MITSUBISHI ELECTRIC
FACTORY AUTOMATION

MATERIAL HANDLING

Automation Solutions

Lean and flexible systems that deliver

**Conveyor systems /// Storage and retrieval (AS/RS) ///
Automatic guided vehicles (AGVs) /// In line and vertical sorting ///
High speed sorting loops /// High speed insertion systems ///**

Moving forward together

Mitsubishi Electric believes in the strength of the independent solutions provider. Our ultimate goal is to deliver innovations that empower our customers and allow them to differentiate themselves while setting higher standards within their respective markets.

Mitsubishi Electric has a long history in automation starting from a ship building background over 85 years ago. Since then we have grown to be a $30Billion multinational corporation with an estimated 100,000 plus employees worldwide. Using a constant progression of knowledge, we continue to increase the speed, accuracy, and quality of both our products and business processes. As a result, many of the world's top material handling solutions providers have already discovered that Mitsubishi Electric is the performance standard they can build upon.

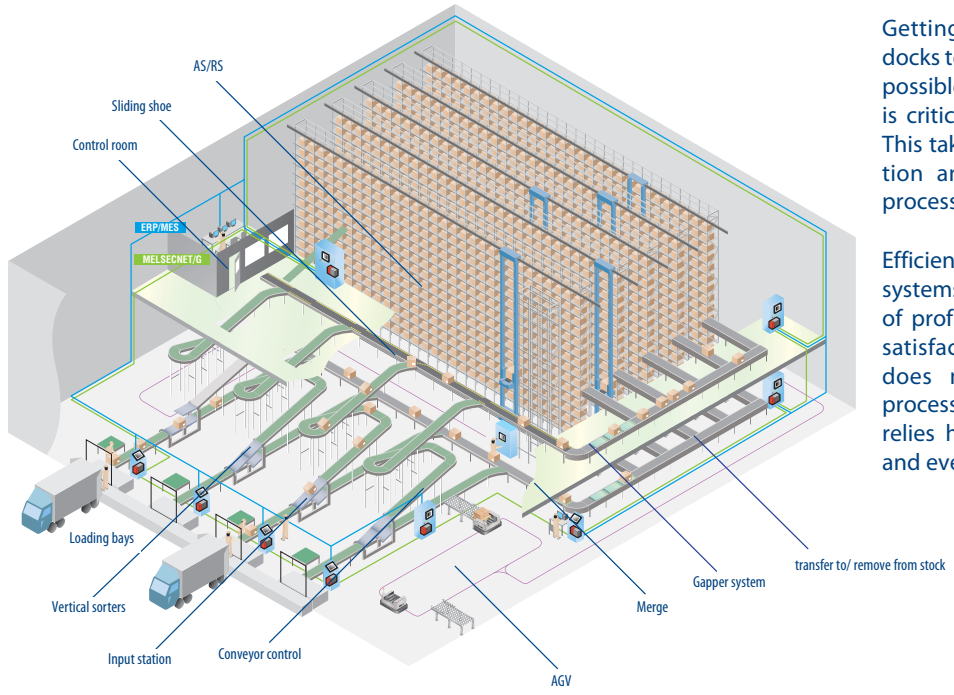
Integration is the key

Mitsubishi Electric's principle of integrating automation products into one common platform is a key advantage to applications for today's cost driven requirements. Every aspect of automation control, ranging from low to high end controllers, servos, inverters, and HMIs are based on our integrated Automation Platform. This provides users with the choice to deliver a PLC, Process, IT or PAC based architecture, using standard components for their chosen solution.

Meeting industry needs

Whether your company provides solutions in baggage handling systems, automated warehousing, postal automation or manufacturing systems; designs single material handling machines or entire automated facilities, Mitsubishi Electric can deliver the tools necessary for the right solution. With Mitsubishi Electric's high function, advanced performance products and technical know how, a complete and truly total solution architecture is easily realized.

Manufacturing and distribution systems



Storage systems require intensive line side data tracking

Getting material from the receiving docks to the shipping docks as quickly as possible with the least amount of errors is critical to any organization's success. This takes high level logistical coordination and error-proofing of repetitive processes.

Efficient manufacturing and distribution systems typically result in higher levels of profitability and increased customer satisfaction. However, lean operation does not happen overnight. It's a process of continual improvement that relies heavily on having a strong plan and even better feedback.

Bridging IT and automation control

Having vast amounts of data and handling, or processing it efficiently has been a hurdle not only for material handling applications but automation applications as a whole. Many automation providers allow for the movement of data from one machine to another on the shop floor. However, moving accurate and detailed data from the shop floor up to IT systems has been overlooked by most, resulting in costly down time, process inefficiencies and many other issues.

With Mitsubishi Electric's e-F@ctory solution, these problems have been eradicated. Together with Mitsubishi's revolutionary integrated Automation Platform it can provide a true total solution architecture, not only concentrating on the shop floor but also providing a direct interface to ERP/MES systems with streamlined real-time data, resulting in a "visible" system solution.

Flexible manufacturing

With so many products and articles being handled in current material handling processes, providing a complete automation platform is paramount to a successful application. Mitsubishi Electric can provide a single centralized automation platform that easily interfaces with bar code readers, pick/place robots, conveyors, weighing machines, scanners and more. The CC-Link device level network provides a high speed method to integrate such devices easily and at a low cost. Even robots and conveyors can be controlled directly from the controller platform, along with interfaces to the GOT1000 HMI series for real time online control and monitoring. With all of this cohesiveness, the right product being delivered to the right destination is ensured.

Conveyor systems

Merge, gap, slide

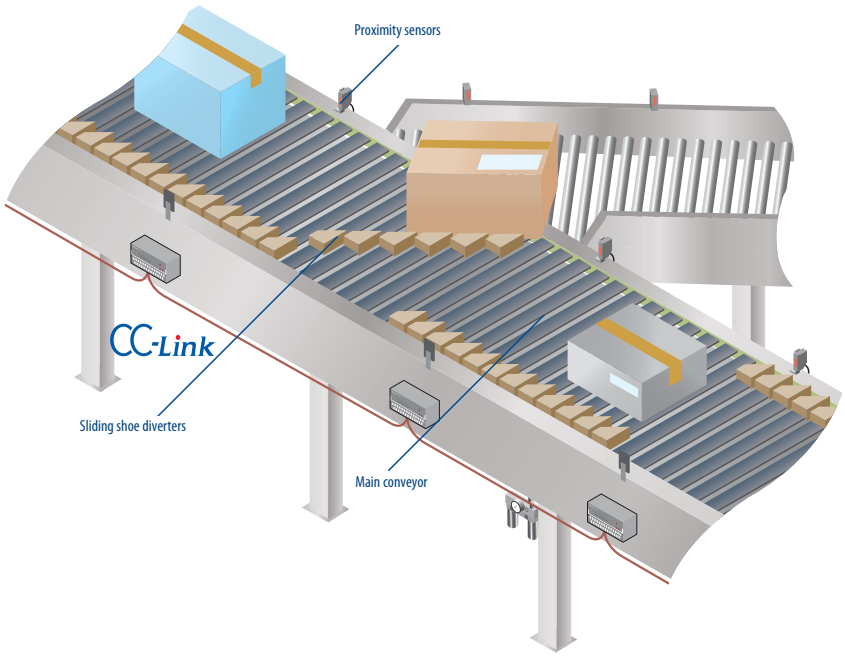
In many material handling applications, items are first loaded onto a merge conveyor which matches speeds with the main conveyor and inserts packages whenever room is available. Next, an induction system uses smart conveyors or gappers to adjust the space between each package and create uniform separation.

Since placement onto the merge conveyor can vary significantly along with both the size and shape of the material being handled, the automation system must recognize these differences and respond accordingly, often with very little time to do so.

Fast input

A gapper system typically consists of a succession of multiple small conveyors, each conveyor changing speeds in relation to the conveyors in front and behind it. The key requirement in gapping technology is the ability of the system to sense product and change conveyor velocity in a very short amount of time.

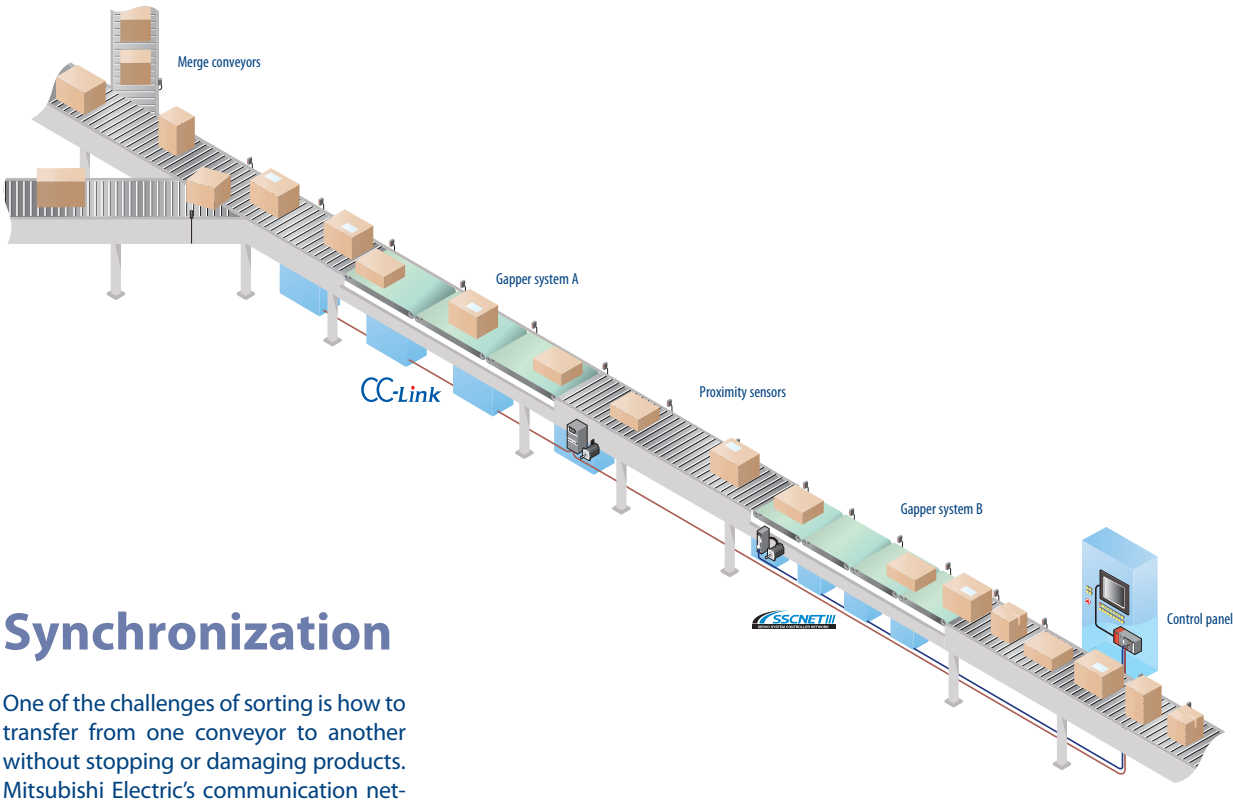
During ultra fast time intervals, proximity sensors send updates to the controller regarding the product location, which then calculates new speeds to be sent to inverters or servo amplifiers. Even with rapid velocity commands, the conveyors must accelerate or decelerate without any overshoot or undershoot occurring.



Timing and speed of response govern many conveying applications

From simple induction systems to the most advanced gapper designs, Mitsubishi Electric delivers with various controller performance levels from the QD75P position module to the new QD series with integrated high-speed BUS [back-plane] for fast multiple CPU communication. In addition, remote I/O and interrupt modules range from standard 20msec response times to the faster 50microsec QI60 up to the extremely fast 10microsec Q172LX devices.

CC-link compatible FR-A700 inverters coupled with CC-link remote I/O provide a very strong baseline that satisfies the majority of induction system requirements. For gapper conveyors that require an extra boost of performance, the SSCNET III based MR-J3-B servo system can be easily added into the integrated Automation Platform, taking "high speed " to a new standard.



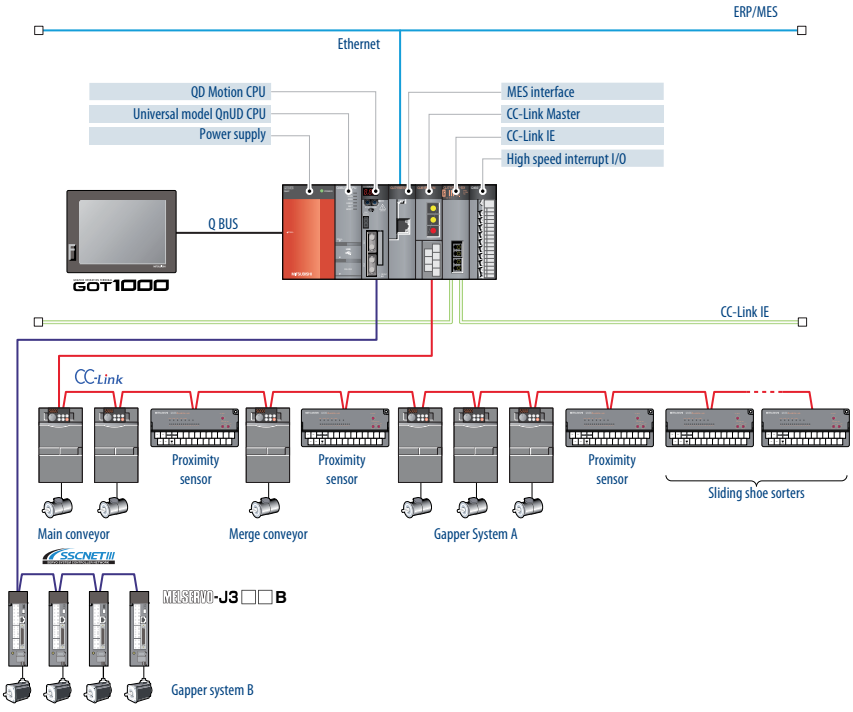
Synchronization

One of the challenges of sorting is how to transfer from one conveyor to another without stopping or damaging products. Mitsubishi Electric's communication networks are optimized for maintaining synchronous control of multiple axes. The servo network SSCNET III is a full-duplex 50 mega baud system where data communication is both bidirectional and high-speed (Synchronous deterministic communication) yet has zero possibility of data collisions which otherwise could cause timing delays and unwanted downtime. Furthermore, the network cycle of SSCNET III is designed to match that of the controller and the servo amplifier. Therefore, all critical motion devices are synchronized and the system is allowed to perform in real-time. This is a huge performance benefit when using electronic gearing or coordinating the motion between two fast moving axes.

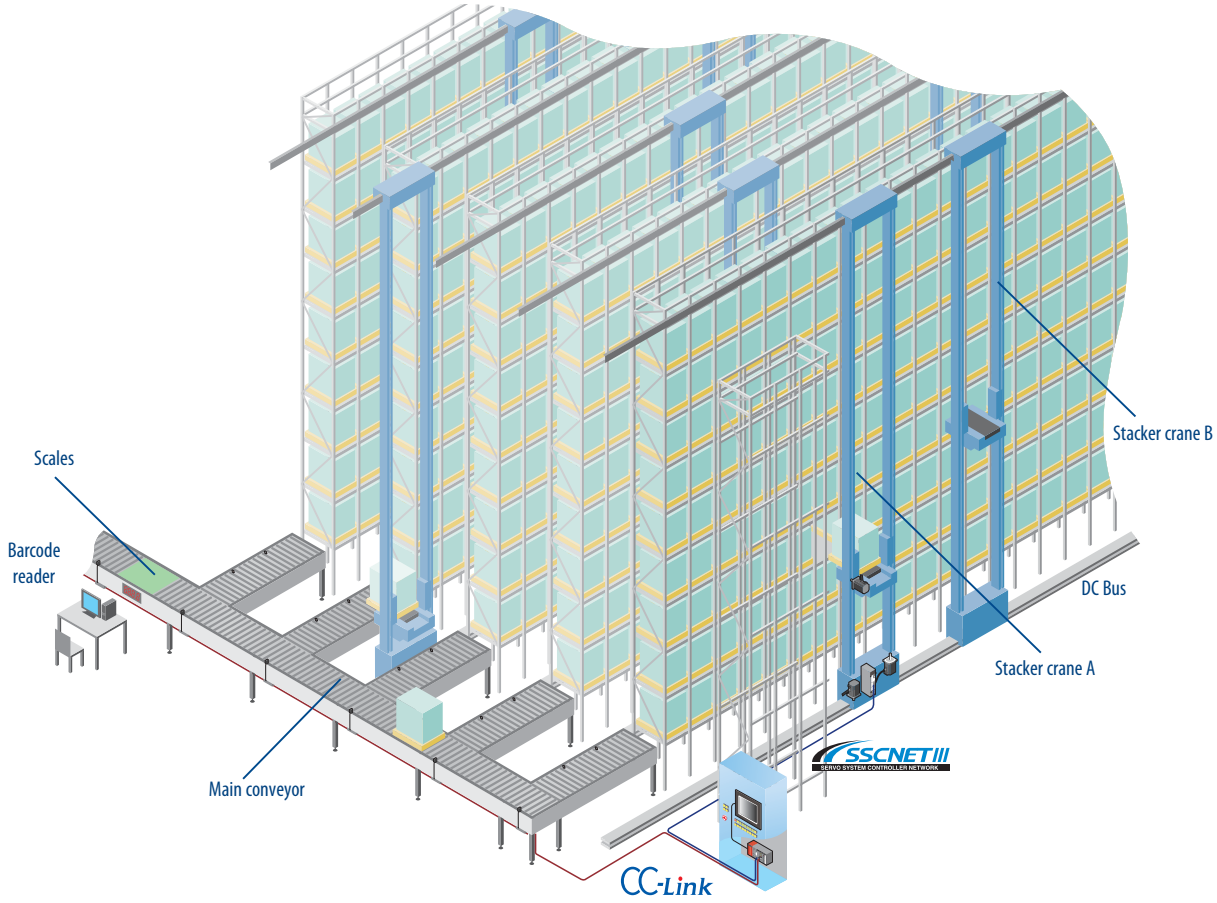
CC-Link IE is an ultra high-speed 1Gbps redundant Ethernet topology communication system for inter-controller communication, allowing various subsystems in a material handling system to all communicate deterministically in a peer-to-peer manner. The sorting subsystem can communicate upstream with an AS/RS system or an AGV command station and prepare those systems for the material they are about to receive. When the time comes, the product can be transferred cleanly to its new carrier without any delay.

In addition, CC-Link, an open standard from the CC-Link Partner Association (CLPA), allows for high-speed access to I/O and other devices over long distances. Unlike other similar networks, adding I/O and increasing distance between devices does little to impede the performance of the network. Speeds of up to 10Mbps, and bus lengths of up to 1.2km without the use of repeaters are standard.

This is especially useful for diverters, such as sliding shoe sorters that have remote I/O elements down the entire length of the conveyor system.



Automated storage/ retrieval systems



Minimize your breaks

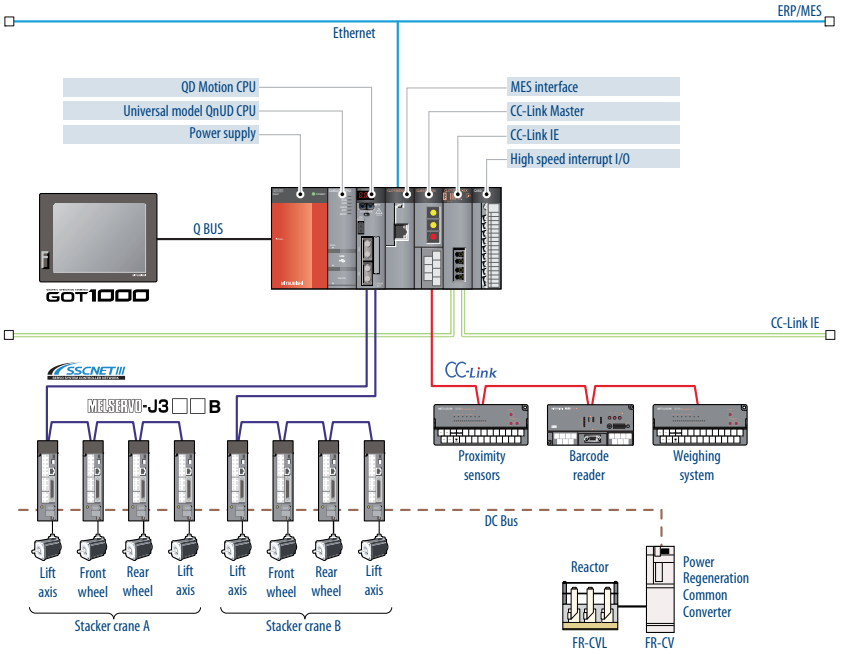
Automated Storage and Retrieval Systems (AS/RS) have many advantages over older warehousing techniques. The ability to store items higher on shelves reduces floor space and the ability to track individual boxes or pallets allows for easy first in-first out systems. In the Baggage Handling System (BHS) industry, Early Baggage Storage (EBS) systems allow for bags to be temporarily stored and then released at the correct time to get on the same flight as the passenger. Since all of these AS/RS systems are typically large, the speed of the transport vehicle is key as it needs to move items in and out as fast as possible.

Continuous power

A single stacker crane in an AS/RS system typically has up to 4 axes of motion: Lift, extraction and two traverse drive wheels. All of this motion requires a lot of energy. Since the cranes are moving long distances at high speeds, power is typically delivered via a DC Bus supplied by our FR-CVL series of line regenerative common converters. These converters allow up to six Mitsubishi Electric inverters (VFDs) to be connected in a common DC Bus configuration and provide AC line regeneration.

Advanced auto-tuning

AS/RS systems need to be able to move at maximum acceleration and velocity under varying load carrying situations. One of the most extreme cases would be an AS/RS that transports heavy, full pallet-sized loads. If tuned to have the same set of gains for both loaded and unloaded conditions, the system, while stable, may still not be optimized for top performance. The MR-J3 amplifier contains advanced real-time auto-tuning technology that can automatically sense a change in load and alter the PID gains accordingly. This allows for maximum performance even with drastically changing load characteristics.



Power, speed and flexibility are prerequisites for a successful AS/RS solution

Automatic guided vehicles

Add flexibility

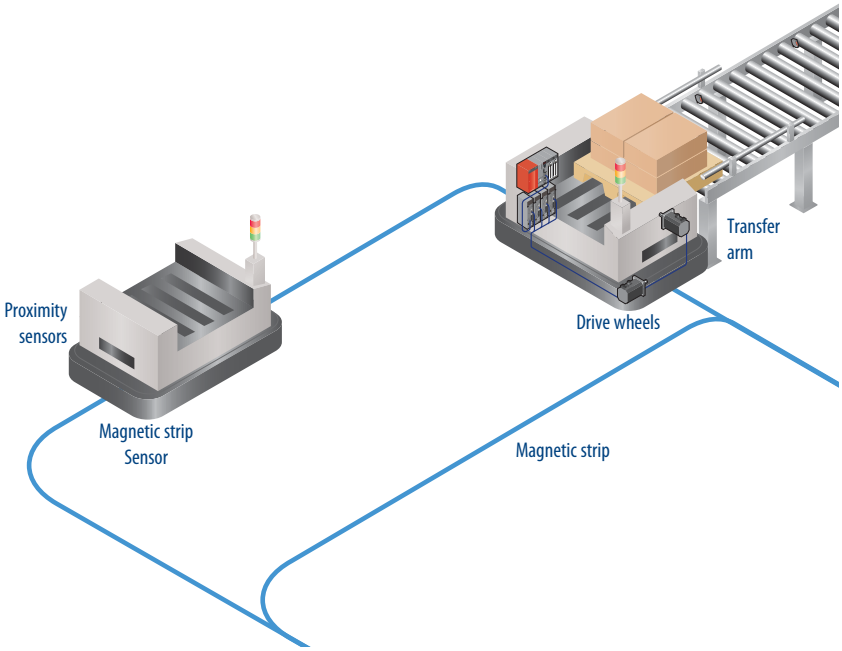
Being able to respond to changing customer demands is a key component of a successful material handling installation. For example, the beginning of the holiday season typically sees a rush of sales and shipments which is followed up by a significant increase in returns and exchanges. In order to accommodate this demand, distribution centers typically need to increase flow in one direction or the other.

In these flexible manufacturing environments, Automated Guided Vehicles (AGVs) become increasingly useful especially where conveyor systems are not practical. Furthermore, they can be used to remove the risks associated with heavy lift situations and reduce the number of forklifts in a factory, thus reducing on-the-job disruptions. Being able to react to and avoid obstacles while maneuvering through a crowded environment is a key element in AGV design.

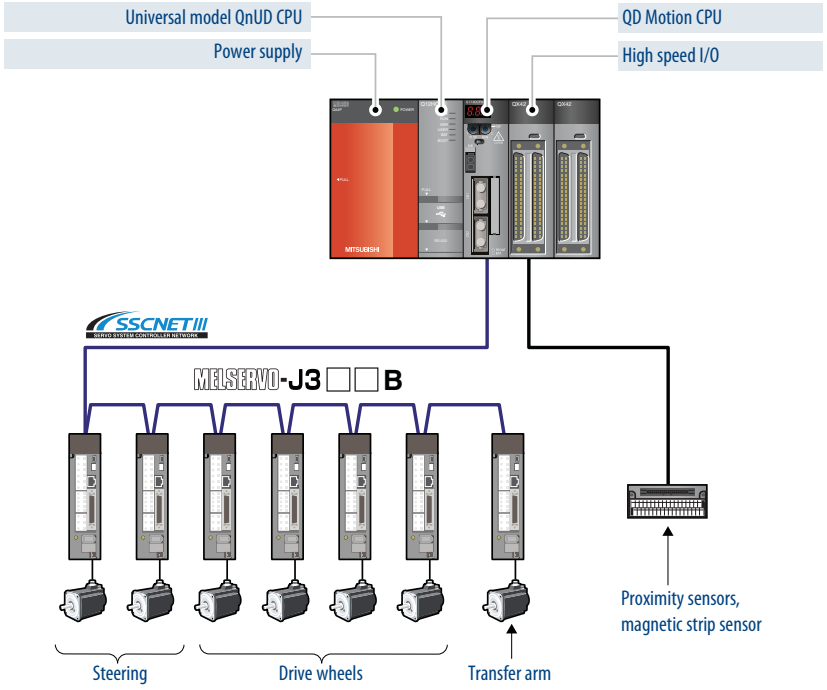
All-wheel drive control

Sort floors can be crowded and vibration intensive environments. Therefore, AGVs must be completely stable even with changing external disturbances and have the ability to make quick and precise movements. Using the phase compensation function, all four wheels (or more) of an AGV can be perfectly synchronized. In comparison to two wheel drive, all-wheel drive can increase acceleration, deceleration and of course handling, making incredibly tight turns possible.

The phase compensation function adjusts for time delays in the system and allows multiple axes to move together in perfect synchronization. Robust disturbance compensation allows the response to external disturbances to be tuned separately from the main PID loop, thus increasing overall responsiveness.



AGV's look deceptively simple but any driverless process requires reliable and repeatable control for safety and task completion



Baggage handling systems

Stay on schedule

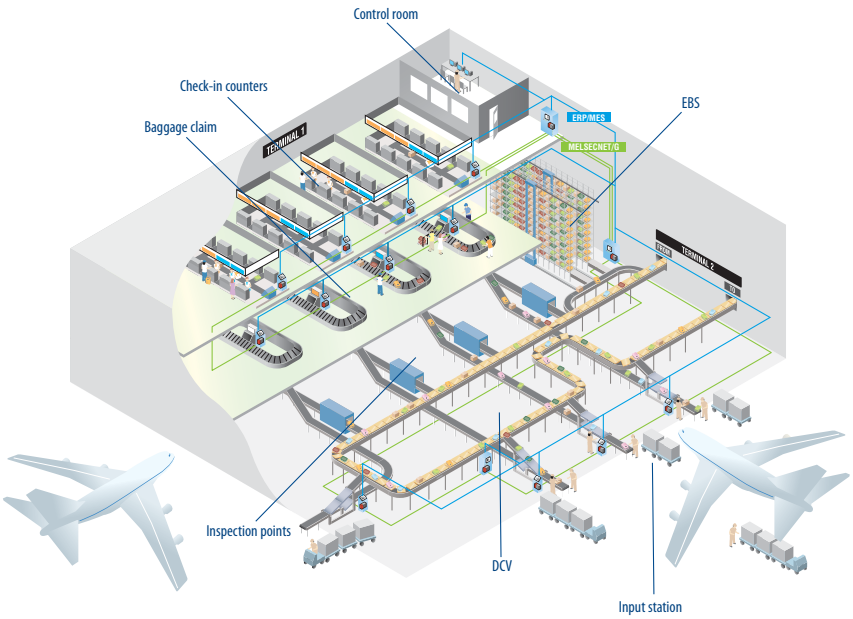
In baggage handling, the goal is to have the passenger and their bag get on the same plane. Airport expansion along with in-line security measures and a decrease in layover times at major hubs has created the need for extremely efficient and high speed baggage handling systems (BHS). Mitsubishi Electric has the complete toolset necessary for a fully integrated solution. When a passenger takes a high-speed tram between terminals in order to catch a connecting flight, the person's baggage must be delivered equally as fast. This typically requires the use of a high-speed Destination Coded Vehicle (DCV) system. On the other end of the spectrum, sometimes passengers check-in earlier than the airline anticipates. If the bag was sent directly to the terminal gate, it might board an earlier scheduled flight. Therefore, Early Baggage Storage (EBS) systems are used to quickly store bags and then retrieve them at the proper timing.

Control with redundancy

Mitsubishi Electric delivers all of the critical components for complete control and visibility of baggage flow throughout the airport. High performance redundant CPUs, motion controllers, linear and rotary servo amplifiers and motors, operator interfaces, distributed I/O and safety are all available direct from one source. The required high speed characteristics and performance are easily realized with Mitsubishi Electric's integrated Automation Platform, which consolidates motion and sequence control, reducing cycle latency, and improving performance. Together with the high performance, high speed characteristics of the Q Series controller, maintaining control and eliminating downtime are pre-requisites of any BHS system. With the Q Series redundant system, control is maintained with a control and standby CPU. In addition, the network topology is also redundant, therefore ensuring system wide control in the event of a failure or power loss to the system.

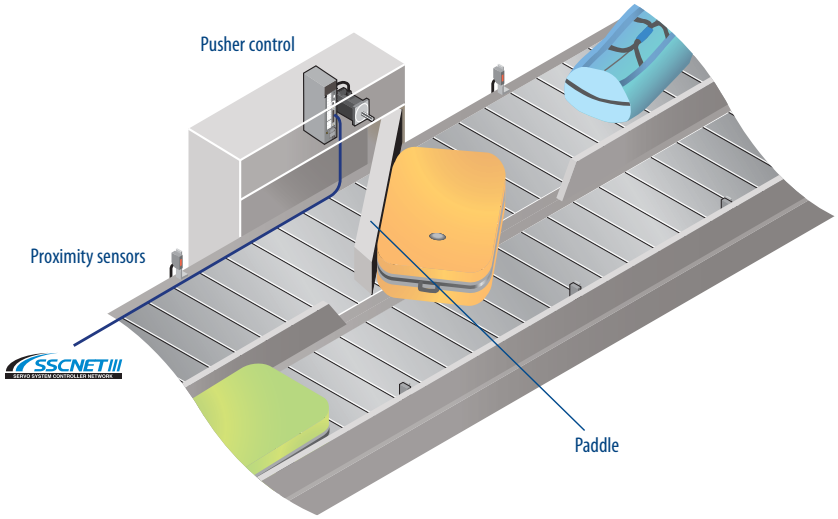
RFID-based tracking

Expanding to fit a system's requirements is the specialty of the integrated Automation Platform. RFID is becoming increasingly popular in BHS due to how easy it makes scanning moving baggage and because of its ability to store information in the tag itself. Successful scan ratios reach close to 100% in many new applications, reducing error and increasing throughput. RFID can be integrated simply by using the serial interface module on the Q series, or by interfacing directly from the CC-Link serial interface block.



Passenger expectations are high and so baggage systems must match and exceed these on a daily, even hourly basis

In-Line and vertical sorting



Each item must be reliably sorted – first time

Moving while sorting

Earlier, sliding shoe sorters were mentioned. Many applications also use pusher devices and vertical sorting systems when heavier items need to be transferred. While these types of machines are commonly seen in the various material handling industries, they are particularly useful in baggage handling systems. An airport typically has check-in counters on one floor with baggage claim on another. Furthermore, a high-speed loop sorting system is usually running at the lowest level, playing catch-up with the passengers on high-speed trams.

Large pusher systems are used between conveyors in order to move large pieces of luggage that often differ greatly in shape and size. Vertical sorting systems change the flow of material to either go up or go down. In this way, a single in-line system can easily redirect product to the correct end-location.

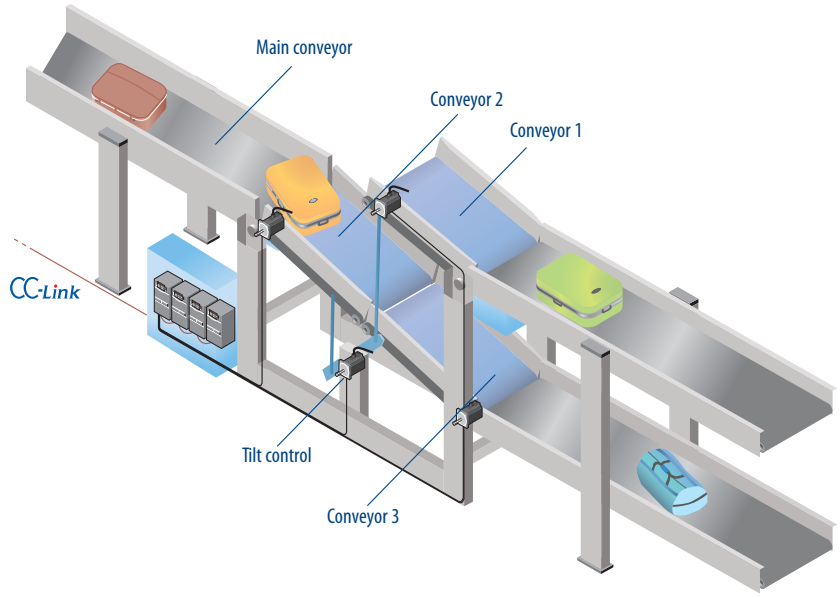
Smoothly does it

For applications that are moving very large and sometimes fragile objects, it is crucial that when ramping up or down to various velocities that acceleration and deceleration is accomplished smoothly. Mitsubishi Electric's intelligent MR-J3 servo is an obvious choice to most when it comes to top performance at all speeds.

What may be unknown to some is that Mitsubishi Electric's variable frequency drives (VFDs) are reaching servo-like performance. The A700 has many similar auto tuning capabilities as the MR-J3 series and is capable of vector control with or without an encoder. Conveyors see sudden load fluctuations every time a product is introduced or removed from them. Our A700 VFDs have extremely high response to these changing load conditions and therefore limit jerking and speed fluctuations.

The Real Sensorless Vector (RSV) motor control system provides unequalled dynamic performance, ensuring a wider speed range, smoother operation and lower motor currents than ever before. RSV starts with a highly accurate motor 'map', obtained during an auto-tune procedure which applies alternating voltage to the motor and determines critical motor characteristics. At the heart of RSV is the Adaptive Flux Observer system which compares actual motor behavior during operation with the theoretical model.

Instead of a response to a change in load or speed being fixed, any variations between the theoretical and the actual motor response measured in operation are analyzed by the Flux Observer, which constantly refines the motor map as speed and load conditions change.



Creative solutions come from a flexible attitude

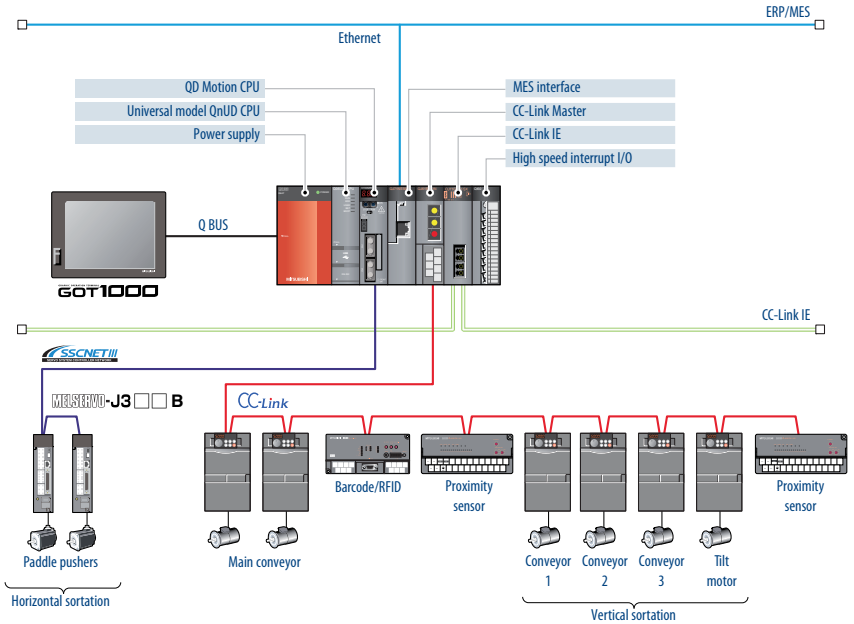
Line side processing

Tracking, collating, updating, interrupting are all actions which happen continuously during the basic sorting operation. All of these processes are fundamentally linked to databases and data manipulation. As each passenger's bags are tracked around the baggage handling system, information needs to continuously be fed back in to the ERP solution. Reactions to changes must be instant, reliable and documented.

This need for constant line side processing of data is why Mitsubishi Electric developed dedicated MES interface technology which allows the IT and automation world to meet at the point of action. In addition, some of these line side MES modules also allow edge processing, which means that data can be manipulated immediately in a database stored locally within the MES module. This means extreme processing speeds can be realized - often stretching the limits of the surrounding legacy automation architecture.

Creative solutions

Often engineers are presented with an existing building or infrastructure in which to install a new or upgraded handling system. Finding solutions to space, flow and control problems can be taxing, but with flexible automation components and a flexible attitude comes success. This is what Mitsubishi Electric calls creating productivity.

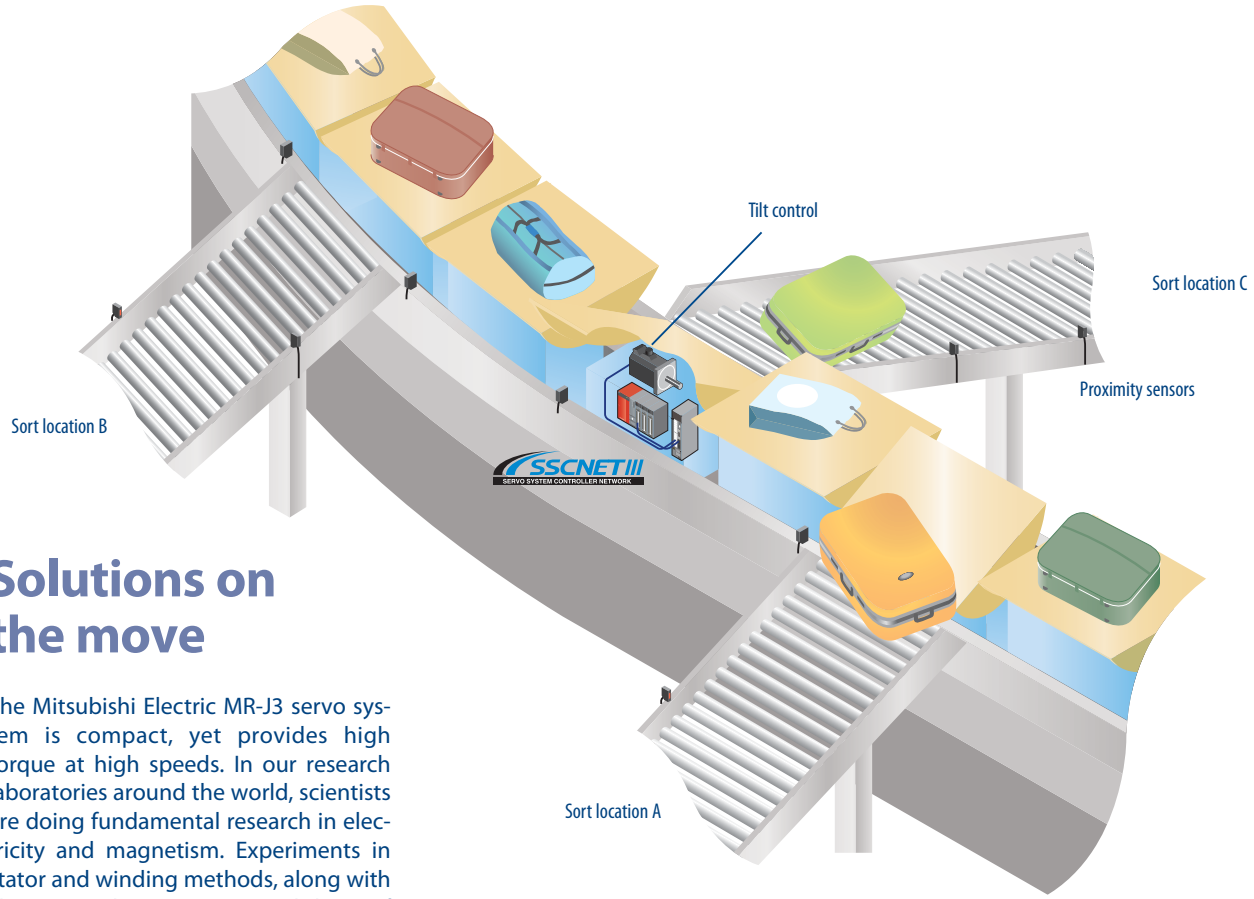


High speed loop sorting

Run faster and on time

Loop sorters are the highways of material handling. They consist of an endless loop of segmented carriers (Destination Coded Vehicles or Sorting Transfer Vehicles) that take the product to a specific target location.

Since the carriers stay on the loop and don't exit with the product, transfer conveyors or tilt tray sorters are used to divert the product from the carrier. This requires knowledge of what is on the DCV or STV in real-time and having the product exit at the required location. Fully electronic tilt mechanisms allow for trays to tilt through curves to counter centrifugal forces.



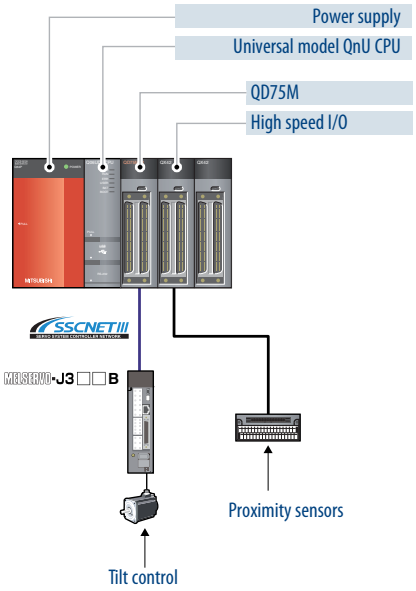
Speed and reliability are fundamentals to the sorting process

Solutions on the move

The Mitsubishi Electric MR-J3 servo system is compact, yet provides high torque at high speeds. In our research laboratories around the world, scientists are doing fundamental research in electricity and magnetism. Experiments in stator and winding methods, along with changes to the orientation and shape of the magnets has led to breakthroughs in motor technology. Mitsubishi Electric's revolutionary design in servo motor mechanics has reduced the overall size of the motor and resulted in an increased power efficiency. The low cogging design allows for higher velocities coupled with higher torque. Like many of our products, the MR-J3 servo motor is a real-world example of scientific advancement aiding product design and development.

Realizing a cost efficient solution consisting of a Q series universal controller and QD75 positional module is second nature for the Q series range. Having so much generic modules on offer, realizes a solution fit for the application without sacrificing key functional requirements and performance.

The QD75 offers up to 4 simultaneous axes that can be utilized for a cost driven system requiring high precision control. Advanced features are supported such as, linear/circular interpolation, speed control, positioning to speed switchover as standard. The QD75 also supports connection to the SSCNET III high speed 50MBaud communication network.



Postal automation

Like most other industries, the postal industry is trending towards higher throughput at lower costs. With increased competition from online bill generation and payments tied with increasing amounts of email-based advertising, a very large portion of many postal operations' incomes is decreasing.

At the same time, world population is increasing and with it, the number of deliverable addresses. This creates a very difficult situation for postal companies. Lower revenue coupled with a more demanding and larger customer base has forced a move towards more advanced sorting and tracking techniques that can allow for drastically reduced overhead, decreased delivery time and increased customer satisfaction.

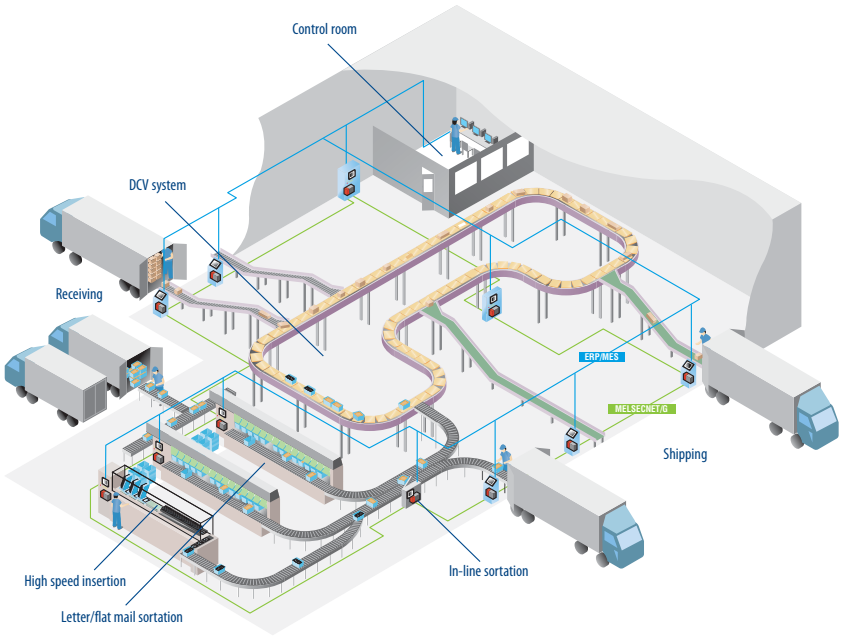
Your customer's transformation

From the latest "Strategic Transformation Plan" created by the United States Postal Service, to the "Cap Qualite Courrier" program of France's La Poste and Royal Mail's "Flats Automation Project" in the United Kingdom, many major mail services around the world have initiated new programs to directly address their changing needs. These programs are funding extremely large investments in new flat sorting machines, mixed sorting machines and technology that enables large-scale, real-time tracking of mail. Utilize Mitsubishi Electric's extensive product range to offer solutions that meet every aspect of your customer's future plans and goals.

From send to receipt

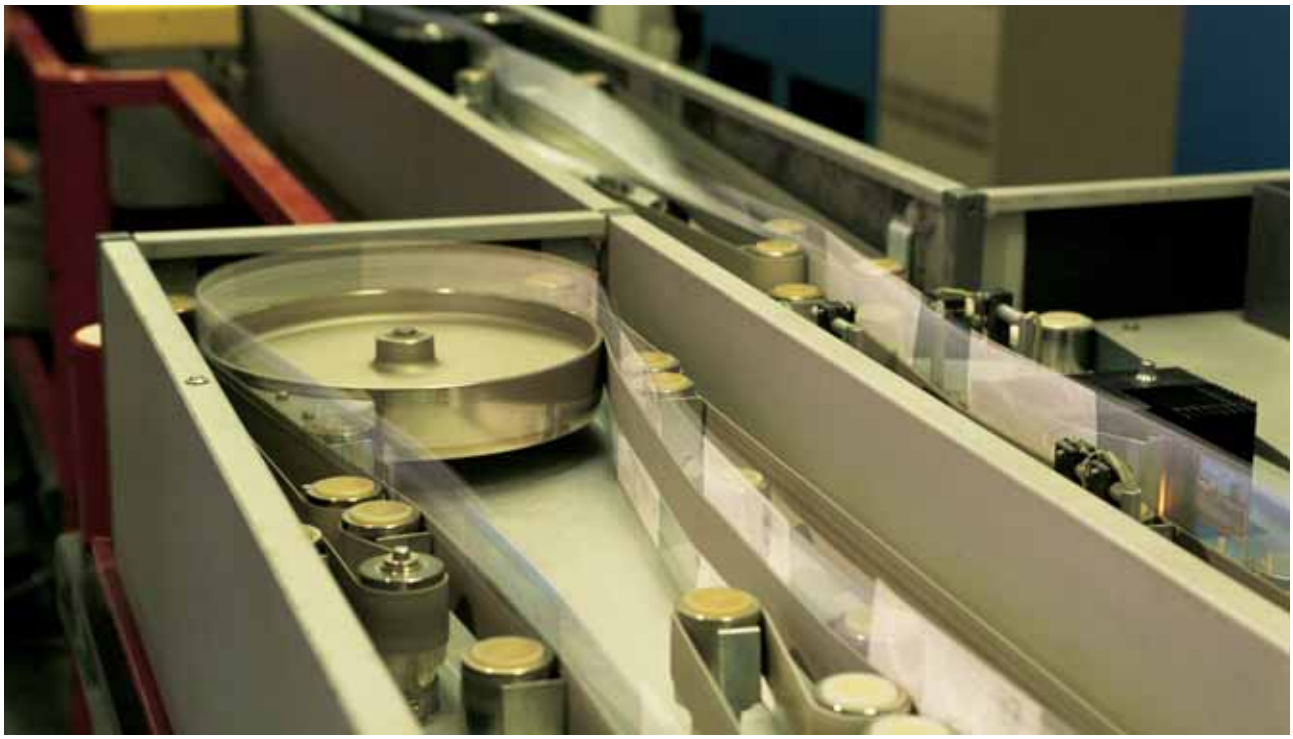
The move towards commercialization of many public mail services (such as in Japan and France), which are typically the largest delivery networks in many countries, is pushing postal services to differentiate and add new and unique advantages to their customer base. This added pressure on the postal providers means more and more are turning to their automation providers to help make the difference. Customers of OEM postal automation machine makers now desire high-speed, high-throughput, highly reliable systems with flexible network options that allow them to view mail flow throughout the entire delivery process.

Thankfully, Mitsubishi Electric is in the business of delivering solutions specifically for their customers success. Everyone around the world right now is talking about Industrial Ethernet but only Mitsubishi Electric has delivered an Ethernet solution that truly connects all levels of the process. By simply adding an MES module to a machine's PLC configuration, the ability to obtain data from every sensor, amplifier and motor becomes instantly obtainable via a standard Ethernet connection. Track mail down to the latest sensor in the system, follow it through multiple passes, see instantly if it's about to be returned due to an unreadable address or change its destination on the fly.



Automation is helping postal service providers keep up with demand and direct, up to the millisecond data helps them stay in profit

High speed insertion



Seal the envelope

High speed insertion deals with inserting flat material into envelopes. This can be anything from single to multi-fold advertisements, magazines and even CD's and DVD's. The technology is quickly getting more advanced and has tended towards extremely high throughput machines. While insertion systems are not typically found in major postal sorting hubs, they are used frequently at printing, marketing and advertising, and direct-mail services companies.

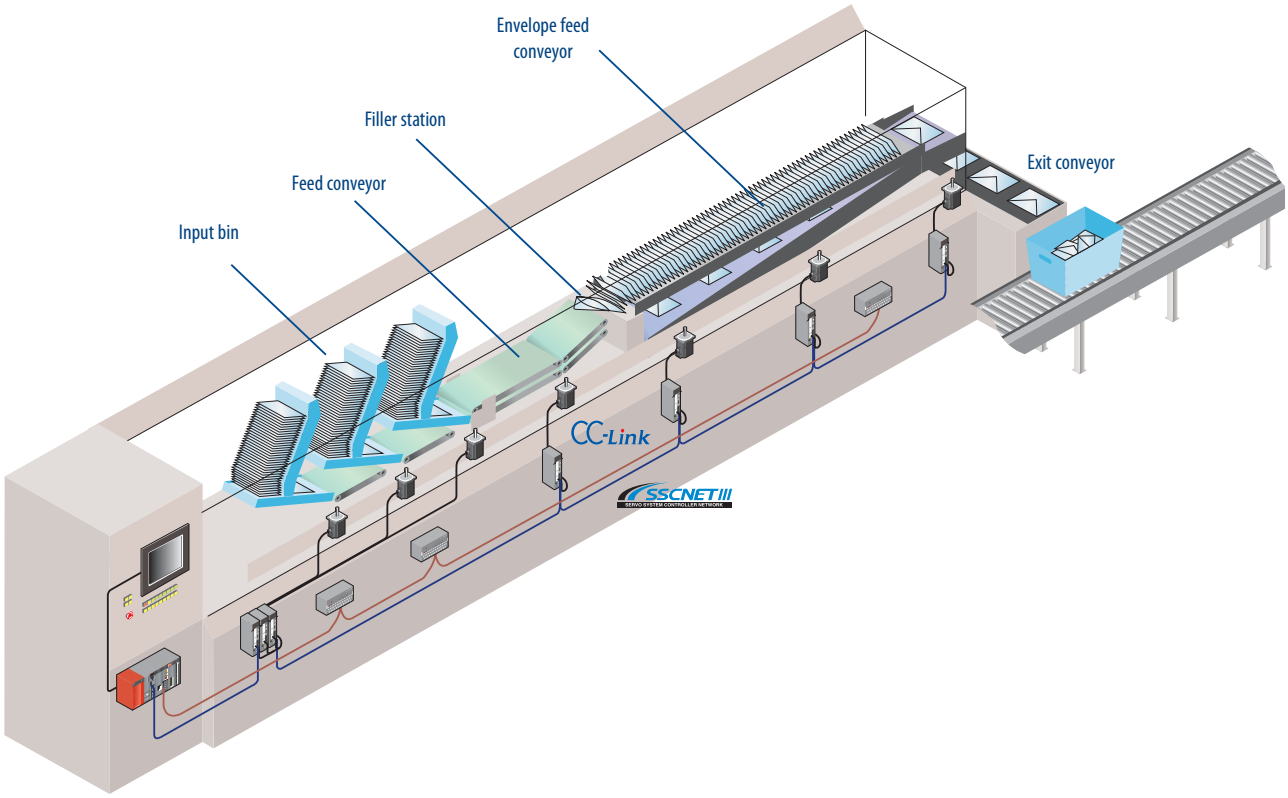
Ensure alignment

By utilizing an external master encoder, the entire insertion system can be synchronized to one axis. This means that as sensors either upstream or downstream obtain new information about the location of inserts, conveyors and diverters can be adjusted for variations in product position all the while maintaining knowledge of their relationship relative to the master encoder.

In fact, utilizing data from various sensors is key to the success of a high speed insertion machine. Not only does the system need to track the location of material, it also needs to continually check for misfeeds, doublefeeds, paper jams and should notify employees when paper needs replacing. CC-Link offers an Open Network standard for interfacing with all of these sensors. It is also extremely easy to deploy and is capable of handling large numbers of I/O without degradation in performance.

Match your customer's needs

Since SSCNET III is a multi-drop servo network, additional axes can be added to insertion machines on an as-need basis. As the customer's requirements and demands grow, so can the system. Even in-field retrofits are made easy. If needed, an extra motion CPU can be added for an additional 8 to 32 axes up to a total of 96 axes from one PLC rack. In addition, CC-Link IE can be utilized to network multiple insertion machines together. Thus, high levels of job coordination between machines can be accomplished.

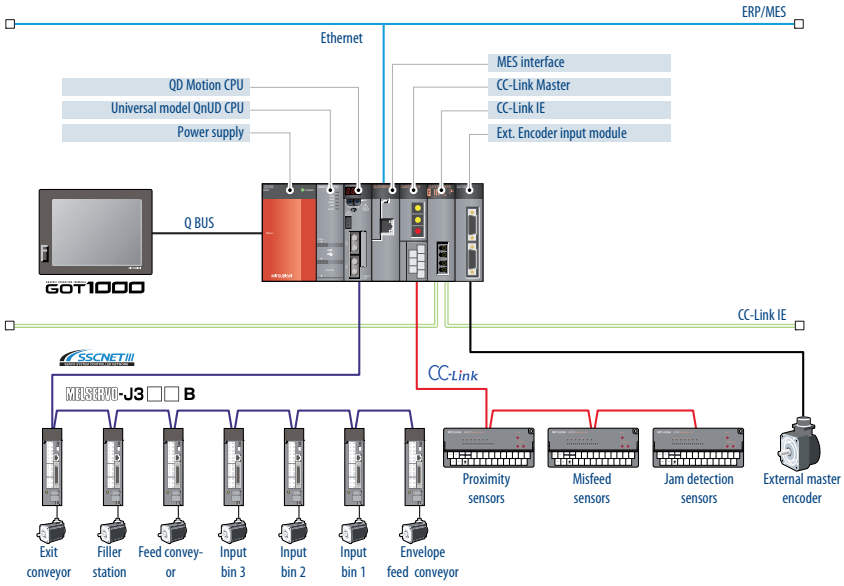


Insertion machines rely on precise co-ordination, often from a single reference axis

Information and trouble-shooting

Due to a Mitsubishi Electric designed graphics chip, the GOT1000 series of HMIs is capable of producing 2D data (graphs, pictograms, etc.) at a rate nearly 4x as fast as competitive products. This means that job data can be streamed straight to the system's HMI and provide the user with up-to-date information in an easily understood format. The high-color, high-contrast display along with the ability to display documents and images, such as JPEGs, allows for trouble-shooting screens that actually use photos of the system to show the user where attention may be needed.

In addition, the GOT1000 gives users multiple ways to trouble-shoot the system. View ladder programs right on the HMI without any additional software or computers. In fact, the One-Touch Ladder Jump function allows users to jump straight to ladder program steps that may have led to a system error. This means that initial trouble-shooting can be started immediately thus reducing downtime and increasing productivity. When more advanced tactics are required, a USB port embedded in the front of the panel allows users to transparently access the controller without needing to open any shop floor enclosures.



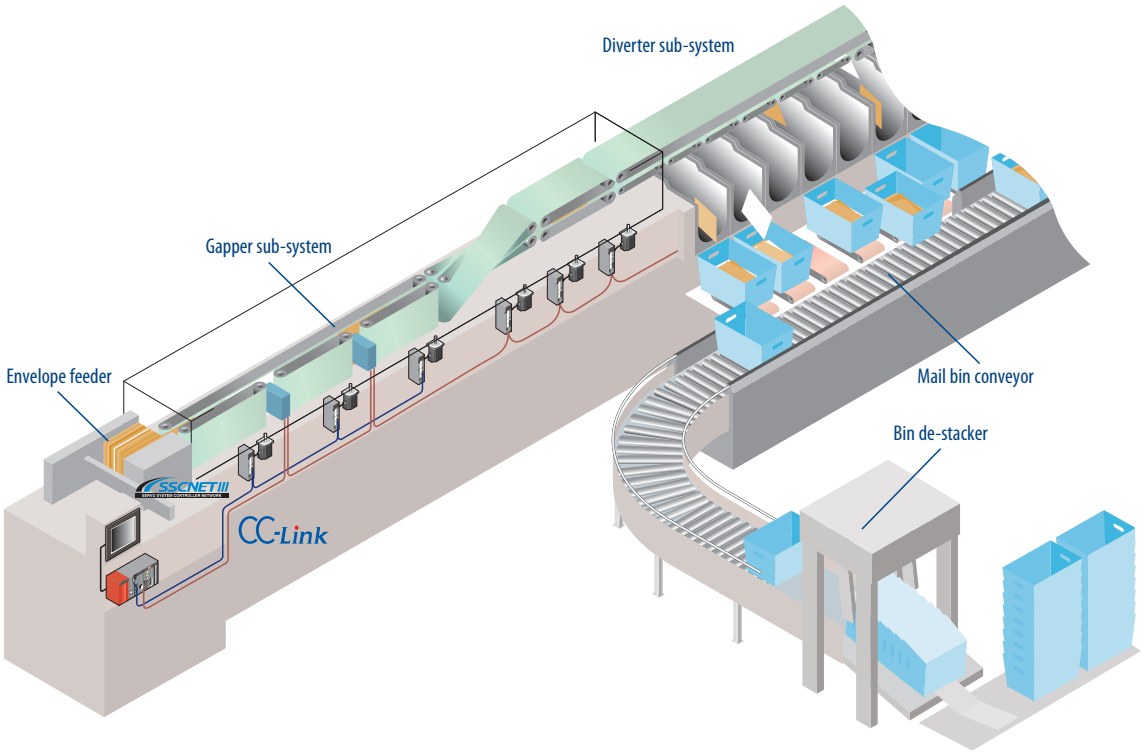
Letters and flat mail Sorting

Deliver your message

Within the postal automation industry are a variety of markets. Large post offices and airport airmail centers are certainly two examples but even insurance companies, universities, print shops and financial institutions have material handling needs for either their incoming or outgoing mail. Therefore, when it comes to automating the sorting of letters, flat mail and parcels, flexibility is key. Mitsubishi Electric's modular system and various communication networks allow integrators and machine builders to design a system with a base configuration that can expand to meet each of their customer's different needs.

Reduce the number of passes

One challenge in postal automation is in attempting to separate letters and flat mail and read various styles of handwriting without the need to slow the system down or send mail back through the system for multiple passes. A high speed, distributed system is essential for creating a flexible and high-performance system. For instance, MES modules allow for real-time monitoring of data, providing insight into process efficiency. Perhaps a specific barcode reader is misreading too many envelopes and thus an excess of multiple passes is occurring. Identifying these bottle-necks is critical to continual improvement, happier customers and higher profits.



Whether linking machines or monitoring performance Mitsubishi Electric's automation solutions increase your visibility

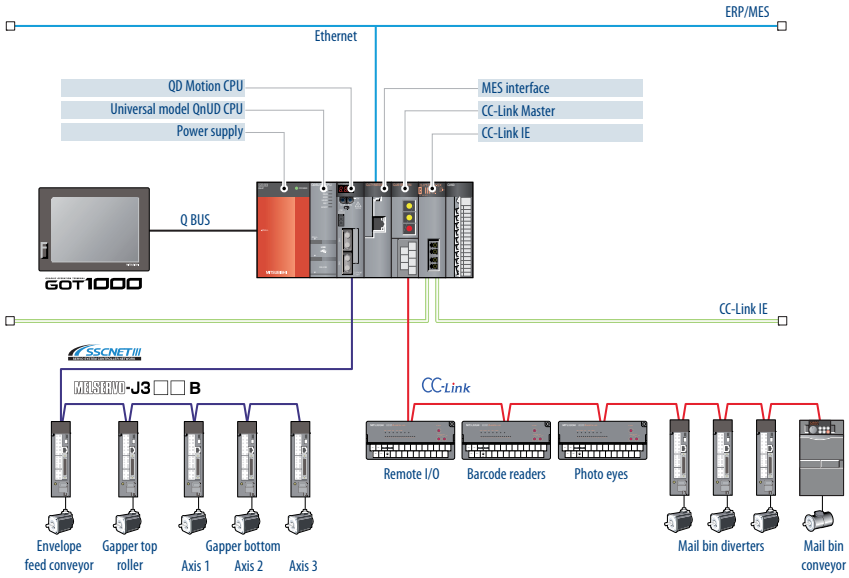
Presort and track

In some countries, companies that pre-sort their mail prior to delivery to the post office receive large price discounts. For example, in the United States, presorting letters and flat mail down to a 5-digit zip code can have dramatic cost saving results. This is all part of the US Postal Service's new strategic plan which also includes the incorporation of CONFIRM, which uses passive barcode scanning to obtain in-process information about mail, such as current location and expected delivery dates.

These advancements, are more than just about decreasing costs though. It is also about increasing customer satisfaction and creating more reasons for business to continue using paperbased mail. So whether you want to couple machines together with CC-Link IE or bring them online using an MES module, Mitsubishi Electric can bring greater visibility to your process.

Speed and expandability

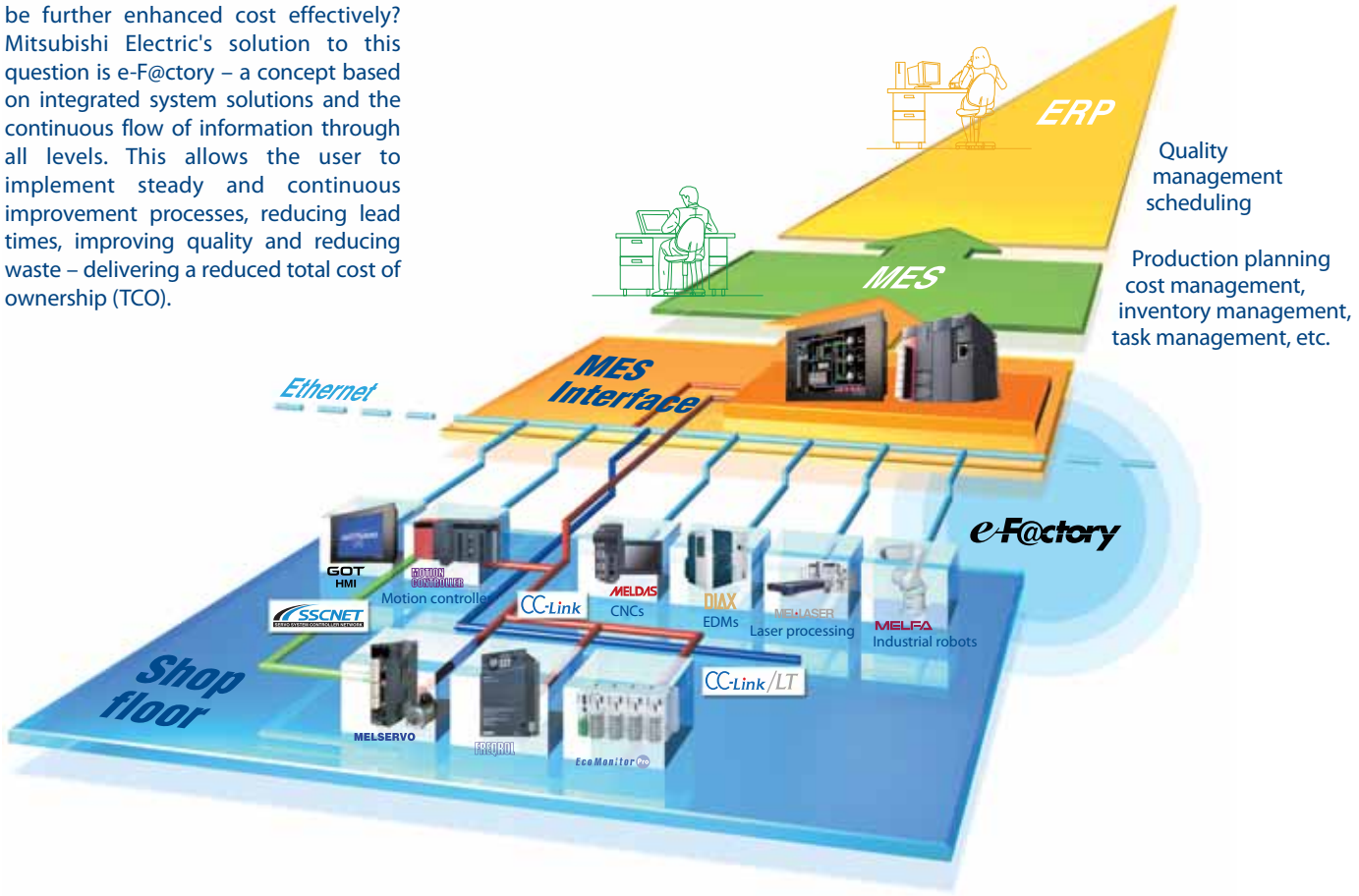
Mitsubishi Electric has a proven track record in postal automation and our products can be found on the highest performing machines in the market.



Paving the way for this success is the ability to mix and match technology to best suit the application's requirements. CC-Link is often used for interfacing with downstream sensors and diverters in flat mail sorters. Servo motors and variable frequency drives can also both be installed on the same multi-drop network allowing for easy wiring and optimum price-to-performance ratio.

A simple and low cost solution

Many companies today must survive in the face of tough competition. Customers expect perfect performance, high quality and fast, punctual delivery, all for the lowest price. How can automated processes be further enhanced cost effectively? Mitsubishi Electric's solution to this question is e-F@ctory – a concept based on integrated system solutions and the continuous flow of information through all levels. This allows the user to implement steady and continuous improvement processes, reducing lead times, improving quality and reducing waste – delivering a reduced total cost of ownership (TCO).



Integrated information flow

The seamless flow of information between operations and management is no longer a dream for the future but daily reality.

Thanks to e-F@ctory, company management can rely on up to date and meaningful information. This simplifies, improves and speeds up decision making.

The MES interface product group enables direct connection between the MES (Manufacturing Execution System) database and shop floor equipment, without a communication gateway such as a PC. The information collected on the integrated Automation Platform is linked by the PLC MES interface module, and the information from existing equipment and 3rd party controllers is linked by the GOT1000 MES interface function. The MES interface product series links shop floor equipment and MES information simply, with minimum cost.

The MES Interface

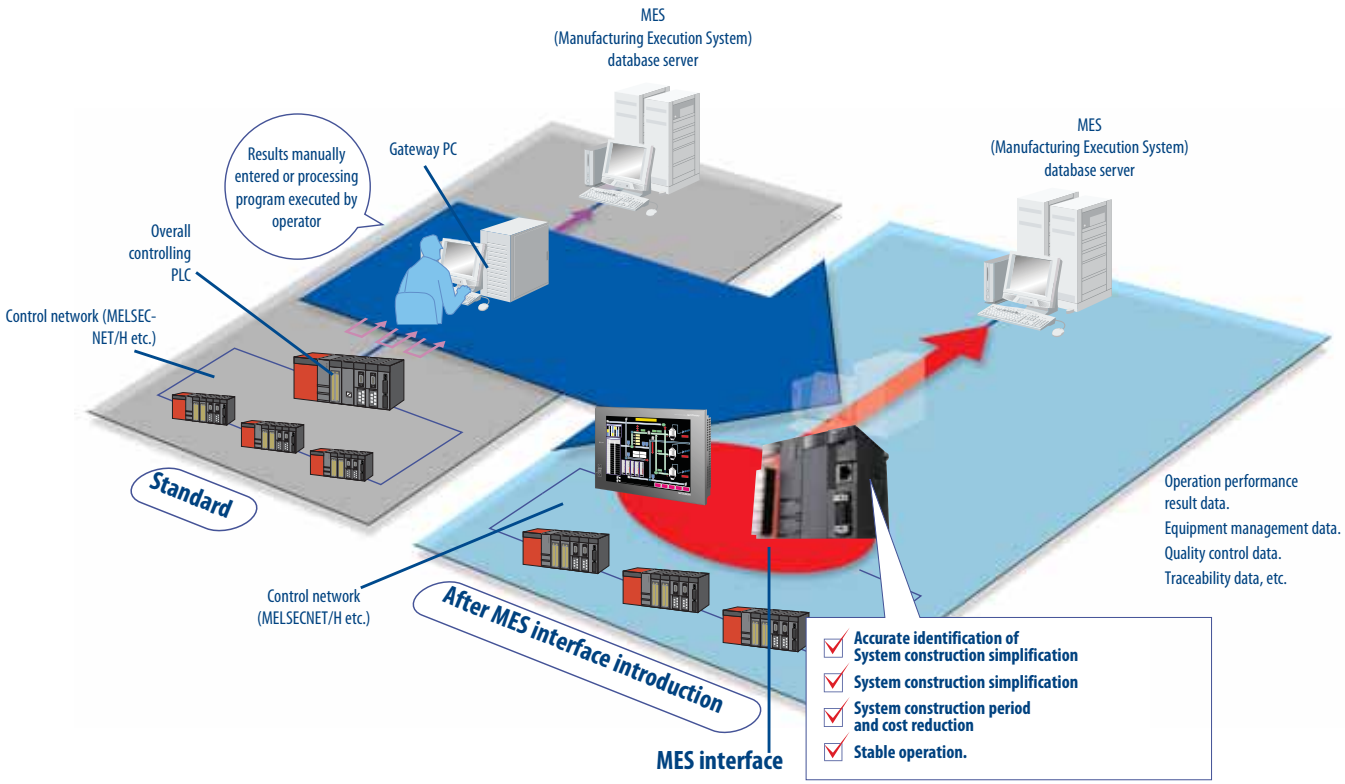
- Provides accurate information in real-time through direct utilization of internal device information.
- Simplifies system implementation by directly connecting to database(s).
- Eliminates the need for PCs and programs, greatly reducing costs.
- Improves reliability by changing the gateway PC to a PLC.

No PC programming

The MES interface module is easily set-up using simple drag and drop configurations. This means both engineering staff and IT staff can quickly configure the units to their needs without additional programming skills.

65% decrease in implementation cost

Implementation costs can be reduced in many ways including the removal of many interfacing PCs, their associated software platforms and the engineering time and effort involved. In addition, because Mitsubishi's MES solution is a standard module it can be added in retrospect to many existing System Q applications as long as the standard configuration rules are not broken.



Guaranteed Mitsubishi quality

Integrating all aspects of automation

The automation control system is based around the Automation Platform System Q series integrated automation platform which is an extensive range of rack mounted controllers ranging from entry level CPUs to high performance logic, motion controllers, numerical control, and robot controllers, all available on a consolidated high speed backplane.

Together with this, a range of digital I/O, high resolution analog, and intelligent function modules are available, providing an effective means of interfacing the controllers with external equipment and components. In addition to the controller series, various networks are available to enable efficient data handling between controllers or devices to save wiring and reduce costs. These are state of the art enterprise level Gigabit Ethernet (CC-Link IE), controller level (MELSECNET/H), device level (CC-Link).

Highly accurate high speed servo drive systems

The MR-J3 has raised the bar for servo speed and performance. The capacity ranges from 50W to 55kW and includes a full line up of linear motors as well. High resolution encoders (262,144ppr), advanced auto-tuning and vibration control are all standard and help to provide stability at all speeds.

Set-up, diagnostics, and tuning are all easy, thanks to MR Configurator, a Windows-based software package. MR-Configurator has many improved diagnostic functions, such as an advanced machine analyzer, software oscilloscope, and high speed monitor. A parameter setting window makes start-up simple, and a USB interface enables highspeed sampling and long-term wavelength measurement.

Intelligent energy saving AC drives

The FR-A700 series of intelligent inverter AC drives are ideal for pump, fan, and conveyor type applications. Ranging from 200V to 400V series, from 0.4KW up to a maximum 500KW drive, the FR-A700 can provide the best solution for many kinds of applications. With the highest performance and VFD functions, such as Real Sensorless Vector control and integrated EMC filter.

The newest addition to the 700 series is the FR-E700 compact intelligent drive, known for its high performance with its small footprint. This drive can be applied to a whole range of applications where space is of concern without limiting on high performance functionality. These drives are very easy to use having an extensive parameter setup architecture that can be setup on board, by using utility software. Providing economical performance is second nature for both the FR-A700 and FR-E700 series, using magnetic flux control to ensure optimum motor operation and ensuring efficient excitation control minimizing motor loss and reducing the overall power consumption of the drive.

High resolution human machine interfaces

Mitsubishi Electric manufactures a diverse range of Human Machine Interfaces or Graphic Operation Terminals as they are sometimes known. The GOT1000 range starts from the GT11 5.7 inch compact GOTs, up to the large 15 inch GT15 series. These terminals use TFT display technology and are solely designed on high performance with clear true color high resolution displays.

They also include a handy front mounted USB programming port to enable easy access without having to open up the cabinet to access the back of the GOT. The GOT can also be connected to existing Mitsubishi networks such as MELSECNET/H and CC-Link, but can also interface directly with the Q series backplane bus, resulting in very high communication speeds. A memory card can also be inserted enabling storage of documents, trend, and recipe data, along with CSV files, etc.

MELSOFT, a complete engineering environment

The MELSOFT engineering suite is an extensive range of software for programming, configuration and maintenance of all Mitsubishi automation system elements. Starting with the GX series which consists of a sophisticated ladder programming tool, debug, and maintenance software combined with utility configuration software which helps when setting up intelligent function modules, without the need for extra programming. Moving up a step is the MX series of software which provides a middleware for connecting and monitoring external 3rd party software with the Q series, i.e., data logging spreadsheets, which can be a simple alternative to high end SCADA software.

Leaving the controller series aside, the GT series provides a detailed graphical tool for designing screens for the GOT1000 series, with embedded editing tools. MR Configurator is a simple programming and virtual debugging environment for the motion controller. Programming and setting up parameters for the FR-A700 series of intelligent drives couldn't be simpler with the FR Configurator software. In addition to parameterizing the inverter drives on board, this utility software enables parameterization from your desktop PC. In addition to the MELSOFT programming software series, a diverse range of simulation software is available enabling you to debug your program without the need for the actual hardware. MELSOFT is a key essential for today's needs.

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