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Innovation Driving the **Next Industrial Chapter**

Manufacturing today stands at the crossroads of precision, innovation, and sustainability. In this February edition of Machine Edge Global, we bring you stories that reflect an industry not just adapting to change, but actively shaping the future—from advanced machining and urban mobility to clean energy and intelligent automation.

Our cover story highlights Fritz Studer AG, which has reported positive results for the 2025 financial year. At the Motion Meeting press conference, CEO Sandro Bottazzo outlined a remarkable year in India, with strong growth across automotive, aerospace, and die & mold segments. Backed by global strengths and innovations such as the newly launched S23 grinding machine, the company is well positioned to leverage India's expanding manufacturing ecosystem.

We also feature insights from Amit Gossain, Managing Director of KONE India, who shares the company's Rise 2025–2030 strategy and its focus on safety, digitalization, modernization, and sustainability in India's rapidly growing urban landscape.

In another engaging conversation, Alexander Enulescu of KonveGas discusses advanced storage solutions and the role of Type IV cylinders in accelerating the clean energy transition, especially as the company prepares to enter the Indian market.

This issue also explores intelligent automation and product-led growth through insights from industry leaders, alongside a feature on safer and more sustainable methods to recycle spent lithium-ion batteries—an urgent need in the era of electric mobility.

As always, Machine Edge Global remains committed to bringing you impactful stories and expert perspectives from across the manufacturing landscape. We look forward to continuing this journey with you as the industry moves toward a smarter, greener, and more resilient future.

Sanjay Jadhav

Sanjay Jadhav
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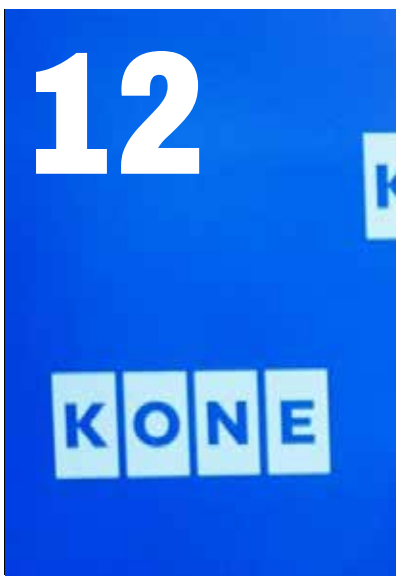

VOICES OF INDUSTRY

STUDER Reports Positive Results for the 2025 Financial Year

The Motion Meeting press conference pulsed with the essence of “Swiss Made”—precision, punctuality, a global mindset, and the unyielding strengths that define Switzerland and inspire the next generation of engineers and students worldwide. Fritz Studer AG's CEO, Sandro Bottazzo, took center stage to spotlight an extraordinary 2025 in India: surging market share in automotive, aerospace, and die & mold segments, marking one of the company's best years ever. Buoyed by global assets like a key North American factory that powered through tariffs via robust aerospace demand, the firm is charging ahead with innovations such as the newly launched S23 grinding machine from IMO Hanover—already sold and delivered—and reliable entry-level CNC solutions tailored for emerging markets. Bottazzo's vision is clear: India's manufacturing boom, driven by foreign investments and local dynamism, promises a prosperous horizon ripe for Swiss precision. Neha Basudkar, Editor of Machine Edge Global, brings you this exclusive interview from the event.

Q. Can you share highlights from your company's performance in India last year and outlook for this year?

Welcome to the Motion Meeting press conference. As we mentioned, the topic is "Swiss Made"—it's all about Switzerland: precision, punctuality, a global mindset, and what makes Switzerland strong. In the same way, it's what makes students strong too. Last year in India, we had a really successful 2025. We increased our market share across a broad variety of segments, including automotive, aerospace, and even die and mold. It was one of the best years we ever had in India. And even for this year, we're expecting good growth.

Q. What new technologies or machines is your company highlighting, and how do they fit into the Indian market?

Of course, as we mentioned, there's the new S23—our new machine that we just launched at the IMO in Hanover. We have high expectations for it. We've already sold many of those machines and even delivered the first one. We see big potential for that machine in India, as well as for our favorite CNC, our entry-level product.

Q. How has your global setup, particularly in North America, influenced your performance

amid challenges like tariffs?

Of course, our global setup supports us—we even have a known factory in North America. On the other hand, we're really focused on a broad variety of segments, and the aerospace segment—which was really strong in the US—helped us achieve good order intake last year, even despite the tariffs.

Q. What are your expectations for the Indian market's growth and your role in it?

Focusing on the Indian market, we really expect India to grow further. We see many foreign companies investing more and more in India, along with local companies—and we're looking forward to a prosperous future for the Indian market.

The Swiss technology company for precision cylindrical grinding machines was able to strengthen its global market position despite the challenging geopolitical situation, expand its portfolio with innovative new products, further develop its customer care, and invest several million euros in infrastructure.

Fritz Studer AG's annual press conference took place in Steffisburg in front of international media representatives under the motto "Swiss Made." "The year 2025 was marked by challenging markets and geopolitical uncertainties. Nevertheless, we exceeded our expectations and emerged from this phase stronger than ever," said CEO Sandro Bottazzo. Despite complex global conditions, the Swiss technology company was able to strengthen its market position worldwide, expand its portfolio with important innovations, and further increase its operational efficiency. Particularly pleasing was the excellent market response to the new S23 universal cylindrical grinding machines and the latest generation of favoritCNC. In customer care, the long-established manufacturer even achieved record sales in paid service and maintenance.

STUDER Maintains and Expands Market Share Worldwide

Total sales were slightly below the previous year's level but exceeded expectations thanks to a strong year-end performance. Thanks to its excellent market positioning, STUDER achieved good sales in North America despite customs challenges. The result in Asia was also positive and above the previous year's level, especially in China. STUDER also exceeded the previous year's level in terms of machine orders received. The high proportion of new customers, at 44 percent, was also encouraging. Orders from North America, Asia, and European countries such as France, Czechia, and Denmark in particular supported this result.

Germany, Italy, and Switzerland, on the other hand, fell short of expectations. Overall, however, market share was maintained or expanded in all regions of the world. The customer care segment performed very well. "Thanks to our global, customer-focused service organization, we were able to set new sales records in the service and maintenance business areas," explained Bottazzo. In many markets, over 70 percent of the active installed base now has a maintenance contract. In the area of machine overhauls, the year ended with one of the best order backlogs in the company's 114-year history.

STUDER is Very Well Positioned in the Aerospace Industry

The aerospace segment delivered another record. It closed as the largest single segment for the first time, accounting for almost a third of all orders. Other important categories were precision engineering, machine tools, and the automotive industry. "Our broad portfolio remains a pillar of success and covers a wide range of universal cylindrical grinding applications," emphasized Bottazzo. The best-selling machine was the S33, followed by the S31 and the S41. Both external and machines for internal cylindrical grinding also performed well. The S141 even achieved one of the best sales results of the last ten years.

An additional event in 2025 was the acquisition of GF Machining Solutions by the UNITED GRINDING Group, which now operates under the name UNITED MACHINING SOLUTIONS. With total sales of over USD 1.5 billion and around 5,000 employees at over 50 locations, the group is one of the largest machine tool manufacturers in the world. As part of the acquisition, the STUDER Competence

Center for internal cylindrical grinding moved to the modern premises of UNITED MACHINING at Roger-Federer-Allee 7 in Biel (Switzerland), just a few minutes away from its previous location.

New Machines and Innovative Grinding Technology

In 2025, STUDER continued to focus on innovation and the further development of reliable grinding technologies to make its customers even more competitive. "One highlight was the world premiere of the S23 universal cylindrical grinding machine with a compact design for precise grinding results," said CTO Daniel Huber. The new generation of favoritCNC with modern FANUC control and automation capabilities also met with a very positive market response. And the further development of WireDress® for internal cylindrical grinding enables contact-free dressing of metal-bonded grinding wheels in the machine. Customers also benefit from a new axis system for the S31 and S33, which allows automatic adjustment to different workpiece lengths. The year also brought important new digital features: "The C.O.R.E. Release 5.0 enables access to Transaction Network's manufacturer-independent customer portal directly from the machine operating panel and visualizes live status updates of the machine park, among other things," concluded Daniel Huber.

Parallel to product development, STUDER consistently drove forward the transformation of its operational processes. "In 2025, we took our production and logistics processes to a new level," explained COO Stephan Stoll. One milestone was the creation of a state-of-the-art small parts warehouse. The fully automated system with 32 autonomous robots and 16,000 containers offers space for tens of thousands of parts and significantly increases efficiency for both machine and spare parts logistics. It also forms a further foundation for future growth. In addition, the company made progress in digitalization on the way to becoming a paperless factory.

STUDER Expects the Economy to Pick up in 2026

In the third and especially in the fourth quarter, STUDER recorded a significant increase in the number of machines sold, which, from today's perspective, is set to continue in 2026. Consequently, the company expects a further increase for the current fiscal year. "Demand for high-quality grinding machines will continue to recover, and the response to our new S23 has been very good. The first machines have already been successfully sold and delivered," said CEO Bottazzo. He intends to continue the strategic investment in innovation, infrastructure, and the workforce.

Dual training also remains a key factor in STUDER's success, with apprentices accounting for around ten percent of the workforce. The high quality of training is regularly demonstrated by successes at events such as the SwissSkills vocational championships. Finally, Bottazzo announced that STUDER would be participating in over 35 trade fairs worldwide this year and looked forward to the 50th anniversary of Granitan®: the high-performance material developed and patented by STUDER continues to set standards for highly stable machine bases today.


KONE

“Sustainability is no longer optional”

As India’s cities grow taller, denser, and more complex, the role of safe, sustainable, and intelligent vertical mobility has never been more critical. In this exclusive interview, **Sanjay Jadhav, Editor, Machine Edge Global,** speaks with **Amit Gossain, Managing Director, KONE India,** to explore how the company is positioning itself for growth in one of its most strategic global markets. From KONE’s long-term vision for India and its Rise 2025–2030 strategy to advancements in safety, digitalization, modernization, and sustainability, Gossain shares insights into how KONE is shaping the future of urban mobility while setting new benchmarks for reliability, energy efficiency, and passenger safety in the Indian built environment.

Q. With the company’s expanding footprint, what is the vision for KONE India’s growth and leadership in 2026 and beyond?

India continues to be one of KONE’s most strategically important and high potential markets globally. As one of the world’s largest elevator markets, India offers a significant opportunity to shape the future of urban mobility at scale.

Building on this momentum, KONE announced its Rise 2025–2030 strategy in 2024. The ambition is clear: to be the number one choice for customers and employees, while driving innovation, sustainability, profitable growth, and operational excellence.

Looking ahead to 2026 and beyond, KONE India’s focus is on building a stronger and more agile organization that stays close to customers and local markets. The company is expanding its footprint and capabilities, particularly across Tier II and emerging cities, where rapid urbanization, infrastructure development, and housing demand are creating sustained growth opportunities.

Digitalization and modernization will play a central role in this journey. Digital connectivity and data led services are transforming operations by enabling predictive maintenance, faster response times, improved safety, and higher equipment uptime. At the same time,

> ***Every KONE solution is engineered with passenger safety at its core, supported by rigorous risk assessments, strict quality controls, and regular safety audits.***

modernization presents a significant opportunity in India, given the large installed base of ageing elevators and escalators and the growing demand for energy efficient, accessible, and digitally enabled solutions.

Residential housing will remain a key growth driver. KONE is investing in fit for purpose solutions and strengthening its service network to better meet customer needs, while continuing to improve speed, quality, and efficiency in delivery. Sustainability runs across all priorities, ensuring KONE India's growth is responsible, resilient, and aligned with the future of urban development.

Q. Safety has always been a core pillar for KONE. How is the company

strengthening safety standards across elevators and escalators in India?

Safety is non-negotiable at KONE. In India, the company is strengthening safety standards across the entire lifecycle, from design and manufacturing to installation, maintenance, and modernization.

Every KONE solution is engineered with passenger safety at its core, supported by rigorous risk assessments, strict quality controls, and regular safety audits. KONE also takes firm positions on critical safety issues, including its clear decision not to offer collapsible gates, reinforcing its commitment to the highest safety standards.

Digitalization plays an important role in strengthening safety. Through KONE 24*7 Connected Services, powered

by cloud connectivity and AI driven analytics, maintenance is shifting from reactive to predictive. Potential issues are identified early, often before they are visible, allowing teams to intervene proactively and improve passenger safety.

By combining strong engineering, strict safety governance, and intelligent digital solutions, KONE continues to build a safer and more reliable vertical mobility ecosystem for India.

Q. Sustainability is becoming increasingly important in the built environment. How is KONE integrating energy efficient solutions into its elevators and escalators?

Sustainability is no longer optional. It is a clear business and environmental priority for the built environment. At KONE, energy efficiency is built into the design of elevators and escalators so that sustainability delivers real and measurable value for customers.

KONE solutions incorporate technologies such as regenerative drives that capture and reuse energy, high efficiency LED lighting, and intelligent standby modes that reduce power consumption and emissions across the equipment lifecycle. As a result, most KONE elevator models carry the highest A class energy efficiency rating under ISO 25745, while several escalator and autowalk models achieve the top A +++ rating. Beyond operational efficiency, KONE is addressing emissions where the greatest impact lies, across product materials and lifetime energy use. The company is targeting a 40 percent reduction in product related emissions compared to a defined baseline, helping customers decarbonize buildings at scale.

Q. With rapid urban development, safety expectations are evolving. How is KONE preparing for future safety challenges in high rise and complex infrastructure projects?

As cities grow taller and more complex, safety expectations are becoming more demanding. KONE is addressing these challenges through advanced engineering, digital technologies, and a strong safety culture across its operations.

Elevator and people flow solutions are designed specifically for high rise and complex infrastructure projects, ensuring safe and reliable movement even in high density environments. Through early-stage people flow planning and consulting, KONE works closely with architects and developers to model traffic patterns, reduce congestion, and enhance safety from the outset.

Connected elevators and escalators enable continuous monitoring, remote diagnostics, and predictive maintenance. This allows potential risks to be identified and addressed before they affect passengers, which is particularly important in high usage buildings.

Together with strict compliance with local and international standards, continuous employee training, and close collaboration with customers and partners, these measures ensure KONE solutions remain safe and future ready.

Q. What are some of the latest technologies or design advancements KONE has introduced to enhance passenger safety?

Passenger safety is where engineering and design come together at KONE. A key advancement is the introduction of the SMART elevator portfolio, including KONE I MonoSpace SMART, KONE I MiniSpace SMART, and KONE A MonoSpace SMART. These are the first elevators in the industry to be fully compliant with IS 17900 safety standards.

At the core of these solutions is PESSRAL technology, which significantly improves the intelligence and reliability of elevator safety systems. Dual channel safety controllers ensure safe redundancy, automatically shifting to a safe mode if any anomaly is detected.

Safety is further strengthened through design features such as tamper proof safety modules, high strength door systems, and sensitive light curtains that protect passengers during entry and exit. Together, these advancements raise the benchmark for elevator safety in the Indian market.

Q. What differentiates KONE's approach when it comes to safety, service reliability, and lifecycle management?

What sets KONE apart is its long term and holistic approach to vertical mobility. Safety, service reliability, and lifecycle management are treated as a single integrated commitment rather than separate elements.

With over 40 years of manufacturing presence in India, combined with strong global innovation capabilities and more than 3,000 patents worldwide, KONE brings together deep local expertise and advanced engineering. The focus goes beyond equipment delivery to creating reliable and seamless mobility experiences.

Digital solutions such as 24*7 Connected Services and E-Link enable predictive maintenance, higher uptime, and better transparency across the lifecycle of equipment. Strong lifecycle management helps extend equipment life, reduce operational risk, and improve long term cost efficiency and sustainability.

Ultimately, KONE's differentiation lies in its customer centric approach, proactive service model, and commitment to delivering safe and future ready mobility solutions that evolve with buildings and the people who use them.

‘India represents a high-growth market with significant long-term potential’


Crafti
Tomorro
Cylinde

As the global energy landscape pivots toward cleaner, low-carbon alternatives, the role of advanced gas storage technologies has never been more critical. At the heart of this transformation is KonveGas, a company redefining how CNG and hydrogen are stored through sustainability-driven composite cylinder technology. In this interview, **Sanjay Jadhav, Editor, Machine Edge Global,** speaks with **Alexander Enulescu, Founder of KonveGas,** about the philosophy behind building what he calls the "greenest vessel for the greenest energy," the growing importance of Type IV cylinders in mobility and industrial applications, and KonveGas' plans as it prepares to enter the rapidly evolving Indian market. The conversation offers insights into safety, standards, localization, and how advanced storage solutions can become a strategic enabler of the clean energy transition.

Q. KonveGas has positioned itself at the forefront of advanced gas storage solutions. What inspired the founding of the company, and how has your original vision evolved over the years?

KonveGas was founded around the belief that if the goal is renewable and low-carbon energy, then the hardware enabling that energy must also be designed for low emissions. Otherwise, emissions are simply shifted from the tailpipe to the supply chain. From the beginning, our vision has been to provide what we call the "Greenest Vessel" for the "Greenest Energy," by placing raw material strategy and lifecycle CO_2 impact at the centre of composite cylinder technology.

Over time, this vision has evolved into a more holistic approach that aligns materials, manufacturing, logistics, service life, and end-of-life planning with the same low-carbon logic as the fuels the cylinders are meant to enable.

Q. Type 4 CNG and hydrogen cylinders are increasingly critical to the clean energy transition.

From your perspective, what makes these technologies a game-changer for mobility and industrial applications?

Type IV composite cylinders enable lightweight, corrosion-resistant, and high-performance storage solutions that support improved operational efficiency, payload utilisation, and system flexibility.

Their high strain tolerance, energy absorption, and damage containment provide robust durability under harsh field conditions, while advanced fatigue behaviour supports long-term pressure cycling.

For both mobility and stationary storage, including hydrogen cascade and modular systems, composite technology enables scalable, standards-compliant storage that aligns performance, safety, and reduced lifecycle CO_2 impact.

Q. Safety and reliability are non-negotiable in gas storage. How does KonveGas ensure the highest safety standards while working with high-pressure CNG and hydrogen systems?

KonveGas designs and tests its Type IV cylinders in accordance with internationally recognized standards, including ECE R110, ISO 11119-3, and EN 12245.

These standards mandate extensive qualification testing such as burst pressure, cyclic fatigue, impact resistance, fire exposure, and environmental testing covering temperature cycling, humidity, chemical exposure, and vibration.

The cylinders are certified for a 20-year service life based on conservative design choices, robust structural layout, and extended pressure cycling validation.

All production is supported by controlled manufacturing, strict quality assurance, and stable, repeatable process control to ensure consistent safety margins beyond normal operating conditions.

Q. Hydrogen is gaining strong momentum globally. How do you see the hydrogen economy evolving over the next decade, and what role will advanced storage solutions play in its adoption?

Hydrogen storage represents the next major wave after clean mobility and the CNG transition. While it is currently more project-based and infrastructure-led, there is clear momentum, supported by longer development and approval cycles.

Advanced composite storage will be a critical enabler of decentralized, low-carbon energy systems, supporting both mobility and stationary hydrogen storage through cascade and modular systems.

Over the next 10–15 years, continued advances in materials, manufacturing and standards are expected to drive wider adoption of composite storage across emerging clean fuel ecosystems.

Q. You are now preparing to enter the Indian market. What attracted KonveGas to India, and how do you assess the country's

readiness for advanced CNG and hydrogen storage solutions?

India represents a high-growth market with significant long-term potential, driven by both scale and a clear strategic direction toward cleaner and more sustainable energy solutions.

The country is making substantial investments in renewable energy, alternative fuels, and reduced dependency on external energy sources.

This transition aligns well with our belief that future energy systems must combine performance, sustainability, and local value creation.

India's development path and policy direction are both forward-looking and pragmatic, creating a strong foundation for modern storage technologies.

Q. India is witnessing rapid growth in alternative fuels, especially CNG, hydrogen, and clean mobility. Which sectors in India do you see as the biggest opportunities for KonveGas?

The strongest near-term growth is expected from clean mobility and the CNG transition, particularly where biomethane and CNG are being used to reduce emissions quickly using existing vehicles and infrastructure.

Hydrogen storage is expected to follow as the next major wave, driven by infrastructure-led projects. Industrial gas applications are relevant in selective use cases where weight, handling, and safety drive value.

Q. Do you plan to manufacture locally in India or collaborate with Indian partners? How important is localization to your long-term strategy in the region?

Localization is a core part of KonveGas' scalability roadmap.

We are moving toward a "local assembly" approach in key markets like India, combining Swedish engineering, validated process control, and training with local production partnerships.

This shortens lead times, reduces logistics emissions, improves supply security, and keeps the technology cost-competitive without compromising safety or performance.

Our material strategy is designed to work with regionally available inputs and multiple qualified sources to avoid dependency on long, emissions-heavy transport routes.

Q. How does KonveGas plan to differentiate itself in a competitive Indian market where cost sensitivity and scale are critical factors?

KonveGas differentiates itself through a combination of low-carbon material strategy, scalable manufacturing, and long-term lifecycle value.

By focusing on regionally available, naturally abundant, non-fossil raw materials and avoiding long import routes, we reduce both emissions and supply-chain risk while supporting cost stability. Our modular manufacturing model enables capacity to scale through standardized production cells while maintaining consistent quality and safety. From a long-term perspective, storage technology should be evaluated as a strategic asset, with value driven by service life, operational efficiency, reliability and reduced lifecycle CO_2 exposure, rather than upfront price alone.

Q. As a European company with global ambitions, how do international standards and certifications influence your approach to new markets like India?

International standards such as ECE R110, ISO 11119-3, and EN 12245 guide our design and testing processes.

These standards define strict requirements for structural integrity, safety, fatigue resistance, and environmental performance.

By meeting these rigorous requirements, KonveGas delivers a consistent safety and performance level across markets, including demanding operating conditions in regions like India. Alignment with global standards also supports predictable risk management, regulatory compliance, and long-term performance assurance.

Q. Looking ahead, what are the key milestones you want KonveGas to achieve in the next five years, both globally and in India?

Over the next five years, our primary focus will be on strengthening our core markets, with particular emphasis on our home market and India.

In India, our priority is to localize manufacturing and integration, working closely with OEMs, system integrators and local partners. Key milestones include industrialization of our technology, alignment with Indian regulatory requirements, and supporting the rapid growth of CNG, biogas and hydrogen infrastructure through locally produced composite cylinders.

Rather than expanding broadly into many regions at once, our strategy is to build depth, volume and long-term partnerships in selected markets. By doing so, we can ensure quality, scalability and sustainable growth, while contributing meaningfully to the energy transition in India and our core markets.

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"The Rise of iPaaS in an Increasingly Automated Business World"

As manufacturing enterprises accelerate their digital transformation journeys, integration, automation, and data-driven decision-making have emerged as critical enablers of operational efficiency and scalability. From connecting shopfloor systems to enterprise applications, platforms such as iPaaS are playing a pivotal role in building agile, connected, and automated manufacturing ecosystems. In an interaction with **Machine Edge Global,** **Jitesh Banga,** Principal Product Marketing Manager at a US-headquartered technology company, shares insights into his journey, the evolving integration landscape, the role of product-led growth in driving adoption, and how intelligent automation is augmenting human capabilities across industries.

Q. Can you tell us about your role and your journey?

I started out as a freelancer writing marketing content in my second year of engineering, back in 2006. Within a year, this evolved into a part-time business with multiple international clients and agencies, providing me with a steady stream of work. This business ran successfully for about six years, after which I exited and moved into a full-time marketing role at a company operating at the intersection of healthcare, integration, and data.

Since then, I have been deeply involved in the integration and automation space, and I currently lead multiple initiatives at one of the world's leading iPaaS companies. In my role as Principal Product Marketing Manager, I spearhead the product-led growth (PLG) initiative, the data integration initiative, and the finance automation vertical. I am responsible for messaging, positioning, and go-to-market (GTM) strategy across these areas.

Q. Can you tell us more about integration as an industry, and what an iPaaS does?

Integration as an industry has always focused on creating a connected enterprise—one where datasets, applications, and business systems communicate seamlessly to provide a holistic view of the business. It encompasses multiple integration patterns, which define how systems and processes connect with one another.

These include application integration, where cloud and on-premise applications communicate, and data integration, where large volumes of data from multiple sources are consolidated into databases for analysis and processing. Other integration types include API integration, EDI integration, and more.

An iPaaS (Integration Platform as a Service) typically supports one or more of these integration types, offering businesses a single platform to manage data connections, data movement, and workflows. The end result is a connected, automated enterprise where business processes are optimized through interconnected systems.

Q. In this context, what is PLG and how does it help an iPaaS?

PLG, or product-led growth, is a strategy focused on optimizing the user experience of a software product so that users can activate, derive value, and convert into paying customers without the need for human intervention. This creates a viral loop, enabling users to experience value faster and use the product more efficiently to drive tangible business outcomes, often with minimal training.

Under our PLG approach, one of our key offerings is a 30-day free trial that provides users with the full capabilities of our iPaaS. This allows them to realize value immediately—even before making a purchase—bringing them closer to achieving full-scale automation across their business processes.

Q. Many organizations are still navigating the balance between automation and human oversight. What's your take on achieving the right equilibrium?

The automation enabled by an iPaaS is designed to free human teams from tedious, repetitive, and unfulfilling tasks. This, in turn, allows people to focus on more strategic and meaningful work that drives greater value in their roles.

Automation should act as a counterpart—an ally—to human talent, not a replacement. Now and in the future, the ideal model is human augmentation through automation, where intelligence and automated systems enable people to achieve more in the same timeframe and with the same resources.

Q. What advice would you give to young professionals?

In today's world, automation is your ally, and the opportunities are limitless. You are standing at the cusp of a generational transformation—much like the advent of the internet a few decades ago. Regardless of your chosen field, there is immense potential for growth and success if you adopt an automation-first mindset. Experiment, explore your interests, and discover your calling. Combine your skills with automation, and there will be very little standing in the way of achieving professional excellence and long-term success.

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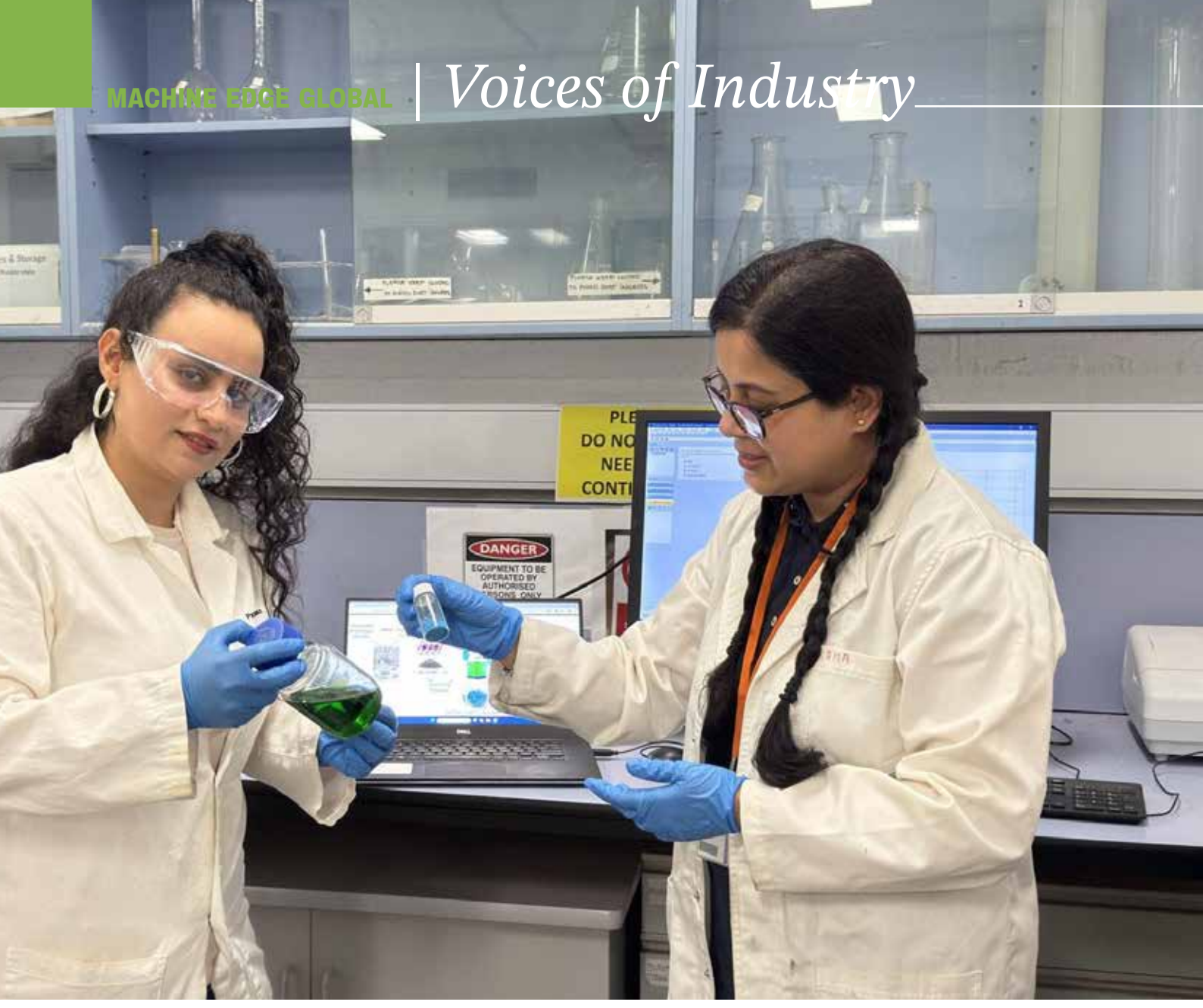

Safer Way to Recycle Spent Lithium-Ion Batteries

With nearly 500,000 tonnes of spent lithium-ion batteries accumulating worldwide, the need for safer and more sustainable recycling solutions has never been more urgent. Traditional recycling methods often rely on high temperatures and hazardous chemicals, recovering only limited materials while posing environmental risks. Researchers at Monash University have now developed a breakthrough process that uses a mild, environmentally friendly solvent to recover more than 95 percent of key metals including nickel, cobalt, manganese, and lithium from complex battery waste. The innovation offers a safer, efficient pathway toward large-scale battery recycling and a stronger circular economy for critical minerals.

Researchers have developed a breakthrough method to recover high-purity nickel, cobalt, manganese and lithium from spent lithium-ion batteries using a mild, sustainable solvent. The process offers a safer and more environmentally friendly alternative to traditional high-temperature or chemical-intensive recycling methods. Globally, around 500,000 tonnes of spent Lithium-ion batteries (LIBs) have already accumulated, and about 10 per cent of spent batteries are fully recycled in Australia. The remainder often ends up in landfill, where toxic substances can leach into soil and groundwater, gradually entering the food chain and posing long-term health risks.

At the same time, spent LIBs are a valuable secondary resource, containing strategic metals such as lithium, cobalt, nickel, manganese, copper, aluminium and graphite. Current recovery methods are often limited, relying on high temperatures or hazardous chemicals to extract only some elements. The Monash team's new method addresses these challenges by using a novel deep eutectic solvent (DES) combined with an integrated chemical and electrochemical leaching process.

Dr Parama Banerjee, principal supervisor and project lead, from the Department of Chemical and Biological Engineering, said the approach achieves more than 95 per cent recovery of nickel, cobalt, manganese and lithium even from industrial-grade "black mass," which contains mixed battery chemistries and common impurities like graphite, aluminum and copper.

"This is the first report of selective recovery of high-purity Ni, Co, Mn, and Li from spent battery waste using a mild solvent," Dr Banerjee said. "Our process not only provides a safer, greener alternative for

recycling lithium-ion batteries but also opens pathways to recover valuable metals from other electronic wastes and mine tailings."

Parisa Biniaz, PhD student and co-author, said the breakthrough is a major step closer to a circular economy for critical metals and reduces the environmental impact of battery disposal.

"Our integrated process allows high selectivity and recovery even from complex, mixed battery black mass. The research demonstrates a promising approach for industrial-scale recycling, recovering critical metals efficiently while minimising environmental harm," Ms Biniaz said.

Conclusion

As demand for lithium-ion batteries continues to surge, managing end-of-life battery waste is becoming a global priority. This new recovery method demonstrates that high efficiency, environmental responsibility, and industrial scalability can go hand in hand. By enabling selective, high-purity metal extraction without harsh chemicals or extreme heat, the process marks a significant step toward sustainable battery recycling. Innovations like this not only reduce environmental harm but also secure valuable resources for the clean energy transition, reinforcing the shift toward a truly circular economy.

Courtesy- Monash University

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Redefining Construction Through Smarter Materials

Scale has always been used to measure construction in India. Today, people are judging it more and more by how fast, how well, and how responsible it is. As projects get bigger and deadlines get shorter, the materials used to build buildings are changing the way construction sites work. Faster execution and better performance are no longer goals that compete with each other. Changes in material science and manufacturing are making it possible for them to be delivered together.

KAUSHAL MEHTA,
Managing Director,
Walplast Products

NextMSC says that the Indian construction market was worth $1.04 trillion in 2024 and is expected to be worth $1.21 trillion by 2025. The market is expected to grow to USD 2.13 trillion by 2030, with a compound annual growth rate of 12.1% from 2025 to 2030. This rate of growth does not provide much room for oversights. Materials that slow projects down, waste resources, or require repeated repairs are becoming increasingly difficult to justify.

From Volume to Performance

For many years, the main factors in choosing building materials were cost and how easy they were to procure. That perception is changing. Contractors and developers are paying more attention to how materials work on site and over time. Now, important factors include faster curing, less water use, less shrinkage, and consistent quality.

This change includes using materials that are good for the environment. Products that are made with recycled materials and have low emissions are helping to cut down on waste and make sites more efficient. For example, wall putties that contain recycled materials and can be recycled themselves help resources be used in a circular way while also providing smoother finishes and faster application. Self-curing plasters that use less water also make work easier on busy sites where managing water is often a problem. These are useful benefits, not abstract environmental goals.

Waste as a Design Issue

When waste comes up, it's easier to see why we need better materials. The Building Material Promotion Council says that India makes about 150 million tons of construction and demolition waste every year but only recycles about one percent of it. This imbalance shows a bigger problem: people still think of materials as disposable instead of long-lasting.

That way of thinking is challenged by high-performance materials. Demolition cycles slow down when surfaces last longer, crack less, and don't let moisture or mold grow. Fewer repairs mean that fewer things need to be replaced. Over time, that means less trash and more value from each tonne of material used.

Material Science in Action

The most obvious changes are happening in the day-to-day work of building. Ready-mix plasters cut down on mistakes and waste of materials that happen when mixing on site. Tile adhesives that make stronger bonds need thinner layers to work, which means they cover more area while using less. Gypsum-based internal finishes speed up the time it takes to move from one stage to the next, which helps projects stay on schedule without sacrificing surface quality.

Chemicals used in construction are also changing how people act on the job site. Waterproofing systems, repair mortars, and performance admixtures are making structures more stable in tough situations. Concrete that has the right amount of strength with less cement lowers both costs and emissions. AAC blocks are lightweight and make it easier to move things around. They also provide thermal insulation, which helps save energy later in the life of a building.

Speed without Shortcuts

People often think that building things faster means lower quality. That assumption is no longer true. Materials are now designed to speed up timelines and make things more consistent. For instance, self-healing concrete fixes micro-cracks before they turn into structural damage. Plasters that don't soak up water cut down on the number of times you have to repaint. These features let buildings get older without having to be fixed up all the time.

This makes people think differently, from finishing things quickly to doing well over time. For contractors, fewer call-backs and repairs mean they get a better reputation. For people who live there and own the property, it means less money spent on upkeep and better living conditions.

Technology Embedded in Materials

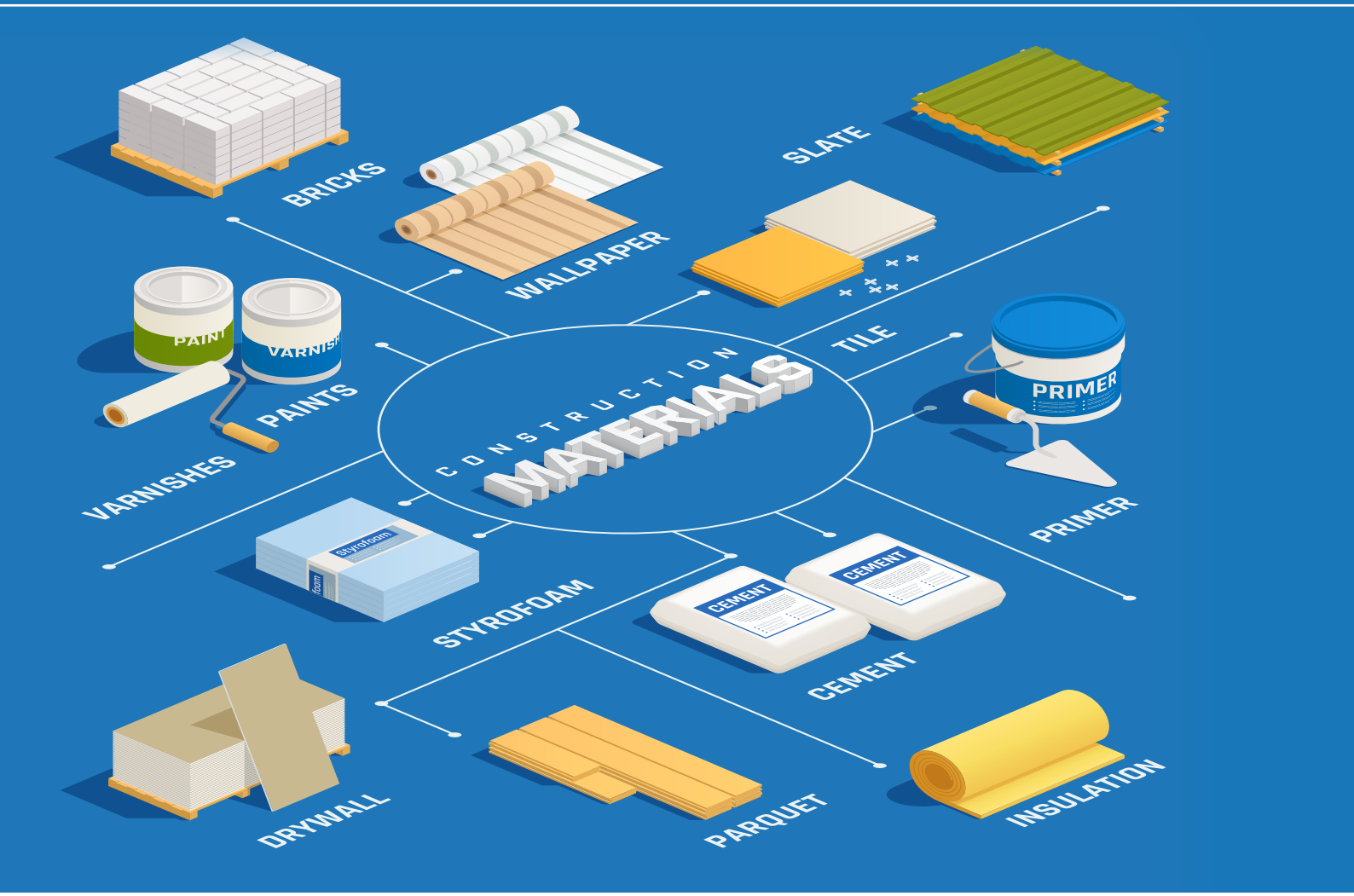
More and more, materials are working with technology. Coatings that change color with light and temperature help keep the heat in the house at a comfortable level. Sensors built into buildings can keep an eye on the humidity or stress levels inside, which can help find problems before they get worse. These tools may look high-tech, but their real value is in stopping problems before they happen.

When used with low-VOC paints, water-efficient plasters, and eco-friendly finishes, these systems cut down on the need for mechanical solutions and make things last longer. Over time, buildings become easier to take care of and use fewer resources.

Precision through 3D Printing

Three-dimensional printing is starting to change how parts are made and put together. Building in layers cuts down on waste and lets you control the shape and strength of the structure very precisely. This means fewer mistakes and faster assembly on construction sites.

3D printing helps make custom panels and modular parts that are ready to be installed inside. When used with eco-friendly composites or



recycled aggregates, the process works well without wasting anything. Slowly, trial-and-error methods that waste time and materials are being replaced by precision manufacturing.

Manufacturing with Care

Factories now play a decisive role in determining speed and quality on construction sites. Manufacturers of plasters, adhesives, blocks, and finishes are refining their processes to include recycled raw materials, renewable energy, and water-saving methods. Fly ash and other industrial byproducts, once treated as waste, are being converted into dependable construction inputs. This approach improves material consistency while reducing environmental impact. When products arrive on site with predictable performance, work progresses with fewer disruptions, less rework, and tighter control over time and resources.

Prefabrication Gains Momentum

High-performance materials are becoming more important because of prefabricated and modular construction methods. Making parts in a factory makes things more accurate and speeds up the process. Lightweight blocks, engineered mortars, and high-bond adhesives are all necessary for these systems to work well.

Prefabrication makes construction sites less crowded and disruptive in cities with a lot of people. It also makes it easier to reuse and move things, which lowers the need for new raw materials. The quality gets better because the materials are tested and put together in a controlled setting.

Building materials now shape how efficiently construction sites operate, how consistently quality is maintained, and how responsibly projects are delivered. As India's construction market expands, efficiency is being redefined through materials that reduce waste, improve durability, and deliver reliable performance. When speed aligns with sustainability and long-term quality, construction moves beyond meeting deadlines and focuses on building with intent and responsibility.

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