

Global Partner. Local Friend.

FACTORY AUTOMATION

PackML SOLUTION

Open, Efficient and Flexible Packaging Automation



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- Simplification
 - Maximized Line Uptime
 - Flexibility
- Cost Savings
 - Reusability
 - Simplified Training



SPEAK PRODUCTIVITY

Packaged goods manufacturers are constantly seeking ways to cut costs per package unit. At the same time, their lines must be flexible and ready to introduce innovative packaging solutions.

As more manufacturers adopt OEE (Overall Equipment Effectiveness) principles to measure the performance, quality and machine availability of their entire line, this analysis requires the collection of uniform data across machines and lines.

Packing Machinery Language (PackML) provides a standardized way to collect this data, and simplifies the functionality of Manufacturing Execution Systems (MES), even in a multi-vendor environment. By providing a unified appearance and functionality between different vendors, PackML allows the operator to look at any display screen on the line and see a familiar interface.

PackML was proposed by the OMAC Packaging Workgroup and has continued to evolve since then. It features the state model for even more advanced machine integration, the concept of PackTags and easy-to-use templates. The most recent ISA88 industry standard incorporates OPW's PackML and PackTags.

The Competitive Edge of PackML

From process owners to OEM's and line manufacturers, upgrading to PackML immediately begins to generate measurable return on your investment.

Advantage 1

Streamline Device Installation

Devices from different manufacturers can be connected on the same line.

Advantage 2

Simplify Maintenance & Training

Unified 'look and feel' and operability reduce human error.

Advantage 3

Enhance Productivity Management

Collection of uniform OEE data across machines and lines.



Reduced System Construction & Operation Costs

BENEFITS OF PackML STANDARDIZATION...



For the end user

For the packaging line operator, the advantages of PackML adoption are clear. Before ordering a new packaging line or retrofitting your existing line, or if you are considering introducing OEE or MES in a multivendor environment, take a moment to consider these benefits.

Simplification

Configuration of line operation and systems is simplified and streamlined, even in a multi-vendor environment.

Maximized Line Uptime

All operator tasks from maintenance to troubleshooting are eased by the consistent “look and feel” across the line. In addition, the learning curve for everyone from operators to engineers and managers is reduced.

Flexibility

PackML is future-ready. Your investment in the software and library is reusable when expanding the system or implementing line changes, saving time and costs.

Cost Savings

By leveraging the full functionality of your systems, the PackML solution actually can reduce the total cost of investment. The efficiencies of reusable hardware and software results in a line that costs less to build, operate and maintain.

For the OEM

Today packaging machines are increasingly complex. They must respond to product diversity while delivering higher rates of performance. They must be designed for easier changeover and feature improved interfaces. The PackML solution answers the challenges of engineering integration and issues such as software development and training with a proven industry standard.

Reduced Development Time

Templates provided by component makers are PackML ready, saving your business valuable time and the cost of development.

Reusability

Don't reinvent the wheel for every development project. With PackML, the time and effort invested in programming is reusable.

Reduced Debugging / Start-up

By reducing the volume of code to test and adoption of modular software programming, the amount time required to debug the system and get the customer on line is significantly reduced.

Simplified Training

PackML can make after-sale support easier. The standardized templates of PackML solution means the same familiar graphic operation terminal screen even for different types of machines, thereby simplifying training.

“SEE” YOUR PACKAGING PROCESS

There are three keys to understanding how PackML works and its advantages: State Model, PackML Modes and PackTag.

KEY 1: STATE MODEL

This model provides a standard vocabulary to describe the current machine operating state, for example, “execute” (running) or “idle” (stopped). This language is generic – that means that it is not unique to a distinctive function or characteristic of a machine. The state language universally applies to all machines. Other standard states include “held” (operator ordered pause) and “suspended” (machine is waiting for supply from upstream in the line.)

Changing from One State to Another

Under PackML, a change in machine state can occur due to:

- 1) A change in the internal condition of the machine or a networked machine;
- 2) Operator action;
- 3) Programmed control of the machine; or
- 4) A command initiated by a remote monitoring computer.

State Transition Model

PackML has a state transition model that clearly defines the commands available for changing from one state to another. As shown in this chart, a change from the IDLE state can be initiated by a Start command (→ STARTING State), a Stop command (→ STOPPING State) or an Abort command (→ ABORTING State). Some states (STARTING → EXECUTE) automatically change to another state unless interrupted by a command.



KEY 2: PackML MODES

A variety of modes are defined by the user. Three commonly used machine modes are Producing (Automatic), Maintenance and Manual. However, if needed, PackML allows users to create an unlimited number of modes, for example, even a Semi-Automatic or Cleaning Mode.



Production Mode

This is the mode for routine production. The machine operates in response to commands entered directly by the operator or issued by another system.



Maintenance Mode

This mode is used for troubleshooting and testing operational improvements. The machine can be operated independently of other machines in a line.

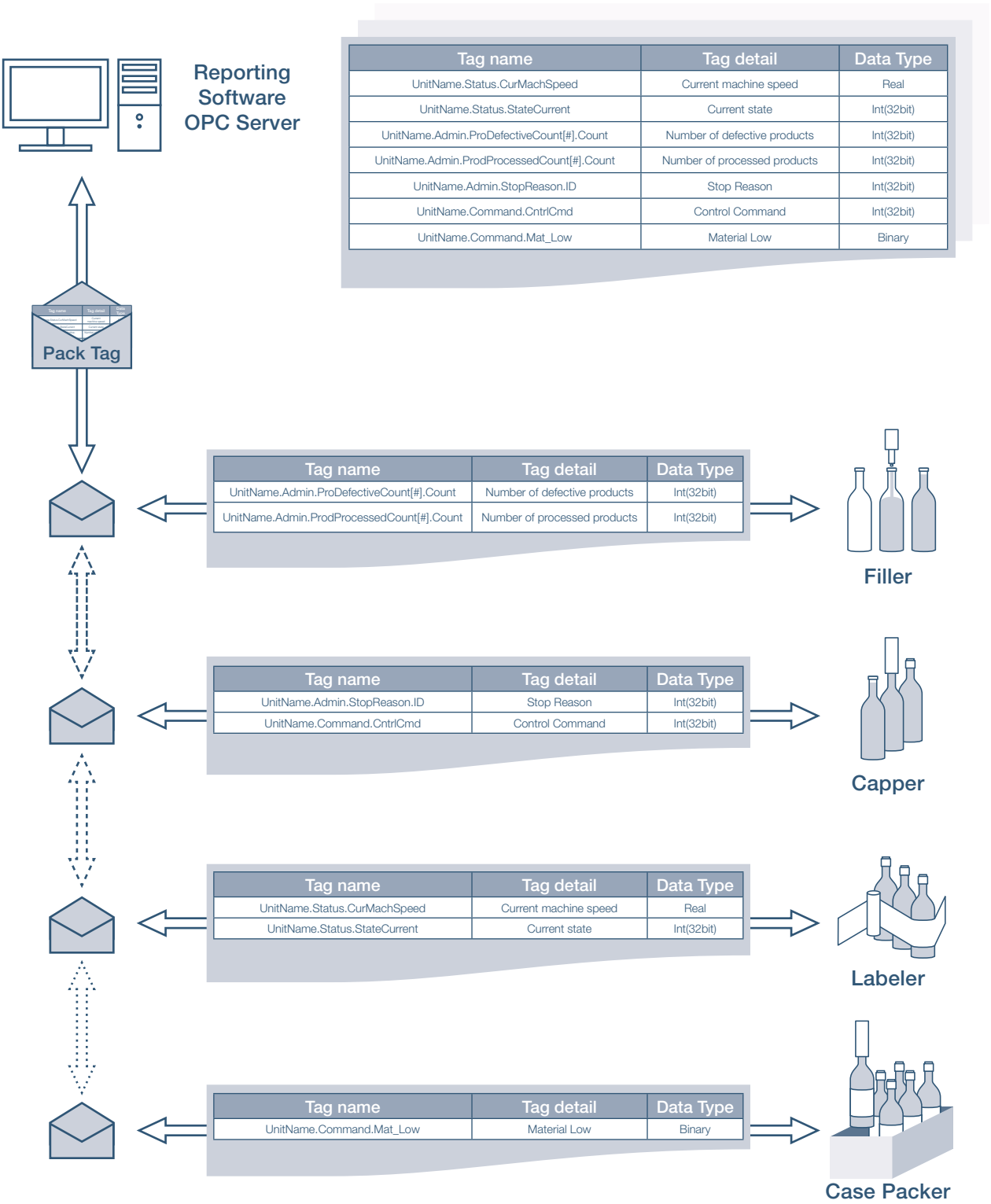


Manual Mode

Typically used for testing and verifying drives, this mode enables direct control of the machine.

KEY 3: PACKTAGS

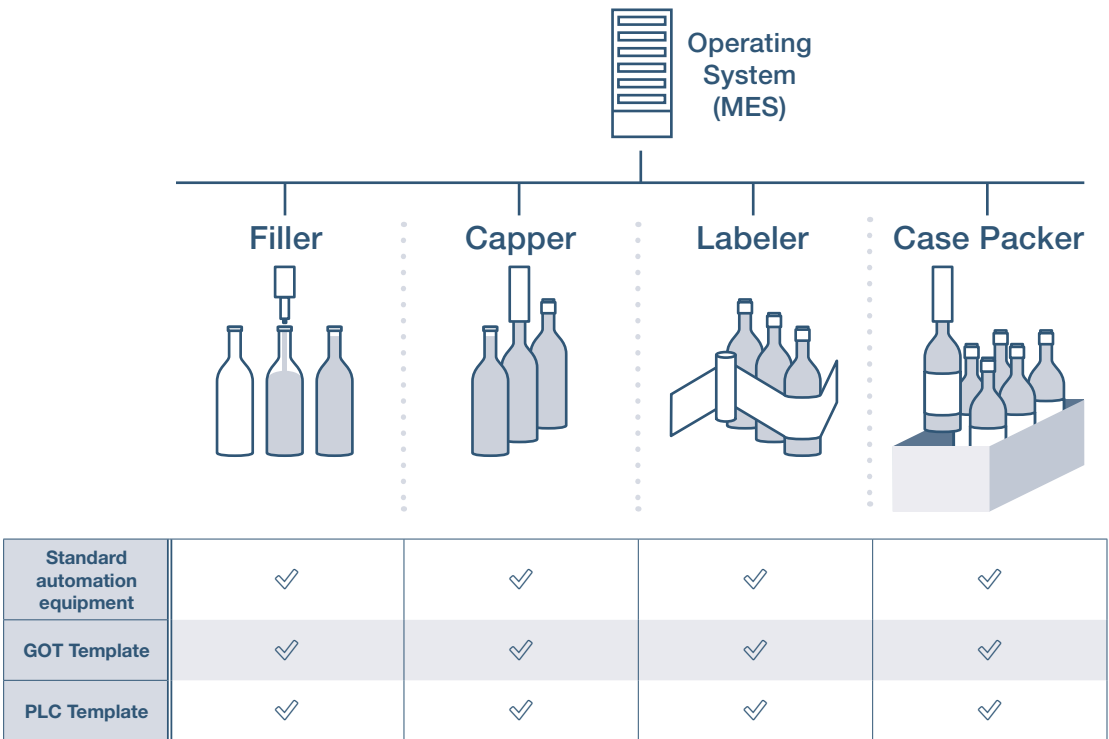
PackTags define certain PLC variables and standardize how packing line data including state and mode commands are communicated. It facilitates not only machine-to-machine communication, but also communication within a machine, for example between a PLC and a controller, and between machines and higher-level information systems. By providing only the raw data necessary to calculate performance, this standard supports OEE or other methods of analyzing machine efficiency. As part of OMAC's Plug-and-Pack™ guidelines, PackTags ease and reduce time for integration of packaging machines even from different vendors, enable automatic start-up and shutdown of lines, and accelerate troubleshooting and analysis.



MITSUBISHI ELECTRIC PackML

The Solution Beyond the Standard

Based on the OMAC PackML standard, the Mitsubishi Electric PackML solution not only delivers all the advantages of standardization including a reduced learning curve for operators and increased reliability, but also addresses many manufacturer concerns about deploying a standard. From streamlining the deployment of the PackML standard to providing predefined HMI templates and ready-made function blocks to speed configuration, the Mitsubishi PackML solution simplifies the entire journey and eliminates many of the costly extras of implementation. Moreover in a multi-vendor environment, Mitsubishi PackML's efficient use of PLC resources lets you use a smaller PLC.



MITSUBISHI PackML FEATURES & TOOLS

Mitsubishi PackML not only empowers you with powerful performance features but also provides the tools to implement your solution with maximum efficiency and effectiveness.

Modularize Coding

By modularization of machine programs, Mitsubishi PackML makes coding not only more organized and easier to debug, but also reusable. The ISA88 physical hierarchy for code modules contains six levels (global company level to individual functions). The diagram on the next page shows the bottom three levels which focus on the individual machine: Machine (Unit

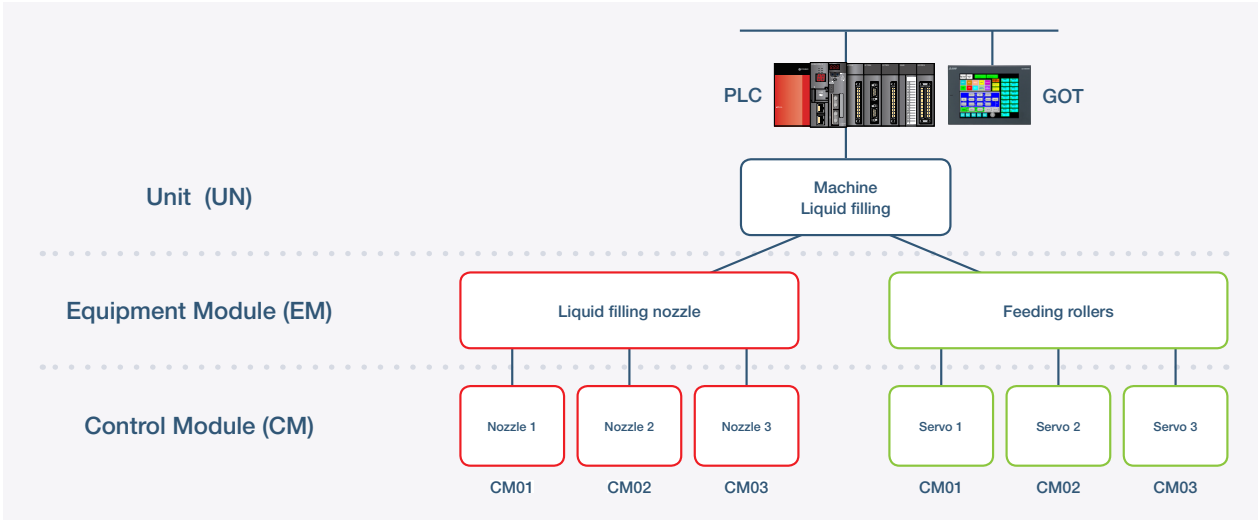
or UN): Processing activity modules; Equipment Module (EM): Functional modules to perform limited activities; and Control Module (CM): Single function modules. PackML commands flow down from the Unit Machine level through the Equipment Modules to the Control Modules. As each module completes its task, the status is reported back up the chain.

Superior Communication

Ready-to-use tables for conversion of PLC labels into PackTags on the OPC server and OPC Server configuration profiles to accelerate system implementation are just a few Mitsubishi PackML solution features that facilitate automatic exchange of data between devices.

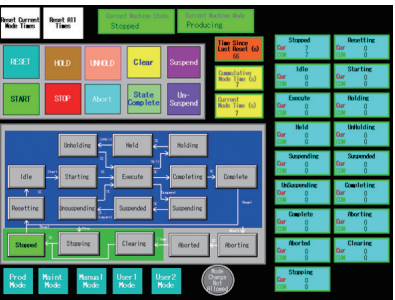
System Configuration

Designed to support modularization, the Mitsubishi PackML Solution simplifies installation and configuration of your machines into an integrated packaging system.



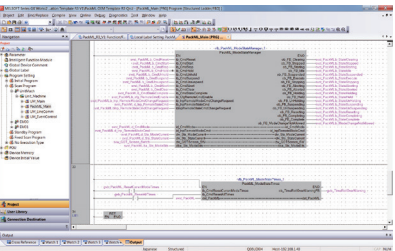
Graphic Operation Terminal (GOT) Template

Arranged for an at-a-glance grasp of machine status and operation, the GOT template displays the Mode, State and Timer information. Color coded buttons for Mode Change Commands, State Change Commands and Timer Reset are clearly identified.



PLC Template Program (ladder logic package)

The main functions of the Mitsubishi PackML templates are to handle PackML state and mode transitions, accumulate machine execution time in each valid mode and state, and process machine operation events such as alarms and warnings. Event handling function blocks included in the templates facilitate easier and more consistent machine event handling.



PackTags Implementation

PackTags are implemented as a part of the Mitsubishi PackML Template system. OPC tags can be added manually one at a time. For a large number of tags, all tags can be created in Excel and easily imported to the OPC server.

Class	Label Name	Data Type
1 VAR_GLOBAL	Unit_Adm_Changeover	PackML_Adm_Changeover_S01
2 VAR_GLOBAL	Unit_Adm_Alarm	PackML_Adm_Alarm_S01(S0)
3 VAR_GLOBAL	Unit_Adm_Reset	PackML_Adm_Reset_S01
4 VAR_GLOBAL	Unit_Adm_Accumulation	PackML_Adm_Accumulation_S01
5 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
6 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
7 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
8 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
9 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
10 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
11 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
12 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
13 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
14 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
15 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
16 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
17 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
18 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
19 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
20 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
21 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
22 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
23 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
24 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01
25 VAR_GLOBAL	Unit_Adm_AccumulationReset	PackML_Adm_AccumulationReset_S01

Time Saving Tools

Mitsubishi's PackML Implementation Package offers a variety of tools and support including an Event Test Screen to simulate an event being generated and cleared in the Unit Machine, sample mode screens with elements that can be copied and used on other screens created by OEMs, and a comprehensive User Guide.

BUILDING SOLUTIONS THAT WORK

Overview

Seeking to improve every aspect of their filling operation, this customer in the food and beverage industry came to Mitsubishi Electric with a long list of expectations: reduced labor, lower machine costs, less waste, and faster output. Our comprehensive PackML Solution not only met but exceeded expectations.

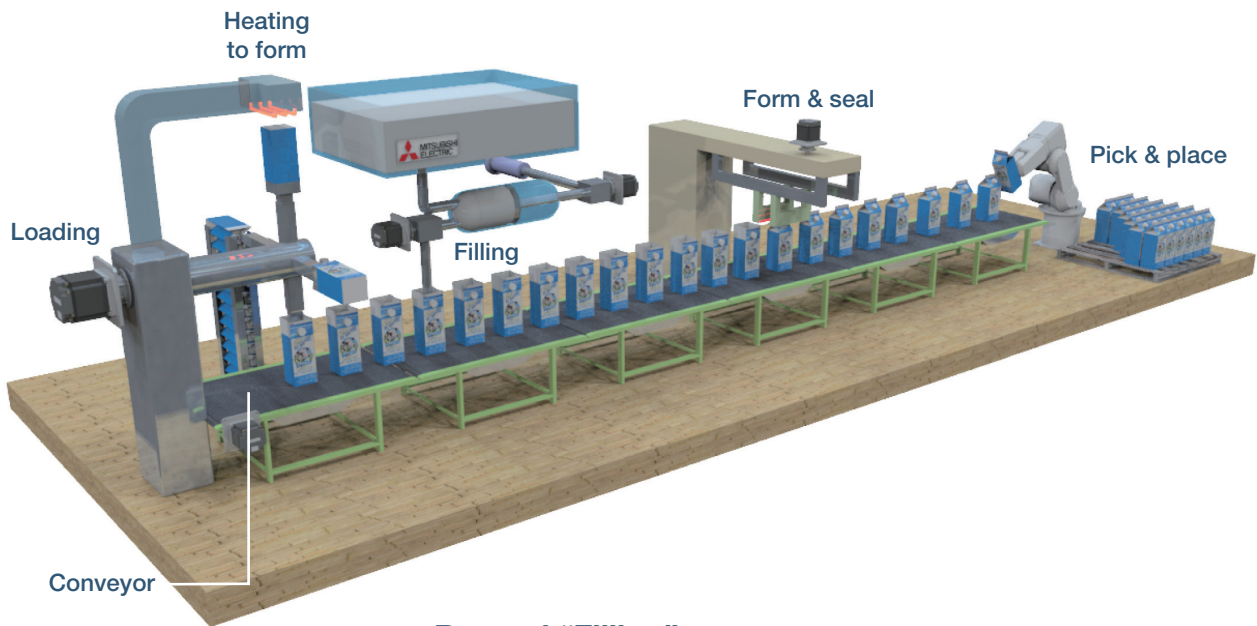
Filling Line (Pre-Solution)

- A loading arm rotates and forms each container with heat before placing it on the conveyor.
- The conveyor carries each item to the filler station where two servos perform the filling process.
- Containers are then manually picked and placed onto a pallet.

Mitsubishi Electric Solution

Mitsubishi Electric combined PLC, HMI, motion and robot programming under a single platform to provide the customer with a total solution.

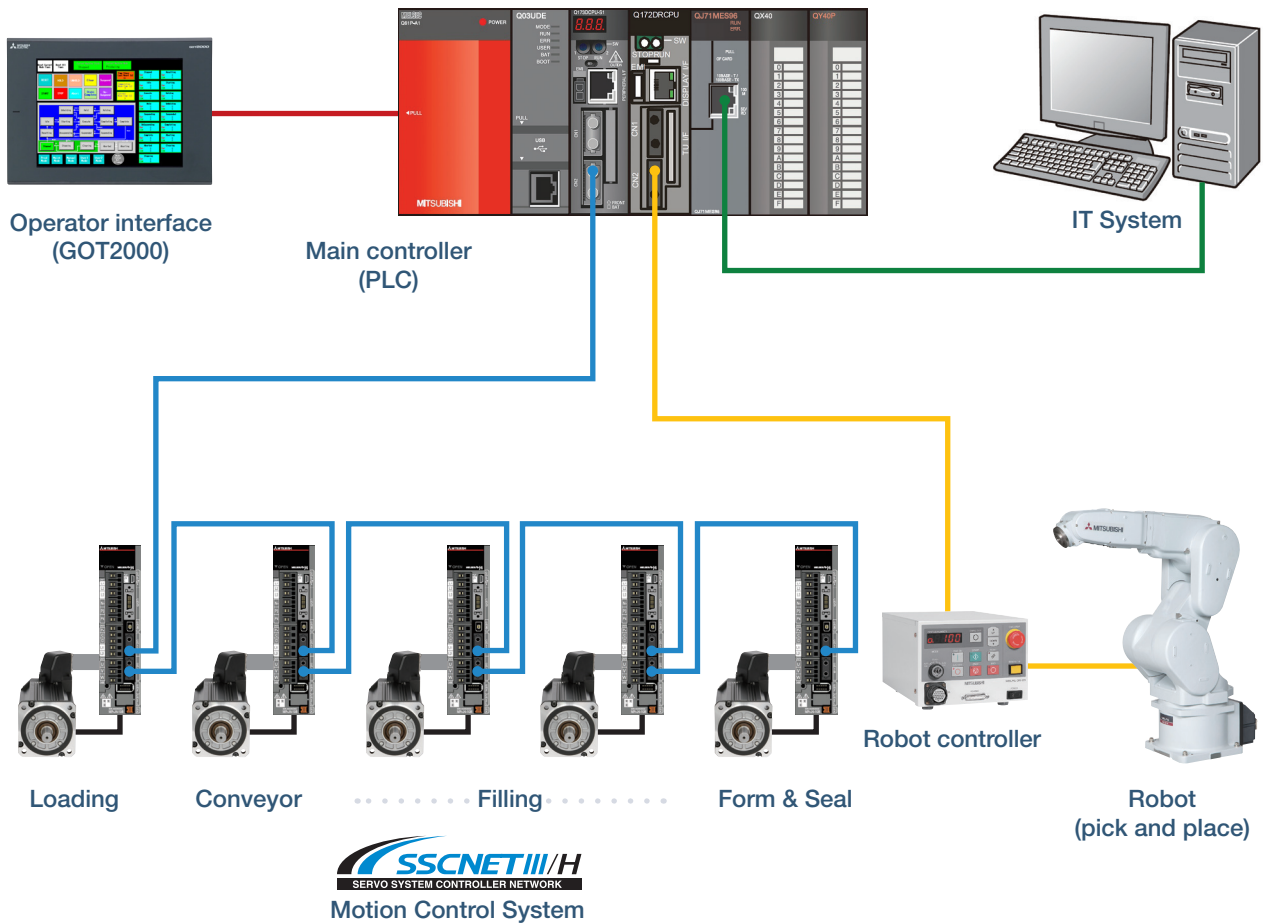
- Q Platform Sequence Controller (Q03UDECPU)
- Servo Amplifier (MR-J3-B)
- Servo Motors (HF-SP, HF-JP)
- MES Interface IT Module (QJ71MES96)
- iQ Platform Motion Controller (Q172DCPU)
- Graphic Operation Terminal (GOT2000)
- “Pick and Place” Robot



Beyond “Filling”

From high-speed filling to stretch wrapping, Mitsubishi Electric PackML solutions can impact the bottom line of every packaging line with...

- Increased Output & Less Scrap
- Quick Product Changeover
- Reduced Labor
- Immediate Cost Savings



RESULTS

Full PackML Implementation

Easy integration and modification to meet specific machine requirements. Enhanced operability thanks to standardized function blocks, alarm and event handling, HMI screens and full PackTag compatibility.

CAM Function

(with Mechanical Support Language)

Reduced programming time with easy-to-create CAM profiles. Reduced labor cost and machine cost.

Single Platform Solution

Higher machine OEE (faster throughput and product changeovers, less scrap) by integrated multi-CPU technology for a high-speed backplane. Reduced TCO (reduced inventory, less downtime). Easy system scalability as the business grows.

Direct HMI Connection

Ease of use from programming to monitoring, operation and diagnostics plus program upload/download capability via the USB port. Reduced maintenance time and cost due to ladder monitor/editor.

SSCNET III Communication

Plug & Play wiring eases set-up and configuration for reduced engineering and wiring costs. High-speed motion network and 100% noise immunity for reduced machine downtime. Automatic parameterization increases positioning accuracy for reduced scrap.

MES Interface

Direct data connection to IT systems eliminated intermediate PCs on the factory floor. Data aggregation from other factory floor devices contributed to improved security and standardization.

THE NEXT GENERATION FACTORY

e-F@ctory is Mitsubishi Electric's factory automation initiative. Through our solutions, Mitsubishi Electric aims to boost the performance of manufacturing enterprises by delivering reduced TCO, maximized productivity, and seamless integration.

The e-F@ctory Alliance

Teaming with best-in-class suppliers, Mitsubishi Electric creates partnerships that promise the most comprehensive solutions possible.

SI Partners

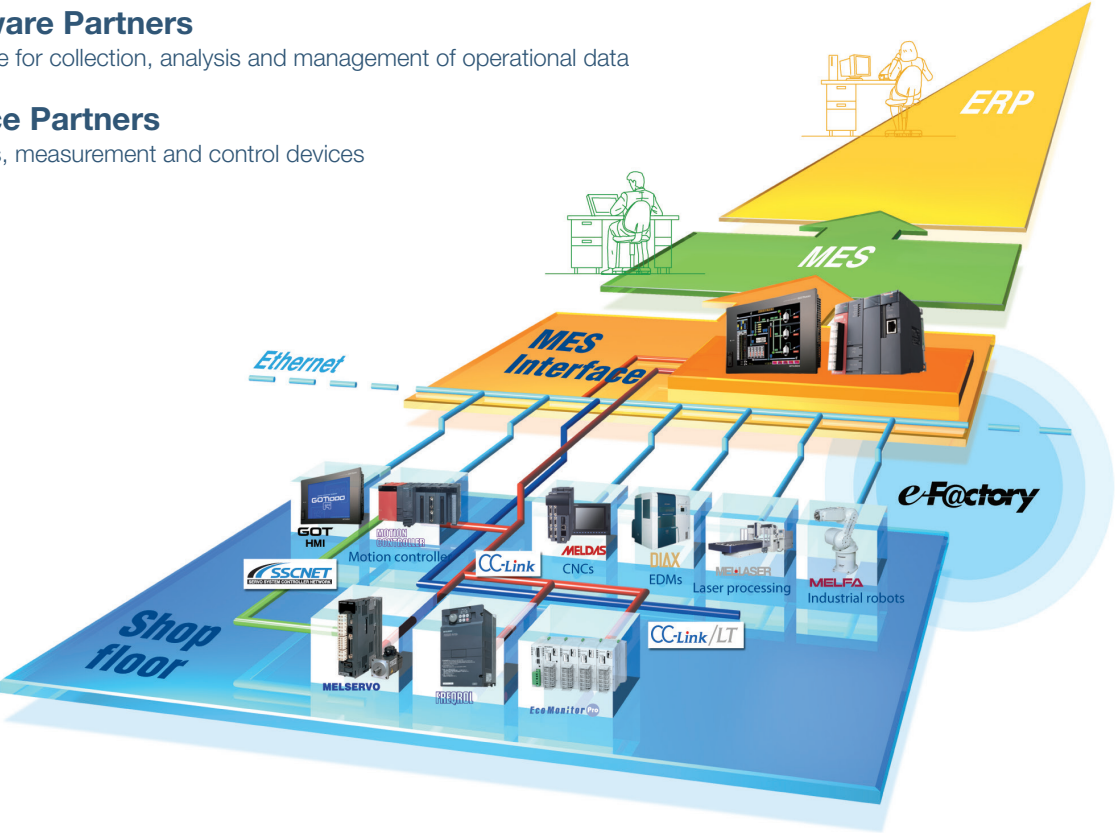
Total support for construction and operation

Software Partners

Software for collection, analysis and management of operational data

Device Partners

Sensors, measurement and control devices



FACTORY FLOOR

Mitsubishi Electric and other leading automation suppliers provide users with the simple and total integration of all elements necessary to challenge new levels of productivity. Seamless integration from actuators, PLCs and sensors to the latest in robot technology and completed machine tools.

MES INTERFACE

The essential link between the manufacturing environment and business operations is assured by connectivity solutions provided by Mitsubishi Electric and e-F@ctory partners. Direct integration spanning the factory floor and IT systems including legacy databases and MES/ERP systems is the key to optimization for improved output.

ERP/MES

e-F@ctory recognizes the importance of MES and ERP in a manufacturing enterprise, and can offer the services of a range of partners in this application space.



KNOW-HOW

Global Group Power

Operating over 230 factories and laboratories in 121 countries and active in diverse fields from the space industry to home products, Mitsubishi Electric knows the importance of reliable, efficient, user-friendly factory automation and control. Behind every Mitsubishi Electric FA solution is access to the know-how and practical insights of our entire worldwide group.

SEAMLESS

SLMP, CC-Link IE, and OPC

Seamless data communication from the plant-level enterprise network to the factory floor network is assured by the SLMP connection protocol between CC-Link IE and Ethernet products, the open 1Gbps CC-Link IE Control standard for manufacturing networks, and the OPC interoperability standard for the seamless, secure and reliable flow of information in the industrial automation space.

e-F@ctoryALLIANCE

Over 3,000 direct and indirect partners ready to build of customer-focused solutions.

e-F@ctory solutions let our customers take advantage of the expertise of leading companies who specialize in the following fields:

- CAD/CAM
- Manufacturing Process
- SCADA Systems
- Communication
- Monitoring
- Vision Systems
- Electrical Power Solutions
- Network Visualization
- Enclosure and Fittings
- Programming
- Enterprise Connection
- Project Management

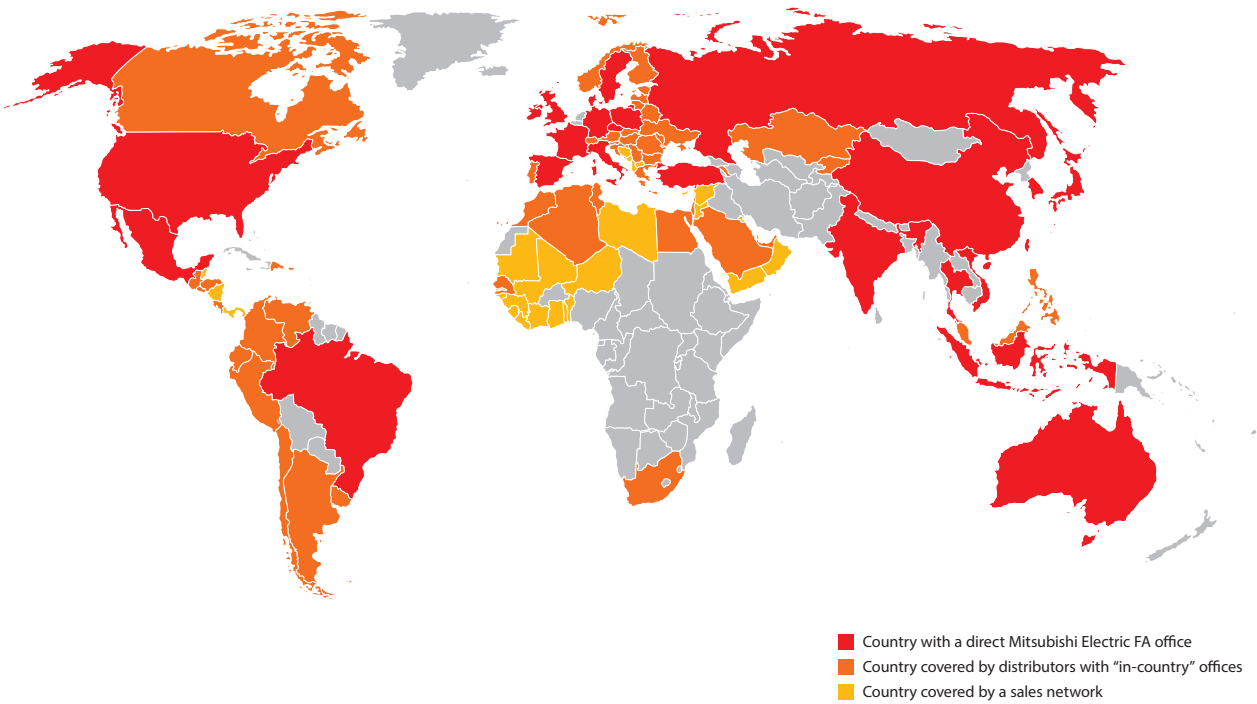
EXPERIENCE

Making plant processes “visible” and optimizing production for over a decade.

Since the dawn of the modern factory automation era, Mitsubishi Electric has developed and provided solutions to enhance the integration of the business and production environments directly with MES and ERP connectivity solutions. In addition, the company also provides outstanding automation hardware, including PACs, PLCs, CNC, Inverters, Servo and motion systems, HMIs, Robots, Low voltage switchgear, EDM machines, and Laser processing machines.

GLOBAL NETWORK

Complete service and support from consulting and design to implementation and maintenance of your PackML solution is backed by Mitsubishi Electric's global network of sales offices and FA Centers.



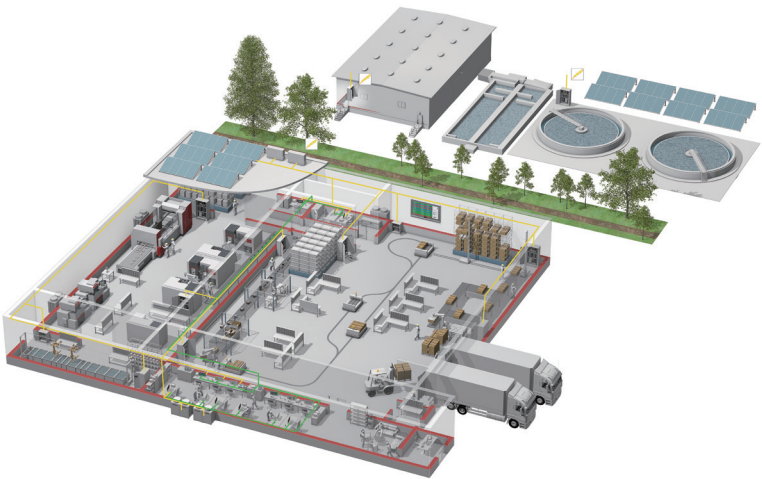
Mitsubishi Electric FA business group is supporting manufacturing not only in Japan but also all over the world. We use various local services to support our customer needs for example local showrooms, FA mobile display caravans, global information service, training schools, 3-year warranty, 7-year repair policy as well as field service and local repair.

Please feel free to contact your local Mitsubishi Electric FA office. With FA Centers established in many regions all

over the world as core operations, we offer various services to our customers in close cooperation with local sales offices, branch offices and agencies.

You can purchase your Mitsubishi Electric FA products in any country and in addition, we will support your global business with repair, training in local language and other services at your local sites.

A WORLD OF SOLUTIONS



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

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 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 237 factories and laboratories worldwide in over 121 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 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.



Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC



Power monitoring, energy management



Compact and Modular Controllers



Inverters, Servos and Motors



Visualisation: HMIs, Software, MES connectivity



Numerical Control (NC)



Robots: SCARA, Articulated arm



Processing machines: EDM, Lasers, IDS



Airconditioning, Photovoltaic, EDS