FACETS

Latest news for people in control

MITSUBISHI ELECTRIC
FACTORY AUTOMATION

/// e-F@ctory /// Intelligent Automation /// Super Fast Ethernet /// European FA Centers /// MyMitsubishi ///

How the transparent factory is changing the face of manufacturing

In this issue...

Notes from the editor

Mitsubishi Electric is not only a manufacturer of automation products but also a major consumer of that very same technology.....as a manufacturer.
Some years back Mitsubishi developed a concept which became known as the e-F@ctory. The background was based on the drive for ever better, more efficient, production methods to reduce waste and rework but also to offer flexibility. It became clear that the e-F@ctory was about building a "transparency" and that in turn would mean that data, information and timely decision making could be shared by all parties involved.This is not a dream. It is reality. See page 5

Published by
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Mitsubishi Electric is growing worldwide!

Mitsubishi Electric is growing on a worldwide scale and the Factory Automation division is making a significant contribution to this growth. Last year, Factory Automation increased its revenues by 10% to €5.6 billion, accounting for around a quarter of the concern's aggregate turnover of €25.42 billion. At the same time, the division has also been posting double-digit growth in its turnover on the European market. Totalling €235 million, European revenues were 11.9% up on the figures for the previous business year. At the Hannover Messe 2008 trade show in Europe, Mitsubishi Electric is going to present a new controller concept that will pro-vide an added boost to growth in the solutions and components segment.

"Mitsubishi Electric has strengthened its position in Europe with acquisitions and investments in Italy and Scandinavia," says Peter Mischitz, head of the Marketing Operations Division. These included the acquisition of Tre Diamanti, the hived-off sales division of leading Italian drive systems specialists Static Control Systems (SCS), and a stake in Mitsubishi's long-standing partner Beijer Electronics Automation. New Factory Automation Centers have been opened in the Czech Republic and Poland as part of the company's expansion strategy in Eastern Europe. Other FA Centers are to follow soon in Russia, Hungary and Turkey ■

Record sales figures for compact controllers and frequency inverters

In 2007 Mitsubishi Electric further consolidated its position as the world market leader in compact controllers. Since the launch of the first compact controllers in 1981, the company has sold more than eight million of these products. In Europe, sales increased by 8% over the previous year's figures. Mitsubishi Electric has increased the capacity of its factory in Himeji, Japan, to cope with the growing world demand and is now able to manufacture over 1.5 million CPUs for compact controllers every year.

Sales of Mitsubishi Electric's frequency inverter drives also set a new record. Since the launch of the first generation of these products in 1985 the company has sold over 11 million inverters, making it the number two player worldwide in this sector. At the Hannover Messe 2008, Mitsubishi Electric is launching its new generations of micro and compact inverters, the FR-D700 and FR-E700 series. These new series cater directly to today's customers' demands for modern inverter technology. In addition to this the entry-level FR-D700 series now also includes the advanced vector control technology from the larger series for more precise speed control and high startup torque.

Performance in the Servo/Motion sector was also excellent, with growth of 12%. In combination with the new iQ Automation, a new high-speed motion controller is now available with twice the performance of its predecessor ■

News in brief ///

New Co-operation

Mitsubishi Electric Corporation, IBM and ILS Technology announced they are delivering a service oriented architecture (SOA) solution that is specifically designed for the automotive manufacturing industry.

The three companies have developed a reference architecture that can help customers meet industry standards more quickly for device-to-IT connectivity. Each company brings key technology that significantly strengthens this alliance. IBM's integration services, SOA Foundation extended for manufacturing and project management will be an integral part of this alliance. IBM creates software, service offerings, as well as custom implementations for the automation and industrial market segments.

Mitsubishi Electric develops best-in-class factory automation systems with direct enterprise computing connectivity via the MX MES Interface IT and other factory devices used in the automation and industrial market segment. ILS Technology's deviceWISE embedded software is integrated into the Mitsubishi Electric e-F@ctory Portfolio and links IBM's and plant floor technologies together for those segments. These frameworks are used to connect the device tier to the enterprise-IT tier ■

Main Sponsor of ARC's European Manufacturing Forum

The European Manufacturing Automation Forum (EMAF) is a series of highly educational events specifically designed for professionals from the discrete industries. Forum participants will learn how to effectively manage and optimize production plants using collaborative manufacturing concepts and technologies. Mitsubishi Electric is one of the main sponsors of the 1st European Manufacturing Forum, that will take place from 14 to 15 May in Frankfurt/Germany. We would like to invite our customers to participate in this high-quality event, which will include lectures and panel discussions on the digital factory, manufacturing IT, governance and control, emerging technologies, lean manufacturing and mechatronics ■

Improve your information flow to improve your profitability

The seamless flow of information between production 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.

Transparent factory

Manufacturing companies today must survive in the face of tough competition. Customers expect perfect production quality and fast and punctual delivery, all for the lowest possible price. How can one further enhance the efficiency of production processes that are already almost entirely automated? Mitsubishi Electric's solution to this question is e-F@ctory – a concept based on integrated system solutions for industrial and factory automation that ensures a continuous flow of information through all levels, from the shop floor to management with a reduced Total Cost of Ownership (TCO).

More transparency

Seamlessly integrated automation components and integrated information flows throughout the entire industrial process chain are the keys to achieving flexible, customer-focused and economical production.

Data on the availability of materials and machines must be transparently available at the touch of a button in exactly the same way as the current process status information. Only access to complete information in real time can enable fast decisions and optimisation of all production processes, from order processing to the finished product.

The weak point of many systems is inadequate or missing IT connections between the production and management levels. In many plants, data is still recorded by hand and information is passed on personally from employee to employee. In addition to the great potential for error, including the possibility of accidental data losses, this also slows down the information flow – and often also the entire production process. Manually-executed production processes, for example in quality control, also often hinder maximum efficiency, preventing faster throughput and delivery times.

Integrated information flow

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1.9 times increase in machine utilization

As manufacturers know the smallest increase in machine utilization can have a dramatic effect in the bottom line. To attain an increase solving a number of production issues such as having access to the correct information, real-time monitoring and plant-wide visibility need to be realised.

50% reduction in lead time

Improving productivity significantly with fewer machine stoppages leads to a much faster production flow, with a corresponding reduction in lead times.

Elements that affect productivity include problems stemming from unreliable PCs that can lose production data or stop the line due to network impediments.

50% reduction in quality loss

A simplified automation process with improved connectivity and information flow will result in a reduction in quality loss, enabling only error-free, fully tested products to leave the production facility.

65% reduction in system configuration costs

By utilising existing equipment, such as sequence's to enable visualisation, dramatically reduces system configuration costs ■

More and more water companies are turning to Mitsubishi

Reliability and support are major factors for the water industry

Water and waste water treatment, like many utilities, are an essential part of everyday life. If they fail they make headline news. Just think of some of the top news stories over the past few years:

- A waste water pump station in Scotland fails and lets sewerage spill into the Firth-of-Forth killing marine life and causing a small eco disaster...or
- Flood controls in Europe which were unable to cope with rapidly rising flood water.

Reliability, predictability and preventative actions are all critical elements for today's water authority, and that's why more and more are turning to Mitsubishi and their partners. But here are a few other reasons which have caught their attention:

- Mitsubishi's new range of 700 series inverters are designed to the highest standards and include a 10 year design life, but in reality this will actually be a much longer installation life as we have demonstrated to many of our customers in the past.
- As with all Mitsubishi inverters since the early 1980's, coated circuit boards have been used offering greater protection and extended operational life.
- The 700 series also offers quick change fans that can be exchanged in less than 90 seconds.
- Preventative/ predictive systems report on many elements such as actual fan speeds allowing early identification of clogged filters while capacitance can be dynamically measured to give performance and life expectancy data and intelligent in-rush suppression circuits allow the drives' operational life to be extended.

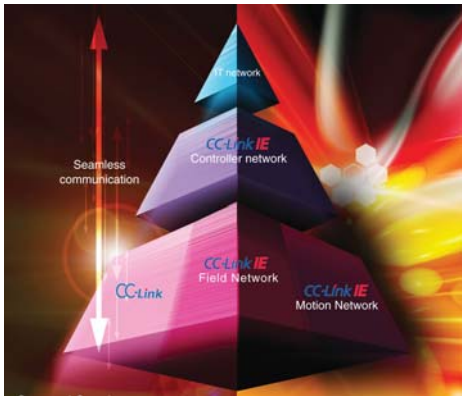
These are some of the small things which make the difference. But of course many suppliers will also try to claim similar capabilities, but perhaps not all in the same drive!

Also, one of Mitsubishi Electric's key strengths is that we have "in-house" expertise in IGBT design which helps us gain maximum performance from the semiconductors that we use. Our deep knowledge of vector and flux management has allowed us to develop drive modules with optimized flux vector control that deliver excellent energy savings as well as models with real sensorless vector control for instant performance when you need it most.

These are just a few reasons why water companies are amongst the users of 11 million inverters that keep Mitsubishi in their boat! ■

Open industrial Ethernet reaches new heights

Industrial Ethernet has just taken a paradigm leap forward with a ten-fold increase in communications rates to 1Gbps (gigabit per second) with the release of a new open communication standard, called CC-Link IE (Control and Communication Link Industrial Ethernet), it is the first completely integrated gigabit Ethernet network for industrial automation. Launched by the CLPA, it defines the new threshold for open standards for Industrial Ethernet.



CC-Link IE combines the best of many existing technologies and applies them to an optical industrial network system with a redundant architecture that enables extremely high-speed and reliable data transfer between field devices and other controllers via Ethernet links. The signalling rate of 1Gbps will redefine the users, expectations and systems capabilities; it being more than enough to cater for the real-time communications requirement of todays manufacturing industries.

In addition to enabling control data transmission to equipment such as PCs, PLCs HMIs and motion controllers, CC-Link realises seamless transmission of data between the various communications layers from shop floor to top floor.

The frequency of the cyclical communications is independent of load and therefore constant for any given network making it predictable and deterministic. This means that data updates do not slow down when data traffic is heavy, such as during major plant operations or emergency actions. In fact data can be sent from any station to any other station (and read by the receiving station), even across interlinked networks. This means that any station can be monitored, programmed, reset and reprogrammed from any other station within the network.

Redundancy is based on a double loop architecture which ensures that the communication can continue even if a cable is cut because a loop-back is done on both sides' of the node with the cut cable.

The ring topology also allows very large networks to be developed. In fact a single network can include up to 66 kilometres (42 miles) of fibre optic cabling with no loss in communication speed. As many as 120 stations can be integrated into each network, and 239 of these networks can be directly linked together creating total systems with over 14,000km of cabling integrating 25,000 or more nodes, enough to solve most users problems! ■

Is Europe leading the way in combating climate change?

Some argue that saving energy should be done to save the planet - we agree, but we also say it just makes good business sense. Why use more energy than you need?

Much of the drive against global warming is derived from EU Directives and other less formalised initiatives, so a review of the latest developments to come out of Strasburg should suggest what the next steps are likely to be.

At first glance the EU's main weapon against global warming would seem to be paperwork - which is perhaps not so good for protecting our forests. But the value of all these Reports and Directives is of course the information they contain and the instructions they give.

At the end of last year Andris Piebalg, European Commissioner for Energy, published his official Energy Efficiency Action Plan (see http://ec.europa.eu/energy/index_en.html for this and more European energy initiatives).

The objective of this report is to highlight 10 things that can be achieved, that can be measured and that will be seen to make a difference. They deliberately directly affect products, buildings and services, education and international co-operation.

Of these activities, the relevant ones to us are:

- Appliance and equipment labelling and minimum energy performance standards.
- Building performance requirements and very low energy buildings (The UK has introduced new Building Regulations, covering things such as inverters on fan drives, and these need to be enforced).
- Making power generation and distribution more efficient.
- Facilitating appropriate financing of energy efficiency investments for small and medium enterprises and Energy Service Companies.
- Spurring energy efficiency in the new Member States.
- A coherent use of taxation (for example the UK Climate Change Levy taxes energy usage; the German equivalent encourages energy usage at night)
- Foster energy efficiency worldwide (The EU global geo-political influence is far greater than a single nation could achieve.)

These activities fall into one of two camps: creating professional obligations and changing the framework in which we operate. So we have both carrot and stick and , far more importantly , opportunities to be enterprising, new products and services to develop and new markets to address.

The Action Plans also includes a list of proposed measures, key ones being an extension of the Energy Performance of Buildings Directive, requirements for large plant to be more energy efficient, and a drive to make individual products more energy efficient.

However, introducing further legislation is only part of the equation. More importantly the EU should be enforcing existing rules and regulations at ground level right across its community. It should also widen the Technology List, cited in climate change legislation to encourage more creative solutions.

Whatever happens, climate change initiatives are creating significant opportunities for engineers and technologists. In fact we would venture to say that the future will be so busy that we are going to need to produce far more young engineers than has been common for the last 20 years or more.

The policy is seeking to create opportunities and boost competitiveness on the world stage, to reduce European energy demand and thus demonstrate to other regions that standards of living do not have to be compromised, and to develop eco-friendly technologies.

Significantly, progress is being made in both gas and electricity interconnection within the EU to move towards a more fluid ability to transport energy around the EU. One practical upshot of this is that the market will open up to at least a degree; another is this will create a number of major engineering projects.

And to finish on a practical level the EU is now positioned to develop the appropriate activities to meet a strategy with defined objectives and timetables. And as the largest trading bloc on the planet, the EU is now able to address the world stage with one voice.

Hopefully the EU will continue to be possibly the most effective global force against climate change ■

New service and support centers in Eastern Europe

Local service and support

Mitsubishi Electric supports its customers in all phases of their automation projects. Beside the excellent support by our local service partners, worldwide 16 Factory Automation Centres offer modern facilities for consulting, training and repairs. In addition to the European FA Centers in Germany and the UK, a new center has recently been established in the Czech Republic to support customers there but also in neighboring Slovakia and Hungary. In addition it has a satellite office directly in Poland. In fact, there will also be a second satellite office in Russia* quite soon as part of the total European FA center structure.

These FA Centers also display a comprehensive selection of products from Mitsubishi's extensive range to enable customers to have a 'hands on' experience ■

* Note some services in Russia, such as training and repair, will be offered through our local partners who are trained to meet the same high standards of our FA Centers.

Automation scholarship scheme awards

Polish and Czech engineers come forward with innovative ideas in scholarship competition

A fundamental change to the national industrial base in countries like Poland and Czech is happening now, and it will continue over the next decade or more. Thus the next generation of engineers is critical to national development. Mitsubishi in conjunction with the publication Control Engineering wanted to do everything to encourage young engineers to grasp the full potential of automation, to be able to see beyond the obvious to realising that true automation is a never-ending process of improvement. Automation is critically important for both Poland and the Czech Republic.

Because of this a competition was created in which students at any Czech or Polish university could submit new and innovative ideas that use Mitsubishi Electric Automation equipment in a practical application to achieve energy savings, improved precision and quality, or improved process outputs.

Five finalists from each country have each won a €2000 bursary to assist with their education, while their university departments were presented with an automation demonstration kit based on Mitsubishi Electrics cutting edge, System Q, PLC technology.

The overall winners, along with their university tutor, will visit Mitsubishi Electric's Nagoya factory in Japan to see the latest automation technology in action and the travel experience of a lifetime.

Fifty runners-up also received a consolation prize ■

MITSUBISHI ELECTRIC
FACTORY AUTOMATION

CONTROL ENGINEERING

Connecting the shop floor to the top floor

Manufacturing Execution Systems

Manufacturing Execution Systems (MES) track, measure and control critical production status and activities. An MES solution offers a number of benefits and operational facilities including increased traceability, productivity and quality improvement.

MES systems can vary greatly in scope and scale from simple work in progress reporting, right through to full end to end manufacturing control and monitoring. The process data gathered is fundamental for management systems such as Enterprise Resource and Planning Systems (ERPs), Product Lifecycle Management (PLMs), Supervisory, Control and Data Acquisition (SCADA) solutions, scheduling and planning systems.

iQ MES Module

The new MES module from Mitsubishi Electric is a revolutionary way of connecting data from Programmable Logic Controllers (PLC) used in manufacturing to the management IT databases feeding the control and reporting systems.

Traditionally data is collected from the PLCs by a SCADA system or some other form of gateway PC. It is then transferred to the management database. These systems, by nature of their design, can be costly and sometimes slow due to the multiple data transfers that take place and polling of data.

The new Q Series MES module interfaces production control systems directly to the management database removing the need for any intermediate PC interface and associated specialist software. This significantly reduces the hardware, software and specialist development costs. The Q Series MES Module also simplifies MES architecture and reduces commissioning costs. Further to this, system reliability is improved as the module is based on industrial PLC design standards.

The module is designed to interface fully with industry standard IT database platforms including; Microsoft SQL, Microsoft Access and Oracle. These databases are found at the heart of MES system software packages ■

Intelligent automation reduces integration time

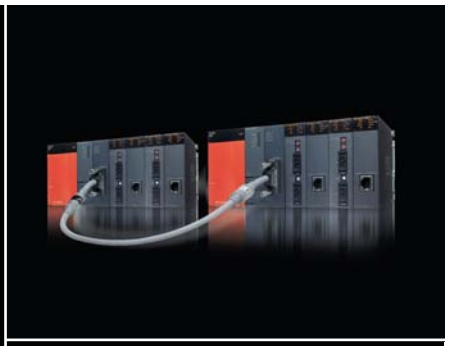
A new generation of more powerful automation and production systems are helping companies automate and standardize work processes. These same systems utilize selective IT components that facilitate the collection, storage, analysis, and distribution of information.

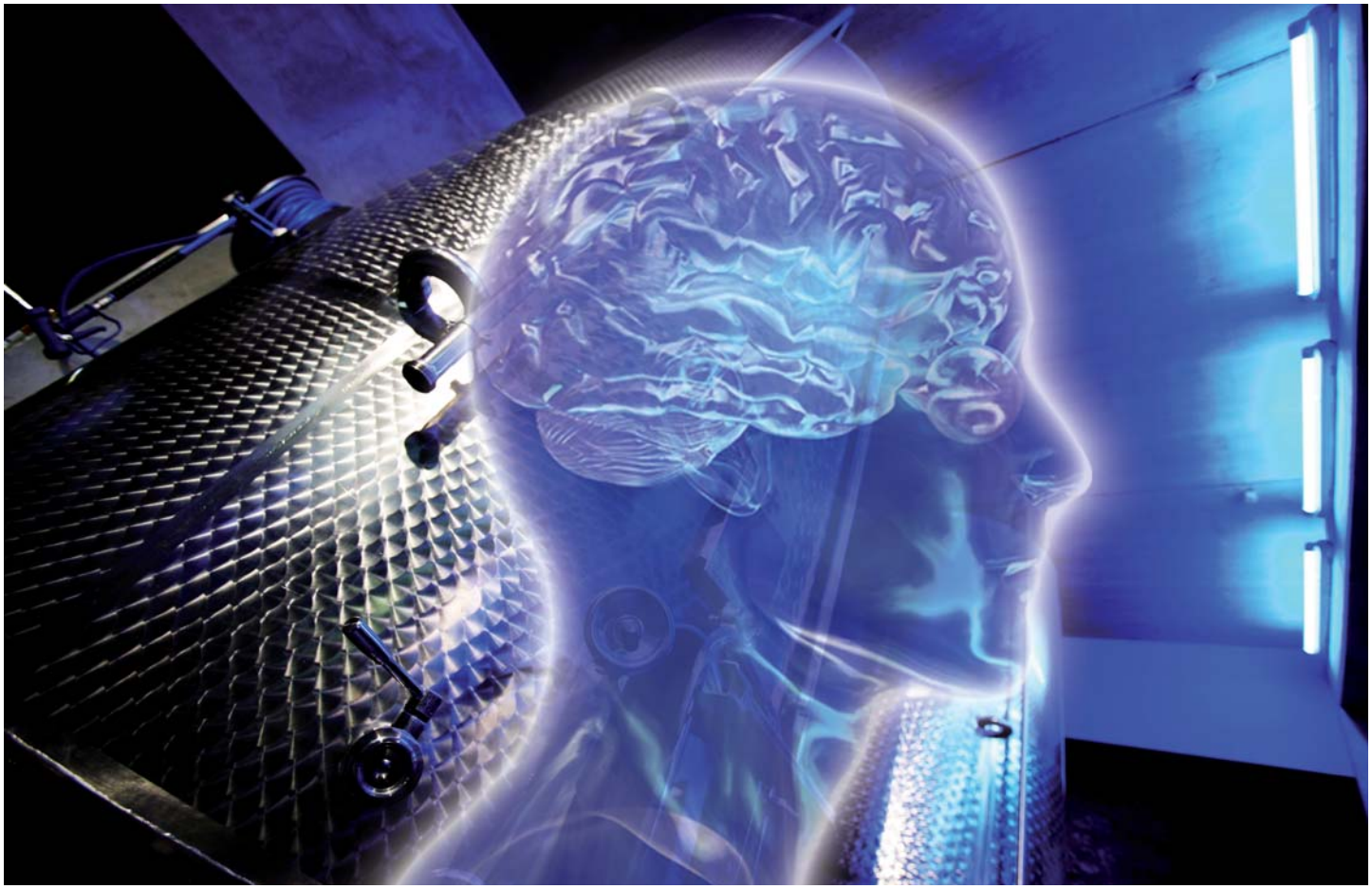
Technology developments, social changes and new business practices have formed a global, web-enabled playing field that allows for multiple forms of competition in real time, without regard to geographic distance or even language in the near future. In this climate, manufacturers that previously competed with producers within arms' reach are now recognizing emerging competition from every corner of the globe. Supply chains have global reach, pricing is more transparent, and customers want timely product availability. At the heart of the challenges many manufacturers face today are enormous populations of people entering the global market-place from China, India, Russia, Eastern Europe, Latin America and Central Asia. These people entered the market right when the global playing field was leveled with the internet, which allows this global playing field to compete and share information more equally, more horizontally, and with less expensive and more readily available tools than ever before. Global competition has forced manufacturers to reduce product costs, shorten product life cycles, and quickly respond to drastic changes in demand.

Increasingly, manufacturers are seeking flexibility and agility in production operations. This goes beyond the automotive sector and has expanded to all discrete and hybrid production sectors such as flat panel displays, food & beverage, and pharmaceutical. The concepts are not limited to these industries, as every manufacturer needs to be relentless in their efforts to minimize the Total Cost of Ownership (TCO) for production and enhance operational performance. To reduce the TCO for factory floor operations, there are three phases in the manufacturing life cycle that require specific care in managing costs: (1) Initial Design & Development, (2) Production Operations, and (3) Maintenance. System integrators and machine builders play an integral role to ensure that these goals of manufacturing operation are achieved.

iQ Intelligent Automation platform

Business requirements from control systems are developing rapidly in today's fast paced commercial environments. Real-time data and other critical information is often required from many areas of control systems, plant instruments or networks.





Traditionally, this information has to be obtained across a number of non-compatible hardware platforms, each requiring a level of interfacing or protocol conversion to work with high level business systems. However, now the iQ Automation gives you the tools to integrate your business to whatever level and whatever function you need to maximise efficiency and minimise costs.

The iQ Automation strategy revolves around the System Q Automation Platform along with powerful extensions and option modules, which have been designed to sit at the heart of a control system or manufacturing process creating a flexible PAC solution. This enables total integration of control and communications from a single hardware platform. The versatile iQ Automation can bring together the needs of corporate business information systems and the power of the world's most successful automation controller.

iQ Control

The iQ Automation hardware is all about control and forms the base for extremely flexible control solutions suitable for many diverse applications. This ranges from the basic logic functions of a single process to complex multi-process control systems running a manufacturing plant. Combinations of up to 4 processors, each running independently yet sharing the same data highways, can reside on a single backplane giving fast data transfers between processes. Specialist controllers such as the dual redundant processor introduce high level functions and high process security ensuring critical systems run without disruption.

iQ Networks

The iQ Automation has a wide selection of network interfaces that enables it to connect to the most popular networks used in modern control systems. This allows it to act as an intelligent protocol converter providing data access to new and legacy networks.

iQ Connections

Control systems generate data and every aspect of an automated process is tracked with the data available in the process controllers. This data is primarily used to track and control the various processes by the PAC. However, there is great value and information held within the data which can be accessed and subsequently turned into valuable knowledge.

Many businesses demand a reliable source for information that is vital to its successful operation, iQ Automation provides a rugged data converter and buffer capable of direct connection into the business IT infrastructure. Using standard IT protocols and connections; connection to the data is straight forward and easy. iQ Automation is configured to "push data" from the controller to the main database. This dataflow can be scheduled and or event driven making the information transfer as efficient as possible.

iQ Modular options

There is a broad range of option modules available making the iQ Automation ideal for a wide range of control and manufacturing applications.

Multi-processing in the iQ Automation offers the benefits of specialised control within a platform that is also used in a general logic and control environment. The addition of multi processing brings a no compromise approach designed specifically for specialist control functions such as motion , or even full PC functionality. Each processor runs its own programming and interrupt processes independently; therefore there is no compromise on the speed or control capabilities of the system. This approach allows complex and diverse applications to be optimised and the data associated with each process to be fully integrated and instantly available to other processors sharing the high speed backplane. As each specialist processor has its own operational program, the development and deployment of iQ Automation is faster with simpler commissioning requirements ■

The new 'MR-J3 Series' AC servo amplifier

Originally published in Mitsubishi Electrics' R&D magazine 'Advance'

A new series of general-purpose AC servo amplifier has been developed. The "MR-J3 series", has incorporated advanced control capabilities that are able to maximize the best advantage from the machinery. This paper introduces control functions that have been beefed up MR-J3 series and the newly developed high-speed synchronous servo system network dubbed SSCNET III.

High-speed high-precision control that adapts itself to mechanical characteristics

A basic way of controlling machinery at high speed with high precision is to raise control gain. However, by raising the control gain, the machine might generate mechanical vibrations. For the reason, that every machine usually has a few vibration mode. Such vibrations will hinder the machine from operating in higher speed and better precision.

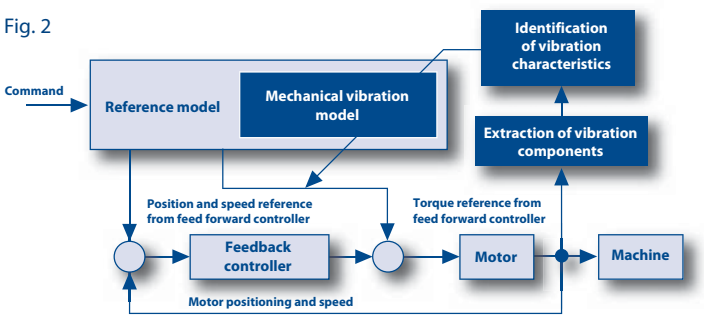
From servo control viewpoint, these mechanical vibrations can be divided into three categories. The first category are vibrations of high frequency in the range of several hundred Hz or above. The characteristic of this vibration is normally initiated by a raise in control gain. Once the control system starts to vibrate in this vibration mode, it becomes unstable and impossible to control.

The second category are low frequency vibrations ranging from several Hz to approximately 100 Hz. In this vibration mode, the control system will not vibrate even when the control gain is increased. However, the control system might generate residual vibrations at the time of stopping/positioning, hence, the settling time becomes longer.

The third category represents a low-frequency vibration mode that poses a problem with machinery of extremely high load/motor inertia moment ratio together with low mechanical rigidity. In this case, vibration itself is not likely to pose any problem. However, the gain becomes small at low frequency, as a result, the machine becomes receptive to disturbance and unable to achieve high precision.

In order to suppress these mechanical vibrations, it is necessary to apply appropriate control methods commensurate with the characteristics of such mechanical vibrations. To cope with these categories of mechanical vibrations, we have developed "Adaptive filter II," "Advanced vibration suppress control" and "Robust disturbance compensation control" to be equipped into the MR-J3.

Fig. 2



Advanced vibration suppress control

Advanced vibration suppress control is designed to suppress the vibrations in Category 2 above. It is effective in suppressing residual vibrations at the time ofsettling during positioning operation.

The MR-J3's control block diagram with Advanced vibration control illustration is shown in Fig. 2. The primary control method of the MR-J3 is model adaptive control. In this method, the motor is driven in such a manner that the tip of the given machinery moves together with the reference model applied.

Under Advanced vibration suppress control, it uses a mechanical vibration model from reference model to generate a drive pattern that prevent the tip of machinery from vibrating, thereby suppressing any residual vibration. Advanced vibration suppress control can extract vibration components from actual motor movements. It identifies the vibration characteristics of the machinery in real time, and automatically make adjustment to the mechanical vibration model.

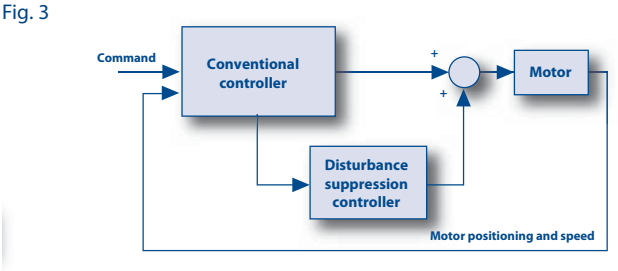
Robust disturbance compensation control

The Robust disturbance compensation control is designed to suppress the mechanical vibrations in Category 3 above. It is particularly effective in increasing the synchronization precision of large load inertia machines such as printing presses and packing machines.

In the case of machines with large load inertia and low rigidity, it is almost impossible to sufficiently raise gain at low frequency using conventional control methods. It is because the gain became larger at high frequency than at low frequency, as a result, the control systems will become unstable. For this reason, such kind of machines was susceptible to disturbance and unable to obtain sufficient precision.

The Robust disturbance compensation control has been designed to stabilize and suppress disturbance for such machines. A Disturbance suppression controller has been added to the conventional controller as shown in Fig. 3. Since the Disturbance suppression controller enhances responsibility for disturbance only, it is not necessary to raise conventional controller's gain considerably and it is possible to greatly reduce the effects of disturbance while retaining stability.

Fig. 3

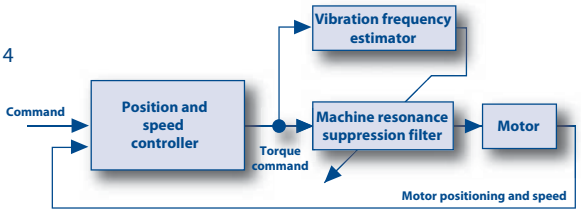


Adaptive filter II

When a given machine has a mechanical resonance at a high frequency, (in the range of several hundred Hz and above.) increase control gain will cause the control system to oscillate in this vibration mode and subsequently lose control. In order to overcome the mechanical resonance, it is common practice to insert a machine resonance suppression filter into the control loop to prevent oscillation. Adaptive filter II is a function that automatically set this machine resonance suppression filter in real time.

Figure 4 shows the configuration of Adaptive filter II. It extracts mechanical resonance components that contained in the torque command, determines their frequency, and automatically adjusts the parameter of the machine resonance suppression filter accordingly.

Abb. 4



Servo system network SSCNET III

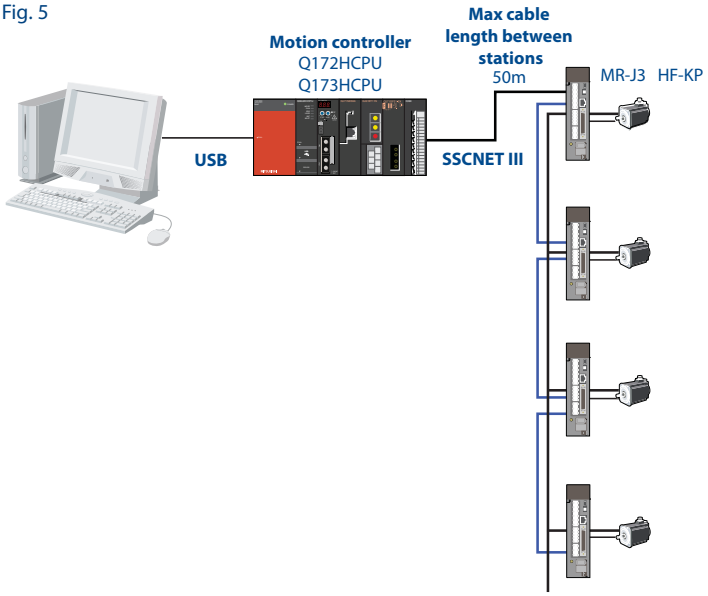
The SSCNET III is a high-speed synchronous network using an optical fiber cable. The Mr-J3B servo amplifier is connected to Q173HCPU or Q172HCPU motion controller via SSCNET III (See Fig. 5). As for the communications specifications of SSCNET III, it can control up to 8 axes per system with the transmission rate of 50 Mbps and command communications period of 0.4 ms. If the command communications period set to 0.8 ms, control of up to 16 axes per system is possible.

(In the case of the conventional SSCNET, the command communications period was 3.5 ms.) The maximum station-to-station cable length between the controller and the servo amplifier is 50 meters. With maximum of 16 axes per system, a maximum overall cable length of up to 800 meters is possible. (In the case of conventional SSCNET, the maximum overall cable length was only 30 meters.) Since long-distance wiring has become possible, it is possible to locate the controller's control panel and drive units far apart and spread widely in a large-scale facility or a large-scale production line. This, in turn, will shorten the cable between amplifier and motor in machines where there is a relatively large amount of wiring.

As for the servo adjustments, a servo setting and support tool, MR Configurator can be used over SSCNET III, just simply connect a personal computer to the motion controller makes it possible to perform controller settings and servo parameters of all the connected axes to SSCNET III. The aforementioned control functions can also be made with ease using the GUI of MR Configurator.

In conclusion, this article has introduced MR-J3's control capabilities and Servo system network SSCNET III on machinery performance enhancement as a total system. We will continue our best efforts to develop products that meet future market need ■

Fig. 5



MR-J3 in focus ///

The new MR J3 series is Mitsubishi Electric's latest generation of servo amplifiers and motors for industrial automation applications, that are small, precise and easy to integrate, sporting a host of new features. The powerful amplifier and motors are significantly smaller than previous generations, reducing the need for costly cubicle space and allowing the motors to fit easily and neatly into small recesses of the machine. From simple single-axis drives for point-to-point positioning, to complex systems with 96 fully synchronised axes, the new MR-J3 series can reduce more than just your stress levels.

Compact design

- It reduces wasted panel space with the smaller compact design.
- It reduces production waste from greater accuracy provided by the standard 262,144ppr encoders.
- It reduces production times with a frequency response of 900Hz.
- It reduces set-up times using advanced auto-tuning.

Hot-Melt Gluing Station benefits from robot technology

We had no trouble at all configuring this 6-axis MELFA RV-3SB for the task, even though this was our very first project with a Mitsubishi robot.

Economical mass production of door handle systems for the motor industry is only possible with automated manufacturing facilities. MW-TEC is a specialised manufacturer of custom-built machines in Velbert, Germany. In their door handle assembly gluing station, the company uses an agile industrial robot supported by the intelligence of a compact controller, both from Mitsubishi Electric. Integrated in a network, these components help to ensure high product quality and more efficiency on the production line.

Faster, better, more productive – the specifications for the new gluing station were clear: A fast-setting hot-melt adhesive would be used to reduce waiting times and make it possible to proceed to the next assembly step sooner. In turn, this would increase throughput and boost the productivity of the entire production line. The requirements for the gluing process were exacting: The quick-setting hot adhesive needed to be applied evenly across the entire contoured surface of the handle components, in exactly the right quantity and within a very narrow time window. This was a perfect task for a six-axis articulated-arm robot from Mitsubishi Electric.

Fully integrated into production cell

At the centre of the production line a rotary table transports the handle components and glued assemblies to the individual processing stations. The small MELFA RV-3SB robot, which is fully integrated in the production cell, positions the part correctly beneath the nozzle of the adhesive metering system and then moves it continuously so that adhesive is applied evenly across the curved contours of the surface. After the adhesive has been applied, the robot then places the outer shell on the metal core of the door handle. The entire operation is completed in just 30 seconds, after which the glued components are pressed together briefly by an automatic mechanism. The special adhesive sets almost completely in just two minutes, after which the finished handles leave manufacturing cell via the removal station for further processing.

In addition to improved performance, the MW-TEC engineers also wanted to keep the costs for engineering, installation, commissioning and maintenance as low as possible. They thus chose a standard field bus system to keep the overheads for the assembly station down and to ensure trouble-free communication between the components. Looking for an equally cost-effective and powerful solution for the visualisation and control system, the engineers chose the MELSEC FX3U compact controller and the E300 control terminal, a well-matched duo from Mitsubishi's wide range of automation components.

Master module for Profibus DP

The MELSEC FX3U compact controller is the only PLC in this segment that has a master module for Profibus DP, making it possible to configure a very economical solution for all the communications within the production facility via the standard network. The robot, control terminal and remote inputs and outputs are all connected to the controller via the Profibus master module, which supports up to 64 remote field devices.

The components and engineering support were supplied by Otto Kuhmann GmbH & Co. KG, Düsseldorf, which is a partner in Mitsubishi Electric's Automation Network and a member of the Sonepar Deutschland Group ■

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Product focus

FR-E700 Series Inverter *NEW!*

This powerful all rounder packages high performance drive technology into a compact body and price. A 200% overload function as well as advanced auto tuning and a wide range of option cards are just some of the highlights seen with the FR-E700.

FX3UC Micro Controller *NEW!*

The new MELSEC FX3UC CPU brings greater flexibility and more performance to applications which do not have space for traditional style PLC's. Like all other members of the FX family, each FX3UC PLC consists of a fully-integrated base unit that contains all the necessary PLC components, from the CPU to memory and the I/O controller.

Q Series MES interfacer *NEW!*

The new MES module from Mitsubishi Electric is a revolutionary way of connecting data from Programmable Logic Controllers (PLC) used in manufacturing to the management IT databases feeding the control and reporting systems.

MR-J3 T

This CC-Link enabled version of Mitsubishi Electric's latest generation of servo amplifiers makes it easier than ever to build truly integrated automation systems. The powerful amplifier and motors are significantly smaller than previous generations, reducing the need for costly cubicle space and allowing the motors to fit easily and neatly into small recesses of the machine.

ST series CC-Link head station

The new ST1H-BT head station offers CC-Link users a flexible low-cost solution for all remote slice I/O needs. Operating as a remote device station of a CC-Link network, it is suitable for up to 64 stations with a wide selection of I/O types, and supports networks speeds up to 10 Mbps.

Designed for ease of maintenance, the ST Series offers a wide range of fault diagnostic functions. The I/O modules and intelligent modules can be removed or replaced without the need to power down the system.

Intelligent Modems

Mitsubishi's range of Intelligent Industrial Alarm Modems (MAM) bring telemetry solutions to a new level. Each unit is available with preloaded PLC protocols for connection to Mitsubishi Alpha 2, FX and System Q controllers. This means that control and telemetry functions can be brought seamlessly together with the minimum of effort.

Robot - MELFA WORKS Software

This advanced package brings virtual engineering to the forefront of robotic control. Through a collaboration with Solid Works (R), Mitsubishi robots can be designed into virtual production environments. Here they can be programmed and tested for path collisions and accurate cycle times - before buying any hardware.

GOT - GT1020

A picture is worth 1000 words but with the GOT1020 you can make that 1003 words with the 3 colour backlight which can be used to highlight actions, item processes or events for example: a red background screen can be an alarm, green could be everything ok and orange could equal editing mode. In addition because the screen is clear and bright it can be seen easily from a distance.

FX3U Modbus card

FX3U users can now add another optional communications card to their system library with the release of a new Modbus communications module. This expands the already comprehensive range of FX3U communication options creating greater flexibility and connectivity.

FR-D700 *NEW!*

Small, compact and available up to 7.5kW. The new FR-D700 offers un-paralled price-performance for this class of Mitsubishi drives. Benefiting from many of the common 700 series design features users can expect reliability and performance in equal measures.

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