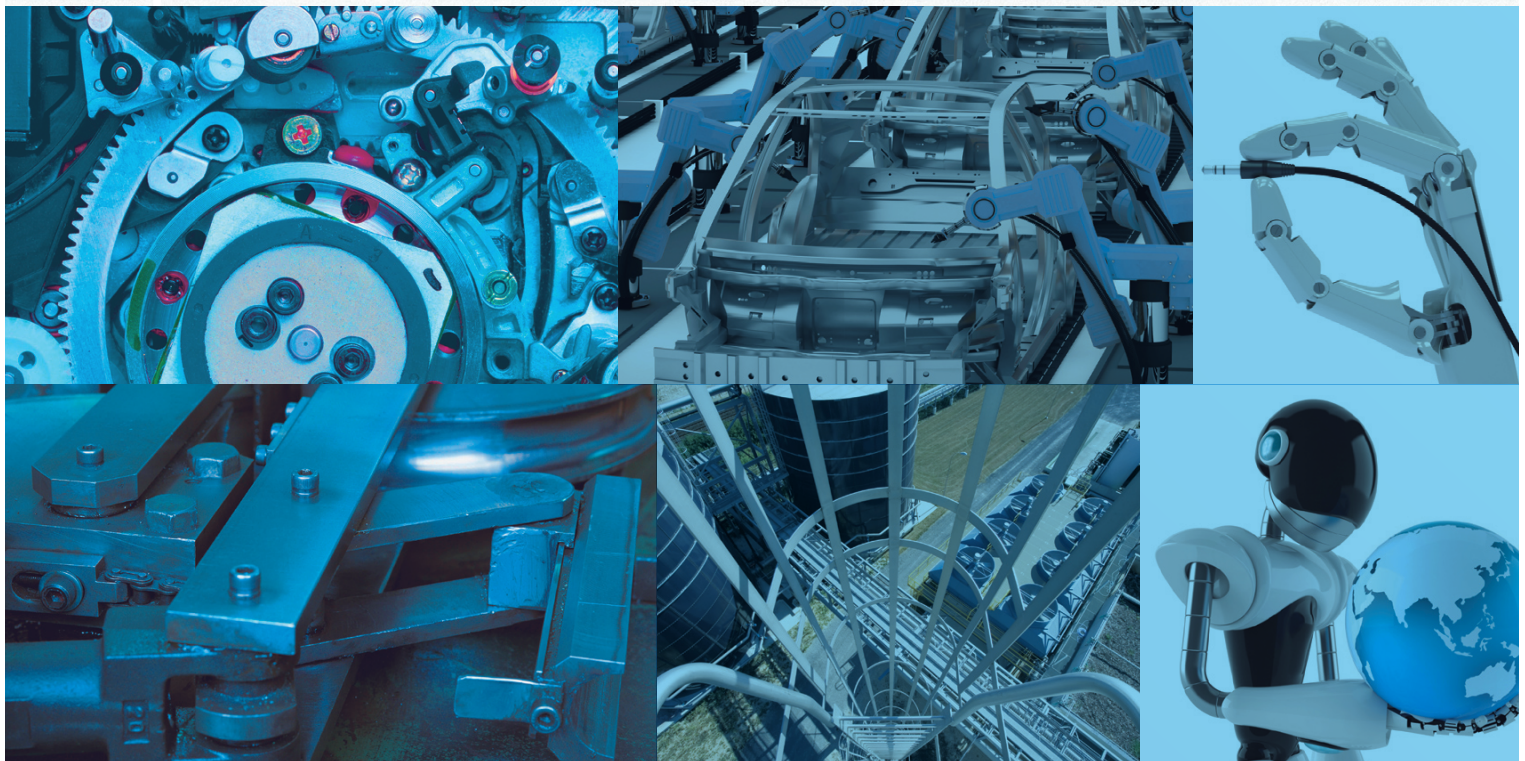


The New Frontier of FA with CC-Link/CC-Link IE



Customer Dialogue

CC-Link Partner Association & Beijing Hyundai Motor Company

The Highly Developed Productivity of Beijing Hyundai Motor Company
Automation Technology is the Strength Behind Its Brand Power

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The Highly Developed Productivity of Beijing Hyundai Motor Company Automation Technology is the Strength Behind Its Brand Power

Hyundai Motor Group owns the highly productive Beijing Hyundai Motor Company (Beijing Hyundai), one of the leading companies in China's automobile industry. CC-Link is used in the production systems of the plants of Beijing Hyundai. Ms. Naomi Nakamura, the global director of the CC-Link Partner Association (CLPA), visited the plant and talked about the automation technology's capability for company development with Mr. Chang Jae Lee, General Manager of the Production Planning Department Production Division, and Mr. Kang Won Kyu, General Manager of the Maintenance Department team.

Ms. Nakamura (hereinafter: N) Beijing Hyundai is one of the Chinese automobile companies that have rapidly grown in recent years, isn't it?



Mr. Chang Jae LEE
Beijing Hyundai Motor Company,
General Manager of Production
Planning Department Production
Division



Mr. Kang Won kyu
Beijing Hyundai Motor Company,
General Manager of Maintenance
department team

Mr. LEE (hereinafter: L) Beijing Hyundai was established on October 18, 2002 as a joint venture company of Beijing Automobile Works and Hyundai Motor Company (Hyundai). We mainly produce compact cars with 1600-cc or lower displacement engines and SUVs, which are products in the premium market segment, such as "Accent", "Verna", "Elantra", "i30", "Moinca", "Sonata", and "Tucson". Our production has been rapidly expanded with the growth of China's automobile market. The production capability at the time of foundation was 50,000 cars a year. However, we can now produce one million cars a year.

Our production capability has been increased by 20 times in 10 years.

N Does the increase in the production capability mean that Beijing Hyundai greatly strengthened the production facility in the past 10 years?

L We have three completed-car plants in Beijing. They are the 1st plant, which has been operating since the foundation of the company, the 2nd plant, which was built in 2008, and the 3rd plant, which started its operation in 2012. The 1st plant was owned by Beijing Automobile Works first and produced trucks as the main product. We used its building and introduced the latest equipment into it. We built the 2nd and 3rd plants. Each plant is capable of producing approximately 300,000 cars a year. The total production capability is about one million cars.

The production facilities of the 2nd and 3rd plants were constructed based on the production facility designed by Hyundai in South Korea. In the production facility of the 1st plant, the existing equipment was used in its pressing line of the body factory. However, the latest equipment designed by Hyundai was used in the paint shop and the assembly shop. I don't think that the production facility of the 1st plant is inferior to those of the other two plants.

World's Top-Level Production Capability

N If the number of production lines has increased the production volume and widened the product types, the production plan has to be complex.

A stricter production plan must have been designed following the expansion of the production facility.

L Exactly. In Beijing Hyundai, my division Production Division is playing such a role. Production Division mainly designs the production plan for the three plants and manages those plants. Production Division also considers the production system when we are to launch new-model car production. The basic design of the three plants was done by Hyundai, but our department considers various plans to improve the production efficiency of the three plants. We suggest improvement plans to Hyundai based on the result.

N We heard that the three plants have one of the best production efficiencies of

all of Hyundai's global production bases.

L Sure, the three plants are highly developed in productivity. In a report created by an outside research company, the three plants were selected as one of the top-10 most productive plants among 130 plants in the world. The production volumes per hour of the 1st and 2nd plants are at the top level in the completed-car plants of Hyundai Motor Group.

N There are lots of approaches to improve productivity of a plant. I think the most important approach is automation. The automation technology is especially capable of improving productivity with high quality, I think. How does Beijing Hyundai go about automation of the production lines?

L In China, where we can acquire relatively-inexpensive manpower, increasing the automation rate does not directly lead to a business advantage. I think that we must promote automation considering various conditions. However, the manpower cost in China has rapidly increased in recent years. Many companies may start promoting automation more and more as the manpower cost increases.

In my opinion, the automation rate of Beijing Hyundai leaves other Chinese automobile manufacturers way behind. The automation rate of the body factories is especially high. For example, the pressing process and the body assembly process of the body factory in the 2nd plant are fully automated. In the body assembly process, many robots are operating and enable production of 73 cars per hour.

CC-Link Plays an Active Role in Body Factories

N Promoting automation always requires an industrial open network. The industrial open networks "CC-Link" and "CC-Link IE", which we promote, contribute to automation in factories in various fields, such as automobiles, liquid crystal displays, and most advanced industrial products.

Mr. Kang (hereinafter: K) CC-Link is playing an active role in our plants. As mentioned already, the plant facilities of Beijing Hyundai are based on a facility designed by Hyundai. Several industrial open networks including CC-Link are used in the facilities. CC-Link is used in the section where Mitsubishi programmable logic controllers are used.

Specifically, CC-Link is used in the assembly processes of the body factories.

I think that the conditions required for an automation system depend on the situation of the country or the area where the plant operates. Beijing Hyundai places a heavy emphasis on reliability and usability. We also think that support by device vendors is important. One of the big advantages of CC-Link is that we can get global support. In fact, we have already received technical support for CC-Link. That was from a service base in South Korea. This is because the basic design of our facility was also from South Korea.

N "Reliability" is what CLPA also places a heavy emphasis on. The standard of CC-Link is designed to essentially have high reliability. In actual typical production lines, devices provided from several vendors are connected by CC-Link. Even when devices provided from various vendors are included in a system, the reliability of the whole system is essential. Thus, CLPA has established a conformance testing programme to guarantee reliability for when devices provided from various vendors are connected each other by CC-Link.

Automation Technology Contributes to Strengthening Brand Power

L The automation technology is also important to strengthen our brand power in the market. Our production capability is now at the top level in China. Next, we need to improve the added value of our products and to strengthen their brand power.

One of the important points to strengthen the brand power is to provide



Ms. Naomi Nakamura
Global Director of CLPA

attractive products to consumers in a timely manner. To achieve this, we must have a system to produce products in response to requests from the market. We also need to provide high quality. The automation technology is necessary to satisfy these requests.

K For example, the production lines in the 1st plant of Beijing Hyundai are designed to handle six models. However, the production volume per unit time differs depending on the model. Leveling such a difference leads to great improvement in flexibility of the production lines. To achieve this improvement, the cause of bottlenecks must be identified for each model and the operation time of each process must be adjusted to eliminate the cause of the bottleneck. Automation technology is the key here.

When we build a production system that can flexibly respond to changes in the market, we think that industrial open networks will help create a mechanism to prevent failures of the production facility.

The mechanism helps create a production system that can flexibly provide the market with products.

N I see. The automation technology can contribute benefits to users in many ways.

I'd like you to keep an eye on the developments of CC-Link. Thank you so much for our meeting today.

CC-Link Safety approved as Chinese National Standard Large certification announcement event held in Beijing

The safety field network standard "CC-Link Safety", which is based on the technology of the industrial open network "CC-Link", was officially approved as one of Chinese National Standards "GB/Z" in May 2013. The announcement event for this approval was held at the Diaoyutai State Guesthouse in Beijing on May 8th 2013. About 80 people attended the event, and persons from organizations involved with this approval, such as the Chinese government, the CC-Link Partner Association (CLPA), user companies, and device vendors, made speeches.

CC-Link Safety, which was approved as a GB/Z standard, is an open safety field network standard which implements functions for detecting communication errors and for supporting communication of safety information such as an emergency stop request. The certification effort began around 2005, when the CLPA, the organization responsible for promoting CC-Link, started to acquire the GB/Z certification for CC-Link, which is the base of CC-Link Safety.

CLPA acquired the GB/Z certification ("National Standardization Guiding Technical Documents"), for CC-Link in December 2005. In June 2009, CLPA acquired the certification for the higher standard GB/T ("Voluntary National Standards") for CC-Link. Ms. Naomi Nakamura, global director of the CLPA, commented, "The GB/Z certification for CC-Link Safety following the GB/T certification for CC-Link will further strengthen the trend of using CC-Link Safety for safety systems in factories, and

will increase its popularity in China. We also expect that the development of devices and systems compatible with CC-Link or CC-Link Safety in China will be further accelerated."

Many key persons related to the certification attended the event, which was hosted by SAC/TC124 (Industrial Process Measurement and Control). Chinese government officials including SAC/TC124 members involved with this certification were invited as guests.

Additionally, about 80 people including persons related to the Chinese FA industry and members of the industry press attended the session. (Fig. 1)

At the beginning of the session, Mr. Ouyang, Secretary General of SAC/TC124 and Director of ITEI (Instrumentation Technology and Economy Institute) in China, introduced the guests. Mr. Sun Wei, Standards Department II Section Chief of the People's Republic of China Industrial, spoke first to make the announcement CC-Link

Safety was approved as GB/Z (29496.1 to 3-2013). (Fig. 2) Mr. Sun Wei was followed by Mr. Wu Yan Yun (Deputy Director General of the State Administration of Work Safety, Department of Policies and Regulations and chairman of the Functional Safety Committee), Mr. Chen Qi Jun (professor of Tongji University and chairman of CLPA China), Mr. Wang Chun Xi (Deputy Secretary General of SAC/TC124), and Mr. Luo An (a representative of the Standard Drafting Workgroup and Chief Engineer of Beijing HollySys Co., Ltd.).

After the speeches and greetings from the Chinese officials above, Mr. Masaki Shiroshita, President of Mitsubishi Electric Automaton (China) Ltd., and Mr. Katsuyuki Tomizawa, Deputy General Manager of Mitsubishi Electric Nagoya Works, handed letters of appreciation to the members of the Standard Drafting Workgroup. Ms. Naomi Nakamura, global director of CLPA, and Mr. Mitsushiro Fujishima, Deputy Chair Person of the CLPA Technical Task Force and Manager of

FA System Department II Safety Planning and Promotion Group, then appeared and explained the activities of CLPA for the certification and the outline of CC-Link Safety technology.

After Ms. Nakamura and Mr. Fujishima,

Mr. Chen Gang, Technical Advisor to the Manufacturing Technology Dept at FAW Car Co., Ltd., appeared as a CC-Link user and spoke about the background of their use of CC-Link. Last, Mr. Yasunori Kasho, Executive Officer and Vice President of the

Sensing Control Division of Panasonic Industrial Devices SUNX Co., Ltd., appeared to represent the vendors of CC-Link Safety-compatible devices and presented the latest CC-Link Safety-compatible device.



Fig. 1: Photograph of related persons and guests



Fig. 2: Scene of CC-Link Safety's GB/Z certification announcement event.

Closeup Panasonic Industrial Devices SUNX Co., Ltd.

Presentation of the latest CC-Link Safety-compatible device

Mr. Yasunori Kasho, Executive Officer and Vice President of the Sensing Control Division of Panasonic Industrial Devices



Mr. Yasunori Kasho
Panasonic Industrial Devices SUNX Co., Ltd.
Executive Officer
Sensing Control Division
Vice President

SUNX Co., Ltd. (SUNX), appearing as a representative of the vendors of CC-Link Safety-compatible devices, spoke about the profile of SUNX, and explained the feature and benefits of the remote I/O module "SF-CL1T264T", the latest CC-Link Safety-compatible device. This device can be a gateway for connecting several safety devices, such as light curtains, to CC-Link Safety-compliant safety networks. Up to two sets of the light curtain "SF4B series", which is one of the main products of SUNX, can be easily connected to the SF-CL1T264T.

Additionally, the SF-CL1T264T has a 12 input terminal block, enabling several safety devices to be connected. This means that several safety devices, including light curtains, can be integrated together for reduced wiring.

SUNX develops industrial sensors and offers sensors for safety systems in factories, including their popular light curtains. SUNX also develops and sells FA devices, such as programmable logic controllers, and the "SF-CL1T264T" is a strategic product for creating further success in the Asian market.

Closeup FAW Car Co., Ltd.

A leading Chinese automotive company presented its CC-Link applications

Mr. Chen Gang, Technical Advisor to the Manufacturing Technology Dept. at FAW Car Co., Ltd. (FAW Car), appeared as a CC-



Mr. Chen Gang
FAW Car Co., Ltd.
Manufacturing Technology Dept
Technical Advisor

Link user and presented the applications of CC-Link at FAW Car. FAW Car is an affiliated company of China FAW Corp, which is the biggest Chinese automobile manufacturer..

According to Mr. Chen Gang, FAW Car has been aggressively adopting an automated production system to achieve both high quality and high productivity, and the technology of the automation system used by FAW Car is at the world's highest level. FAW Car is also a key Chinese user of CC-Link technology. For example, in their "First Factory", one of FAW Car's three main production bases, CC-Link is

used for the welding process, all the assembly process, and the conveyor system. For only a few processes, such as painting and pressing, other network standards are used.

In his speech, he presented their history of automation, starting from the foundation of the company and explained the design concept of the automation system in FAW Car's main production process. He presented the outline of the actual automation system that is based on the concept and explained the role of the CC-Link-compatible devices in the system.

Exploring new applications for CC-Link globally

The CC-Link Partner Association (CLPA) appointed Prof. Kabe as an engineering adviser in 2012. He is a professor of the faculty of human sciences at Waseda University and has been engaged in research and development of advanced medical and social care robots. We interviewed him about the role of the engineering adviser and a new direction for CLPA. Prof. Kabe, whose background includes the development of factory automation (FA) devices, assists the direction of CLPA using his wide viewpoints and sophisticated knowledge about automation technology. He will work on the promotion of CC-Link and CC-Link IE to non-FA fields from a global viewpoint.

— Please tell us about your background.

Prof. Kabe I studied robotics at Tokyo University's mechanical engineering department before joining Mitsubishi Electric Corporation. There, I worked on the development of FA devices and industrial networks. In April 2003, Waseda University opened its Department of Health Sciences and Social Welfare. This gave me the opportunity to change career and become a university professor.

— Would you tell us about your research theme?

Prof. Kabe One of the major research themes is development of a "human-service robot" used in the medical and welfare fields. I am working on the development of a system that supports the health and medical services offered at

various places in people's lives, such as in hospitals, cities, transportation, and homes, to help offer solutions to problems accompanied with the super-aging of society.

I have been carrying out my research under the concept of "social implementation", developing an entire service covering the administration of actual operation sites and a business model for the operation, rather than developing hardware or software for a particular-function robot.

Application to service robots

— Would you introduce the products of your research?

Prof. Kabe I currently have two major products: "Jukusui-kun" and "Tocco-chan".

Prof. Akiyoshi Kabe

Faculty of Human Sciences, Waseda University
School of Human Sciences
Department of Health Sciences and Social Welfare
Robot Media Laboratory
Waseda Research Institute for Science and Engineering
Professor

Jukusui-kun helps people with sleep apnea syndrome. Tocco-chan is intended to reduce vulnerability to "locomotive syndrome", a high-risk state in which the activities of bones, joints, and muscles are decreased, decreasing the independence of one's life and requiring nursing care (Fig. 1 and 2).

Sleep apnea syndrome, in which people often stop breathing or breathe infrequently during sleep, not only imposes a great load on one's body but also may cause other diseases, such as high-blood pressure, diabetes mellitus, or cardiac infarction. With the current medical treatment, a patient has to wear a device, such as a breathing mask. Such a device is a great inconvenience for patients. To ease this load, I have been developing Jukusui-kun.

Jukusui-kun is a stuffed-bear robot having robot arms and a microphone that detects snoring. While used as a pillow, Jukusui-kun moves its arms to softly tap a patient's head or to move his/her face sideways when it detects apnea or infrequent respiration to help him/her breathe.

Jukusui-kun detects apnea or infrequent respiration based on the blood oxygen level that is detected with a pulse oximeter "Mini Jukusui-kun" attached to patient's fingertip and based on snoring that is detected with its microphone. I employed cordless communication between Jukusui-kun and Mini Jukusui-kun so as not to disturb one's sleep. When I presented this prototype at the international robot exhibition in 2011, many people were interested in it and it was introduced through newspaper and TV programs in Japan and overseas.

— Would you tell us about "Tocco-chan"?

Prof. Kabe Tocco-chan is a panda robot,

and its first prototype was developed to cause its user to laugh in order to promote his/her health. For this purpose, actuators for moving the arms and legs, a voice-recognition function, and a face-recognition function are built in. Since an algorithm to detect smiles is built into the face-recognition function, the Tocco-chan can keep talking with various gestures until the user smiles. I have been developing the second Tocco-chan that supports training for locomotive syndrome prevention by improving the mechanism for wider applications. Specifically, the second Tocco-chan will motivate a patient who takes the necessary training by talking and showing comical actions to entertain him/her. For the control of the actuators, commercially-available programmable controllers and CC-Link are used.

In my laboratory, in addition to producing prototypes of human-service robots such as Jukusui-kun and Tocco-chan, I study business models for implementing these robots.

Expanding the possibility of CC-Link and CC-Link IE

— Would you tell us about your role as the engineering adviser?

Prof. Kabe I attend each committee held by CLPA and activities of various working groups under CLPA as an adviser. One of my major roles is to give advice about the direction of technology development and marketing strategies related to CC-Link and CC-Link IE. I think that CLPA expects me to give opinions or advice based on the wider viewpoint of a person who has put oneself in a university, and who has wide networks across various industries and fields. I also give information about the latest trends of advanced technology and applications, which are important to determine plans for CC-Link and CC-Link IE.

In particular, I think that I need to give advice for improving the technology of CC-Link and CC-Link IE and for promoting



Fig. 1: Sleep apnea syndrome support robot "Jukusui-kun"



Fig. 2: "Locomotive-training support robot Tocco-chan"

the activities of the CLPA to strengthen global competitiveness of users and member companies. Many industrial network standards were created at a certain period. Many such networks were eliminated, but there are still several networks. To strengthen the presence of CC-Link and CC-Link IE and to increase the global share, activities and technology development considering the needs of users in advance are essential. I give advice based on these concepts.

— What is your goal as an engineering adviser?

Prof. Kabe The major goal is to promote the status of CC-Link and CC-Link IE in the global market. For this purpose, it is important to pay attention to new trends that are globally growing in various fields including non-FA fields. Fusion of information-communication technology (ICT) and FA is especially important. For example, "big data", with which meaningful information is extracted to build a new application system, is gathering interest as a key for new business mainly in the ICT field. However, compared to the ICT field, the FA field has not been interested in big data yet, although this is now beginning to change as we hear talk of "Industry 4.0". I believe that people involved in the FA field must understand that big data can have a large impact and possibility to be related with FA. Information networks collecting big data and industrial networks collecting data from sensors at actual FA sites are

both indispensable. The application of big data can only be expanded by personnel and field staff at sites who analyze the data and determine its use.

For example, home electronics and service robots that "talk" are becoming more common. If using robots in our various lives becomes the norm, the robots will be connected to each other through a network. I think that the architecture of this network will be developed combining an information network and an industrial network.

— In other words, the technology of CC-Link and CC-Link IE will be more likely to be used in non-FA fields, won't it?

Prof. Kabe Exactly. In fact, the technology of CC-Link and CC-Link IE is already used in large robots at attractions in museums or theme parks. CC-Link and CC-Link IE will be more and more used in non-FA fields.

If human-service robots, such as the locomotive-training support robot "Tocco-chan" and the sleep apnea syndrome support robot "Jukusui-kun" that I presented before, are used in many households, application software connecting such robots through networks may be developed. I think that we, people outside the FA field, can notice these new needs related to CC-Link and CC-Link IE faster than anyone inside the FA field. As an engineering adviser, I will positively work on pioneering new needs and pursuing No. 1 in the world together with you.



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