MITSUBISHI ELECTRIC
Changes for the Better

Automating the World

BEYOND REALITY: HOW DIGITAL TWINS POWER ROBOTICS APPLICATIONS

- Gemini as the Monitoring Hub
- Benefits of Using Gemini and MELFA Robots
- Steps to Efficient Robot Deployment with Gemini

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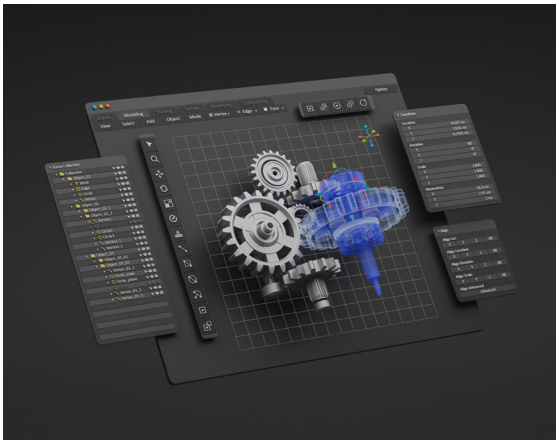
INTRODUCTION



Imagine building an entire factory—and demolishing it 100 times—before spending a single penny on actual construction. Sound like science fiction? This is the power of digital twins. Digital twins are not just a buzzword; they represent a fundamental shift in designing and optimizing manufacturing processes.

Mitsubishi Electric's Gemini software exemplifies this transformative technology, acting as a sophisticated editor for a virtual factory environment. Users can drag and drop robots, conveyor belts, and other equipment, arranging them within the simulated space. This digital twin approach empowers engineers to design, test, and refine entire production processes before physical implementation, significantly impacting real-world efficiency, safety, and productivity.

Three key advantages drive this revolution:

- The economics of experimentation: Digital twins allow manufacturers to test hundreds of scenarios without the risk and expense of real-world changes.
- Prediction over reaction: Simulations identify potential problems before they impact physical operations.
- Democratising optimization: Intuitive drag-and-drop interfaces empower even non-technical personnel to design and test improvements.

Mitsubishi Electric's integrated ecosystem works to maximise efficiency, including agile MELFA robots, Programmable Logic Controllers (PLCs), Human-Machine Interfaces (HMIs), and motion control systems.

Gemini streamlines layout planning with drag-and-drop functionality, accelerating design and resolving spatial conflicts. Its simulations extend to dynamic production lines, incorporating Automated Guided Vehicles (AGVs), human workers, and robots, enabling comprehensive workflow optimization. Virtual commissioning within Gemini integrates PLC, motion, and robot simulations. This allows engineers to validate programming and operational sequences before deployment, reducing commissioning time and errors. Post-deployment, Gemini facilitates remote monitoring and optimization of robots and machinery, analyzing log data to diagnose issues and minimize downtime.

By leveraging this comprehensive digital twin ecosystem, manufacturers can significantly enhance operational efficiency, safety, and productivity.

GEMINI AS THE MONITORING HUB

1. BENEFITS OF VIRTUAL COMMISSIONING TO REDUCE COMMISSIONING TIME AND ERRORS

Gemini's virtual commissioning allows manufacturers to simulate and test new equipment and configurations in a digital environment before their physical implementation. This process significantly reduces the time and resources, as potential issues can be identified and resolved virtually.

Advantages:

- Accelerated Time-to-Market: faster commissioning means products can
- be manufactured and brought to market more quickly.

- Decreased Commissioning Errors: virtual testing identifies errors in the design phase, reducing the risk of costly mistakes during the physical commissioning.

- Enhanced Planning: virtual commissioning provides valuable insights into the optimal layout and configuration of production lines.

2. SIMULATION OF PRODUCTION WORKFLOWS FOR CYCLE TIME REDUCTION AND OPERATIONAL EFFICIENCY

Gemini's simulation capabilities offer comprehensive simulation of entire production workflows. This enables manufacturers to analyse and optimise the flow of materials, the efficiency of machinery, and the allocation of human resources across the production process. By identifying bottlenecks and inefficiencies, Gemini helps streamline operations, reducing cycle times and enhancing overall productivity.

Impact:

- Optimised Production Flows increase throughput and reduce waste, contributing to a leaner manufacturing process.

- Strategic Resource Allocation maximises productivity and minimises idle time.

- Data-Driven Decision-Making supports both daily operations and long-term planning.

BENEFITS OF USING GEMINI AND MELFA ROBOTS

Gemini 3D by Mitsubishi Electric is a visualisation and simulation software designed for factory automation. It enables its users to create detailed 3D models of production lines, facilitating efficient planning and optimisation. By simulating processes in a virtual environment, it helps in identifying potential issues and improving operational efficiency.

1. ENHANCED EFFICIENCY AND PRECISION

Gemini 3D enhances the efficiency and precision of MELFA robots by providing a virtual environment for detailed simulation and planning without physical trials. This reduces setup times, minimises errors, and ensures precise robotic operations, thus improving the overall productivity.

1.1. Reduced Downtime

The robust design and state-of-the-art diagnostics of Gemini and MELFA robots contribute to a notable reduction in downtime. Predictive maintenance capabilities, powered by MELFA SmartPlus, allow for real-time monitoring of robot health, predicting potential issues before they lead to operational disruptions.

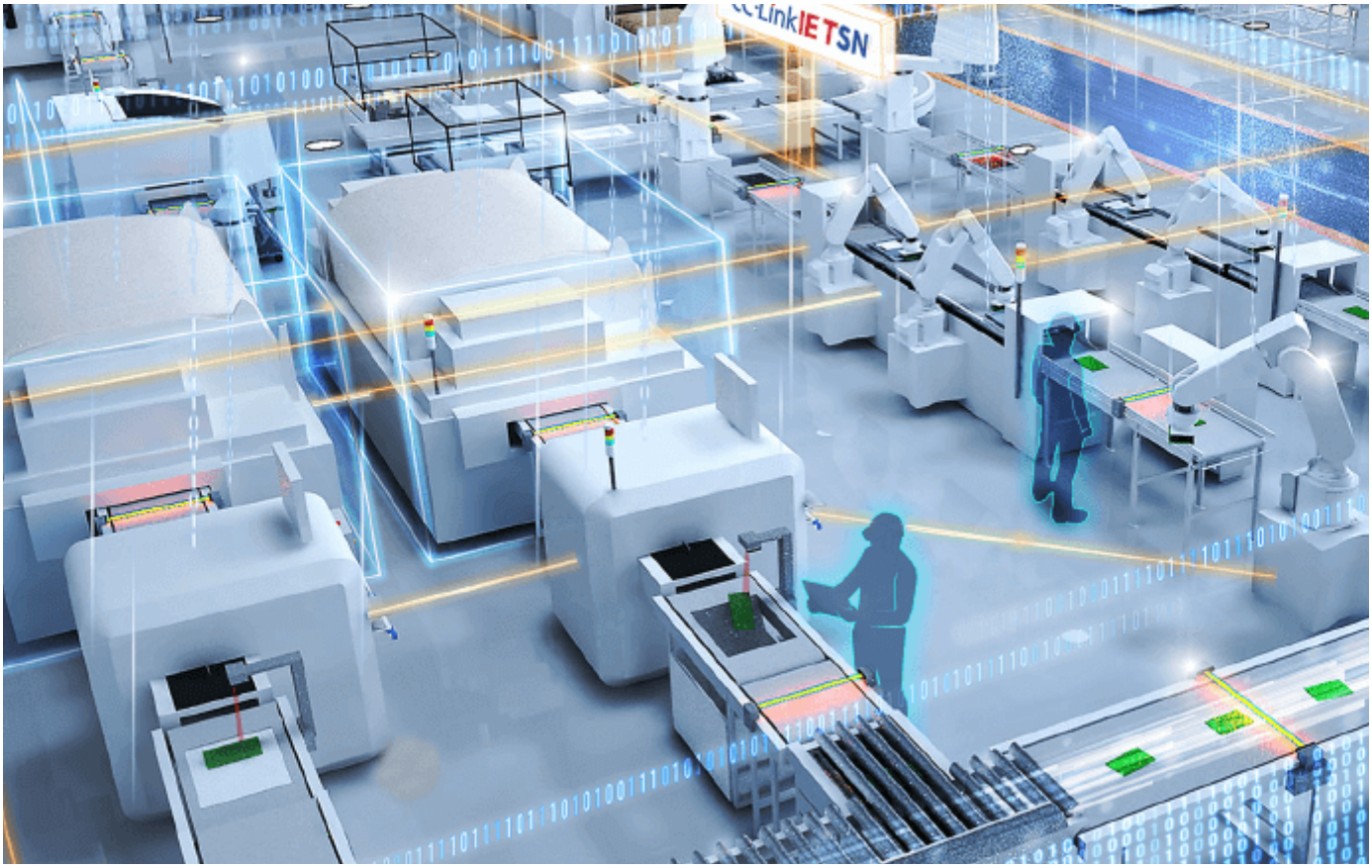
1.2. Significant Reduction in Rework Time

By identifying and addressing potential issues in the virtual environment, Mitsubishi Electric's solutions significantly reduce the time and resources spent on rework, which translates into faster time-to-market and lower production costs.

1.3. Enhanced Productivity through Optimal Robot Placement

The precise optimisation of robot placement ensures that each robot operates at its full potential, contributing to overall productivity improvements.

2. FLEXIBILITY AND SCALABILITY

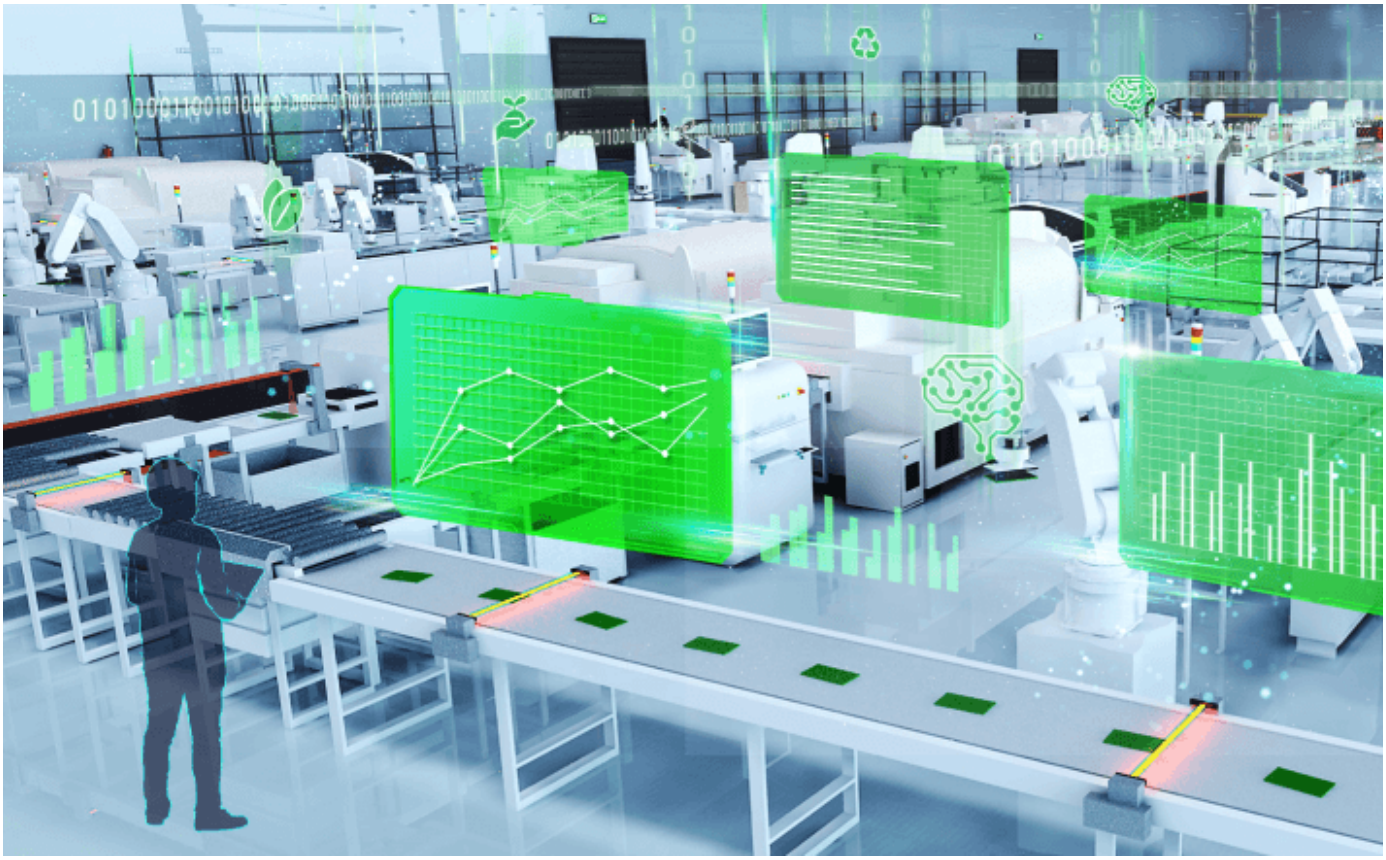


One of the most compelling benefits of Gemini and MELFA robots is their inherent flexibility and scalability. The use of an extensive e-Catalog for layout planning and the ability to simulate the entire production flows ensures that these robots can adapt to changing manufacturing demands.

2.1. Customisation for Specific Needs

Gemini's simulation tools and a versatile range of MELFA robots have been designed to cater to the specific needs of various industries, offering a level of customisation that can significantly enhance operational efficiency and product quality.

3. COST-EFFECTIVENESS



Adopting Gemini and MELFA robots can lead to substantial cost savings over time. By automating previously labour-intensive tasks, businesses can reduce labour costs and reallocate human resources to more strategic roles.

3.1. Energy Efficiency

Optimised motion control systems and the use of energy-efficient components mean that MELFA robots consume less power compared to traditional machinery and older robotic systems. This not only reduces operational costs but also supports sustainability initiatives.

4. SAFETY AND ERGONOMICS

Safety is a paramount concern in any manufacturing environment, and Gemini and MELFA robots excel in this regard. Their design includes numerous safety features which protect both the robots and human workers. Furthermore, by taking over repetitive and physically demanding tasks, these robots can reduce the risk of injuries and improve workplace ergonomics.

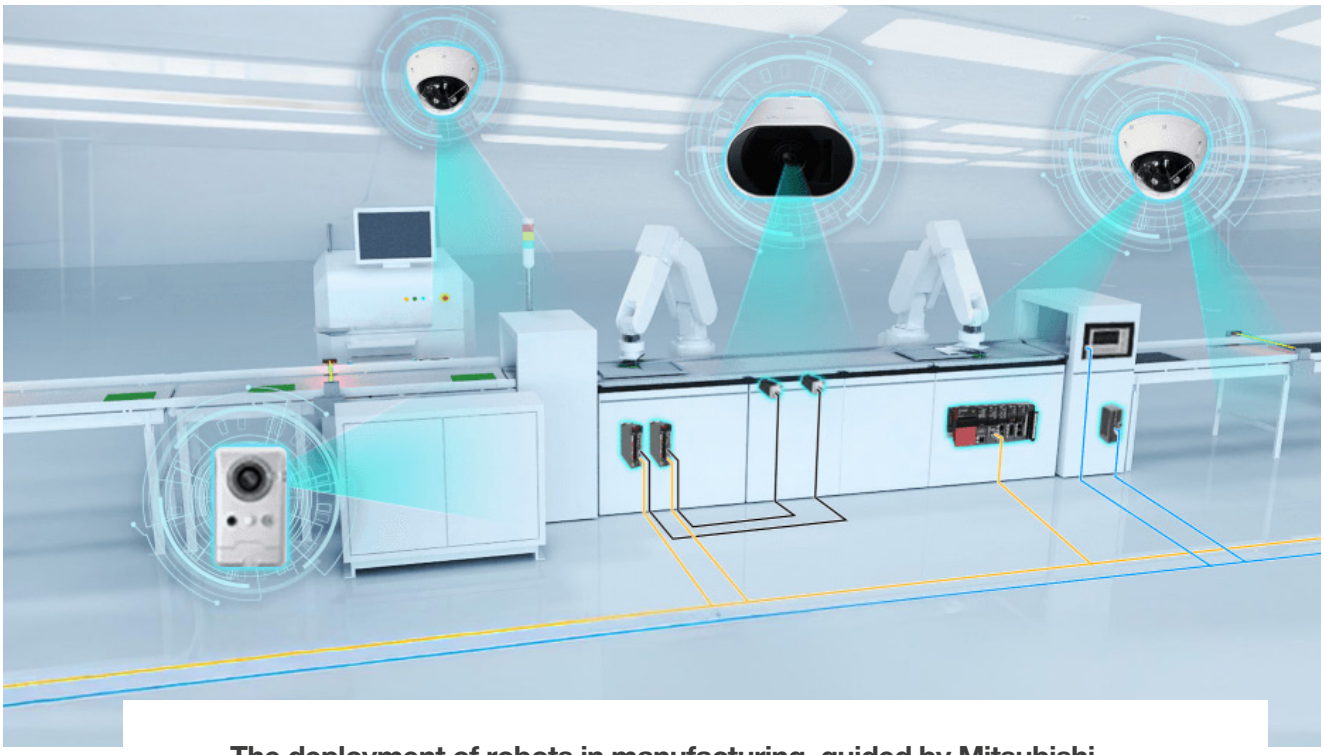
4.1. Creating a Collaborative Workspace

Integrating Gemini and MELFA robots creates a collaborative workspace where human creativity and robotic precision combine. Gemini's virtual environment allows stakeholders—engineers, operators, and managers—to visualize and interact with the planned production line, regardless of location. This shared platform facilitates collaborative design refinement and problem-solving, streamlining communication and promoting a more efficient design process.

CONCLUSION

The benefits of integrating Gemini and MELFA robots into manufacturing processes range from enhancing efficiency and precision to ensuring flexibility and safety. Their adaptability and advanced capabilities will undoubtedly play a crucial role in shaping the manufacturing landscape and driving businesses towards greater innovation and competitiveness.

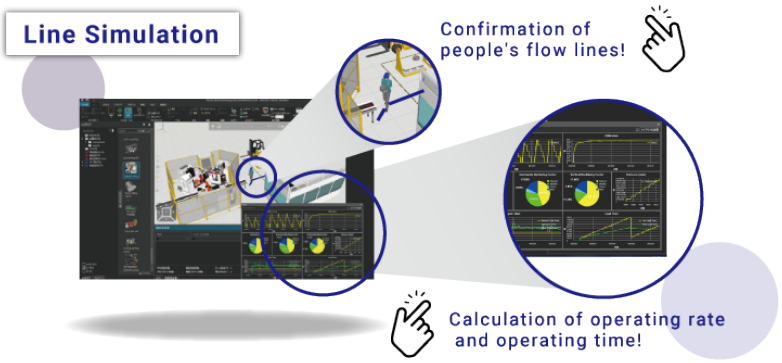
STEPS TO EFFICIENT ROBOT DEPLOYMENT WITH GEMINI

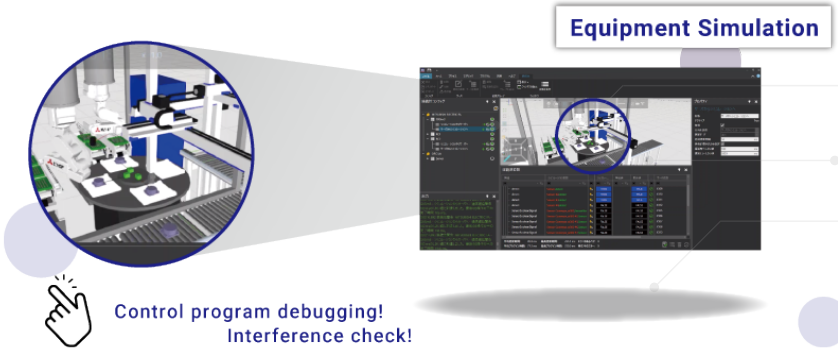


The deployment of robots in manufacturing, guided by Mitsubishi Electric's Gemini software, represents a transformative step towards achieving unparalleled efficiency and precision in production processes

1. LAYOUT PLANNING AND DESIGN

The initial phase in robot deployment involves meticulous layout planning and design, a process significantly enhanced by Gemini's e-Catalog tools. They facilitate the simulation of robot positioning and layouts, enabling engineers to visualise and refine the manufacturing space.





1.1. Simulating Robot Positioning and Layouts Using e-Catalog Tools

Gemini's e-Catalog provides an extensive library of 3D models, including robots, conveyors, and other essential manufacturing components. Gemini simplifies the complex task of layout planning by allowing users to drag and drop these models into a virtual workspace. This capability accelerates the design process and enables the identification and resolution of potential spatial conflicts.

1.2. Avoiding Collisions and Enhancing Flow with Internal Simulations

Through internal simulations, Gemini assesses the dynamic interactions between the robots and other elements within the layout. This helps avoid collisions and ensures a smooth workflow, thereby enhancing overall operational efficiency and safety.

2. PRODUCTION FLOW PLANNING

With the layout set, the next step focuses on simulating the complete production line, incorporating Automated Guided Vehicles (AGVs), workers, and robots. This comprehensive approach to simulation allows for a holistic view of the production process, identifying bottlenecks and areas for improvement.

2.1. Simulating Complete Production Lines Including AGVs, Workers, and Robots

Gemini's simulation capabilities extend beyond static layout planning and enable the dynamic simulation of production flows. This includes the movement of AGVs, the activities of human workers, and the operation of robots.

2.2. Investment Optimisation via Trial Simulations and Cost Analysis

Trial simulations of different production scenarios allow for the comparison of various configurations and operational strategies, facilitating cost-effective decision-making based on performance projections and ROI analysis.

3. VIRTUAL COMMISSIONING

Virtual commissioning represents a critical phase in robot deployment, where Gemini's tools are used to integrate PLC, motion, and robot simulations. This integration verifies the programming and operational logic before physical implementation, significantly reducing commissioning time and potential errors.

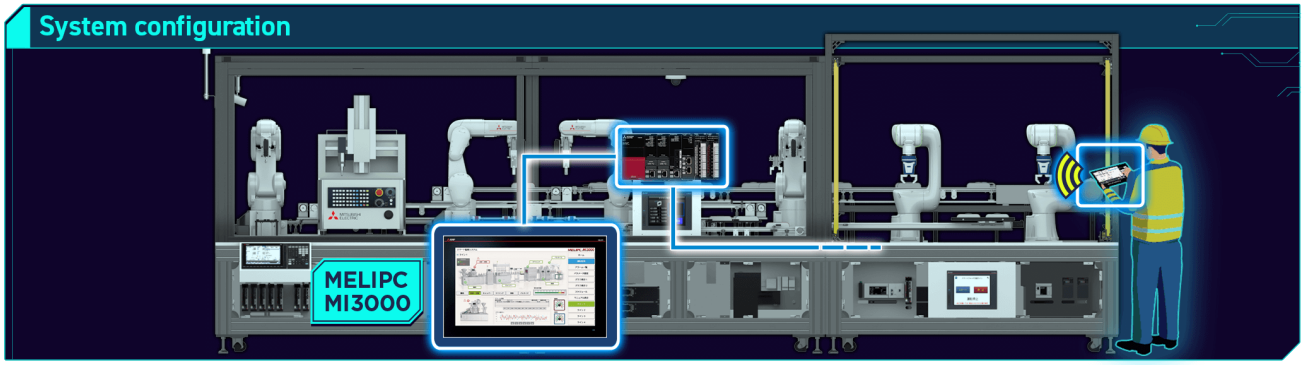
3.1. Integrating PLC, Motion, and Robot Simulations to Verify Programming

Gemini's virtual commissioning capabilities ensure that all elements of the production system work in harmony. By simulating the entire control system, engineers can validate programming and operational sequences, ensuring seamless real-world execution.

3.2. Reducing Commissioning Time and Programming Errors with Gemini's Intuitive Tools

The intuitive nature of Gemini's simulation tools streamlines the commissioning process, enabling rapid iteration and adjustments. This not only reduces the time required to bring production systems online, but also minimises the risk of costly programming errors.

4. MONITORING AND OPTIMISATION



Post-deployment, Gemini facilitates the continuous monitoring and optimisation of robots and machinery, ensuring that production systems operate at peak efficiency, with real-time data enabling swift responses to any emerging issues.

4.1. Remote Monitoring of Robots and Machines Using Log Data for Real-Time Troubleshooting

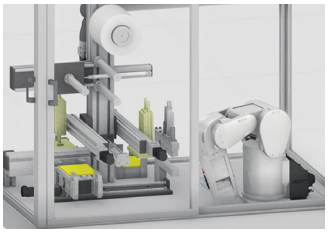
Gemini's remote monitoring capabilities allow for the oversight of robotic systems from anywhere, at any time. By analysing log data, engineers can identify and diagnose issues remotely, which reduces downtime and maintains productivity.

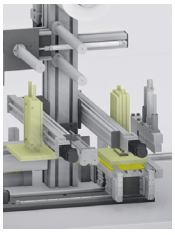
4.2. Reproducing Machine Errors in 3D Models for Faster Recovery

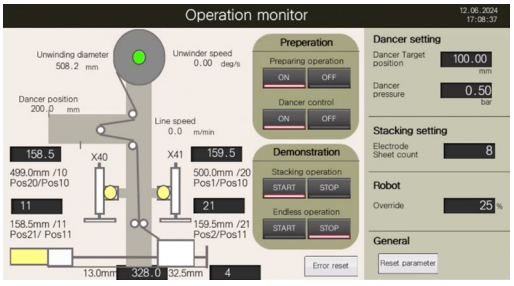
When errors occur, Gemini's ability to reproduce these issues within its 3D simulation environment enables engineers to visualise problems in context, which facilitates a faster and more effective recovery process.

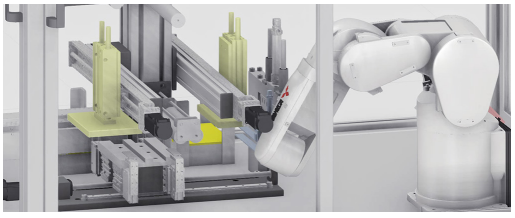
Mitsubishi Electric's Gemini 3D simulation software and MELFA robots enhance manufacturing efficiency, precision, and safety. They offer virtual commissioning, real-time monitoring, and flexible integration, reducing commissioning time, errors, and downtime while optimizing workflows and resource allocation for improved productivity and cost-effectiveness. Explore how Gemini and MELFA can revolutionize your manufacturing processes today!

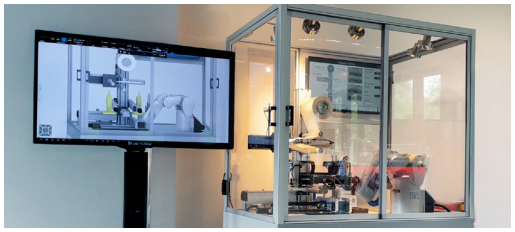
GEMINI AND MELFA ROBOTS











COLLABORATE BY LEVERAGING THEIR COMPLEMENTARY CAPABILITIES:

Virtual Environment Integration:
Gemini 3D software creates a virtual workspace where MELFA robots are modeled and simulated, allowing for precise planning and testing of production processes before physical implementation.

Optimized Robot Placement:
Gemini enables dynamic simulations to determine the best placement and operation of MELFA robots, ensuring efficiency, avoiding collisions, and enhancing workflow.

Virtual Commissioning:
The software integrates MELFA robot simulations with PLCs and motion control systems, validating programming and operational logic digitally, reducing commissioning time and errors.

Enhanced Productivity and Safety:
The collaboration improves productivity through optimized robot performance while ensuring workplace safety by automating repetitive or hazardous tasks.

Real-Time Monitoring:
Post-deployment, Gemini monitors MELFA robots remotely, analyzing log data to predict maintenance needs, troubleshoot issues, and minimize downtime.

CONCLUSION

Mitsubishi Electric's Gemini simulation software and MELFA robots offer a comprehensive approach to optimizing manufacturing processes. From initial design and layout planning to virtual commissioning, real-time monitoring, and ongoing optimization, Gemini and MELFA empower businesses to address workforce challenges, enhance productivity, and improve efficiency. These tools enable manufacturers to make data-driven decisions, streamline workflows, and achieve a more sustainable and competitive future by bridging the gap between the virtual and physical worlds.

Creating Solutions Together.

Low-voltage Power Distribution Products

Transformers, Med-voltage Distribution Products

Power Monitoring and Energy Saving Products

Power (UPS) and Environmental Products

Compact and Modular Controllers

Servos, Motors and Inverters

Visualization: HMIs

Edge Computing Products

Numerical Control (NC)

Collaborative and Industrial Robots

Processing machines: EDM, Lasers

SCADA, analytics and simulation software

Mitsubishi Electric's product lineup, from various controllers and drives to energy-saving devices and processing machines, all help you to automate your world. They are underpinned by software, innovative data monitoring, and modelling systems supported by advanced industrial networking and Edgecross IT/OT connectivity. Together with a worldwide partner ecosystem, Mitsubishi Electric factory automation (FA) has everything to make IoT and Digital Manufacturing a reality.

With a complete portfolio and comprehensive capabilities that combine synergies with diverse business units, Mitsubishi Electric provides a one-stop approach to how companies can tackle the shift to clean energy and energy conservation, carbon neutrality and sustainability, which are now a universal requirement of factories, buildings, and social infrastructure.

We at Mitsubishi Electric FA are your solution partners waiting to work with you as you take a step toward the realization of sustainable manufacturing and society through the application of automation.
Let's automate the world together!

Note: not all products are available in all countries

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