MITSUBISHI ELECTRIC
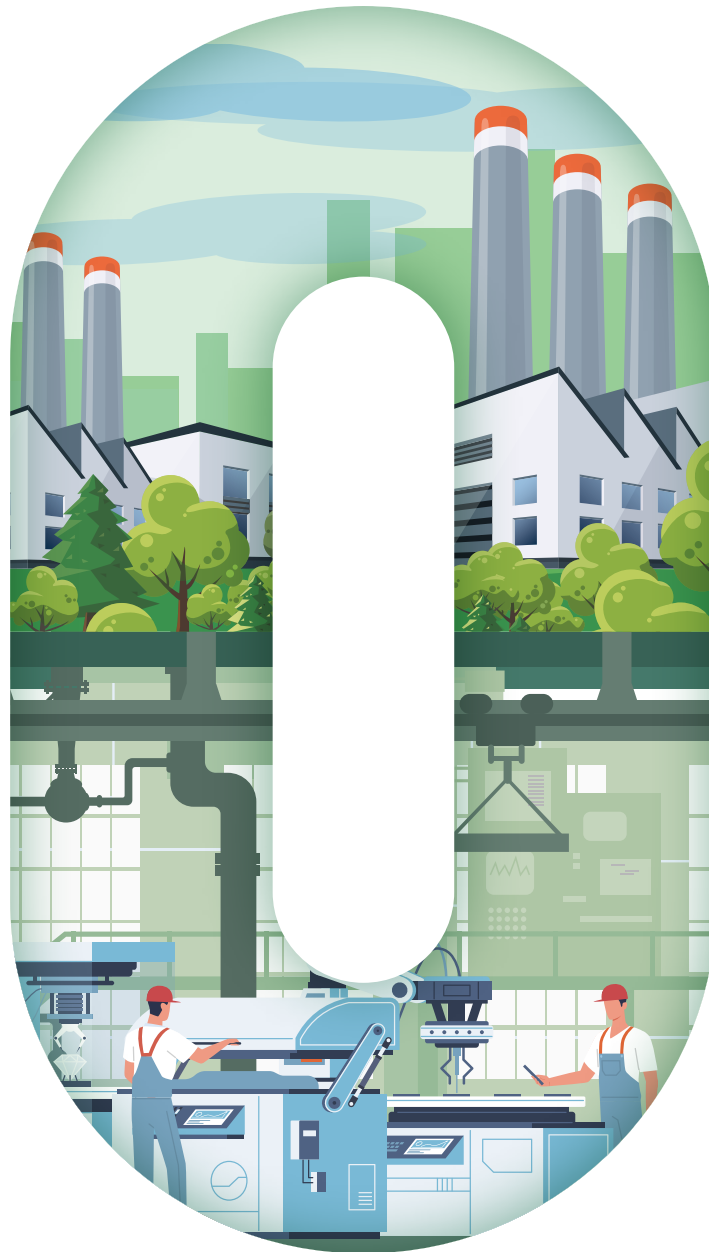*Changes for the Better*

FACTORY AUTOMATION

CARBON NEUTRAL SOLUTIONS

e-F@ctory

Toward Manufacturing in a Decarbonized Society

GLOBAL IMPACT OF MITSUBISHI ELECTRIC

Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

"Changes for the Better" represents the Mitsubishi Electric Group's attitude to "always strive to achieve something better", as we continue to change and grow. Each one of us shares a strong will and passion to continuously aim for change, reinforcing our commitment to creating "an even better tomorrow".

Our advances in AI and IoT are adding new value to society in diverse areas from automation to information systems. The creation of game-changing solutions is helping to transform the world, which is why we are honored to be recognized in the 2019 "Forbes Digital 100" as one of world's most influential digital corporations.

#41
2019 Forbes
TOP 100 DIGITAL COMPANIES

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.

FA-IT Integrated Solution

e-F@ctory

The "e-F@ctory" FA-IT integrated solution proposes ways of utilizing FA and IT technologies that reduce the total cost of development, production, and maintenance activities, continuously support customer kaizen activities, and promote monozukuri that is one step ahead.
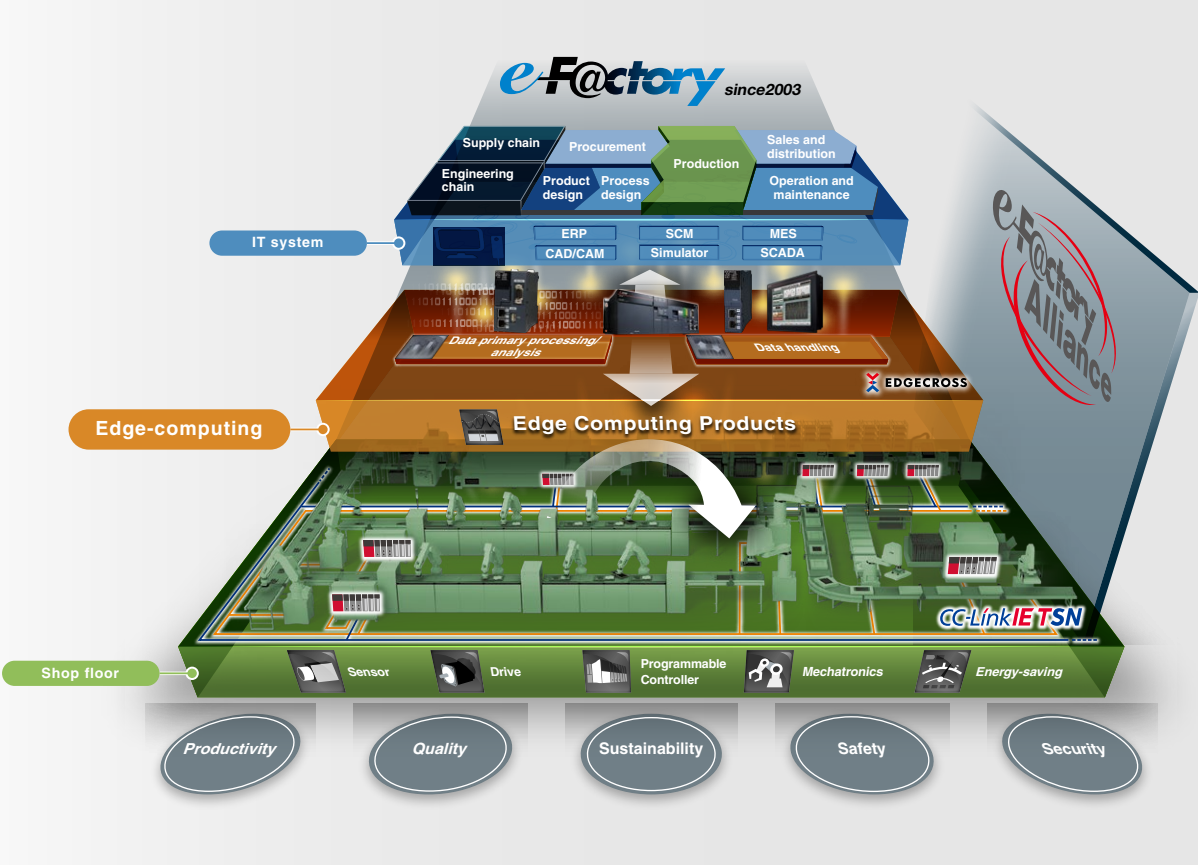

INDEX

Aiming for a decarbonized society

Introduction of renewable energy

By voluntarily introducing equipment to create renewable energy, such as solar power, as well as purchasing renewable energy, manufacturers will replace the CO_2 we emit with renewable energy and contribute to CO_2 reduction.

It is also crucial to use renewable energy without waste by optimizing power interchange and storage battery operation between sites.

Power interchange

Storage battery operation

CREATE
renewable energy

BUY
renewable energy

USE
without waste

Factory
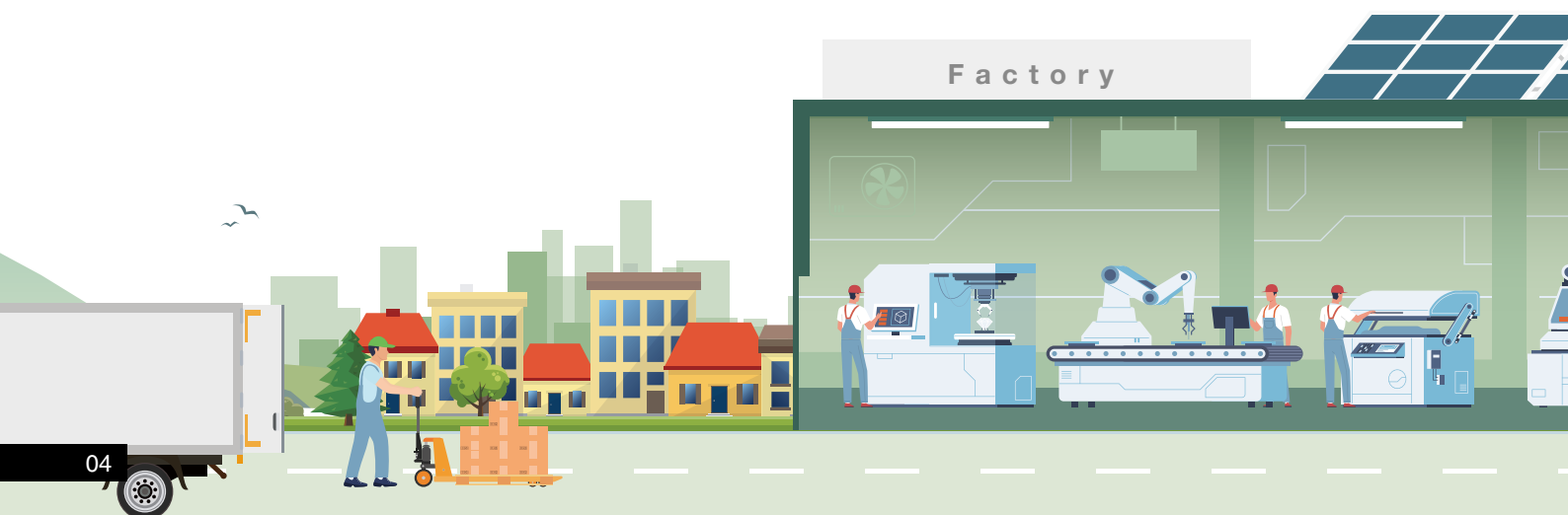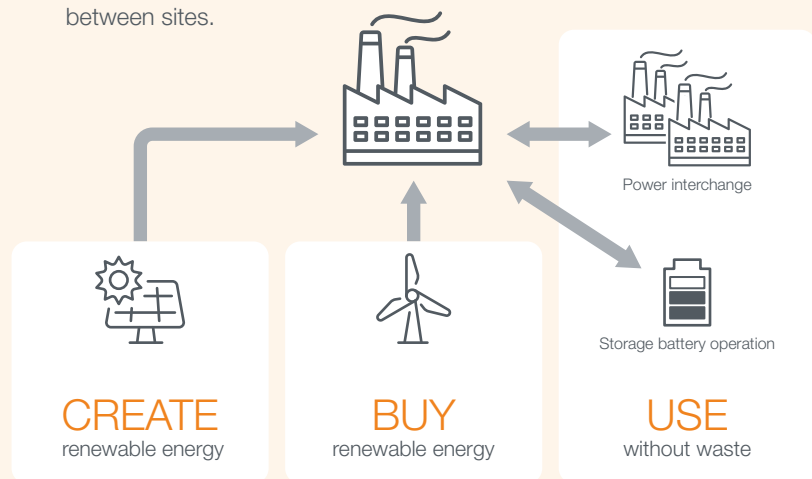
As a leading manufacturer, Mitsubishi Electric considers contributing to carbon neutrality our major mission.

In addition to FA equipment and power distribution control equipment,

we support our customers' sustainable business activities by utilizing IoT platforms as well as applications

for visualization, analysis, and diagnosis.

Achieving carbon neutrality
(Net-zero CO_2 emissions)

CO_2
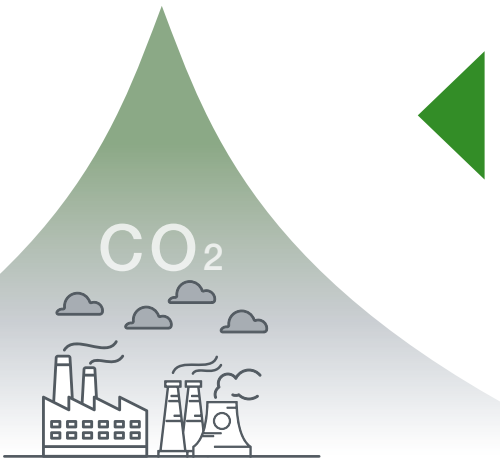
Promotion of energy saving

We will reduce energy consumption and CO_2 emissions by introducing high-efficiency equipment and improving its operation in order to maximize energy efficiency.
In addition, reducing energy consumption can help cover the increased costs of purchasing relatively expensive renewable energy.

REDUCE
energy costs
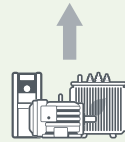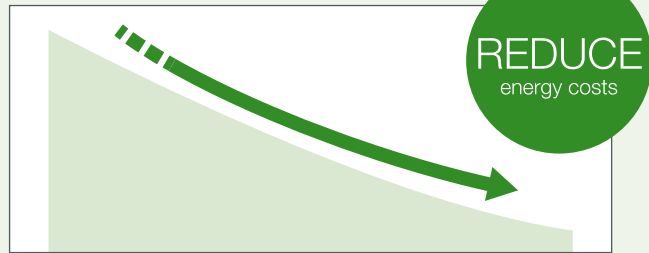
Introduction of high-efficiency equipment

Operational improvements

In this catalog, we propose solutions to reduce both CO_2 emissions and energy costs by promoting energy saving.

Mitsubishi Electric Carbon Neutral Solutions

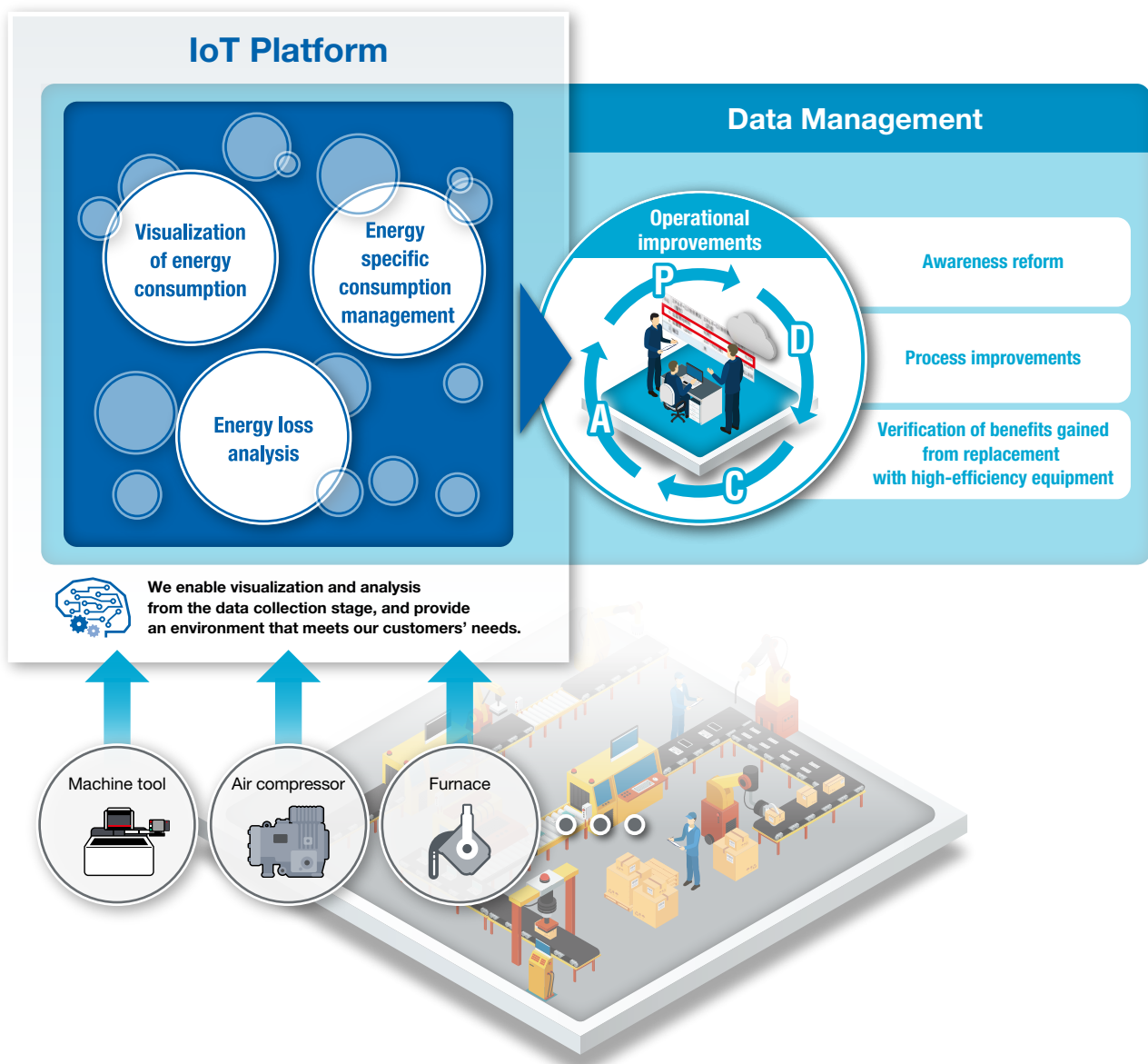Mitsubishi Electric provides carbon neutral solutions by not only offering equipment that efficiently uses energy (our high-efficiency equipment product lineup), but also by supporting continuous improvement activities through data management (data collection, visualization, analysis, and diagnosis).

IoT Platform

- Visualization of energy consumption
- Energy specific consumption management
- Energy loss analysis

We enable visualization and analysis from the data collection stage, and provide an environment that meets our customers' needs.

Data Management

Operational improvements

P D C A

- Awareness reform
- Process improvements
- Verification of benefits gained from replacement with high-efficiency equipment
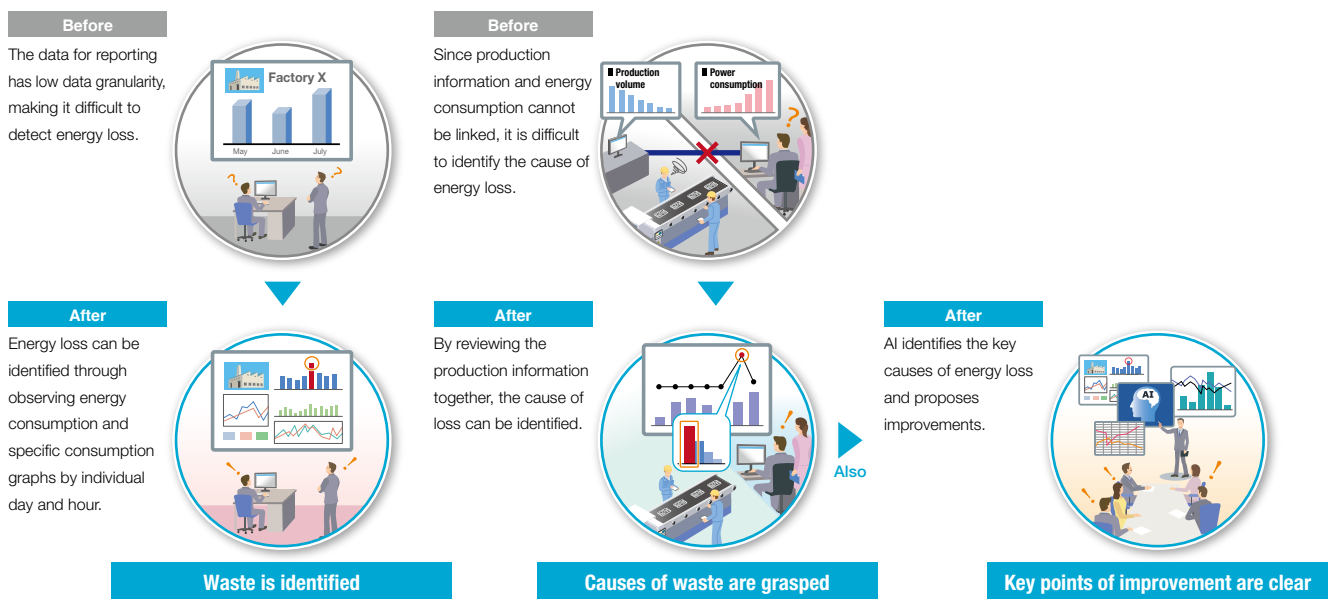
Machine tool

Air compressor

Furnace

Data Management is indispensable for continuous reduction of CO_2 emissions.

Operational improvements through data management contribute to the continuous reduction of CO₂ 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.

Before

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

Before

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

After

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

After

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

After

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

Also

Waste is identified

Causes of waste are grasped

Key points of improvement are clear

CASE INDEX

Visualization	Analysis	Diagnosis	Improvement

Buildings and Utility Equipment

CASE 1

To automatically collect and manage CO_2 emissions from electricity, gas, and heavy oil

The higher-ups are saying "Strengthen management to reduce CO_2 emissions!" but where should we begin?
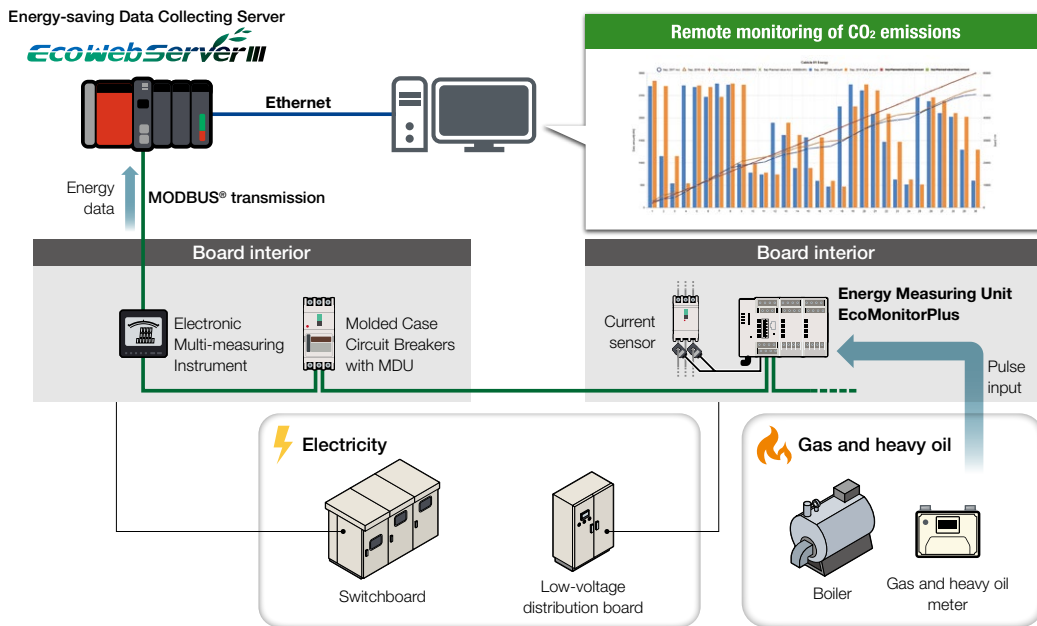
Solution

- Measures the amount of electricity, gas, and heavy oil used in the factory with various measuring instruments
- Measured data is automatically collected by a special-purpose data collection server, and CO_2 emissions are checked on a special-purpose screen on a web browser

EcoWebServerⅢ, an Energy-saving Data Collection Server, provides a solution for CO_2 emissions management

Electrical equipments, such as sweitchboards and switchboards and low-voltage distribution boards, as well as gas and heavy oil consumed in boilers, etc., are measured.
The energy data collected by EcoWebServerⅢ is used in calculations with CO_2 conversion factors to manage CO_2 emissions.

Energy-saving Data Collecting Server

EcoWebServerⅢ

Remote monitoring of CO_2 emissions

Ethernet

Energy data

MODBUS® transmission

Board interior

Electronic Multi-measuring Instrument

Molded Case Circuit Breakers with MDU

Board interior

Current sensor

Energy Measuring Unit EcoMonitorPlus

Pulse input

⚡ Electricity

Switchboard

Low-voltage distribution board

🔥 Gas and heavy oil

Boiler

Gas and heavy oil meter

Benefits

- Energy management is centralized by measuring electricity with measuring instruments suited to the site and collecting the amount of gas, heavy oil, etc. consumed
- By automating data collection and CO_2 conversion, the amount of labor time required to aggregate energy and CO_2 emissions is reduced

Product and Solution Introduction

Visualization	Analysis	Diagnosis	Improvement

Buildings and Utility Equipment

CASE 2

To reform employee awareness of energy saving by disclosing energy information internally

In order to reduce CO_2 emissions,
we would like all employees to have a higher awareness of energy saving.
Is there a good way of doing this?

Solution

- Review energy data and CO_2 emissions in an Energy Saving Software
- Easily create reporting materials for CO_2 emissions reduction activities using a dashboard screen

EcoAdviser, an Energy Saving Support Software, provides a solution for energy data utilization

Energy-saving Data Collecting Server
EcoWebServerIII

Energy Saving Support Software
EcoAdviser
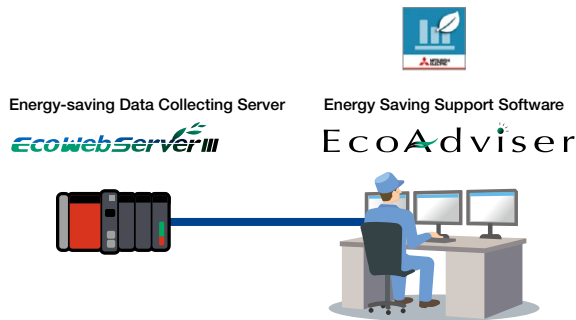
Reports that were previously created by data input and aggregation in Excel® are processed and pasted by the dashboard

▶ Aggregation in Excel®   ▶ EcoAdviser

Alleviates the burden of data aggregation and graph creation

CO_2 emissions of entire factory and individual building

Business operators and managers

CO_2 emissions by individual department, line and product type

Production shop floor

Benefits

- Effectively supports employees' awareness of CO_2 emissions reduction and energy saving by preparing the dashboard with consideration to the people viewing it
- Reduces labor time for preparing materials such as internal reports on the results of CO_2 emissions reduction

Product and Solution Introduction

Visualization | Analysis | Diagnosis | Improvement

Production Lines and Equipment

CASE 3 — To grasp wasted energy consumption

Even if we know how much our energy consumption is, we don't know whether energy is being consumed correctly according to fluctuations in production volume.

Solution

- By attaching an energy measuring module to a vacant slot of an existing programmable controller, energy data can be collected in addition to production data
- Free sample projects of the programmable controller and display device enable users to easily check production volume, electrical energy, and specific consumption

e-F@ctory Starter Package provides a solution for energy specific consumption management by individual process

Specific consumption management

This function calculates the intensity from the power consumption and number of production, and identifies improvements such as wasted power consumption of equipment.

Specific consumption

Electrical energy

Production volume
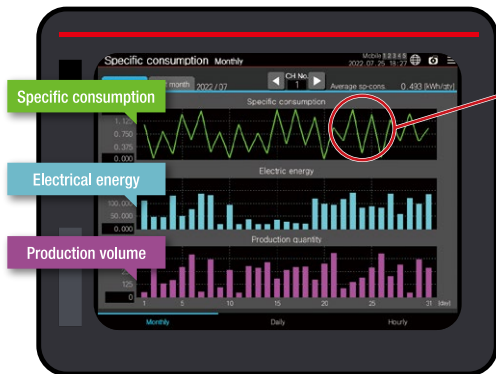
GOT2000

Can detect worsening of specific consumption in a glance
(Example: Electrical energy is almost constant even though production volume is low)

Can identify areas for improvement

Reduce time spent on improvement activities

MELSEC iQ-R
Energy measuring module
Voltage
Electrical current — Current sensor
Programmable controller
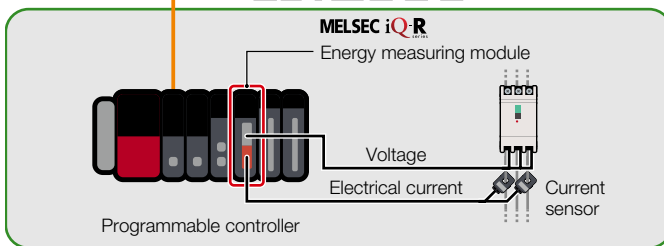
Benefits

- The module is attached to an empty slot of the programmable controller and can perform measurements with a small footprint and minimal installation work
- Enables management of energy specific consumption, thus contributing to improvement activities on the production shop floor

Product and Solution Introduction

Visualization	Analysis	Diagnosis	Improvement

Production Lines and Equipment

CASE 4

To analyze the energy loss of production facilities and reduce CO_2 emissions

We want to reduce the amount of CO_2 emitted during production, but we don't even have time to check the data in the first place, so we don't know where the waste is.

Solution

- AI automatically extracts energy loss for each device process and its associated causes
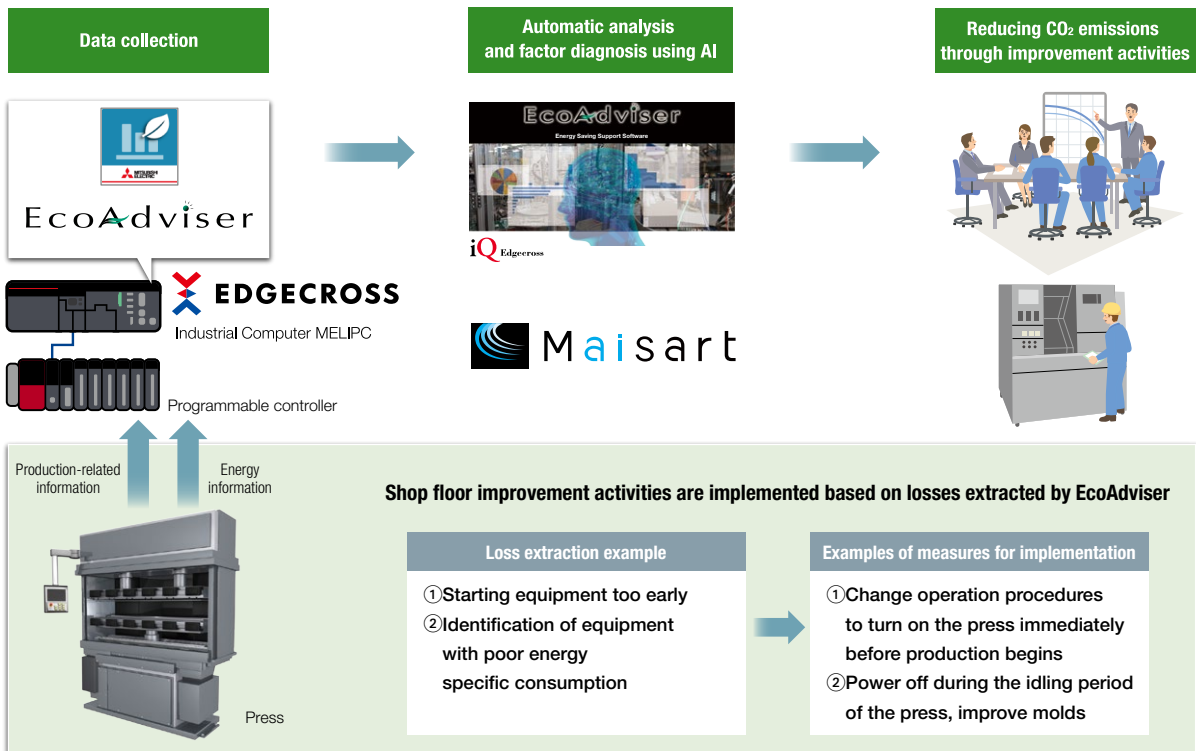- Improvement activities are implemented based on diagnosis results of the automatically extracted loss factors

EcoAdviser's AI function provides a solution for CO_2 emissions loss analysis and diagnosis

Data collection	Automatic analysis and factor diagnosis using AI	Reducing CO_2 emissions through improvement activities

EcoAdviser

EDGECROSS
Industrial Computer MELIPC

Programmable controller

EcoAdviser
Energy Saving Support Software

iQ Edgecross

Maisart

Production-related information

Energy information

Press

Shop floor improvement activities are implemented based on losses extracted by EcoAdviser

Loss extraction example	Examples of measures for implementation
①Starting equipment too early ②Identification of equipment with poor energy specific consumption	①Change operation procedures to turn on the press immediately before production begins ②Power off during the idling period of the press, improve molds

Benefits

- Through automatic analysis, AI finds the waste hidden in production equipment difficult for humans to detect
- AI identifies loss factors then implements appropriate countermeasures, thus reducing labor time conventionally required for such tasks

Product and Solution Introduction

Visualization | Analysis | Diagnosis | Improvement

Entire Factory

CASE 5

To reduce CO_2 emissions throughout the company and aim to increase corporate value

We want to reduce CO_2 emissions by checking information on energy waste at each site in real time, then implementing the necessary countermeasures

We want to identify the causes of energy loss on each production shop floor and use that information for improvement activities

Solution

● Use cloud-based SCADA to perform batch monitoring of energy information and production information collected from each site

Solution

● At each site, customers monitor and analyze various data on SCADA to identify causes of energy loss

GENESIS64™ provides a solution for advanced monitoring and analysis

Centralized management of information from all sites

Occupancy rate of each site, energy consumption, etc.

GENESIS64™

Locations with high CO_2 emissions can be easily identified from AssetWorX's tree structure
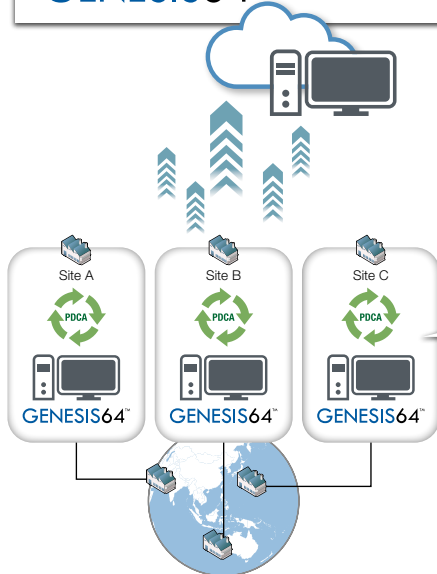
Feedback to each site

Site A   Site B   Site C

PDCA   PDCA   PDCA

GENESIS64™   GENESIS64™   GENESIS64™

Analysis of energy loss factors at each site

GraphWorX, Energy AnalitiX, etc.

Identify factors on a Pareto chart

Improvement activities

Benefits

● Monitor the energy information of each site, analyze the energy loss of each line throughout the company, and support improvement activities in factories

Product and Solution Introduction
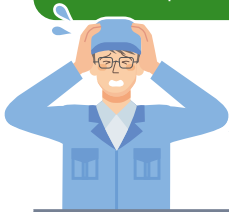
▶ SCADA GENESIS64™   P. 24

Buildings

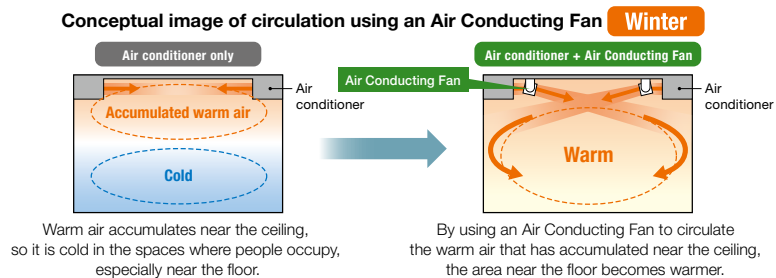## CASE 6 — To eliminate temperature unevenness and achieve energy saving at the same time

> The building is large that the air conditioning isn't evenly distributed (Some areas are hot while some are cold).
> We want to save more energy, but we can't sacrifice comfort.

Solution

- An air conditioner and Air Conducting Fan are used in combination to firmly circulate cold and warm air even in large spaces
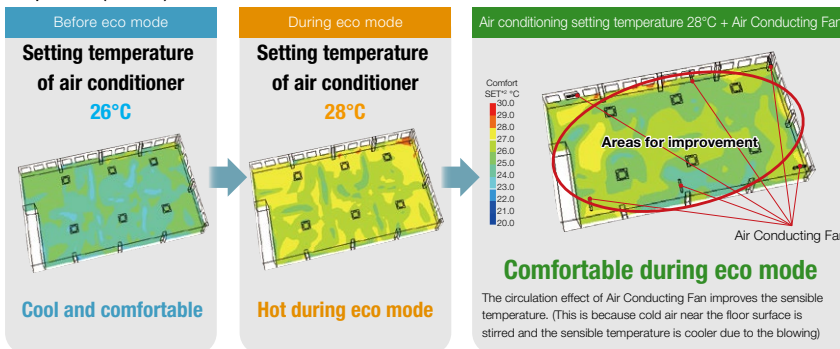- Achieving energy saving while maintaining comfort by increasing heating and cooling efficiency

Circulation effect improves indoor temperature distribution

Air Conducting Fan
+
Air conditioner

Conceptual image of circulation using an Air Conducting Fan — Winter

Air conditioner only
- Accumulated warm air
- Cold
- Air conditioner

Air conditioner + Air Conducting Fan
- Air Conducting Fan
- Warm
- Air conditioner

Warm air accumulates near the ceiling, so it is cold in the spaces where people occupy, especially near the floor.

By using an Air Conducting Fan to circulate the warm air that has accumulated near the ceiling, the area near the floor becomes warmer.
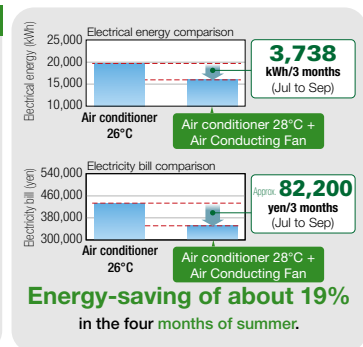
Even if the setting temperature of the air conditioner is changed, it is possible to save energy and electricity effortlessly while maintaining comfort

Simulation of benefits*1*3 — Summer

Temperature (comfort) simulation

Before eco mode
Setting temperature of air conditioner **26°C**
Cool and comfortable

During eco mode
Setting temperature of air conditioner **28°C**
Hot during eco mode

Air conditioning setting temperature 28°C + Air Conducting Fan
Comfort SET*2 °C: 30.0, 29.0, 28.0, 27.0, 26.0, 25.0, 24.0, 23.0, 22.0, 21.0, 20.0
Areas for improvement
Air Conducting Fan

Comfortable during eco mode
The circulation effect of Air Conducting Fan improves the sensible temperature. (This is because cold air near the floor surface is stirred and the sensible temperature is cooler due to the blowing)

Energy-saving and cost-saving benefits

Electrical energy comparison (kWh)
Air conditioner 26°C | Air conditioner 28°C + Air Conducting Fan
3,738 kWh/3 months (Jul to Sep)

Electricity bill comparison (yen)
Air conditioner 26°C | Air conditioner 28°C + Air Conducting Fan
Approx **82,200 yen/3 months** (Jul to Sep)

Energy-saving of about 19% in the four months of summer.

*1 Simulation results are displayed using a general-purpose simulator.
*2 SET (Standard Effective Temperature) is used. A temperature at which a person feels it is the same temperature as an environment with 50% relative humidity without airflow based on the air temperature, humidity, airflow, radiant heat, and clothing level.
Calculation conditions: Sedentary and office work/ clothing level: [Winter] Men, long-sleeved shirt + jacket + pants [Summer] Men, short-sleeved shirt + pants
*3 This simulation is the case in Japan.

Benefits

- Even in large spaces, air conditioning is distributed to every corner and the temperature environment is improved
- Reduce electricity bills with more conservative air conditioning temperatures while maintaining comfort
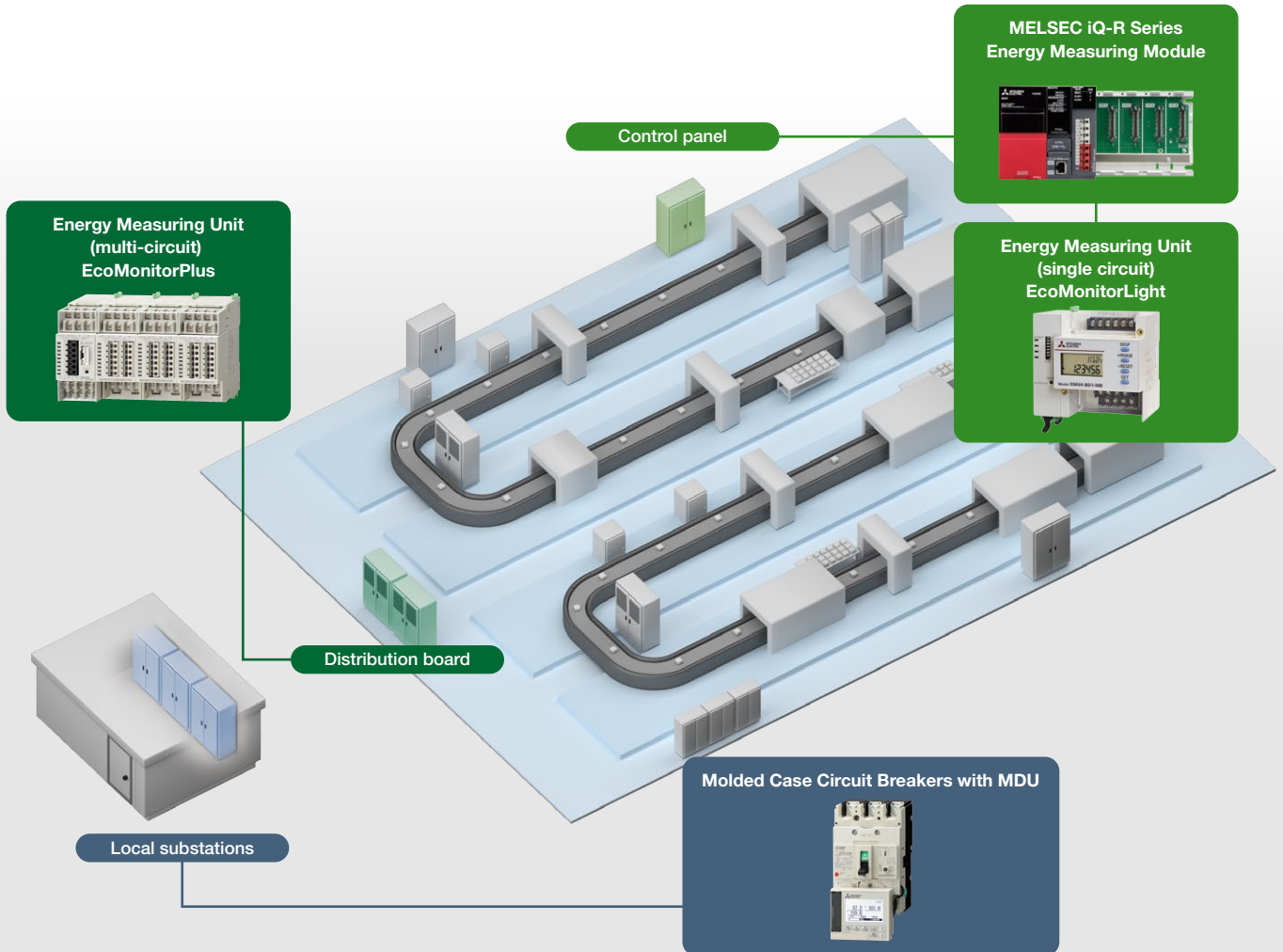
Product and Solution Introduction

▶ Air Conducting Fan — P. 28

Installation example of energy measuring equipment

We have a lineup of measuring instruments according to the measurement location and application, allowing us to build the right measurement system for each customer.

MELSEC iQ-R Series Energy Measuring Module

Control panel

Energy Measuring Unit (multi-circuit) EcoMonitorPlus

Energy Measuring Unit (single circuit) EcoMonitorLight

Distribution board

Molded Case Circuit Breakers with MDU

Local substations

Molded Case Circuit Breakers with MDU

A breaker that integrates a circuit breaker and a measurement display module and is also equipped with a communication function.
The breaker has a built-in measurement function, VT, and CT to support energy measurement in a small footprint while saving on installation work and wiring.

Energy Measuring Unit EcoMonitor Series

EcoMonitorLight:
A compact single-circuit measurement device that can measure, display, set, and communicate energy all in one unit.

EcoMonitorPlus:
An energy measuring unit that can be used in combination to expand circuits and communications. It can measure electrical energy, analog and pulse inputs, and leakages.
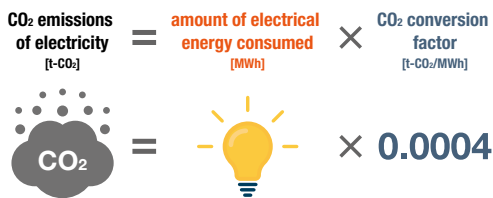
EcoMonitor Light   **EcoMonitor Plus**

■ CO_2 conversion value display function

The computing function of the measurement terminal can calculate CO_2 emissions from the electrical energy.

$$CO_2 \text{ emissions of electricity [t-}CO_2\text{]} = \text{amount of electrical energy consumed [MWh]} \times CO_2 \text{ conversion factor [t-}CO_2\text{/MWh]}$$

$$CO_2 = \text{💡} \times 0.0004$$

■ Utilizes pulse input function to capture elements other than electricity

It is possible to obtain the elements (production volume) necessary for calculating energy other than electricity, such as gas and heavy oil, and the energy (specific consumption) required to produce one product.

Electrical energy ●●●●▶

Gas, heavy oil, production volume, etc. (Pulse) ●●●●▶
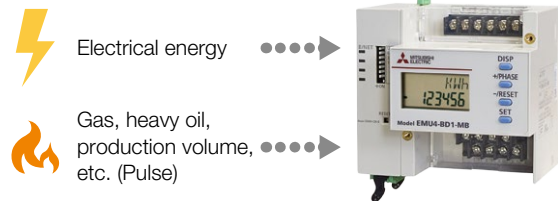
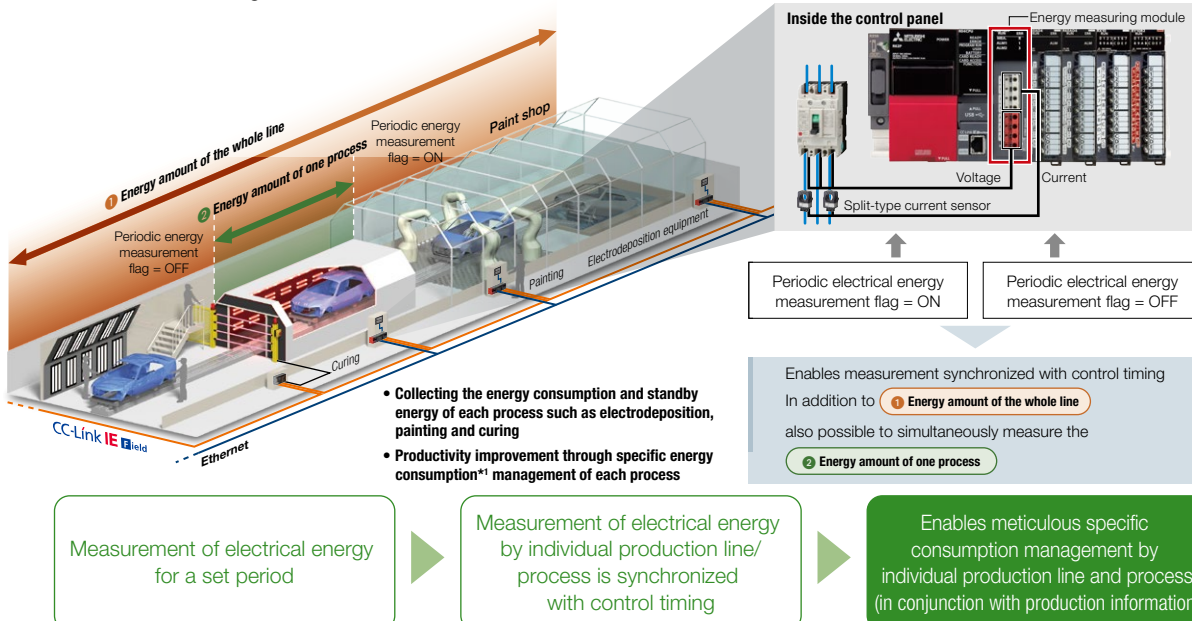## MELSEC iQ-R Series Energy Measuring Module

Managing both energy amount and production data (production volume, non-defective volume, etc.) of the facility realizes specific energy consumption management according to model and process. By visualizing the points where specific energy consumption are deteriorating, problems at production site can be detected in real time, allowing operation improvement.
The energy consumption during production and non-production can be collected by turning on the measurement flag during production using the periodic electric energy measurement function. Monitoring wasteful standby energy during non-production helps to realize energy saving.

■ Detailed energy measurement by individual production line/process

■ Automotive manufacturing line

① Energy amount of the whole line
② Energy amount of one process

Paint shop
Periodic energy measurement flag = ON
Periodic energy measurement flag = OFF
Electrodeposition equipment
Painting
Curing
CC-Link IE Field
Ethernet

Inside the control panel
Energy measuring module
Voltage   Current
Split-type current sensor

Periodic electrical energy measurement flag = ON
Periodic electrical energy measurement flag = OFF

Enables measurement synchronized with control timing
In addition to ① Energy amount of the whole line
also possible to simultaneously measure the
② Energy amount of one process

• Collecting the energy consumption and standby energy of each process such as electrodeposition, painting and curing
• Productivity improvement through specific energy consumption[*1] management of each process

Measurement of electrical energy for a set period ▶ Measurement of electrical energy by individual production line/process is synchronized with control timing ▶ Enables meticulous specific consumption management by individual production line and process (in conjunction with production information)

*1   The specific energy consumption is a numerical value displayed by "dividing energy consumption by production volume," which is one type of index that measures energy productivity.

MELSEC iQ-R Series/ MELSEC iQ-F Series

MELSEC iQ-R series

MELSEC iQ-F series

A manufacturing plant is seldom stopped or taken offline and continuously produces the desired product or component. However, the control system occasionally requires maintenance; for example, at the time of a faulty product or system upgrade for manufacturing a new or updated component. At that time, thanks to the extensive maintenance functions embedded in the hardware and software, the user can trust the control system to handle transition into/out of the maintenance period for both preventive and post maintenance.

Based on the concept of "Easy, Convenient, and Excellent Cost Performance," the MELSEC iQ-F Series contributes to customers' operations with functions that are enhanced by IoT and maintenance functions that are useful for early recovery in the event of trouble.
From stand-alone use to system proposals including networks, we strongly support our customers' "one-step-ahead manufacturing."

■ CPU module   iQ-R | iQ-F

Device data transferring without programming with simple CPU communication function

● The programmable controller CPU module allows device data sharing by parameter registration with Mitsubishi Electric programmable controllers and third-party programmable controllers (simple CPU communication function)*1
● Data collection is easier without changing programs of the existing programmable controllers.

*1　For the list of connectable devices, please see the link below.
　　https://www.MitsubishiElectric.com/fa/ref/ref.html

Programmable controller CPU Module

Device data exchange program

SP.SOCOPEN
SP.SOCSND
SP.SOCRCV
SP.SOCCLOSE

Device data exchange parameter setting

Ethernet switch

Only parameter registration is required.

Ethernet

Device data

MELSEC iQ-R Series*2

MELSEC-Q Series

MELSEC iQ-F Series*2

Third-party Programmable controller

Third-party Programmable controller

*2　Supported by the embedded Ethernet port only.

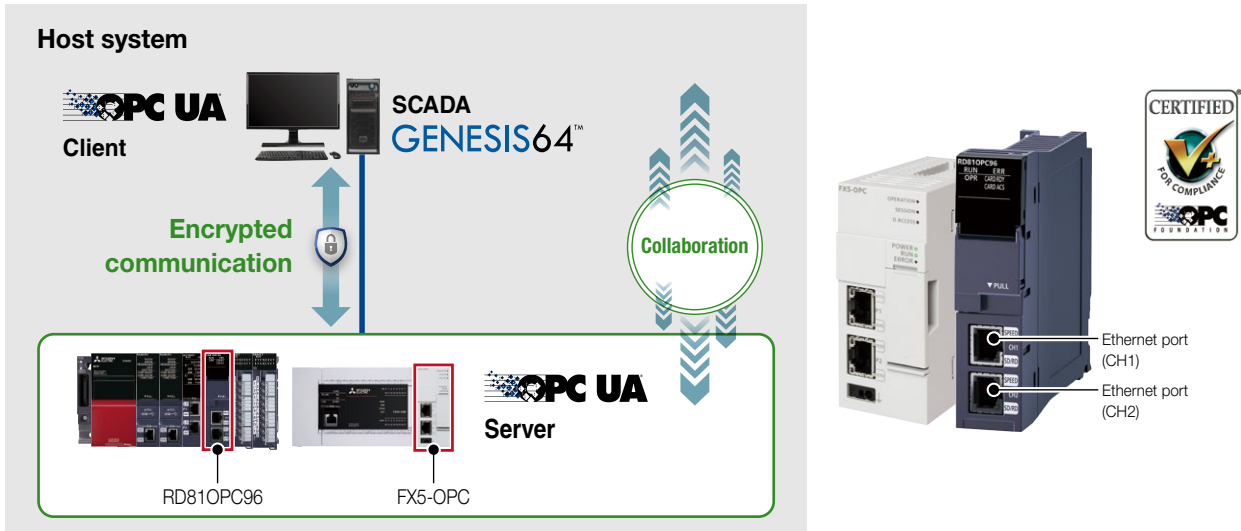## ■ OPC UA Module

An OPC UA server module makes it easy to build reliable systems

● Enables data exchange between multi-vendor products and across different operating systems, enabling secure and reliable data communication between manufacturing and host IT systems

Host system

OPC UA
Client

SCADA
GENESIS64™

Encrypted communication

Collaboration

OPC UA
Server

RD81OPC96   FX5-OPC

CERTIFIED FOR COMPLIANCE OPC FOUNDATION

Ethernet port (CH1)

Ethernet port (CH2)

OPC Unified Architecture (UA):
Platform independent service-oriented communication standard developedby the U.S. OPC Foundation

■ CPU module

Efficiently analyze equipment operation status and cause of problems

● Data can be collected at specified intervals (maximum speed of 1ms) or at any time, and collected data can be saved as CSV files
● CSV files can be utilized to create various materials tailored to the specific purpose, such as daily reports, form creation, and reports.

■ **General data collection using computers and external connection devices (100ms)**

I can't identify the cause from logging data

0   100   200   300
►Time [ms]
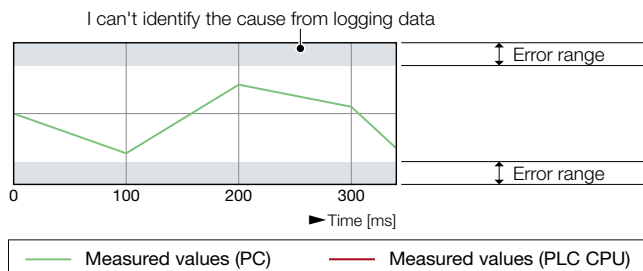
■ **Data collection with a CPU module (sequence scan synchronization: Max. speed of 1ms)**

Collecting data in milliseconds

The portion of the waveform where the error cause is detected is not visible with conventional data logging

Error range

Error range

0   100   200   300
►Time [ms]

—— Measured values (PC)   —— Measured values (PLC CPU)
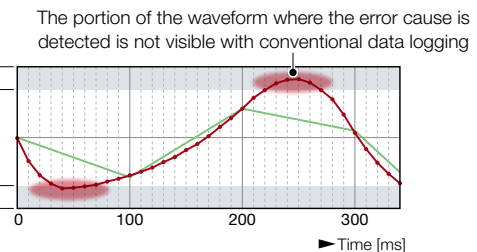
■ CPU module

Efcient diagnostics with extensive event logging

● Logging of program change events, errors and when the power is turned off
● Event logging displayed in list form
● Quickly detect problems due to operating mistakes by multiple users
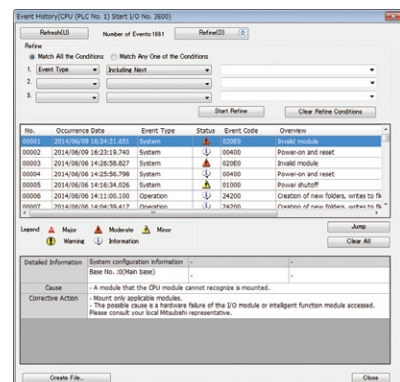
GOT2000 Series

GOT stands for Graphic Operation Terminal.
Switches and lamps had been conventionally attached to an operation panel as hardware. However, by using the screen design software, those can be created, and displayed and operated on the monitor screen of the GOT, the touch-panel HMI.

GOT2000
Graphic Operation Terminal

■ Drive Control Interaction GT27 GT25 GT23 GT21 GS21 GT SoftGOT2000

GOT**Drive**

The GOT2000 provides advanced functionality and improves connectivity with Mitsubishi drive control equipment (servo, inverter, robot). It provides some functions such as parameter setting on the GOT screen.
The GOT Drive enhanced functionality is designed to eliminate need for additional hardware, software and suit customers' applications to speed up system startup, improve maintenance and troubleshooting. GOT screens (sample screens) of various interactive functions are available.
* Depending on the GOT model, some equipment is not supported or there are function limitations.

■ GT SoftGOT2000

iQ Edgecross **GT SoftGOT 2000**

GT SoftGOT2000 is the HMI software that runs on computers and panel computers, and has the same functions as the GOT2000 Series HMI.
Up to four channels of industrial devices can be monitored on a single module of GT SoftGOT2000 by using the multi-channel connection. Edgecross integration also makes it easy to visualize data collected and processed by Edgecross.
* Supports Ethernet connection, OPC UA server connection, and multichannel connection only when connecting to a microcomputer.
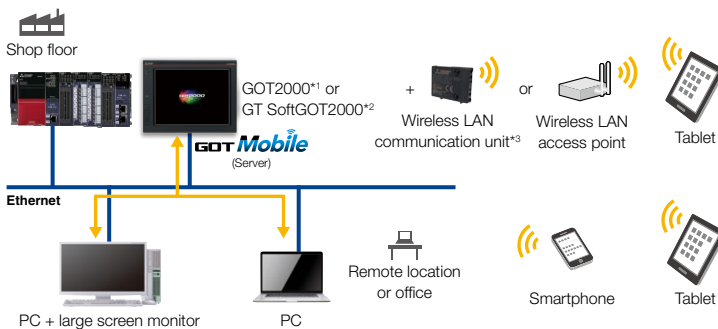
GT SoftGOT 2000

One online module of GT SoftGOT2000 is recommended

PC

Channel 1   Channel 2   Channel 3   Channel 4
Ethernet

Third-party PLC A   Third-party PLC B   Third-party PLC C   Mitsubishi Electric PLC
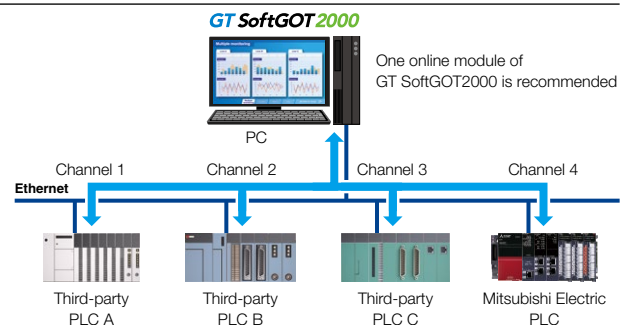
■ GOT Mobile function GT27*1 GT25*1 GT23 GT21 GS21 GT SoftGOT2000*2

GOT**Mobile**

Use a web browser on tablets to check the equipment status from a remote location.
Multiple*1*2 information devices (clients) can simultaneously access GOT so that you can view and operate a different screen on each device.

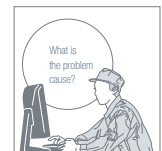**Simultaneous monitoring on multiple*1*2 information devices**

Shop floor

GOT2000*1 or GT SoftGOT2000*2

GOT**Mobile**
(Server)

+   or

Wireless LAN communication unit*3   Wireless LAN access point   Tablet

Ethernet

PC + large screen monitor   PC

Remote location or office   Smartphone   Tablet

Check the status of the worksite using a web browser.

An error occurred. How do I deal with it?

What is the problem cause?

Outside of the clean room   From a remote location   From your office

Other usage

What's the progress? Any problems?

PC + large screen monitor

Equipment A has an error
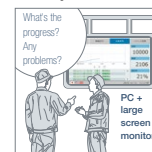
On a large screen   Simultaneous confirmation by multiple people   Monitor production with one PC

*1   If the GOT Mobile server is GOT2000 (GT27, GT25), up to five information devices can monitor a single GOT simultaneously.
     A separate GOT Mobile function license (GT25-WEBSKEY-□) for GOT2000 is required.
*2   If the GOT Mobile server is GT SoftGOT2000, up to 15 information devices can monitor a single GT SoftGOT2000 module simultaneously.
     A separate GOT Mobile function license (SGT2K-WEBSKEY-□) for GT SoftGOT2000 is required.
*3   The wireless LAN communication unit cannot be used with GT2505, GT25 handy, or GT SoftGOT2000. A separate access point is required.

■ Safety Precautions
When using the remote control function, ensure the safety of the field site by being prepared to handle unexpected situations such as communication delays and interruptions.

e-F@ctory Starter Package

The e-F@ctory starter package includes sample projects for the MELSEC iQ-R/iQ-F Series programmable controller and the GOT2000 Series human-machine interface. Programs for visualization and simple analysis are provided in sample project format, realizing IoT infrastructure on the shop floor just with basic settings such as device assignment and parameter registration. The starter package can help solve issues including consideration time and budget required for IoT system construction.

e-F@ctory **Starter Package**

- GX Works3 sample project for the MELSEC iQ-R/iQ-F Series
- GX Works3 sample project for the GOT2000 Series
- Instruction manual

■ Specific consumption control   `iQ-R`

This function calculates the intensity from the power consumption and number of production, and identifies improvements such as wasted power consumption of equipment.
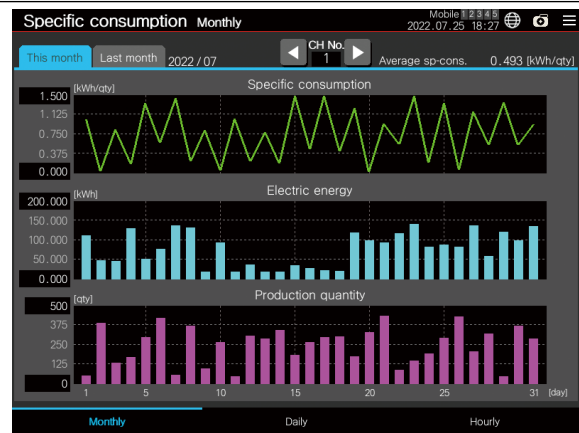
■ Operational status monitor   `iQ-R`

This function visualizes the operation status (operation, stop, non-operation) of the equipment.
The data is displayed in a time-series graph, which enables real time monitoring of the equipment status.
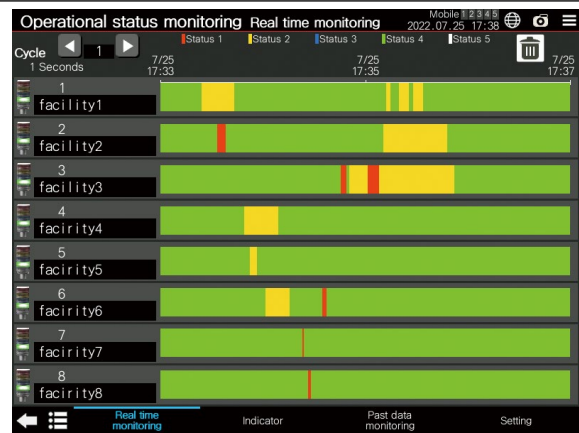
■ Loss time analysis   `iQ-R`

This function analyzes the loss time due to top 16 losses or 7 losses, which reduce the production efficiency.
The rates of the non-operation time for each non-operation factor of the equipment are measured and displayed in a graph.
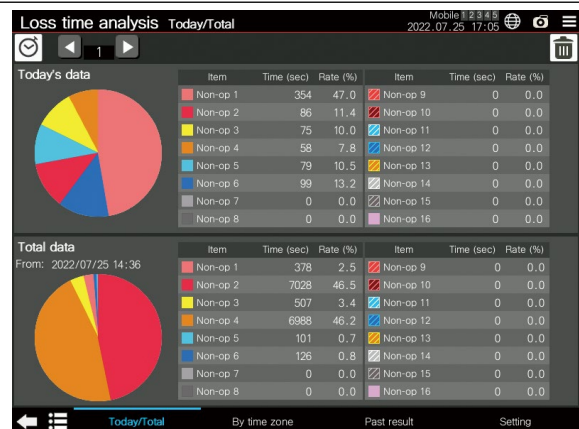
Industrial Computer MELIPC Series

Mitsubishi Electric's industrial-use PC MELIPC Series makes it possible to build systems with edge computing utilizing IoT at a high degree of freedom due to its robust features specifically for FA use and adoption of general-purpose applications.
The lineup consists of four product types to suit various data utilization scenarios depending on the application; from a high-end model supporting a high-performance processor and CC-Link IE field network capable of high-speed communication to a simple and compact lowrange model.

MELIPC

■ Pre-installed with Edgecross – an open software platform suited to data utilization

EDGECROSS

Edgecross[1], a software platform in the edge computing domain, is preinstalled, therefore through combination with Edgecross-compatible software,
it supports preventive maintenance and building of systems for quality improvement, etc. by utilizing shop floor data.
[1] An open software platform provided by the Edgecross Consortium, a general incorporated association.
https://www.edgecross.org/en/solution/feature.html

■ MI5000

Windows® **VxWorks®**

One unit can process production information and control equipment in real-time

By operating VxWorks®, a real-time OS, in addition to Windows®, device control and information processing functions are consolidated into one unit, thus contributing to reduced system build costs and space-saving.
Moreover, control and production information of equipment connected via CC-Link IE field network are communicated at a maximum speed of 1ms, realizing high-precision device control and high-speed collection of production information.

Intel® Core™ i7

■ MI3000

Windows®
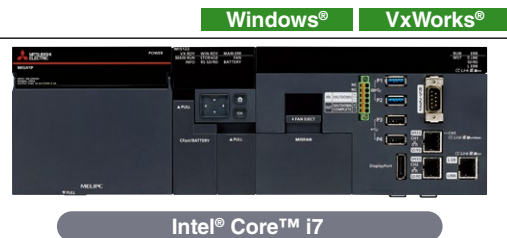
Panel computers equipped with integrated high resolution touch screens

Large screen and high resolution LCD panel is equipped as standard for data display and touch operation. Light-touch operation is realized with a PCAP touch panel that is widely used for smartphones and tablet devices. The touch panel with high transmittance offers clear and high visibility display.
In addition, GT SoftGOT2000 is preinstalled[2] to easily achieve monitoring equivalent to the GOT2000 Series.
[2] Does not require a separately-sold license key for GT SoftGOT2000 (for USB port).

GT SoftGOT2000 **21.5 widescreen Full HD**

■ MI2000

Windows®

Realizing optimal IoT for the production shop floor by expanding various systems

Intel® Core™ i3

Intel® Core™ i3 is adopted as the CPU, and performs not only data collection, but also simple analysis, diagnosis, and monitoring of collected data to contribute to quality improvement. It also features a 2.5" HDD/SSD slot[3] and a PCI Express®/PCI slot[4] to accumulate large amounts of data and expand functionality.
[3] 2.5" HDD/SSD slots are available on MI2000 only.
[4] MI3000 is PCI Express® only.

■ MI1000

Windows®

Links with existing equipment to realize low-cost IoT integration on the production shop floor

Intel® ATOM™

The energy saving Intel® Atom™ E3826 is adopted and enables computer functions in a compact size of 26 mm in height. It is space-saving and can easily be expanded to existing facilities, contributing to IoT support for customer facilities.

Energy-saving Data Collecting Server EcoWebServerⅢ

EcoWebServerⅢ is a "simple, convenient, and compact" data collection server that collects and stores data from measurement equipment with communication functions, as well as visualization in graph format on a web browser. One EcoWebServerⅢ can perform both demand management and energy consumption management.
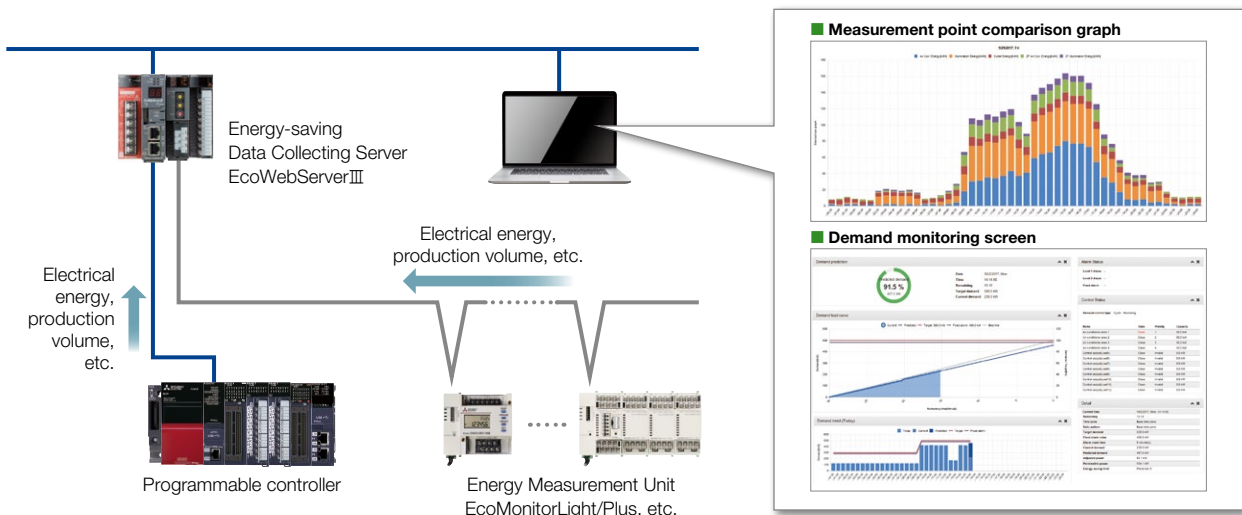
In addition, by data input/output with a MELSEC programmable controller, a separate file transfer server and mail server, this product is equipped with functions that realize automatic transfer of measurement data (CSV format), mail notification, and more.

■ Web server function

The collected data can be transmitted to the intranet via Ethernet, then current values and graphs of the measurement data can be checked on a web browser. Because it is a standardized packaged product, there is no need to build in a screen, therefore engineering labor time can be greatly reduced.

Energy-saving
Data Collecting Server
EcoWebServerⅢ

Electrical energy, production volume, etc.

Electrical energy, production volume, etc.

Programmable controller

Energy Measurement Unit
EcoMonitorLight/Plus, etc.

■ Measurement point comparison graph

■ Demand monitoring screen

■ Easy setting function

All users need to do is register which elements to collect with which measuring instrument, then energy data will be collected and graphed.

Even if the number of measurement points or names change due to expansion, updating, layout change, etc. of equipment, it is possible to change the settings by following simple steps as long as the user has a computer, configuration software, and the product itself.

■ Register measurement terminal

■ Register measurement point
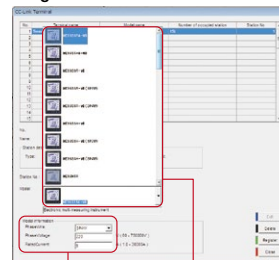
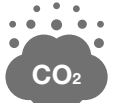Select model information Select terminal to be used
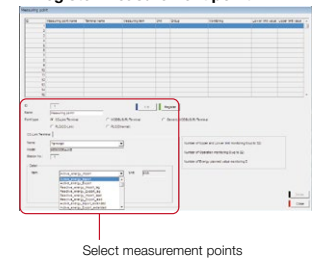
Select measurement points

■ Management of CO₂ emissions

EcoWebServerⅢ	EcoAdviser

CO₂ measurement data can be calculated by multiplying the collected electrical energy data by CO₂ conversion factor.

$$\text{CO}_2 \text{ emissions of electricity } [\text{t-CO}_2] = \text{amount of electrical energy consumed } [\text{MWh}] \times \text{CO}_2 \text{ conversion factor } [\text{t-CO}_2/\text{MWh}]$$

$$\text{CO}_2 = \times\ 0.0004$$

■ Specific consumption management function

| EcoWebServerⅢ	EcoAdviser

The energy (specific consumption) required to produce one product can be calculated from the data collected on electrical energy and production volume.
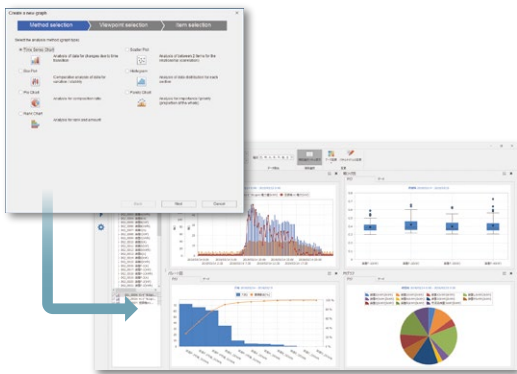
21

Energy Saving Support Software EcoAdviser

EcoAdviser can create graph dashboards based on energy data collected from EcoWebServerIII and Edgecross. It can also calculate CO_2 emissions and specific consumption based on energy data.

The AI diagnostic version is equipped with Mitsubishi Electric's AI technology Maisart, which supports energy saving activities through automatic analysis of energy loss, factor diagnosis, and calculation of countermeasure effects.
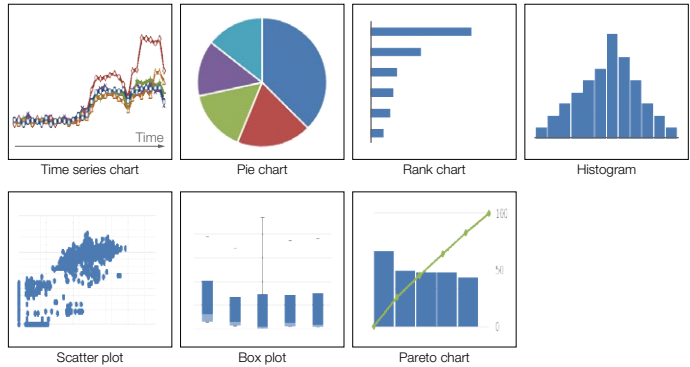
EcoAdviser
Energy Saving Support Software

iQ **Edgecross**
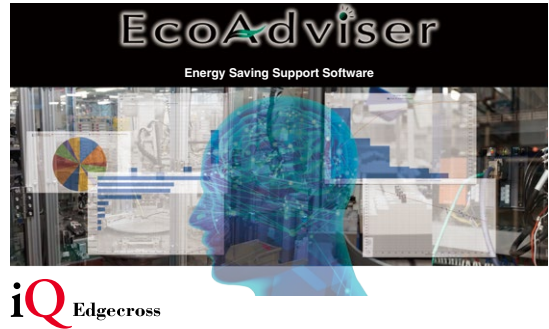
■ Graphing function

With its built-in graphing function, EcoAdviser can create graphs according to the contents users want to analyze. **Common EcoAdviser features**

■ Available graphs (7 types)

Time series chart | Pie chart | Rank chart | Histogram

Scatter plot | Box plot | Pareto chart

■ Management of CO_2 emissions

CO_2 measurement data can be calculated by multiplying the collected electrical energy data by CO_2 conversion factor.

$$\text{CO}_2 \text{ emissions of electricity [t-CO}_2] = \text{amount of electrical energy consumed [MWh]} \times \text{CO}_2 \text{ conversion factor [t-CO}_2\text{/MWh]}$$

$$\text{CO}_2 = \text{(electricity)} \times 0.0004$$

■ Specific consumption management function

The energy (specific consumption) required to produce one product can be calculated from the data collected on electrical energy and production volume.

In addition, it is possible to register specific consumptions by hour, and even if a wide variety of products are produced on the same line, the specific consumption for each model type can be calculated.

■ Visualization of CO_2 emissions and raising employee awareness (dashboard function)

EcoAdviser enables analysis and visualization of CO_2 emissions and energy consumption.

Benefits

- Saves labor required to prepare reports via the conventional method of aggregation in Excel®
- Educational benefits such as raising awareness of initiatives at the workplace level through visualization

NEW

Specialized consultants assist users with the creation of dashboards to offer services that support the effective utilization of measurement data and promote activities.

Recommended for the below needs

- Want to display CO_2 emissions and energy consumption and use it for educational activities and internal materials, but can't properly visualize the screen that would be most appropriate
- Want to display and use the screen effectively, but can't devote time to creating it
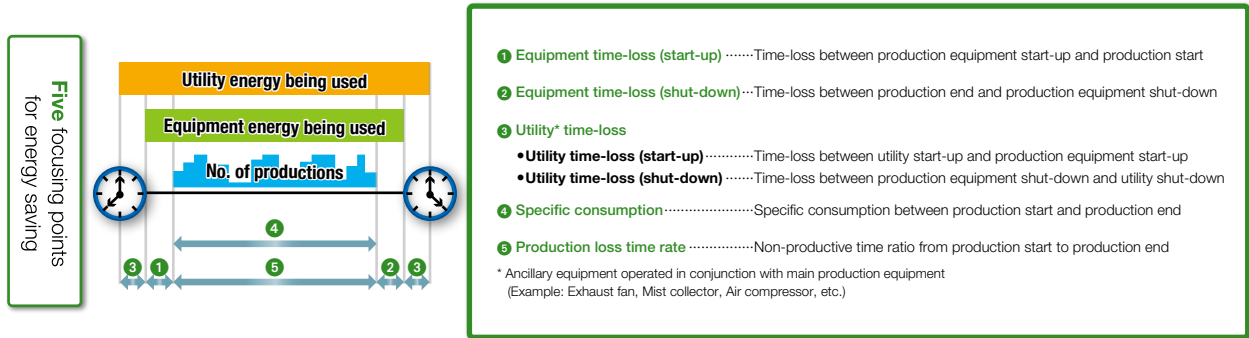
■ Automatic analysis function to reduce energy loss in production equipment

Mitsubishi Electric's unique know-how can automatically extract energy losses
from production equipment in accordance with the five major perspectives of energy saving.

Maisart

AI diagnosis edition

Five focusing points for energy saving

Utility energy being used

Equipment energy being used

No. of productions

❶ Equipment time-loss (start-up) ·······Time-loss between production equipment start-up and production start

❷ Equipment time-loss (shut-down) ···Time-loss between production end and production equipment shut-down

❸ Utility* time-loss
  • Utility time-loss (start-up)···········Time-loss between utility start-up and production equipment start-up
  • Utility time-loss (shut-down) ·······Time-loss between production equipment shut-down and utility shut-down

❹ Specific consumption······················Specific consumption between production start and production end

❺ Production loss time rate ·············Non-productive time ratio from production start to production end

* Ancillary equipment operated in conjunction with main production equipment
  (Example: Exhaust fan, Mist collector, Air compressor, etc.)

■ Energy-losses identification, Factor diagnosis function, countermeasure effect verification function

■ Losses identification screen

❶ Equipment time-loss (start-up)
❸ Utility time-loss (start-up/shut-down)
❺ Production loss time rate

plot	Date	(1)Equipment time-loss (start-up) [Minutes]	(2)Equipment time-loss (shut-down) [Minutes]	(3-1)Utility time-loss (start-up) [Minutes]	(3-2)Utility time-loss (shut-down) [Minutes]	4)Specific consumption kWh/個]	5)Production loss time rate %]
	3/22/2020						
	3/23/2020	10	20	42	311	0.31818	41
	3/24/2020	16	4	12	76	0.22494	16.
	3/25/2020	8	17	53	794	0.27545	24
	3/26/2020	10	13	58	566	0.22241	22
	3/27/2020	22	2	52	683	0.23048	19
	3/28/2020						
	3/29/2020						
	3/30/2020	15	3	2	229	0.19284	12.

❷ Equipment time-loss (shut-down)
❹ Specific consumption

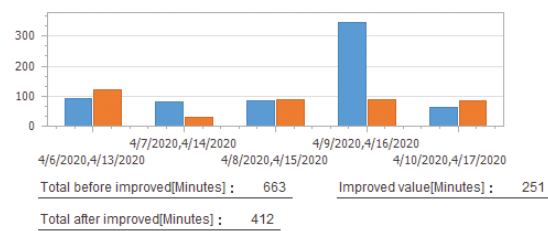### ■ Factor diagnosis screen

Energy-loss factor diagnosis

Diagnosis period: 3/1/2020 - 4/30/2020
Equipment name: Line 2 of printed board manufa
Energy saving points: (1)Equipment time-loss (start-up)

Rank	Energy-loss factor (type)	Energy-loss factor (detail)	Expected improved result[$/Year]	Does this information help you?
1	Manufacturing starting time	9[Time]	75	○ Yes ○ No
2	Production volume	330~410	125	○ Yes ○ No
3	Day of the week	Thursday	142	○ Yes ○ No
4	Production volume (the previ...	220~440	85	○ Yes ○ No
5	Equipment start-up time	4[Time]	62	○ Yes ○ No

+ Apply evaluation

<Tips>
Using ByDay of the week Equipment time-loss (start-up)(average) graphs, you can compare operational statuses which
losses are high and low.
Then you can find some energy-saving activities.
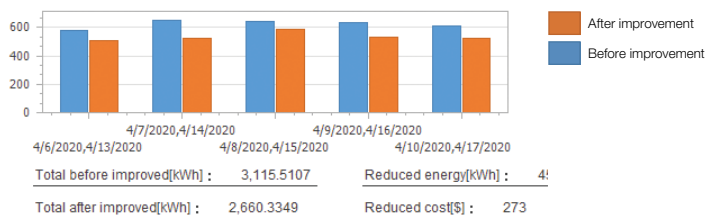
● Improvement advice

● Evaluation of diagnostic results
Reflects user's evaluations
in subsequent diagnostic results

■ Effect verification screen

After improvement
Before improvement

Total before improved[Minutes] : 663
Improved value[Minutes] : 251
Total after improved[Minutes] : 412

Effects of power consumption improvements

Total before improved[kWh] : 3,115.5107
Reduced energy[kWh] : 4
Total after improved[kWh] : 2,660.3349
Reduced cost[$] : 273

**Effects of improvements
from five focusing points for energy saving**

■ Automatic extraction function for energy loss during standby and breaks

The AI analysis function makes it possible to automatically extract electrical energy used during standby and breaks by individual day
based on the data related to electrical energy consumed by utilities other than production facilities.

■ What is Mitsubishi Electric AI technology, Maisart?

An abbreviation of "Mitsubishi Electric's AI creates the State-of-the-ART in technology,"
"Maisart" is Mitsubishi Electric's AI technology brand,
and it embodies the concept of making everything smart by leveraging our unique AI technology.

Maisart

SCADA GENESIS64™

This cutting-edge software delivers real-time visualization, mobility, analytics, and connectivity to deliver a contextualized view of enterprise operations for manufacturing, industrial automation, and smart buildings customers.
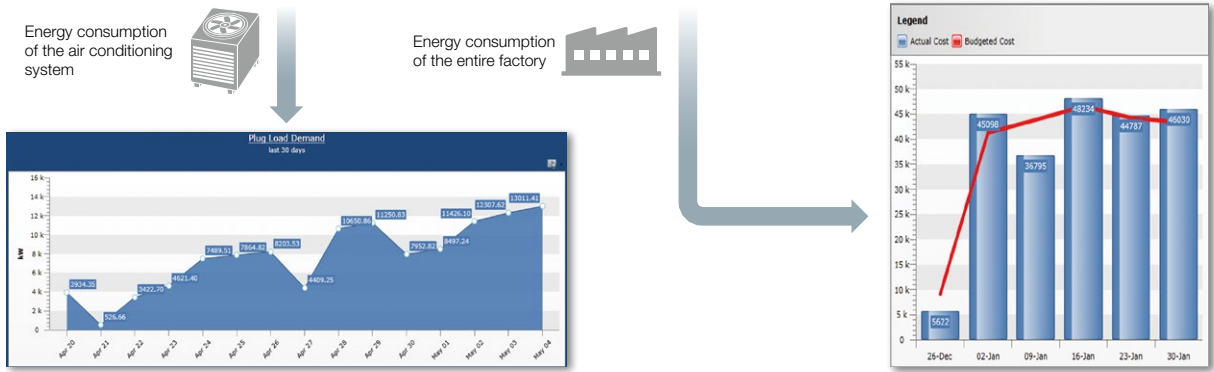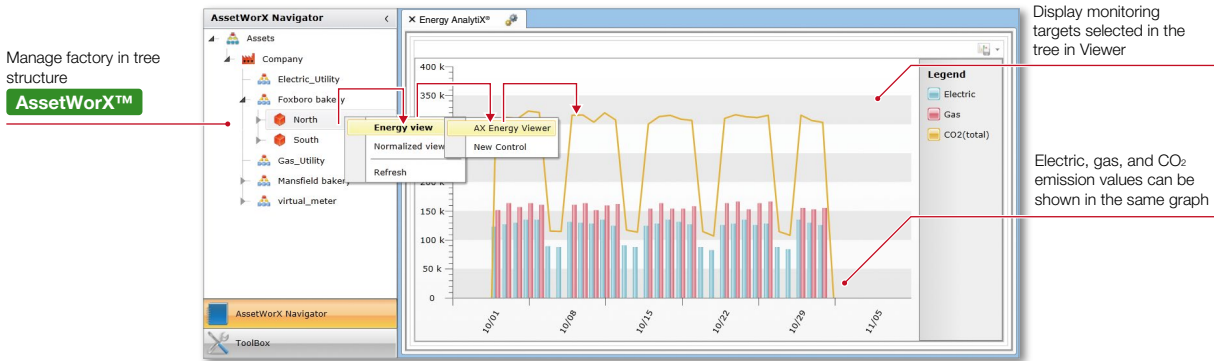
iQ Edgecross   GENESIS64™

■ Energy AnalytiX®

Energy AnalytiX® provides real-time data collection and visualization of energy consumption such as electric, gas, and other utilities. It enables the calculation of specific CO_2 emissions data and other energy metrics at any level of your organizational hierarchy, making it easy to uncover energy efficiency offenders and reduce overall energy costs.

Manage factory in tree structure
AssetWorX™

Display monitoring targets selected in the tree in Viewer

Electric, gas, and CO_2 emission values can be shown in the same graph

Energy consumption of the air conditioning system

Energy consumption of the entire factory
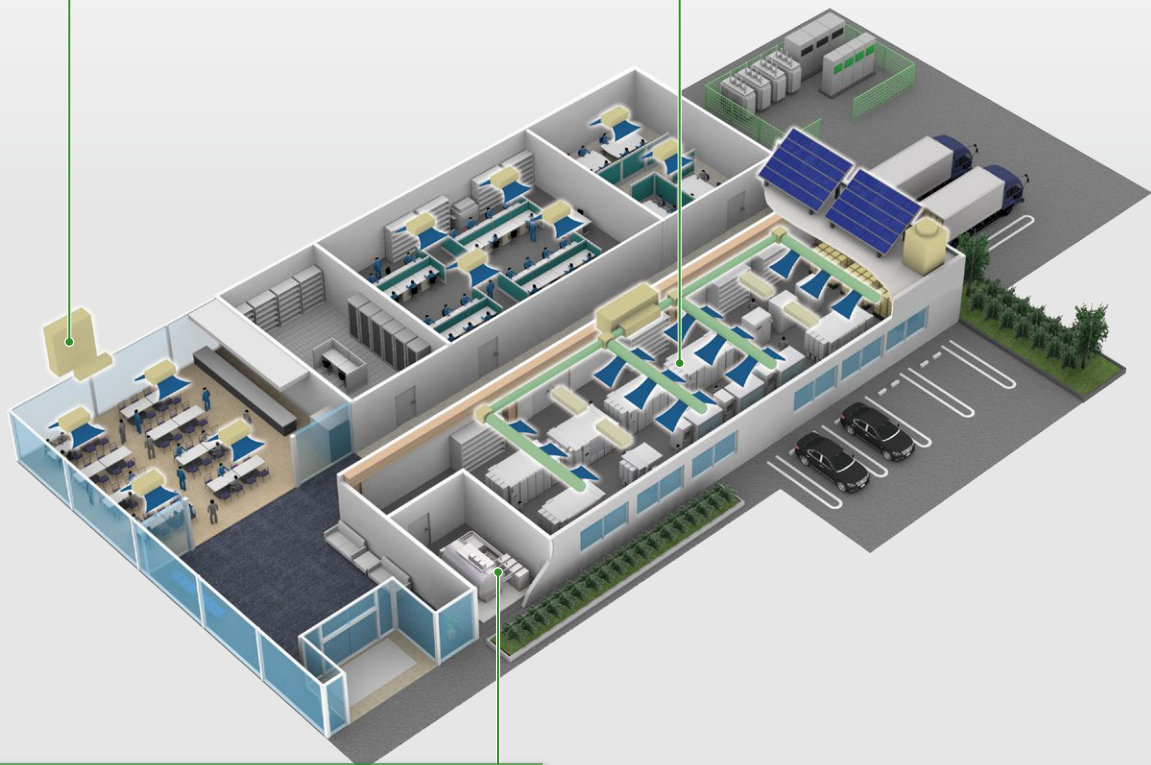
■ EarthWorX™

EarthWorX™, a geographic information system (GIS) mapping module, provides visualization for widely dispersed assets. Create a geographical overview to monitor multiple locations while maintaining the ability to locate and drill into specific assets. Smart Pin™ enables the status of many assets to be easily understood at a glance. Users can integrate with Google Maps™, Bing® Maps, and Esri™ to include additional GIS mapping features and data layers.

Smart Pin™

Alarm

Energy usage condition

Production progress
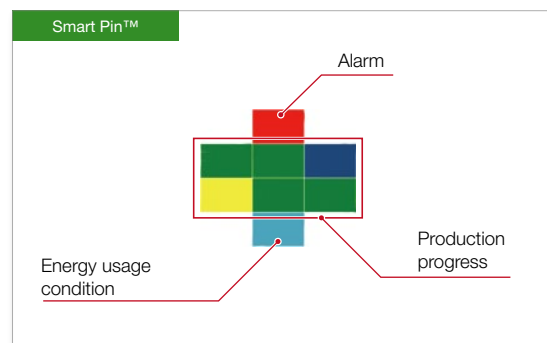
High-efficiency equipment lineup achieving energy saving in factories

Mitsubishi Electric is rolling out various high-efficiency equipment related to manufacturing in order to realize energy saving at its factories.

Inverter FREQROL Series

FR-F800/F700PJ
Energy-saving with an inverter
Compatible with IE4 high-efficiency IPM motor drive

FR-E800
Compatible with IE5 global PM motor EM-A drive

FR-D700-G
Mitsubishi Electric's S-PM geared motor proposes stable speed control and energy-saving via sensor-free control

MELSERVO-J5 Series

Rotary servo motor HK Series
Increased motor efficiency due to high power density design

Simple Converter MR-CM
Drive Unit (Converter Separate Type)
MR-J5D-G4
Effective utilization of line power through common busbar connections

Multi-axis Servo Amplifier MR-J5W
Multi-axis unit achieves energy saving, miniaturization, and cost reduction of equipment

Top Runner Motor SF-PR
Compatible with premium efficiency IE3
Reduces loss by **40 to 50%**
* Comparison with our standard efficiency motor (Super Line series SF-JR type)
* Emissions are reduced by 20 to 30% relative to our high-efficiency motors (Super Line Eco Series SF-HR type)

Synchronous Reluctance Motor
SynRM [Coming soon]
Exceeds current Top Runner motor (SF-PR)
Achieves IE5 efficiency class
Reduces loss by **20 to 30%**
* Inverter drive only, efficiency reference value: IEC/TS 60034-30-2

Inverter FREQROL Series

Supports the drive of IE5 global PM motor EM-A and contributes to energy saving on customers' production shop floors.

■ Improved energy saving by drive with induction motors and PM motors

General-purpose motor (SF-PR)

Mitsubishi Electric's high-performance energy-saving motor, SF-PR, which complies with Japan's Top Runner standards (equivalent to IE3), can reduce running costs by reducing electricity through energy-saving operation.
Since the motor constant, etc. are built-in, energy-saving operation can be performed just by setting the parameters.

Efficiency [%]

4P 200V 50Hz

- IE3 standard
- SF-PR

Output [kW]
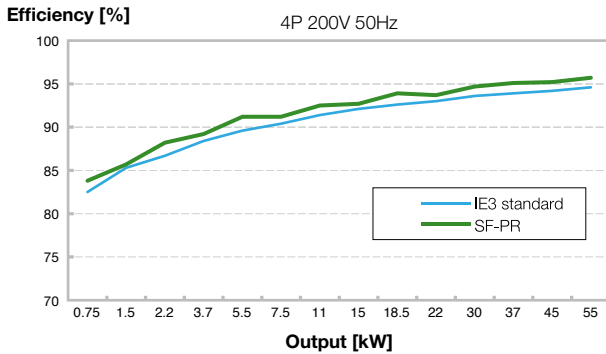
PM motor

The PM motor achieves even higher efficiency as compared to the general-purpose motor.
The setting for driving PM motors is enabled just by setting parameters.

Why is a PM motor so efficient?

● No current flows to the rotor (secondary side), and no secondary copper loss is generated.
● Magnetic flux is generated with permanent magnets, and less motor current is required.

[Comparison of motor losses]
* Example of 22 kW motors
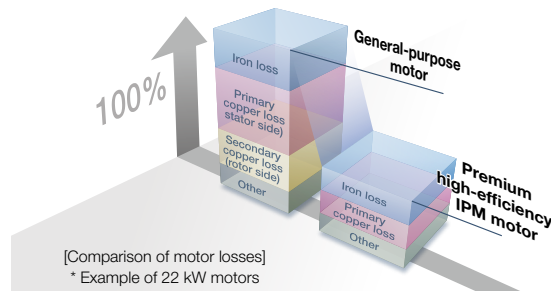
AC Servo System MELSERVO-J5 Series

MELSERVO-J5 Series compatible with CC-Link IE TSN.
The highly responsive servo amplifier with a speed-frequency response of 3.5 kHz contributes to shortening the takt time of production equipment. The rotary servo motor is equipped with a high-resolution encoder (67,108,864 pulses per revolution) to reduce torque fluctuations and achieve stable control.
By constructing a drive system using the industry's highest performance level servo amplifier and servo motor, the takt time and operating time of the equipment are shortened, and energy saving is achieved.

■ Common busbar connection achieving energy-saving, space-saving, and wiring-saving

• Simple Converter MR-CM   • Multi-axis servo amplifiers

Utilizing a common bus connection conserves energy through the efficient use of regenerative power. Wiring can be simplified and installation space can be saved by reducing the number of molded-case circuit breakers and magnetic contactors. The MR-CM simple converter can connect to up to six compatible servo amplifiers having a total capacity of 3 kW or lower.
Wiring for the bus and the control circuit power supply can be simplified by using daisy chain power connectors for passing wiring.
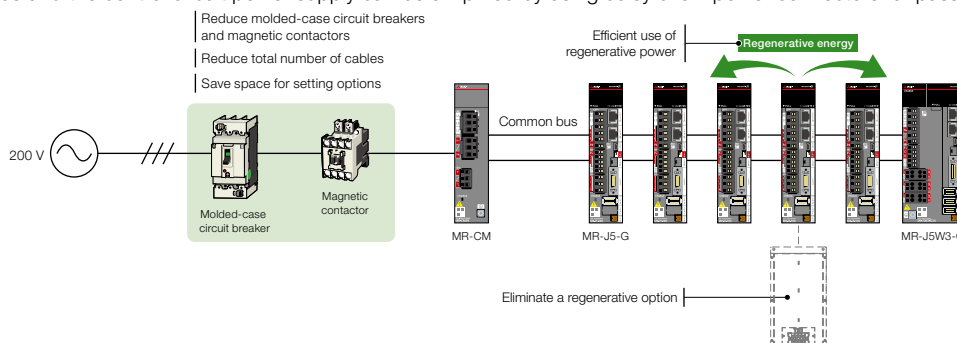
## High Performance Energy-saving Motor – SuperLine Premium Series SF-PR Type

The SuperLine Premium Series SF-PR Type has an original metal frame allowing it to achieve one of the highest efficiency performances in the industry and meet the Top Runner standard of Japan's Act on the Rational Use of Energy.

■ Supports IE3 with even higher premium efficiency

Reduces loss by 50% compared to Mitsubishi Electric's standard efficiency motor (SF-JR type IE1 standard) and 20 – 30% compared to our high-efficiency motor (SF-HR type). SF-PR also supports IE3, which is an even higher premium efficiency, thus enabling even higher energy saving during operation.

* Excludes some models

Efficiency [%]

4P 200V 50Hz

Legend:
— IE3 standard
— SF-PR
— SF-HR
— SF-JR

Output [kW]
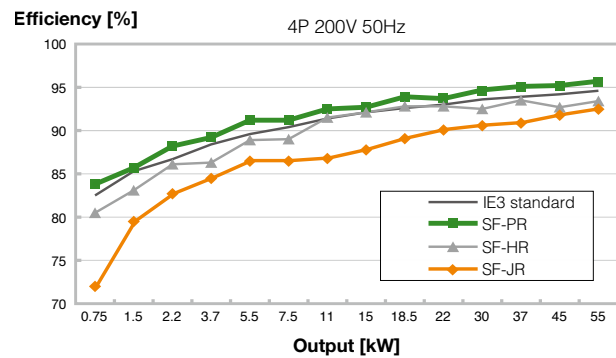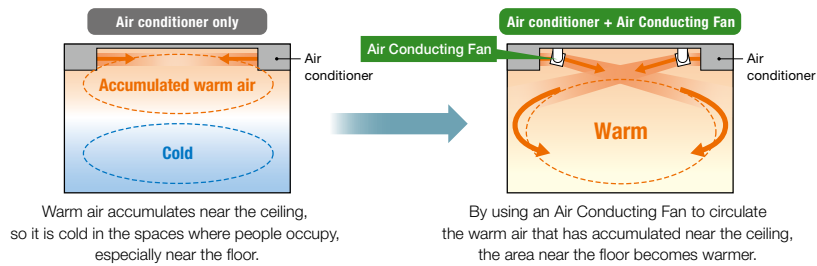
Air Conducting Fan

Air Conducting Fan helps to improve the indoor environment with a spacious airflow. In combination with an air conditioner, Air Conducting Fan works to improve indoor temperature distribution and raise air conditioning efficiency.
It adopts a twin nozzle structure, minimizes airflow attenuation, and achieves airflow over long distances reliable even in large spaces.

■ Air Conducting Fan assisted air conditioning

By using an air conditioner and Air Conducting Fan in combination, cool air is distributed throughout an indoor space when cooling, and warm air that rises is blown downward during heating, thus it improves indoor temperature distribution through circulation.
It is possible to maintain comfort while increasing air conditioning efficiency and enabling adjustment of air conditioning temperature settings, thus effortlessly saving energy and electricity.
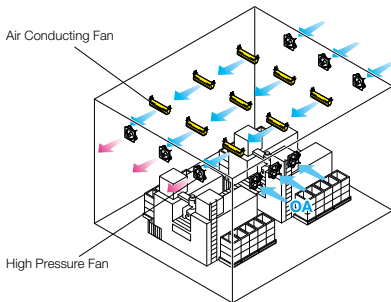
Conceptual image of circulation using an Air Conducting Fan

Air conditioner only
Accumulated warm air
Cold

Air conditioner

Air Conducting Fan

Air conditioner + Air Conducting Fan
Warm

Air conditioner

Warm air accumulates near the ceiling, so it is cold in the spaces where people occupy, especially near the floor.

By using an Air Conducting Fan to circulate the warm air that has accumulated near the ceiling, the area near the floor becomes warmer.

■ Air Conducting Fan can be used for these applications as well

| Ventilation assistance	Anti-condensation measure	Cool breeze sensation
By using in combination with High Pressure Fan, Air Conducting Fan can efficiently discharge summer heat.	It prevents condensation and mold by creating airflow in the ceiling of showcases used in supermarkets, etc.	By enabling airflow in gymnasiums, etc., it is possible to create a cool breeze sensation at low cost.

Air Conducting Fan

High Pressure Fan
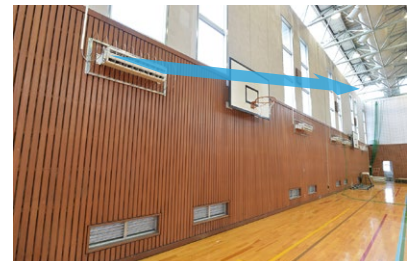
*The installation in these pictures are cases in Japan.

Open Integrated Network CC-Link IE TSN

CC-Link IE TSN supports TCP/IP communications and applies it to industrial architectures through its support of TSN enabling real-time communications. With its flexible system architecture and extensive setup and troubleshooting features make CC-Link IE TSN ideal for building an IIoT infrastructure across the entire manufacturing enterprise.
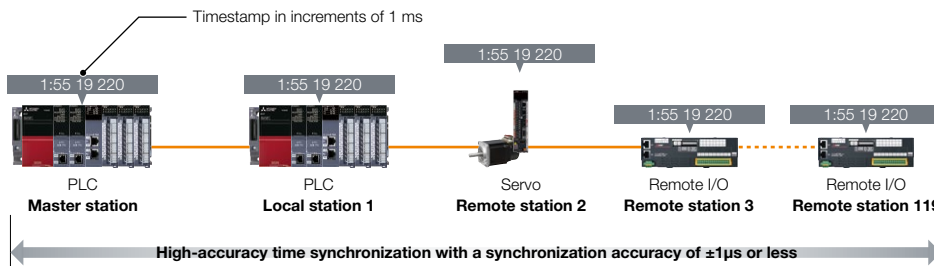
* What is Time-Sensitive Networking (TSN)?
TSN is the IEEE-defined standard technology that enables deterministic messaging on standard Ethernet. The technology ensures deterministic communications by utilizing the time synchronization method (IEEE 802.1AS) and time-sharing method (IEEE 802.1Qbv). With the addition of these standards to Ethernet technology, real-time control communication and non-real time information communication can be mixed, which is not possible with conventional Ethernet communications.

CC-LinkIE TSN

TSN technology enables the transfer of deterministic communication even when delivering the information communication data of IT systems on the same network. By increasing network bandwidth and giving priority to CC-Link IE TSN communications and TCP/IP communications, devices that use general Ethernet communicationscan be connected to the same network without affecting real-time control communication performance.
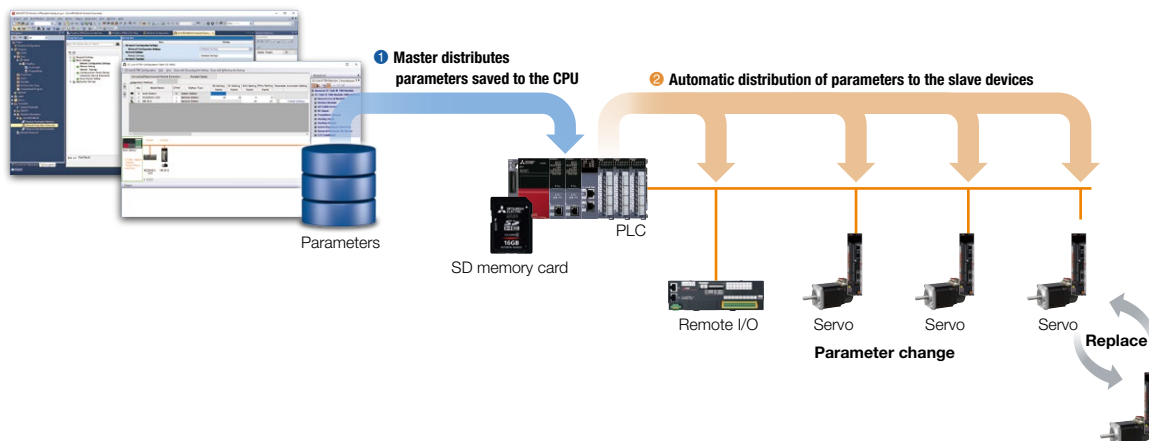

CC-Link IE TSN — TCP/IP — Other networks — CC-Link IE TSN — TCP/IP

■ Time series analysis using high-accuracy time synchronization

Achieves high-accuracy time synchronization with a synchronization accuracy of ±1μs or less and retains timestamp information in each connected station at increments of 1 ms. Error history can be displayed in time series, therefore enabling users to accurately analyze what happened and the cause of the problem from the exact time an error occurs.

Timestamp in increments of 1 ms

| 1:55 19 220 | 1:55 19 220 | 1:55 19 220 | 1:55 19 220 | 1:55 19 220 |

| PLC | PLC | Servo | Remote I/O | Remote I/O |
| **Master station** | **Local station 1** | **Remote station 2** | **Remote station 3** | **Remote station 119** |

High-accuracy time synchronization with a synchronization accuracy of ±1μs or less

■ Easy replacement of slave devices through automatic parameter distribution [Reducing start-up time]

When power is turned on or there is contingency, the master device automatically distributes parameters saved on the CPU unit to slave devices. As such, even when a slave device is replaced, there's no need to separately write parameters to it; making for smooth replacement.
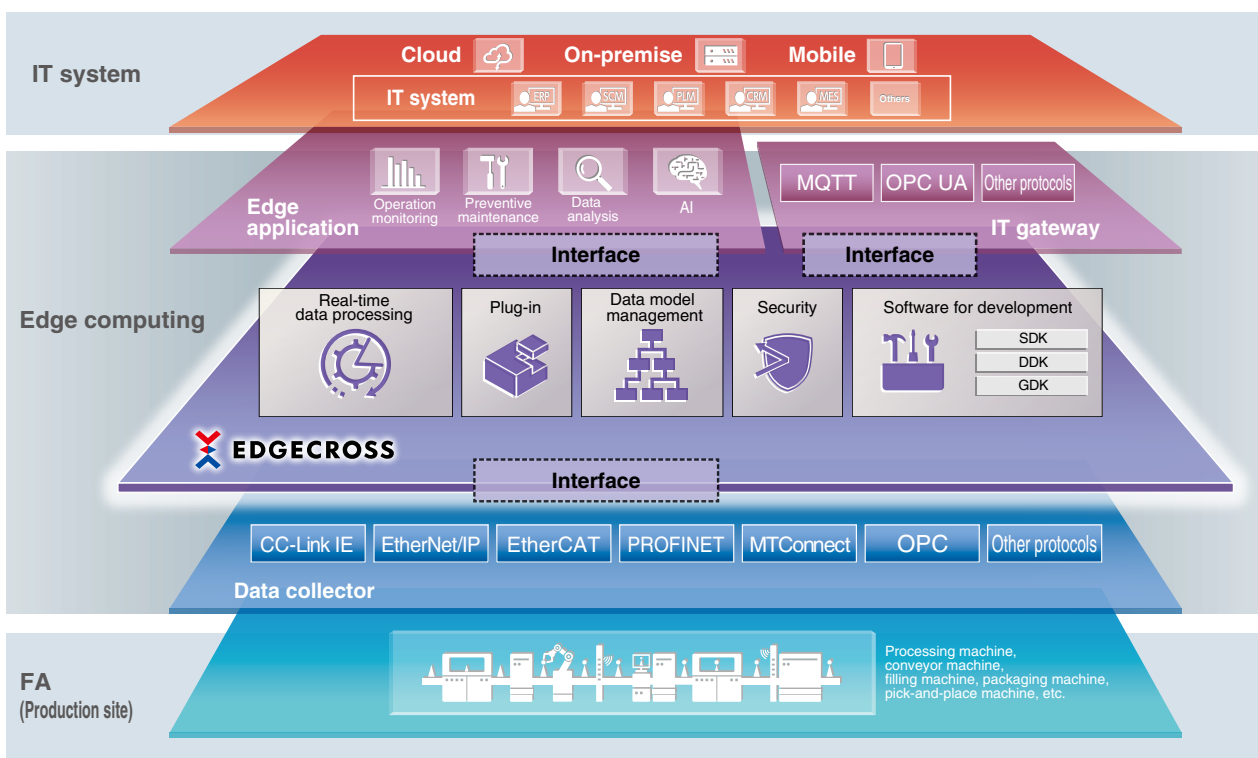

❶ Master distributes parameters saved to the CPU

❷ Automatic distribution of parameters to the slave devices

Parameters

SD memory card

PLC

Remote I/O   Servo   Servo   Servo

Parameter change

Replace

Open Platform Edgecross

In the manufacturing industry, IoT adaptation is accelerated to enhance competitiveness and create new value. Following the trend, Edgecross Consortium aims to create new added value based on the edge computing layer beyond the borders of companies and industries, contributing to IoT adoption in the manufacturing industry.

EDGECROSS
CONSORTIUM

■ Creating new value with a focus on the edge computing domain

IT system
- Cloud
- On-premise
- Mobile
- IT system: ERP, SCM, PLM, CRM, MES, Others

Edge application — Operation monitoring, Preventive maintenance, Data analysis, AI

Interface

IT gateway — MQTT, OPC UA, Other protocols

Interface

Edge computing
- Real-time data processing
- Plug-in
- Data model management
- Security
- Software for development: SDK, DDK, GDK

EDGECROSS

Interface

Data collector
- CC-Link IE
- EtherNet/IP
- EtherCAT
- PROFINET
- MTConnect
- OPC
- Other protocols

FA (Production site)
Processing machine, conveyor machine, filling machine, packaging machine, pick-and-place machine, etc.

■ Contact us

Edgecross Consortium Secretarial office
Info@edgecross.org

Room 301-2, Main Bldg., Kikai Shinko Kaikan Bldg., 3-chome 5-8 Shibakoen, Minato-ku, Tokyo, Japan 105-0011

■ **Edgecross Consortium**
https://www.edgecross.org/en/

Mitsubishi Electric AI technologies Maisart

Support the realization of our customers' non-stop factories.

AI is made compact, reducing computing load and enabling the integration of artificial intelligence on the shop floor.

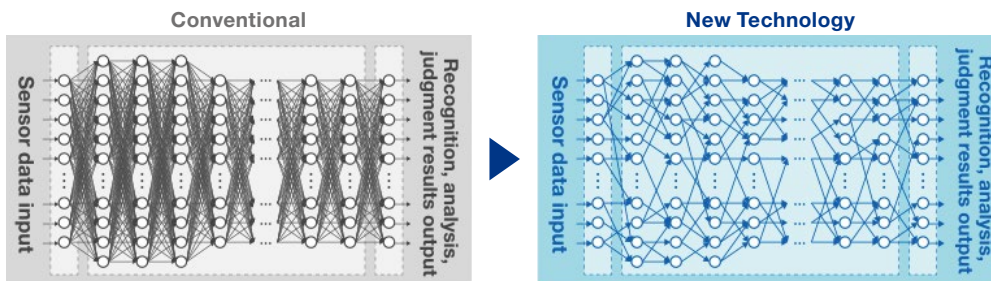**Our FA knowledge supports the application of AI technologies to customers' systems.**

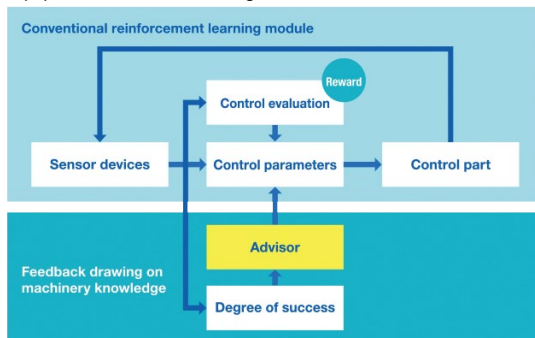**Our edge-computing products simplify data collection and support the construction of AI systems.**
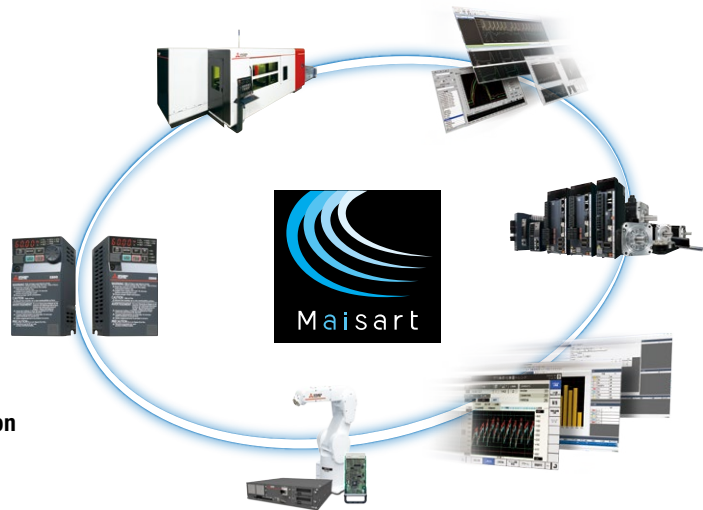
Features

Deep Learning

Compared to conventional methods, our compact algorithms reduce deep learning branches by 1/30- 1/100.

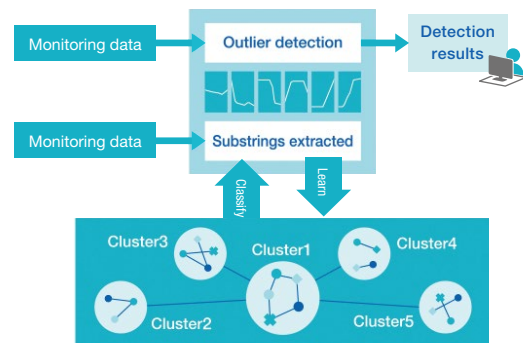| Conventional	New Technology
Sensor data input → Recognition, analysis, judgment results output	Sensor data input → Recognition, analysis, judgment results output

Reinforcement Learning

Reduces the number of pre-learning trials approximately 1/50 compared to conventional methods by estimating the degree of success through improving learning efficiency using equipment domain knowledge.

Conventional reinforcement learning module
Reward
Control evaluation
Sensor devices
Control parameters
Control part
Advisor
Feedback drawing on machinery knowledge
Degree of success

Big Data Analytics

Reduces the number of operations necessary to detect abnormal signs by 1/40 through streamlining time series data analysis using equipment domain knowledge.

Monitoring data
Outlier detection
Detection results
Monitoring data
Substrings extracted
Classify
Learn
Cluster3
Cluster1
Cluster4
Cluster2
Cluster5

"Maisart" is the name of Mitsubishi Electric's AI technology brand and stands
for Mitsubishi Electric's AI creates the State-of-the-ART in technology,
with the idea of making everything intelligent (smart) by leveraging original AI technologies.

MEMO

MEMO

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.

YOUR SOLUTION PARTNER
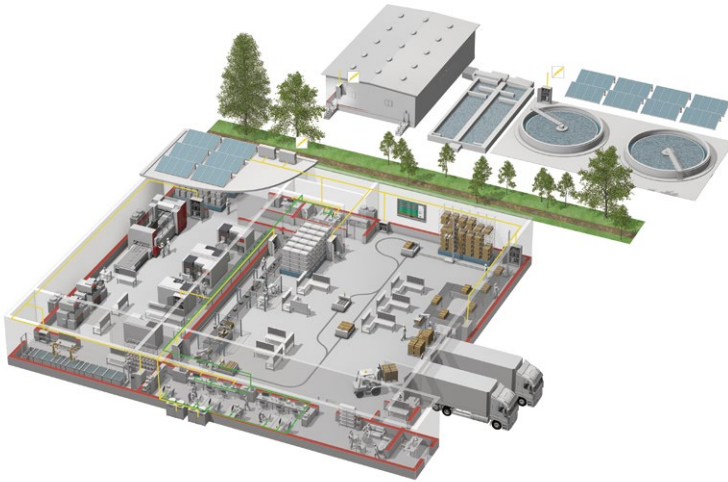
Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

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

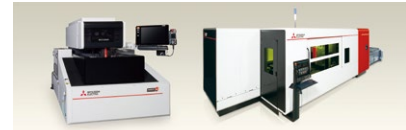Servos, Motors and Inverters

Visualization: HMIs

Edge Computing Products

Numerical Control (NC)

Collaborative and Industrial Robots

Processing machines: EDM, Lasers

A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation, established in 1921, is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 183 factories, laboratories and offices worldwide in over 140 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 billion), employing over 146,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

* Not all products are available in all countries.

Global Partner. Local Friend.
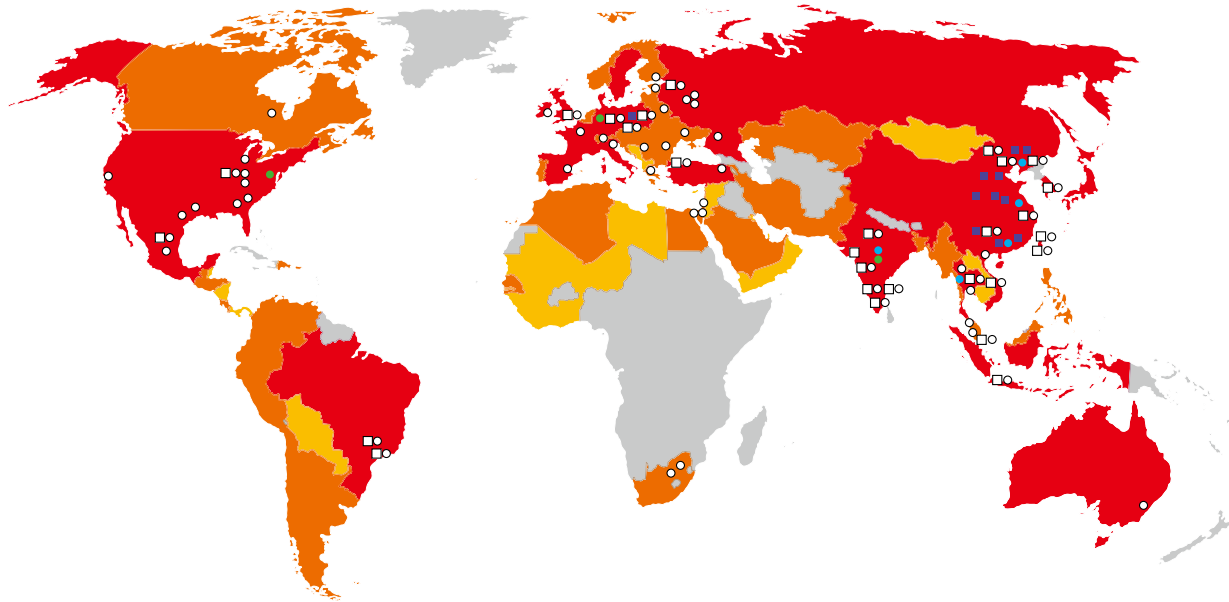
○ Sales office
□ FA center
■ FA center satellite
● Production center
● R&D center

Note: This is a map of our global sales and support coverage. It does not reflect any national boarders.

■ A region where there are direct Mitsubishi Electric FA offices (main/local and satellite).
■ A region covered by primary sales partners (distributors) who have local sales offices.
■ A region covered by our extended sales network which may or may not have local offices.

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Mexico	MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch Mariano Escobedo #69, Col. Zona Industrial, Tlalnepantla Edo, C.P.54030, Mexico	Tel : +52-55-3067-7511
Brazil	MITSUBISHI ELECTRIC DO BRASIL COMÉRCIO E SERVIÇOS LTDA. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
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