



CHEMICALS & PETROCHEMICALS

The new safety imperative

Technology, people and smarter processes are reshaping safety, compliance and sustainability across India's chemical industry.



BY: Roshny Batu

India's chemical and petrochemical sector is at a turning point. Rising demand and tighter regulations are pushing manufacturers to improve productivity while maintaining safety, sustainability and compliance. AI, IoT, analytics and automation are helping identify and manage risks. However, technology alone cannot prevent incidents. Strong safety cultures, skilled people and disciplined processes remain essential for long-term, responsible growth.

Compliance challenges

India's chemical industry operates in an increasingly complex regulatory environment. As manufacturers expand, modernise plants and manage sophisticated processes, compliance has moved from a periodic exercise to an everyday operational priority.

Mahesh Babani, Chairman & Managing Director, Privi Speciality Chemicals Ltd, highlights the importance of embedding compliance into daily operations. Babani says, "Compliance is no longer a periodic exercise. Chemical manufacturers must continuously manage process safety, hazardous materials, emissions, waste and emergency preparedness while maintaining operational efficiency. With 1,861 Major Accident

Hazard units across 303 districts, as identified by the Ministry of Environment, Forest and Climate Change, the scale of responsibility is significant. At Privi, we address this through an integrated framework covering HAZOP, HIRA, JSA, Change Control, Safety Reviews and standard operating procedures. We also conduct quarterly emergency mock drills and senior-management safety audits. The way forward is to embed compliance into everyday decision-making, supported by strong systems, competent people and disciplined execution."

Raj Tiwari, CEO, SUPERFORM, believes the challenge extends beyond meeting individual regulations. "The chemical industry is operating in an environment where expectations around process safety, environmental performance, product stewardship and operational transparency are becoming increasingly interconnected. The challenge is therefore not simply complying with individual regulations but building manufacturing systems that can continuously adapt to evolving standards without compromising safety, efficiency, reliability and competitiveness.

"At SUPERFORM, we believe compliance must be embedded into the design and operation of our facilities. As a company focused on complex



▲ **Mahesh Babani**, Chairman & Managing Director, Privi Speciality Chemicals Ltd



▲ **Raj Tiwari**, CEO, SUPERFORM



▲ **Raji Pillai**, GM Mechanical & Utilities, SRF Ltd

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- Mahesh Babani

chemistries and custom synthesis, we embed safety, quality and environmental considerations into every stage of the manufacturing lifecycle. Our approach includes structured Process Safety Management, Management of Change, hazard identification and risk assessment, pre-start-up safety reviews and continuous workforce capability development. We are also reviewing high-risk processes and implementing risk-reduction measures in line with international best practices.”

Compliance also extends beyond the factory floor, influencing market access, supply chains and business reputation. Raji Pillai, GM (Mechanical & Utilities), SRF Ltd, says, “Chemical compliance is no longer just a regulatory need mandating compliance to global and Indian safety standards — it’s a fundamental part of market access, safety/ risk management, trade and business sustainability, and brand integrity across industries. Forward-thinking businesses are investing in digital tools and partnerships to reduce risk, improve efficiency, and build trust across their value chains. Non-

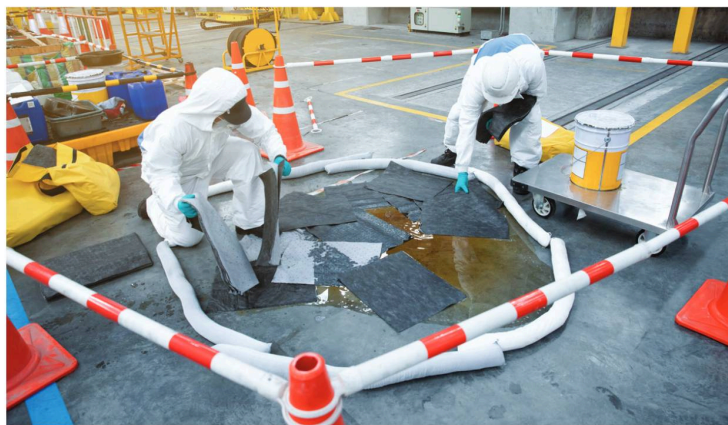
compliance can lead to legal penalties, supply chain disruptions, reputational damage, or even harm to human health and the environment.”

Technology-driven safety

As chemical manufacturing becomes more connected, technology is changing how plants monitor processes, identify risks and respond to potential incidents. AI, IoT, automation and advanced analytics are helping manufacturers shift from reactive responses to predictive risk management.

Babani explains, “Technology is strengthening this approach by giving manufacturers greater visibility into processes and enabling earlier intervention. In chemical manufacturing, where a small deviation can have significant consequences, real-time monitoring and automated controls are particularly valuable. At Privi, critical operations such as hydrogenation, pyrolysis, hydrogen peroxide and high-vacuum distillation are controlled through DCS, PLC and SCADA, with safety interlocks and architecture supporting reliability. Our ISO 27001 certification covers 100% of operations, reinforcing the security of increasingly connected systems. The next step is to move from monitoring to prediction by combining process data, advanced analytics and AI. This can help identify weak signals earlier, optimise processes and strengthen both safety and compliance.”

The wider industry is also moving towards predictive operations. Tiwari says, “Digital technologies are transforming chemical manufacturing from reactive operations to predictive and intelligent operations. According to IoT Analytics’ Digital & AI Adoption in Process Manufacturing 2026 report, process manufacturers anticipate reducing total annual plant operating costs by 12% over the next three years through digital transformation.



▲ **Expectations around process safety**, environmental performance, product stewardship and operational transparency are becoming increasingly interconnected in the chemical industry.

“The top technologies deployed to date are smart sensors, process automation, AI-based video analytics and advanced process control. The global AI-in-chemicals market is projected to grow from USD 2.8 billion to USD 37 billion by 2035, at a CAGR of 29.4%. Seventy-six per cent of chemical firms already use AI to optimise production, while 63% of executives expect it to drive significant revenue growth by 2028.

“At SUPERFORM, digitalisation is helping strengthen process governance through real-time monitoring, digital change-management systems and advanced safety-management platforms. We have initiated digital reporting of every incident, from near misses to serious incidents. These are assessed and investigated in digital systems, and the learnings are shared.”

Technology is also supporting innovation and sustainability. Pillai points to green technology, process intensification and digital transformation as important tools for reducing fossil-fuel dependence and improving manufacturing efficiency, alongside advances in materials, catalysis, renewable energy and biotechnology.

The safety culture

Technology can strengthen safeguards, but people remain at the heart of process safety. A proactive safety culture depends on employees being encouraged to identify risks, speak up and act before incidents occur.

Babani stresses, “Technology and systems can provide safeguards, but ultimately safety is a people-led discipline. A proactive culture develops when employees are encouraged to identify risks, speak up and act before an incident occurs. At Privi, this is reinforced through daily Toolbox Talks, Behaviour-Based Safety observations, HAZOP, JSA, audits and CAPA, with worker and management representatives participating in safety reviews. This sustained focus has contributed to 2.60 million safe man-hours as of March 31, 2026, alongside recognition from the National Safety Council and 19 consecutive years of recognition from the Maharashtra Chapter. For us, the objective is not simply zero incidents. It is creating an organisation where every unsafe condition becomes an opportunity to learn, intervene and improve.”

Tiwari emphasises that safety must be a shared responsibility. “A proactive safety culture is built when safety is a shared responsibility rather than the sole responsibility of the HSE function. It requires visible leadership, employee participation and a willingness to learn from incidents and near misses. Equally important is ensuring that lessons

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identified at one site are converted into preventive action across the wider organisation.

“At SUPERFORM, safety is one of our core values and is deeply integrated into how we operate. Our process-safety framework includes hazard studies, risk assessments, Management of Change, incident investigation, contractor safety management and continuous competence development. We complement these systems with behavioural interventions, leadership engagement and organisation-wide learning from incidents and near misses. We have a well-defined six-stage process for identifying process-safety hazards, from the design stage through implementation, followed by pre-start-up safety reviews and follow-up on recommendation closure.”

Strong safety practices also protect employees and surrounding communities. Effective hazard identification, risk assessment, process safety management, PPE, chemical labelling, waste management, environmental controls and emergency preparedness can help prevent illness, fires, toxic leaks, explosions and incidents caused by human error.

Cyber-physical safety

As chemical plants become more connected and automated, cybersecurity is increasingly becoming a process-safety concern. A cyberattack on a control system can affect not only data and IT infrastructure but also people, equipment, production and the environment.

Babani says, “As manufacturing becomes more connected, the boundary between cybersecurity and process safety is disappearing. A cyber incident

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- Raji Pillai

affecting a control system can potentially become a physical safety event, so protecting Operational Technology infrastructure must be treated with the same seriousness as protecting critical process equipment. At Privi, 100% of our operations are covered by ISO 27001 certification. The priority now is convergence: IT and Operational Technology teams must work together on network segmentation, access control, continuous monitoring, vulnerability management and incident response. Cyber resilience is increasingly an essential component of process safety.”

Tiwari adds, “As manufacturing facilities become more connected, cybersecurity can no longer be viewed solely as an IT issue. A cyber incident affecting operational technology, industrial control systems or critical process infrastructure can have consequences for people, assets, production continuity and the environment. Cybersecurity should therefore be treated as an integral part of operational resilience and process safety.

“Manufacturers must adopt a comprehensive approach that combines technology, governance and people. This includes strong supply-chain risk management. We have high-tech cybersecurity firewalls, well-organised training for all employees, various protocols and periodic dummy spam emails to test employee compliance.”

Sustainable operations

For chemical and petrochemical manufacturers, sustainability is increasingly being integrated into plant design, operations and improvement programmes. The focus is on using resources efficiently, reducing emissions and waste, and maintaining safety and compliance without compromising productivity.

Babani emphasises the need to treat these objectives as interconnected: “The most effective approach is to stop viewing safety, sustainability, compliance and productivity as separate objectives. In a well-designed chemical operation, they should reinforce one another. India’s Bureau of Energy Efficiency reported 25.78 million tonnes of oil-equivalent energy savings under the Perform, Achieve and Trade (PAT) scheme in 2025, demonstrating the scale of opportunity from more efficient industrial operations. At Privi, this philosophy is reflected through our waste-to-wealth approach, process automation, controlled handling of hazardous materials, environmental management and resource-efficiency initiatives. The real opportunity lies in designing these considerations into processes from the beginning, rather than addressing them independently later.”

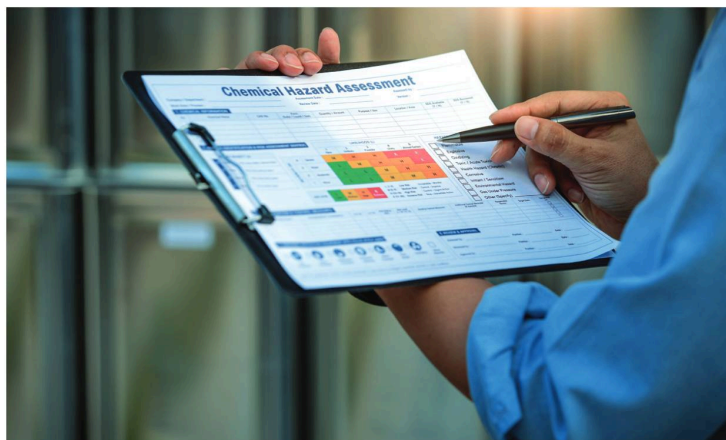
Tiwari sees the same integration across the plant lifecycle. “Production efficiency, sustainability and safety should not be viewed as competing priorities. This requires manufacturers to consider safety and sustainability across the plant lifecycle, from process design and material selection through operations, maintenance and eventual decommissioning.

“At SUPERFORM, sustainability is embedded within our manufacturing and innovation strategy. Our teams continuously focus on improving resource efficiency, reducing emissions, minimising waste and advancing greener chemistries that help customers achieve their own sustainability goals. We have invested heavily in solar power generation, green energy and energy-conservation methods, supported by a dedicated green cell.”

Beyond individual plants, industry-wide collaboration can further strengthen safety and sustainability. Pillai concludes, “Ensuring safety and compliance is not just a legal obligation—it’s a business imperative. As India’s chemical industry scales up, investments in workplace safety, green processes, and advanced monitoring systems will define the next phase of growth.

Initiatives like forums for sharing best industry practices in the sector through domain experts from academia and industry, representatives and trade bodies like CII/FICCI and regulatory authorities are expected to contribute significantly towards strengthening the culture of safety, compliance, and disaster preparedness in the chemical and petrochemical industries.

Let’s ensure that safety and compliance is entrenched in such a key sector and in every walk of life, to catapult India to the next stage of being not only a developed nation but a responsible nation as well in all aspects by 2047.” ■



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