP-R are two types of polymers within polypropylene. PP-H is a homopolymer consisting of only propylene monomers, whereas PP-R contains both propylene and a small percentage of another monomer, typically ethylene.

Polyvinyl Chloride (H₂C-CHCl)_n : PVC is the largest volume in the vinyl family of plastics. It is a versatile synthetic polymer made from vinyl chloride monomers through polymerization. Overall, it has excellent basic properties, can be easily processed, joined, and is exceptionally economical in cost.

Chlorinated Polyvinyl Chloride (C₂H₃Cl)_n: It is derived from polyvinyl chloride (PVC) through a chlorination process. This process involves introducing chlorine molecules into the PVC polymer matrix. The result is a material that combines the inherent

properties of PVC with improved heat resistance and chemical resistance (This chemical formula is for CPVC with 67% Chlorine)

Polyvinylidene Fluoride (C₂H₂F₂)_n : Polyvinylidene Fluoride is a high-performance thermoplastic polymer derived from vinylidene fluoride monomers through a polymerization process. It is known for its exceptional chemical resistance, thermal stability, electrical insulating properties, and mechanical strength.

Glass Fiber Reinforced Plastic with Epoxy Resin: It is a composite material consisting of layers of glass fiber fabric embedded in an epoxy resin matrix. This combination of materials results in a high-strength, corrosion-resistant, and durable material.

Maximum Temperature, Minimum Yield and UV Resistance

One of the most criticized factors for non-metallics is their application limited to low temperatures. Due to their chemical structure, it is well known that these materials have low melting points and lower mechanical strength. Adding to that, some have poor resistance to ultraviolet (UV) radiation from the sun. It limits their usage in above ground applications in process industry. Table 1 summarizes the temperature, yield strength and UV resistance for these materials. These are commonly accepted values, and attention shall be given to system specific limitations / opportunities while selecting their usage for certain applications. Latest technologies use various additives to enhance UV resistance of certain plastics.

The temperature and yield values mentioned in this table are for long term usage based on

Material	Max. Temp. (°F)	Min Yield (psi)	UV resistance
HDPE	140	3000	Good UV resistant after carbon black addition
PP-H	210	4500	Poor UV resistant, will degrade quickly even with paints
PVC	140	7000	Resistant to short term UV exposure, continuous exposure for prolonged period leads to damage
CPVC	200	7000	Resistant to short term UV exposure, continuous exposure for prolonged period leads to damage
PVDF	200	7700	Strong UV resistant
GRE	220	5800-17000**	Strong UV resistant
** This is indicative range based on certain catalogs. The average yield of GRE can vary, depending on the specific formulation, manufacturing process, and product specifications of the GRE material used. It can be even more than indicated in some cases.			

Table 1: Maximum Operating Temperature, Minimum Yield and UV resistance

recommendations from ASME (American Society of Mechanical Engineers) standards as well as vendor catalogs. The design factor plays a key role in deciding maximum temperature (and then pressure range) for the system using these non-metallic materials. With right design factor, system owner approval and vendor consultation, these limits can be increased in certain cases for short term as well as long term usage. Some of these plastics are quite customizable and specific to manufacturing processes, hence values shall always be verified from applicable design standards and manufacturers.

Corrosion Resistance

Excellent corrosion resistance against wide range of chemicals is one of the unique factors for these materials. According to IMPACT study done by NACE in 2016, total annual cost of managing corrosion across all sectors of industry was to exceed US \$2.5 trillion, with the Oil & Gas industry accounting for about US \$1.4 billion. Non-metallic materials can save significant costs in long term from this perspective. Below table 2 gives reference to corrosion resistance of these materials against commonly used fluids. Operating temperature plays a vital role in corrosion resistance properties, as with same concentrations, material may not be equally resistant at elevated temperatures. This

table is given only as a preliminary reference, it needs detailed evaluation from material engineer along with consultation from manufacturer before material selection.

Availability of Sizes

In any process plant, pipe sizes vary based on process parameters. Metallic pipes have been evaluated and proven across extensive range of sizes in industry with internal pressure design criteria of hoop stress. In case of non-metallics, sizes depend highly on manufacturing methods, market needs, thickness, and pressure limitations. HDPE is well known for range of sizes available from as small as NPS 0.5 to large sizes of NPS63 and beyond. However, it is not the case with all other plastic materials. Below table shows commonly used sizes with the materials under discussion in this paper.

Ease of Installation and Joining Methods

Non-metallics are easy to manage from transportation to installation due to their flexibility, and lighter weights. They have high strength to weight ratio which contributes to this characteristic. Joining methods for plastics vary based on type and services they are used in. It is not necessary that one method can be used to

Media Group	Fluid / Chemical	HDPE	PP-H	PVC	CPVC	PVDF	GRE	SS316L
Water	Potable, Fire, Sewer, etc.	✓	✓	✓	✓	✓	✓	✓
	Sea Water	✓	✓	✓	✓	✓	✓	⊗
Acids	HNO ₃ ≤ 25%	⊗	⊗	✓	✓	✓	✓	⊗
	25 % < HNO ₃ ≤ 65%	⊗	✗	⊗	✓	✓	✓	⊗
	H ₂ SO ₄ < 70%	✓	✓	✓	✓	✓	✓	⊗
	70% < H ₂ SO ₄ ≤ 96%	✗	✗	✓	✓	✓	⊗	✗
	HCL ≤ 30%	✓	✓	✓	✓	✓	✓	⊗
	CH ₃ COOH ≤ 50%	✓	✓	✓	✓	✓	✓	⊗
Bases	Inorganic (NaOH, KOH, Caustic, etc.)	✓	✓	✓	⊗	✗	⊗	✓
Salts	NaCl, FeCl ₂ , FeCl ₃ , CaCl ₂ , etc.	✓	✓	✓	✓	✓	✓	⊗
Fuels / Oils	Aliphatic hydrocarbons (Methane, ethane, propane, ethene, propyne, etc.)	⊗	⊗	✓	⊗	✓	✓	✓
	Aromatic hydrocarbons (ex. Benzene, Xylene, Naphthalene, etc.)	✗	✗	✗	✗	✓	✓	✓

(✓ - Resistant ⊗ - Conditionally resistant ✗ - Not resistant)

Table 2: Corrosion resistance of non-metallics vs stainless steel (ideal at 68°F)

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Material	Common size range (NPS)	Remark
HDPE	0.5 - 63	
PP-H	0.5 - 20	
PVC	0.5 - 24	Allowable pressure for PVC is highly dependent on size
CPVC	0.5 - 24	Allowable pressure for CPVC is highly dependent on size
PVDF	0.5 - 16	
GRE	0.5 - 72	Sizes up to NPS 156 are defined in AWWA (American Water Works Association) and available in certain supplier catalogs

Table 3: Commonly available sizes for non-metallic pipes

all variety of plastics. Case-to-case attention is needed based on material along with end application. Below are the key methods for joining these materials:

- **Heat Fusion:** This method can be considered as welding of non-metallic thermoplastics, mainly for polyolefins and fluorinated ones. Materials are heated to a state where molten state is reached, creating a bond, and fusing them together. There can be different methods to perform heat fusion. Following four are widely known:

- **Contact Butt Fusion:** It involves simultaneous heating of the ends of two components to be joined, with the physical contact to a metal plate, until a molten state is attained on each contact surface. The plate is lifted, and two surfaces are then brought together under controlled pressure for a specific cooling time, leading to formation of a homogeneous fusion joint.

- **Infrared (IR) Butt Fusion:** In IR butt fusion, a machine with infrared radiation is used to heat the surfaces of thermoplastics, rather than a physical contact to metal plate. It is a fast, non-contact and particulate free joining method eliminating possibility of contamination. It has applications in high purity services.

- **Bead and Crevice Free (BCF):** This method is famous for clean room applications. It uses inflated insert while joining two pipes with the help of heated clamp assembly. It does not generate any weld bead.

- **Electrofusion:** Electrofusion uses implanted metal coils inside fittings to use resistive implant welding. The joint is produced with the help of electricity. This requires separate set of fittings with pre-installed metal coils to facilitate electrofusion.

- **Adhesive bonding / Solvent Cementing:** Solvent

cementing is a common method to join chlorinated thermoplastics PVC and CPVC. It uses different solvents based on requirement, which generates heat during chemical reaction. Solvent evaporates once applied, generating a cooling effect, and leaving a permanent waterproof bond. This needs socket type arrangement for the joint.

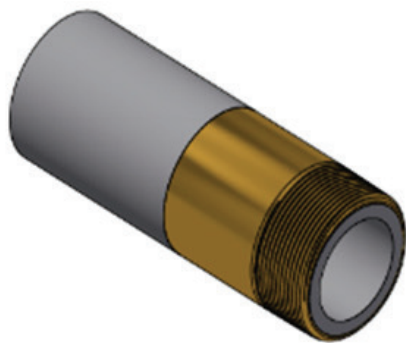
In adhesive bonded methods, an adhesive is used (instead of solvent) between two mating surfaces. Solidification or hardening of the adhesive leads to formation of the bond. Average curing time is around 2 hours for this type of joint, however it varies based on temperature and size. Adhesive bonding is used to join some of the GRE pipes.

- **Laminated joint:** This method is prominently used in GRE pipes. Two straight ends of pipes are aligned together, then resin mixed with catalyst is applied on the joining location, consequently wrapped with suitable fiberglass materials. Average curing time is 4 to 8 hours for this type of joint.

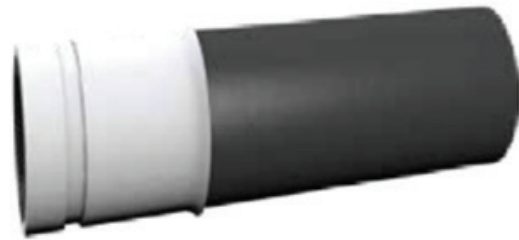
Above joining methods are relatively simple compared to welding of metallic materials. Some methods may take longer curing time than other, but they are not much critical since usually these joints oversee low pressures. However, proper training and certification are needed for joining personnel involved in all cases.

When it comes to joining non-metallic pipe to metallic pipe, there are multiple options available. Most popularly known are mechanical connections like flanges and threaded fittings, which are flexible connections. However, there are also transition pieces available in market, where one side is with non-metallic material and other side is with metallic material. They can be directly used for transition from metallic to plastic pipes. Below are examples of such transition pieces with HDPE to Metallic connections.

Figure 1: Transition pieces for Plastic to Metallic connection [5]



HDPE to Brass
(Plain End x External NPT)



HDPE to Carbon Steel Epoxy Coated
(Plain End x Grooved End)

Carbon Footprint and Recyclability

As world is heading towards sustainability goals with target of reducing carbon emissions, all industrial sectors are under pressure to reduce their own carbon footprints. Since preliminary source of non-metallic materials are petrochemicals, it gives first impression that they leave more carbon footprint than metallic materials. But when dived deeper into their complete lifecycle, it turns out to be otherwise.

Since calculating life cycle carbon footprint involves lot of variables and considerations, even an example can lead to complex calculations beyond scope of this paper. However, certain references are noteworthy out of numerous studies conducted by various agencies as well as individuals.

As per one paper published in Journal of Cleaner Production under Science Direct, non-metallic composite pipes were found to have a lower carbon and energy footprint than carbon steel pipes. The stages were assessed from the raw material extraction to the installation phase. The reduction in CO₂ emissions can reach up to 60% while the energy footprint can be reduced by up to 50%.

There is another study referred within the same paper, where a considerable reduction in CO₂ emissions was reported, ranging from 40% to 90%, when using plastic pipes (PVC and HDPE) compared to ductile iron pipes.

When it comes to recyclability, HDPE and PP-H are easy to recycle and commonly found in recycling programs. PVC and CPVC (Chlorinated Polyvinyl Chloride) are also recyclable, but the recycling process can be more complex and may vary compared to other plastics due

to the need to separate different PVC formulations. Similar can be said for PVDF which is recyclable but needs attention on methods and specific facilities. GRE is more complex to recycle due to requirement to separate resin and fiber. It varies based on specific epoxy and glass used within the composition and involves more costs with highly specialized process of recycling.

Average Cost

In general, non-metallic materials can be cheaper than metallics including carbon steel and stainless steel. However, it depends on several factors, including the type of material, size, thickness, application, and performance characteristics. It requires detailed cost comparison specific to plant type, total quantum, location, and variety of sizes to conclude. Though following parameters can be a good starting point for evaluation:

- **Material cost** : Basic plastics like HDPE, PVC, PP are often less expensive than steel based on per unit costs. GRE (Glass Reinforced Epoxy) and other composites can have wide range of costs based on resin, reinforcement, and manufacturing processes. Material costs can fluctuate based on market conditions.
- **Installation cost**: The cost of labor and installation can vary significantly depending on locations and criticality between non-metallic and metallic materials. As discussed earlier, non-metallics are often lighter, easier to work with and have simpler joining methods. This can lead to overall less costs during installation.
- **Maintenance cost**: Non-metallics are superior in corrosion resistance and usually have longer life span

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compared to the metallic materials. They need less maintenance over time, potentially reducing overall costs.

In summary, while non-metallic materials can be cheaper than steel in most of the cases, the decision should be based on a careful evaluation of the specific application's requirements and the overall cost-effectiveness, which includes factors beyond the initial material cost.

Other Considerations

There are other considerations while exploring application of non-metallic pipes for process industry. They vary on case-to-case basis and detailed analysis is beyond scope of this paper. Here is brief about two of them.

Co-efficient of thermal expansion

Plastics typically have a larger coefficient of linear thermal expansion compared to metals. So, subjected to the same change in temperature, a plastic will generally expand (or contract) more than a metal. However, it is noteworthy that plastics will typically have a much lower coefficient of thermal conductivity than metals. Hence when it comes to rate of thermal expansion, metals tend to expand (or contract) faster than plastics, even though absolute linear expansion of metals will be less than plastics at certain temperature change.

Pipe supporting

Supporting of non-metallics needs special considerations in design. Plastic pipes usually need more supporting due to their flexibility and low modulus of elasticity. Moreover, larger coefficient of thermal expansion plays role in deciding location of pipe loops, anchors and guide supports. Plastics also have unique joining methods. So, when it comes to modular construction, some supports may need to be loosened up to facilitate joining of pipes between two modules. This sometimes demands involvement of fabricators and installers during design phase.

Conclusion

Non-metallic materials have their own advantages and disadvantages. Excellent corrosion resistance, flexibility, ease of handling, lower costs and low carbon footprint are remarkable advantages. Whereas

low range in design temperature-pressure and UV resistance limits are major restrictions. There are other factors to be considered like pipe supporting, coefficient of thermal expansion while using them in piping design. However, intent of this paper is to brief about certain non-metallic materials and opportunities to use them within the parameters they offer.

Usage of non-metallic materials can be encouraged in all cases where high mechanical strength and resistance to elevated temperatures are not required. For applications with operating temperatures below 250°F, with low to medium exposure of UV radiation, these materials can be an excellent first preference considering the other advantages listed in this paper. Detailed analysis shall be done based on system design and relevant parameters before going ahead with specific material grades.

Looking at the future, these materials have the scope for substantial number of applications. With proper consideration in design, in consultation with plant owner and expertise of manufacturers, there can be potential savings in long-term overall costs and reduction in carbon footprint by choosing right non-metallic materials. ■

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Exploring Chlor-Alkali Dynamics: Challenges, Prospects, and Growth Trajectories



ALVIN ANG

Executive Director
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It was an honour and privilege to have S&P Global Commodity Insights at the inaugural Chlor-Alkali World Expo & Conference. Amid geopolitical tensions and supply chain disruptions, the chlor-alkali industry faces significant uncertainties. However, by focusing on key macroeconomic drivers and demand growth in related sectors such as construction and automotive, there is optimism for industry players who can navigate these complexities. **Alvin Ang, Executive Director of S&P Global Commodity Insights**, sheds insight into the intricate interplay of factors shaping the chlor-alkali market's trajectory, highlighting its challenges, opportunities, and future prospects.

The chlor-alkali market is highly correlated to several downstream sectors, among which the global housing market has been experiencing a slowdown since 2022. At the same time, the surge in electricity prices in Europe severely curtailed the energy-intensive production of chlor-alkali in the region.

The myriad challenges created doubts on the future of the chlor-alkali market. Compounding the complex landscape is the seemingly rising prevalence of black swan events. Heightened geopolitical tensions around the world and the prospects of wars are becoming

topics of discussions in corporate boardrooms. Certain supply chain issues have evolved from mere hiccups to longer disruptions. Logistical bottlenecks and diversions, including incidents at chokepoints such as the Panama Canal and the Strait of Hormuz, along with a bridge collapse leading to a blockade of the Baltimore port, a key hub for U.S. shipping, have added stress to operations.

Understandably, there is a sense of weariness in the air. Nevertheless, S&P Global Commodity Insights is anticipating industry players capable of navigating

current challenges would benefit from demand growth over the next decade and beyond. The buoyant outlook is supported by the relevant macroeconomic drivers and the growth in related industries.

Conducive macro environment supports Chlor-alkali consumption

In 2023, India and China represented 22% of the global oil consumption and 27% of the global ethylene demand combined. Accounting for 36% of the world's population, nearly 40% of the global automobiles were produced in the two countries. As much as 53% of the global polyvinylchloride (PVC) demand came from India and China, higher than the 41% for the other common thermoplastic, polyethylene.

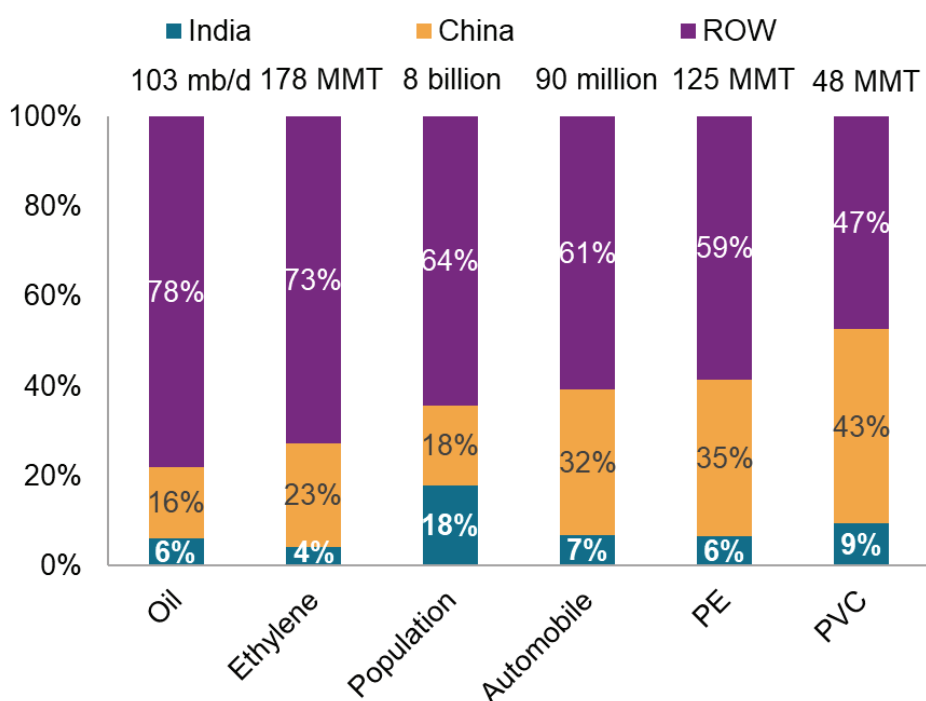
With China and India responsible for over half of the world's PVC consumption, the strong GDP growth rates forecasted by economists from S&P Global for the two countries – 4.7% and 6.5% respectively in 2024 and 4.5% and 6.1% respectively in 2025 – bode well for PVC demand. This compares with the global GDP growth forecast at 2.6% for 2024 and 2.7% for 2025. The Eurozone which saw a GDP growth of only 0.5% in 2023, is forecasted to enjoy a slight recovery in 2024 with the GDP growing 0.6% before a larger rebound in 2025 with

1.4%.

A few fields of consideration while making an analysis of Chlor-alkali industry

▪ **Construction spending and its impact on Chlor-alkali** : Despite the sustained gloomy data on the Chinese property market, S&P Global Market Intelligence is projecting the construction spend in China to grow at a CAGR of 6.4% over the next ten years. This is slower than the projected growth rates for India, Africa, and East Europe. However, China constituted nearly one-third of the global construction spending in 2023, larger than Europe as a whole. The U.S. was half the size of China's at USD1.9 trillion in 2023, with a forward 10-year CAGR of 2.8%. China would stand for an even bigger share ten years forward, building on its large base to rise from USD4.0 trillion in 2023 to USD7.4 trillion in 2033.

▪ **Rising Urbanisation - effects and benefits** : Rising urbanisation is a major driver of the steady climb in construction spending. Three major population centres – India, China, and Africa – are projected to see higher urbanisation over the next two decades. China's city dwellers would swell to over three-quarters of its total population by 2043, up from just half in 2013. India's urbanisation would grow to nearly 50% of its projected population exceeding 1.6 billion by 2043. Nearly half of all Africans would live in the cities by 2043, even as the population on the continent balloons by around 50% to more than two billion. The twin engines of urbanisation and population expansion would also buoy the consumption of chemicals and plastics in areas like medical care (chlorine intermediates in pharmaceuticals and vinyls in medical products), soap and detergents, and textiles. In addition, more city dwellers typically suggest higher income and a greater propensity to own or use a car.



Source: S&P Global Commodity Insights.

China+ India demand vs rest of the world

▪ **Automotive growth and Chlor-alkali demand:** For China, the automotive growth story is not just about wealthier Chinese, but also production for exports. For India, the Make In India initiative has spurred an expansion in domestic production. India's vehicle output is projected to come close to that of Japan and South Korea combined by 2033; thereafter, surpassing the two traditional majors. This would be an incredible feat with material implications on chlor-alkali consumption, especially when more of the new vehicles would be equipped with large batteries, along with the ongoing light weighting endeavours benefitting plastics like vinyls and polyurethanes.

▪ **Battery story :** Indeed, the skyrocketing battery demand and the associated metals has led to governments around the world looking to extract greater value from their natural resources. Following an export ban on nickel ore to facilitate the growth of its domestic processing industry, Indonesia has experienced a rapid climb in the export value of processed nickel in the past few years. Nickel exports hit \$22 billion in 2023, up massively from \$1.4 billion in 2014.

Riding on the success, Indonesia sought to employ the same playbook on bauxite, enforcing a ban on bauxite exports from June 2023. However, Indonesia has insufficient bauxite-processing capacity, limiting the benefit for caustic soda. Nevertheless, that situation should improve soon. Metals and mining, together with chemicals and plastics, constituted around half of Indonesia's 2022 foreign direct investments (FDI),

according to Statistics Indonesia. Collectively, 2022's FDI gained more than 60% year-on-year. Some of that money should find its way into expanding bauxite processing. At the same time, the categories of food, property, and others are also seeing higher FDI, a positive for chlor-alkali utilised as intermediates and processing agents.

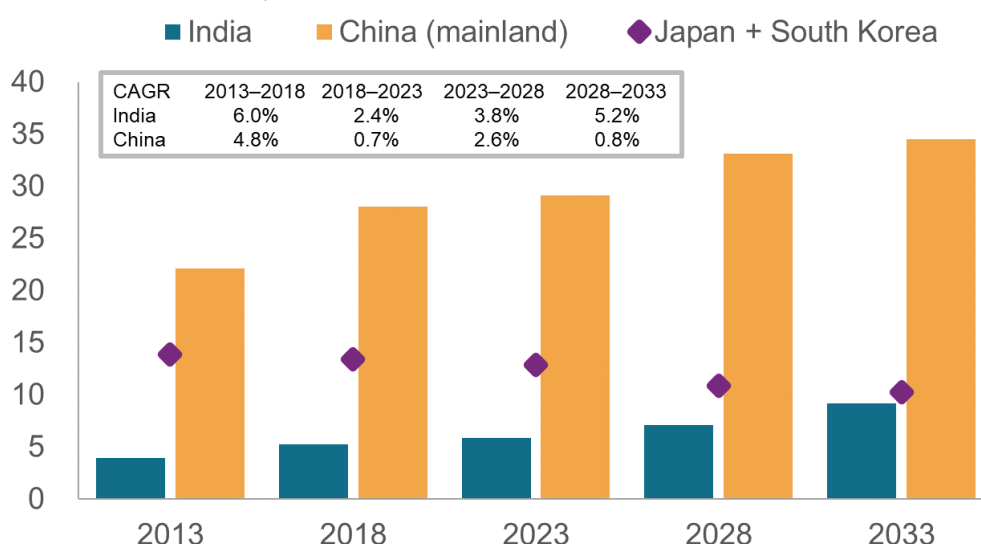
▪ **Indonesia's playbook on bauxite:** Indonesia is not alone. S&P Global Market Intelligence has forecasted the gross output from the mining of metals and stone globally to grow at 4.0% CAGR in 2023-2033, up from just 1.3% CAGR in 2018-2023. Substantial growth is expected from China, Central and South America, Southeast Asia, as well as Australia.

▪ **Global growth in mining and paper making :** Paper making, another chlor-alkali application, would see every region contributing to the faster global growth over the next decade. The gross output from paper and paper products is projected to grow at a CAGR of more than 2% in 2023-2033, up from -0.6% in 2018-2023. Last year, I visited two leading paper research institutions where the researchers opened my eyes to the advanced technologies on pulp and paper developments and the potential for paper consumption growth. One was the Indian Institute of Technology Roorkee, Saharanpur Campus, formerly known as The Institute of Paper Technology. The other was in China – the Institute of Chemical Industry of Forest Products.

▪ **Positive GDP growth rates bode well for PVC demand:** Converters making PVC products such as pipes, vinyl

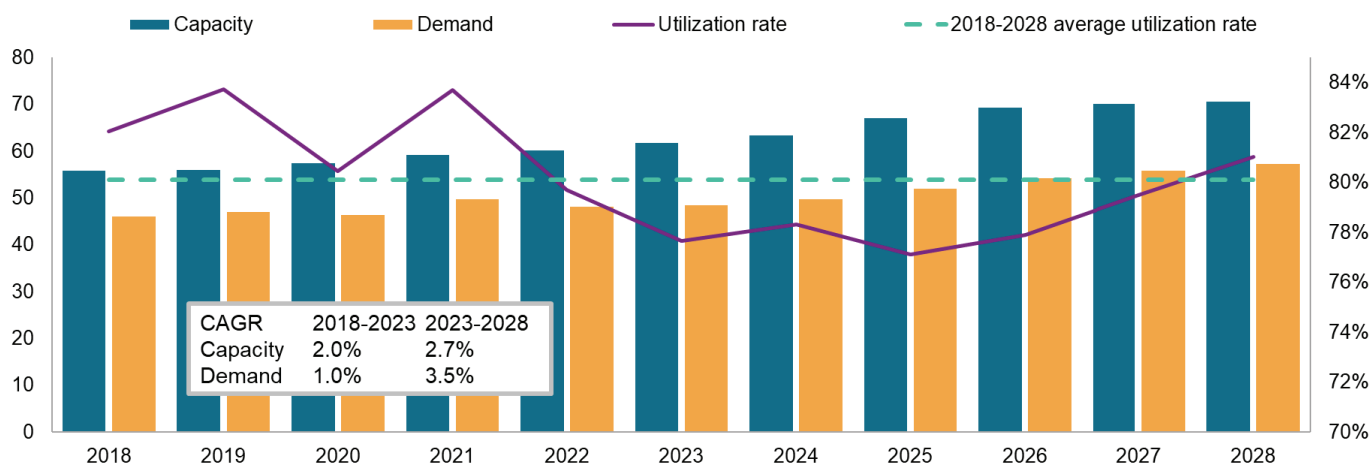
floorings, ceiling panels, window and door profiles, decorative wall coverings, etc. are beneficiaries of the construction boom ahead. Chlorine is also consumed in the making of raw materials such as polycarbonate, epoxy resins, and polyurethanes that are used in the manufacturing of household appliances, consumer products, furniture, and electronics. Drilling down deeper into the macroeconomic forecast,

Vehicles Production, million



Source: S&P Global Market Intelligence.

Global PVC capacity & demand, million MT



Source: S&P Global Commodity Insights.

we see greater positivity. Over the next decade, infrastructure spending on water and sewers is projected to enjoy double-digit percentage

CAGR in countries like India and Indonesia (both at around 15%), more than double their GDP growth rates. China, with its relatively advanced developments, is still projected to spend 8.4% CAGR through 2033 on infrastructure, higher than the 7.8% for the world. PVC will enjoy a considerable share of this spending given that PVC is the leading material in clean water access and sewage handling projects, riding on its low failure rate, longevity, and cost-effectiveness. In mature markets, there is replacement demand from damaged pipes and older ones, including those made from asbestos cement and galvanized iron.

Acceleration in PVC demand growth to underpin higher chlor-alkali production

Caustic soda is industrially co-produced with chlorine. As chlorine is not easily stored or shipped overseas, only when producers can find takers for chlorine would producers make adequate caustic soda to satisfy demand. PVC is the largest chlorine consuming segment, constituting around one-third of chlorine demand in 2023. In the forecast released by S&P Global Commodity Insights in early 2024, the global PVC demand would grow at a five-year CAGR of 3.5% in 2023-2028, more than tripling the 1.0% CAGR in the prior period (2018-2023).

The PVC outlook is supported mainly by a recovery in the traditional markets of China, Europe, and the U.S.,

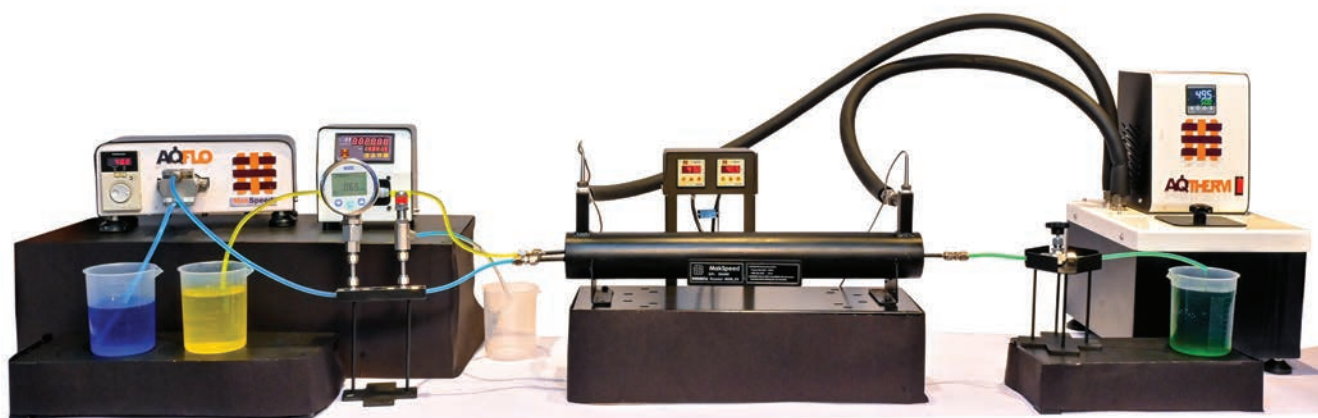
as well as robust growth from developing countries like India that are leveraging on the many excellent physical properties of the versatile plastic. From 2018 to 2033, South Asia's PVC demand is forecasted to grow more than 70% to reach 6.7 million metric tons, predominantly thanks to the voracious appetite of India.

Conclusion

Coupled with the aforementioned chlorine demand drivers, there appears to be ample room for increases in the co-production of caustic soda to fulfil the anticipated consumption growth. An area to watch would be the pace in the adoption of renewable energy in producing chlor-alkali. The green credentials, by-production of green hydrogen, and potential cost-savings over fossil-based electricity could stimulate additional demand growth surpassing our base case. For the derivatives, their appeal could be boosted by an escalation in the use of bio-based feedstocks and recycling. ■

Process Intensification in Chemical Manufacturing: Transitioning to Continuous Flow

The chemical manufacturing industry is evolving to become safer, more efficient, and environmentally friendly each day. Discover the transformative shift from traditional batch processing to innovative continuous flow systems. **Dr. Makarand Pimplapure, MD and Founder MakSpeed Technologies**, reveals the challenges of conventional methods, particularly in nitration and chlorination, and showcases how cutting-edge flow chemistry is revolutionizing the field production and its remarkable benefits.



Chemical processing has long relied on batch processing as the standard method for numerous reactions, including nitration and chlorination. This traditional approach involves processing a set amount of material in a single, confined batch, with the focus on safety and control. Ensuring safety is a critical aspect in these processes, typically achieved by implementing several strategies aimed at reducing the reaction rate. Key strategies include:

- **Semi-batch Conditions:** By controlling the concentration of reactants to a minimal level, the semi-batch approach helps mitigate the risk of uncontrolled reactions. This is especially important in highly exothermic reactions like nitration and chlorination, where excessive heat release can be hazardous.
- **Large Amounts of Solvent:** Using a significant quantity of solvent serves dual purposes. It

dilutes the reactants, reducing their effective concentration, and acts as a heat absorbent, thus helping to control the temperature and avoid hot spots that could lead to runaway reactions.

- **Lower Temperatures:** Conducting reactions at lower temperatures inherently slows down reaction rates, providing another layer of safety. This is particularly crucial for maintaining control over highly reactive processes.

These features are not just safety measures but also integral to the overall effectiveness of batch processes, particularly for nitration and chlorination chemistries. However, when these processes are transitioned to continuous processing, many of the inherent limitations of batch processing are overcome due to the distinct advantages of continuous flow systems. The benefits of continuous flow processing include:

- **Simultaneous Feeding of Reactants:** Continuous flow processes require the simultaneous and

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continuous feeding of all starting materials, which ensures a consistent and controlled reaction environment. This leads to the highest concentration of reactants being maintained at optimal levels throughout the process.

- **Perfect Mixing:** The design of continuous flow reactors is such that they ensure perfect mixing. This eliminates mass transfer limitations that are often a concern in batch processes, leading to more efficient and uniform reactions.
- **Enhanced Heat Transfer:** Continuous flow reactors are designed to have superior heat transfer characteristics, maintaining nearly isothermal conditions. This is crucial for managing exothermic reactions like nitration and chlorination, where heat buildup can be a significant issue.

Given these advantages, the operating window of flow chemistry differs significantly from that of batch processing. Therefore, the transition from batch to continuous processing can be viewed as a process development or optimization step. Figure 1 shows a typical flow chemistry system used for these purposes, which usually includes a continuous flow reactor, dosing pumps, a utility circulator, and sometimes additional downstream components such as heat exchangers or separation units.

Optimization of Flow Chemistry

Predicting the exact operating conditions or expected results for flow chemistry based on an optimized batch recipe is not feasible. While a qualitative analysis can suggest potential improvements, concrete proof must be obtained through experimental data generation.

Key optimization targets for flow chemistry include:

- **Improvement in Conversion and Selectivity (Yield):** The goal is to achieve higher conversion rates and better selectivity towards desired products. This reduces waste and improves overall efficiency.
- **Reduction in Excess Reactants:** Reducing the use of large excesses of non-limiting components minimizes waste and lowers costs.
- **Minimization of Residence Time:** Reducing the residence time to minutes or even seconds increases throughput and reduces the size of the reactor required.
- **Reduction or Elimination of Solvents:** Minimizing solvent use simplifies downstream processing and reduces environmental impact.
- **Temperature Management:** For cryogenic chemistries, bringing the reaction temperature closer to ambient conditions can significantly reduce energy consumption and operational complexity.

In a laboratory environment, the influence of various parameters on conversion and selectivity is systematically examined to identify trends and refine the optimization strategy. Table 1 shows typical results from an optimization exercise for a nitration process, where each parameter is evaluated individually for its effect on conversion and selectivity. While the individual impact of each operating parameter is studied for understanding purposes, the outcome is the result of their combined effects. Therefore, one should avoid attempting to optimize a single parameter in isolation.

	Feed-A (ml/min)	Feed-B (ml/min)	Residence Time (sec)	Temperature (°C)	Molar Ratio	Product (%)	Impurity (%)
Impact of Residence Time	31	29	10	Low	High	High	Low
	10.3	9.7	30	Low	High	Low	Low
Impact of Mole Ratio at Medium Temperature	37.6	22.4	10	Medium	Low	Low	Low
	34	26	10	Medium	Medium	High	Low
	31	29	10	Medium	High	High	Low
Impact of Mole Ratio at High Temperature	37.6	22.4	10	High	Low	High	High
	34	26	10	High	Medium	High	Medium
	31	29	10	High	High	High	Medium
Impact of Residence Time	68	52	5	Medium	Medium	High	Low
	45.3	34.7	7.5	Medium	Medium	High	Low
First Pass Optimum	118.9	81.1	3	Low++	Medium ++	High	Low
	71.4	48.6	5	Low++	Medium ++	High	Low
	35.7	24.3	10	Low++	Medium ++	High	Low

Table 1: Results of optimization exercise for a nitration process

	Conventional Recator	INTENSEFLO Reactor
Operation	Semi-Batch	Continuous
Temperature	-20 °C	30 °C
Solvent	0.8	0.4
Conversion	0.9	0.99
Batch/Residence Time	—14 hr	—1 min
Byproducts	10-12%	8-10%

Table 2: Shows the result of converting a batch process into continuous processing

Scenario for Considering Alternate Technology

Organizations often consider alternate technology when there is a need for expansion or when the existing process has been used for a considerable time and is commercially viable. If fundamental knowledge indicates that an alternate technology can improve efficiency, reduce waste, and provide other advantages, organizations are open to exploring flow chemistry for specific cases. The expectation from flow chemistry is clear in such scenarios, making the exercise data-driven and ensuring the customer is aware of the potential economic benefits. Clear identification of objectives for flow chemistry is crucial in defining the optimization strategy.

Table 2 shows the result of converting a batch process into continuous processing and compares key performance parameters of the conventional process with flow chemistry.

Results of Process Intensification

Examining the results reveals the extent to which process intensification has been achieved:

- **Residence Time Reduction:** The residence time for the reaction has been reduced from 14 hours (840 minutes) to less than a minute. For a given throughput, the ratio of reactor sizes for batch versus continuous processes will be proportional to their respective residence times. This means that the throughput generated by a 1 kL (1000 liter) batch reactor can be achieved by approximately 1.2 liters of a continuous flow reactor. This result proves that flow chemistry can be used to achieve significant process intensification.
- **Commercial Impact:**
- **Energy Savings:** Operating at ambient temperatures instead of sub-zero conditions leads to substantial energy savings.
- **Reduced Solvent Use:** The reduction in solvent

use decreases the load on downstream separation processes, simplifying operations and lowering costs.

- **Improved Conversion:** Higher conversion rates can eliminate the need for removing unreacted starting materials from the reaction mass, further streamlining the process.

- **Smaller Reactor Footprint:** The significantly reduced residence time means that the production reactor's footprint is much smaller, which can lead to lower capital and operational costs.

- **Byproduct Generation:** Although the reduction in byproduct generation may not represent a substantial economic benefit, it contributes to overall process efficiency and environmental compliance.

Conclusion

This article dives into how flow chemistry can be used to improve traditional batch processes. It focuses on two specific reactions: nitration and chlorination. The article explains why these reactions are particularly well-suited for flow chemistry. It then goes on to detail a strategy for optimizing the generation of flow chemistry data. Finally, it compares the results of batch chlorination with continuous flow chlorination, emphasizing the potential commercial advantages of flow chemistry.

Flow chemistry offers a transformative approach to chemical processing, providing enhanced efficiency, safety, and economic benefits. As industries continue to seek ways to improve processes, reduce costs, and enhance safety, the shift from batch to continuous processing represents a significant advancement in chemical manufacturing. The ability to conduct reactions under more controlled and optimized conditions, with improved heat and mass transfer, positions flow chemistry as a key technology for the future of chemical production. ■

Author



Dr. Makarand Pimplapure
MD and Founder
MakSpeed Technologies

Make in India: Industry Expectations from PVF Manufacturers

Rajiv Gupta, Vice President, Advance Valves, industry expert and advocate for self-reliance, shares his observation about the “Make in India” initiative’s potential to transform the Pumps, Valves, and Fittings (PVF) sector. During the Panel discussion of IAC+ PVF at ChemTech World Expo 2024 in Mumbai, he highlighted opportunities for domestic manufacturing, the challenges of indigenization, and the critical role of stakeholders in fostering a supportive environment to achieve Atmanirbhar Bharat and enhance India’s global competitiveness in the PVF industry.



(L to R) Mr Mohan B Mate, General Manager Manufacturing , BPCL, Mr Rajeev Mathur, Director, HCG Group & Member Chemtech Core Committee, Mr. Rajiv Gupta, Vice President, Advance Valves & Mr. Atul Raje, Managing Director, Samson Controls Pvt. Ltd during panel discussion Make in India for Pumps Valves & Fittings

The “Make in India” (MII) initiative is a national mission aimed at propelling Bharat towards global prominence. It embodies the nation’s heart and soul, driving the stride towards Atmanirbhar Bharat, encouraging Vocal for Local, and establishing India as a global supplier. This mission opens vast opportunities, particularly in the field of Pumps, Valves, and Fittings (PVF), to expand the domestic manufacturing portfolio where either no Indian vendor or only a few Indian vendors exist.

Opportunities in Domestic Manufacturing

The PVF sector presents a significant opportunity for growth by increasing the range of products manufactured domestically. This is particularly relevant in areas where Indian vendors are scarce or non-existent. To leverage this potential, all stakeholders—including consultants, EPC contractors, suppliers, and end-users—must collaborate. By doing so, existing suppliers can expand their portfolios into these underserved areas.

More studies and research can facilitate the development of new applications or improve solutions for difficult applications where limited suppliers currently exist. For instance, the use of Triple Offset Butterfly Valves in large sizes, traditionally dominated by Gate valves, can be promoted. These valves reduce the dimensions and weight of the equipment as well as the supporting structures, making them ideal for flare terminals and potentially for utility headers, fire water systems, isolation, battery limit isolation, and plant shutdown applications.

Moreover, the implementation of fugitive emission certified packings in all services can significantly reduce emissions, saving energy and benefiting the environment. Similarly, the use of metal-seated zero leakage valves for all services can lower energy consumption and maintenance costs, offering a more sustainable and efficient solution.

Challenges in Indigenization

However, the path to indigenization comes with its set of challenges for Indian entrepreneurs and startups. Keeping pace with technological advancements is crucial to remain competitive. This requires the development of specialized skills and facilities, substantial investment in research and development, and overcoming financial challenges. These hurdles must be addressed to fully realize the potential of domestic manufacturing under the MII initiative.

Industry Expectations from End Users, PMCs, and EPCs

In public procurement and projects managed by Engineering, Procurement, and Construction (EPC) companies, tenders often include multiple items like valves and pumps. However, for some items, there might be no Indian vendor or only a few Indian vendors, which are not covered in the tender or project vendor list under MII. This situation prevents domestic bidders from meeting the Prequalification Technical Requirements (PTR) specified in bids.

To address this, prequalification for such items should be based on a qualifying PTR for existing manufacturers through Bid Qualification Criteria (BQC) or open tenders under public procurement. Unfortunately, a level playing field often does not exist in public procurement or EPC procurement, as MII benefits may not be available in EPC executions.

Industry leaders like Engineers India Limited (EIL) have set a commendable example with their notification "Atmanirbhar Bharat @ EIL- Introduction of New Item Categorisation" under MII. This initiative categorizes new items where no Indian vendor or only a few Indian vendors are listed. However, this item categorization does not extend to tenders with multiple items like valves and pumps, where Indian vendors are scarce. Therefore, it is not available for enlistment or enhancement under MII.

Conclusion

The "Make in India" initiative holds tremendous promise for the PVF manufacturing sector, with opportunities to enhance domestic production and foster innovation in areas currently underserved by Indian vendors. However, realizing this potential requires addressing significant challenges, including technological development, skill acquisition, facility enhancement, and financial investment. Stakeholders must work collaboratively to create a supportive environment for Indian manufacturers, ensuring a level playing field in public procurement and EPC projects. By doing so, the industry can fully embrace the spirit of Atmanirbhar Bharat, achieving self-reliance and global competitiveness in the PVF sector. ■

Author



Rajiv Gupta
Vice President, Advance Valves

Optimizing Operational Efficacy: Non-Metallic Energy-Efficient Centrifugal Pumps

In today's competitive industrial landscape, sustainability, efficiency, and compliance are paramount. **Firoj Mulani, Director of Chemitek Process Equipments Pvt Ltd.**, highlights how the non-metallic energy-efficient centrifugal pumps embody these ideals. These solutions reduce costs and carbon emissions, while optimizing operations through innovative design and advanced material. Additionally, their technological prowess ensures reliability and safety, meeting stringent regulatory standards with ease.

In the ever-evolving landscape of industrial operations, the quest for efficiency and cost-effectiveness is perpetual. This is particularly evident in fluid handling, where downtime, along with operations and maintenance costs, can significantly impact productivity and profitability. Recognizing these challenges, Chemitek Process Equipments Pvt Ltd. has introduced the NM Series of non-metallic centrifugal process pumps, specifically designed for industrial fluid handling.

A standout feature of the NM Series is the trapezoidal shape of the non-metallic volute casing, a pioneering design by Chemitek. This unique shape efficiently converts velocity energy into pressure energy, enhancing pump efficiency and performance. The volute casing is constructed using thick-walled polymer molded with metal armor support, ensuring durability and strength even at elevated temperatures, mitigating the risk of minor leakages and extending pump life. Additional features such as casing drain options, flanges drilled with free holes for ease of maintenance, and a top discharge, self-venting, and back pull-out design further enhance the operational efficiency and convenience of the NM Series pumps.

Production of Ethyl Chloride - A Case Study

In the complex realm of chemical manufacturing, a pivotal entity, recognized for its production of

ethyl chloride, assumes prominence. This case study embarks on a journey to uncover significant operational enhancements achieved through the integration of NM Series Centrifugal PFA Pump into its production process. It outlines the challenges encountered and explores how the innovative design and material selection of the pump acted as a catalyst for substantial improvements. These advancements not only bolstered efficiency but also strengthened sustainability and safety within its operations.



N M Series energy Efficient Centrifugal Pump

Challenges

- Operational hurdles due to the existing pump handling Recirculating Hydrochloric acid (HCL) and Ethanol solution at 142°C.
- Excessive noise generation (approximately 90 dB) creating an unfavourable work environment.
- High energy consumption (50 amps) leading to increased operational costs.
- Risks of accelerated wear and tear from harsh chemicals and high operating temperatures.
- Potential impacts on production uptime and equipment safety due to wear-related concerns.
- Search for a solution to effectively transfer chemicals while addressing noise, energy, and wear and tear related challenges

Solution

The Chemitek NM Series Centrifugal PFA Pump emerged as the optimal solution due to:

- Advanced Material Construction:** The NM series utilizes a robust PFA (perfluoroalkoxy) construction, offering exceptional chemical resistance to HCL and ethanol even at elevated temperatures (142°C). This material selection ensures process compatibility and extended pump life.
- Pioneering Trapezoidal Volute Design:** This innovative design optimizes flow efficiency within the pump, leading to reduced energy consumption and improved overall operational costs.
- Twisted Van Support Impeller:** The NM series incorporates a unique twisted van support impeller that enhances mechanical strength and prevents deformation during operation. This translates to smoother pump operation, minimized vibration, and extended equipment lifespan.
- Specialized Internal Double Mechanical Seal:** The NM series features a heavy-duty double mechanical seal with thick and sturdy faces, specifically engineered to withstand the demanding chemical environment and high operating temperatures encountered in company's process.

- Reinforced Bearing Housing and Shaft:** The NM series boasts a robust bearing housing and shaft design that minimizes vibration and ensures reliable operation under demanding loads.

Results

The implementation of the NM Series PFA Pump delivered quantifiable improvements across various facets of the production process.

- Enhanced Energy Savings and Reduced Carbon Footprint:** The NM series pump's lower current draw (28 amps) translates to a potential power saving of approximately 15 kW per hour.
- Considering a power unit rate of INR 11/unit and continuous operation for 24 hours a day, 300 days a year, the annual estimated cost saving is, $(15 \text{ kW/hr} * 24 \text{ hr/day} * 300 \text{ days/year} * \text{INR } 11/\text{unit}) = \text{INR } 11,88,000/-$. Additionally, the lower energy consumption reduces company's carbon footprint & environmental impact through lower greenhouse gas emissions.
- Reduced Noise Levels:** The NM series operates at a significantly lower noise level (76 dB) compared to the old pump (90 dB). This reduction creates a safer and more comfortable work environment for employees, fostering improved productivity and worker well-being.
- Minimized Wear and Tear:** The NM series pump's design features, including its PFA construction



VIBRATION TEST



NOISE LEVEL TEST



CURRENT (AMPS)

Case Study Challenges

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Advantages of the NM Series: Efficiency and Reliability Redefined

The NM Series offers a numerous advantages that set it apart from conventional centrifugal process pumps:

- Compliance with ASME (ANSI) B73.1 dimensional requirements ensures compatibility and interchangeability within existing systems.
- Standardized flange ratings (ASA 150, with ASA 300 optional) streamline installation and maintenance processes.
- Flow-optimum hydraulic design guarantees improved efficiency and reliability, optimizing performance in various operational conditions.
- The trapezoidal shape of the volute casing, combined with the robust polymer-metal armour construction, minimizes leakages and extends pump life, reducing maintenance costs and downtime.

and lower vibration levels (0.77 mm/sec compared to 4.77 mm/sec), significantly reduce wear and tear on the pump components. This leads to:

- Extended pump life, reducing overall equipment replacement costs.
- Reduced maintenance requirements, minimizing downtime and enhancing operational efficiency.
- Lower risk of unexpected equipment failures that can disrupt production.
- Improved Durability and Reliability: The NM series boasts a longer bearing life, superior mechanical seal life, and a robust overall design, ensuring reliable performance and minimizing the risk of unexpected failures that can disrupt production.

Inference

The Chemitek NM Series Centrifugal PFA Pump proved to be a strategic investment for the company. By addressing noise levels, operational costs,



Case study Result

environmental impact, and safety concerns, the NM series pump has demonstrably enhanced efficiency, sustainability, and safety within company' production process. This case study exemplifies how innovative pump technology can contribute to significant improvements in the chemical manufacturing industry. However, this case study presents estimated values based on the provided information. Actual power savings and cost reductions may vary depending on specific operating conditions.

Conclusion

As industries strive to optimize operations and minimize costs, the importance of efficient and reliable fluid-handling solutions cannot be overstated. With the NM Series centrifugal process pumps, Chemitek Process Equipments Pvt Ltd. offers a transformative solution that not only meets but exceeds the expectations of industrial fluid handling. By combining innovative design with meticulous craftsmanship, genuine materials, and a customer-centric approach, Chemitek is paving the way for a new era of Energy Efficient and Reliable Pumping Solution in Process Industries. ■

Author



Firoj Mulani
Director
Chemitek Process Equipments Pvt Ltd

Molecular Filters for Effluents & Emissions Reduction in Manufacturing



DR. PRERNA GORADIA
CEO, Exposome

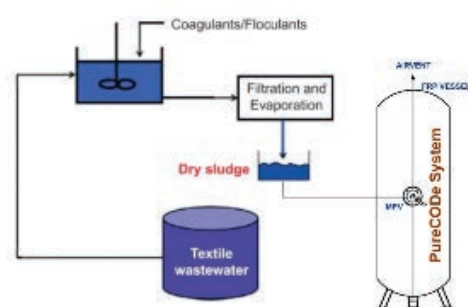
Exposome pioneers and produces advanced molecular filtration technology that empowers manufacturing sectors to recycle and repurpose pollutants from their emissions and effluents. Their proprietary technology, protected by patents, facilitates the extraction of pollutants, including those present in low concentrations in tertiary wastewater and emissions, which are typically resistant to conventional treatment methods. In an exclusive conversation, **Dr. Prerna Goradia, the Founder & CEO, Exposome**, provides valuable insights into this groundbreaking technology, which assists industries in tackling their challenges and attaining greater resource utilization efficiency.

The Indian molecular filtration market for both air and water stood at over USD 685 million in 2022, boasting a Compound Annual Growth Rate (CAGR) of 5.8% in air and 10.5% in water until 2027. Despite such a substantial market opportunity, there is a notable absence of Indian-based manufacturers producing advanced technical media for enhanced and more efficient treatment of effluent wastewater and air emissions. Dr. Goradia remarks, "We identified this gap and recognized the potential for significant growth in this sector. Exposome's vision is to emerge as the most esteemed global technology partner for water and air treatment enterprises, leveraging cutting-edge materials chemistry to deliver scalable and sustainable products."

Identifying technology gaps

Speaking of cutting-edge solutions, she explains that

Tertiary treatment of Textile WW -Remove COD + BOD + Color + Turbidity



Usage of Exposome media PureCODE for treatment of tertiary water in the textile industry

the filter materials for air, branded as "Pur-Safe," are both selective and long-lasting. They are specifically engineered to eliminate pollutants like SO_x, NO_x, carbon monoxide, hydrogen sulfide, hydrocarbons, carbon disulfide, and microbes. The technology

developed by Exposome is world-class, unique, and protected by patents. She elaborates, "We've developed a regenerable chemisorptive process that effectively removes targeted contaminant gases through adsorption, absorption, and chemical reactions (neutralization). Hazardous gases are captured within the media and transformed into harmless solids, which are then recycled as raw materials, reflecting our belief that waste is a misplaced resource." Their wastewater treatment solutions, known as "PureCODE," are also cutting-edge and contribute to producing cleaner water from various industrial streams such as paper and pulp, textiles, food, pharmaceuticals, and metalworking. "We also provide materials for clean energy production, including advanced electrodes and separators. For instance, we specialize in manufacturing advanced carbon-based molded electrodes in custom form factors," she further explains.

Industry wide acceptance

The technologies are gaining significant recognition, and Exposome is collaborating with numerous large and medium-scale industries across sectors such as oil and gas, textiles, wastewater, and paints. Currently, the company boasts over 35 engagements with both local and global organizations. Exposome's world-class innovations facilitate cleaner air and water, as well as the prevention of food spoilage. Their clean antimicrobial additives and thin-layer coatings aid in safeguarding everyday items from microbial infestation and bacterial growth, while their environmental sensor products enable enhanced monitoring

Value proposition

Other existing technologies in the market, such as dust collectors, mist collectors, HEPA filters, cartridge filters, baghouse filters, wet scrubbers, and dry scrubbers, are cost-effective but have their limitations. They are ineffective in capturing pollutants at low concentrations and cannot be regenerated. Their main objective is to remove particles from the stream, which presents Exposome with an opportunity for tertiary treatment using tailor-made patented products that cater to the specific requirements of each industry. Exposome can customize its products to suit various industries, while keeping the capital expenditure (CAPEX) and operational expenditure (OPEX) low, thanks to the



Presentation at Tarapur Manufacturers Association in May 2024 regarding tertiary waste water treatment

regenerative and long-lasting nature of its basic technology

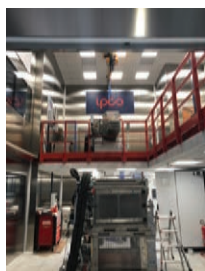
Ease of implementation

Exposome's products are plug-and-play filters. They are also regenerable and cater to a wide range of needs, particularly in the industrial wastewater and emissions segment. In collaboration with engineering partners, these molecular filters can be easily deployed and often retrofitted with existing infrastructure. They are synthesized using locally available raw materials, making them cost-effective. The technology is highly scalable, and the products stand out among the competition. Industries have warmly embraced our technology to help them achieve their sustainability goals.

Partnership-Driven Growth

Speaking about the business model and revenue generation strategy, Dr. Goradia states, "Our business model revolves around partnerships. With our technologies having broad applicability across industrial, commercial, utilities, and other sectors, we prioritize innovation while relying on our partners to proliferate our solutions worldwide. We aim to establish go-to-market partnerships with global enterprises, integrators, distributors, and startups. As an original equipment manufacturer (OEM), we will offer distinctive, scalable solutions at competitive price points tailored to different markets, fostering adoption and success for our partners, end customers, and ourselves." ■

High Stability Steel Belt Enables 'Super Speed'



Agfa's new SpeedSet 1060 inkjet press boasts groundbreaking speeds of up to 150 m/min, thanks to IPCO's stainless steel conveyor belt. The perforated belt, integrated with a powerful vacuum, ensures precise sheet positioning under print heads. Head of packaging, Matt Brooks, hails it as the fastest digital packaging press, producing 11,000 B1 sheets per hour. IPCO, renowned for precision steel belts, enhances stability in digital printing. Research by the Fraunhofer Institute for Production Technology IPT confirms steel belts significantly reduce vibrations, making them preferred over plastic counterparts. This innovation marks a leap in high-speed printing technology. ■

Evonik's Eco-Friendly TEGO Foamex Defoamers



Evonik Coating Additives introduced two groundbreaking defoamers, TEGO Foamex 16 and TEGO Foamex 11, at the American Coatings Show 2024. These siloxane-based additives aim to enhance the sustainability and performance of waterborne architectural coatings. TEGO Foamex

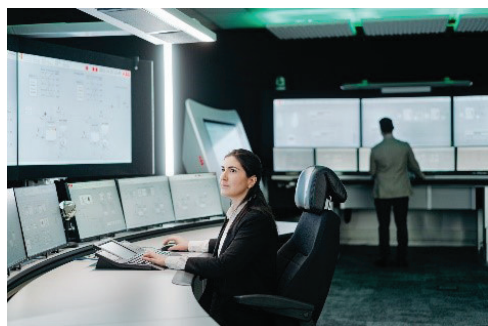
16, a concentrated defoamer, offers an optimal balance of defoaming efficiency and compatibility, ideal for low to medium PVC coatings. On the other hand, TEGO Foamex 11, an emulsion defoamer, is tailored for high PVC coatings, boasting a 15 percent active ingredient and providing a greener alternative to traditional mineral oil-based defoamers. Both products underscore Evonik's commitment to environmental responsibility, boasting low VOC and SVOC content while being free from solvents and mineral oils. TEGO Foamex 16 even incorporates 25 percent bio-based material, reducing the environmental footprint without compromising quality or performance. Michael Zink, Head of Evonik Coating Additives Americas, highlighted these innovations as a step towards more sustainable coatings, meeting stringent environmental regulations while delivering exceptional results in foam prevention and elimination throughout coating processes. ■

BASF introduces Efficon: Next-Gen Insecticide for Indian Farmers



BASF, a global leader in material science, has launched Efficon, a groundbreaking insecticide, to combat piercing and sucking pests plaguing Indian agricultural crops. Powered by BASF's innovative active ingredient, Axalione, Efficon boasts a unique mode of action under the new IRAC group 36 classification, ensuring superior resistance management. Introduced initially in Australia in 2023, Efficon arrives early in India, promising effective control against aphids, jassids, and whiteflies at various life stages. Its systemic properties offer enduring residual control, safeguarding crops even during new growth phases. This advancement reinforces BASF's commitment to supporting farmers globally, aligning with local needs for sustainable solutions. Giridhar Ranuva, Business Director of Agricultural Solutions at BASF India, emphasized Efficon's compatibility with non-target organisms, signaling a step forward in responsible pest management practices for enhanced crop yields and environmental preservation. ■

Margo: Edge interoperability initiative to unlock Industrial IoT



A recently established open standard interoperability initiative called "Margo" that aims to remove the main obstacles to digital transformation. ABB Process Automation and ABB Machine Automation (B&R) are among the founding group of industrial automation solution providers that are driving the initiative. Margo aims to unlock interoperability at the edge, a key layer of Industrial IoT ecosystems where plant data is transformed into AI-powered insights to drive efficiency and sustainability.

Margo initiative draws its name from the Latin word for 'edge' and will define mechanisms for interoperability between applications, devices and orchestration software at the edge of industrial ecosystems. It will make it easy to run and combine applications from any ecosystem member on top of the hardware and runtime system of any other member. Margo aims to deliver on its interoperability promise through a modern and agile open-source approach, which will bring industrial companies increased flexibility, simplicity and scalability as they undergo digital transition in complex, multi-vendor environments. ■

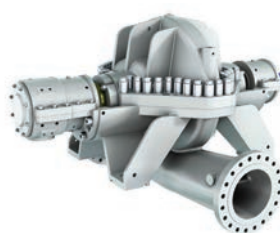
DuPont Introduces Tyvek TrifectaA2 Fire-Rated Breather Membrane



DuPont Performance Building Solutions has unveiled its latest innovation, Tyvek® Trifecta™, a fire-rated breather membrane designed for external walls

of high-rise buildings. With a roll size of 1.5m x 25m, Tyvek® Trifecta™ offers exceptional fire safety and moisture protection, surpassing UK Building Regulations with its A2-s1, d0 Class Fire Performance. Complementing the DuPont AirGuard A2 FR AVCL, it forms a complete A-rated membrane system, further enhanced by the DuPont AirGuard FR System Tape. Featuring 12 months UV resistance and Class W1 water resistance, Tyvek Trifecta ensures quality façade installation while providing excellent moisture management properties. Andrea Albert, Shelter Solutions EMEA Marketing Leader at DuPont, emphasized its role in enhancing fire safety and moisture protection standards in construction, demonstrating DuPont's commitment to developing innovative solutions for building owners. ■

HPDM Axially Split Volute Pumps Revolutionize Water and Oil Transportation



Tailor-made HPDM axially split volute pumps are designed to transport large volumes of liquid over long distances and high geodetic heights, ideal for

water and oil pipelines. Available in single or multistage configurations with single or double suction impellers, these pumps offer exceptional performance and reliability.

Key benefits include an optimal technical solution tailored for each application, a wide range of proven hydraulics ensuring high efficiency and suction performance, and a sturdy design with generous safety margins for long-term reliable service with minimal maintenance. The pumps are fully engineered with 3D CAD and casing integrity checked by finite element analysis. Horizontal suction and discharge nozzles are standard, but other positions can be customized to fit specific pipe layouts.. ■

Oil Gas & Power

World Expo 2025

5-7 March 2025

Venue: Hall 4, Bombay Exhibition Center, Goregaon (East), Mumbai, India



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- Power & Coal
- Nuclear Energy
- Shipping, Marine & Ports
- Surface Engineering Coating & Corrosion Control
- Student Outreach Program

FACTS AND FIGURES OIL GAS & POWER 2023



3
DAY
TRADESHOW



201
EXHIBITORS &
PARTNERS



8897
VISITORS FROM
28 COUNTRIES



192
VIP GUESTS



5
CONFERENCES



853
DELEGATES



147
SPEAKERS



670
ENGINEERING UNDERGRADS
FROM 23 C COLLEGES ACROSS INDIA

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- Storage Tanks
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- IT Infrastructure & Digital Technologies

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Concurrent Events



Scope for ChemTECH World Expo 2026

- Plant Machinery & Industrial Consumables
- Engineering Consultants
- OEMs for Chemicals & Pharmaceutical Processing Equipment
- Metals & Metallurgy
- Bioprocessing Equipment
- Construction Services Providers
- Plant Maintenance Services Providers
- Logistics & Supply Chain Solutions Providers
- Instrumentation & Process Control
- Industry Automation (Process & Factory)
- Systems Integration & ERP Solutions Providers
- Water & Waste Water Treatment Consultants
- Environment Solutions Providers
- Waste Management Consultants
- Financial Institutions
- Fire & Safety Solutions Providers
- Material Handling Solutions
- Certification Bodies
- Welding Solutions
- Quality Health & Environment Solutions
- Analytical & Laboratory
- Packaging Materials, Machinery & Systems
- Business Consultants

Scope for Specialty Chemicals World Expo 2026

- Agrochemicals Intermediates
- Adhesives & Sealants
- Agrochemicals & Crop Protection
- Bulk Drugs & Intermediates
- Enzymes
- Colorants, Dyes & Pigments
- Cosmetics & Personal Care Ingredients
- Hygiene & Cleaning Chemicals
- Laboratory Chemicals
- Surfactants
- Water Treatment Chemicals
- Catalysts
- Electronic Chemicals
- Flavours & Fragrances
- Contract Manufacturers

Scope for Biopharma World Expo 2026

- Materials Processing
- Pharma Machinery
- Pharma Ingredients
- Plant Engineering, Process Plants & Equipment
- Laboratory & Analytical Solutions
- Process Measurement & Inspection
- Sterilization & Clean Room Solutions
- Biopharma R&D And Manufacturing
- IT Solutions
- Water & Waste Treatment Solutions

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