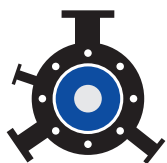


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(Guaranteed approach of 1°C to design WBT)

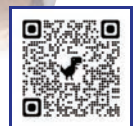
- Close Approach to WBT ensuring huge process benefits
- FAN-LESS, FILL-LESS Design
- Maintenance free Operation due to Choke-less design of Nozzles.
- Rugged structure with HDGI MOC & FRP casing, Saran3 PVC Nozzles, ensuring a life of 15 years plus.

MODEL - II

INDUCED DRAFT MIST COOLING TOWER

(Fill-Less Technology)

- Approach to 3°C to design WBT with temperature drop up to 15°C.
- Direct saving of 30 to 50% on Fan Power due to low pressure drop across the Tower.
- Maintenance free operation due to absence of Fills even for contaminated water application.
- Rugged structure with pultruded FRP/HDGI MOC with FRP casing & Stainless Steel 304 Nozzles, ensuring a life of 15 years plus.



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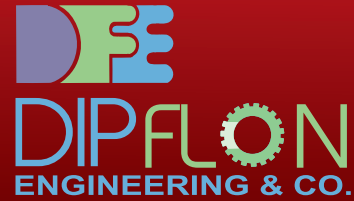
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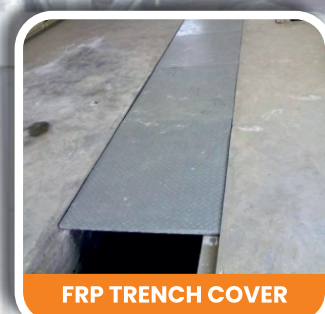
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Complementary Reaction Insights: FTIR and Raman Spectroscopy

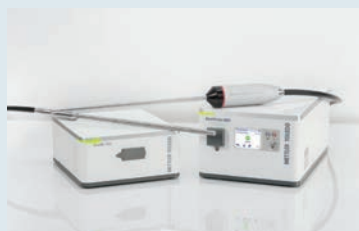
Reaction monitoring is the real-time measurement of reaction kinetics, mechanisms and pathways, as well as the influence which specific experimental variables can exert on the quality of a given process. Real-time trends of key reaction components provide critical insight to scientists during development and optimization of their chemical processes.

Fourier Transform Infrared (FTIR) and Raman spectroscopy are often employed to monitor reactions in situ yet provide different understanding of chemical compounds and syntheses. While many chemical reactions can be monitored by both Raman and IR, depending on certain molecular symmetries, Raman bands and IR bands can be mutually exclusive: i.e., a bond will be either Raman or IR active. Functional groups with large dipole changes are strong in the IR, whereas those with weak dipole changes or a high degree of symmetry will be better observed in Raman spectra.

Guidelines for Choosing FTIR or Raman

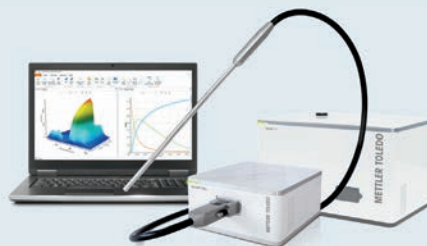
Raman is useful when

- Carbon bonds in aliphatic and aromatic rings are of primary interest
- Bonds are difficult to see via FTIR (i.e., O-O, S-H, C=S, N=N, C=C, etc.)
- Particles are examined in solution, e.g. polymorphism is an issue
- Lower frequency modes are important (e.g. for inorganic oxides)
- Reaction observation through a sight glass is easier and safer (e.g. highly toxic, corrosive, impossible to interface an immersion probe)
- Initiation, endpoint and product stability of biphasic and colloidal reactions are of interest



FTIR is useful when

- Liquid-phase reactions must be studied
- Reactants, reagents, solvents and reaction species fluoresce
- Bonds with strong dipole changes are important (e.g. C=O, O-H, N=O, CN)
- Reagents and reactants are at low concentration
- Solvent bands are strong in Raman and can swamp key component signals
- IR-active intermediates form



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BPCL flags off first extreme weather grade diesel rake from Bina Refinery to power Indian Army's high-altitude operations



(L-R): Shri Manoj Menon, Business Head (Industrial & Commercial Solutions), BPCL; Shri Subhankar Sen, Director (Marketing), BPCL; Lt Gen Mukesh Chadha, AVSM, SM, VSM, DGST, IHQ of MoD (Army); and Shri K. K. Das, Executive Director, BPCL Bina Refinery, during the flag-off ceremony.

Madhya Pradesh: Bharat Petroleum Corporation Limited (BPCL), a Fortune Global 500 company and a Maharatna PSU, marked a significant milestone in its commitment to national service and technological innovation with the flag-off of the first Extreme Weather Grade (XWG) Diesel Rake from its Bina Refinery.

The XWG diesel rake was ceremonially flagged off by Lt Gen Mukesh Chadha, AVSM, SM, VSM, DGST, IHQ of MoD (Army) in the august presence of Subhankar Sen, Director (Marketing), BPCL, along with senior officials of Indian Army, Indian Railways and BPCL.

The XWG Diesel has been indigenously developed by BPCL after assessing the unique challenge faced by Indian Army in operating military vehicles in extreme winter and high-altitude environment. BPCL's Corporate Research & Development Centre (CRDC) and Bina Refinery collaborated for development of Extreme Weather Grade (XWG) diesel through innovation and technological advancements.

BPCL's XWG Diesel offers several advance performance characteristics, including ultra-low pour point, low Cold Filter Plugging Point (CFPP), excellent cold startability, improved drivability, reduced field maintenance requirements, and enhanced reliability under severe climatic conditions.

Speaking on the occasion, BPCL leadership highlighted that the successful development and dispatch of

XWG Diesel is a testament to the organization's focus on innovation, self-reliance, and nation-building. The product is expected to play a vital role in enhancing fuel reliability for military logistics and operations in high-altitude areas, thereby strengthening operational efficiency and mission readiness.

Subhankar Sen, Director (Marketing), BPCL, said, "The successful development of Extreme Weather Grade Diesel and the dispatch of the first rake is an excellent example of BPCL's research capabilities, technological excellence and commitment to *Atmanirbhar Bharat*." He added, "BPCL remains committed to providing innovative energy solutions aligned with the nation's strategic requirements."

"The flag-off of the first XWG Diesel rake is a moment of immense pride for Bina Refinery. This achievement is the result of excellent coordination and teamwork across BPCL's research, refining, marketing and logistics functions," said K. K. Das, Executive Director, BPCL Bina Refinery.

Manoj Menon, Business Head (Industrial & Commercial Solutions), BPCL, said, "BPCL continues to work towards providing specialised energy solutions for the country's strategic sectors, and ensuring uninterrupted and reliable fuel supplies to the Indian Armed Forces remains among its highest priorities."

NOCIL Limited reports Q1FY27 results; profit grows 61%

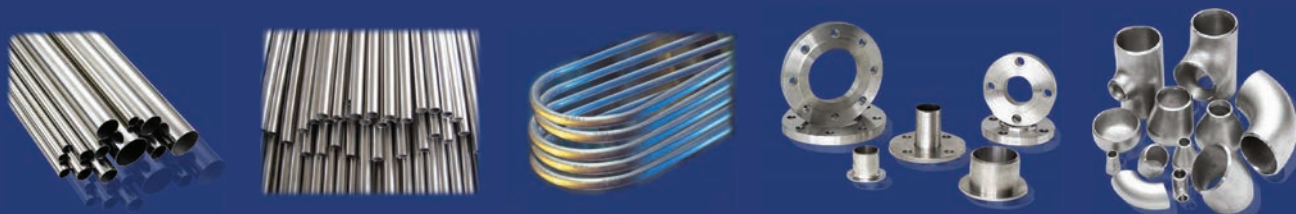
Mumbai: NOCIL Limited, India's largest manufacturer of rubber chemicals, reported its financial results for the first quarter of FY27. Revenue from operations grew 20 per cent year-on-year to ₹403 crore, mainly driven by increased selling prices on account of sharp increase in input costs, and net profit rose 61 per cent to ₹28 crore, with EBITDA margin expanding to 11.2 per cent, up 210 basis points over the previous year due to a combination of improved operating efficiency and inventory gains.

Volumes grew 9 per cent year-on-year, led by strong double-digit growth in domestic demand following the implementation of GST 2.0, alongside continued conversion of the Company's export pipeline.

The company has separately announced a further ₹130 crore brownfield capital expenditure programme at its Dahej facility, aimed at expanding capacity for peak-utilisation rubber chemical products through

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UPCOMING ISSUE - SEPTEMBER 2026 DIGITALIZATION & AUTOMATION

The **September 2026** edition of Chemical Engineering World will highlight how digital transformation and automation are driving efficiency, sustainability, and innovation across the chemical industry.



Upcoming Projects: Insights on digital transformation & automation initiatives



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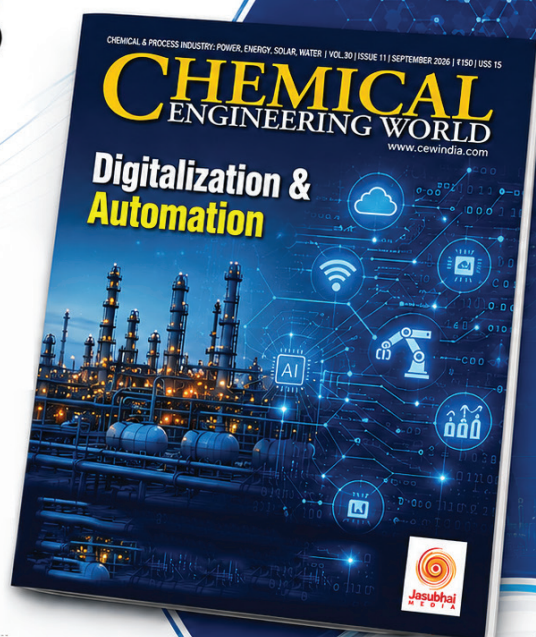
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an integrated, backward-integrated facility. This is in addition to the ₹250 crore capex programme already underway at Dahej, which has moved into trial production.

The new investment, targeted for completion by H1FY28, will be funded largely through internal accruals.

Commenting on the results, V.S. Anand, Managing Director, NOCIL Limited, said, "Our performance this quarter reflects consistent execution across both our domestic and export businesses in a challenging environment. Beyond the numbers, we are equally focused on building for the future, our expanded investment at Dahej reinforces our commitment to structured capacity augmentation, backward integration and long-term competitiveness in a market that is increasingly looking to India as a reliable manufacturing partner."

Privi Speciality Chemicals brings AI education infrastructure to Mahad, enabling students to access emerging technologies



Mumbai: Privi Speciality Chemicals Limited, a leading global manufacturer, supplier and exporter of aroma and fragrance chemicals, has established an Artificial Intelligence (AI) centre at Hirwal Education Trust's College of Science, Computer Science and Information Technology in Mahad, creating a dedicated technology-enabled learning environment designed to equip students with future-ready skills and exposure to emerging technologies.

The Centre features dedicated AI-enabled computer systems, internet-connected smart panels, specialised classroom infrastructure, power backup systems and technology-enabled learning resources that support experiential learning and innovation.

Speaking about the initiative, Mahesh Babani, Chairman and Managing Director, Privi Speciality Chemicals Ltd. said, "Technology is transforming the way industries operate and creating entirely new career opportunities. Ensuring that students have access to emerging technologies and relevant skills is essential to preparing them for the future. As an organisation with deep roots in Mahad, we remain committed to supporting initiatives that contribute to education, skill development and long-term community progress."

Since its launch, the Centre has hosted a series of workshops, lectures and training sessions aimed at introducing students to the practical applications of artificial intelligence. These include AI-focused workshops conducted by Chetan Taksale, Director, Softech Solutions and Services, Pune, along with expert sessions by Pushkar Adhikari, Co-Founder of Apex Academy, Mumbai, Harshita Gaikwad, AI Teacher, and Masooda Antule, AI Trainer. The programmes are designed to help students understand the real-world applications of AI and encourage innovation-led thinking.

The initiative forms part of Privi's broader commitment to community development through education, skill development and knowledge access. By bringing advanced learning infrastructure closer to students and creating opportunities to engage with emerging technologies, the company aims to contribute towards building a future-ready talent pool while strengthening educational infrastructure in the Mahad region.

BASF India Limited announces Q1 2026-2027 results

Mumbai: BASF India Limited registered revenue from operations (continuing operations) of ₹48,248.6 million for the first quarter of the financial year 2026-27, as compared to ₹37,413.2 million in the same quarter of the previous year.

The company reported profit before tax (before exceptional items) from continuing operations of ₹4,802.4 million for the quarter ended June 30, 2026 compared to Profit before tax (before exceptional items) of ₹2,001.4 million for the corresponding period of the previous year.

"BASF India achieved a resilient start to the financial year, with improved revenues and earnings across most businesses driven by strong demand, higher volumes,

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and favorable pricing. While Agricultural Solutions business experienced challenges due to delayed and erratic monsoon conditions during the quarter, the strength of our diversified portfolio and disciplined execution enabled us to capitalize on opportunities arising from supply dynamics. We remain committed to delivering value to our customers and stakeholders through operational excellence, and sustainable growth," said Alexander Gerding, Managing Director, BASF India Limited & Head - BASF Group Companies in India.

Tata Chemicals and CSPC deploy 120 trained local education volunteers to strengthen government schools in Okhamandal



Gujarat: Tata Chemicals Society for Rural Development (TCSRSD), the CSR arm of Tata Chemicals Limited, in partnership with the Coastal Salinity Prevention Cell (CSPC), has launched a school support programme in Okhamandal to address teacher shortages in government schools and strengthen the quality of education across the block. While the Right to Education (RTE) Act mandates quality education for children from Classes 1 to 8, several government schools in Okhamandal require additional academic support to ensure continuity in classroom learning. To address this gap, TCSRSD and CSPC have recruited and trained 120 local education volunteers who will provide academic support across primary and secondary schools.

The programme includes 40 Primary School Volunteers to support government primary schools facing teacher shortages; 44 Remedial Education Volunteers to strengthen foundational literacy and numeracy; 16 High School Educators to provide Mathematics and Science support for Classes 9 and 10; 13 Re-enrolment and NIOS Instructors to help out-of-school children and youth continue their education through the National

Institute of Open Schooling (NIOS) and 7 Academic Enhancement Educators to strengthen the overall learning environment across villages.

The programme was formally launched on August 4, 2026, at Sabras Bhavan, Mithapur, in the presence of Shri Pabubha Virambha Manek, Member of the Legislative Assembly, Devbhumi Dwarka; Smt. Madhuben Bhatt, District Primary Education Officer; Shri R. V. Odedra, Taluka Development Officer, Devbhumi Dwarka; Shri Bharatbhai Karmata, Vice President, Dwarka Taluka Panchayat; Shri Bhurabha Jadiya, Block Resource Centre Coordinator; Smt. Aashaben Parmar, Taluka Education Coordinator; and Mr. Rino Raj, Vice President Manufacturing, India, Tata Chemicals Ltd. The launch marked the commencement of a collaborative initiative to strengthen government schools in Okhamandal through enhanced teaching support and improved learning outcomes for students.

Rino Raj, Vice President Manufacturing (India), Tata Chemicals Ltd, said, "At Tata Chemicals, we believe quality education is fundamental to long-term community development. Through this partnership, we aim to ensure that students continue to receive uninterrupted learning support while creating opportunities for local youth to contribute to the education ecosystem. We hope this initiative will strengthen schools and encourage more children to stay connected with education."

CSPC is a specialized resource organization dedicated to mitigating coastal salinity, supporting land and water resource management, and enhancing rural community livelihoods across coastal Gujarat.

Tata Chemicals Society for Rural Development (TCSRSD) is the social development arm of Tata Chemicals. Through initiatives focused on livelihoods, women's empowerment, education, healthcare, and sustainability, TCSRSD works towards building resilient rural communities across India. Through Okhai, TCSRSD continues to support artisan livelihoods while helping preserve India's rich craft heritage.

BPCL reinforces India's energy security amid challenging global environment

Mumbai: Bharat Petroleum Corporation Limited (BPCL), a Fortune Global 500 company and a Maharatna PSU, announced its financial results for the quarter ended June 30, 2026. Despite

geopolitical uncertainty and volatility in global energy markets, BPCL maintained its commitment to ensuring uninterrupted energy supply nationwide. BPCL strengthened national energy security by maintaining seamless operations across its refining, marketing, and distribution network. Through a resilient supply chain and disciplined execution, the company ensured uninterrupted availability of petroleum products in urban, industrial, and rural markets.

The company continued to invest in refining and marketing infrastructure, pipeline connectivity, city gas distribution, digital capabilities, and emerging energy businesses. BPCL also accelerated technology-driven initiatives in supply chain management, retail operations, and customer engagement to deliver reliable and efficient energy solutions.

During the quarter, BPCL optimized product placement nationwide using advanced planning systems, digital monitoring tools, and real-time supply chain coordination. These measures enabled effective responses to changing demand, operational continuity, and reliable product availability in a dynamic global environment.

Aries Agro delivers robust Q1 FY27 growth

Mumbai: Aries Agro Limited, a leading company in micronutrient fertilizers and plant nutrition solutions, has started FY27 on a strong note, reporting healthy growth in revenue and profitability for the quarter ended 30 June 2026. The company's Consolidated Net Income from Operations increased to ₹185.86 crore in Q1 FY27, compared with ₹159.79 crore in the same quarter last year, registering a year-on-year growth of approximately 16.3 per cent.

Profitability also witnessed a significant improvement. Consolidated Profit after Tax (PAT) attributable to owners rose to ₹14.91 crore, up from ₹10.03 crore in Q1 FY26, representing a strong 48.7 per cent YoY increase. During the quarter, Consolidated Total Comprehensive Income attributable to owners stood at ₹14.18 crore, compared with ₹10.18 crore in the corresponding period of the previous year.

The company also delivered strong growth on a standalone basis. Net Income from Operations stood at ₹180.83 crore, compared with ₹154.19 crore in Q1 FY26, reflecting a growth of approximately 17.3 per

cent. Standalone PAT increased to ₹13.62 crore, from ₹9.17 crore in Q1 FY26, representing a year-on-year growth of approximately 48.5 per cent. Commenting on the performance, Dr. Rahul Mirchandani, Chairman & Managing Director, Aries Agro Limited, said, "The performance in the first quarter reflects the strength and resilience of our business, supported by our focus on innovative plant nutrition solutions and our extensive reach across the agricultural ecosystem. The improvement in profitability alongside revenue growth is encouraging and reflects our continued focus on operational efficiency and value creation."

Going forward, Aries Agro remains focused on expanding and strengthening its portfolio of micronutrient fertilizers and plant nutrition solutions. The company is also working to deepen its presence across markets and strengthen its engagement with agricultural communities. Given the nature of the agricultural sector, Aries Agro's business remains influenced by factors such as cropping patterns, seasonality and weather conditions. Accordingly, the company noted that quarterly results may not necessarily be indicative of its performance for the full financial year.

Henkel delivers strong sales and earnings performance in the first half and upgrades top-line guidance for 2026

Mumbai: Henkel delivered strong organic sales growth and very good earnings performance in the first half of 2026 despite a persistently highly challenging economic environment. Henkel posted Group sales of 10,348 million euros in the first half of 2026, equivalent to a nominal development of -0.5 per cent (Q2: 5,396 million euros, +4.6 per cent). Foreign exchange effects reduced sales by -3.9 per cent (Q2: -2.6 per cent). Acquisitions and divestments had a slightly positive impact on sales of 0.2 per cent (Q2: +2.5 per cent). While the divestment of the retailer brands business in North America in April 2025 had a negative impact, the acquisitions completed in both business units in the first half of 2026 – particularly ATP Adhesive Systems and Not Your Mother's – made a positive contribution. In organic terms, i.e. adjusted for foreign exchange effects and acquisitions/divestments, Henkel recorded strong sales growth of 3.2 per cent (Q2: +4.7 per cent). ■

APPOINTMENT NEWS



Aarti Industries appoints Suyog Kotecha as MD & CEO

The Board of Directors of Aarti Industries Limited has approved the appointment of Suyog Kotecha, currently Chief Executive Officer and Executive Director, as Managing Director and Chief Executive Officer of the company with effect from October 1, 2026, subject to shareholders' approval. Since joining Aarti Industries as Chief Executive Officer in June 2024, Mr Suyog Kotecha has worked closely with the Board and the leadership team to strengthen strategic execution, deepen customer engagement, strengthen organisational capabilities and reinforce the company's long-term growth agenda. Based on his leadership and contribution, the Board has unanimously expressed its confidence in his ability to lead Aarti Industries through its next phase of growth. ■

Tata Projects appoints Sukumar Hebbar as MD & CEO

Tata Projects Limited, one of India's trusted technology-led Engineering, Procurement and Construction (EPC) companies, has announced the appointment of Mr. Sukumar Hebbar as its new Managing Director and Chief Executive Officer, effective immediately. Mr. Hebbar succeeds Mr. Vinayak Pai, who has led the company since 2022. Hebbar, an industry veteran with over three decades at L&T, will steer the company's next phase of growth across infrastructure, data centres and urban development. ■



Smarten appoints Ranjit Singh as Chief Operating Officer

Smarten Power Systems, an Indian power backup and solar energy solutions company catering to residential and commercial users, has appointed Ranjit Singh as Chief Operating Officer (COO), effective from 1 August 2026. Prior to this appointment, Mr. Singh was associated with Smarten Power Systems as Consultant – Vice President, Operations, where he played an instrumental role in strengthening operational processes, enhancing manufacturing efficiencies and supporting several of the company's key initiatives. In his new role as COO, he will lead the company's end-to-end operations, manufacturing excellence, supply chain, quality systems and strategic execution while driving operational efficiencies to support Smarten's expansion plans in India and international markets. ■

Hindalco commissions India's first superfine PPT ATH plant, strengthening India's self-reliance in cable fire safety



Hindalco leadership at the commissioning of the Superfine PPT ATH manufacturing plant in Belagavi, Karnataka

Karnataka: Hindalco Industries Limited, the metals flagship of the Aditya Birla Group, has commissioned a greenfield Superfine PPT ATH (Precipitated Aluminium Trihydrate) manufacturing plant in Belagavi, Karnataka, bringing domestic production of this high-value specialty alumina product to India for the first time.

The new facility, with an annual production capacity of 30,000 tonnes, strengthens Hindalco's Specialty Alumina portfolio and advances the country's journey towards *Atmanirbhar Bharat* in critical fire-safety applications. The facility is also the world's only specialty alumina plant to operate entirely on renewable energy, setting a global benchmark for sustainable manufacturing.

PPT ATH is a high-value, halogen-free flame-retardant material used in Halogen-Free Flame Retardant (HFFR) cables, polymer insulators, thermal insulation, composites and paints. In applications such as cables, it helps suppress flame propagation and smoke generation without releasing halogen acid gases, supporting safer electrical and infrastructure systems. Demand is growing with stricter fire-safety standards, rising EV and infrastructure adoption, and the shift towards sustainable, high-performance materials.

Further, BIS has introduced IS 17048:2018 for HFFR cables, aligning Indian standards with global safety benchmarks and supporting wider adoption across infrastructure, electrical and mobility applications.

Against this backdrop, the plant's Phase 1 capacity of 30,000 tonnes per annum is designed to meet almost the entire domestic demand for safer cables from the wire and cable industry, an important step in self-reliance for this critical material. The facility is designed for phased expansion to 60,000 tonnes, enabling Hindalco to scale capacity in line with domestic market growth.

Satish Pai, Managing Director, Hindalco Industries, said, "The commissioning of our Superfine precipitated hydrate plant in Belagavi will further strengthen our leadership position, and enhance our high-value specialty alumina portfolio in India. This investment reflects Hindalco's focus on creating value, moving up the value chain and delivering advanced solutions that meet the emerging needs of customers in India and global markets."

Saurabh Khedekar, CEO, Alumina Business, Hindalco Industries, said, "The addition of Superfine PPT ATH strengthens our Specialty Alumina portfolio and reinforces our focus on innovation-led growth. Our InnoSafe solution enhances fire safety by retarding flame spread and suppressing smoke, enabling safer and more sustainable infrastructure. As India's first manufacturer of Superfine Precipitated Hydrate, we are proud to offer an indigenous, world-class solution that strengthens self-reliance, reduces import dependence and supports the evolving needs of the wire and cable industry."

The facility has been developed through Hindalco's flask-to-factory innovation journey, with technology and R&D developed in-house from the ground up. The plant incorporates automated controls for critical processes and a fully integrated manufacturing ecosystem, enabling stringent control over feedstock quality and product consistency.

Sustainability is another key differentiator of the facility. The PPT ATH is produced at Hindalco's Belagavi refinery, which achieved a GHG intensity of 0.44 tCO₂e per tonne of alumina (YTD FY26). The facility is powered by 100 per cent renewable energy from biomass, solar and wind sources, enabling the production of high-performance specialty materials with a lower environmental footprint.

By combining domestic manufacturing, in-house innovation, stringent quality control and sustainable production, the plant strengthens India's capability to develop advanced materials for the next generation of fire-safe electrical and mobility applications.

Tata Power Renewables marks a major milestone with groundbreaking of 800 MW RE project in Andhra Pradesh

Andhra Pradesh: Tata Power Renewable Energy Limited (TPREL), one of India's leading renewable energy companies and a subsidiary of Tata Power, has conducted the groundbreaking ceremony of its 800 MW renewable energy project. The project marks a

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significant milestone in the company's commitment to accelerating India's clean energy transition through innovative and reliable renewable energy solutions. The Chief Guest for the ceremony was Shri Lokesh Nara, Hon'ble Minister of HRD, ITE&C and RTG, Government of Andhra Pradesh. Dr Praveer Sinha, CEO & MD, Tata Power, marked his gracious presence at the event.

The project comprises 400 MW of wind power capacity (based out at Kanekallu, Ananthapuram) and 400 MW of solar power capacity (based out at Pattikonda, Kurnool). TPREL will serve as the project developer for the wind asset, while Suzlon will undertake the Engineering, Procurement, and Construction (EPC) scope for the wind component at Ananthapuram. Suzlon is a leading wind turbine manufacturer and end-to-end wind energy solutions provider. The remaining 400 MW Project will be developed by TPREL for NTPC and will comprise a 200 MW Firm and Dispatchable Renewable Energy (FDRE) project for NTPC.

The FDRE project will incorporate a Battery Energy Storage System (BESS) with a storage capacity of 25 MW / 50 MWh. The balance 200 MW solar project capacity remains available for future allocation. The project has secured 800 MW Inter-State Transmission System (ISTS) connectivity at the Ananthapuram II and Kurnool-4 CTUIL Substations, enabling efficient evacuation of renewable power through the national transmission network. The availability of ISTS connectivity provides a robust transmission network for efficient evacuation of power from the project.

The project is being implemented in accordance with the Andhra Pradesh Integrated Clean Energy (ICE) Policy, which seeks to encourage large-scale investments in clean energy, accelerate renewable capacity addition, and promote sustainable industrial growth within the State. The project will require a total land area of 3,462 acres, including 2,700 acres for the solar installation and 760 acres for the wind development.

Dr. Praveer Sinha, MD & CEO, Tata Power, said, "The groundbreaking of an 800 MW renewable energy project in Andhra Pradesh marks a significant step in

Tata Power's mission to accelerate India's clean energy transition. By integrating 400 MW of solar and 400 MW of wind capacity, the project will contribute to the development of reliable and round-the-clock renewable power, supporting the nation's growing energy needs while advancing sustainability goals. We are grateful to the Government of Andhra Pradesh for its progressive vision and support in fostering a conducive ecosystem for clean energy investments."

Lubrizol and Polyhose inaugurate advanced medical tubing facility in Chennai



Chennai: Lubrizol, a global specialty chemicals leader, and Polyhose, a leading manufacturer in fluid conveyance systems have inaugurated a new medical manufacturing site in Chennai, Tamil Nadu. The facility will manufacture precision extruded medical tubing for minimally invasive devices, supporting India's rapidly growing medical technology and healthcare sectors.

John Valukas, President, Lubrizol Engineered Materials, said, "This inauguration is an important milestone in Lubrizol's commitment to India and to supporting our customers in the global medical device industry. By combining Lubrizol's medical device expertise with the manufacturing strength of local partners in India, this facility will deliver advanced tubing solutions for life-saving neurovascular and cardiovascular applications. Our goal is to help our customers bring these critical technologies to patients faster, with reliable local supply and the highest quality standards."

Designed as a world-class operation, the ISO13485 facility provides customers with a reliable source of high-quality medical tubing, backed by dedicated quality control and the same rigorous standards applied across Lubrizol's global manufacturing network. This investment strengthens Lubrizol's ability to serve customers in India and across global markets. Operations focus on delivering precision extruded tubing from a wide range of high-performance materials, including polyamides, nylon, Pebax, polypropylene, polyethylene, and Lubrizol's medical grade Thermoplastic Polyurethane (TPU).

Abhishek Shrivastava, Managing Director, Lubrizol IMEA, said, "India is a strategic growth market for Lubrizol and a key hub for our investments in manufacturing, R&D and technical services. This medical manufacturing site in Chennai is another step in building a stronger local ecosystem for high-value, technology-driven products. By working closely with Polyhose and regional stakeholders, we aim to support innovation, create high-skilled jobs and enable India to become a more significant contributor to the global medical device supply chain"

Mittal Shah, Business Head, Medical Devices IMEA, Lubrizol, said, "Minimally invasive procedures are transforming patient care, and high-precision tubing is at the heart of many of these devices. With this Chennai site, we are bringing world-class catheter tubing capabilities closer to our customers in India and across IMEA. This partnership with Polyhose will enable a broad range of devices utilizing high-performance materials, further strengthening our ability to partner with medical device OEMs in India across the full product development lifecycle."

Shabbir Yusuf Jamnagarwala, Founder & Managing Director, Polyhose, said, "For more than three decades, Polyhose has partnered with global customers by delivering innovative extrusion and fluid conveyance solutions. Our collaboration with Lubrizol marks a new chapter in our journey, combining Polyhose's world-class manufacturing strengths with Lubrizol's deep materials science and medical device expertise to deliver advanced medical tubing solutions for the rapidly evolving healthcare industry. This investment reflects our commitment to innovation, creating skilled employment opportunities, and strengthening India's position as a trusted global hub for advanced medical device manufacturing."

Kshema Power secures transmission order for 315 MW wind power project in Karnataka



Dr. Sateesh Basant,
Managing Director,
Kshema Power

New Delhi: Kshema Power, a renewable energy EPC company, has secured an order from a leading Independent Power Producer (IPP) for the development of critical transmission infrastructure for a 315 MW wind power project in Karnataka. The order includes the supply, civil works, erection and

commissioning of approximately 33 km of 220 kV Single Circuit Transmission Line on Double Circuit Towers and Multi-Circuit Towers, along with the supply, civil works, erection and commissioning of unit substations and 33 kV transmission line infrastructure.

The order comes at a point of strong momentum for India's wind sector, which added a record 6,057 MW in FY 2025-26 to cross 57 GW of installed capacity, as tracked by the Ministry of New and Renewable Energy (MNRE). Karnataka ranks third among Indian states at close to 8,900 MW, and evacuation infrastructure is increasingly the constraint on how quickly new capacity reaches the grid. The Central Electricity Authority's National Electricity Plan (Transmission) envisages over 191,000 circuit kilometres of new transmission lines and an investment of more than ₹9.15 lakh crore through 2032 to support 500 GW of non-fossil capacity by 2030.

Dr. Sateesh Basant, Managing Director, Kshema Power, said, "India's renewable energy journey is entering a phase where transmission infrastructure will play an increasingly decisive role. Adding generation capacity is only one part of the equation; ensuring that renewable power can be evacuated and delivered reliably to the grid is equally important. This project reflects our commitment to building the infrastructure that enables renewable energy to move from generation to consumption efficiently and reliably."

With an integrated scope covering procurement of required approvals for high-voltage transmission, substation infrastructure, electrical balance of plant, civil works, erection and commissioning, the project further strengthens Kshema Power's capabilities as an end-to-end EPC partner for large-scale renewable energy projects.

BPCL acquires Videocon's Oil & Gas interests in Brazil

Mumbai: Bharat Petroleum Corporation Limited (BPCL), a Fortune Global 500 company and a Maharatna PSU, through its upstream entity, Bharat PetroResources Limited (BPRL) has successfully completed the acquisition of all of Videocon's shareholding in its Brazilian joint venture company, IBV Brasil Petróleo Ltda. (IBV). The acquisition was made through step-down subsidiaries of BPRL and with this, BPRL's ownership in IBV has increased from 65.40 per cent to 100 per cent, making IBV its wholly owned subsidiary.

BPRL had earlier exercised its Right of First Refusal available under the shareholders' agreement of IBV to acquire the stake of the remaining shareholder in IBV.

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After all due approvals and necessary registrations from Brazilian authorities, the transaction has now been consummated.

IBV holds participating interests in oil and gas concessions in Brazil including BM-SEAL-11 and BM-C-30 concessions. The aforementioned acquisition has the potential to add equity oil and gas production of approximately 1 million tons of oil equivalent per annum, upon commencement of production from the BM-SEAL-11 concession. BM-SEAL-11 concession, in which IBV holds 40 per cent participating interests and the remaining interest held by Petrobras, is currently progressing through the development phase, with the contract for the Floating Production Storage and Offloading (FPSO) unit having been executed in May 2026.

Commenting on the transaction, Chairman and Managing Director, BPCL, Mr. Sanjay Khanna said, "This acquisition marks a significant milestone in our overseas upstream growth journey. By increasing our stake in a strategic developing asset, we are reinforcing our long-term commitment to strengthening our global energy portfolio and contributing to India's energy security through secure and sustainable access to hydrocarbon resources."

Shivtek Spechemi commits ₹150 crore towards a greenfield integrated complex in Gujarat

Gurugram: Leading specialty chemicals manufacturer Shivtek Spechemi Industries Ltd, a flagship company of the Shiva Group of Industries, has acquired approximately 21 acres of industrial land in Pungam (Ankleshwar), Gujarat. The company will invest over ₹150 crore to construct a state-of-the-art greenfield integrated manufacturing complex designed to meet surging domestic and global demand for specialty chemicals and clean fuel technologies.

The strategic expansion builds on Shivtek's existing multi-hub footprint across Kurnool (South), Rajpura (North), and Dahej (West). Situated along the Delhi-Mumbai Expressway (NE-4) and near Hazira Port, the Pungam site offers direct access to key freight corridors, raw material sources, and international shipping lanes. Connectivity will be further augmented by the upcoming Bhadbhut Barrage Project, creating seamless operational integration with Shivtek's primary manufacturing plant at Dahej.

The project will comprise of advanced manufacturing units, utilities, quality control laboratories, warehousing

facilities, storage infrastructure, and supporting services designed to meet global manufacturing and safety standards.

Phase 1 will include manufacturing of Pharma Grade Hydrochloric Acid (HCl) as well as the processing and manufacturing of specialty feedstock and specialty petrochemicals, with a planned capacity of 84,000 MTPA.

Crucially, Phase 2 will establish pilot-scale units for Methanol-to-Gas and Hydrogen Fuel technologies, addressing the global maritime sector's shift toward cleaner energy alternatives. Additionally, the company will expand the product portfolio to include a wide range of petrochemical intermediates, ranging from low boilers to heavy boilers, with an additional capacity of 60,000 MTPA.

Upon commercial operation, the complex will supply high-value feedstock and intermediates to critical end-use sectors, including pharmaceuticals, agrochemicals, personal care, industrial coatings, water treatment, textiles, and other specialty chemical applications. The project is designed to generate significant direct and indirect employment across construction and operational phases. Built to international Environmental, Health, and Safety (EHS) benchmarks, the facility reinforces Shivtek's commitment to responsible chemical manufacturing, supply chain resilience, and long-term value creation

Phase 1 is targeted for commissioning by March 2027, with commercial operations expected to begin shortly thereafter.

Mecpower Solutions Limited signs MoU with Government of Gujarat for proposed 5 GWh BESS assembly facility



Gujarat: Mecpower Solutions Limited, a Gujarat-headquartered leader in solar infrastructure and clean energy solutions, has signed a Memorandum of

Understanding (MoU) with the Government of Gujarat to set up a proposed 5 GWh Battery Energy Storage System (BESS) assembly facility at Karjan, with an envisaged investment of approximately ₹160 crore. The proposed facility is expected to reinforce domestic energy storage capabilities and contribute to India's evolving renewable energy landscape.

The MoU marks a significant milestone in Mecpower's growth journey and reinforces its commitment to supporting India's clean energy transition through investments in advanced manufacturing and energy storage infrastructure. The proposed facility is expected to contribute to the development of a robust domestic ecosystem for battery energy storage solutions, which are increasingly being recognized as critical to integrating renewable energy, improving grid resilience, and ensuring reliable power availability.

The proposed facility will strengthen domestic manufacturing capabilities in this strategically important sector and support the nation's broader vision of fostering self-reliance in next-generation energy technologies.

Commenting on the development, Setul Shah, Managing Director, Mecpower Solutions Limited, said, "The signing of this MoU with the Government of Gujarat represents an important step in Mecpower's journey towards becoming a future-ready energy infrastructure company. Our proposed investment in a 5 GWh Battery Energy Storage System assembly facility reflects our confidence in India's clean energy growth story and our commitment to strengthening domestic manufacturing capabilities. Energy storage will play an increasingly critical role in enabling renewable energy adoption, enhancing grid resilience, and supporting long-term energy security. We are pleased to partner with the Government of Gujarat in advancing these shared objectives."

thyssenkrupp nucera hands over chlor-alkali plant to Chlorum Solutions in Brazil

Milano: thyssenkrupp nucera has successfully handed over a new chlor-alkali electrolysis plant to Chlorum Solutions at its site in Palmeira, Brazil. The facility has now been successfully commissioned and is fully operational. The proven skid mounted plant concept, the experience of the commissioning teams and close coordination among the partners ensured that project execution and operational readiness progressed in line with expectations.



The project in Palmeira comprises the delivery of thyssenkrupp nucera's well proven and highly efficient chlor-alkali technology as part of an engineering and procurement scope. Chlorum Solutions ordered a skid-mounted plant with BM2.7 electrolysis technology from the supplier of world-leading technologies for high-efficiency electrolysis plants. The BM2.7 zero-gap membrane electrolysis system is characterized by low energy consumption and high energy efficiency, enabled by an increased usable membrane area combined with a full zero-gap-design.

Chlorum Solutions specializes in the construction and operation of small-scale chlorine plants for the production of soda, hydrochloric acid and hypochlorite. The chlor-alkali electrolysis plant provides a production capacity of more than 15,000 tons of chlorine per year. It marks an important milestone for Chlorum Solutions as the company is expanding its production footprint in the region. ■

National Chemistry Day

Godrej Industries Group's National Chemistry Day Summit Explores Resilience as a Defining Capability for Chemical Industry

Third edition examines how businesses can build resilience through innovation, technology, talent and stronger partnerships



Glimpses from National Chemistry Day Summit

Mumbai: Godrej Industries Group (GIG) hosted the third edition of the 'National Chemistry Day' summit. Building on the success and momentum of the previous two editions, this joint initiative by GIG companies, Godrej Industries (Chemicals) and Astec LifeSciences, brought together leaders from across the chemical industry under the theme 'Staying Resilient in a New Age World,' to

examine how businesses can adapt, innovate and build for the future.

The Indian chemical industry finds itself in a period of major transformation, with changing market dynamics, evolving supply chains, technological disruptions and a shifting sustainability landscape reshaping the way businesses operate. Against this backdrop, the

summit explored how organisations can move beyond responding to change to anticipating it, strengthening their capabilities and creating long term value.

Reflecting on the summit, Vishal Sharma, Executive Director & Chief Executive Officer, Godrej Industries (Chemicals) and Chairperson, Astec LifeSciences, said, "Resilience today is no longer just about managing disruption; it is about anticipating and being prepared for what comes next. As our industry navigates geopolitical uncertainty, evolving customer needs, and a rapidly changing environment, agility will define the winners. But no company can build that future alone. In the chemical industry, each of us is simultaneously a competitor, a supplier, and a customer. If we want to take this industry forward in the right direction for India, we must move beyond operating only as individual companies and work together as the Chemical industry. That is the spirit behind National Chemistry Day and our commitment to building it as a permanent platform for collaboration. Together, we can create an industry that is more innovative, more agile, more sustainable, and most importantly, future ready and resilient."

The first panel, 'Resilience Beyond the Enterprise: Building a Future-Ready Chemical Industry,' was moderated by Vishal Sharma, and brought together Murali Krishna Duvvuri, Senior Managing Director, Life Sciences, Asia and Region India, Croda; Alexander Gerding, Managing Director, BASF India; and Bankim Patra, Country Head (Lubes), Indian Oil Corporation Limited.

The discussion highlighted the need for a more integrated approach to strengthening India's chemical ecosystem, with greater collaboration across the value chain, stronger technology and R&D partnerships, enabling infrastructure and policies, and faster project execution emerging as key priorities for future growth. These priorities underscore the importance of building a stronger ecosystem that can support investment, innovation and scale.

The second panel, 'Resilience for the Enterprise: Driving Growth, Competitiveness, and Agility in a Changing Market,' was moderated by Sandeep Arora, Chief Commercial Officer, Godrej Industries (Chemicals) and brought together Raj Tiwari, CEO,

SUPERFORM and Whole-time Director, UPL Limited; Ajith Kumar, Chief Operating Officer, Birla Opus; and Vimal Bhola, Co-founder and Chief R&D Scientist, Innovist, formerly Onesto Labs.

The conversation brought out the importance of building organisational strength through people, a strong product proposition, customer understanding and a culture that enables innovation, with the discussion highlighting talent development, long term business design, customer centricity, faster innovation and the balance between short term execution and long-term R&D as important considerations for businesses seeking to remain agile and responsive to change.

The summit also featured two focused sessions examining emerging priorities for the chemical industry. 'Preparing for the Next Decade: AI in the Chemical Industry' featured a keynote by Sambit Patra, Senior Partner, Chemicals Practice, Bain & Company, while a fireside chat around 'The Talent Imperative: Attracting, Developing, and Retaining Talent in a Rapidly Evolving Chemical Industry' featured Shefali Kohli, CHRO, Global Chemicals, Fashion Yarn and Insulators, Aditya Birla Group and Poonam Burman, Chief Human Resource Officer, Godrej Industries (Chemicals).

The event highlighted the industry's shift toward green chemistry, the transformative power of AI, and the urgent need to attract new talent to the sector.

With revenues of USD 7.2 billion in FY26 and a market capitalisation of USD 19 billion as of 31 March 2026, Godrej Industries Group operates across FMCG, real estate, financial services, agriculture and chemicals. ■

BPCL Pioneers District-Level CBG Ecosystem in Satna, Linking Waste to Local Energy Demand

Locally produced Compressed Biogas meets the energy requirements of PNG domestic and commercial customers and CNG automobiles in Satna.



Mumbai: Bharat Petroleum Corporation Limited (BPCL), a Fortune Global 500 company and a Maharatna PSU, has established Satna as a district-level gas ecosystem where the energy requirements of PNG domestic and commercial customers, as well as automobiles using CNG, are being met through Compressed Biogas (CBG) generated from waste. The initiative marks a significant step in demonstrating how renewable gas can be integrated across multiple customer segments and utilised within a local energy ecosystem.

The initiative forms part of BPCL's '#TheGoodPrint Solution for the nation', a decentralised model focused on converting locally available waste into clean energy and enabling its use within the same ecosystem. In Satna, waste generated in and around the district is processed to produce biogas, which is upgraded into CBG and supplied through the existing gas distribution infrastructure to meet local energy requirements. This creates an integrated value chain connecting waste generation, CBG production, distribution and end-use within the same geography.

The Satna model demonstrates the potential of CBG to move beyond its conventional use as a transportation fuel and serve a wider range of energy needs. The locally produced renewable gas is being utilised by PNG domestic and commercial consumers as well as

CNG-powered automobiles, demonstrating how CBG can be integrated into existing gas infrastructure and contribute to a more decentralised energy system. BPCL is also strengthening the CBG value chain through strategic partnerships and tie-ups with CBG producers across the country. These collaborations are aimed at developing a reliable and scalable supply base for renewable gas while enabling greater integration of CBG into the Company's City Gas Distribution (CGD) network. By connecting producers with multiple consumer segments through existing infrastructure, BPCL is working towards creating a wider market for renewable gas.

More than 7 per cent CBG is currently being blended across BPCL's CGD operations in India, with the share expected to increase as additional CBG plants become operational and the network of producers expands. Satna represents a further evolution of this approach, demonstrating how local production and local demand can be brought together to create a decentralised gas ecosystem powered by renewable energy.

The #TheGoodPrint Solution reflects BPCL's broader approach to supporting India's energy transition by making productive use of locally available resources and integrating renewable energy into everyday consumption. By connecting waste management with energy generation and end-use, the model has the potential to be replicated across other suitable geographies, supporting the wider adoption of CBG while contributing to a more circular and decentralised energy system. As BPCL continues to expand its partnerships with CBG producers and strengthen renewable gas integration across its CGD network, the Company remains focused on developing practical and scalable solutions that can support India's transition towards cleaner and more sustainable sources of energy. ■

Beyond Conservation: Engineering a New Paradigm for Water Preservation



Dr. Aditi Mullick

Managing Director

PrasinTech Innovations



Water management can no longer focus only on conserving water or treating it after pollution has occurred. As urbanisation, industrial activity and climate variability place increasing pressure on freshwater resources, the priority must shift towards preserving water quality, restoring degraded ecosystems and ensuring the long-term usability of available resources. This requires moving from a reactive treatment model towards prevention, preservation, restoration and responsible reuse. It also calls for engineering approaches that are resource-efficient, scalable and sensitive to the ecological functions of water bodies, emphasises **Dr. Aditi Mullick, Managing Director, PrasinTech Innovations.**

Water is often described as a finite resource, yet the challenge facing the world is not simply the availability of water—it is the **availability of clean, usable water**. Rapid urbanisation, industrial growth, agricultural intensification and climate variability are placing increasing pressure on freshwater resources, while pollution and degradation of lakes, rivers and groundwater are reducing their ability to sustain communities and ecosystems.

For decades, water management has largely focused on **conservation, treatment and supply**. However, a more comprehensive approach is now needed—one that moves beyond reducing consumption to actively **preserving the quality, ecological health and long-term usability of water resources**. This requires a shift from treating water after it becomes polluted to preventing degradation, restoring impaired water bodies, promoting reuse and deploying technologies that improve water quality with greater resource efficiency. Engineering and innovation therefore have a critical role to play in shaping a new paradigm where water is not merely treated as a commodity to be consumed and recovered, but as a resource to be continuously protected, restored and sustained.

From Water Conservation to Water Preservation

Traditional water conservation strategies have largely centred on reducing consumption, improving efficiency and increasing the availability of freshwater. While these measures remain essential, they address only one part of a much larger challenge. A water body can contain abundant water and yet be functionally unusable because of pollution, eutrophication, algal proliferation, industrial contaminants or declining ecological health.

Water preservation therefore requires a broader perspective. It involves protecting water quality at the source such as decentralized water and wastewater treatment, preventing contamination, maintaining the ecological balance of natural water bodies, and ensuring that treated water can be safely returned to productive use. This shifts the focus from simply asking *“How much water can we save?”* to a more fundamental question: *“How can we ensure that the water we have remains usable for generations?”*

Such a transition requires the integration of **resource efficiency, pollution prevention, restoration, reuse and advanced & green treatment technologies**. Instead of relying solely on large, centralised treatment systems after pollution has occurred, engineering solutions must increasingly address water quality closer to its source and enable continuous management of water bodies.

This is particularly important for lakes, ponds, reservoirs and urban water systems, where deterioration can result from multiple interacting factors. Excess nutrients can trigger algal growth; organic and industrial pollutants can reduce dissolved oxygen; sediment accumulation can alter ecological conditions; and untreated or inadequately treated inflows can continuously reintroduce contaminants. Addressing these challenges requires solutions that are not only effective in treatment, but also **energy-conscious, scalable, adaptable and capable of supporting long-term waterbody health**.

The future of water management, therefore, lies not in a single technology or treatment process, but in moving towards an integrated approach where **prevention, preservation, treatment and restoration work together**. Engineering can provide the tools to make this transition possible—but the objective must ultimately be to preserve water before it reaches a point where intensive intervention becomes necessary.

The Growing Challenge of Water Quality

The global water challenge is increasingly becoming a **water-quality challenge rather than simply a water-quantity challenge**. Freshwater resources are under pressure from untreated and partially treated wastewater, agricultural runoff, industrial discharges, excessive nutrient loading and increasing urbanisation. As these pollutants enter water bodies, they can trigger eutrophication, algal blooms, oxygen depletion and progressive ecological degradation.

What makes this challenge particularly complex is that water bodies are **dynamic systems**. Pollution does not occur through a single pathway, and treating one contaminant alone may not restore the overall health of a lake, pond or river. Continuous pollutant loading can also undermine conventional restoration efforts, making long-term preservation difficult.



This highlights the need to move from a **reactive treatment model to a preventive and continuous management approach**. Protecting water quality at the source, controlling pollutant inflows, maintaining dissolved oxygen, managing biological growth and enabling safe water reuse must become integral parts of water resource management.

Engineering innovation can play an important role in this transition by developing decentralised, energy-efficient and adaptable technologies that address water-quality challenges before they become irreversible. The objective is not merely to treat polluted water, but to maintain the health and usability of water resources throughout their lifecycle.

Technology for Sustainable Water Preservation

Technology has an important role to play in protecting water resources, but technological advancement alone cannot define sustainable water management. The real objective should be to develop and adopt solutions that improve water quality while **minimising energy consumption, chemical dependency, waste generation and ecological disturbance**.

Emerging approaches in process engineering, advanced oxidation such as ozone technology, biological treatment, membrane systems, nanotechnologies like advanced nanobubble generators are creating new possibilities for addressing complex water-quality challenges. Their value lies not simply in their treatment efficiency, but in how effectively they can be integrated into existing systems with lower resource requirements and reduced environmental impact.

Sustainable water preservation also requires looking beyond the treatment process itself. The **entire lifecycle of a solution** - including energy use, material requirements, maintenance, waste generation and eventual reuse or disposal - must be considered. A technology that removes a pollutant but consumes excessive energy or generates significant secondary waste may simply shift the environmental burden from one stage to another.

The future therefore lies in **context-specific and resource-efficient engineering**. Technologies must complement natural processes wherever possible, support water reuse, minimise intervention and preserve the ecological functions of water bodies. Such

an approach can help transform water management from a predominantly reactive activity into a long-term strategy for **resource conservation, ecosystem resilience and sustainable development**.

Principles for Sustainable Water Preservation

A sustainable approach to water preservation must consider not only how effectively water is treated, but also how the intervention affects the wider environment and the resources required to sustain it. This calls for a shift from isolated treatment objectives towards **integrated water-resource management**.

Key principles include:

- **Prevention before treatment:** Reducing pollutant entry into water bodies is generally more sustainable than relying solely on downstream treatment by establishing and maintaining STP/ETP/WTTPs.
- **Resource efficiency:** Treatment processes should aim to minimise energy, chemicals, freshwater consumption and material requirements.
- **Water reuse and circularity:** Treated water should increasingly be viewed as a resource that can be safely recovered and reused wherever appropriate.
- **Protection of ecosystems:** Water-quality interventions should preserve aquatic biodiversity and the natural functions of lakes, rivers and wetlands through green routes such as solar based ultrasonic device, nanobubble based oxygenation or disinfection.
- **Decentralised solutions:** Where appropriate, localised treatment and management through STP/ETPs can reduce conveyance requirements and enable faster responses to site-specific challenges.
- **Lifecycle thinking:** Environmental impact should be assessed across the complete lifecycle of a technology—from manufacturing and operation to maintenance and end-of-life management.
- **Continuous monitoring:** Data-driven monitoring of parameters such as dissolved oxygen, nutrients, organic load and biological indicators can support timely and informed intervention.

Ultimately, sustainable water preservation is not about finding a single technology that solves every water problem. It is about **combining appropriate technologies, sound engineering and responsible resource management** to protect water quality while maintaining the ecological and economic value of water resources.

The Indian Context: Preserving Water Beyond the Source

India's water challenge illustrates why water preservation must extend beyond simply increasing water availability. The country has an extensive network of rivers, lakes, ponds, wetlands and groundwater resources, yet many of these systems are under increasing pressure from urbanisation, industrial activity, agricultural runoff and inadequate wastewater management. The Central Pollution Control Board identifies wastewater-related organic and microbial pollution as significant concerns affecting Indian water bodies.

The challenge is particularly visible in rapidly growing urban centres, where water bodies often receive multiple pollutant loads while also serving as important ecological and community resources. Once a lake or river becomes degraded, restoring it can require substantially more resources than preventing the degradation in the first place.

India therefore needs to move towards a **source-to-reuse approach**, where water is managed across its entire lifecycle rather than through isolated interventions.

Key priorities include:

- **Protecting natural water bodies** from untreated and partially treated discharges.
- **Reducing pollution at source** through better industrial and municipal wastewater management.
- **Reusing treated wastewater** for suitable non-potable applications and reducing pressure on freshwater sources.
- **Restoring degraded lakes, ponds and wetlands** while maintaining their ecological functions.

- **Improving water-use efficiency** in agriculture, industry and urban systems.
- **Strengthening decentralised and context-specific management**, particularly where centralised infrastructure is difficult to implement.
- **Using monitoring and data** to identify deterioration early and enable preventive action.

Indian water policy is increasingly recognising the importance of **source sustainability, water efficiency, reuse, recharge and integrated water-resource management**. The next step is to translate these principles into long-term practices in which preservation becomes an integral part of planning, engineering and everyday water management.

For a water-stressed and rapidly developing country like India, the objective should not be merely to find more water, but to **protect the water resources that already exist and ensure that they remain functional, accessible and resilient for the future**.

From Treatment to Circular Water Management

Water management has traditionally followed a linear model: **withdraw, use, treat and discharge**. While treatment remains essential, this approach does not fully recognise the value contained in wastewater. A more sustainable model views water as part of a circular system, where water, nutrients and other recoverable resources are retained within the cycle for as long as possible.

Circular water management focuses on reducing freshwater demand, increasing safe water reuse and recovering useful resources from wastewater. Depending on the application, treated wastewater can support industrial processes, agriculture, landscaping, groundwater recharge or other non-potable uses, reducing dependence on freshwater sources.

This transition requires a combination of **appropriate treatment, monitoring, risk management and fit-for-purpose reuse**. Not every application requires the same level of treatment, and designing systems according to the intended end use can prevent unnecessary consumption of energy and chemicals.

A circular approach can therefore create multiple benefits:

- **Reduced freshwater abstraction** and greater water security.
- **Lower pollutant discharge** into natural water bodies.
- **Recovery and reuse of water and nutrients** wherever technically and economically feasible.
- **Reduced treatment and disposal burdens** through better resource utilisation.
- **Greater resilience** for industries and communities facing water scarcity.

The objective is not to circulate water indefinitely at any cost, but to create safe, efficient and environmentally responsible loops wherever they make sense. Such thinking represents an important step from conventional water treatment towards long-term water preservation and resource sustainability. ■

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India's Chemical Industry is Rewriting the Rules of Global Supply Chains

Mahesh P. Babani

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The global supply chain is undergoing one of its most significant realignments in decades. New disruptions in the Red Sea due to attacks by Houthis on commercial vessels, increasing tensions in the Middle East region and emerging tariff and trade policies have only further highlighted a fundamental truth that in today's business world, resilience has become as important as costs. Companies are no longer evaluating suppliers solely on manufacturing economics but also on their ability to ensure continuity, compliance, and long-term reliability, opines **Mahesh P. Babani, Chairman & Managing Director, Privi Speciality Chemicals Ltd.**

For years, China dominated global chemical manufacturing, but today multinational companies are actively diversifying their sourcing strategies to reduce concentration risk. The “China+1” approach has moved from being a procurement strategy to a business imperative, with India emerging as one of the most credible alternatives.

India’s chemical industry is no longer viewed merely as a low-cost manufacturing base. It is steadily establishing itself as a strategic partner, combining manufacturing scale with process innovation, engineering expertise, regulatory compliance, and dependable supply for industries such as personal care, home care, pharmaceuticals, food ingredients, and speciality chemicals. According to industry estimates, the Indian chemical market is expected to surpass USD 300 billion¹ by 2030.

The sector already contributes² nearly 7 per cent to India’s GDP and accounts for approximately 13 per cent of the country’s merchandise exports, underscoring its growing role in both the domestic economy and global manufacturing value chains.

This transformation is particularly evident in the aroma chemicals and fragrance segment, where Indian manufacturers are moving beyond cost competitiveness to become innovation-led partners. By combining scale, technical expertise, and consistent quality, they are strengthening India’s position in global supply chains while helping consumer brands meet rising expectations around performance, compliance, and sustainability.

Chemical Manufacturing in India Evolves Along the Value Chain

Today, reliability, sustainability, regulatory compliance, and innovation have become extremely critical, with global companies seeking partners that can ensure uninterrupted supply, maintain consistent quality, and accelerate product development.

India’s chemical industry has steadily evolved to meet these expectations. Investments in advanced chemical processing, process engineering, research and development, and manufacturing excellence have strengthened the industry’s position within global value chains. This transformation has been further supported by government initiatives aimed at expanding India’s manufacturing capabilities and enhancing its competitiveness as a global production hub.

The development of the cluster-based integrated chemicals production plants like those at Dahej in Gujarat and Mahad in Maharashtra will make the sector even more competitive in the future. The use of common infrastructure and utilities will help save on capital expenses needed for setting up new plants.

As a result, India’s advantage today extends far beyond cost. It lies in a combination of deep chemical expertise, robust process engineering, manufacturing scale, regulatory compliance, and innovation. Across the industry, companies are investing in backward integration, process automation, solvent recovery, and high-purity manufacturing to improve operational efficiency while meeting the increasingly stringent quality and sustainability requirements of global customers.

One other major strength comes from the continual process improvement by Indian scientists and chemical engineers. This has been done through developments like environmentally friendly solvents that are economically viable, greater efficiencies in the process, and reduced wastes.

As demand shifts towards long-term manufacturing partnerships rather than transactional supplier relationships, India is emerging as a preferred destination for speciality chemicals and high-value ingredients.

Increasingly, global companies are looking to Indian manufacturers for technical collaboration, process innovation, and the ability to deliver consistent performance at scale.

Aroma Chemicals and the Rise of Sensory Branding

Few segments reflect India’s evolution up the chemical value chain better than aroma chemicals. Aroma chemicals have become an integral part of products that consumers interact with every day. According to industry estimates, the Indian aroma chemicals market was valued at nearly USD 500 million³ in 2025.

Fragrance has become an integral part of a brand’s identity and product experience. Fragrance influences how consumers perceive quality, build familiarity, and develop long-term brand affinity. As a result, global consumer brands are increasingly looking for manufacturing partners that can deliver not only high-quality aroma molecules but also the technical expertise required to meet evolving performance expectations.

The Importance of Consistency Across Markets

For global brands, developing a signature fragrance is only one part of the challenge. Delivering the same sensory experience across different geographies, climatic conditions, and product applications is equally important. A fragrance designed for a detergent in Europe may perform differently in tropical climates, while formulations often need to behave consistently across applications ranging from soaps and cosmetics to home care and fine fragrances.

To meet these expectations, Indian aroma chemical manufacturers are investing in advanced manufacturing technologies, application-focused research and development, process automation, batch traceability, analytical testing, and formulation stability studies. Adherence to globally recognised standards such as International Fragrance Association (IFRA) and Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) has become a prerequisite for serving international markets.

As supply chains become more complex and consumer expectations continue to evolve, consistency has emerged as a defining competitive advantage. Increasingly, global customers are choosing partners that can combine technical expertise, regulatory compliance, and manufacturing excellence to deliver the same quality and performance, irrespective of geography or scale.

Commodity Production to Tailored Solutions

The evolution of India's chemical industry is also reflected in the changing nature of customer relationships. Global brands are no longer looking for manufacturers that supply standard molecules at competitive prices. Instead, they are seeking long-term partners that can contribute to product development, optimise manufacturing processes, and respond quickly to changing consumer and regulatory requirements.

Brands increasingly seek distinctive fragrance profiles; demand is growing for specialised aroma molecules that deliver consistent performance across diverse applications. This has encouraged Indian manufacturers to strengthen their research and development capabilities, collaborate closely with global customers, and develop application-specific solutions rather than standard products.

Sustainability has become an integral part of innovation. Customers increasingly expect manufacturing partners to demonstrate responsible sourcing, green chemistry practices, energy-efficient production, waste minimisation, and resource optimisation. In response, Indian chemical companies are embedding sustainability into product development and manufacturing processes, recognising that environmental responsibility is becoming as important as technical capability.

The Rising Influence of India within Global Supply Chains

As global supply chains continue to evolve, India's role within them is set to expand further. Digitalisation, intelligent manufacturing, and advanced process optimisation. Technologies such as process automation, predictive maintenance, AI-enabled formulation development, and data-driven manufacturing are gradually reshaping how chemical companies improve efficiency, quality, and sustainability.

In the future, AI has the potential to help discover new molecules such as fragrance molecules and APIs. This is an opening for the Indian chemical industry to go beyond just process innovation to molecular innovation, something which the Indian industry has not traditionally done much of.

It reflects the industry's sustained investment in technology, process excellence, research, and responsible manufacturing, capabilities that increasingly define competitiveness in global markets.

By combining manufacturing excellence with technical innovation, regulatory compliance, sustainability, and deep customer collaboration, Indian manufacturers are demonstrating that the country's future in global chemicals will be shaped not by cost leadership alone, but by its ability to deliver differentiated value to customers worldwide. ■

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The Handoff Problem: Where **Chemical Supply Chains** Actually Fail



Akash Agarwal

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Every conversation about supply chain risk in the chemical process industry eventually arrives at the same image: a truck on a highway, a container on a ship, cargo in motion. The instinct is understandable — transit feels like the vulnerable phase. But two decades of operating temperature-controlled logistics across India has taught us something counterintuitive: the chain rarely fails while it is moving. It fails when it changes hands. Through this article, **Akash Agarwal, CEO, Crystal Group**, explains how cold chain infrastructure holds the chemical supply chain together — and why it fails at custody transitions, and not in transit.

Supply chain management in the chemical process industry means managing procurement of raw materials, transportation, storage and distribution of finished products. What that description hides is the thread running through all four: for a large and growing share of chemical products, none of it works without controlled temperature.

Supply Chain and Cold Chain: Hand in Hand

For temperature-sensitive chemicals, supply chain and

cold chain are not two disciplines that occasionally meet — they are the same system described from two angles. Four dependencies make the relationship inseparable:

- **No supply without shelf life.** Procurement plans, safety stocks and batch schedules all assume the material survives storage and movement. Cold chain is what makes that assumption true, and every lead time and reorder point in the plan quietly becomes fiction.



- **No visibility without temperature visibility.** Modern SCM runs on track-and-trace. For chemical cargo, knowing where a shipment is means little without knowing what condition it is in. Real supply chain visibility is location plus temperature, on one screen.
- **No compliance without cold chain records.** GDP audits, customer qualifications and export documentation all demand proof of controlled conditions end to end. The cold chain's data trail is the supply chain's compliance file.
- **No resilience without cold buffer.** Disruptions port congestion, monsoon delays, plant shutdowns — are absorbed by holding inventory. For temperature-sensitive products, that resilience is only as large as the cold storage and reefer capacity behind it. Cold chain capacity is supply chain shock-absorption.

A chemical company can therefore only be as good at supply chain management as its cold chain allows it to be. The dependency runs through every stage of the SCM cycle:

- **Procurement.** Imported catalysts, peroxides and speciality intermediates arrive with 2-8°C or 15-25°C stamped on the CoA. Reefer containers at port and temperature-controlled first-mile movement decide whether the raw material entering the plant is actually the raw material that was purchased.
- **Manufacturing and in-plant storage.** Batch schedules rarely match arrival schedules. Modular cold rooms and on-site reefer capacity buffer inbound material against the reactor — protecting shelf life and production continuity without permanent capex.

- **Transportation.** Long-haul movement of adhesives, resins, agrochemical actives and pharma intermediates depends on reefer fleets pre-cooled and validated to the product's band, with live monitoring rather than a logger read after the damage is done.

- **Distribution.** Regional cold stores and last-mile reefer movement carry the product through the most fragmented, most handled leg of the journey — where most excursions actually occur.

Cold chain, in short, is what converts a chemical supply chain from a diagram into a working system. Which makes its most common failure mode worth understanding closely.

Where it Breaks: The Handoff, not the Highway

A specialty chemical shipment moving from a plant in Gujarat to a formulator in Vizag may pass through five or six custodians — a first-mile transporter, a consolidation warehouse, a long-haul fleet operator, a port handler, a regional cold store, and a last-mile distributor. Each is competent within its own boundary. But every boundary is a handoff, and every handoff is a moment when accountability, temperature control, and data continuity can quietly lapse. Those minutes at the dock door are where the real risk lives. Three characteristics make this uniquely expensive for chemicals:

- **Narrow tolerance bands.** Peroxides, catalysts, adhesives, resins, agrochemical actives and pharmaceutical intermediates frequently specify 2-8°C or 15-25°C windows. Unlike general cargo, an excursion is not cosmetic — it changes the chemistry. And unlike food, the damage is often invisible at the point of delivery, surfacing only in QC failures weeks later.
- **Compliance follows the product, not the vendor.** GDP guidelines, CDSCO expectations, and customer audits treat the manufacturer as responsible for the product's condition end to end. "The transporter's reefer failed" is not a defence a regulator or an export customer accepts. When four vendors each hold one segment of the temperature log, reconstructing a complete, audit-ready record becomes an exercise in diplomacy rather than data retrieval.

- **Batch economics.** Chemical shipments are high-value and lumpy. A single rejected consignment of an API intermediate or a specialty additive can erase the margin of an entire quarter's lane. The cost of a handoff failure is therefore not the freight invoice — it is the batch, the replacement expedite, the customer's line-down penalty, and sometimes the customer.

Handoff failures rarely look dramatic. They look like a pallet waiting forty minutes on an open dock in May because the receiving bay was occupied; a reefer pre-cooled to the wrong setpoint because the booking passed through three parties and the specification did not; a data logger never downloaded because it belonged to the previous vendor. In each case, every individual vendor can truthfully claim their segment performed. The failure lives in the seam — and in a fragmented chain, **the seam belongs to no one.**

The Single-Owner Alternative

The structural answer is to collapse the number of custody transitions — ideally to zero — by placing storage, transportation, equipment and monitoring under one accountable operator. In practice, a vertically integrated cold chain for chemical cargo means:

- **One control tower, one temperature record.** From the plant's dispatch bay to the customer's inbound dock, a single continuous data stream — not a stitched-together relay of vendor logs. When an auditor asks for the journey, it is one export, not four requests.
- **Owned equipment, matched to the product.** Reefer containers and cold rooms specified, pre-cooled and validated against the product's actual band — including deep-freeze and precise-tolerance applications — rather than whatever asset the cheapest sub-vendor had free that day.
- **Accountability that survives an incident.** One counterparty, one SLA, one insurer, one throat to choke. Claims resolve in days because there is no inter-vendor blame cycle to arbitrate.
- **Flexibility without fragmentation.** Modular cold rooms and leased reefer capacity add temperature-controlled buffer at a plant, port or depot without capex — extending the single-owner chain instead of bolting on another vendor.

Five Questions for Your Next Logistics Review

For supply chain and procurement leaders in the chemical process industry, the health of a cold chain can be assessed with five uncomfortable questions:

- How many times does our product change custody between dispatch and delivery — and can we name every custodian?
- Can we produce a single, continuous temperature record for any shipment from the last ninety days within one hour?
- Who is contractually liable for the product during loading, unloading and staging — the minutes between vendors?
- When an alarm triggers at 2 a.m., who acts — and do they have the authority and equipment to intervene?
- What did our last temperature-related loss actually cost, once expedites, retesting and customer penalties are counted?

If the answers involve more than one phone call, the chain has seams. And in this industry, seams are where value leaks.

Conclusion

Supply chain management in the chemical process industry is often framed as an optimisation problem — cost per tonne-kilometre, fleet utilisation, warehouse throughput. For temperature-sensitive products, it is more honestly framed as a custody problem. The companies that will lead the next decade of chemical logistics in India are not those with the largest fleets, but those who can stand behind one simple commitment: one chain, one owner, one answer when it matters. ■

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Akash Agarwal is CEO of Crystal Group, a vertically integrated cold chain logistics and container leasing company founded in 1962. Crystal operates refrigerated transportation, cold storage, modular cold rooms and reefer container leasing across India, serving the chemical, pharmaceutical, food and agriculture sectors.

When Borders Multiply: Managing Supply Chains Across Diverse Regulatory Regimes

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Global supply chains no longer rely exclusively on geography, pricing, and logistics timing. Instead, they are now governed by something much more intricate: regulatory disparity. Every new market into which chemicals, industrial goods, or any other cargo are transported adds yet another layer of regulations concerning customs laws, environmental policies, paperwork, classification of goods, and sustainability issues.

These challenges are not merely short-term; according to UNCTAD, geopolitics, slowing trade, and green and digital transformations have become the major drivers of global trade for 2026. Therefore, the issue for supply chain leaders is not if regulations are going to change but if their networks are ready to handle them without jeopardising efficiency, emphasizes ***Pushpank Kaushik, CEO & Head of Business Development (Subcontinent, Middle East, and Southeast Asia), Jassper Shipping.***

The old way saw compliance more as a documentation process or a legal issue. This approach is becoming outdated. A single chemical delivery may pass through several jurisdictions, each having different rules about classification, labelling, documentation, customs declaration, and environmental reporting. Any lack of regulation here can cause delays in delivery, higher costs, inspections, or even exclusion from the market. The scale of this challenge is significant. UNCTAD estimates¹ that technical regulations and sanitary standards now affect around two-thirds of world trade, making regulatory compliance an increasingly important part of supply chain planning.

The new chemical regulation in 2026 shows the trend clearly. More stringent regulations can be seen in Europe, the USA, Turkey, Latin America, and other countries, with more focus on hazard classification and environmental reporting. In such a situation, compliance should be taken into account when planning the route, accepting cargo, preparing documents, choosing suppliers, and communicating with customers.

Chemical Logistics Needs a “Compliance-by-Design” Approach

Chemical logistics is one of the high-stakes businesses since cargo may also be classified as dangerous goods in addition to being subject to specific environmental and safety regulations. The changes expected to take place in 2026 for dangerous goods shipping emphasise the need for proper classification, packaging, labelling, documentation, and handling.

Compliance-by-design becomes one of the principles of conducting business operations. Prior to the shipment of cargo, logistics providers need to make sure that the product is classified properly, that the necessary safety documents are up-to-date, that packaging corresponds to destination market regulations, and that customs codes and origin are documented. Such an approach minimises the risks of facing compliance problems at the last moment.

Data Will Become the Common Language

Where there is a variance in regulations, data consistency serves as the link across jurisdictions. Businesses need to have a consolidated data layer for compliance, which will tie in product data, HS classification, safety documents, shipping information, supplier details, nationally specific regulations, and sustainability data. This makes it possible to detect any change in regulations early enough and establish what shipments, suppliers, and logistics routes will be impacted.

In India's chemicals sector, a convergence of different regulatory pressures such as carbon, chemicals and sustainability reporting is already taking place. There is an opportunity to shift from responsive to predictive compliance through digital and data analytics.

Diversification Must Include Regulatory Risk

Supply chain diversification often refers to the process of diversifying suppliers, ports, and routes. Supply chain diversification without assessment of the associated regulatory environment will simply result in moving the risk geographically.

The supplier might have attractive prices, but does not have the necessary paperwork for exporting its products into a certain export destination market. Another port could have adequate capacity, yet it may add more complexity in the form of customs or handling processes. In the same way, a new market would represent new opportunities as well as increased compliance costs.

This means that in designing supply chains, cost, capacity, connectivity, resilience, and regulatory risks need to be considered. The decision by India to launch Preferential Trade Agreement negotiations with the Southern African Customs Union in 2026 is an example of such a situation.

From Compliance Cost to Competitive Advantage

Future logistics on a global scale will be for those who make it easy to handle complexity. For companies manufacturing and exporting chemicals, regulatory ability could be a competitive edge. Quick availability of documents, better cargo visibility, compliance partners and fast adaptation to market changes can eliminate bottlenecks while improving the confidence of customers.

At Jassper Shipping, we believe that the next level of supply chain resilience would come through visibility, regulatory intelligence, adaptability and collaboration. While borders will multiply from a regulatory perspective, supply chains don't have to fragment.

Our goal is clear: create networks where regulatory change is anticipated, compliance is integrated, and cargo keeps moving confidently. ■

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Resilience is Rewriting the Rules of Supply Chain Competitiveness

Sagar Puranik

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Welspun One



For a long time, supply chains were designed around one dominant principle, efficiency. Consolidate inventory, maximise warehouse utilisation, reduce the number of nodes and move goods through the network at the lowest possible cost. That model worked well when disruption was the exception. Today, it is becoming a less reliable assumption, emphasizes **Sagar Puranik, National Head – Leasing (Gateway), Welspun One.**

Geopolitical tensions, trade disruptions, changing consumption patterns and pressure on transportation networks have made uncertainty a more permanent feature of supply chains. Companies are therefore looking beyond how cheaply a network can operate in normal conditions and asking a more fundamental question, how well can it continue to operate when conditions change?

The shift is already visible in India's warehousing market. According to Knight Frank¹, leasing activity across the country's eight major cities increased 15 per cent in Q1 2026 to 19.3 million sq. ft., making it the second-highest quarterly transaction volume since 2023. This growth came despite continued geopolitical disruptions affecting international trade and supply chains. What is changing is not simply the amount of warehousing being built. It is the way companies

are thinking about where that capacity should sit and what it should enable.

The Cost of Concentration is Under Review

The logic behind a concentrated supply chain is straightforward. Fewer warehouses mean lower operating complexity and better utilisation of assets and inventory. But concentration also creates points of vulnerability. A disruption at a port, supplier, transportation corridor or distribution centre can quickly affect the rest of the network. The warehouse that looked highly efficient on paper can become a bottleneck when the network around it is under pressure.

This is why diversification is becoming a more important part of warehouse planning. Adding another distribution point or positioning inventory closer to an important market may carry a marginally higher cost. But that cost needs to be weighed against what the additional node makes possible: an alternative route, faster replenishment, shorter delivery cycles or the ability to keep operations running when another part of the network is disrupted.

The objective is to build enough choice into the network so that one disruption does not dictate the outcome for the entire operation. That is where the role of warehousing begins to change.

"Lean" to "Calibrated": Inventory Planning Strategy is Evolving

The same thinking applies to inventory. The answer to disruption is to understand where inventory is needed, how quickly it needs to move and how easily it can be replenished. This is where a network of well-positioned warehouses can make a meaningful difference. Inventory can remain relatively lean at an overall level while being distributed closer to key demand centres.

The 2025 India Logistics Occupier Survey by CBRE² captures this changing priority. Nearly 70 per cent of India-based respondents cited improving inventory visibility and planning, along with supplier diversification, as key measures for strengthening their supply chain networks. More than 80 per cent also planned to expand their warehouse portfolios over the next two years.

The implication is important. Warehousing decisions are being made as part of an operating strategy rather than simply a real estate decision. Where the

As networks become more distributed, the warehouse itself must do more. It is no longer simply a place where inventory is stored between two stages of a supply chain. The modern warehouse needs to support faster movement, better inventory visibility, multiple transportation options and changing fulfilment requirements.

warehouse sits can determine how quickly a business can respond.

Location is No Longer Just About Distance

This is perhaps the most visible change taking place in the sector. Earlier, the ideal warehouse was often the one that offered an acceptable balance between land cost, rent and proximity to the market. Today, the calculation is broader. A warehouse located close to a major consumption market serves a different purpose from one positioned along a manufacturing corridor. A facility near a port can play a very different role in an import-export network.

This is why port-led warehousing is gaining relevance. Ports are not simply gateways through which goods enter or leave the country. When warehousing capacity is positioned around these gateways, it can become an important link between international supply and domestic distribution, reducing unnecessary movement and creating greater control over the flow of goods. The broader warehousing network then becomes more diversified: port-linked facilities can support EXIM flows, manufacturing-linked facilities can serve production clusters, while urban and near-market facilities can bring inventory closer to consumption.

The data reflects this movement towards strategically located capacity. Knight Frank's H1 2025 India³ Warehousing Market report found that manufacturing contributed 32 per cent of total warehousing activity, while 3PLs accounted for 25 per cent. Both segments depend heavily on moving goods efficiently between production centres, warehouses and consumption markets.

CBRE's H2 2025 India Logistics figures tell a similar story. More than 30 million sq. ft. of warehousing absorption was recorded in the second half of 2025, with Delhi-NCR, Mumbai and Chennai together accounting for 64 per cent of absorption. 3PLs remained the dominant tenant category, with a 44 per cent market share. The pattern is clear. Warehousing demand is following the movement of goods and the concentration of economic activity.

The Warehouse is Becoming Part of the Operation

As networks become more distributed, the warehouse itself must do more. It is no longer simply a place where inventory is stored between two stages of a supply chain. The modern warehouse needs to support faster movement, better inventory visibility, multiple transportation options and changing fulfilment requirements.

That is driving demand for infrastructure designed around different operational needs. First-mile facilities can connect manufacturing and regional distribution. Port-linked facilities can handle large EXIM flows and provide an interface between global and domestic supply chains. Urban logistics centres can position inventory closer to the end consumer and reduce the time involved in the final leg of delivery.

The significance of this is easy to overlook. A warehouse is a physical asset, but its value comes from what it allows the wider operation to do. Consider locations such as Hoskote near Bengaluru and Chinnambedu. Their relevance lies in their relationship with manufacturing, consumption, transportation and broader logistics networks. The better question, therefore, is not simply whether a warehouse has enough space. It is whether the location and infrastructure give an occupier enough operating choices.

Resilience Now Has a Commercial Value

Supply-chain resilience ultimately has a commercial impact. Disruptions can mean delayed deliveries, idle production and lost sales. A well-planned warehousing network can reduce both the impact and recovery time.

The market reflects this shift. According to CBRE⁴, H1 2025 recorded 27.1 million sq. ft. of industrial and logistics leasing across eight major cities, while more

than 80 per cent of respondents in its 2025 India Logistics Occupier Survey planned to expand their warehousing capacity over the next two years.

The implication is clear: efficiency is no longer about minimising the number of warehouses or the cost of each node. It is about building a network that can keep operations moving when conditions change.

As India's logistics network expands, the value of a warehouse will increasingly depend on its location, connectivity to ports and industrial corridors, and ability to support multiple supply routes. Warehousing is moving from being a cost to be managed to an operational asset that gives businesses the choice and agility to keep moving. ■

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“ India’s emergence as a global manufacturing hub creates a significant opportunity ”



Subash Gaijes Selvaraj
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*Founded in Japan in 1881, Nippon Paint is among the world’s leading paint and coatings companies, with a strong global presence across decorative, automotive, industrial, marine, and protective coatings segments. Nippon Paint’s Industrial Coatings Business in India combines Japanese technology expertise with local manufacturing and technical support capabilities to deliver high-performance coatings designed for durability, corrosion resistance, aesthetics, and operational efficiency. In an exclusive interview with **Chemical Engineering World**, **Subash Gaijes Selvaraj, President - Industrial Coatings, Nippon Paint India**, throws more light on the company’s growth journey.*

Nippon Paint has a diverse industrial coatings portfolio. Which product segments are driving the company’s growth today, and what makes them stand out in the market?

Our growth is being driven across multiple segments, particularly Coil Coatings, Automotive Coatings, Protective Coatings and General Industrial applications. What differentiates us is our ability to combine global technology expertise with strong local R&D, application knowledge and customer collaboration. We are also expanding our focus on advanced technologies such as PVDF Spray and Fluoroethylene Vinyl Ether (FEVE) coatings for applications that demand exceptional weatherability, durability, and lifecycle performance. Nippon Paint is currently the only company manufacturing FEVE in India. Our objective is to offer our customers a comprehensive portfolio that addresses performance requirements across diverse environments and applications.



Industrial customers are demanding coatings that offer longer life and better performance. How is Nippon Paint advancing technologies in corrosion protection, abrasion resistance, and durability?

Industrial customers are increasingly evaluating coatings based on lifecycle performance rather than only initial cost. Our R&D efforts therefore focus on enhancing corrosion protection, UV and weather

INTERVIEW

resistance, scratch and abrasion resistance, chemical resistance and long-term aesthetic performance. We undertake extensive testing under different environmental conditions to understand how coating systems perform against humidity, temperature, UV radiation and other exposures. Technologies such as advanced fluoropolymers, high-performance primer systems and specialised functional coatings allow us to develop solutions for demanding applications. The objective is straightforward—extend service life, reduce maintenance interventions and deliver better lifecycle value for customers.

How closely do you work with OEMs and industrial manufacturers to develop customized coating solutions for their specific applications?

Customer collaboration is fundamental to how we approach innovation. We work closely with OEMs and industrial manufacturers to understand their substrates, application processes, operating environments, performance expectations and production requirements. Our technical and R&D teams then work alongside customers to customise coating systems and application parameters. This relationship often continues throughout the customer's product lifecycle. We do not see ourselves simply as a coating supplier; our philosophy is to become a long-term product and technology partner, continuously improving solutions as customer requirements and manufacturing processes evolve.

As manufacturing plants become more automated, how are your coating products evolving to meet the requirements of robotic and high-speed application systems?

Automation is changing the way coatings need to be formulated and applied. Robotic and high-speed production lines require consistency in viscosity, atomisation, transfer efficiency, curing behaviour and finish quality. A small variation can affect productivity when operations are running at scale. Our development approach therefore considers the complete application process rather than coating chemistry in isolation. We work with customers to optimise products for their equipment and production environments, with the objective of improving application efficiency, reducing wastage, maintaining consistent quality and supporting higher throughput. The future of coatings will increasingly involve chemistry, application engineering and automation working together.

Powder coatings and water-based coatings are gaining momentum across industries. How do you see these technologies shaping the future of industrial coatings in India?

Both technologies will play an increasingly important role as manufacturers seek to balance performance, productivity and sustainability. Powder coatings offer advantages such as high material utilisation and reduced solvent requirements, while water-based technologies can help manufacturers lower VOC emissions. Nippon Paint has experience across solvent-based, water-based, powder and electrodeposition technologies, allowing us to recommend solutions according to specific application requirements. The transition may not be uniform across industries because performance expectations and manufacturing processes differ significantly. The opportunity lies in developing technologies that make sustainability commercially and operationally viable without compromising coating performance.



With industries focusing on cost optimization and operational efficiency, how do Nippon Paint's coating solutions help customers improve productivity while reducing maintenance and lifecycle costs?

We increasingly encourage customers to evaluate coatings based on total cost of ownership rather than the purchase price alone. A high-performance coating can create value by improving transfer efficiency, reducing material consumption, supporting faster processing, extending maintenance intervals and increasing the service life of the finished product or asset. Technologies offering enhanced corrosion resistance, weatherability and scratch resistance can further reduce repainting

and maintenance requirements. Our technical teams work with customers to identify these opportunities across both product and application processes. Ultimately, the right coating system should improve performance during manufacturing as well as deliver value throughout the product lifecycle.



Sustainability has become a business priority. What innovations is Nippon Paint introducing to develop low-VOC, environmentally responsible, and energy-efficient coating solutions?

Sustainability is embedded in our product development strategy. Our focus includes low-VOC and high-coverage coatings, water-based technologies, powder coatings, energy-efficient curing systems and solutions designed to extend product and asset lifecycles. We have already achieved 100 per cent heavy metal-free systems in the automotive segment, and in coil coatings we have phased out several products containing heavy metals and are actively working towards eliminating the remaining ones, even in the absence of regulatory restrictions. Importantly, sustainability cannot come at the expense of performance. Our Research & Development (R&D) approach therefore seeks to balance environmental impact, durability, application efficiency and customer economics, enabling manufacturers to progress towards their sustainability objectives while maintaining the performance standards their operations demand.

R&D has always been a key differentiator in the coatings industry. Which emerging technologies or material innovations do you believe will redefine industrial coatings over the next few years?

We see significant opportunities emerging around advanced fluoropolymers, functional coatings, smart materials, sustainable chemistries and coatings designed for new substrates. PVDF Spray and FEVE technologies are particularly relevant for customers who require exceptional weatherability, colour retention, and long-term exterior performance. Beyond this,

smart coatings with functionalities such as corrosion sensing, self-cleaning surfaces, heat reflection and potentially self-healing capabilities will progressively change expectations from coatings. Digital tools will also become more important in formulation, application monitoring and quality control. The next generation of coatings will increasingly combine chemistry, material science, digital technology and application engineering.

Which end-user industries are creating the strongest demand for your industrial coatings today, and what changing customer expectations are influencing your product development strategy?

We see strong opportunities across automotive and auto-ancillary, infrastructure and construction materials, steel and metal processing, appliances and consumer durables, engineering, industrial equipment, renewable energy, and heavy manufacturing. Automotive transformation, infrastructure investment and India's expanding manufacturing base are creating new requirements across these sectors. At the same time, customers are demanding longer product life, higher corrosion and weather resistance, greater application efficiency and more sustainable technologies. These requirements are making product development increasingly application-specific. Our approach is therefore to combine global technology platforms with local R&D and customer collaboration to develop solutions suited to the actual operating and manufacturing conditions in India.

What is your vision for Nippon Paint India's industrial coatings business, and what key trends should the chemical and manufacturing industries keep an eye on?

Our vision is to build Nippon Paint Industrial Coatings as a comprehensive coating solutions partner capable of addressing increasingly complex requirements across India's manufacturing ecosystem. We will continue expanding across industrial coating verticals while strengthening R&D, manufacturing capabilities, customer partnerships and our talent base. Over the next few years, sustainability, automation, advanced materials, electrification, smart coatings and greater localisation of global technologies will reshape the industry. India's emergence as a global manufacturing hub creates a significant opportunity. Our role is to bring together Nippon Paint's global innovation legacy and local expertise to develop future-ready solutions that help customers grow competitively and sustainably. ■

Connected Systems Will Shape the Future of Logistics

The supply chain is becoming increasingly interconnected and reliant on data, the advent of the next generation of logistics will not hinge on the different technologies involved, but rather on whether these technologies can work together. Interoperability is beginning to emerge as the pillar that paves the way for faster trading and smarter decisions, emphasizes Vaibhav Singh, Program Manager, NICDC Logistics Data Services Ltd (NLDSL).

The logistics sector has recently gone through an impressive technological transformation. Companies The logistics sector has recently gone through an impressive technological transformation. Companies have adopted the use of digital solutions such as warehouse automation, IoT-enabled tracking, artificial intelligence, and predictive analytics. However, despite the above advancements, organizations are still faced with one problem that compromises their initiatives, i.e. disconnected systems that cannot communicate with one another. What will be most important in the next decade is not adopting more technology, but instead ensuring that the technology, platforms, and parties involved are capable of sharing relevant data and related information.

Why Interoperability Matters Today

One shipment normally goes through several checkpoints, namely transportation operators, ports, customs, shipping lines, warehouses, banks, and regulatory organizations, among others. These stakeholders might have their own digital systems, which means that coordination will be unsuccessful if the information is not exchanged. Interoperability is a technique that makes it possible for different systems to exchange information securely while still allowing organizations to continue using existing technologies. Thus, the logistics industry will gain better operational visibility in the future.

Connected Platforms Driving Interoperability

The effectiveness of interoperability in the logistics industry is well-shown in India, where digital platforms like ULIP, LDB, and TYT allow for easier data exchange among stakeholders of the field. The ULIP platform enables secure data exchange so that the platform connects different parties. Similarly, LDB is a tool for achieving better visibility across ports and connections. TYT enables to track shipment by using different means of transport, whereas further initiatives are focused on other areas. Nevertheless, all systems will connect different parties that have various systems, which will lead to better data exchange and increased transparency.

Building an Interoperable Logistics Ecosystem

- **Quick data transfer:** Connected digital platforms facilitate safe information exchange among members of the logistics chain.
- **Wide operational visibility:** Integrated systems have real-time access to cargo information, eliminating uncertainties and improving planning.
- **Better co-operation of participants:** Interoperability enhances coordination between logistics companies, corporations, and public authorities.

Emerging technologies such as artificial intelligence, blockchain, IoT and digital twins have immense potential to transform logistics. However, these technologies cannot operate effectively in disconnected environments. Their success depends on interoperable data ecosystems that enable information to move freely, securely and in real time.

- **Lower duplication and delays:** The use of standard information exchange mechanisms leads to the reduction of various redundant processes and paperwork.
- **Digital foundations ready for AI:** Connected data ecosystems provide quality data needed for advanced analytics and intelligent automation.
- **Scalable innovations:** Open and interoperable systems make it possible for new technologies to launch, thus promoting innovations in the industry.

Industry Perspective

The world's leading logistics ecosystems are abandoning separated digital platforms in favor of connected networks that ensure the data flow in both directions among organizations. India's logistics transformation is moving in a similar direction with endeavors aimed at providing secured access to information, establishing digital public infrastructure, and expanding interoperability among the actors. Instead of creating new independent systems, the aim is increasingly focused on connecting existing system.

Looking Ahead

Emerging technologies such as artificial intelligence, blockchain, IoT and digital twins have immense potential to transform logistics. However, these technologies cannot operate effectively in disconnected environments. Their success depends

on interoperable data ecosystems that enable information to move freely, securely and in real time. As India strengthens its manufacturing capabilities and expands its participation in global trade, investments in interoperability will help reduce logistics costs, improve resilience and create a more competitive business environment. The organisations that embrace connected ecosystems today will be better positioned to lead the logistics industry of tomorrow.

Conclusion

The future of logistics will not be determined by the number of digital tools organisations deploy, but by how effectively those tools work together. Interoperability transforms isolated systems into connected ecosystems, enabling faster decisions, stronger collaboration and more resilient supply chains. As logistics continues its digital evolution, the ability to connect information across stakeholders will become one of the defining drivers of efficiency, innovation and global competitiveness. ■

Author



Vaibhav Singh
Program Manager
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High Efficiency Mist Cooling System & Induced Draft Mist Cooling Tower: A Superior Alternative to Conventional Cooling Towers



Makarand A. Chitale

Whole Time Director

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Pune

*Water cooling has played an important role in all types of process industries and power plants since its inception. Efficiency of a process industry largely depends on availability of designed cold-water temperature through-out the year. However especially in summer and monsoon. During these months when humidity is high, cooling tower fails to achieve desired cold-water temperature which results in lower efficiency of plant. Now it is time to find new solution to get desired cold-water temperature throughout year. Through this article, **Makarand A. Chitale, Whole Time Director, Mist Resonance Engineering Pvt. Ltd.**, reviews basic types of cooling systems utilized in process/chemical plants and other industries. He also explains why new mist creation system is superior than conventional cooling towers.*

The ultimate Mist Creation Technology is the best alternative to conventional cooling towers. This advanced mist creation system can achieve an approach of 1 to 2°C to Wet Bulb Temperature (WBT) as against 5 to 6°C approach for conventional cooling tower. Hence guaranteed cold water temperature of around 30°C could be obtained throughout the year in our tropical climate. Also, the spraying head is equivalent to the height of cooling towers thus requiring same pumping power. As mist creation system does not require fans for cooling it saves huge

amount of power. Also, as there are no moving parts involved in Mist Creation System the maintenance cost is negligible and system runs trouble-free.

Introduction

In process/chemical plants, product vapour generated in the process is condensed in a heat exchanger and is recovered back. The condensation of steam/vapour requires a cooling medium. In early days this was achieved by using water from a river, a basin or seawater. The cold water is pumped through a heat

exchanger and the warm water is discharged back to the water source. This is called once through cooling system. A once through system is an open loop system. The necessity to reduce the huge amount of water gave birth to the idea of closed loop system. Thus, the wet cooling system came into effect.

In a wet cooling system, water is circulated to condense the steam in the same type of heat exchanger that is used in once through cooling. The warm water, instead of being returned to the water source, is cooled in a cooling tower using air as the cooling medium. Only the water carried away due to evaporation, drift and blow-down needs to be replenished by make-up water. Thus, requirement of water quantity is vastly reduced.

Wet Cooling Systems

1. Wet Cooling Tower System

We will first consider the wet cooling tower system. The wet cooling tower system is based on the principle of evaporation. The heated water coming out of the surface condenser is cooled as it flows through a cooling tower, where air is forced through the tower by either mechanical or natural draft. Now a days, mostly, all wet cooling towers are mechanical draft cooling towers, where the air flow is accomplished by the fans.

The principle cooling device used in an induced draft cooling tower are fans which run at the top of Cooling Tower (CT). Air enters through side louvers and escapes from the top. Water enters at the top and trickles down while getting cooled by air draft.

A correctly designed induced draft CT can give an approach of 4 to 6°C to WBT with a ΔT of 10°C. Even a very highly efficient CT can not give an approach less than 4°C to WBT. Moreover, if ambient temperature or humidity levels rise, efficiency of CT reduces.

2. Mist Cooling System

Mist Resonance Engineering Pvt. Ltd. (MREPL) has come out with a solution by designing Mist Cooling System (MCS), which is a high efficiency system, which ensures an approach of 1°C to prevailing WBT with a ΔT of 12 to 15°C even in adverse climatic conditions.

In tropical conditions, worst WBT even at coastal applications is maximum 30.5°C. Hence MCS will

always maintain cold water of around $31^{\circ}\text{C} \pm 1^{\circ}\text{C}$ throughout the year. No other cooling system can operate with such efficiency and it makes cooling tower/spray pond systems obsolete.

Various Models of Mist Cooling System / Tower to Suit Site Conditions

Model-I: Open Type Mist Cooling System: Here, MCS ensures an approach of 1°C to design WBT with a ΔT of 12 to 15°C. Water loss due to drift is 0.1 to 0.25 % depending on wind speed.



Model-I: Open Type Mist Cooling System.

Model-II: Louver Type Mist Cooling System: Model-II Louver type mist cooling system is a perfect option for conventional induced draft cooling tower. Here MCS pond is closed from sides, up to a height of 8 to 10 m by louver type cover sheeting. This reduces the plot size by 60% of open pond design. MCS ensures an approach of 1 to 2°C to WBT with a ΔT of 12 to 15°C. Drift loss comes down to 0.02% and also space requirement reduces considerably.



Model-II: Louver Type Mist Cooling System

Salient Features of Open/Louver Type Mist Cooling System:

1. Cold Water Temperature:

Mist Cooling System ensures an approach of 1°C to WBT with a ΔT of 12°C to 15°C.

2. Energy Savings:

Due to such high temperature drop obtained, water quantity required at the process side is much less. MCS requires water pressure equivalent to the height of cooling tower. Hence, considerable amount of energy is saved on circulation water pumping. Also, MCS does not require any fans for cooling. Thus, a huge amount of energy is saved on circulation and cooling.

3. Process Benefits:

MCS will supply cold water at a temperature very close to WBT (Approach of 1°C) as against an approach of 4 to 5°C in cooling tower. This will reduce the product vapour losses in shell and tube heat exchangers. This will ensure that your plant operates at an enhanced yield in summer and monsoon, also giving stable output throughout the year. Hence installation of MCS will ensure large commercial benefits to you in the form of additional product obtained at a higher yield.

4. Maintenance:

MCS has no moving parts. It does not use any fills and fins for cooling. Also, material used in the MCS is special grade saran3 polymer, a highly non-corrosive material having a life of more than 10-15 years. This

makes MCS absolutely maintenance free.

As against this, conventional cooling towers require a heavy maintenance in the form of replacement of fills, louvers, fan blades, etc. every year.

5. Choke-Less Design of Nozzles:

MCS operates with a choke-less design. Size of smallest opening in MCS is more than one inch (25 mm) in diameter. Hence chances of particles choking the system are remote.

Table Top Design: Prevents water stagnation, minimizing algae formation by directing water to a covered suction pit.

MCS Design for Dusty Environments:

Unique suction pit design prevents dust entry, draining it via valve, and ensures clear water supply to circulation pumps.

6. System Flexibility (Capacity Turn Down Ratio):

MCS is offered with individual line isolation valve. MCS is the only system, which gives such a high flexibility in operation.

7. Hydro-Balance Valve:

HBV is provided to take care of sub-cooling, which may happen in winter. It is also helpful to release excess pressure which may develop on system at times.

8. Chemical Treatment:

Chemical dosing requirements are similar to that of cooling tower as same hold up of water is maintained in suction pit of table top MCS.

9. Pay-Back Period:

The pay-back period of the MCS in most of the cases, will be obtained in less than one year only.

Model-III: Induced Draft Mist Cooling Tower (Fill-Less Design):

Model-I and Model-II require higher basin size by 3 to 4 times in comparison to conventional IDCT. To eliminate this drawback, first time in the world, we have combined the technology of Mist Creation with induced draft fan thus cooling the water most efficiently. This uses our patented technology of Mist Creator Nozzles. Mist Creator Nozzles breaks water in micron size, thus giving highest surface area for heat transfer.

This technology completely eliminates fills inside cooling tower making it maintenance free. Due to elimination of fills it reduces air pressure drop across cooling tower and hence BkW of fan drops by 30 to 50% with respect to conventional IDCTs.

Models available from 50 m³/hr to 3000 m³/hr with an approach of 3°C to WBT and ΔT of up to 15°C.



Model-III: Induced Draft Mist Cooling Tower

Salient Features of Induced Draft Mist Cooling Tower (Model-III):

1) Approach & Temperature Drop: An approach of 3 to 4°C is ensured to design WBT with a ΔT up to 15°C.

2) Fill-Less Design: No fills used as required surface area is created by mist formation.

3) Footprint: Footprint required is same as compared to Conventional IDCT.

4) Life Expectancy: Rugged structure with pultruded FRP/ HDGI MOC and FRP casing with SS 304 nozzles, ensuring a life of 15+ years.

5) Maintenance: Choke-less design of our Mist Creator Nozzles ensure a maintenance free operation for lifetime. Guaranteed designed performance even in summer & monsoon.

6) Make-Up Water: IDMCT requires same make-up water in comparison to conventional IDCT.

7) Guarantee: Guaranteed designed performance even in summer and monsoon.

Refurbishment of Conventional Induced Draft Cooling Tower to Induced Draft Mist Cooling Tower by installing Revolutionary Mist Creation System inside existing cooling tower. The fills are completely removed as nozzles carry out work of fills and at higher efficiency. ■

For further details

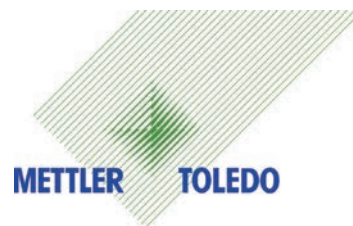
Contact: +91 - 020-24472726/24471184

Email: mistcreation@gmail.com

Website: www.mistcreation.com



Excellence Titrators for Bulk and Intermediate Chemicals: Reliable Solutions for 24/7 Routine Operation



Bulk and intermediate chemicals form the backbone of many industrial processes. Also known as basic or commodity chemicals, these products are manufactured on a large scale, typically in continuous process plants designed to produce a single chemical efficiently and consistently. These chemicals may be organic or inorganic and are widely used as raw materials for specialty chemicals, industrial gases, fertilizers, acids, and chloralkali products.

Because bulk chemical manufacturing operates on low margins, improving production efficiency and reducing costs are always top priorities. As a result, many manufacturers are increasingly consolidating production plants for similar or complementary products to optimize operations globally. Today, bulk chemical production is concentrated mainly in the EU, the USA, and China, with China leading in overall production capacity.

Industry Situation

In bulk chemical plants, analytical instruments play a critical role in both quality control and production monitoring. Since these processes often run 24/7, results must be delivered quickly and reliably to support continuous operations. Instruments are frequently used by shift workers in near-production environments, which makes ease of use, ruggedness, and automation essential.

Bulk chemical manufacturers usually prefer dedicated instruments that measure a single parameter accurately and efficiently. In addition, automatic data transmission is highly valued, as it helps avoid manual transfer errors and improves workflow efficiency. Operator safety is also a major concern, especially in environments where chemicals are handled continuously.

Beyond process monitoring, instruments are also used for incoming material quality control. In these cases, users again prefer straightforward, reliable solutions that can determine specific parameters with minimal complexity.



Application Challenges

The main challenge in bulk chemical analysis is balancing speed, reliability, and simplicity. Production environments demand short time-to-result, while operators may not always be highly trained in analytical methods. This means instruments must be intuitive, robust, and easy to operate without compromising on accuracy.

To meet these needs, manufacturers require solutions that support routine testing with minimal effort and maximum confidence.

Reference Applications

In the quality control of bulk chemicals, titration is one of the most important analytical methods used to verify that products meet the required concentration levels. Depending on the product type, several key parameters are commonly determined titrimetrically, including:

- Active chlorine
- Acids, such as hydrochloric acid
- Bases, such as caustic soda

To support these applications, the **T5, T7, and T9 Excellence titrators** offer a reliable solution for routine operations. With flexibly configurable operator guidance and automatic data transfer, they are well suited for 24/7 production environments.

Key benefits include:

- **Easy operation** with built-in SOPs and tailored pop-ups
- **One-click start** for even complex workflows
- **Automatic export** of results to LIMS and/or ERP with LabX
- **Automatic import** of sample size from the balance with SmartSample™

For bulk and intermediate chemical producers, these features help improve efficiency, reduce manual errors, and ensure consistent analytical performance across shifts.

About METTLER TOLEDO

METTLER TOLEDO is a leading global manufacturer of precision instruments. The company is the world's largest

manufacturer and marketer of weighing instruments for use in laboratory, industrial and food retailing applications. The company also holds top-three market positions for several related analytical instruments and is a leading provider of automated chemistry systems used in drug and chemical compound discovery and development. In addition, the company is the world's largest manufacturer and marketer of metal detection systems used in production and packaging. Additional information about METTLER TOLEDO is available at www.mt.com. ■

For more details, please visit us at:

https://www.mt.com/gb/en/home/products/Laboratory_Analytics_Browse/Product_Family_Browse_titrators_main.html

Email us at: sales.sales@mt.com

Call us toll-free at: 1800 22 8884 and 1800 1028 460



Suraj Limited: Dedicated towards Technical Excellence & Quality Products



Suraj Limited, is an ISO-9001:2015, 14001:2015, OHS AS 45001:2018 certified company, PED approved and Government Recognized Export House and one of the world's leading producers and exporters of stainless steel, alloy steel, carbon steel seamless pipes, tubes, fittings and flanges. With over three decades of expertise, we serve critical industries including Oil & Gas, Petrochemicals, Power, Nuclear, Defense, Fertilizers, and Water Treatment across 60+ countries.

Manufacturing Infrastructure

Suraj Limited operates from two state-of-the-art plants in Gujarat, India:

- **Thol Plant:** Dedicated to seamless pipes, tubes, and fittings with hot extrusion, cold pilgering, and finishing facilities.
- **Chandarda Plant:** Specialized in carbon and alloy steel forged fittings and flanges with advanced forging, heat treatment, and machining lines.

Our total installed capacity exceeds 24,000 MT per annum.

Quality Assurance

We have our own in-house testing laboratory with modern testing equipment to carry out all mandatory as well as optional tests on the products. Complex tests for which we do not have in-house facilities will be conducted at an external third party approved test house. Products will also be supplied under third party inspection where customer demands.

Certifications & Approvals

- Our manufacturing is PED 2014/68/EU approved, and we hold product approvals from IBR, EIL, ONGC, BHEL, NTPC, and major global EPCs.
- We are also approved by international inspection agencies like Bureau Veritas, DNV, TUV, Lloyd's, and SGS.

Commitment

At Suraj Limited, we believe every customer has unique needs. Our technical and commercial teams work closely with clients to offer customized solutions, reliable delivery, and dedicated after-sales support.

Key Highlights

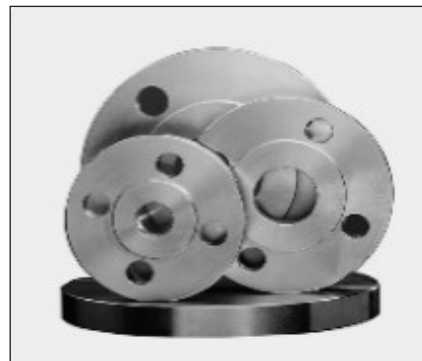
- Gujarat-based Suraj Limited is one of the world's leading producers and exporters of stainless steel, alloy steel, carbon steel seamless pipes, tubes, fittings and flanges.
- SO-9001:2015, 14001:2015, OHS AS 45001:2018 certified company.
- PED approved and Government Recognized Export House.
- Operates from two state-of-the-art plants in Gujarat.
- Company's total installed capacity exceeds 24,000 MT per annum.



Seamless Hot Finish Mother Pipe



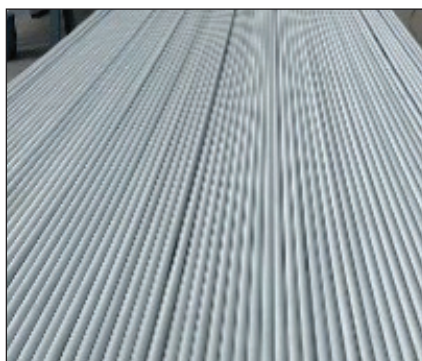
Stainless Steel Seamless Heat Exchanger U-Tubes



Stainless Steel Flanges



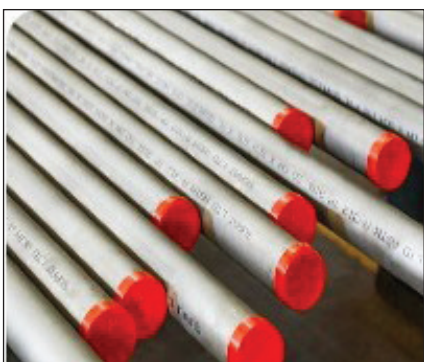
Stainless Steel Seamless Butt weld Fittings



Stainless Steel Seamless Heat Exchanger Tubes



Stainless Steel Forged Rings



Stainless Steel Seamless Pipes

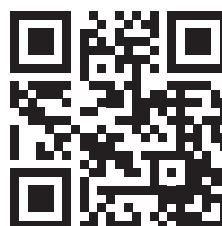
- **Heat Exchanger 'U' Tubes:**
12.70 mm to 50.80 mm OD
- **Hydraulic & Fuel Injection Tube:**
6.00 mm to 114.00 mm OD

Grades: AISI-304, 304L, 304H, 304N, 304LN, 309, 310, 310S, 316, 316L, 316H, 316Ti, 316N, 317, 317L, 321, 347, 405, 410

Duplex: UNS-S32750, S32760, S31803, S31500, S32205, S32304 and Its Equivalents in DIN, NFA, JIS, etc.

Length: Pipes up to 11.800 meter long and tubes up to 20 meter long ■

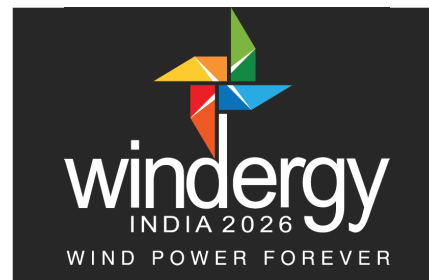
For detailed product information, please visit :
www.surajgroup.com



Product Range

- **Stainless Steel Seamless Pipes:**
1/8 NPS to 6 NPS
- **Stainless Steel Seamless Butt-weld Pipe Fittings:** 1/2 NPS to 12 NPS
- **Stainless Steel Seamless Stubends (Type A):**
1/2 NPS to 12 NPS
- **Stainless Steel Flanges:** 1/2 NPS to 40 NPS
- **Stainless Steel Forged Rings:**
Max. 1200 mm OD
- **Heat Exchanger Tubes:**
6.00 mm to 101.60 mm OD

Windergy India 2026: Where the Forces Accelerating Wind Energy Converge



Chennai: Wind energy has evolved well beyond the role of an alternative power source. Today, it is a force driving industrial advancement and strengthening manufacturing ecosystems. It continues to accelerate technological innovation, attract global investment, and create new opportunities for collaboration across the global wind energy value chain.

As this transformation continues, Windergy India 2026 stands as the industry's platform where innovation, enterprise, and expertise converge to advance the next chapter of wind energy.

Scheduled from 7–9 October 2026 at the Chennai Trade Centre, Chennai, the 8th edition of Windergy India will bring together the global wind energy community for three days of business engagement, knowledge exchange, technology showcases, and strategic collaboration.

20,000-plus Attendees | 400-plus Industry Delegates | 350 Global Exhibitors | 30-plus Countries Represented



Glimpse of Windergy India 2025

Organised by the Indian Wind Turbine Manufacturers Association (IWTMA) and PDA Ventures Pvt Ltd, Windergy India 2026 is officially supported by the Ministry of Power, Ministry of New and Renewable Energy (MNRE), and apex industry bodies, including the German Agency for International Cooperation

(GIZ), German Wind Energy Association (BWE), German Offshore Wind Energy Foundation, Spanish Institute for Foreign Trade (ICEX), Danish Energy Export, India Energy Storage Alliance (IESA), National Institute of Wind Energy (NIWE), Indian Wind Power Association (IWPA), National Solar Energy Federation of India (NSEFI), Net-Zero Energy Transition Association (NETRA), and Skill Council for Green Jobs (SCGJ).

The gathering brings together key market players, including OEMs, component manufacturers, developers, EPCs, and utilities. It will also convene policymakers, regulators, and investors, alongside technology innovators, researchers, academia, and industry bodies. Together, they create a powerful confluence for strategic dialogue, commercial deals, and partnerships that accelerate sector growth.

3-Day Trade Fair | 2-Day Conference | Technical Sessions | Round Tables | Live Demonstrations | B2B & B2G Meetings | Academia Sessions

Windergy India 2026 is supported by a distinguished lineup of Supporting Partners, led by Suzlon India as Platinum Partner, with Envision and Senvion serving as Gold Partners, Adani Wind (Visitor Bag & Conference Chair Tag). Functional partners driving event experiences include Winergy (Drive Solution; Lanyard & Badges), Mobil (Lubricant), Globe Ecologistics (Logistics), NeXHS (Registration Area), Leap Green (Delegate Kit), UL Solutions (Advisory & Certification) and Madras Hard Tools (Hydration).

Anchoring this powerhouse ecosystem are leading OEMs and developers such as Venwind Reflex, Nordex, Sany, GE Vernova, Vayona Energy, KP Group, Windar, Renfra Energy, Avanti Wind, and HEFT Energy, alongside key component manufacturers, material suppliers, and engineering partners including ZF Wind, Bonfiglioli, Nabros, Sanghvi, NGC Transmission,



Speakers participating during past edition of Windergy India.

thyssenkrupp, Aditya Birla, Gurit, Sumeet Infra, Foster, Greentech, Indore Composites, Seforge, Ultra Labs, Mankiewicz and many more. Further elevating the event's global dimension, country pavilions from Denmark, Germany, and Spain will showcase their innovations.

The exhibition will spotlight the latest advancements across the wind energy value chain, spanning turbine technology, component manufacturing, digitalisation, offshore wind, energy storage, grid integration, operations and maintenance (O&M), and emerging clean energy solutions. In addition to the exhibition, Windergy India 2026 will feature Round Tables with industry leaders, Academia Sessions to highlight research and innovation, an Outdoor Display showcasing large scale equipment and technologies, and dedicated Product Presentation segments for companies to unveil their latest offerings.



Complementing the exhibition, the two-day conference themed "Wind - Powering India's Energy Resilience" will examine the growing role of wind energy in strengthening India's energy security, enhancing grid resilience, and enabling a future-ready energy system.

The conference programme will feature the Shri Tulsi Tanti Memorial Lecture - Wind as the backbone of an electrified and resilient India, alongside sessions on 'State Leadership: Attracting Investment', 'Wind Manufacturing: Competitiveness through Localisation',

'Demand for Wind: Unlocking Value Beyond the Megawatt', 'Women in Wind (WIN): Empowering Women Across the Wind Energy Workforce', 'Demand for Offshore Wind: Unlocking India's Next Energy Frontier', 'Manufacturing: Technology & Innovation - Building India's Competitive Edge', 'Exporting from India: Strengthening India's Global Wind Energy Footprint', 'Asset Management: Building a Smarter, Resilient & Future-Ready Wind Fleet', 'Repowering India's Wind Fleet: Unlocking the Next Generation of Capacity', and 'ESG, Skills & Green Jobs: Building the Workforce for India's Wind Future'.

As global markets look toward rapid decarbonisation, Windergy India 2026 reinforces the industry's collective commitment to a resilient, wind-powered future. The flagship gathering remains the definitive catalyst for breaking operational boundaries, expanding cross-border value chains, and accelerating India's emergence as a global wind manufacturing hub. ■

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Kosol Energie Introduces Enhanced Hail-Resistant N-Type Glass-to-Glass Solar Modules



Kosol Energie Pvt. Ltd. has introduced enhanced N-Type Glass-to-Glass (G2G) Solar PV Modules, engineered to deliver exceptional durability, long-term reliability, and superior performance under extreme weather conditions. Designed to withstand harsh monsoons and severe hailstorms in global markets, the new modules reinforce Kosol's commitment to manufacturing technologically advanced and climate-resilient solar solutions.

As climate conditions become increasingly unpredictable, solar modules are expected to perform reliably under heavy rainfall, high humidity, strong winds, and hailstorms. Addressing these evolving challenges, Kosol's latest N-Type Glass-to-Glass modules are qualified for 35 mm hail impact testing, significantly exceeding the conventional IEC qualification requirement of 25 mm hail diameter under IEC 61215:2021 standards. The modules have successfully undergone testing at a NABL-approved IEC laboratory, demonstrating enhanced resistance against glass damage and microcracks caused by hail impact.

The modules are manufactured using thermally tempered high-strength solar glass, providing improved mechanical strength and impact resistance. Their premium Glass-to-Glass (G2G) architecture offers enhanced protection against moisture ingress, environmental stress, and long-term degradation while improving overall module reliability.

To further strengthen durability, the modules utilize higher GSM POE (Polyolefin Elastomer) encapsulation, offering superior cushioning to solar cells during

transportation, vibration, thermal cycling, and hail impact. The advanced encapsulation technology helps minimize mechanical stress, ensuring sustained module performance throughout its operational life. Additionally, the modules feature high-transmission Anti-Reflective Coated (ARC) glass, enabling greater light absorption and improved energy generation while maintaining high conversion efficiency under diverse climatic conditions.

The newly introduced modules are available in 600 Wp, 620 Wp, and 630 Wp variants and are fully compliant with IEC 61215:2021 standards. They are also available in BIS-certified DCR configurations, including G12R and G12 models, supporting the growing demand for domestically manufactured high-performance solar modules in India.

Commenting on the launch, Mr. Kalpesh Kalthia, Chairman and Managing Director, Kosol Energie Pvt. Ltd., said, "The future of solar energy depends not only on higher efficiency but also on long-term reliability under increasingly challenging weather conditions. Our enhanced N-Type Glass-to-Glass modules are engineered to deliver exceptional durability, helping customers maximize energy generation while reducing long-term operational risks. At Kosol, we continue to invest in advanced manufacturing technologies that deliver global quality standards while addressing the evolving needs of the Indian and international solar markets." ■



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