Event Recap: Hannover Messe – April 2024

Manufacturing Technology team

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Contents

Hannover Messe 2024 was a success and discussed the latest electrification, digitization, and automation trends in the industry

- Hannover Messe 2024 (#HM24) concluded its five-day run on April 26. The event brought together the latest electrification, digitization, and automation innovations to demonstrate high-performance solutions and achieve carbon neutrality. The trade fair encompasses the entire industrial value chain, ranging from individual components to intelligent factories. The event slogan for 2024 is “More Important than Ever!”
- The technology trade fair reported visitor, exhibitor, and startup numbers similar to those of 2023 but observed a slight reduction in attendance. Although the number of visitors was not as high as the 215,000 recorded in 2019 before COVID-19, over 40% of the visitors were international, with visitors from China, the Netherlands, and South Korea leading. There was a notable increase in visitors from the US and Japan compared with 2023. However, Chinese exhibitors and attendees have yet to fully rebound to pre-pandemic levels (still 30% of visitors, second only to Germany).

	130,000	4,000	150
	visitors	exhibitors	nations
Percentage difference compared to 2023:	*(↑1.6%)*	*(0%)*	*(↓3.8%)*

Hannover Messe 2024’s exhibition grounds, Messegelände, 30521 Hannover, Germany

Source: Deutsche Messe AG

A strong presence of Chinese exhibitors demonstrate their overseas strategies at Hannover Messe 2024

- At HM24, the number of exhibitors from China exceeded 1,100, second only to the number of exhibitors from the host country, Germany.
  - Chinese exhibitors covered a wide range of industrial products, such as components, robots, hydrogen fuels, high-end automation equipment, and energy solutions.
  - The “Invest in China” exhibition organized by the Investment Promotion Bureau of the Ministry of Commerce of the People’s Republic of China provided a platform to promote the Sino-German Energy Partnership.
- More Chinese companies are actively laying out their overseas strategies. For example, Inovance and INVT are growing in countries like Eastern Europe.
- In the short term, Europe is counting on a rebound in the Chinese market in 2024 to elevate demand while reducing its dependence on the Chinese market to mitigate supply chain risks.

From the point of view of Chinese exhibitors involved in the field, exports are moving from singular automation parts and components to higher-end automation products and overall solutions.

Lisa Wang
Senior Analyst
Manufacturing Technology

The Investment Promotion Bureau of the Ministry of Commerce of the People’s Republic of China’s “Invest in China” booth

Source: Omdia analyst photo, Hannover Messe 2024

The key themes of Hannover Messe 2024 were AI, digitalization, and industrial sustainability

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI), including generative AI (GenAI), was showcased with applications across the product lifecycle from design to supply chain. The aim is to drive efficiency, productivity, and innovation.

The 16th International MES Conference centered on understanding whether AI would revolutionize manufacturing. MES provides structured data; across HM24, Omdia observed integrated use cases of AI in MES applications. Also discussed was the impact the EU data act will have on the data quality of AI-based MES tools.

DIGITALIZATION

Software-defined automation, including virtual programmable logic controllers (vPLCs), connectivity, industrial edge, and integrated solutions, were key topics of digital transformation.

The virtualization of physical equipment and production environment was back in vogue at HM24. Building a digital twin enables manufacturers to simulate and scenario plan, with effective use cases being maintenance and agile manufacturing based on changes to product design or capacity.

INDUSTRIAL SUSTAINABILITY AND CIRCULAR ECONOMY

Industrial sustainability through decarbonization, hydrogen energy, and renewables excited the industry.

Norway is the official partner country for Hannover Messe 2024 owing to its long-standing commitment to sustainable energy solutions

- Several companies showcased Norway's commitment to reach net-zero carbon emissions. They include the following:

Company	Business Focus
equinor	An energy company with growing activity in renewables and investments in offshore wind, hydrogen, and solar energy
GreenCap SOLUTIONS	A technology provider offering green carbon capture solutions using solid adsorbents (zeolites)
MORROW	A battery manufacturer and partner of Siemens, building the world's first large-format lithium manganese nickel oxide battery
Norge Mineraler AS	A mining company focusing on vanadium, phosphate, and titanium, which are key for energy and digital transition
Statkraft	A hydropower company and Europe's largest supplier of renewable energy, including green hydrogen
THE CORING COMPANY	A software company that meets the mining industry's need to be more efficient in reducing carbon footprint
VIREON A Norwegian Hydrogen Company	A hydrogen refueling company producing renewable hydrogen, renewable ammonia, and oxygen for heavy-duty tracks
YARA	A chemical company enabling the first green shipping route between Norway and Germany

Source: Omdia

Hannover Messe 2024 was commended as a catalyst for the digital transformation of the industry

"The key to transformation is to produce more electricity in a climate-friendly manner and at an affordable price."

"AI could be found in even the smallest products."

Olaf Scholz
German Chancellor

"We are proud to continue the EIB Group's work in supporting innovation to accelerate the green transition while boosting our economies' competitiveness in close connection with the EU Commission."

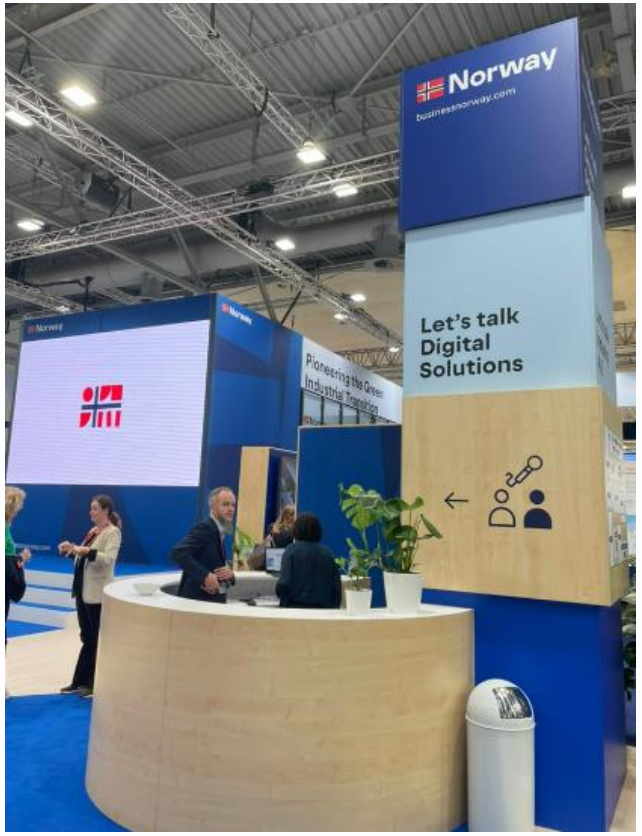
Nicola Beer
Vice President of EIB

"…industry should be the driving force when developing hydrogen and CO_2 value chain."

"…Norway to take the full scale of the hydrogen market in Europe to meet our climate target through CCS full-value chain."

Jonas Gahr Store
Norwegian Prime Minister

Showcasing Norway as the official Hannover Messe 2024 partner country



Source: Omdia analyst photo, Hannover Messe 2024

Omdia team at Hannover Messe 2024

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Key takeaways

Analysts' observations for Hannover Messe 2024 compared with 2023

Interesting observations for 2024

- **GenAI:** GenAI applications across the lifecycle of production from design to supply chain were shown
- **Data management:** Data fabric solutions for data integration, orchestration, and management are on the rise as a foundation for AI implementation
- **Ecosystem development:** Digital and sustainable transformation were emphasized both in numerous partnerships and exhibitions at booths
- **Software-defined automation:** The future is software and solutions defined and led by new virtual PLC developments

What was missing compared with 2023?

- **Connectivity solutions:** There was less discussion around 5G and single-pair Ethernet, with adoption currently limited
- **Industrial metaverse and digital twin:** There were far fewer references to the metaverse, and digital twin solutions seemed to focus more on operation opportunities
- **Moving away from China:** PV and battery manufacturing are moving away from China

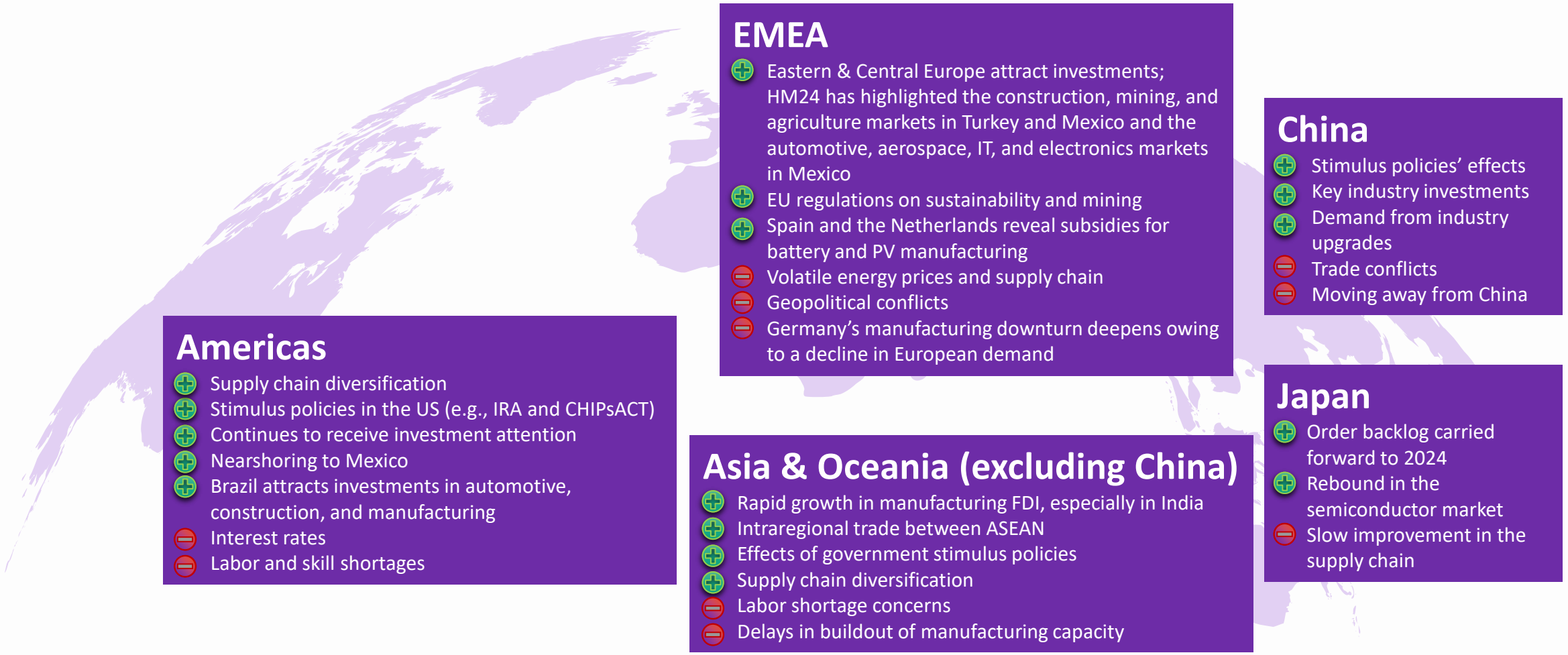
Market outlook for 2024 and beyond: The industry is excited about promising growth

- HM24's core topics included GenAI, digitalization, and industrial sustainability and circular economy. The technology trade fair was a remarkable success; visitors gathered to discuss their key challenges—such as gaps in a skilled workforce—supported by the best technological solutions, such as GenAI.
- HM24's automation equipment vendors are looking forward to an industry recovery in 2H24 with a cautious attitude toward the German market, which is expected to recover in early 2025. This lines up with Omdia's *Industrial Automation Equipment Market Tracker* published in 1Q24; the industrial automation equipment industry is expected to enter a moderate growth period in 2025, increasing by 4.2% after a trough of 1.9% in 2024.
- In Europe, process industries such as food and beverage, life sciences, and renewable energy are bright spots, while discrete industries will pick up momentum toward the end of 2024. Signs include postponed capex projects and cautious investments in mining and oil & gas. In America and Asia & Oceania, the infrastructure and construction machinery industries drive growth.
- Supply chain mitigation remains a focus to increase competitiveness; national security policies are leading toward protectionism, resource conservation, and the continued introduction of investment incentives.
- Industrial automation equipment manufacturers are feeling uncertain about new orders in 2H24 and report fewer orders owing to a high order backlog for machinery. End users, such as the OEM market, have well-stocked inventories, resulting in little to no new orders and an expected decrease in ASP. To maintain profits, these manufacturers are now targeting the mentioned process industries and expanding their product range; according to Omdia's *Machinery Production Market Tracker* published in 1Q24, China is forecast to grow the most in revenue at 3.2% in 2024, followed by the US at 2.5%.
- European semiconductor and electronics equipment machinery vendors have echoed the gradual recovery and are expected to normalize in 4Q24 or 2025. According to Omdia's *Industrial Semiconductor Market Tracker* published in 1Q24, the industrial semiconductor market is expected to have a positive year-over-year (YoY) growth rate of 6.6% over the next year with a 3.7% CAGR for 2022–27.

Rachel See
Senior Analyst
Machinery Technology

The need to mitigate supply chain risks, in regard to critical minerals and energy security, will shape the manufacturing landscape in the coming years.

Economic outlook for 2024: Regional opportunities and challenges



EMEA

- ⊕ Eastern & Central Europe attract investments; HM24 has highlighted the construction, mining, and agriculture markets in Turkey and Mexico and the automotive, aerospace, IT, and electronics markets in Mexico
- ⊕ EU regulations on sustainability and mining
- ⊕ Spain and the Netherlands reveal subsidies for battery and PV manufacturing
- ⊖ Volatile energy prices and supply chain
- ⊖ Geopolitical conflicts
- ⊖ Germany's manufacturing downturn deepens owing to a decline in European demand

China

- ⊕ Stimulus policies' effects
- ⊕ Key industry investments
- ⊕ Demand from industry upgrades
- ⊖ Trade conflicts
- ⊖ Moving away from China

Americas

- ⊕ Supply chain diversification
- ⊕ Stimulus policies in the US (e.g., IRA and CHIPsACT)
- ⊕ Continues to receive investment attention
- ⊕ Nearshoring to Mexico
- ⊕ Brazil attracts investments in automotive, construction, and manufacturing
- ⊖ Interest rates
- ⊖ Labor and skill shortages

Japan

- ⊕ Order backlog carried forward to 2024
- ⊕ Rebound in the semiconductor market
- ⊖ Slow improvement in the supply chain

Asia & Oceania (excluding China)

- ⊕ Rapid growth in manufacturing FDI, especially in India
- ⊕ Intraregional trade between ASEAN
- ⊕ Effects of government stimulus policies
- ⊕ Supply chain diversification
- ⊖ Labor shortage concerns
- ⊖ Delays in buildout of manufacturing capacity

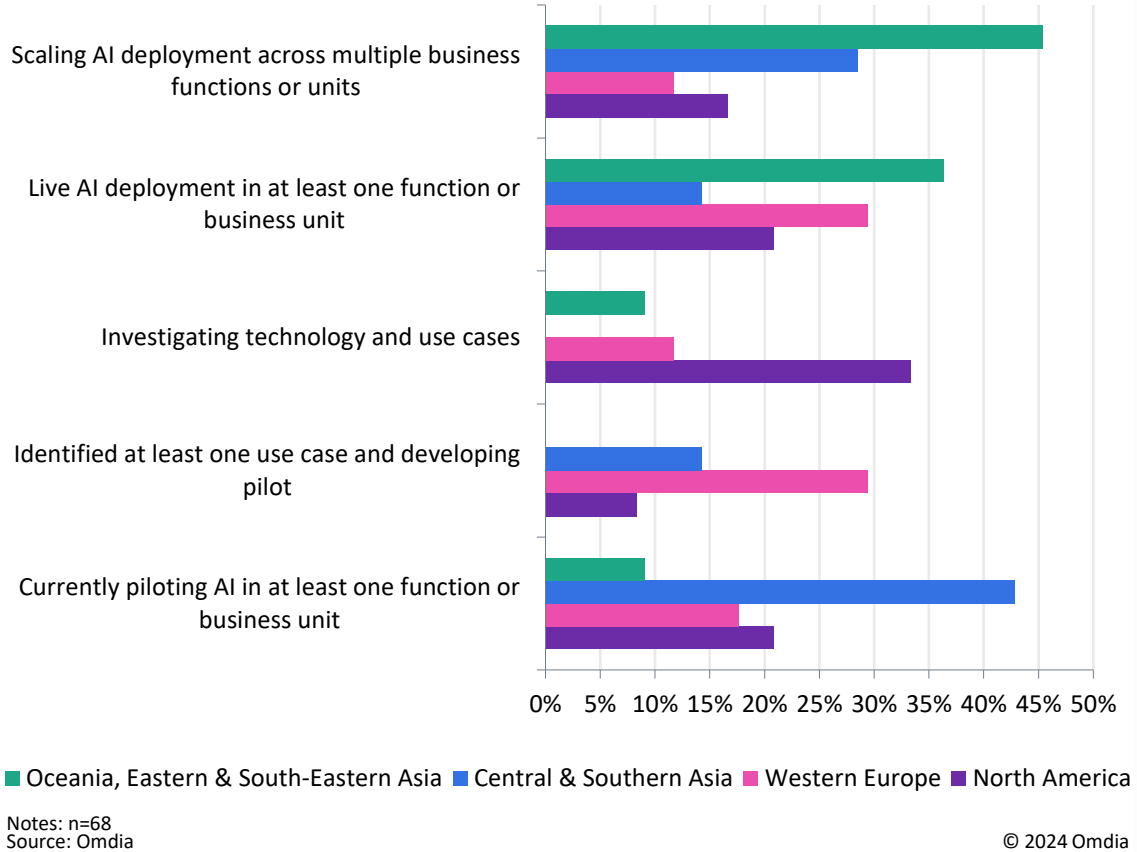
Notes: Summarized from Omdia's 1Q24 versions of *Machinery Production Market Tracker* and *Industrial Automation Equipment Market Tracker*
Source: Omdia

Artificial intelligence

AI in manufacturing covers a wide range of applications, but adoption is challenging

- AI in manufacturing is gaining traction, with the OSEAN region leading the adoption, according to Omdia's *AI in manufacturing – Survey Analysis*.
- AI was one of the most showcased and discussed topics at HM24. Almost every company included AI applications in their portfolio. Major applications target overall equipment efficiency (OEE) and worker efficiency. Next to traditional AI-based quality inspection are machine vision, condition-based monitoring, and cybersecurity tools. A range of new use cases were showcased, such as autonomous AI-based yield and throughput optimization based on real-time analysis and use of synthetic data and simulation; energy efficiency applications; root cause analysis for quality and production optimization; supply chain analytics; planning and adjusting; compute/machine learning (ML) and control combination; augmented reality (AR) and AI for quality control improvement; and copilot for robotics. GenAI-based collaboration tools included design and engineering optimization, PLC code generation and updates, visualization, low-code and no-code programming, worker safety applications, and applications supporting sustainability targets.
- Initially hosted in the cloud, AI solutions on the edge are on the rise. One motivating factor is cost savings for cloud usage, apart from real-time near-source analytics. Machine vision systems, robotics, and automotive lead industrial edge applications.
- Although overall interest in AI is high, implementing and especially scaling AI projects is challenging. Foundation models need to be developed for better cost predictability and scalability; monetization models are outstanding as well.
- Industrial AI's ecosystem is developing quickly, with AI-powered edge devices, edge-cloud platforms, unified connectivity, data harmonization solutions, and integration services. Details about the ecosystem are available in Omdia's *AI in manufacturing – Survey Analysis* report.

Status of AI adoption in manufacturing in different regions



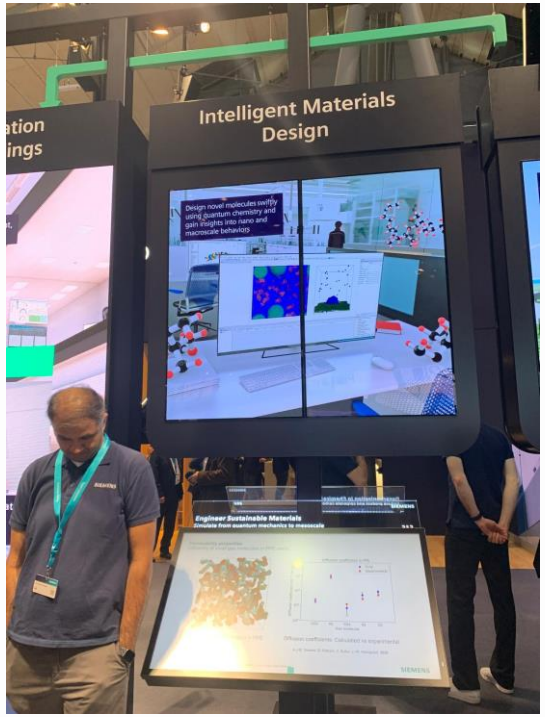
Notes: n=68
Source: Omdia

Siemens showcased a very strong and comprehensive industrial-grade AI portfolio, focusing on production and quality optimization

- Siemens will launch Siemens Industrial Copilot (in around July 2024), its first GenAI-powered product for engineering in the industry. This innovation has the following goals:
  - Support employees with training and provide easy access to relevant information through queries
  - Accelerate development of code, such as PLC, to reduce workload and address skills shortfall
  - Improve quality, productivity, and efficiency over time as employees are empowered to focus on more complex, value-added tasks
- Siemens' goal is to make AI real, industrial, and easy to use:
  - Joining forces with Amazon Web Services (AWS) to create tailored GenAI models to drive productivity within their workforces
  - Expanding collaboration with NVIDIA on GenAI for immersive real-time visualization
  - Strategic collaboration with Microsoft to drive industrial productivity, enabling visual quality inspections on the shop floor through its Azure OpenAI Service
  - Partnership with Schaeffler to generate code for machines and PLCs to obtain data from the machine's diagnostics and performance, compare machines, and predict the OEE of the machines; scalability at a factory and global level depends on hardware

Siemens showcases its latest industrial-grade AI applications

AI application that picks out "unknown objects" at the Siemens booth; the user does not require any new programming or training



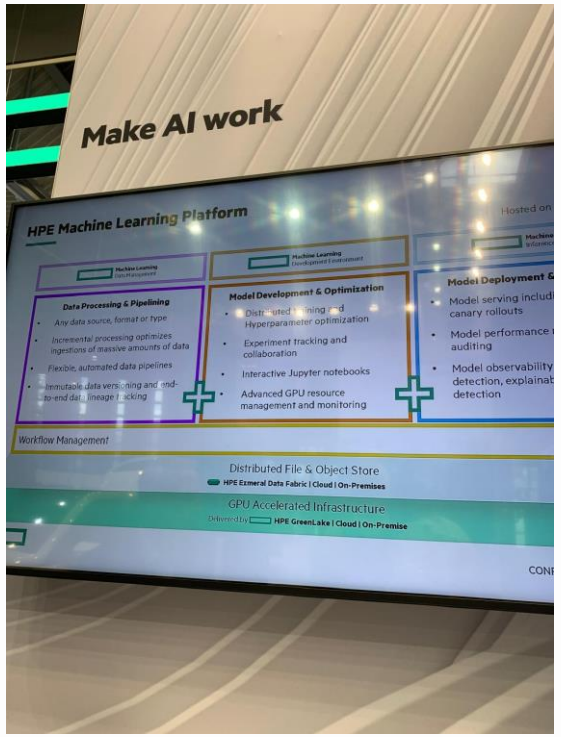
Intelligent Materials Design with Simcenter Culgi AI software, which accelerates material development in domains such as pharmaceutical development and cosmetic development

Source: Omdia analyst photo, Hannover Messe 2024

Several vendors presented frameworks for AI implementation and tools for AI-supported code programming

Beckhoff Automation's AI for automatic PLC code and dashboard generation, AI combined with control application, and AI training tools

HP is focusing on AI implementation tools like ML model development and application deployment



Source: Omdia analyst photo, Hannover Messe 2024

Transforming manufacturing with generative AI

- GenAI will overhaul how manufacturers work by driving efficiency, productivity, and innovation. The value of large language models (LLMs) is their ability to distill complex data and analytics into actionable insights. Prominent use cases throughout HM24 are as follows:
  - **AI chatbots:** Tulip showcased its Frontline Copilot, equipping those closest to operations with tools for answering questions, exploring data, and creating personalized manufacturing assistants using conversational language. Examples of use include gathering instructions for technical manuals and offering manufacturers operational support.
  - **AI for planning and production scheduling:** Supply chain resilience protects profitability for manufacturers globally. Since COVID-19, supply chains in different verticals have been affected by trade tensions between the US and China, while the war in Ukraine affected the food chain, not to mention the rising inflation. Deepsense.AI was one of many vendors that demoed the use of AI in demand forecasting, which offers manufacturers a promising solution to improve scheduling, forecasting, planning, and route optimization. Therefore, mitigating the impact of disruptions, enhancing supply chain resilience, and maximizing production efficiency.
  - **AI for quality and visual inspection:** For most manufacturers, improved quality is where AI can achieve the fastest return on investment; fewer faults lead to a higher yield, less rework, and less waste. Rockwell Automation displayed an active use case running at Nestle: a vision inspection machine connected to its software to check for defects in the chocolates on the production line.
  - **AI for code generation:** This use case will help shorten the learning curve for new employees. Schneider Electric demonstrated its Automation application copilot, which helps write code for PLCs and scripts that include references to the source assembly. This has been effective in upskilling new starters to give them a foundation in coding standards and architecture.

Rockwell Automation displays an active use case running at Nestle

Source: Omdia analyst photo, Hannover Messe 2024 © 2024 Omdia

Anthony Mukoro
Senior Analyst
Manufacturing Software

AI is effective when provided with structured data from the OT environment, such as an MES, APM, or QMS. The time-to-value of investment in AI is accelerated when this is in place. As such, consultancies and systems integrators will have a significant say in the adoption and buildout of use cases for AI in leading digital transformation strategies and building industry-specific applications.

Digitalization

IT influences automation architecture with software-defined automation

- IT technologies are influencing automation architecture and design. Schneider Electric has been driving its open software-defined automation approach for application-centric automation design based on the EcoStruxure Platform.
- At the Hannover exhibition, Schneider Electric showcased horizontal and vertical integration with EcoStruxure Automation Expert (using an open approach with different vendors' devices based on the UniversalAutomation.org runtime) for the plastic recycling application demo. According to the vendor, the implementation of the software-defined automation is taking off for several customers.
- Capgemini also presented a similar concept in a software-defined factory, a software-centric approach based on integration, abstraction, and automation utilizing multipurpose hardware.

EcoStruxure Automation Expert uses an open approach with different vendors' devices based on the UniversalAutomation.org runtime

Source: Omdia analyst photo, Hannover Messe 2024

IT influences automation architecture with Modular Type Package

- A different approach to automation architecture engineering is Modular Type Package (at PROFIBUS & PROFINET International's [PI's] booth), driven by organizations like ZVEI, NAMUR, PNO, and P-PAS and supported by the major automation vendors. The concept was initially developed for implementation in the process industry, but it is also advantageous to the hybrid industry. It emphasizes the standardization of modules or building blocks that can be easily configured, combined, and reconfigured to meet changing production requirements and customer demands. Modular Type Package enables short time-to-market cycles and easy product customization. It is an emerging standard for the software integration of process modules into a control system.
- PI had a demonstration to showcase the integration and management and HMI support of different vendors' control systems with the Open Platform Communications (OPC) Unified Architecture (UA) layer and process orchestration layer at PNO's booth.
- More details on software-defined automation, Modular Type Package, and other emerging automation architectures can be found in Omdia's *Future of Automation – Virtual PLC: A New Era of Software-based Control* report.

PROFIBUS & PROFINET International (PI) showcasing its Modular Type Package

Source: Omdia analyst photo, Hannover Messe 2024

Virtual programmable logic controllers (vPLC), a key topic in software-defined approach

- At the exhibition, vPLC was present with a few podium discussions on the topic. No new vPLC vendors or milestones were showcased at Smart Product Solutions (SPS) 2023 (which took place in November 2023), but some developments revealed at HM24 indicated progress in terms of product maturity:
  - All vendors confirmed end-market interest, though, the actual market potential is difficult to estimate.
  - Siemens showcased vPLC implementation in a pilot project with Audi. The setup is edge-based and is a part of the Siemens Industrial Edge portfolio. According to Siemens, a 1ms response time has been achieved. Safety certification is still outstanding but will be completed toward the end of 2024.
  - To date, only CODESYS has safety-certified vPLCs. Schneider Electric offers a single-vendor, high-availability vPLC setup as part of its EcoStruxure Automation Expert solution.
  - Bosch Rexroth showcased vPLC implementation with VMware/Broadcom as a part of ctrlX ecosystems on an Intel-based device. This was the same demonstration as that at SPS in fall 2023.
  - The ecosystem for vPLC is developing further:
    - PI is working on the standardization of the PROFINET interface for vPLCs in a dedicated working group. So far, there is only a single association.
    - Cisco offers industrial-grade connectivity solutions with embedded reliability and redundancy.
    - Beckhoff and Phoenix are coming closer to vPLC implementation with PLCnext and TwinCAT Runtime containerization.
    - Startup Software Defined Automation included vPLCs in its vendor-independent PLC management and orchestration portfolio next to conventional PLCs.

Demonstration of Siemens' vPLC S7-1500V at its booth

Bosch Rexroth's demonstration of vPLC as part of the ctrlX ecosystem in partnership with VMWare/Broadcom and Intel

Source: Omdia analyst photo, Hannover Messe 2024

OPC UA as a cloud connectivity enabler, and the growing 5G ecosystem

- Omdia's *Industrial Communications Report – 2023* indicates OPC UA growth in newly shipped connected nodes at a 42.4% CAGR for 2022–27. In the meetings, companies reported strong OPC UA adoption, with an increasing need for unified data for digital applications. OPC Foundation's Cloud Initiative is supported by Alibaba Cloud, AWS, Microsoft, Huawei, and SAP, which is contributing to the growth.
- The OPC Foundation launched a new working group, OPC UA for AI, which will focus on several areas such as data analysis, next-generation user interface, and code generation and documentation. The combination of standardized domain information models based on OPC UA will provide a quick-to-market solution, addressing the needs of the industry.
- There was no news regarding Single-Pair Ethernet (SPE) adoption takeoff or Time-Sensitive Networking (TSN) automation profile completion.
- 5G was less prominent at the exhibition. The initial hype around the technology has faded, but adoption is forthcoming, though, at a slow but steady rate. Also, the ecosystem is starting to take shape.
- During the media tour at HM24, the 5G-ACIA organization reported steady but slower-than-expected growth for private 5G networks. 5G is no longer perceived as a standalone technology but as an enabler of new advanced applications. To support adoption and involve the end market, the ACIA, which was initially dedicated to technology providers and vendors, announced a new membership category for end users.

A demonstration of a range of 5G industrial-grade–enabled devices at the 5G-ACIA booth and in the show; these are mainly routers, combining different connectivity options; several have edge compute or AI capabilities

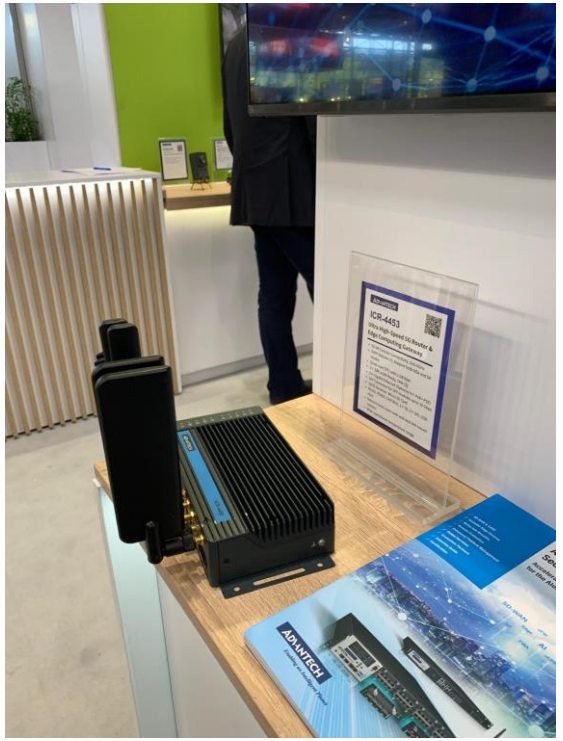
Source: Omdia analyst photo, Hannover Messe 2024

5G and edge

The 5G demo wall, which includes several private 5G core network solutions

Wireless Bolt 5G by HMS Network based on Release 16, with edge compute, Ethernet and SPE, CAN, IO-Link, and others (including safety) for AGVs and switch cabinets; can run up to eight containers

The Advantech booth showcases Advantech's ICR-4453 industrial router with edge gateway functionality, based on Release 15; quad-core GPU with 1GB RAM, gigabit Ethernet, and can run containers



Source: Omdia analyst photo, Hannover Messe 2024

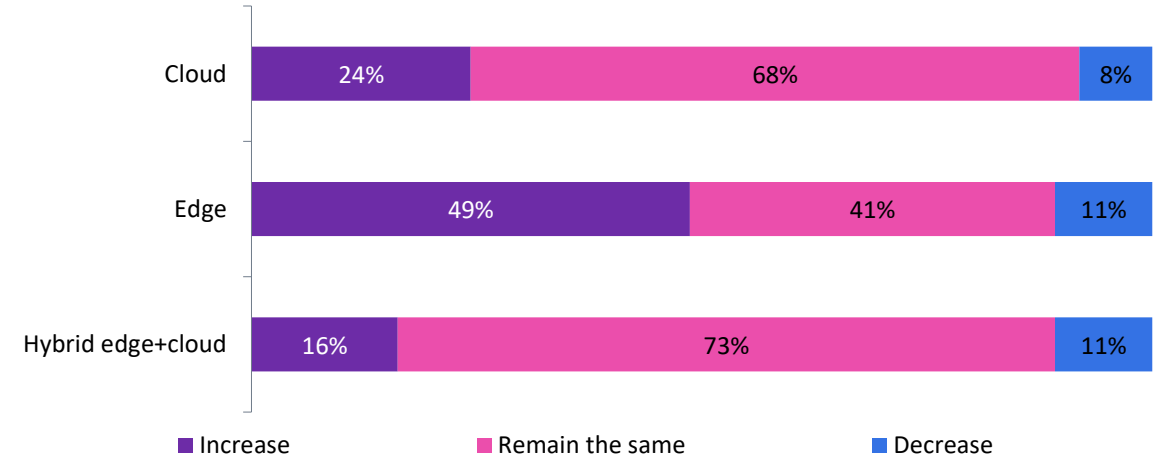
Industrial edge: +5G, +(Gen)AI, +orchestration, +management, and +cloud (1/3)

- According to Omdia's *Industrial Edge and Cloud Compute Survey – 2023*, 49% of companies will increase the use of edge within the next three years.
- According to Omdia's *Industrial Edge Compute and the Future of Automation Report – 2023 Data*, the segment of edge-enabled industrial devices will grow at a 30% CAGR for 2022–27. Recent developments in hardware and software support the implementation of AI applications at the edge, accelerating industrial edge growth. The orchestration and management of edge devices are becoming critical.
- Intel announced an important milestone just before HM24, including the launch of Margo, a new open standard initiative for interoperability at the edge of industrial automation ecosystems. The initiative is supported by some of the largest automation ecosystem providers globally, including founding members ABB (including B&R), Capgemini, Microsoft, Rockwell Automation, Schneider Electric (including AVEVA), and Siemens. Margo defines the mechanisms for interoperability between edge applications, edge devices, and edge orchestration software.
- The combination of hardware, AI ability, connectivity, and cloud connectivity and the orchestration and management of edge devices and applications was showcased by several vendors in their edge offerings at the exhibition.

Anna Ahrens
Senior Analyst
Industrial IoT

Recent developments in hardware and software support the implementation of AI applications at the edge, accelerating industrial edge growth. The orchestration and management of edge devices are becoming critical.

How will your usage of the following platforms change in the next three years?

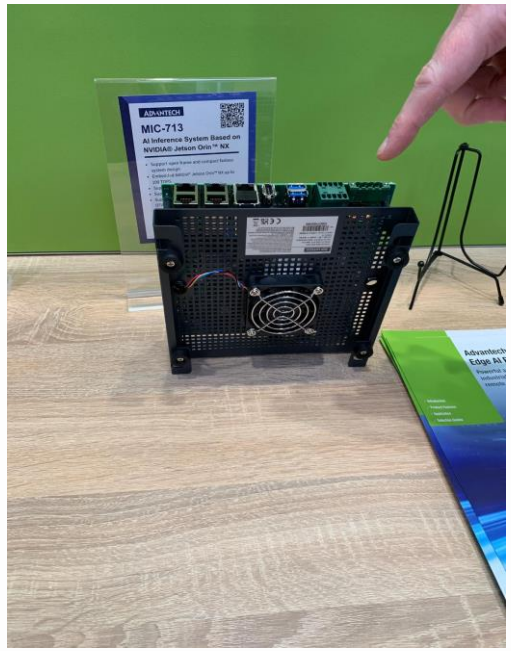


Source: Omdia

Industrial edge: +5G, +(Gen)AI, +orchestration, +management, and +cloud (2/3)

Nokia showcases several AI-powered industrial safety applications utilizing the recently introduced MX Grid field edge device orchestration platform within Nokia MX Industrial Edge on OnLogic on-premises edge (e.g., the system identifies employees falling, and the AGV is notified via 5G connectivity before the AGV approaches the worker)

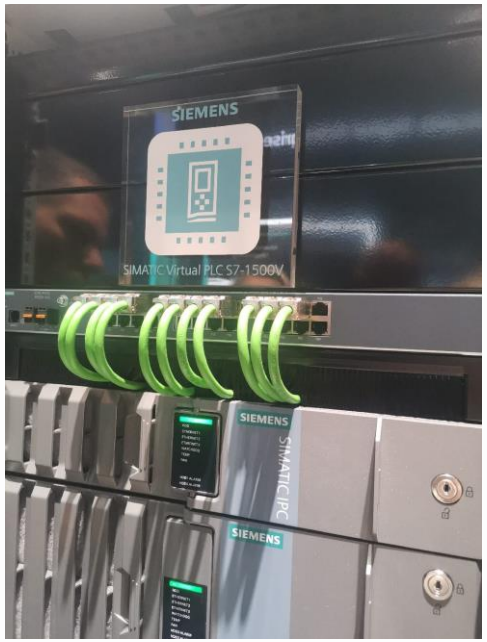
Advantech presents a comprehensive product portfolio for NVIDIA Jetson Orin and RTX (Gen)AI-capable industrial edge devices for different industrial verticals and applications, inclusive of robotics and vision; Advantech is collaborating with Namla for cloud-edge infrastructure and applications management and orchestration and showcased Namla's GenAI CoPilot service and the AWS IoT Greengrass demo on Advantech devices; the other partner, AIIxon, offers remote monitoring and management solutions with out-of-band (OOB) technology



Source: Omdia analyst photo, Hannover Messe 2024

Industrial edge: +5G, +(Gen)AI, +orchestration, +management, and +cloud (3/3)

Siemens presents a wide portfolio of inter-process communication and servers capable of customized visualization based on AI, visual quality control applications, and PLC virtualization



HPE showcases its edge portfolio, with a focus on HPE GreenLake for Data Fabric in the automotive industry and its AI/ML applications dedicated framework

Dell presents its native edge orchestration and management platform for its own edge devices and applications portfolio (SaaS on the edge) for industrial verticals, such as manufacturing, retail, and energy

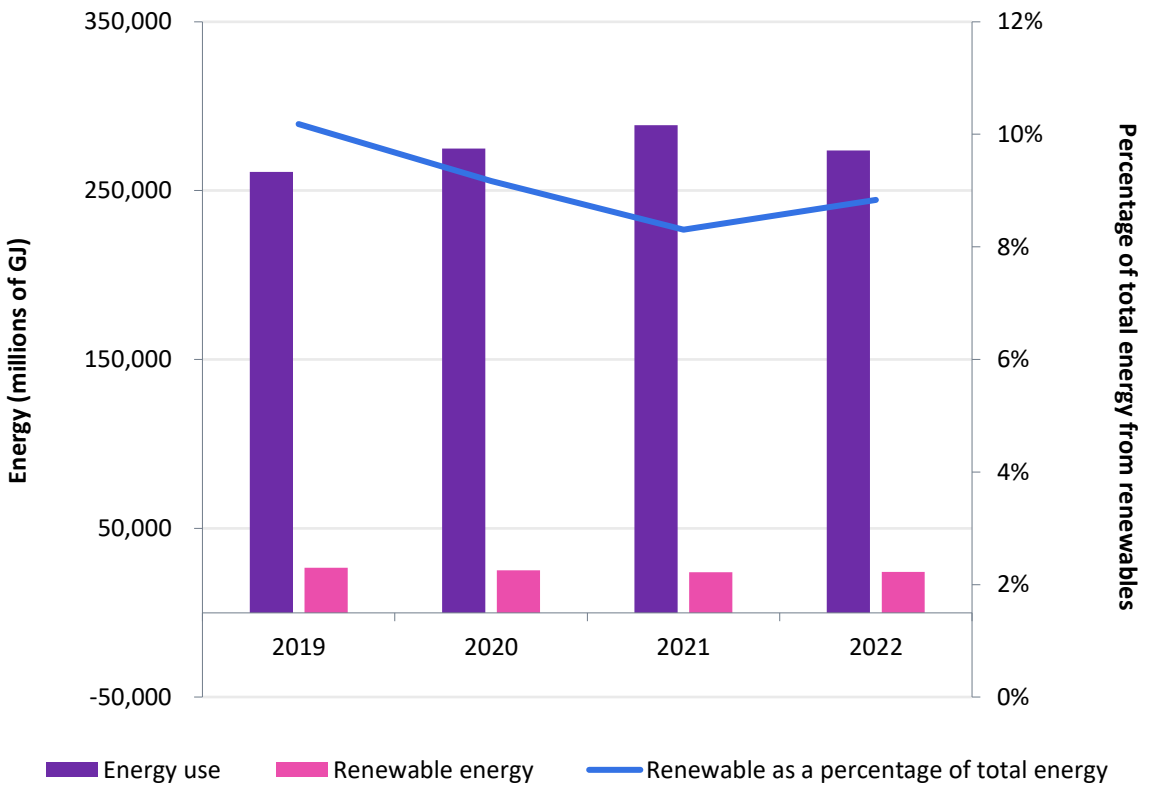
Source: Omdia analyst photo, Hannover Messe 2024

Industrial sustainability

The evolving energy journey of manufacturing: Doing more with less

- Sustainability as a marketing theme was less evident at HM24, instead replaced by more specific applications around topics such as energy, emissions, and water management as well as circularity.
- Press conferences from Peter Herweck (CEO of Schneider Electric) and Cedrik Neike (Member of the Managing Board of Siemens AG and CEO Digital Industries) highlighted “megatrends” of global population growth, aging workforces, urbanization, and glocalization in addition to the role of technology in addressing how to do more with less.
- Energy decarbonization remains a priority for manufacturers. Although growth has slowed over the last couple of years, according to Omdia’s analysis, the average proportion of total energy that renewable sources accounted for increased from 12.3% in 2019 to 16.2% in 2022. However, answering the question of how to enable the infrastructure to support decarbonization remains an area of focus, especially how to drive investment from the demand side.
- Numerous companies showcased their ability to support energy management of the grid, such as Phoenix Contact with its MINT energy management system that helps control and optimize the balance of renewable and traditional power generation on the grid. This also allows companies to maximize their use of self-generated power.
- At the show, Schneider Electric introduced EcoStruxure Plant Predictive Energy, which monitors and analyzes energy consumption to detect anomalies across assets and multiple sites to support decision-making and improve savings.
- The next step for energy management will be to converge power and production. One example of this is adjusting production based on weather forecasts to optimize production at times of peak renewable energy availability or according to energy spot prices.

The contribution of renewable energy to total energy consumption in manufacturing

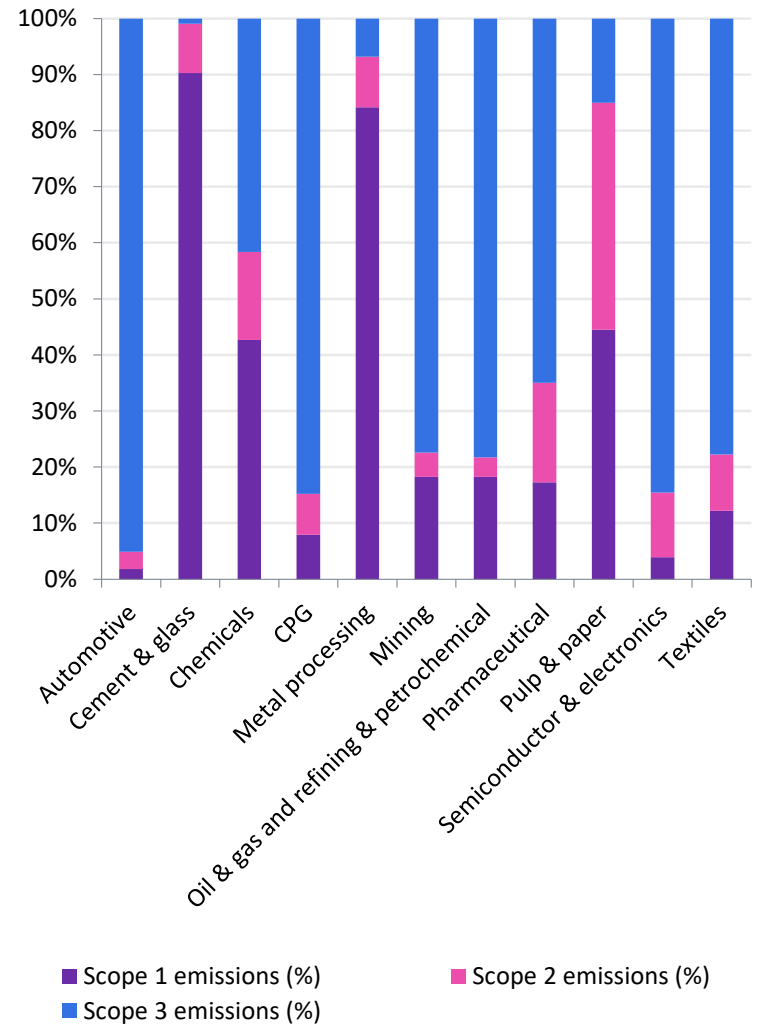


Notes: Modeled based on an analysis of around 550 million manufacturing companies across 13 industry sectors
Source: Omdia

Data is the basis of any sustainability transformation

- The current performance in meeting sustainability targets in the manufacturing sector varies significantly based on the type of metric considered. Although many manufacturing companies believe they are on track to meet their water and waste consumption targets, a greater proportion are falling behind on their emissions targets.
- Only 38% of manufacturing companies are currently collecting data specifically to assess and optimize sustainability activities. Data is central to the development of a company's ESG strategy, crucial to both reporting and improving. With imminent legislative requirements (along with stakeholder pressure) and the desire to avoid accusations of greenwashing, companies are working toward a deadline for having verifiable data for reporting sustainability performance and progress.
- Despite manufacturing companies' growing digital capabilities, many are still not mature, and many facilities still have a plethora of legacy, unconnected assets combined with outdated networks. Even where companies can access granular data from their facilities, many still struggle with how to use that data to deliver meaningful and actionable insights.
- Among survey respondents, 73% have commitments to reduce their "owned" (Scope 1 and Scope 2) emissions by a certain date. Tracking supply chain (Scope 3) emissions has proven far more challenging, with only 27% committing to reducing Scope 3 emissions.
- This level of reporting for Scope 3 emissions will require the following:
  - Collaboration across the ecosystem for data sharing
  - Standardization of reporting requirements
  - Support for SMEs with limited resources and skillsets
- Achieving a circular economy often requires greater transparency in the supply chain. This transparency helps companies track the flow of materials and products, enabling better resource management and waste reduction.

Ratio of emissions by scope and industry sector



Source: Omdia

Sustainability is an ecosystem play

- AWS introduced the Guidance for Building a Sustainability Data Fabric to support use cases, such as accurately calculating estimated carbon emissions, assessing climate risks, or understanding biodiversity impact.
- The need for collaboration was highlighted by Siemens introducing the first implementation of Carbon Ecosystem MVP, which is targeted for rollout in August 2024. This is a collaborative effort among Siemens SiGREEN, the State of Querétaro, Grupo Ecológico Sierra Gorda, Callirius, and OpenForests, which combines Siemens' SiGREEN Connect for emissions tracking, a carbon offsetting registry from OpenForests, and compensation automated with Callirius' marketplace.
- Another example of the circular economy coming to life at the show was Salzgitter AG, which launched its green steel brand SALCOS. SALCOS helps customers reduce Scope 3 emissions and provides independent Product Carbon Footprint (PCF) certification.
- Transportation and distribution contribute to a company's Scope 3 emissions, so partner and vendor location must also be considered. Among industrial companies, 31% indicated that vendor location and the logistical impact of transportation of goods were the top three sustainability criteria when selecting their technology vendors.
- At the show, companies exhibited solutions that could leverage AI that would help companies optimize their supply chain networks and adjust according to priorities such as desired lead time, carbon footprint, and cost.
- BMW Group announced it had entered the next phase with Catena-X (a consortium for the automotive industry focused on standardizing the access and flow of data), showing carbon measurements from raw material through to the end product modeled in a data chain for the first time.
- Several discussions touched on the introduction of digital product passports in relation to battery manufacturing, in which customers must know everything from the origin of rare earth materials (to ensure they are ethically sourced) through to the overall product carbon footprint of the end product.
  - This is becoming a regulatory requirement. For example, starting in February 2027, new EU traction, two-wheeled, and industrial batteries over 2kWh need a digital passport. This is to boost transparency and sustainability, reduce environmental impact, and promote battery reuse. To address this, the Battery Pass Consortium, with the participation of the Fraunhofer Institute, announced it was developing frameworks and recommendations for implementing the passport.

Alex West
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Industrial IoT

The drive for improved resource management is supported by the monitoring and optimization of energy and emissions, both in-house and across the supply chain. This involves redesigning equipment to support a circular economy and remanufacturing as well as implementing digital product passports to document the data of a product throughout its supply chain.

Key takeaways: Lots to uncover about the power of green hydrogen and its potential in achieving net carbon zero

- Green hydrogen is an emerging area of research for renewable energy. Many traditional automation vendors also focused on the hydrogen industry as part of their booths, particularly the green hydrogen sector. However, the challenge is that green hydrogen is such a small part of an already small hydrogen market that it seems impossible to support so many companies and demand such investment. It is expected that many of these automation vendors highlighting the solutions for green hydrogen will also sell to the more heavily polluting grey hydrogen production projects.
- According to the International Energy Agency (IEA), only 0.7% of hydrogen production in 2022 came from low-emissions hydrogen. Most production came from grey hydrogen, the burning of fossil fuels with no carbon capture and storage technology on the backend. This is heavily polluting. Despite being labeled a "green" technology, IEA estimates suggest the hydrogen industry accounted for over 900 million tonnes (Mt) of CO_2 emissions in 2022, producing just 95Mt of hydrogen.
- Based on IEA forecasts, grey hydrogen is expected to remain the main source of hydrogen production in the next 5 to 10 years. Of the current 1,001 projects announced to produce low-emissions hydrogen from 2024 to 2030, only 136 have reached a final investment decision (FID); the remainder are in the concept, demonstration, or feasibility study phase.

- The focus on green hydrogen is being used to boost the perceived "eco" credentials of many of these automation companies, which actively work with heavily polluting industries such as oil & gas, mining, metal processing, and power generation.
- There are several bottlenecks in the industry, including the lack of scalability of technology and processes, affecting costs; shortages of rare metals and minerals, restricting growth targets over the next 10 years; and a general lack of investment in the industry in general, stifling technological advancement.
- Market feasibility studies suggest that the use of carbon capture and storage technology, resulting in blue hydrogen production, could be the most likely scenario for the success of the low-emission hydrogen sector in the future.

A section of booths dedicated to showcasing Green Hydrogen research

Source: Omdia analyst photo, Hannover Messe 2024

Enhancing sustainability through battery production, hydrogen energy, and the circular economy (1/2)

- The solution for battery production shows how batteries can be assembled and disassembled using high-precision linear robots and ctrlX automation solutions. With the real-time operating system Linux, consistent open standards, application programming technology, web-based engineering, and comprehensive Internet of Things (IoT) connectivity, ctrlX AUTOMATION reduces component and engineering costs by 30% to 50%.
  - According to Omdia's *Battery Manufacturing Market – 2023 Analysis*, manufacturers based in the Americas and EMEA need to invest significantly ($87bn and $102bn) to meet domestic battery demand with fully local supply chains by 2030.
- Hydrogen hydraulic solutions were also a highlight of the stand. Bosch Rexroth is driving its penetration into the industry by providing safe components and systems for the compression of gaseous hydrogen and the handling of liquid hydrogen.
  - The H4U hydraulics platform improves hydraulic integration by transferring control functions previously tied to hardware to separate software modules.

Bosch Rexroth presents solutions for battery production and the hydrogen energy industry

Source: Omdia analyst photo, Hannover Messe 2024

Enhancing sustainability through battery production, hydrogen energy, and the circular economy (2/2)

- Festo aims to provide automation solutions for the whole value chain from production to supply, such as the electrodes for green hydrogen production; conversion into acids; and transportation of hydrogen, which requires high pressure.
- Festo also highlighted its goal toward the circular economy by reducing material consumption and tapping into alternative raw materials with bionic hydrogen batteries.
- Festo's path to CO_2 neutrality is as follows:
  - Aim to reach net zero in 2040 until it offsets its emissions from fossil fuel combustion
  - Massive investments in PV; it has reached 14MWh by the end of 2023 and will aim to reach 20MWh by the end of 2040
- Festo focuses on being the provider of automation equipment for battery processes, including mixing, cell production, degassing, and assembly as well as disassembly and recycling. Although the battery market is an emerging sector, it is expected to flourish in the coming years with the growing demand for EVs.

Festo showcases its innovations to achieve carbon dioxide neutrality

Source: Omdia analyst photo, Hannover Messe 2024

Schneider Electric’s efforts in energy and wastewater management to drive sustainability

- One of the displays at the Schneider Electric booth stressed that targeting water and wastewater is important for life sciences. Its challenge is to reduce water consumption through optimization; feeding water back to the environment must not be damaging to the environment. Pumps are the most important hardware, so it must be ensured that the drives within are designed with the latest regulations. EcoStruxure Motor Control Configurator with drives ensures clean and reliable power across the water cycle.
  With AVEVA, end users can manage the water management dashboard to monitor quality, sustainability, and maintenance.
- Schneider Electric strategically offers solutions for the growing process industries with combined disciplines in the past to achieve the best efficiency, starting with optimization and operations, offering full visibility on the data and process and management level.
  - To make process chemicals more resilient and flexible, it partnered with Universal Automation for ecosystem decoupling automation hardware and software and to facilitate IT/OT convergence and enable asset-centric control. Another key product is EcoStruxure Edge Apps, which transforms businesses by converting data into actionable insights through industrial applications.
- Schneider Electric also focuses on modernization and circularity, with EcoFit for drives with solutions, to be more sustainable and is also updated with recent regulations to be better digitized and more resilient.
  - Schneider Electric collaborated with Electrical Transient Analyzer Program (ETAP) to use digital twin solutions on energy management solutions to design, operate, and automate electrical systems
- Visibility of the entire process, including hardware such as pumps, is crucial when monitoring the consumption of energy and water. Sensors also help with the maintenance of hardware.

The Schneider Electric booth emphasizes how automation and digitalization are key to making sustainability a reality

Source: Omdia analyst photo, Hannover Messe 2024

Press releases

Partnerships and ecosystems

- Although not exhaustive, Omdia has listed some of the notable announcements from HM24:
  - **Elli (subsidiary of Volkswagen Group), EnerKíte**, and the **Technical University of Braunschweig** collaborated on energy-autonomous charging for EVs with the future name **TechnoHyb Project.** It is an innovative energy solution that enables remote and constant power supply owing to a grid-independent energy source derived from EnerKíte's base-load-capable airborne wind turbines and Elli's charging and storage technology.
  - **Google Cloud** and **KonnectAI** partnered to offer AI-powered quality inspections for manufacturing. This uses image recognition algorithms to automate quality inspections and can be deployed on any camera.
  - **LS Electric** has several collaborations:
    - **Microsoft:** On GenAI to improve visual inspections and provide intelligence functions to GridSol FEMS
    - **Sight Machine and Manufacturing Data Platform:** To analyze shop floors and energy data used by machines to reduce energy consumption and improve product quality
    - **Miracom**: To establish a platform-based manufacturing execution operation system
    - **LG Electronics**: Smart factory solutions for manufacturing lifecycles and the delivery of customized hardware and software solutions based on total factory consultations
  - **OPC Foundation** launched a new initiative to boost interoperability across IT and cloud platforms using **OPC UA**, targeting data analytics using AI and digital twins to create a cloud reference architecture to provide best practices for broader data sharing in line with EU's Cyber Resilience Act (CRA).
  - **Rockwell Automation** and **Microsoft** collaborated to showcase three major technology innovations that aim to achieve sustainability goals and operational excellence, including the following:
    - **FactoryTalk Solutions:** Seamless manufacturing operations are enabled through AI-assisted and cloud environments through the integration of **Microsoft Azure**'s adaptive cloud approach
    - **Plex MES Integration:** Transformative AI tools from **FactoryTalk DataMosaix** and **Microsoft's Cloud for Manufacturing** to boost productivity, safety, and quality in manufacturing
  - **Siemens** formed partnerships with **NVIDIA, Microsoft,** and **Schaeffler Group** to focus on its AI expansion into all areas of the industry:
  - The European Commission's European Green Deal, Interinstitutional Relations, and Foresight and the Norwegian Minister of Trade and Industry signed an MoU for a strategic partnership on batteries and raw materials.

Product announcements (1/4)

- **AWS** showcased its **e-Bike Smart Factory** or **AWSome e-Bikes**, which emphasizes AWS and AWS Partners integration in addressing industrial challenges. This solution can solve quality control issues, production challenges, and inventory shortages.
- **AVEVA** launched a **new hybrid cloud Manufacturing Execution System (MES)** to enhance CONNECT, its industrial intelligence platform. The solution enables data management in the cloud through the utilization of ML, AI, and data visualization. Also, organizational data silos can be eliminated.
- **Belden's** leading solutions and services were on display in several key locations within the exhibition: the **AWS Booth**, the **Industrial Security Circus**, the **SPE Industrial Partner Network** section, and the **PI International Booth**.
  - **Belden Horizon** helps customers shorten time-to-value for their industrial data solutions, overcoming data interoperability and integration challenges. It also empowers them to centrally manage and monitor networking and edge infrastructure and applications.
- **Bosch Rexroth** launched several products for factory automation and hydraulics solutions to assist manufacturers in achieving sustainability:
  - **FirstElement Fuel:** A cryogenic pump that allows up to 600kg of liquid hydrogen to be compressed per hour; this efficient compression is a solution for an economical hydrogen infrastructure
  - **H4U software platform:** Hydraulic functions are implemented without hardware integration to reduce engineering work costs and broaden the functionality of hydraulics for wider market potential
  - **eLION platform:** A solution for the full electrification of mobile machines, which includes high-voltage cables, onboard chargers, motors, inverters, and DC/DC converters as well as BODAS software modules and hydraulic components

Product announcements (2/4)

- **Delta** unveiled its **D-Bot series** of collaborative robots (cobots).
  - Delta announced a significant milestone in its development of smart manufacturing solutions with the launch of six highly versatile models in the D-Bot series of collaborative industrial robots.
  - “We aim to meet this demand with our D-Bot series Cobots, thereby assisting our customers in optimizing their production processes, enhancing manufacturing efficiency, and mitigating labor shortages in many industries," said Michael Mayer-Rosa, Senior Director of the Industrial Automation Business Group at Delta Electronics EMEA Region.
- **LS Electric** launched the next-generation energy storage system (EES) platform MSSP, in which smart independent driving functions by modularizing PEBB are employed. The EES package solution includes the ESS solution (battery system and PCS and PMS system) and the MV power station.
- **Microsoft** launched Manufacturing Data Solutions (MDS) in Fabric to revolutionize factory data usage. It also announced **Accenture** and **Avanade Microsoft Manufacturing Copilot** to simplify data access for frontline workers and providers.
- **ifm** launched the cloud-based moneo platform, which represents a significant step forward in Industrial IoT (IIoT) software. By offering a plug-and-work solution for condition-based monitoring without the need for coding, ifm streamlines automation processes, potentially reducing implementation barriers and accelerating digital transformation within industrial sectors.

ifm presents its moneo IoT platform; the ifm team and Omdia’s analysts at the ifm booth

Source: Omdia analyst photo, Hannover Messe 2024

Product announcements (3/4)

- **Nokia** launched **MX Grid**, a hyper-distributed and connected AI/ML solution for on-premises use. This solution enables OT responsiveness and decision-making improvements. Also, it announced Visual Position and Object Detection (VPOD) as a new MX Grid application to enhance industrial positioning and tracking to increase worker safety.
- **Rockwell Automation** launched new centralized motor control solutions:
  - Rockwell Automation launched **FLEXLINE 3500**, a new low-voltage motor control center (MCC) for IEC markets globally.
  - With this MCC, manufacturers can unlock production data and increase uptime and productivity through a portfolio of smart products. By integrating with smart motor control devices, **FLEXLINE 3500 MCC** delivers real-time operation and diagnostics data for critical equipment.
- **Salzgitter AG** launched the green steel brand **SALCOS**, which receives an independent PCF certification. This reflects the Salzgitter Group's high level of decarbonization on its way to climate neutrality.
- **Schneider Electric** showcased the latest innovations in its portfolio, including industrial software, AI, and digital twin technology. These solutions were demonstrated through the lens of a digital and sustainable life science campus, highlighting Schneider's deep domain expertise across the entire industrial value chain.
  - **CONNECT**: This agnostic, end-to-end industrial intelligence platform from **AVEVA** enables visibility and integration of engineering and operational data across the entire value chain, building an ecosystem of employees, partners, and even customers. Enriched with AI and founded on an intelligent digital twin, CONNECT empowers businesses to unlock efficiencies and drive sustainability with Schneider Electric, AVEVA, etap, RIB, and other third-party software providers.

Product announcements (4/4)

- **Siemens** expanded its AI application and announced **Industrial Copilot,** its GenAI tool. Also, Siemens announced **Building X** and **Electrification X** platforms, aiming for sustainability in building and electrification management.
- **Simatic S7-1200 G2**, a part of **Siemens Xcelerator**, debuted at HM24 and will be available in Winter 2024. This new-generation controller enables easier user programming and automation by bridging OT and IT gaps. Some new notable and innovative features of Simatic S7-1200 G2 include the following:
  - Improved processing power and expanded memory
  - Multiple coordinated axes and simple kinematics management through integrated control motion
  - NFC-enabled for easy access to diagnostics, device data, and operational data through mobile apps
  - Reduced machine downtime and provision of quick data access from plain text diagnostics information for the entire PLC station
- **SFC Energy AG** showcased its pilot series **EFOY H2PowerPack,** a powerful fuel cell solution. This low-maintenance, emission-free, and sustainable solution provides a continuous electrical output of 50kW to users for their applications.

Omdia analysts attend the Siemens booth

Source: Omdia analyst photo, Hannover Messe 2024

Appendix

Appendix

Methodology

This summary was collated from insights from the Omdia team, which attended HM24, and validated with various press releases. The team also conducted meetings and one-on-one conversations with vendors to capture detailed insights about the market outlook, company strategies, business focus, latest product launches, and collaborations. Insights captured were cross-referenced with Omdia's published reports for market and research validation.

Further reading

AI in manufacturing – Survey Analysis

Battery Manufacturing Market – 2023 Analysis

Future of Automation – Virtual PLC: A New Era of Software-based Control?

Industrial Automation Equipment Market Tracker

Industrial Semiconductor Market Tracker

Industrial Communications Report – 2023

Industrial Edge and Cloud Compute Survey – 2023

Industrial Edge Compute and the Future of Automation Report – 2023 Data

Machinery Production Market Tracker

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Appendix

Omdia Consulting

We hope that this analysis will help you make informed and imaginative business decisions. If you have further requirements, Omdia's consulting team may be able to help you. For more information about Omdia's consulting capabilities, please contact us directly at consulting@omdia.com.

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