MITSUBISHI ELECTRIC
Changes for the Better

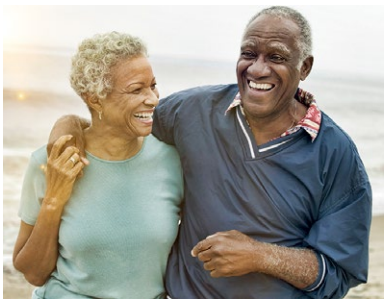
Automating the World

FACTORY AUTOMATION

FA-IT Integrated Solution
e-F@ctory

Connect everything

Automating the World



Our Factory Automation business is focused on "Automating the World" to make it a better, more sustainable environment supporting manufacturing and society, celebrating diversity and contributing towards an active and fulfilling role.

SUSTAINABLE DEVELOPMENT GOALS

The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

OVERVIEW

Connect everything

The industrial world has come to a major turning point with the introduction of the Internet of Things (IoT).
The key to surviving today's severe market competition is the prompt and timely implementation of IoT/optimization; not only on the production shop floor, but also throughout the monozukuri field.

In response to this need, we developed the "e-F@ctory" FA-IT integration solution. At its core is "edge computing," advanced technologies that utilize AI to collect data from the production shop floor and analyze it in real-time, thereby improving monozukuri. Utilizing wide-ranging knowledge and technologies, as a comprehensive FA manufacturer cooperating with more than 1,000 partner companies,* we are disseminating e-F@ctory around the world. With us, you can implement "one-stop" operations using optimum IoT proposals for the shop floor, and realize the digital shift throughout monozukuri.

In Japan, and around the world, e-F@actory innovation connecting all things and optimizing all areas of monozukuri has already started.

*as of December 2022

We aim to connect the entire manufacturing lifecycle by linking "real, virtual, and data" to achieve optimal and flexible manufacturing and ultimately ride out these uncertain times.

Toward the Realization of Digital Manufacturing

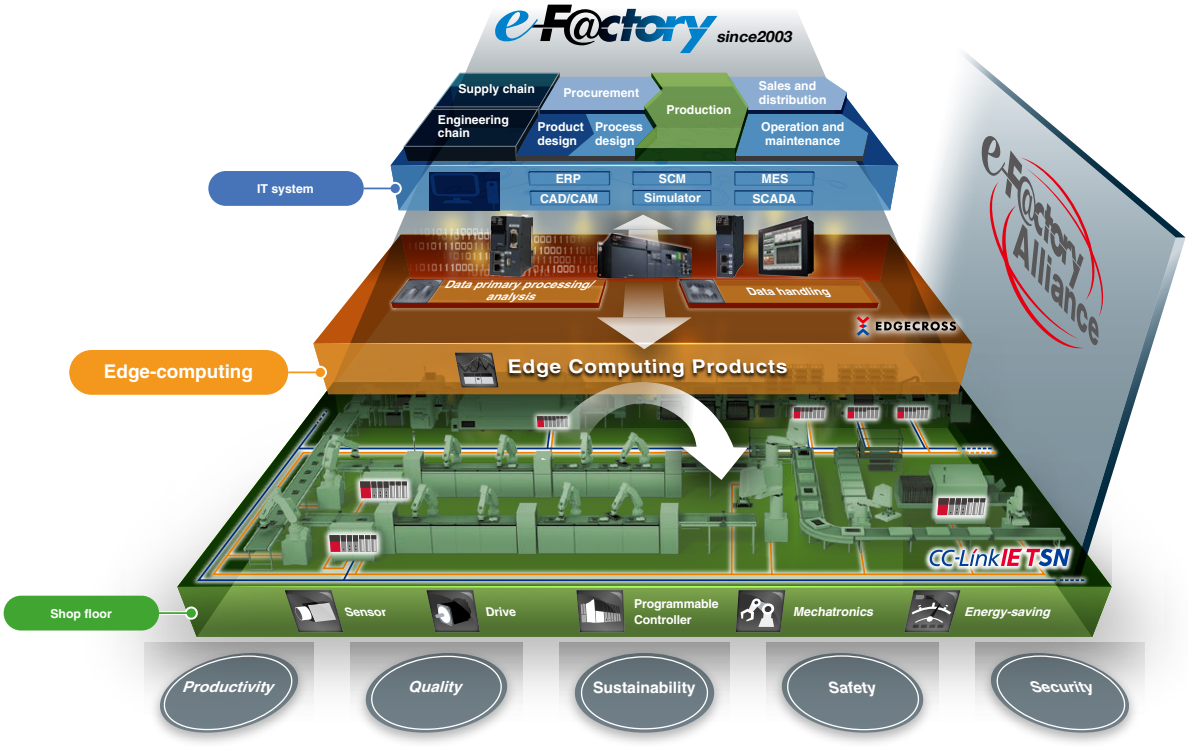
Manufacturing of the future will require the realization of "digital manufacturing" that utilizes the latest technologies in software, AI, and networks to connect the entire manufacturing lifecycle from planning and manufacturing to post-delivery recycling.
Mitsubishi Electric optimizes the entire manufacturing lifecycle, from design to maintenance, through synergy of control equipment, which is a core component, digital technologies such as 3D simulators and visualization tools, and services leveraging on-site knowledge.
Our integrated FA-IT solution, e-F@ctory, plays a central role in this process.

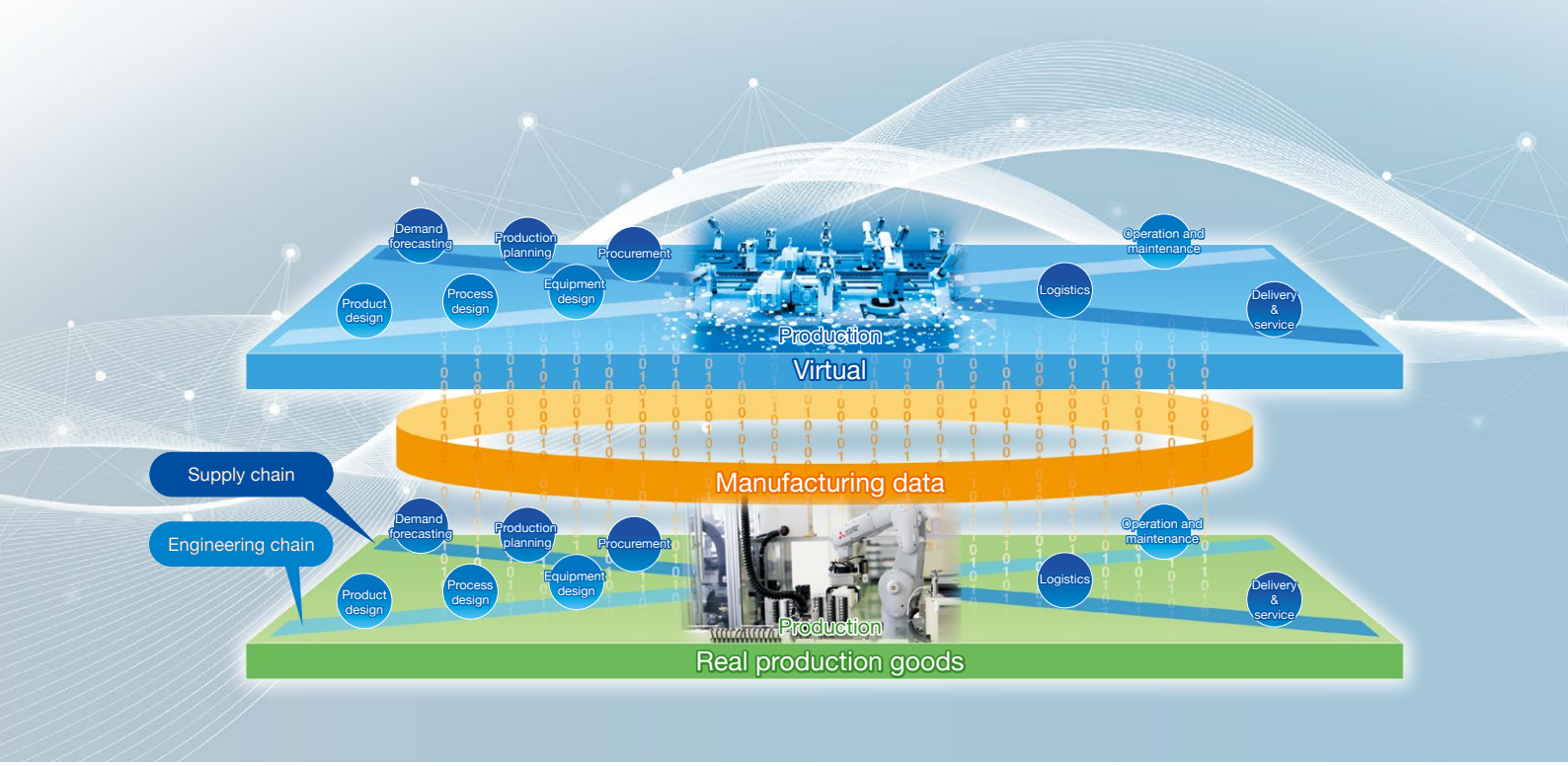
FA integrated solutions e-F@ctory

This solution solves customers' issues and concerns by enabling visualization and analysis that lead to improvements and increase availability at production sites.

By utilizing FA and IT technologies, we reduce total costs throughout all phases of development, production, and maintenance, continuously support our customers' improvement activities, and propose solutions oriented toward 'one-step-ahead' manufacturing.

*1 Visualize, analyze, and improve



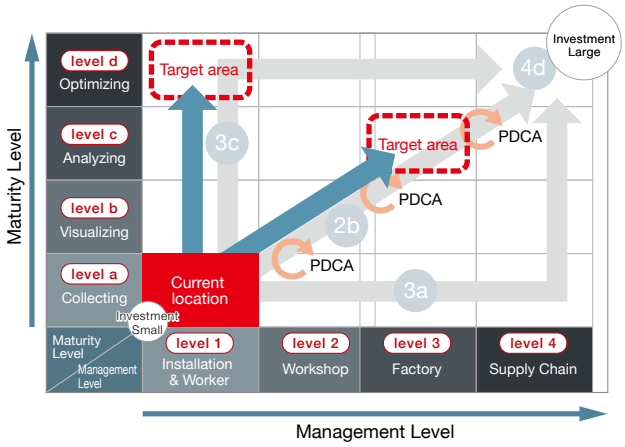


Realizing a Smart Factory

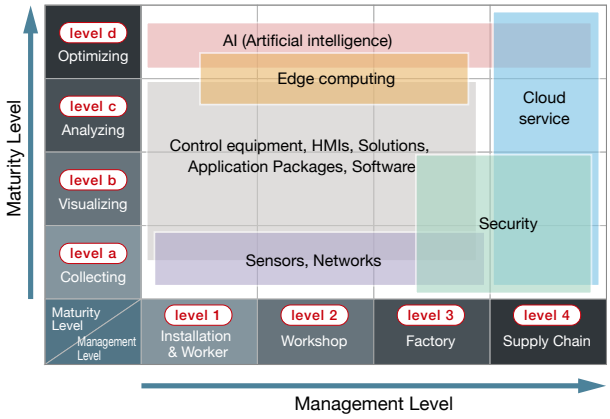
Nagoya Works and Industrial Mechatronics Systems Works use SMKL*2 to evaluate the level of e-F@ctory promotion at manufacturing sites and formulate improvement plans.

*2 SMKL (Smart Manufacturing Kaizen Level) is a measure that evaluates the level of IoT implementation at manufacturing sites using 16 cells to determine the current level.

Features of SMKL



SMKL and Technology/Response to Products



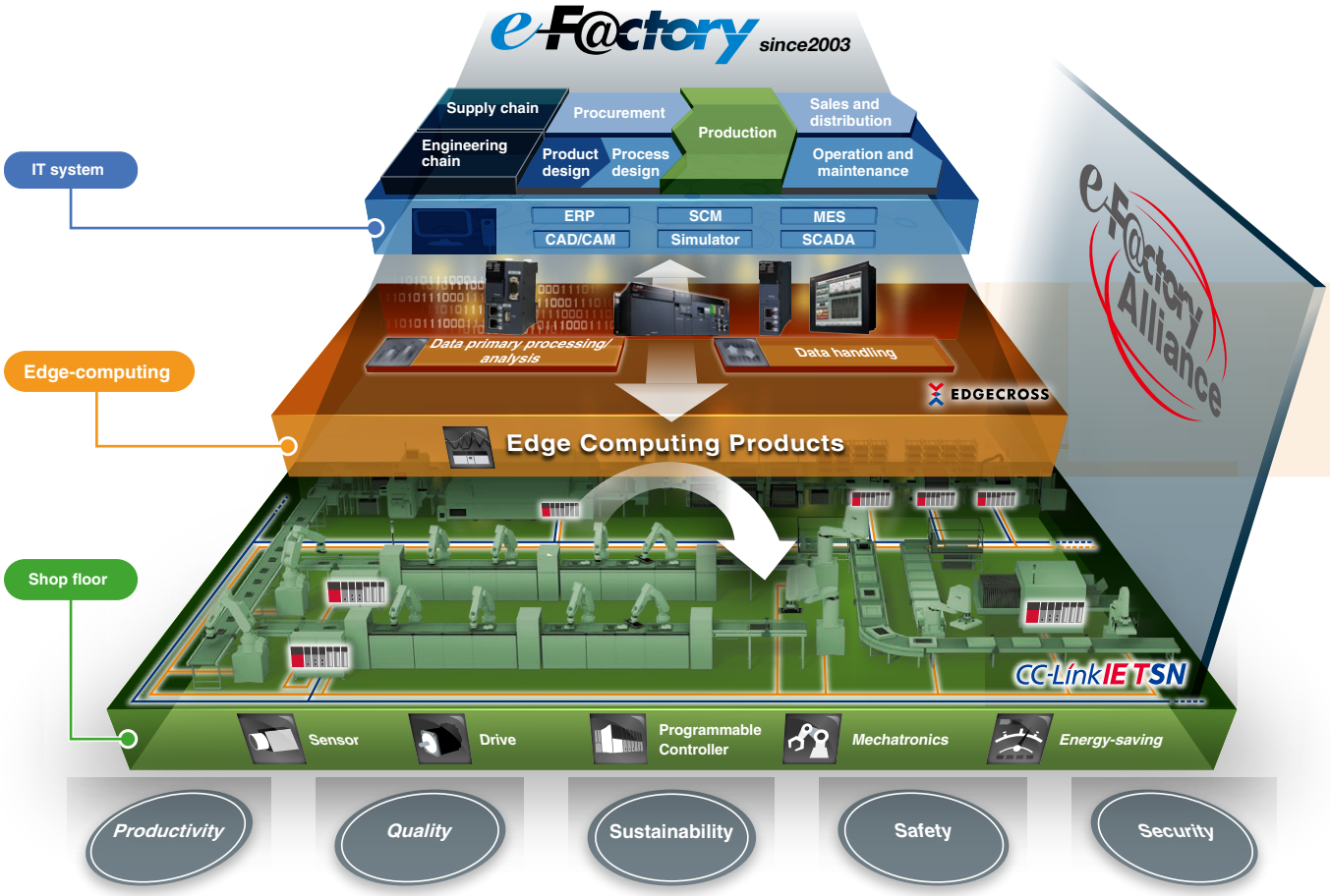
What SMKL Achieves

By utilizing SMKL, the current "visualization level" can be evaluated for the particular equipment, operator, line, plant, and supply chain respectively, and improvements can be made toward the next step.
It also enables planned investment decisions to be made between management and those in charge of equipment.

*SMKL has been opened by IAF (Industrial Automation Forum)/SMKL project, and a white paper is available.

The key to creating a smart factory is edge computing.

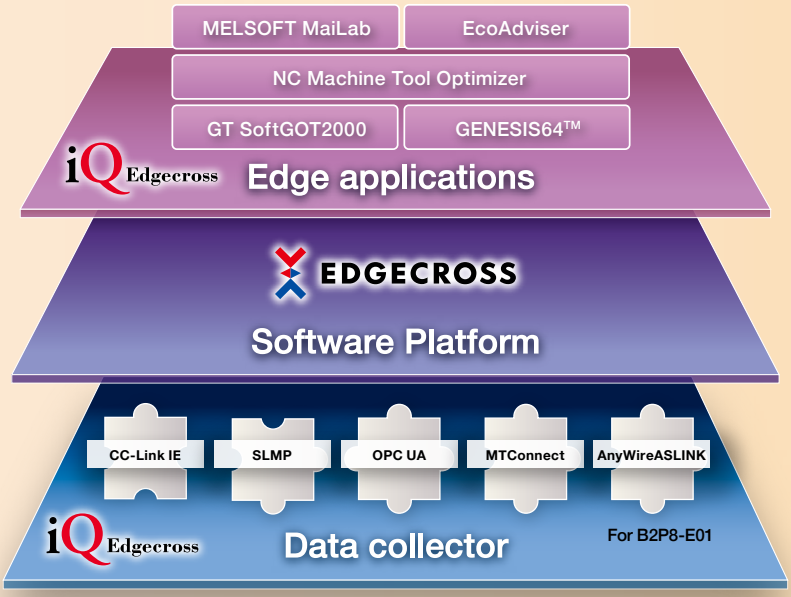
For a smart factory to be achievable, the real-time utilization of production shop floor data and efficient connectivity with IT systems are essential. With e-F@ctory, by utilizing “edge computing,” a technological concept for information processing between the shop floor and IT systems, it is possible to achieve data connectivity with optimal efficiency.



An Environment Where Manufacturers Participate Freely

EDGECROSS

Edgecross is an open software platform operating in edge computing environments built in collaboration with members of the Edgecross Consortium* to enable FA and IT collaboration. It is possible to build a free and flexible edge computing environment independent of application vendors and device manufacturers.



Edge applications

- Executes various processes such as monitoring, analyzing and diagnosing data from shop floors
- Possible to choose appropriate applications from an abundant lineup

Edgecross

- Controls the collection, processing, diagnosis and feedback of data utilized in edge computing
- Abstract hierarchical management of production floor lines, equipment and devices

Data collector

- Regardless of device manufacturer or network, collect various shop floor data
- Collect data from existing facilities

Edge computing Products

Industrial PC
MELIPC Series

Data science tool
MELSOFT MaiLab
Maisart

CNC Operation Monitoring Software
NC Machine Tool Optimizer

Mitsubishi Electric SCADA software
GENESIS64™

Energy-saving support software
EcoAdviser
Maisart

GOT2000-compatible HMI Software
GT SoftGOT2000

*Edgecross Consortium is an organization for formulating Edgecross specifications and promoting dissemination. **https://www.edgecross.org**

Industries

We propose solutions to the challenges faced by each industry and process by fully leveraging our accumulated knowledge and experience.

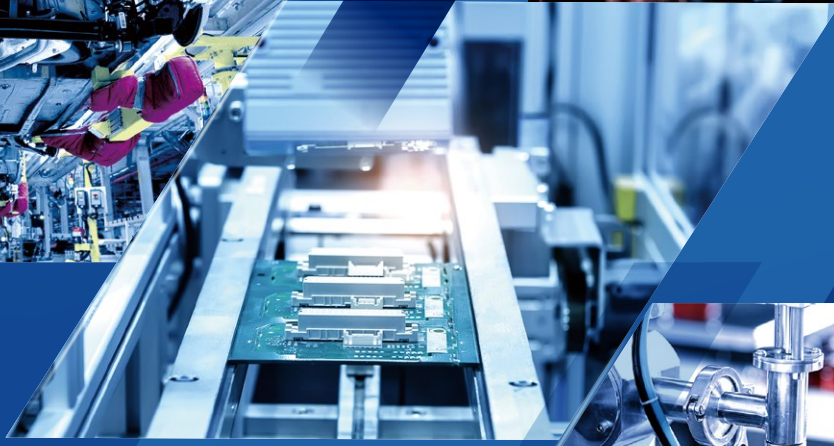
Competencies

We propose solutions related to global trends and industry-specific issues such as design and maintenance.

e-F@ctory

CASES

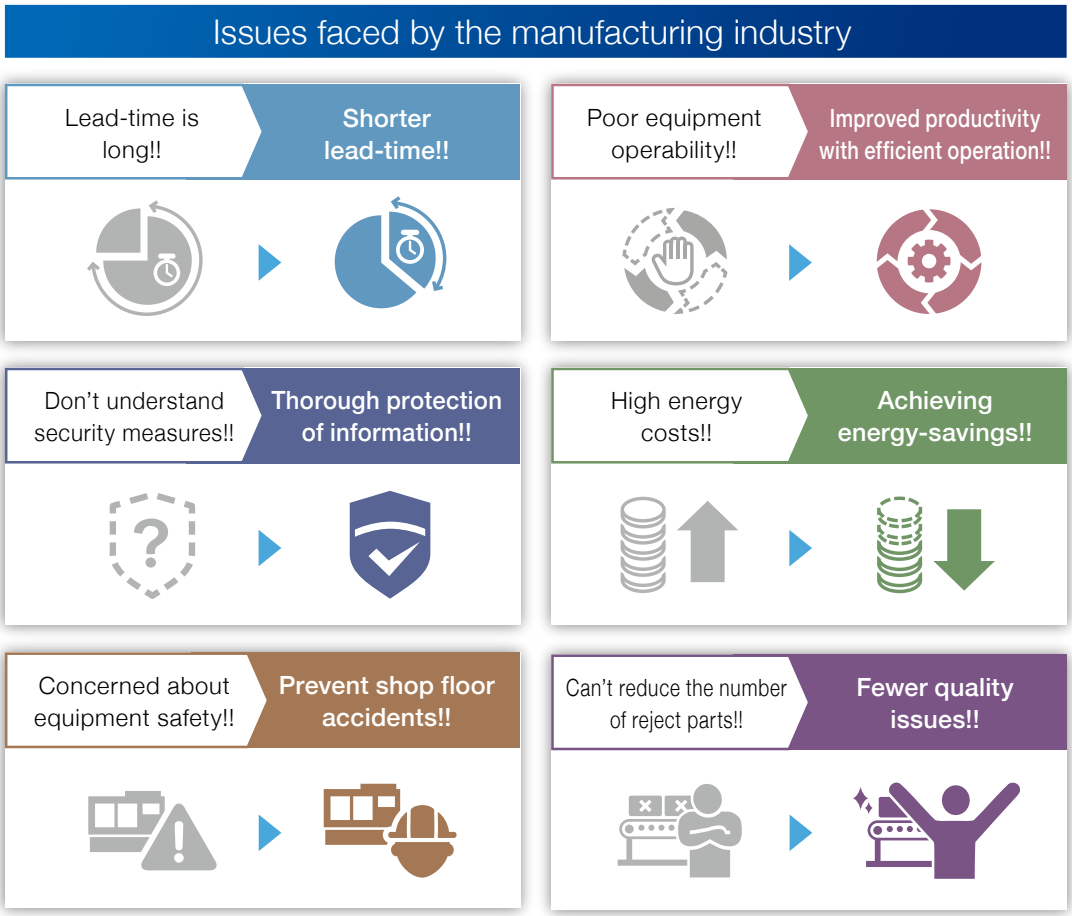
Introduction of Solutions



Solutions Introduced

e-F@ctory leverages knowledge accumulated to date to find the optimal solution for each industry type and process.

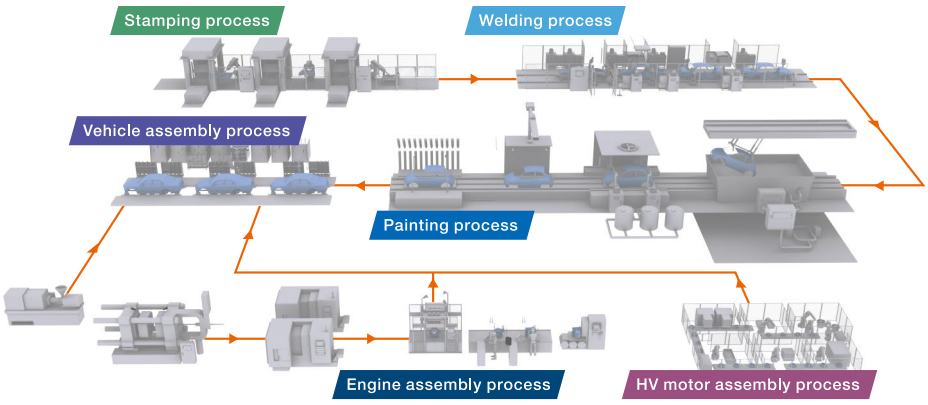
e-F@ctory was launched in 2003 and has helped many companies solve various issues.
From the knowledge accumulated down through the years, e-F@ctory proposes optimal solutions for each industry type and process to achieve productivity and quality improvements, cycle-time reductions, preventive maintenance, “visualization” of energy, energy savings and so on.



Automotive Manufacturing

Scan here for details

In vehicle manufacturing plants that handle a vast number of parts and wide variety of processes, there is a need to solve various issues such as responding to mixed production of many different car models, improving production speed and quality, considering worker safety and engaging in environment-oriented initiatives.
e-F@ctory helps provide solutions to the issues customers face by offering optimal solutions through forming common platforms and alliances with many different partners.



Stamping process

Issues
- Obtaining the most suitable driving pattern for press machines
- Improving energy efficiency by reducing power waste
- Reducing die changeover time by switching multiple stamping patterns according to the situation

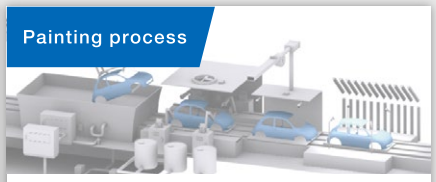
Solutions
- Monitor the sensor values and the servo output current.
- Connect multiple servo amplifiers/drive units to an MR-CV power regeneration converter unit through common bus.
- Create various cam patterns and switch stamping patterns according to the situation.

Welding process

Issues
- Maintaining and managing welding quality by monitoring the welding conditions constantly
- Reducing the defect rate by measuring the width of welded vehicles from both sides
- Lowering the defect rate by inspecting for welding defects (blowholes, height, misalignments, etc.)

Solutions
- Monitor the quality fluctuation and alarms with an Xbar-R control chart.
- Monitor the quality in real time with an Xbar-R control chart and a histogram.
- Detect welding defects with a vision sensor and a laser displacement sensor.

Painting process



Issues
- Ensuring uniformity of the painting quality by controlling the temperature and humidity, and adjusting the air intake/exhaust balance of the paint booth
- Improving quality by collecting, analyzing and collectively managing multiple data of various equipment, such as temperature, humidity, and air intake/exhaust
- Saving energy of the intake/exhaust fan for the paint booth

Solutions
- Control temperature (using PID control) and air conditioning to ensure uniformity of the painting quality.
- Send large amounts of data to the database via the MES Interface module and collectively manage the data.
- Drive the motor with less power by using the highly efficient IPM motor.

Engine assembly process

Issues
- Enhancing traceability by storing serial numbers of mechanical parts and process/equipment history information in a database
- Improving quality by preventing incomplete fitting of connectors
- Performing preventive maintenance by monitoring the operational status of robots

Solutions
- Link the engine assembly information and each mechanical part information collected by the MES Interface module in a database.
- Collect noise during fitting with a high-speed analog input module and perform FFT analysis with a PLC.
- Visualize the operational status of robots with e-F@ctory starter package.

Vehicle assembly process

Issues
- Clarifying operation procedure/time for a diversified workforce to improve quality
- Measuring and constantly monitoring each part of the assembled vehicle body to improve quality

Solutions
- Clarify operation procedure/time with the ANDON, POKA-YOKE, and screw-tightening support systems.
- Constantly monitor everything such as assembly precision, adhesive application, and QR code reading with MELSENSOR.

HV motor assembly process

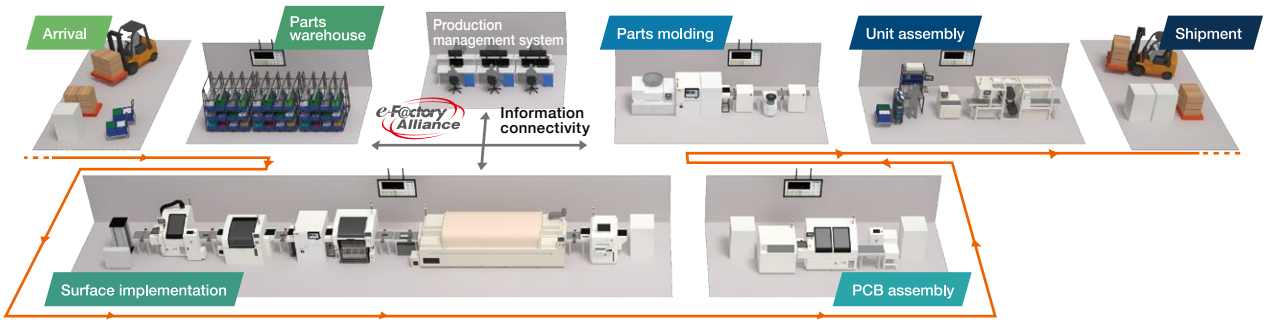
Issues
- Reducing equipment size and visualizing trouble
- Configuring a production line that manufactures products flexibly according to the production status and that does not require a safety fence
- Reducing downtime by early error detection with visualization of the production line

Solutions
- Combine processes with the collaborative robot, MELFA, and collect interlock signals in an andon system.
- Cooperate with FA products and support human collaboration using area sensors.
- Visualize the entire network with CC-Link IE.

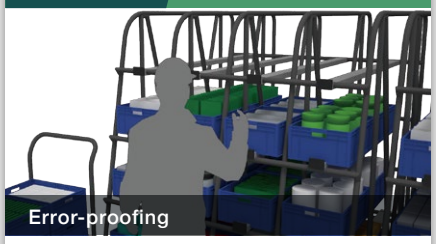
Electronics
(Compact LCD)

Scan here for details

Electricity and electronic fields require elaborate and complex work, yet a high percentage of tasks are still performed manually. A major issue faced is how to automate the processes of part loading, surface implementation, PCB assembly, unit assembly and shipment in order to reduce human error. e-F@ctory helps provide a solution to this issue by providing robots equipped with force sensors and work support systems.



Parts warehouse — Parts warehouse



Issues
- ☐ Incorrect part selection/supply
- ☐ Process stops due to parts shortage

Solutions
- ☑ Prevent mistakes with a work instruction system
- ☑ Advance notification of shortages with a status indicator

Parts molding — Deburring/Polishing

Issues
- ☐ Complicated adjustments in order to machine workpieces of various shapes
- ☐ Tool wear

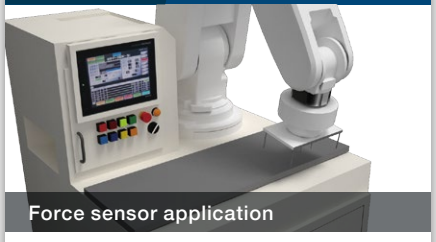
Solutions
- ☑ Shorten start-up time with simple teaching
- ☑ Detect wear amount with a force sensor

Unit assembly — Unit assembly

Issues
- ☐ Incorrect assembly during high-mix, low-volume production
- ☐ Flexible support of production load fluctuations

Solutions
- ☑ Prevent mistakes with a work instruction system
- ☑ Optimize to suit production status

Unit assembly — Inspection



Issues
- ☐ Manual work by humans is required to connect connectors to inspection units

Solutions
- ☑ Full automation of inspection process through introduction of a robot equipped with a force sensor

Unit assembly — Packaging

Issues
- ☐ Seal suited to workpiece, cutting operation and cut length correction necessary

Solutions
- ☑ Simplification of equipment start-up with a seal/cut mechanism and correction function

Progress management — Progress management

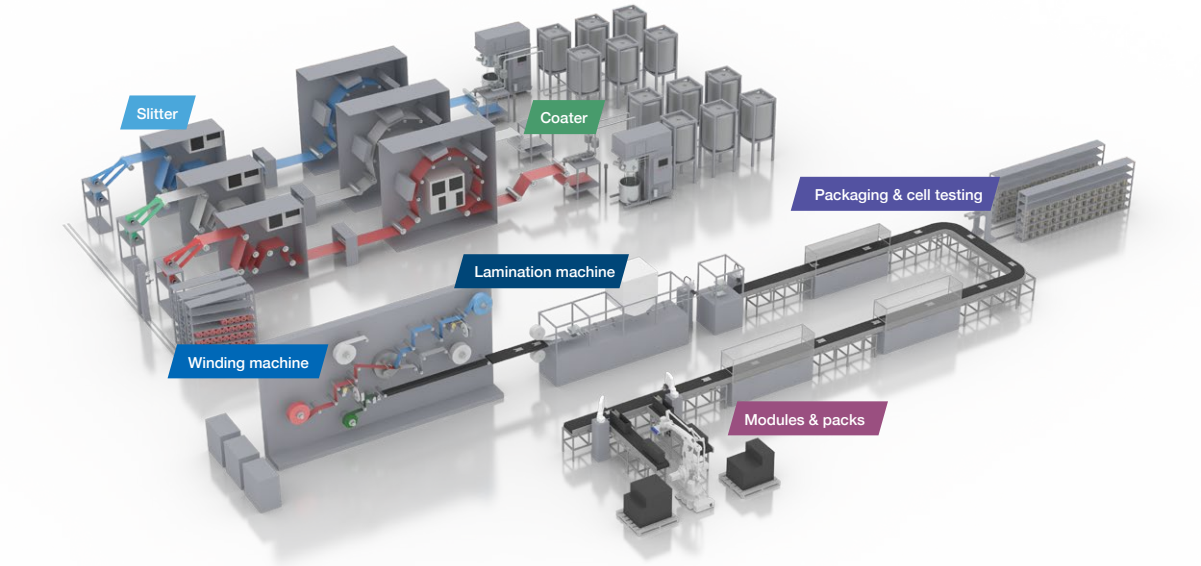
Issues
- ☐ Interested in visualizing production status but can't decide due to lack of professional knowledge

Solutions
- ☑ Andon can easily be built using dedicated setting tool
- ☑ Visualizing production status facilitates sharing of information between workers

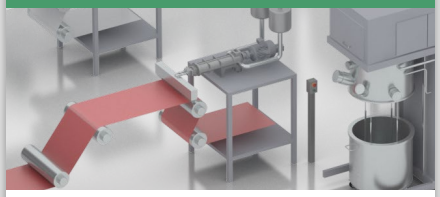
Lithium-ion battery

Scan here for details

Lithium-ion battery lines are large production lines consisting of electrode forming, lamination, inspection, packaging and shipping processes. By utilizing various technologies such as tension control, drive control, synchronous control, robots, and IT cooperation of Mitsubishi Electric FA equipment for the equipment of each process, lithium-ion batteries can be produced efficiently and with high quality.



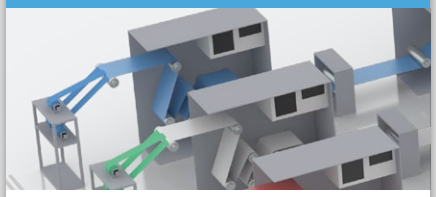
Coater



Issues
- ☐ I want to suppress tension fluctuations and perform uniform coating
- ☐ I want to have stable tension control even in the winding of metal foil
- ☐ I want to achieve synchronous driving between continuous machining processes with the same equipment

Solutions
- ☑ Easy tension control
- ☑ Stable speed control
- ☑ Precise synchronization control

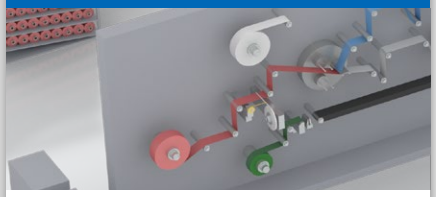
Slitter



Issues
- ☐ I want to easily control tension
- ☐ I want to suppress winding displacement and winding tightening
- ☐ I want to integrate the drive control of the entire device

Solutions
- ☑ Easy wiring, high-precision tension control
- ☑ Easy taper tension control with parameter settings only
- ☑ Easy synchronization control in one unit

Winding machine



Issues
- ☐ Difficult to create flat-winding cams
- ☐ I want to reduce the positional loss of the battery and separator
- ☐ Difficult to adjust the gain of tension control

Solutions
- ☑ Automatic generation of multi-rotating cams for flat winding
- ☑ Crawling correction function
- ☑ Automatic tension control adjustment function

Lamination machine

Issues
- ☐ I want to control tension in an optimal way for processing operations
- ☐ I want to suppress vibration of the arm where the electrode is placed
- ☐ I want to improve equipment capabilities.

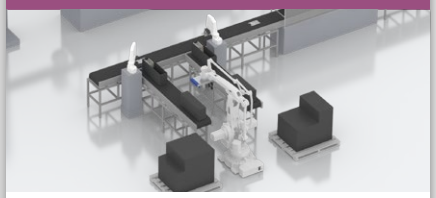
Solutions
- ☑ Tension control can be achieved with various equipment
- ☑ Vibration suppression by vibration control
- ☑ Reduction of takt time by cam for laminate machine

Packaging & cell testing

Issues
- ☐ I want to easily design and launch packaging machines
- ☐ I want to structure the equipment configuration to easily achieve the requirements of battery manufacturers
- ☐ I want to perform positioning with high accuracy at low cost

Solutions
- ☑ Applications for packaging machines
- ☑ Simple CPU communication function
- ☑ Simple Motion Unit for iQ-F

Modules & packs



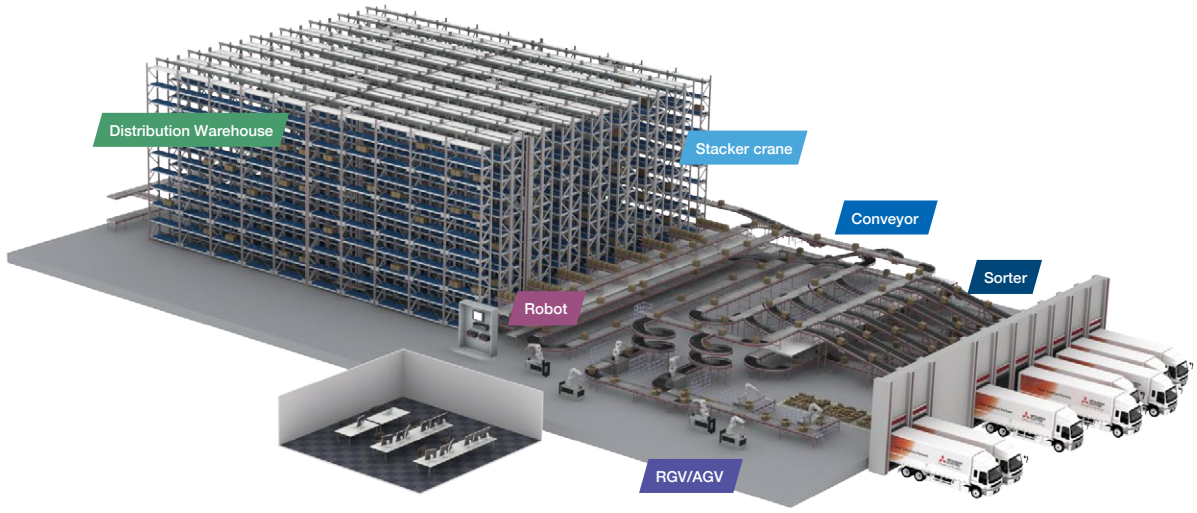
Issues
- ☐ I want to suppress the vibration of the robot and convey it at high speed
- ☐ I want to easily achieve cooperation between the vision system and the robot
- ☐ I want to prevent damage to the workpiece in the case of a robot collision

Solutions
- ☑ Robot capacity improvement function
- ☑ Easy vision setting
- ☑ Reduction of workpiece and robot breakage

Logistics

Scan here for details

The importance of "logistics reforms" as supply chain management is attracting attention. Mitsubishi Electric is building smart, efficient and safe logistics systems to meet issues such as reducing inbound and outbound times, improving cargo handling efficiency, and reducing overall equipment costs. We contribute to the optimization of supply chain management.



Distribution Warehouse

Issues
- ☐ Improvement of operating rate
- ☐ Elimination wasted energy

Solutions
- ☑ Predictive and preventive maintenance at the warehouse/machine/ equipment level
- ☑ Demand management for the entire warehouse

Stacker crane

Issues
- ☐ Crane stability and high-speed operation
- ☐ Crane fault avoidance

Solutions
- ☑ By vibration control, and position calibration functions faster and more stable load/unload
- ☑ Utilize the positioning and safety functions of the stacker crane special-purpose inverter.

Conveyor

Issues
- ☐ Easy start-up and variable speed operation
- ☐ Ensuring safety

Solutions
- ☑ Simultaneous speed change through FR-E800 and the CC-Link IE TSN
- ☑ Use of FR-E800 safety functions

Sorter

Issues
- ☐ Acceleration of cargo identification and sorting
- ☐ Scanning cargo ID correctly even in bad conditions

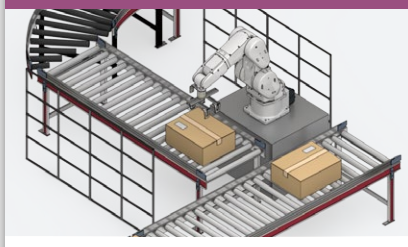
Solutions
- ☑ Real-Time processing of cargo sorting data by CC-Link IE TSN communication
- ☑ Stable scanning of Cargo ID during high-speed transport

RGV/AGV

Issues
- ☐ Avoidance of slip effect during high-speed operation and stop
- ☐ Miniaturization of RGV/AGV

Solutions
- ☑ High response and high precision positioning by combining multiple encoders
- ☑ Space saving utilizing multi-axis amplifier

Robot



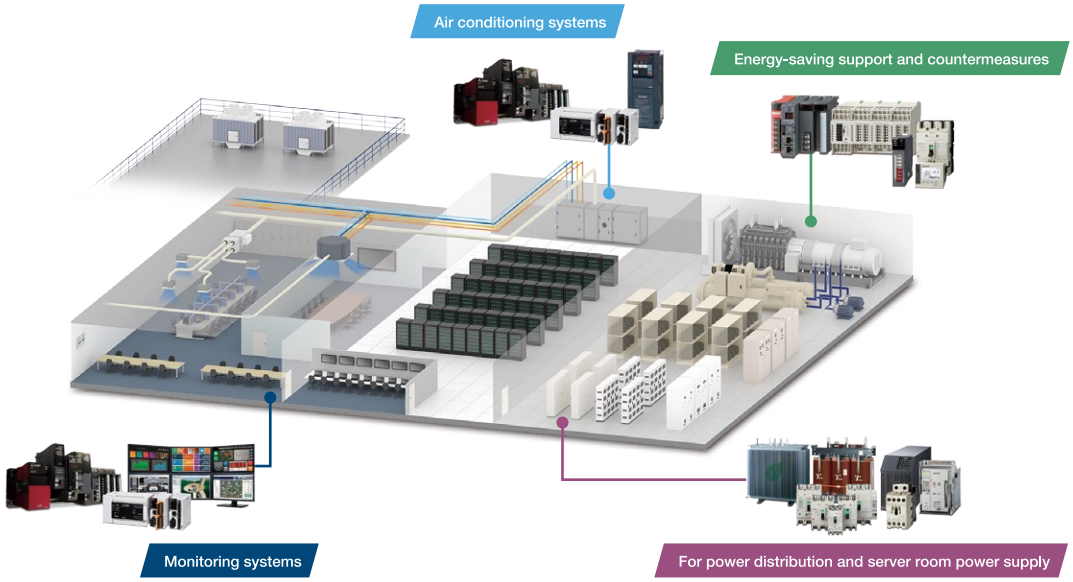
Issues
- ☐ Prediction of robot failure timing
- ☐ Collaboration between humans and robots

Solutions
- ☑ Preventive and predictive maintenance function
- ☑ Optimum layout utilizing cooperative robot

Data Center

Scan here for details

From SCADA to controllers and drive-anddistribute equipment,
Mitsubishi Electric helps you build data center systems.

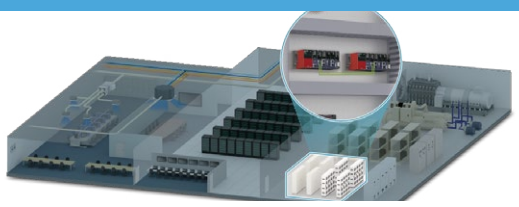


Monitoring systems

Issues
- ☐ Want to reduce lifecycle costs from system introduction to operation
- ☐ Want to centrally manage and utilize data
- ☐ Want remote and wide area monitoring

Solutions
- ☑ Supports energy-saving through visualization of energy usage and helps reduce lifecycle costs with an equipment preventive maintenance function
- ☑ Works with several systems as a platform for data utilization
- ☑ Remote monitoring/analysis using smart terminals enables wide-area monitoring using cloud

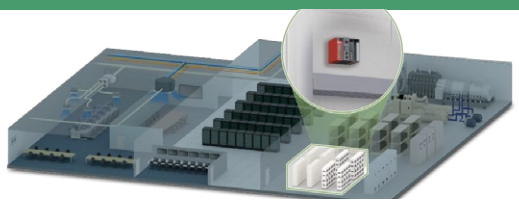
Air conditioning systems



Issues
- ☐ Avoid system downtime of critical equipment
- ☐ Want to control air conditioning using an open building system

Solutions
- ☑ Ensuring high reliability by adopting duplex system
- ☑ Establishing open building systems

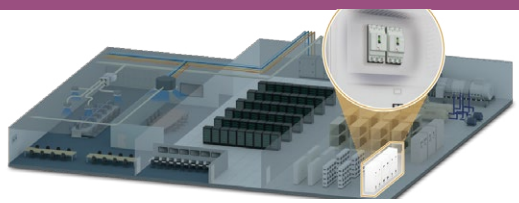
Energy-saving support and countermeasures



Issues
- ☐ Want to achieve visualization of energy consumption and simplify report creation

Solutions
- ☑ Support for energy visualization using energy-saving support devices

For power distribution and server room power supply

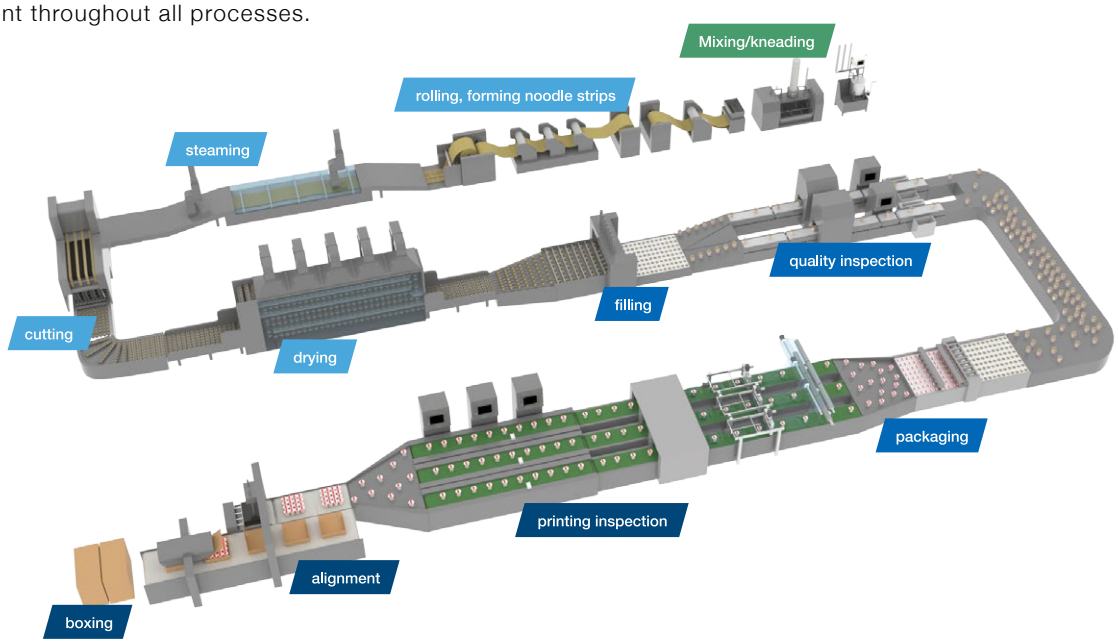


Issues
- ☐ Want to achieve stable power supply
- ☐ Want to use highly reliable breaker and switch

Solutions
- ☑ Introduce transformers for power distribution and uninterruptible power supply (UPS)
- ☑ Introduce a high-reliability low-voltage breaker and electromagnetic switch

Food/Beverage
(Instant noodles)

In food (instant noodles) manufacturing that involves a diverse range of processes, Mitsubishi Electric's solutions contribute to building the ideal manufacturing environment throughout all processes.

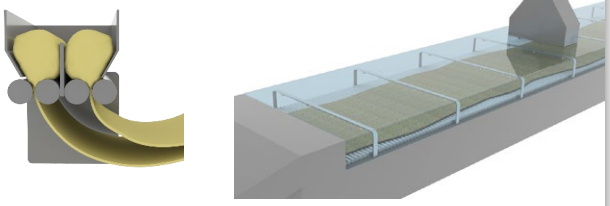


Blending (Mixing/kneading)

Issues
- ☐ How to make uniform noodle dough by reducing variations in ingredient ratios and temperatures?

Solutions
- ☑ Control the temperature of the dissolution tank to prepare water addition adjustment liquid (kneading water) of uniform quality
- ☑ Create uniform dough by controlling the pressure in the mixer and the rotation of the agitator shaft

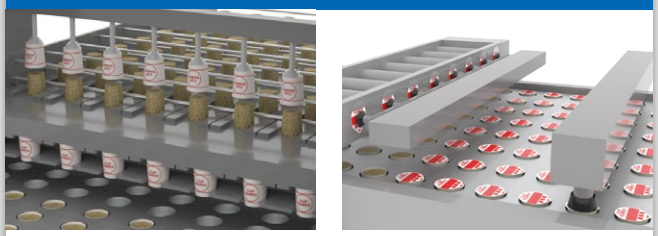
Processing (rolling, forming noodle strips, steaming, cutting, drying)



Issues
- ☐ How to make the thickness and cut-width of noodle dough uniform to eliminate variation in noodle quantity?
- ☐ How to steam at appropriate pressure and temperature to suit the individual product?

Solutions
- ☑ Utilize a temperature control module to achieve highly-stable temperature control
- ☑ Control ingredient feed speed to adjust steam time

Filling and packaging (filling, quality inspection, packaging)



Issues
- ☐ How to fill the cups properly without snapping the noodles?
- ☐ How to package accurately with no misalignment?

Solutions
- ☑ Utilize interrupt positioning function
- ☑ Standard-size cut of packaging film by automatic cam generation and box motion function, and adjustment of packaging film adhesion time

Inspection and packaging (printing inspection, alignment, boxing)

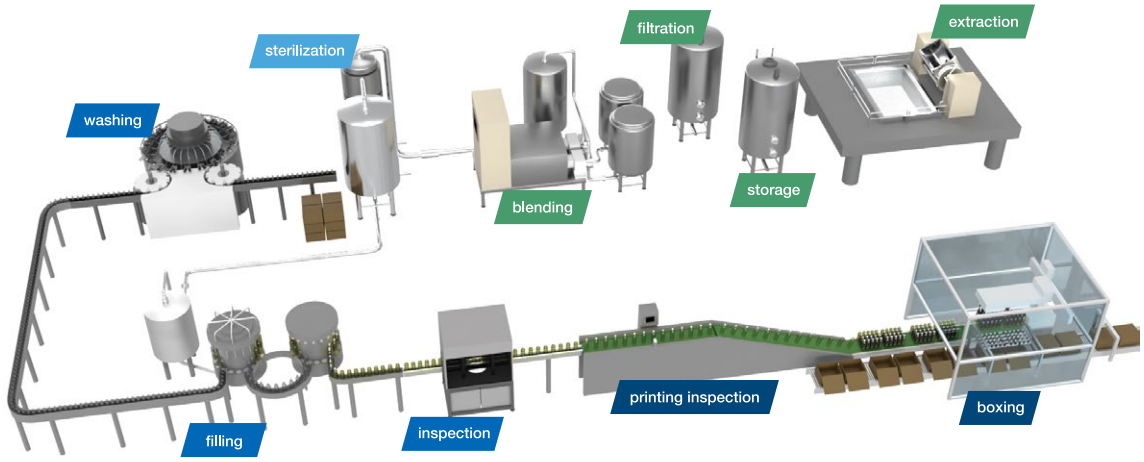
Issues
- ☐ How to automatically inspect products for printing or barcode defects?
- ☐ How to automatically place packed and packaged products into cardboard boxes?

Solutions
- ☑ Conveyor transport control of print inspection equipment and camera-based image recognition
- ☑ Conveyance and positioning control of caser equipment

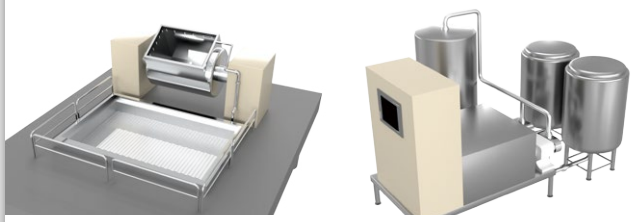
Cases

Food/Beverage
(Plastic bottle beverages)

In plastic bottle beverage (tea) manufacturing that involves a diverse range of processes, Mitsubishi Electric's solutions contribute to building the ideal manufacturing environment throughout all processes.



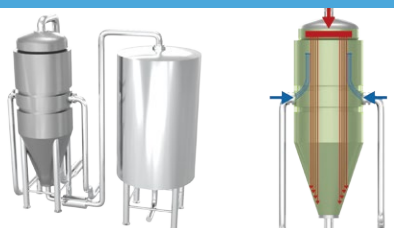
Blending (extraction, storage, filtration, blending)



Issues
- ☐ How to extract essence from dehydrated ingredients?
- ☐ How to remove tea dregs, etc., and make a clear liquid?
- ☐ How to combine and formulate multiple raw ingredients?

Solutions
- ☑ Control of the extraction equipment's agitator shaft and water supply amount
- ☑ Control and monitor storage tank agitator shaft and filter pump
- ☑ Control and monitor raw ingredient supply amount and flow rate of blending equipment

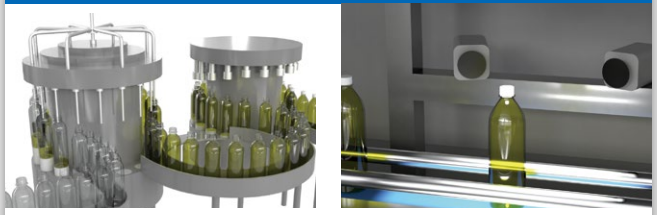
Processing (sterilization)



Issues
- ☐ How to use steam to heat and prevent beverage spoilage?

Solutions
- ☑ Automatic control of steam temperature and supply volume for direct-heating sterilizers

Filling and packaging (washing, filling, inspection)



Issues
- ☐ How to wash the inside of the plastic bottle before filling it with a beverage?
- ☐ How to fill the plastic bottle with the beverage and close the lid without letting oxygen in as much as possible?
- ☐ How to inspect for foreign matter contamination and filling amount (flavoring) after filling?

Solutions
- ☑ Synchronized control of container loading/unloading and main unit rotary of rinser device
- ☑ Transport control and filling control of liquid filling (filler) equipment
- ☑ Conveyor control of image inspection machines and inspection with vision sensors

Inspection and packaging (printing inspection, boxing)

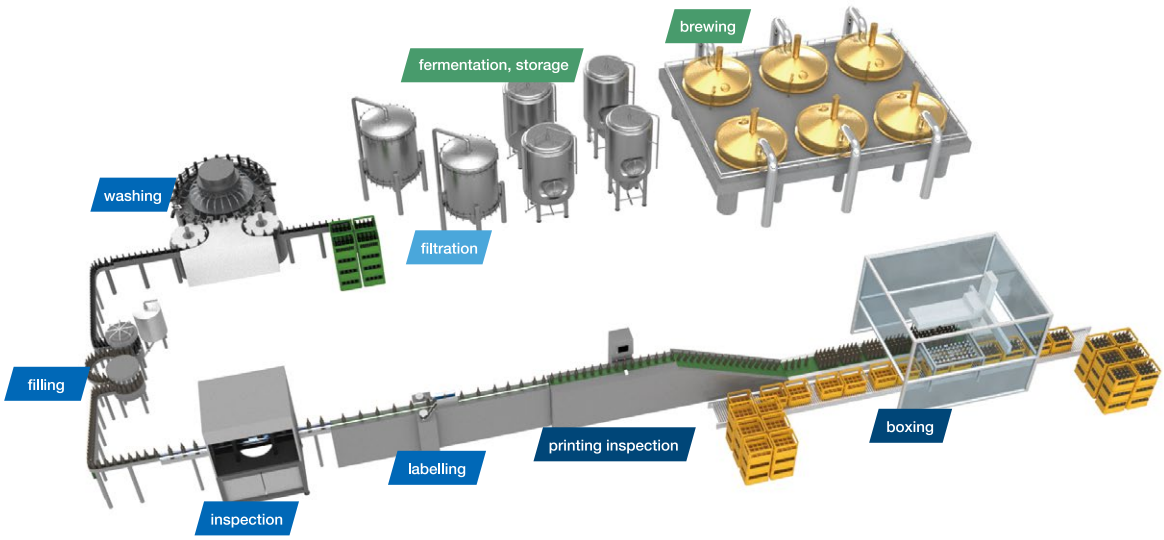
Issues
- ☐ How to automatically inspect products for printing or barcode defects?
- ☐ How to automatically place packed and packaged products into cases?

Solutions
- ☑ Conveyor transport control of print inspection equipment and camera-based image recognition
- ☑ Conveyance and positioning control of caser equipment

Food/Beverage
(Beer)

Scan here for details

In beer manufacturing that involves a diverse range of processes, Mitsubishi Electric's solutions contribute to building the ideal manufacturing environment throughout all processes.

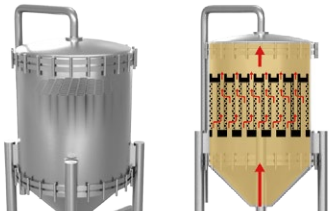


Blending (brewing, fermentation, storage)

Issues
- ☐ How to make wort from raw ingredients?
- ☐ How to homogenize the taste and type of beer when fermenting wort?

Solutions
- ☑ Accurate temperature and flow control of the preparation kiln
- ☑ Control temperature and pressure in the tank over time, which affect the taste and type of beer

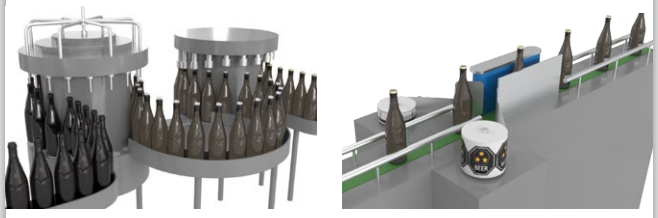
Processing (filtration)



Issues
- ☐ How to remove yeast, etc., and make the beer a clear liquid?

Solutions
- ☑ Control and condition monitoring of pump motors in filtration equipment

Filling and packaging (washing, filling, inspection, labelling)



Issues
- ☐ How to wash the inside of the glass bottle before filling it with a beverage?
- ☐ How to fill the glass bottle with the beverage and close the lid without letting oxygen in as much as possible?
- ☐ How to attach labels automatically and at high speed?

Solutions
- ☑ Synchronized control of container loading/unloading and main unit rotary of rinser device
- ☑ Transport control and filling control of liquid filling (filler) equipment
- ☑ Conveyance and positioning control of labelling equipment

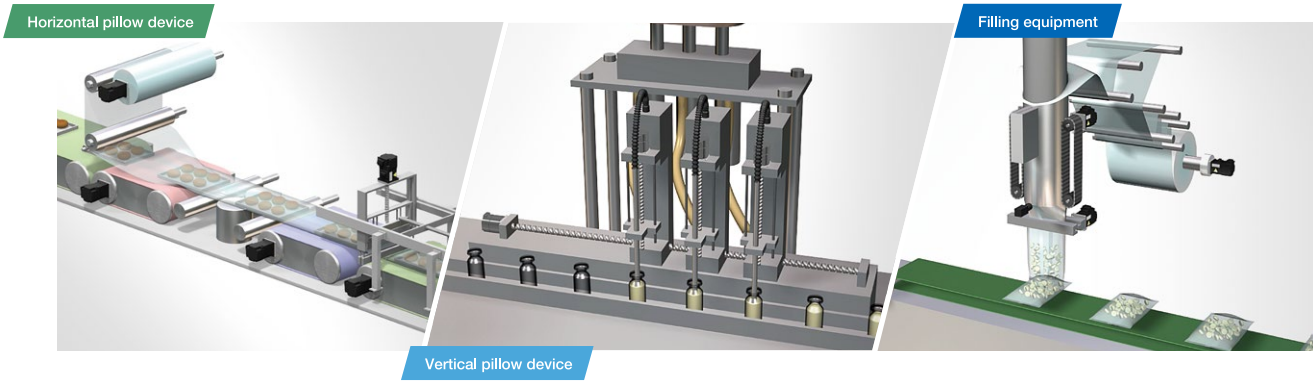
Inspection and packaging (printing inspection, boxing)

Issues
- ☐ How to automatically inspect products for printing or barcode defects?
- ☐ How to automatically place packed and packaged products into cases?

Solutions
- ☑ Conveyor transport control of print inspection equipment and camera-based image recognition
- ☑ Conveyance and positioning control of caser equipment

Food/Beverage
(Packaging machine)

Due to the diversification and complexity of needs, the packaging form of food and beverage products is constantly changing. In addition, machinery that performs packaging and packaging itself requires greater reliability and functionality than ever before. Mitsubishi Electric's packaging equipment system facilitates the construction of systems according to each customer's purpose and scale.



Horizontal pillow device

The film roll for packaging is sent out horizontally, and both ends are sealed and cut while wrapping food sent from the conveyor in pillow shape.

Vertical pillow device

The film roll for packaging is sent out vertically and molded into a bag. After putting food in the bag, the top of the bag is sealed and cut.

Filling equipment

Fill solids and liquids to the optimum amount.

Building systems tailored to purpose and scale

BASIC
For low-mix, high-volume production

Issues
- ☐ I want to keep the initial cost down
- ☐ I want to build a system with minimal equipment

Solutions
- ☑ Control using mechanical cams
- ☑ Simple configuration

MIDDLE
For high-mix, low-volume production

Issues
- ☐ I want to stabilize the quality of packaging
- ☐ I want to respond flexibly to specification changes and setup changes
- ☐ I want to reduce takt time

Solutions
- ☑ Control using electronic cams
- ☑ Easy launch with iQ Monozukuri PACKAGING

HIGH
For high-mix, low-volume production

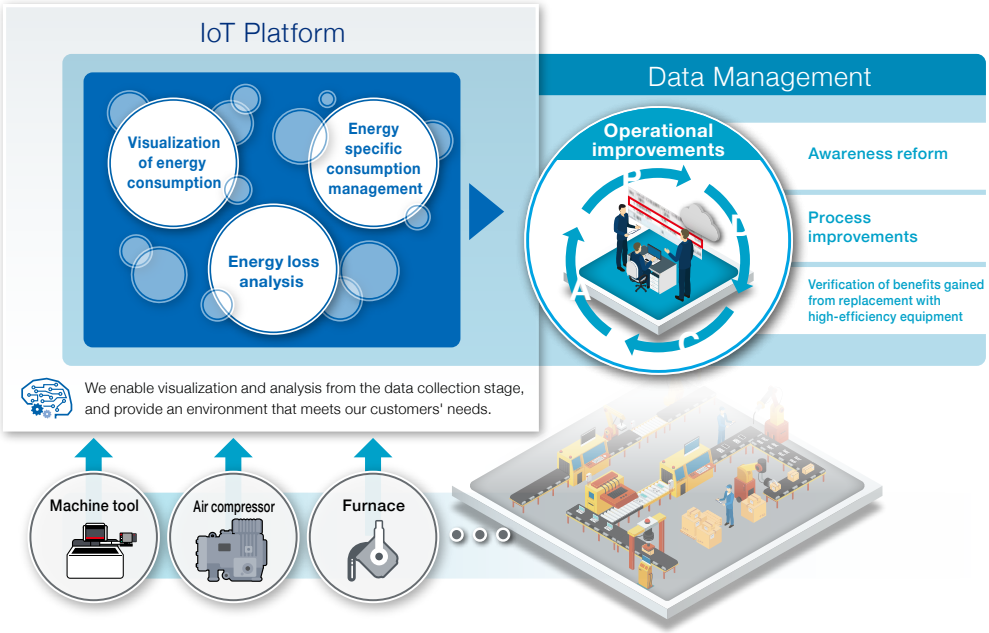
Issues
- ☐ I want to easily build a high-quality, flexible system
- ☐ I want to perform predictive maintenance of equipment and reduce downtime

Solutions
- ☑ Control using electronic cams
- ☑ Easy launch with iQ Monozukuri PACKAGING
- ☑ Predictive maintenance and traceability are also supported.

Carbon neutral solutions

Scan here for details

Mitsubishi Electric provides carbon neutral solutions by not only offering equipment that efficiently uses energy (our high-efficiency equipment product lineup), but also by supporting continuous improvement activities through data management (data collection, visualization, analysis, and diagnosis).



Data Management is indispensable for continuous reduction of CO_2 emissions.

Operational improvements through data management contribute to the continuous reduction of CO_2 emissions.

Mitsubishi Electric provides a platform to collect and analyze all information related to energy and production. Through the visualization, analysis, and diagnosis of the collected data, we support further operational improvements on our customers' production shop floors.

The data for reporting has low data granularity, making it difficult to detect energy loss.

Energy loss can be identified through observing energy consumption and specific consumption graphs by individual day and hour.

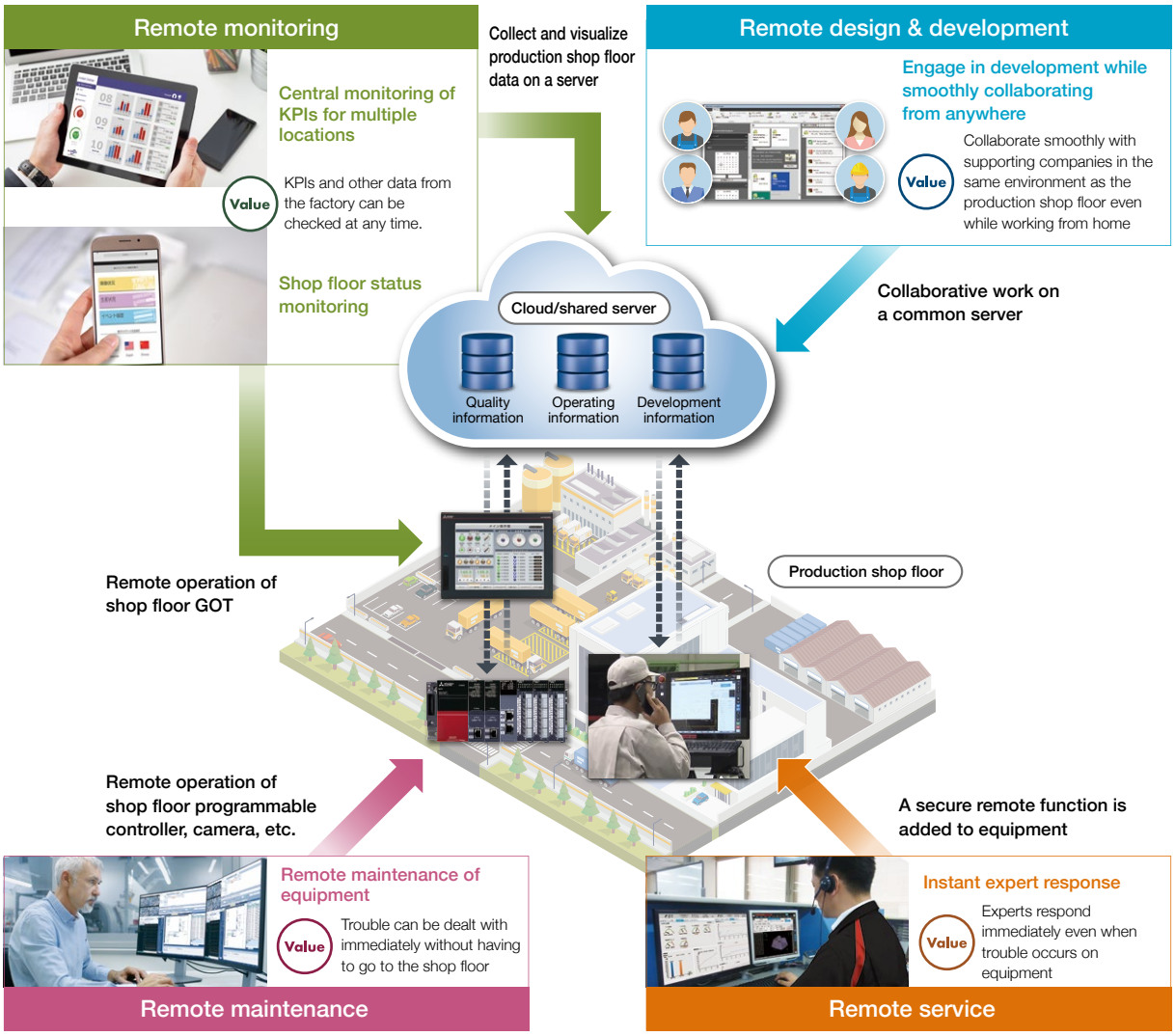
Since production information and energy consumption cannot be linked, it is difficult to identify the cause of energy loss.

By reviewing the production information together, the cause of loss can be identified.

AI identifies the key causes of energy loss and proposes improvement.

FA remote solutions

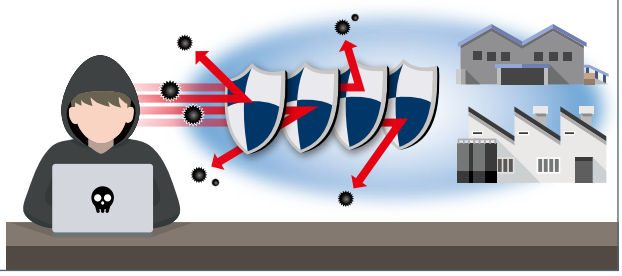
Technological innovation is accelerating the diversification of work styles and the manufacturing industry is no exception. As it becomes standard practice to perform monitoring, maintenance, service, development and many other production operations regardless of time or place, concrete benefits such as reducing downtime and minimizing travel costs can be anticipated.
Mitsubishi Electric's FA remote solutions promote the diversification of work styles and help improve the competitive edge of all manufacturing-related companies.



Build a safer and more reliable security environment

Promotion of defense-in-depth

We recommend implementing security measures at each layer (human layer, physical layer, network layer, and device layer) in accordance with Mitsubishi Electric's FA security guidelines, and introducing defense-in-depth to FA systems to realize manufacturing in factories with a safe and reliable security environment.



Data collection/analysis solutions

Scan here for details

Improving productivity, quality, and energy efficiency by utilizing shop floor data to find the key to solving production issues and promoting improvements.

The Cycle for shop floor Improvement With Data Utilization

Targets Setting

What is the issue?
What is the current status?
What needs to be solved?

Point
Clarify what issues should be solved.

Identify managerial issues
- Productivity improvement
- Quality improvement
- Energy saving & conservation

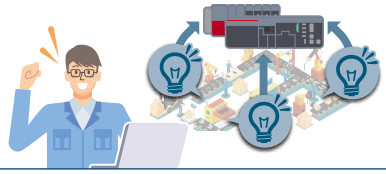
Break down the issues
Break down each managerial issue into more specific shop floor issues for which solutions can be devised.

1 Data collection

What kind of data should be collected and how?

Point
Select and collect data based on knowledge in equipment and production processes.

Factor analysis, data selection, and data collection
Select, collect, and accumulate the data necessary for solving the shop floor issues based on the engineer's wealth of experience, intuition, and knowledge.



2 Visualization

Visualization of collected data and confirmation of the effectiveness of improvements

Point
Quantify the current situation and gain awareness.

Data visualization
Display the collected data in an easily viewable format, to provide a visual indication of the status of the shop floor.

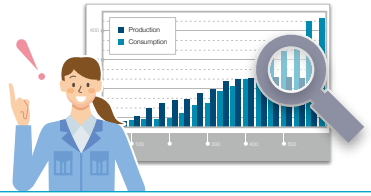
Application of data collection/analysis solutions

3 Analysis

Factor analysis from collected data

Point
Find the factors necessary for improving the shop floor and solving issues.

Data analysis
Use the collected data to analyze problem-solving factors.



4 Diagnosis

Data diagnosis based on the analysis results

Point
Evaluate the improvements made and issues solved and create a continuous cycle for improvements.

Improvements using a diagnostic system
Create diagnostic rules based on the analysis results, diagnose the collected data in real time, and provide the shop floor with feedback.

Total Maintenance solutions

Scan here for details

Total Maintenance Solutions comprise "**Predictive Maintenance**", which prevents problems before they arise by detecting signs of abnormalities based on data collected, "**Preventive Maintenance**", which enables planned maintenance by managing data regarding operating time and frequency, as well as "**Corrective Maintenance**", which shortens the cause investigation time to achieve early recovery of equipment by utilizing historical data. These are solutions supporting our customers' maintenance activities in all phases and scales, whether it be line, device, or equipment.

Current Issues

- How to prevent equipment outages caused by sudden failure of parts with a set service life?
- How to reduce costs by using parts and tools to their respective limits?
- How to minimize the impact on production by quickly and efficiently investigating the cause in the event of trouble?

After Introducing the Total Maintenance Solutions

Optimization of maintenance work with data management

Non-stop factory

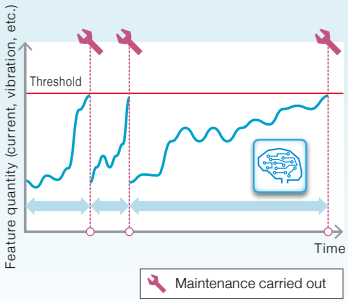
Planned operations

Less downtime

What is Total Maintenance Solution?

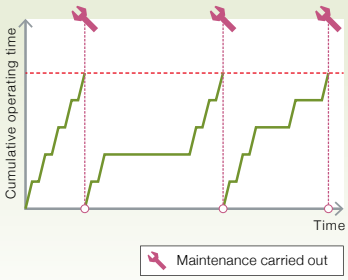
Predictive Maintenance

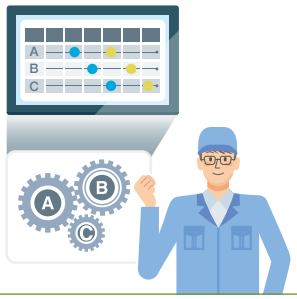
Prevents trouble by detecting signs of abnormality by **analyzing operation data**



Preventive Maintenance

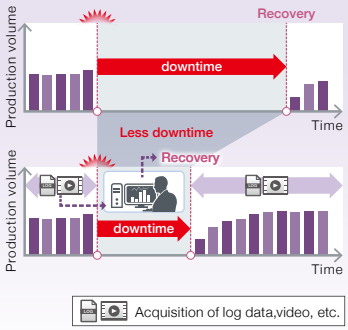
Operating time and frequency **data management** utilized to prevent the generation of problems

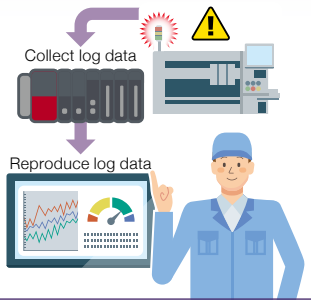




Corrective Maintenance

Historical **data utilized** for detailed cause investigation and rapid recovery

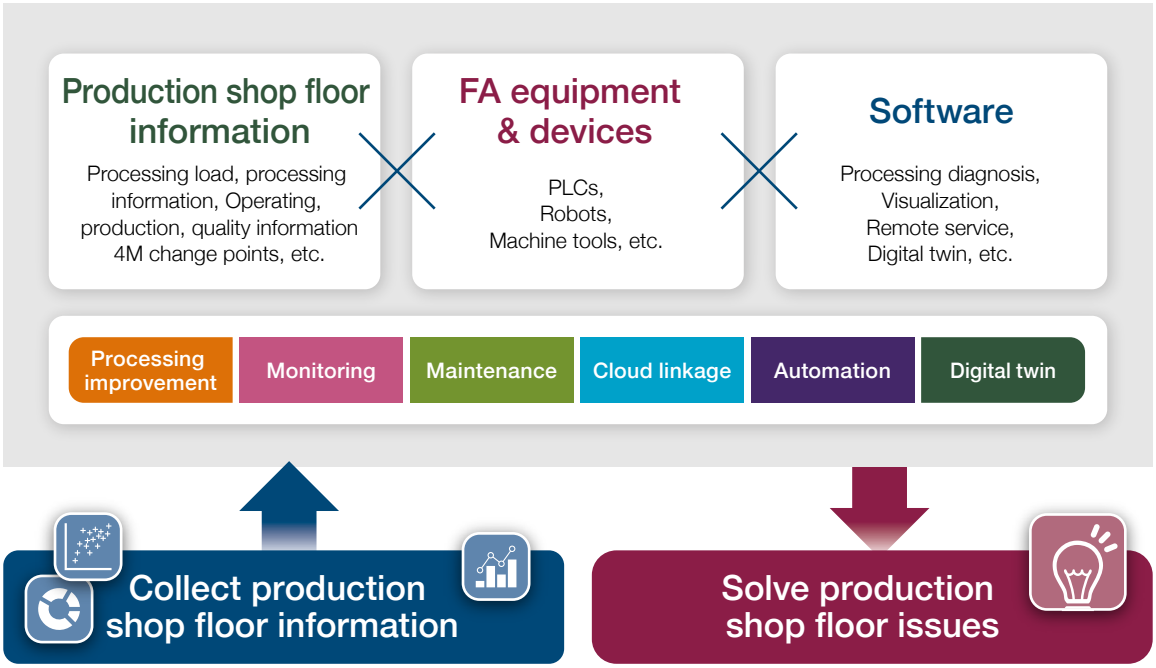




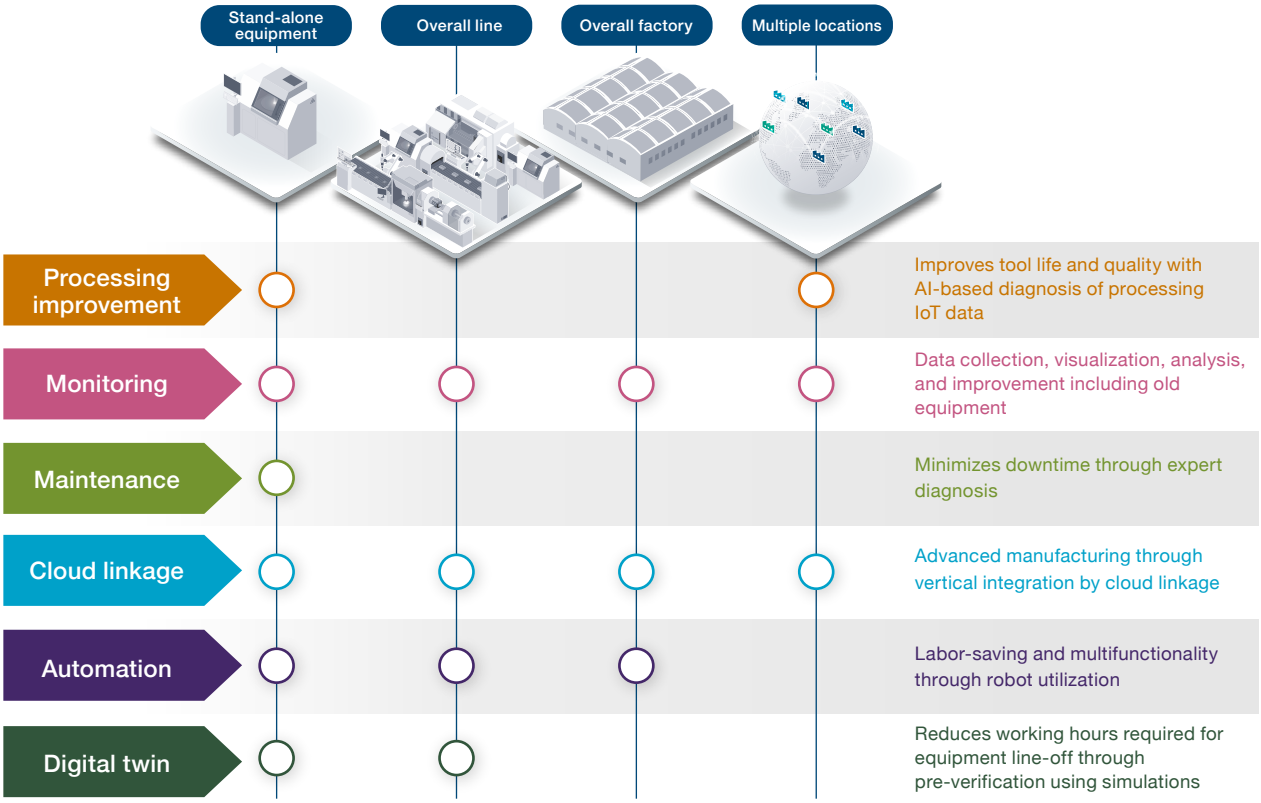
IoT solutions for machining lines

Scan here for details

Mitsubishi Electric promotes the digitalization of our customers' operations by collecting data from various machine tools and peripheral equipment, AI-based data analysis, streamlining equipment design through simulation, and achieving overall optimization by cloud integration.



Mitsubishi Electric proposes an IoT solution to suit our customers' requests.



Mitsubishi Electric realizes significant improvement in productivity, quality, energy-efficiency, safety, and security through the introduction of e-F@ctory.

01 Example of operation management/energy conservation /work support system introduction

Issues

- ☐ Stabilization of operating ratio by reducing the installation of incorrect parts
- ☐ Reduction of time taken for failure analysis
- ☐ Alleviation of burden on experienced operators who provide guidance
- ☐ Safety countermeasures for operators who perform loading/unloading work

Nagoya Works, E4 Building:
Programmable controller manufacturing factory

Solutions

- ☑ **Introduction of a surface-mounting operation management system utilizing C controllers**
- ☑ **Introduction of a work instruction system based on HMI screens**
- ☑ **Introduction of an energy conservation system for AC/lighting using GENESIS64™ and programmable controllers.**
- ☑ **Introduction of a vertical conveyance system using safety programmable controllers**

Benefits

Energy cost	Poor quality	Productivity	Man-hours required to train new employees
Approx. 30% reduction	Approx. 50% reduction	Approx. 30% improvement	Approx. 65% reduction

02 Example of quality control on assembly line

Issues

- ☐ Response to varying demand and high-mix, variable production
- ☐ Improvement of equipment operating ratio and quality

Nagoya Works, W3 Building:
Servo motor manufacturing factory

Solutions

- ☑ **Direct collection of information inside equipment from the MES interface (programmable controller)**
- ☑ **Strengthen information management through direct connection of equipment with the manufacturing execution system (MES) and conducting various improvement activities**

Benefits

Lead-time	Machining time	Poor quality	System build time	Manufacturing timeframe
Approx. 50% reduction	Approx. 40% reduction	Approx. 50% reduction	Approx. 65% reduction	Approx. 50% reduction

* Figures assume calculations without computer and program

03 Example of assembly work support system using tablet terminals

Issues

- ☐ Prevent human errors by workers
- ☐ Reduce load of skilled workers who provide instruction
- ☐ Shorten analysis time for improvement points

Industrial Mechatronics Systems Works
E7 Factory:
Electrical Discharge Machine manufacturing factory

Solutions

- ☑ **Utilization of tablet terminals to improve efficiency kitting and electronic instruction of work procedures**
- ☑ **Improvement of work through work data collection and analysis, and improvement of design**

04 Example of iQ Monozukuri process remote supervision introduction

SMKL 2b

Issues

- Visualization of operation status and production status
- Improvement of equipment operation rate and quality
- Reducing downtime
- Video supervision and recording

Solutions

- **Realizing visualization with iQ Monozukuri process remote supervision without modifying existing equipment programmable controllers**
- **Variation analysis of quality data using iQ Monozukuri process remote supervision template screen**
- **Recording/playback of process video using Industrial Computer MELIPC MI3000 (GT SoftGOT2000) and network camera**

Nagoya Works, E2 Building:
Inverter manufacturing factory
E800 manufacturing line

05 Example of AI robot/3D simulator introduction

SMKL 2b

Issues

- Improve operating ratio of lines with a high number of processes
- Support high-mix, low-volume, high-cycle production
- Reduce equipment installation area
- Reduction of production line design time and onsite adjustment time

Solutions

- **Introduction of a robot production system that fuses people and machines**
- **Uniform management of quality and equipment information by utilizing e-F@ctory**
- **Collection and management (traceability) of product data (barcodes) and quality (inspection) data for each machine**
- **Utilization of robot intelligent technologies (assembly/inspection using force sensors)**
- **Interference check of equipment at the design stage using 3D simulator and coordination between electrical CAD and engineering tools**

Nagoya Works, Kani Factory:
Magnetic Motor Starters
manufacturing factory

Benefits

Productivity	Man-hours	Installation rate	Operating ratio	Start-up time
Approx. 30% improvement	Approx. 55% reduction	Approx. 85% reduction	Approx. 60% improvement	Approx. 25% reduction

06 Example of productivity improvement of shaft processing line through introduction of e-F@ctory

SMKL 2d

Issues

- [redacted]

Solutions

- **Manage production information through introduction of e-F@ctory**
  - **Automatic work instructions to the processing lines based on information from the upper production management server**
  - **Expand unmanned operation through planned set-up changeover and improve productivity**
- **A grinder-free system utilizing a C controller**
  - **Automatically calculating the offset value of the lathe from the automatically calculated outer-diameter dimensions and achieving stable finishing on the lathe**
  - **Significant reduction of cycle time through the abolishment of the shaft rotor grinding process**

Nagoya Works,
Shinshiro factory:
3-phase motor
manufacturing factory

Benefits

Machining time	Productivity
Approx. 15% reduction	Approx. 30% improvement

Mitsubishi Electric's Fukuyama Works introduced e-F@ctory and, as a result, has benefited from productivity improvements and innovative energy-savings thanks to management of short stoppages.

01 Improving Productivity with a Short Stoppage Management System

Fukuyama Works

SMKL 2b

Issues

In the case of circuit breaker manufacturing lines, conventionally, people were in charge of status management and solving issues for each individual line, therefore there were delays in responding to short stoppages and improvements were only temporary

Solutions

- ☑ **Management of operating status for all production processes at an equipment level**
- ☑ **Collection and analysis of management data online and in real-time**
- ☑ **Identification of cause behind problems and swift improvement**

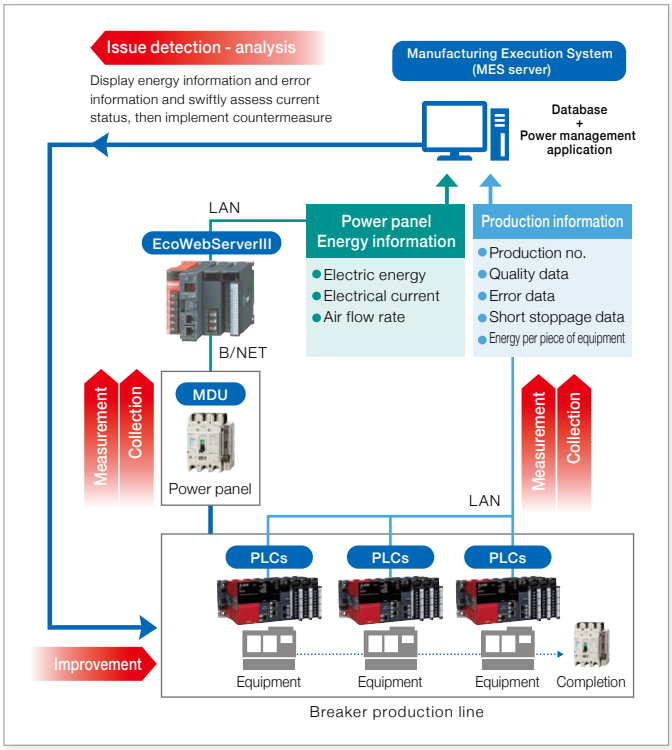
Benefits

Short stoppage occurrence

Approx. 75% reduction

Operating rate

Approx. 50% reduction



02 Energy-savings with Demand Management

Fukuyama Works

SMKL 3d

Issues

Management and control of General Administration Building power demand

Solutions

- ☑ **Real-time measurement, collection and visualization of power consumption**
- ☑ **Automatic online adjustment of air-conditioning**

Benefits

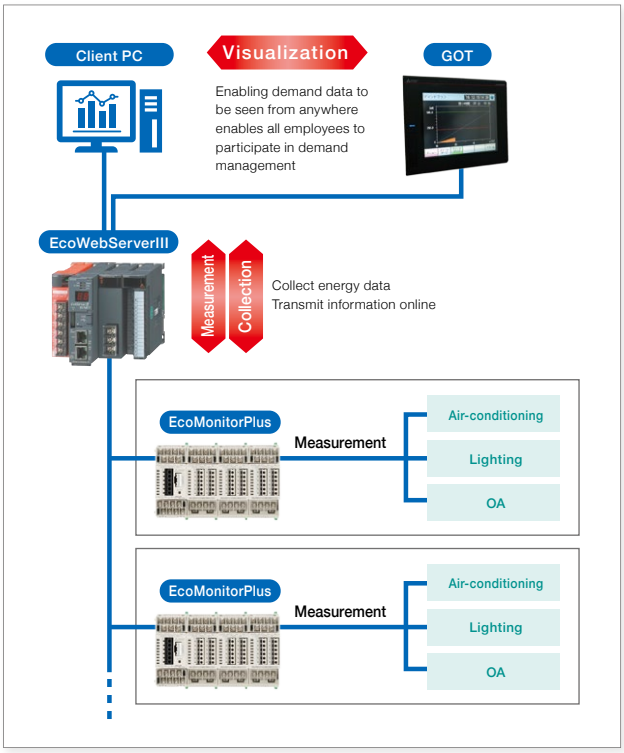
General Administration Building

24% less energy consumption

Fukuyama Works overall

Approx. 100 million yen annual reduction in costs

(base year: 1996, FY2010 results)



03 High-Efficiency Energy-savings Based on Production Status and Power Demand Forecasts

Fukuyama Works

3d

SMKL

Issues

Ongoing energy savings in smart meter production buildings overall

Solutions

- ☑ **Effective demand peak shift with power demand, weather information, etc. managed online**
- ☑ **Measure load current for each piece of production equipment and control air-conditioning and lighting while detecting the presence/absence of operators**

Benefits

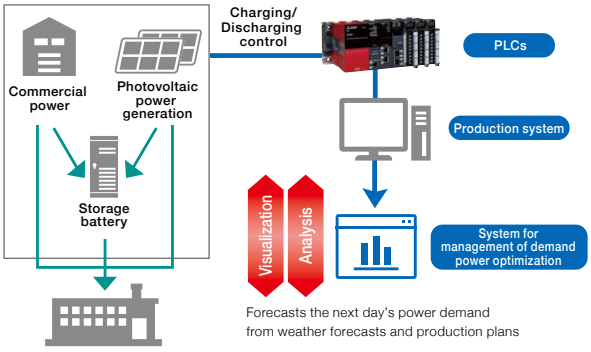
Air-conditioning/lighting Annual power consumption

Approx. 20% reduction

In monetary value

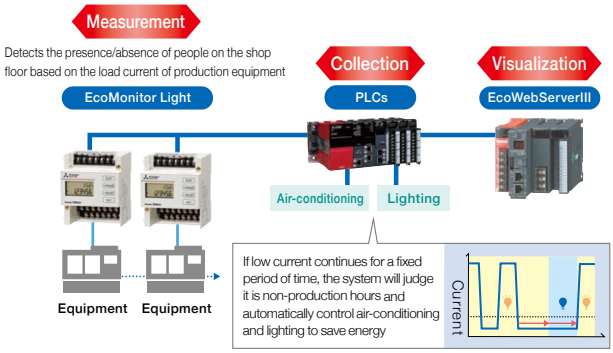
Achieve/maintain a reduction of approx. 500,000yen

Demand peak shift



Forecasts the next day's power demand from weather forecasts and production plans

Air-conditioning/Lighting control



Iida Factory of Mitsubishi Electric's Nakatsugawa Works introduced e-F@ctory and, as a result, reduced equipment downtime at low cost.

01 Reducing Equipment Downtime through Low-cost IoT Migration

Iida Factory of Nakatsugawa Works

3c

SMKL

Issues

Unable to achieve traceability, making improvement and quality control difficult

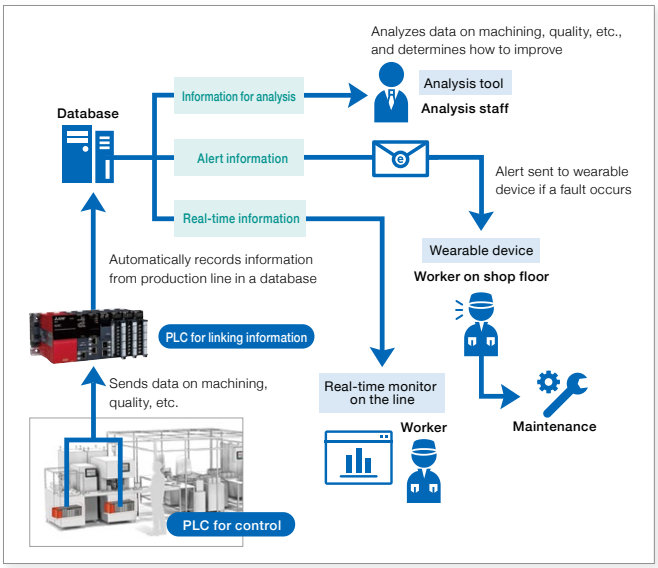
Solutions

- ☑ **When a fault related to equipment or quality occurs, an alert is sent to a device worn by a worker on the shop floor**
- ☑ **A traceability system was built to automatically record production line information in a database. Furthermore, by utilizing common tools, IoT was also achieved at low-cost**

Benefits

Equipment downtime

Approx. 25% reduction



Cases

FA Devices Linked with Cloud Realizes 24/7 Around-the-Clock Stable Operation of Logistics System

company Amazon Japan

Issues
- The company wanted to create a non-stop logistics system in order to efficiently deliver products to customers
- They wanted a solution to immediately discover warehouse errors and swiftly recover

Measure The MELSEC iQ-R PLC, which is connected to the industrial open network through CC-Link IE, collects and leverages operating information accumulated in the AWS cloud

Results
- Achieved 24/7 around-the-clock stable operation with high reliability and swift processing capability
- Visualized real-time operating data by gathering information in the cloud
- Detects device trouble in advance


Promoting paperless operations and centralized control of production information

株式会社スノウチ SUNOUCHI CORPORATION

company Sunouchi Corporation

Issues
- Unable to quickly provide answers regarding delivery dates due to paper-based information-sharing, therefore lose potential business
- Many foreign-national employees, therefore need to show clear numbers to achieve accurate operations
- Difficult to identify causal factors of rejects

Measure Systemization of production planning and connection to sales management system Collection of shop floor data with a PLC and handy terminal

Results
- Able to confirm everything in the system from delivery date response to production and shipment
- Automatic recording/sharing of performance in numerical form
- Identify causal factors through traceability connecting information on products and individual processes

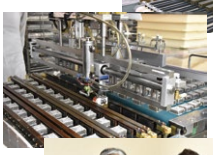

Leveraging IoT to Realize Cylinder Monitoring and Improve Cycle Time

company Takeuchi Seika Co., Ltd.

Issues
- The company wanted to improve productivity to deal with higher ingredients costs
- Continuous operation leads to lower equipment performance, which then results in a drop in production speed

Measure Built a cylinder monitoring system with the e-F@ctory Starter Package

Results
- Leveraged IoT to monitor operating speed of the air cylinder, which was the cause of reduced production capability
- Achieved at low cost by utilizing the sample program of the e-F@ctory Starter Package
- Improved productivity to exceed initial expectations, bringing positive effects to work style


Labor-saving

Reducing time required to build a machine tool operation monitoring system by approx. 83%!

company An electrical equipment/electronic manufacturer

Issues Company A, who has a production shop floor with machine tools made by multiple different manufacturers, wants to set up an operation monitoring system. When it tried setting up a monitoring system at another factory in the past, Company A incurred significant costs related to screen specification studies and studies into equipment data collection methods, so this time it was looking for a way to build a system fast and at a low cost.

Measure Company A introduced the Edgecross-compatible operation monitoring software "NC Machine Tool Optimizer" and the industrial PC "MELIPC" which enabled it to set up an operation monitoring system supporting machine tools made by multiple manufacturers

Results **Because screen design and development, as well as collecting data from different equipment became easier, the time required for specification studies and design work was significantly reduced, cutting system build time from 12 months to 2 months (approx. 83%) and reducing introduction costs by around 75%.**

NC Machine Tool Optimizer

Improving Productivity

Real-time monitoring increases factory operating ratio by 38%!

company An auto parts manufacturer

Issues Company A was considering a system to assess production plans and results, as well as operating status. Operators were tallying data on paper or in Excel spreadsheets but it wasn't until at least the following day that the status could be ascertained. Company A realized that it needed a system it could utilize to improve the production shop floor, not just tally data.

Measure Company A introduced Edgecross-compatible SCADA software "GENESIS64™" and industrial PC "MELIPC" to build an operation monitoring system using centrally collected data

Results **Now Company A can perform real-time monitoring of the operating status and quickly identify causes of short stoppages. Operating ratio has improved by around 90% by reducing downtime. The improvement has also led to an increase in production volume and productivity.**

Mitsubishi Electric SCADA software

GENESIS64™

Labor-saving

Utilizes AI to reduce working hours required for energy analysis by 92%!

company An electrical equipment/electronic manufacturer

Issues Company A was spending an excessive amount of time analyzing energy data collected at a substrate mounting line. Although the company had established a system to collect data that could be used for energy-saving, such as energy and production volume, there was a limit to the personnel resources that could be assigned to quantitatively grasp and analyze the vast amount of data in order to link it to improvements.

Measure Introduction of EcoAdviser, an Edgecross-compatible energy-saving support software

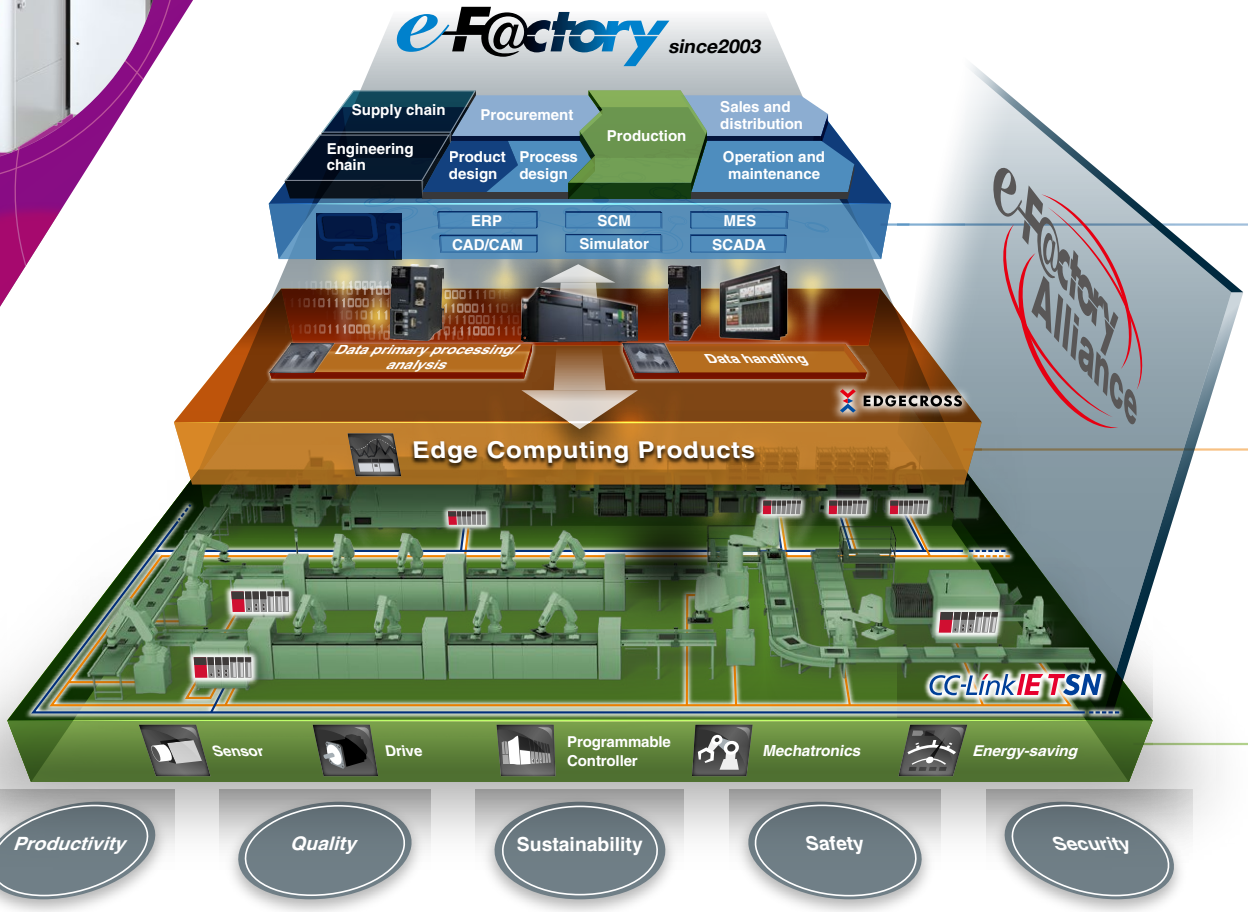
Results **Company A is now able to ascertain the current status of energy use. Furthermore, through the automatic energy loss extraction and diagnosis functions made possible by AI, it has become possible to estimate latent losses and factors in the process, and link them to concrete energy-saving activities.**

EcoAdviser

e-F@ctory

COMPONENTS

Introduction of Core Products/ Technologies



The Advanced Products, Software and Networks Behind e-F@ctory

The new e-F@ctory enables connectivity with an even higher number of devices and networks.
e-F@ctory goes beyond the barriers of companies and standards to connect a wide variety of devices and equipment to each other to make innovative monozukuri possible.

IT System

Mitsubishi Electric products contributing to the improvement (visualization) of the production shop floor by utilizing the SCADA and simulator software and cloud service.

3D Simulator
MELSOFT Gemini

Mitsubishi Electric SCADA software
GENESIS64™

Data science tool
MELSOFT MaiLab

Remote Service
iQ Care Remote4U

iQCare Remote4U

Edge Computing

Preventive maintenance, etc., is possible by analyzing data collected from the production shop floor (visualization) and instantly feeding the analysis results back to the shop floor. Moreover, data can be seamlessly linked with IT systems by carrying out primary processing of the collected data to give it meaning.

Open software platform

EDGECROSS

Edgecross-compatible Software

iQ Edgecross

Industrial PC MELIPC

MES interface product

OPC UA compatible product

Logging product

Windows® equipped product

C/C++ language compatible product

Shop Floor

These products collect various data in real-time and utilize it on the production shop floor.

e-F@ctory starter package

FA application package

iQ Monozukuri

FA products

Network

CC-Link IE TSN

Industrial PC

MELIPC Series MELIPC

EDGECROSS

Preinstallation of Edgecross data collector

Suited to the two applications of “real-time control” for control of devices, and “edge computing” to collect and analyze data in the edge layer. The extensive lineup features everything from high-end to low-range models, and contributes to improvements on the production shop floor through data utilization.

MI5000

- Equipped with Windows® and VxWorks®, integrates device control and information processing into one module
- High-accuracy device control with CC-Link IE Field Network

Real-time control application

Edge-computing application

Microsoft Azure Certified

MI3000/MI2000

MI3000 Able to display and operate data collected

MI3000 MI2000 Able to accumulate data analysis and large-capacity data

Edge-computing application

Microsoft Azure Certified

aws qualified device

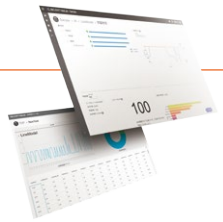
*MI2000: AWS qualified device for AWS IoT Greengrass

Edgecross-compatible Software

iQ Edgecross

Data science tool
MELSOFT MaiLab

Maisart



- Data analysis and diagnosis of production shop floor data without the need for specialized knowledge.
- Free system configuration enables data analysis and diagnosis in the optimal configuration.
- Graphical display function makes intuitive operation possible.

GOT2000-compatible HMI Software
GT SoftGOT2000

GT SoftGOT2000

- Able to use GOT2000 functions on a computer
- Able to reuse screen data from the GOT2000 Series
- Interconnectivity with other applications

CNC Operation Monitoring Software
NC Machine Tool Optimizer

- Achieves connection to a wide-range of manufacturers' machine tools.
- Enables overall monitoring through connection to multiple locations.
- Simplified diagnosis of downtime and trend analysis.
- Enables comparison and analysis of (actual) results with production plans.

Mitsubishi Electric SCADA software
GENESIS64™

GENESIS64™

- Enables monitoring of a wide variety of data from the shop floor
- Enables remote monitoring with 3D display and other forms of advanced visuals and web browser/mobile devices

Energy-saving support software
EcoAdviser

EcoAdviser

Maisart

- In addition to the imaging of collected energy data, effective energy-saving activities can be made by extracting energy loss by AI and diagnosing factors.

*Abbreviation of Mitsubishi Electric's AI creates the State-of-the-ART in technology.

MES Interface Products - Use databases without computers or programs

MELSEC iQ-R/MELSEC-Q Series PLC MES Interface Module

Directly connects PLCs and databases without using gateway computer or communication program.

- Directly transmits information collected from the production shop floor to a database.
- High-speed transmission of manufacturing results and receipt of recipe information.
- Optimal for building traceability systems.

Computerized Numerical Controller (CNC) M800/M80 Series MES Interface Function

CNC sends machining information and operation status of machine tools to MES.

- Enhances traceability and supports visualization of the entire factory.
- When machining is complete, etc., the information collected by the CNC is sent from the built-in MES interface to the database.
- Achieves visualization of operation status, as well as the visualization of machining results and alarm occurrence status.

GOT2000 HMI MES Interface Function Graphic Operation Terminal

The GOT2000 HMI collects and sends data to the MES from FA products connected to it.

- Collects data from existing equipment and other equipment that utilize third-party PLCs.
- Supports operators' tasks by providing access to a barcode reader, document viewer, or other such tools.
- Equipped with substantial information management functions characteristic of a display unit (HMI).

OPC UA Built-in Servers - Building secure systems

MELSEC iQ-R/iQ-F Series OPC UA Server Module

Simply setup using OPC UA communications.

- When designing manufacturing devices, it is possible to internally store and manage the data that is to be released using tag names and layered structures.
- OPC UA security functions can be set optionally on an as needed basis.
- Intuitive operation possible using a Wizard format and setup screen selection format.

High-Speed Logging of Shop Floor Information

MELSEC iQ-R/MELSEC-Q Series High-speed Data Logger Module

- Data logging synchronized with PLC scans.
- Swift problem-solving when trouble arises.
- Contributes to operational analysis, trend analysis and preventive maintenance of devices.

Information processing utilizing Windows®

MELSEC iQ-R Series WinCPU Module

- Easily build an IT system utilizing Windows®.
- Enables stable operation even in harsh production shop floors due to having robustness equivalent to a programmable controller.
- Can be developed on the shop floor, therefore reducing the risk of information leakage.

Performing Control, Information Processing and Host Communication Process with a C/C++ Programs

MELSEC iQ-R/MELSEC-Q Series C Controller Module

- Easy programming independent of the microprocessor.
- Parameter settings, diagnosis and monitoring with CW Configurator.
- Easy application development.

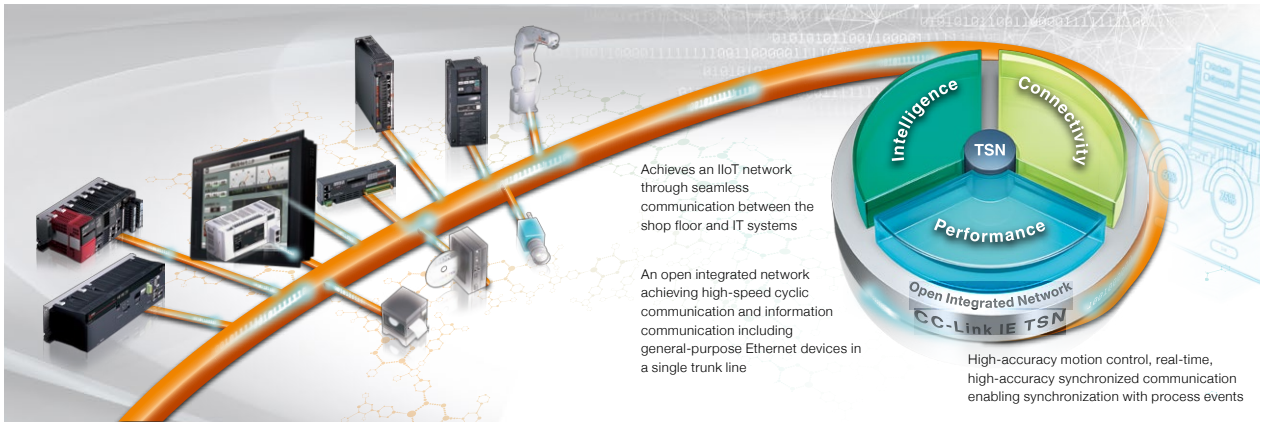
MELSEC iQ-R Series C Intelligent Function Module

- C/C++ supports complicated computation processing.
- Easy application development.
- Optimal for usage even in clean rooms which must be kept dust-free.

CC-Link IE TSN

Open integrated network connecting the production shop floor and IT systems

CC-Link IE TSN is a network achieving seamless communication using TSN technology and innovative communication protocols to collect data from various devices on the shop floor in real time and transmit it to IT systems, thereby creating new added value.



Performance

In today's production shop floor environments, there is a need to improve productivity and quality. As such, it is essential to have a network that can utilize AI and preventive maintenance to transmit high volumes of data to IT systems while performing high-speed, stable control.
CC-Link IE TSN uses an updated communication method to achieve significantly improved communication performance, therefore enabling high-accuracy motion control in addition to high-speed I/O control.

Intelligence

In industrial communications, to reduce overall cost, there is a need for intelligent networks that contribute to easy system construction and maintenance.
CC-Link IE TSN supports various convenient functions such as automatic generation of system configuration diagrams and batch distribution of network parameters, thereby significantly reducing system development costs and maintenance costs.

Connectivity

In order to achieve monozukuri at a more advanced level, there is a need for networks that can connect to various devices at the same time as securing real-time performance. CC-Link IE TSN makes it possible to combine general-purpose Ethernet communication and control communication, and connect to general-purpose Ethernet devices without impacting control communication.
Furthermore, it is possible to build a network compatible with various topologies; therefore, flexible IIoT systems can be built.

e-F@ctory Starter Package

The e-F@ctory Starter Package is a sample project for MELSEC iQ-R Series PLCs and GOT2000 Series HMIs. It shows how easy it is to achieve the low-cost implementation of IoT (easy data analysis, visualization, etc.) at the production shop floor level.

Utilization of IoT on the Shop Floor

Applying IoT technologies to the manufacturing industry, production equipment status, product manufacturing status and product quality status can all be understood in real-time, thus making it easy to provide feedback to equipment and workers, and achieve ongoing cost reduction throughout the entire production shop floor.

Supporting Implementation of IoT at the Production Shop Floor Level

Because programs for visualization, easy analysis, and other functions are provided in a sample project format, implementing IoT at the production shop floor level can be accomplished using only basic configurations such as device allocation and parameter settings.

Various Functions Incorporated

The e-F@ctory Starter Package incorporates various functions to implement IoT for production shop floor data through visualization, easy analysis, and other means, and can be easily matched for use with customers' applications.

Achieving IoT with Minimal Impact on Existing Equipment

By adding a PLC and HMI embedded with the e-F@ctory Starter Package, it is easy to implement IoT on the production shop floor with minimal impact on existing equipment.

e-F@ctory Starter Package GOT HMI example

Cylinder plan monitor/cycle monitor

Vibration analysis

MT method

Equipment trouble Pareto diagram

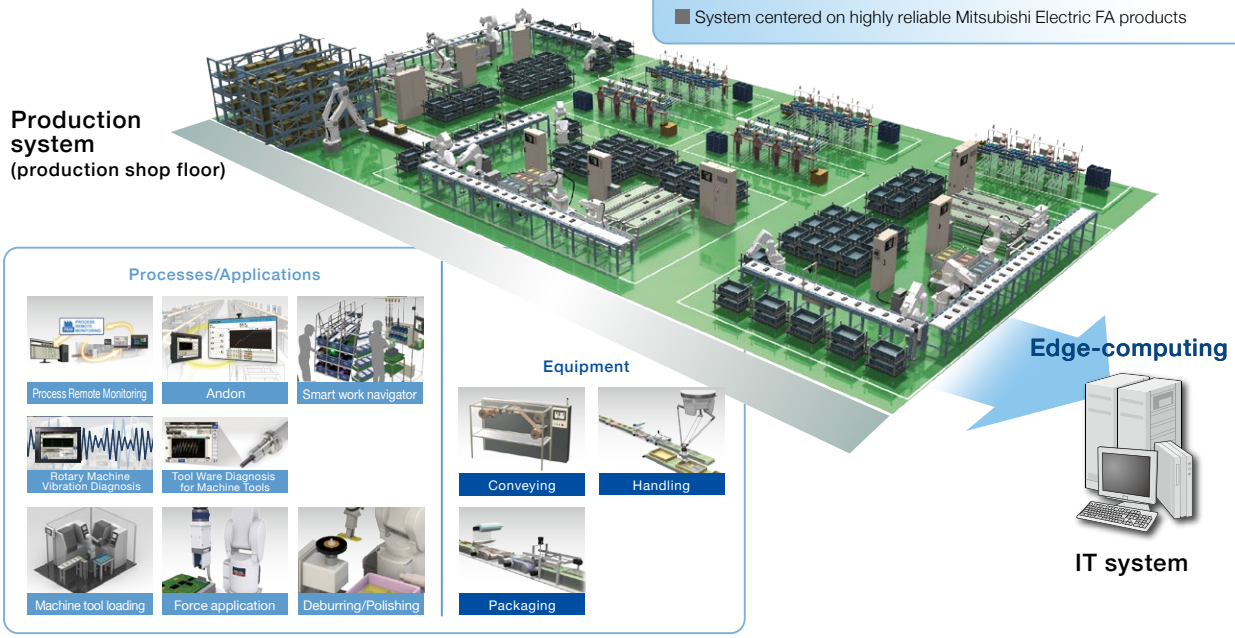
Mitsubishi Electric FA Application Package iQ Monozukuri

iQ Monozukuri is a step towards realizing e-F@actory by merging production shop floors and IT systems via open integrated networks.

The iQ Monozukuri FA application package helps customers find solutions to various monozukuri issues they are confronted with, and is an optimal product with the know-how that makes it possible to introduce, expand, operate and maintain efficient systems.

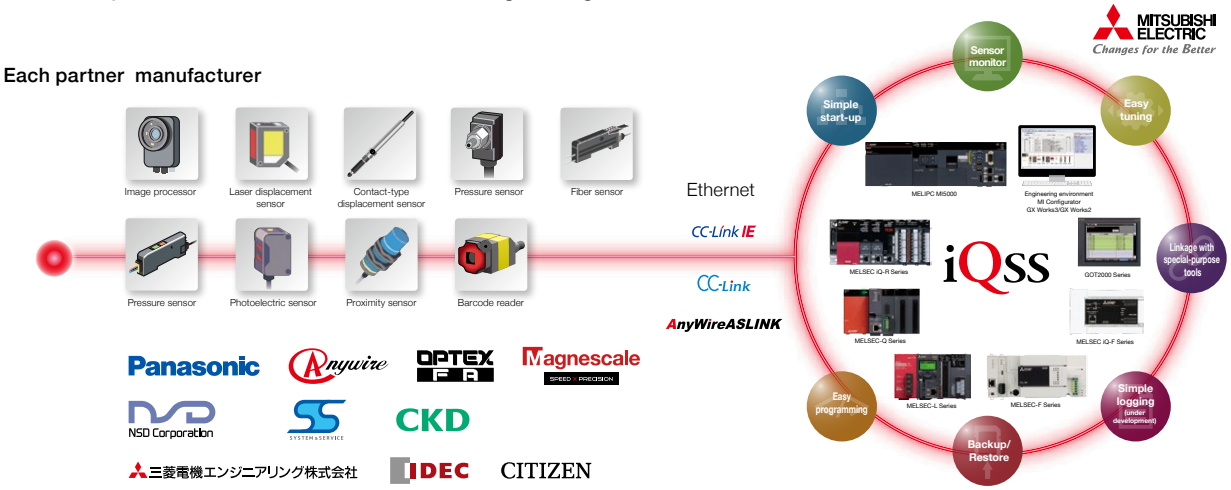
What iQ Monozukuri Provides

- Lineup of a myriad of applications for each process, application, and piece of equipment
- Monozukuri know-how and ideas cultivated by Mitsubishi Electric and its partners over many years
- System centered on highly reliable Mitsubishi Electric FA products



iQSS (iQ Sensor Solution)

Set sensors, perform maintenance, etc. using a single tool. IQSS helps customers reduce total cost of operation through connectivity between sensors, PLCs, HMIs and engineering environments.



Reducing Overall Cost of Sensor Systems

MELSENSOR

MELSENSOR makes it possible to reduce the overall cost of sensor systems, including costs related to design, start-up, operation and maintenance, utilizing automatic sensor detection, address change and tool connectivity functions.

iQ Care Remote4U

This service utilizes IoT to collect and accumulate various information from laser processing and electrical-discharge machines, thereby enabling real-time confirmation and diagnosis from a remote location. It is possible to confirm system faults, or signs thereof, and estimate machining time in real-time using a mobile terminal such as a computer, smartphone, etc.

Remote Diagnosis Function

Connects directly from a terminal installed in a service center to customers' processing machines for rapid support through remote diagnosis. Supports changes to machining conditions, analysis of alarm content, and provision of preventive maintenance information.

Dashboard Function

Enables confirmation of processing machine operating information in real-time via a computer or smartphone. Collects, accumulates, and performs central management of operating/cost information from multiple units. Contributes to production process improvement and operating cost reduction through visualization-based analysis.

MELSOFT Gemini

Pre-verification is performed in the digital space of a virtual factory or equipment line.
This significantly reduces cost and time during the design phase.

Concern 1

Want to build a highly productive line.

Productivity can be verified in advance and easy to understand the result with visualizations before the actual operation.

Enable to build a highly productive line!

Concern 2

Actual on-site adjustment takes a huge amount of time which majorly delays launch.

Pre-verification of mechanical operations in a digital space is possible with a control program.

Shorter on-site adjustment period!

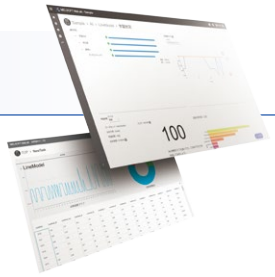
Concern 3

Not possible to verify line/equipment defects during operation without visiting site.

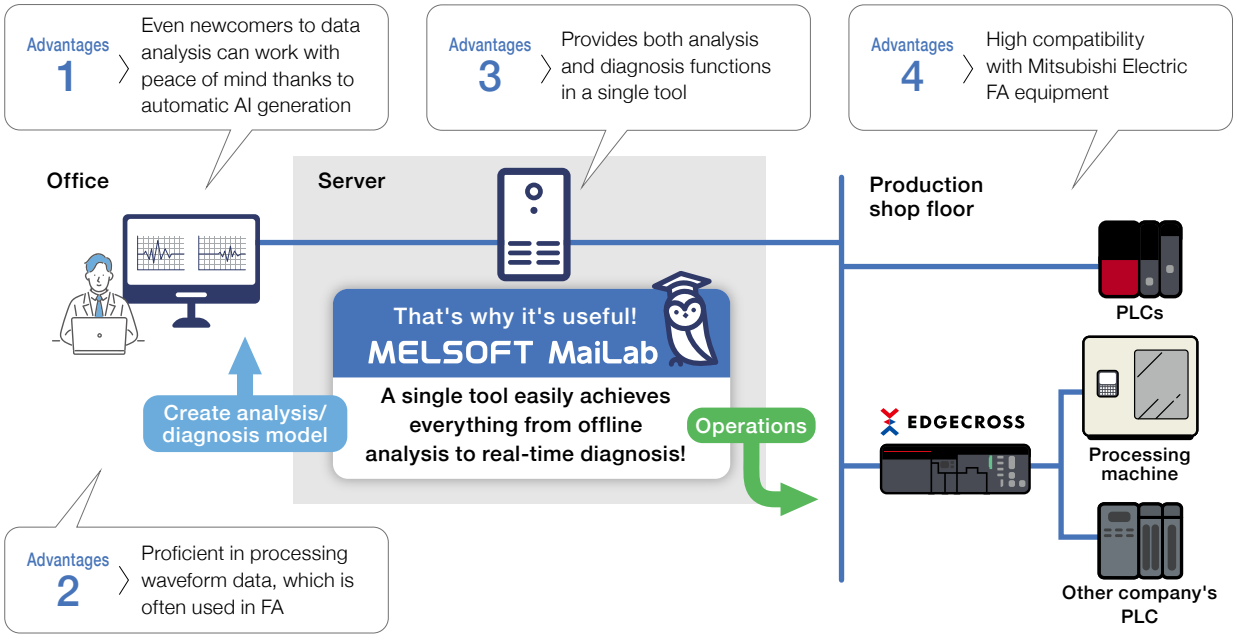
Reproduce remote line/equipment conditions.

Effective troubleshooting!

MELSOFT MaiLab



MELSOFT MaiLab is a data science tool that further improves manufacturing by converting human "intuition" and "experience" into digital technology that can be easily integrated into control systems.



GENESIS64™

GENESIS64™

We use data that was not previously visible to help customers improve their business activities. GENESIS64™ is an IoT platform that centrally manages FA and IT data to monitor and analyze various types of data. We provide monitoring and integration solutions optimal for customer needs, such as factory automation, smart building construction, and social infrastructure system establishment.

Want to improve efficiency of monitoring and operation tasks

- Synchronized monitoring on a single screen when a 3D graphic screen is used
- Confirm necessary information together with a multi-monitor, multi-view display function
- Transmit information instantly with an email function and new push notification

Want to promote energy savings

- Visualization of energy consumption/CO_2 emissions for overall system and individual devices

Want to build a highly reliable system

- Duplication of data collection servers (collector) and data storage servers (logger)
- MC Historian enables prolonged period logging, even for large-volume data

Want to perform wide-range monitoring over multiple plants

- Real, wide-range monitoring possible by utilizing map data
- Guard customers' valuable data through safe communications and cloud environments

Want to improve operating rate

- Prevent trouble leading to prolonged equipment stoppages
- Rapid cause identification by customers through know-how accumulation

Want to improve the efficiency of equipment operation

- Improve system operations by centrally managing and making data visible

PARTNERS

Partners

MITSUBISHI ELECTRIC

Broad knowledge and skill as a comprehensive FA manufacturer

e-F@ctory Alliance

Software Partner

SI Partner

Device Partner

Know-how of all fields relating to monozukuri

Co-creation

Customer

Giving customers back the values born from co-creation

e-F@ctory Ecosystem – Co-creation with over 1,000 Partners*

As a solutions provider, we collaborate with many partners across all monozukuri fields. This ecosystem provides optimal solutions in various regions and fields in response to the issues experienced by our customers.

*As of December 2022

SI Partner

Producing entire production systems
Achieving advanced systems integration


IT


Production shop floor

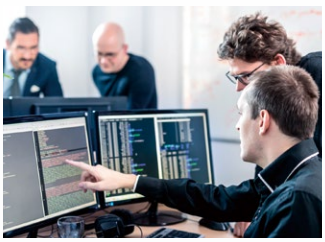

Robots

Software Partner

Development of application software strengthening connection affinity with Mitsubishi Electric FA devices


ERP/MES/SCADA


CAD/CAM/3D simulator


Data analysis

Device Partner

Provide device compatibility with Mitsubishi Electric FA equipment
Achieve improved system builds and maintainability


Sensors


RFID


Related network devices

Factory Automation Global website

Mitsubishi Electric Factory Automation provides a mix of services to support its customers worldwide. A consolidated global website is the main portal, offering a selection of support tools and a window to its local Mitsubishi Electric sales and support network.

From here you can find:

- Overview of available factory automation products
- Library of downloadable literature
- Support tools such as online e-learning courses, terminology dictionary, etc.
- Global sales and service network portal
- Latest news related to Mitsubishi Electric factory automation

Mitsubishi Electric Factory Automation Global website:

www.MitsubishiElectric.com/fa

Online e-learning

An extensive library of e-learning courses covering the factory automation product range has been prepared. Courses from beginner to advanced levels of difficulty are available in various languages.

Beginner level

Designed for newcomers to Mitsubishi Electric Factory Automation products gaining a background of the fundamentals and an overview of various products related to the course.

Basic to Advanced levels

These courses are designed to provide education at all levels. Various different features are explained with application examples providing an easy and informative resource for in-house company training.

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions or other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; or any other duties.

⚠ For safe use

- To use the products given in this publication properly, always read the relevant manuals before beginning operation.
- The products have been manufactured as general-purpose parts for general industries, and are not designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger-carrying vehicles, consult with Mitsubishi Electric.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

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

Country/Region	Sales office	Tel/Fax
USA	MITSUBISHI ELECTRIC AUTOMATION, INC. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100 Fax : +1-847-478-2253
Mexico	MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch Boulevard Miguel de Cervantes Saavedra 301, Torre Norte Piso 5, Ampliacion Granada, Miguel Hidalgo, Ciudad de Mexico, Mexico, C.P.115200	Tel : +52-55-3067-7512
Brazil	MITSUBISHI ELECTRIC DO BRASIL COMERCIO E SERVICOS LTDA. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brasil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
Germany	MITSUBISHI ELECTRIC EUROPE B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-7780
UK	MITSUBISHI ELECTRIC EUROPE B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780 Fax : +44-1707-27-8695
Ireland	MITSUBISHI ELECTRIC EUROPE B.V. Irish Branch Westgate Business Park, Ballymount, Dublin 24, Ireland	Tel : +353-1-4198800 Fax : +353-1-4198890
Italy	MITSUBISHI ELECTRIC EUROPE B.V. Italian Branch Centro Direzionale Colleoni - Palazzo Sirio, Viale Colleoni 7, 20864 Agrate Brianza (MB), Italy	Tel : +39-039-60531 Fax : +39-039-6053-312
Spain	MITSUBISHI ELECTRIC EUROPE, B.V. Spanish Branch Carretera de Rubi, 76-80-Apdo. 420, E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-935-65-3131 Fax : +34-935-89-1579
France	MITSUBISHI ELECTRIC EUROPE B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68 Fax : +33-1-55-68-57-57
Czech Republic	MITSUBISHI ELECTRIC EUROPE B.V. Czech Branch, Prague Office Pekarska 621/7, 155 00 Praha 5, Czech Republic	Tel : +420-255-719-200
Poland	MITSUBISHI ELECTRIC EUROPE B.V. Polish Branch ul. Krakowska 48, 32-083 Balice, Poland	Tel : +48-12-347-65-00
Sweden	MITSUBISHI ELECTRIC EUROPE B.V. (Scandinavia) Hedvig Mollersgata 6, 223 55 Lund, Sweden	Tel : +46-8-625-10-00 Fax : +46-46-39-70-18
Russia	MITSUBISHI ELECTRIC (RUSSIA) LLC St. Petersburg Branch Piskarevsky pr. 2, bld 2, lit “Sch”, BC “Benua”, office 720; 195027 St. Petersburg, Russia	Tel : +7-812-633-3497 Fax : +7-812-633-3499
Turkey	MITSUBISHI ELECTRIC TURKEY ELEKTRIK URUNLERI A.S. Serifali Mahallesi Kale Sokak No:41 Umraniye / Istanbul	Tel : +90-216-969-2500 Fax : +90-216-661-4447
UAE	MITSUBISHI ELECTRIC EUROPE B.V. Dubai Branch Dubai Silicon Oasis, P.O.BOX 341241, Dubai, U.A.E.	Tel : +971-4-3724716 Fax : +971-4-3724721
South Africa	ADROIT TECHNOLOGIES 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100 Fax : +27-11-658-8101
China	MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. 7F to 9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9569 Fax : +82-2-3664-8372
Singapore	MITSUBISHI ELECTRIC ASIA PTE. LTD. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308 Fax : +65-6476-7439
Thailand	MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO., LTD. 101, True Digital Park Office, 5th Floor, Sukhumvit Road, Bang Chak, Prakanong, Bangkok, Thailand	Tel : +66-2682-6522-31 Fax : +66-2682-6020
Vietnam	MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED 11th & 12th Floor, Viettel Tower B, 285 Cach Mang Thang 8 Street, Ward 12, District 10, Ho Chi Minh City, Vietnam	Tel : +84-28-3910-5945 Fax : +84-28-3910-5947
Indonesia	PT. MITSUBISHI ELECTRIC INDONESIA Gedung Jaya 8th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-31926461 Fax : +62-21-31923942
India	MITSUBISHI ELECTRIC INDIA PVT. LTD. Pune Branch Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune-411026, Maharashtra, India	Tel : +91-20-2710-2000 Fax : +91-20-2710-2100
Australia	MITSUBISHI ELECTRIC AUSTRALIA PTY. LTD. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

www.MitsubishiElectric.com

L(NA)16012E-N 2302〈IP〉

New publication, effective Feb. 2023.
Specifications are subject to change without notice.