Manufacturing's Digital Goldmine: Where the Factory Floor Meets Cyberspace

According to an analysis by Deloitte, the global industrial sector generates 1.8 thousand petabytes of data daily. By comparison, the government sector generates 911 petabytes, the media and communications industry 776, and the banking industry 773. The industrial sector generates this digital fuel, whose processing and analysis enable organizations to draw meaningful conclusions, increase process efficiency, and reduce costs across multiple areas.

In its study "Capturing the True Value of Industry 4.0" McKinsey demonstrated that implementing a "Data First Strategy" in manufacturing plants can reduce machine downtime by up to 50%, improve prediction quality by 85%, and lower quality-related costs by 20%. While this report was published in 2019, the tools for implementing data-driven intelligence in the industry continue to evolve rapidly. Today, the potential benefits of this strategy are even more compelling, particularly in the automotive industry.

Refining Digital Fuel

Automotive manufacturers increasingly leverage the Industrial Internet of Things (IIoT) to gather vital information from production machines, sensors, cameras, and connected devices. Mitsubishi Electric Iconics Digital Solutions has developed a solution demonstrating how modern management systems can transform manufacturing operations.

The system can process a comprehensive range of manufacturing insights, including machine operating parameters (temperature, pressure, speed, vibration), production metrics (cycle times, output rates, defect rates), energy consumption readings, equipment status indicators, and quality control measurements. Additionally, it can monitor environmental conditions, such as humidity and ambient temperature, while tracking safety-related parameters. The solution delivers real-time monitoring, efficient information

caching at source, compression, and intelligent mapping capabilities through its advanced architecture.

"Large automotive manufacturing plants utilize various data transmission networks between IIoT devices. This often presents challenges with synchronization and centralization of information processing from devices at different levels of the manufacturing process. The solution lies in Time-Sensitive Networking (TSN) technology, provided by CC-Link IE TSN, which enables mixing different networks on one network while ensuring complete data analysis control at every point of the manufacturing process," explains Christian Nomine, Strategic Product Manager Visualization & Analytics at Mitsubishi Electric Europe B.V. from Mitsubishi Electric.

This information is presented through intuitive dashboards, making it easily accessible for operators and managers at every organizational level. Continental's DOPAC (Database Online Process Analysis and Control) project, implemented with the MEIDS solution, demonstrates these capabilities. Initially deployed at two production plants, the success of this data visualization and collection system has led to plans for implementation across 20 car, truck, and bus tire factories.

[Find out more about this Case Study here]

The widespread adoption validates the project's effectiveness. While the technical aspects of automating data collection and analysis from multiple sources are impressive, the business benefits are equally compelling. The key advantage is foresight. A data-driven manufacturing strategy enables a preventive rather than reactive approach to maintenance. Real-time analysis of production machine data allows for early detection of potential problems before they escalate into major failures, causing extended shutdowns. It also facilitates Overall Equipment Effectiveness (OEE) tracking, providing a more comprehensive view of production line optimization opportunities.

"The data historian plays a crucial role here, automating data collection in chronological order at defined intervals," notes Christian Nomine. "This allows analytics systems, like the solution developed by MEIDS, to build extensive data collections, linking information into logical cause-and-effect sequences. The system can predict which machines will likely experience problems based on historical data analysis, enabling preemptive

maintenance or replacement of potential weak points in the production chain."

Data in the Service of Quality

Real-time data collection from multiple sources is an essential input for AI tools, which are increasingly important in manufacturing. These advanced capabilities benefit quality control particularly.

In automotive manufacturing, AI-enabled intelligent inspection transforms quality control, as demonstrated by a MELSOFT MaiLab implementation that monitors the quality of weld points. By analyzing all welding parameters in real time, at a rate of 1,000 per second, the tool can detect even the most minor changes in patterns and deviations that indicate potential quality problems before they cause defects or flaws. Implementing this solution in European factories in Poland and Italy has made it possible to analyze its effectiveness in practice. The system can achieve 97% accuracy in defect detection and 100% welding point coverage, which has resulted in a 65% reduction in manual inspection time and a 40% decrease in welding-related defects. The return on investment for the solution was 4.5 months.

"Quality control continues to evolve through data-driven strategies and AI visual inspection solutions," adds Christian Nomine from Mitsubishi Electric. "Early anomaly detection enables quick response and minimizes defect risks. Real-time analysis of parameters and potential defects through the MELSOFT VIXIO solution allows rapid production halts when issues are detected, limiting defective component production to single units rather than hundreds or thousands."

Virtual Testing, Real Benefits

Digital Twin technology represents another significant advancement in automotive manufacturing. This solution creates a virtual replica of the production line, enabling manufacturers to simulate and test various changes before real-world implementation. These simulations allow companies to evaluate different scenarios, modify production parameters, and analyze potential impacts without disrupting operations. This capability significantly reduces implementation risks and optimizes production processes. While

Digital Twin technology excels at simulation and testing, it is an optimization tool rather than a replacement for physical production processes. It allows quick transitions between the factory floor and cyberspace to validate process improvements.

Testing changes virtually before physical implementation is particularly valuable in automotive manufacturing, where production line downtime can cost over $20,000 per minute. Such virtual approaches can significantly reduce both implementation risks and timelines.

Energy Under Control

Energy consumption management represents another crucial aspect of data-driven manufacturing. Digital Twin solutions enable testing of various production cycle scenarios to identify the most energy-efficient options. Monitoring individual machine energy consumption and historical analysis helps identify high-consumption process elements. The EcoAdviser solution captures excess consumption patterns and intelligently suggests energy reduction opportunities through visualization and specific consumption estimates for alternative scenarios, while maintaining compatibility with various metering devices from different manufacturers.

Factory Floor A.D. 2025

The multipoint connection of factory floor and cyberspace isn't just another technological trend – it is the new manufacturing reality, where data has become as crucial as raw materials. In an era where a single minute of production line downtime can cost the price of a modern SUV, the ability to predict, prevent, and optimize through data intelligence is not merely an advantage – it is a critical necessity for survival. As automotive manufacturing evolves toward an electric and autonomous future, those who excel at turning raw data into actionable insights will define the industry's next chapter. The question is no longer whether to embrace data-driven manufacturing, but how quickly you can transform your factory floor into an intelligent, predictive ecosystem before your competitors do.

About the Report: "Drive the EVolution! Automotive Industry Factory Automation Expert Round-up Report 2025" combines insights from industry experts across Europe, Asia, and the Americas with real-world case studies and actionable recommendations for manufacturers aiming to stay ahead in a rapidly evolving industry.

About Mitsubishi Electric Corporation

With more than 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing, and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation, and building equipment. Mitsubishi Electric enriches society with technology in the spirit of its "Changes for the Better." The company recorded a revenue of 5,521.7 billion yen (U.S.$ 36.8 billion*) in the fiscal year ended March 31, 2025.
For more information, please visit www.MitsubishiElectric.com.

U.S. dollar amounts are translated from yen at the rate of ¥150=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2025.

About Mitsubishi Electric Factory Automation Business Group

Offering a vast range of automation and processing technologies, including controllers, drive products, power distribution and control products, electrical discharge machines, electron beam machines, laser processing machines, computerized numerical controllers, and industrial robots, Mitsubishi Electric helps bring higher productivity – and quality – to the factory floor. In addition, its extensive service networks around the globe provide direct communication and comprehensive support to customers. The global slogan "Automating the World" shows the company's approach to leveraging automation for the betterment of society through the application of advanced technology, sharing know-how, and supporting customers as a trusted

partner.

For more about the story behind "Automating the World", please visit:

www.MitsubishiElectric.com/fa/about-us/automating-the-world