

The 40% Gap: Optimizing the Overall Equipment Effectiveness Score

Most car factories run at only [60% of what they could really produce](#) – a huge efficiency gap that costs millions in lost production every year. Behind the shiny robots and automated assembly lines is an uncomfortable truth: even the most modern facilities lose performance through hidden inefficiencies.

The traditional approaches to OEE may no longer be sufficient in an era where AI, self-diagnosing robots, and predictive maintenance are redefining manufacturing excellence. The pioneers pushing beyond the coveted 85% OEE benchmark aren't just monitoring metrics – they're fundamentally reimagining what efficiency means in the age of intelligent machines.

OEE : Beyond the Traditional Formula

A noteworthy approach to improving OEE in automotive manufacturing is by implementing solutions that automatically monitor production processes and machine conditions. Modern manufacturers are now deploying systems with sensors that continuously track performance parameters across production equipment. These monitoring systems enable machines to detect potential issues early, collect operational data, and provide maintenance teams with actionable insights. By integrating these capabilities, factories can shift from reactive maintenance to proactive optimization, significantly improving their OEE metrics. This shift is the foundation for building cognitive factories - the manufacturing environments where production efficiency is continuously improved by constant flow of data from multiple sources.

"We're seeing robots that not only detect impending failures but can signal the need for operational adjustments to prevent them," explains Jacek Taczala, Robot Product Manager at Mitsubishi Electric FA Poland. "For example, MELFA FR-series manufacturing robots equipped with MELFA Smart Plus cards can quickly detect abnormalities in drive system

components before they affect robot behavior. This shifts OEE from a reactive measurement to a predictive optimization tool."

These systems go beyond simple predictive maintenance. "In Poland, we are pioneering new services. For example, when a robot detects an anomaly in the system we deployed with our client, it automatically generates a Digital Service Request (DSR). This request contains comprehensive diagnostic data that alerts maintenance teams while also informing inventory systems about potentially needed parts," - mentions Jacek Taczała from Mitsubishi Electric. This dramatically reduces the 'availability' losses that have traditionally plagued OEE calculations. But to get there, it is crucial to follow the right path towards the cognitive factory.

First Steps Toward Cognitive Factories

The journey toward cognitive factories often begins with implementing advanced visibility to identify efficiency gaps. PGT Industries, a leading US manufacturer of residential impact-resistant windows and doors, demonstrates how this first step can yield transformative results.

Facing rising product demand without the ability to expand their facility, PGT deployed GENESIS, a Productivity Analytics software solution from Mitsubishi Electric Iconics Digital Solutions (MEIDS), across their 12 most critical production assets to analyze Overall Equipment Effectiveness (OEE), focusing on its three key components: availability, productivity, and quality.

The transformation was immediate. Previously, production issues were reported through time-consuming manual procedures, creating information bottlenecks. The new analytics platform made performance deviations instantly visible across all organizational levels. This transparency revealed critical inefficiencies: extended production start-up times, insufficient loading cart availability, and material layout issues causing gaps in furnace conveyors. In response, PGT formed dedicated employee teams to tackle these challenges.

"The success factor wasn't just implementing analytics - it was providing an intuitive, transparent system that employees across departments could easily operate. The key was simple configuration and seamless integration with existing IoT infrastructure, eliminating the need for extensive training,"

explains Lucas Majewski, Global Director of Automotive/EV Industry from Mitsubishi Electric.

Although this represents just the first step toward building a cognitive factory, the results proved transformative. PGT expanded the analytics implementation from 12 to approximately 80 assets over three years. The improved efficiency was so significant that the factory reduced operations from seven to five days a week while maintaining output. The company achieved roughly 20% savings in labor and electricity costs. For automotive manufacturers, with their more complex production environments and hundreds of components, the potential savings could be even more substantial.

Digital Twins: Perfecting OEE Through Virtual Simulation

Digital twin technology can offer valuable capabilities for OEE optimization. These virtual replicas simulate entire production environments with unprecedented accuracy, allowing engineers to test and refine processes before implementing changes on the factory floor.

A recent study demonstrates the direct impact on efficiency metrics. By creating a comprehensive digital twin of the factory, the engineering team could evaluate different production schedules and optimize overtime requirements, [resulting in 5-7% monthly cost savings](#). In this case, the digital twin was able to reveal hidden inefficiencies that traditional OEE monitoring had missed. In another example, a [metal fabrication plant used a factory digital twin](#) to analyze batch sizes and production sequences across four parallel lines. The AI-based system provided recommendations for optimal order sequencing, enabling managers to achieve significant cost reduction compared to conventional methods.

This technology is crucial for the cognitive factory concept, where intelligent robots, self-diagnosing equipment, and virtual simulation provide data-driven insights to help operators optimize OEE. The most advanced implementations connect digital twins directly to production monitoring systems, creating a continuous feedback loop that helps refine operations based on real-time data.

Building Cognitive Factories Through OEE-Focused Activities

The transition to a fully cognitive factory requires a systematic approach focused on specific areas of improvement. Based on successful implementations across the automotive industry, manufacturers should prioritize these critical elements:

- **Connected IoT Infrastructure:** Establish continuous communication between all Industrial Internet of Things devices, creating a unified data ecosystem where machines share information seamlessly.
- **Multi-Point Data Collection & Visualization:** Implement comprehensive data collection across all levels—from individual components and production machines to assembly lines and whole factories—and integrate this with visualization and analytics tools like GENESIS from MEIDS to create a complete digital representation of operations.
- **Automated Intelligence:** Deploy analytical systems like MELSOFT MaiLab that visualize impacts on production efficiency, identify maintenance needs, and suggest preventive measures, supporting faster and more informed decision-making.
- **Systematic Elimination of Losses:** Address the "Six Big Losses" that traditionally impact OEE: Unplanned Stops, Planned Stops, Small Stops, Slow Cycles, Production Rejects, and Startup Rejects through automated detection and alert systems.
- **Human-Machine Collaboration:** Engage factory employees in production performance monitoring and encourage knowledge sharing. AI solutions like the MELSOFT MaiLab platform enhance decision-making by combining empirical data with human expertise, creating a centralized knowledge center that benefits the entire organization.

This structured approach transforms traditional manufacturing into cognitive factories where machines and humans collaborate to continuously optimize OEE through data-driven insights and operator-approved improvements.

The New Competitive Battleground: OEE as a Strategic Advantage

The pursuit of perfect OEE in automotive manufacturing has evolved from a technical exercise to a strategic need. Traditional automakers face a particularly complex scenario: they must achieve exceptional OEE not only to maintain profitability but also to compete with purpose-built EV facilities designed from inception for maximum automation and efficiency.

"Automotive companies that effectively monitor and optimize OEE gain significant advantages," notes Lucas Majewski, Global Director of Automotive/EV Industry at Mitsubishi Electric. "In an industry where a 1% OEE improvement can represent millions in annual savings, the companies deploying self-diagnosing robots, AI inspectors, and augmented human expertise aren't just optimizing – they're redefining manufacturing itself."

As cognitive factories are an emerging trend in automotive manufacturing, the ability to continuously improve OEE through intelligent systems will separate industry leaders from those left behind. The future belongs to manufacturers who view OEE not as a static metric but as a dynamic optimization opportunity enabled by the seamless integration of human expertise and machine intelligence.

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