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Mitsubishi FA Integrated Solutions:

Honda Motor Co., Ltd., a Customer Case Study.

Honda's cutting-edge "Yorii Plant" adopts "CC-Link IE Field Network"; higher production line efficiency increases its competitive ability in the global market.

Honda Motor Co., Ltd. has increased efficiency of production and operation management at its Yorii Plant (Yorii, Saitama, production from July 2013) by introducing the Ethernet-based CC-Link IE Field Network, which allows communication within a unified network for control signals from FA devices such as PLCs, production management information, and safety signals, etc. Having established Yorii as the "mother factory", lateral expansion to overseas factories such as the new plant in Mexico and elsewhere is beginning, aiming for further enhanced competitive ability on a global scale.

Key Points

1. Build a simple and robust network worthy of the "mother factory".
2. Enhanced visualization of FA control devices, and streamlined operation and maintenance management.
3. Flexible expansion and change as the network also supports communication of safety information.

The Yorii Plant (Yorii, Saitama, Japan) of Honda Motor Co., Ltd. (hereafter Honda) opened in July 2013. Since then, it has continued to be at the cutting edge of the vehicle production industry, introducing everything Honda has developed in the way of high-level production technology and

high-efficiency production systems.



Picture 1: Over the past several years demand for new cars has plateaued in Japan

The rate of new cars sold within Japan has plateaued at around 5 million per year for the last several years, and the industry can no longer count on the consistently rising sales figures of the past. The Yorii Plant was built with a view to increasing cost-competitiveness through highly efficient production and energy management. The huge site, which covers 0.95 km² including greenbelts, is scheduled for a full production capacity of 250,000 vehicles per year. As of March 2014, it produces the "FIT" and "VEZEL" brands [also marketed as "JAZZ" and "HR-V"].



Picture 2: By introducing cutting-edge production technology, the Honda Yorii Plant has achieved a tact time of less than 50 seconds for the production of the FIT.



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Moreover, the Yorii Plant also fulfills the role of "mother factory." Realizing this function entails sharing its production technology and know-how gradually to domestic and international production hubs, increasing overall global competitive ability.

As the construction of the Yorii Plant proceeded with this mission in mind, it was late 2011 when the design and selection of production line control devices began seriously. Mr. Taku Yokomukai, currently the maintenance supervisor for vehicle body assembly production line facilities and involved with the selection of control devices, recalls, "We talked a lot about what kind of control devices and networks would be appropriate for a state-of-the-art factory."

Aiming for visualization of devices and greater freedom of safety functions

The first issue which arose when constructing a control network for the vehicle body assembly line was how to handle the overall network architecture. "We did consider a flat construction linking the whole Yorii plant in a single network, but given the possibility that a single failure could stop the entire plant's network, we decided we were better off with multiple networks," commented Yokomukai.

However, constructing individual networks by application would not only mean a more complex system but increased introduction and operation costs. Additionally, from the perspective of spreading know-how from the Yorii "mother factory" to other factories, something not only sturdy but simple in construction was called for.

While considering the system architecture, the team also identified two functions essential for the network. One was the centralized "visualization" of FA control devices; the vehicle body assembly line alone uses dozens of PLCs, making individual management inefficient. The target was an environment in which FA control device setup,

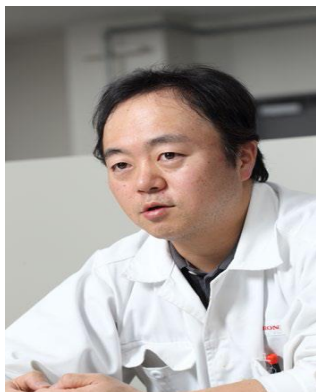
monitoring, failure detection and so on could be centralized through the network.

The other essential function was the communication of "safety signals." When a worker enters a prohibited area or approaches a robot, safety considerations mandate a sensor for detection and a production facility stop (interlock). However, the traditional practice of using relays to configure a hardware based safety circuit presented the issue of serious time loss during line expansions and changes. Given this situation, they decided to incorporate safety signals into the network as well, aiming for a structure that would allow flexible line changes.

Selecting "CC-Link IE Field Network"

Based on these needs, Yokomukai focused on Mitsubishi Electric's "CC-Link IE Field Network" solution. With a "CC-Link IE Field Network," a single Ethernet cable not only allows communication of control information for PLCs and controllers, but also maintenance and safety information from the connected FA devices.

"When Mitsubishi Electric introduced its 'CC-Link Field Network' to us, I discovered that it could handle maintenance and safety information as well, reflecting our various on-site needs. I felt that it would allow us to build a simple and high-reliability network suitable for our cutting-edge Yorii Plant," observed Yokomukai.



Picture 3: Honda Motor Co. Lt Saitama Works, Yorii Plant, Yorii Management Block, Maintenance Supervisor Mr. Taku Yokomukai



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Furthermore, compatibility with FA control devices was also an important point. "In order to fulfill the projected production numbers, the vehicle body assembly line was going to have to be maintained at a near constant 100% operating rate, requiring reliability and guaranteed performance from the FA control devices. So when we were selecting FA control devices for the Yorii Plant's vehicle body assembly line, our in-house proposal was for Mitsubishi Electric's products, which had proven themselves over many years at our Sayama plant (Japan), and which I myself have always held in high regard. Because the 'CC-Link IE Field Network' is highly compatible with Mitsubishi Electric's control devices, we felt that we could construct an optimal system by combining the two," explained Yokomukai.

maintenance (monitoring and failure detection) of controller devices, but it also features a "safety communication function" allowing sharing of safety information among multiple safety PLCs.

After considerable in-house deliberation, the final selection fell to Mitsubishi Electric's FA control devices and, likewise from Mitsubishi Electric, the "CC-Link IE Field Network" Solution for the vehicle body assembly line; installation and testing began in November 2012. In addition, while a detailed discussion cannot be presented here, Mitsubishi Electric's solutions have also been introduced to the press shop, resin molding process, vehicle body painting line, and other production areas.

Batch management of 50 PLCs for improved operating efficiency



Picture 4: Mitsubishi Electric's PLC "MELSEC-Q Series" was used on the vehicle body assembly line

The Honda Yorii Plant began operation in July 2013, and moved to full operation with the introduction of a second shift in September 2013. Yokomukai is pleased: "We really get a sense of the effect of the "visualization" that we were aiming for originally, even the way that when there's trouble with the equipment or FA control devices, the diagnostic functions of CC-Link IE Field help us locate the problem faster. Also, we're extremely satisfied with Mitsubishi Electric's responsiveness, regarding system construction and support."

The "CC-Link IE Field Network" is an Ethernet based field network following the physical and data layers as defined by IEEE 802.3 (1000BASE-T). Through the work of its industry group, the CC-Link Partner Association (<http://www.cc-link.org/jp/>), it has become widely adopted and considered a standard. As well as covering high-speed I/O and control of distributed controllers, it offers flexible network topology options such as star and ring types, allowing great freedom in the arrangement and configuration of connected devices. In addition, not only does it support management (setup and monitor) and

Through this introduction of "CC-Link IE Field Network", a centralized "visualization" of FA control devices has been achieved, just as required in the original plan. "The vehicle body assembly line uses as many as 50 Mitsubishi Electric PLCs: we're able to get a centralized overview of the line status or any trouble that may be happening when a necessary signal isn't being received, making operation management efficiency much, much higher. The recovery time has also been shortened," remarked Yokomukai.



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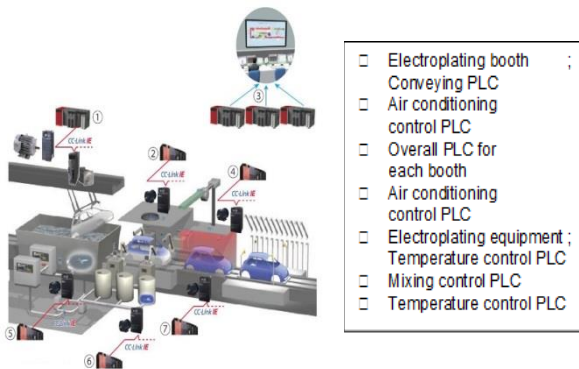


Image 5: Example system configuration

With regard to line expansion and safety information, it is as simple as connecting a LAN cable to a vacant port on the “CC-Link IE Field Network” and the interlock can be added immediately in Mitsubishi Electric’s Safety PLC, reducing the workload considerably.

Honda has assessed these merits highly in-house, and introduced a similar system to its new Mexico plant, which began operation in January 2014. The Yorii Plant has proved its value as the “mother factory”.

The market conditions surrounding the automobile industry have undergone major changes. New car sales are struggling in developed countries, while major growth is predicted for markets in the developing countries, as each automobile manufacturer is competing for dominance. Increased competitive ability through increased efficiency is a constant concern for manufacturers, and Honda plans to work towards further increased efficiency while utilizing the Yorii Plant as its “mother factory”. Mitsubishi Electric expects higher demands to be placed on integrated FA solutions as users construct future leading-edge production systems.

About Mitsubishi Electric

With over 90 years of experience in providing reliable, high-quality products to both corporate

clients and general consumers all over the world, Mitsubishi Electric Corporation is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, as well as in products for the energy sector, water and waste water, transportation and building equipment.

With around 124.000 employees the company recorded consolidated group sales of 39.3 billion US Dollar* in the fiscal year ended March 31, 2014.

Our sales offices, research & development centres and manufacturing plants are located in over 30 countries.

Mitsubishi Electric Europe, Industrial Automation – UK Branch is located in Hatfield, United Kingdom. It is a part of the European Factory Automation Business Group based in Ratingen, Germany which in turn is part of Mitsubishi Electric Europe B.V., a wholly owned subsidiary of Mitsubishi Electric Corporation, Japan.

The role of Industrial Automation – UK Branch is to manage sales, service and support across its network of local branches and distributors throughout United Kingdom.

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