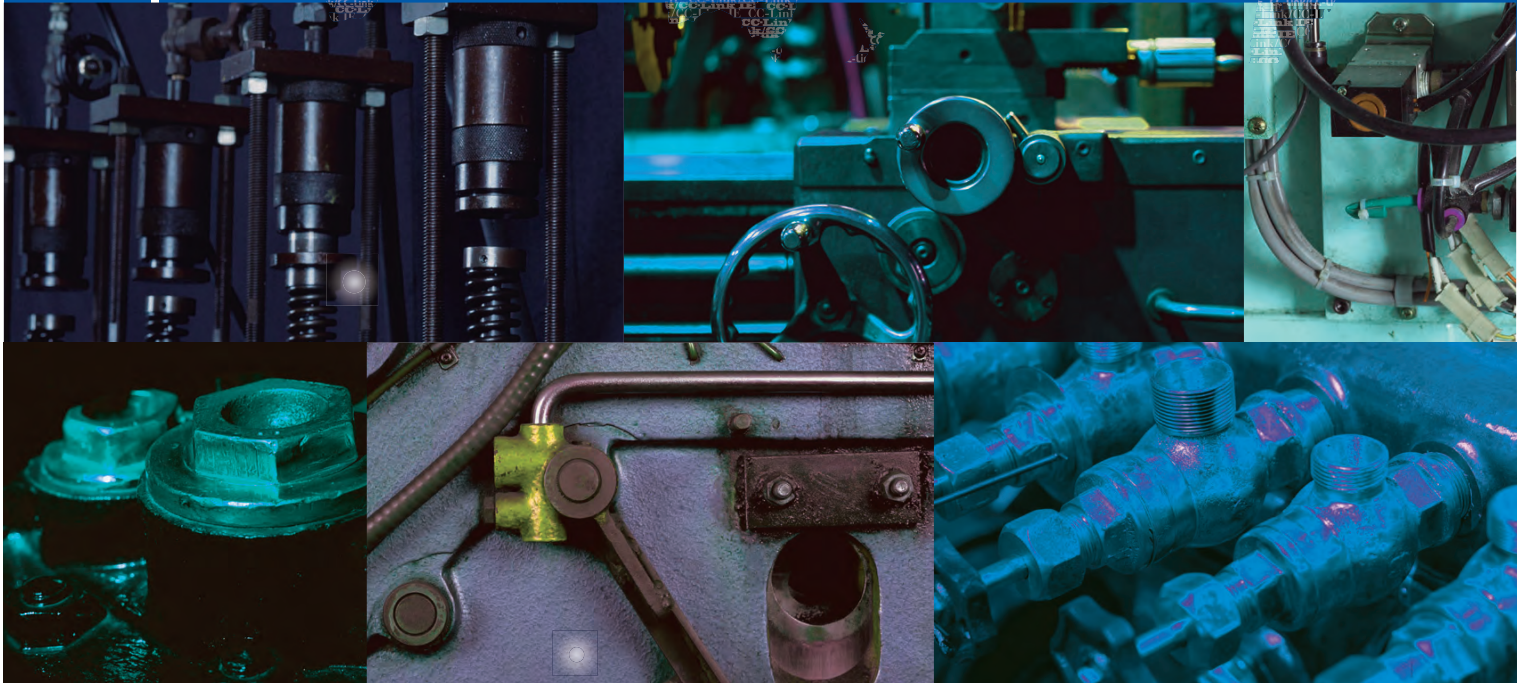


CC-Link and CC-Link IE The Most Widely-Used Networks in Asia



Special Feature

[Global strategy]

"CC-Link and CC-Link IE", Open Industrial Networks from Japan
Spreading Globally From Their Stronghold in Asia

Interview

[CC-Link Partner Association & FAW Car Co., Ltd.]

Part1

Production systems are strengthened to respond to market diversification
Keys of evolution are in the hands of automation technology

Part2

Reliability is important for industrial networks
New technology designed for integration with information systems looks promising

Interview

[CC-Link Partner Association & China Optics and Optoelectronics Manufacturers Association LCD Branch]

The Chinese FPD Industry Continues to Grow. "CC-Link and CC-Link IE Will Meet The Challenge of Production Advancement"

Special Report

[Review of FPD International China 2012/Beijing Summit]

CC-Link and CC-Link IE were the Hot Topics at the FPD International Event
Attendees Saw Technology and Application Examples from the Latest Factories

[Review of FPD International Taiwan 2012]

CC-Link Partner Association (CLPA) Joins FPD Technology Seminar in Taiwan,
Addresses Attendees on the Theme of Manufacturing Technology Evolution

"CC-Link and CC-Link IE", Open Industrial Networks from Japan Spreading Globally From Their Stronghold in Asia

"CC-Link" is the industrial open network that was born in Japan. The CC-Link Partner Association (CLPA) is now putting great effort into developing CC-Link in China with the slogan "Gateway to China". The entire Chinese manufacturing industry, not only the advanced companies, is now trying to adopt advanced automation using industrial networks. With the promotion in China, CC-link and CC-Link IE will not only increase their presence in Asia, where they have captured about 40% of the market, but also in the global market.

CLPA, the association to promote CC-Link, was established in November 2000. CLPA has promoted CC-Link for about 11 years by aggressively supporting the companies involved with developing CC-Link-compatible devices and system building. As of September 2012, 1253 products are compatible with CC-Link and 1742 partner companies support the activity of CLPA. Compared to 134 companies at its foundation, the number has increased about 12 times (figure 1).

Now companies all over the world support CC-Link and CC-Link IE, and 60 % of the partner companies are foreign companies. Specifically, companies in Europe,

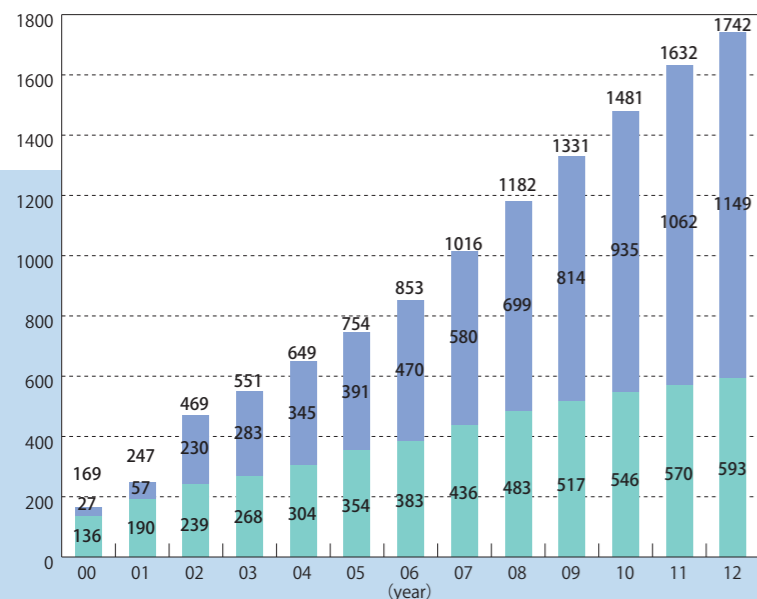


Figure 1 : CLPA partners are increasing globally

North America, China, South Korea, and Taiwan have joined as partners. "Especially in Asia, CC-Link has been adopted by companies in South Korea and Taiwan and commands about 40 % of the industrial open-network market, which is the highest market share of the industry. The main users are big companies which manufacture liquid crystal panels, glass, automobiles, and tires", said Ms. Naomi Nakamura.

Active Support for Promotion in China

To support partner companies and users, CLPA has acted globally, with offices in South Korea, Taiwan, United States, Germany, China, and Singapore (figure 2). CLPA is especially focused on promotion in China. "In China, a quality change in manufacturing is now beginning. Accompanied by this trend, the entire manufacturing industry is focusing on the automation technology in factories. We will expand the share of CC-Link in China to 20% or more in a few years, thanks to this opportunity", said Mr. Yoshiaki Nagashima.

Manufacturing in China used to mean simply assembling goods. However, more and more companies in China handle components or materials, not only assembly, which means that the spread of manufacturing is getting wider. On the other hand, this expansion of the market requires that manufacturing companies improve their productivity and especially the quality of their products. To deal with this movement, now more and more companies have an interest in advanced automation technology using

industrial open networks. In fact, FAW Car Co.,Ltd. (hereafter: FAW Car), the leading Chinese automobile manufacturer, has started trying to automate its factories using CC-Link first. (See the column on the next page.)

Strengthened Support for Product Suppliers

The slogan CLPA chose for its CC-Link and CC-Link IE promotion activity in China is "Gateway to China". "For the promotion of CC-Link and CC-Link IE, increased variety of CC-Link devices will be provided and services will also be strengthened in China. To do so, we will become a gateway for companies handling CC-Link-related business to enter the Chinese market. This is the concept of our slogan", said Ms. Nakamura.

CLPA offers two ways to support companies with CC-Link and CC-Link IE: market development and product development. For example, as support for market development, CLPA takes a leading role for the promotional activities of CC-Link-compatible products. "We place advertisements introducing CC-Link-compatible products to key industries in China and hold technical seminars to deliver information to users directly. We also provide free media, like webinars", said Mr. Nagashima. CLPA participated in the two big events for the flat panel display industry; "FPD International Taiwan 2012" held in Taipei on August 30, 2012 and "FPD International 2012 China/Beijing Summit", held at the China National Convention Center on September 18 and 19, 2012. "The flat panel display field is one of the most automated industries. In these international events, we promoted the advantages of CC-Link to key persons in the industry", said Mr. Nagashima.

As support for product development, CLPA distributes a development support kit containing the



Figure 2 : CLPA world branches

necessary parts for CC-Link device development. This kit enables a company to develop a CC-Link-compatible product easily. In addition, as another service, CLPA bears the cost for the conformance test of CC-Link. "In the near future, semiconductor manufacturers around the world will launch various chips, like ASSP (Application Specific Standard Product), which support CC-Link or CC-Link IE. This will make CC-Link-compatible product development even easier.

"We hope the device vendors will develop CC-Link-compatible products more easily by using the support from CLPA under the "Gateway to China" programme and will develop their business further in the significantly growing Chinese market", said Mr. Nagashima.

CC-Link is supported by many companies not only in Japan, but also in Asia. The standard itself has continued to develop. For example, "CC-Link IE" has been added to the family. This is the Ethernet-based specification which connects the information and production systems seamlessly. CC-Link and CC-Link IE will continue to attract further attention as a key technology providing effective solutions for enterprises which are seeking a way to reinforce their production systems for further growth.

Production systems are strengthened to respond to market diversification. "Keys of evolution are in the hands of automation technology"

China FAW (First Automobile Works) Corp. (hereafter: China FAW) is the biggest automobile manufacturer in China. FAW Car Co., Ltd. (hereafter: FAW Car), an affiliated company of China FAW, has been aggressively adopting an automated production system to achieve both high quality and high productivity. The company, employing what they claim is the world's highest level automated production system, has demonstrated a strong commitment to CC-Link. We interviewed Mr. Wang Yuchun, one of the executives in charge of the production system, to ask about CC-Link.

FAW Car is a wholly-owned subsidiary of China FAW. It was formed in 1997 and celebrated its 15th anniversary in 2012. Currently, FAW Car produces private-label automobiles including Hongqi (its flagship and the highest class model in China), Besturn, and Oley. In addition to these, FAW Car also manufactures the Mazda 6 and 8 as part of an alliance with Mazda. FAW Car currently operates three main production factories; the 1st factory, the 2nd factory, and the



Mr. Wang Yuchun
FAW Car Co., Ltd.
Deputy General Manager

Ms. Naomi Nakamura
CC-Link
Partner Association
Director

Hongqi-dedicated factory. Additionally, FAW Car plans to build a new factory, the 3rd factory.

The company is trying to establish a production system that can be flexibly adopted for a complex production plan while increasing its productivity and pursuing high quality. "Recently, the demand for automobiles in the Chinese market has kept increasing, and consumers' needs are getting more and more varied. Our aim is to respond to this situation," Mr. Wang said. He emphasizes that quality has the highest priority in the endeavour. "We pay attention to quality even when planning arrangements of equipment and staff at a factory startup. After production is started, we strictly manage our equipment, materials, components, and staff arrangements based on our quality control system," he continued. To deliver that, FAW Car has its own unique production system, the Hongqi Production System (HPS). HPS was developed independently by FAW Car incorporating concepts inspired by its partnerships with Toyota and Mazda.

"New Energy" & "Digitalization" in the new factory

Satisfying both high productivity and high quality is a great challenge in factories. To meet this challenge, automation technology plays a significant role. "Automated systems are important when a new factory is built. Therefore, we employ state-of-the-art

automated systems in our plants," said Mr. Wang. For example, 200 robots are used in the welding line of the 2nd factory, which started operation in 2010. According to him, a factory using so many robots in one process is rare in China. "Employing robots has reduced the number of staff on this process by half; however, the productivity has doubled. Reducing human operations has helped to reduce errors, which has in turn improved the quality", he said.

FAW Car will take a more advanced approach for the 3rd factory. "As we establish a new factory, we always set a theme and try to employ a new technology according to the theme to advance the whole concept of the factories. The theme for the 1st factory was "Standardized Factory", and the 2nd was "Automated Factory". For the 3rd factory we set two themes, which are "New Energy" and "Digitalized"." he said.

At the 1st factory, the operations and processes were standardized to improve the quality and productivity. The automated system employed in the 2nd factory was more advanced than in the 1st factory, improving productivity while maintaining quality. The new 3rd factory is positioned as a production base of environmentally-friendly automobiles, and energy saving is a key goal. Furthermore, FAW Car plans to computerize all the factories. "We will automate more processes using the latest technologies and, at the same time, enhance the linkage between the production equipment using network technologies. We expect this to improve the productivity and quality. Presently, we are discussing the details on how to realize these ideas. Furthermore, we will improve the information system so that the development and production departments can cooperate closely," Mr. Wang said. FAW Car will create an enhanced production system satisfying customers' needs while improving the production efficiency.

CC-Link contributes to "Digitization"

Mr. Wang says that industrial networks play important roles in advanced automation. "Our affiliates develop host information systems, and we have been



Inside the 2nd factory of FAW Car Co., Ltd., and installed CC-Link devices.

actively configuring an advanced industrial network system in cooperation with them."

According to him, the factories of FAW Car employ several industrial networks of which CC-Link is the most widely used (see below).

"We first brought in CC-Link in 2004. In all of the 1st, 2nd, and Hongqi-dedicated factories, CC-Link is playing an active role. We will adopt CC-Link in the new 3rd factory too."

Mr. Wang also says that the factories of FAW Car face many issues for automation, such as linkages between production lines and between machines. To solve those issues, FAW Car will widely adopt effective automation technologies such as CC-Link. "We will need to integrate the information system and the production system to streamline the production system further. We hope vendors will suggest solutions to establish such advanced systems. The Ethernet-based integrated network "CC-Link IE", which is introduced this time, is capable of transmitting large volumes of data at the high speed of 1Gbit/s. CC-Link IE will help us establish an advanced system. We expect that CC-Link IE will also contribute to improve the reliability of production systems," he said.

Reliability is important for industrial networks. New technology designed for integration with information systems looks promising

This is the second interview with FAW Car Co., Ltd., a leading Chinese automobile manufacturer. Ms. Naomi Nakamura, the global director of the CC-Link Partner Association (CLPA), interviewed Mr. Gang Chen, who is a manufacturing technology department researcher involved in production line design for FAW. Ms. Nakamura asked him about his thoughts on automation systems for factories and the reason why FAW had introduced the industrial network CC-Link as the base for their automation systems. Mr. Gang, who regards "reliability" as the most important factor for automation, said that he highly valued the basic design of CC-Link.

MS. Nakamura (hereafter: N) I understand FAW Car is one of the automobile manufacturers that has been aggressively automating its production lines?

Mr. Chen (hereafter: C) Sure, we are. We have been focusing on automation technologies since they are important to ensure both high quality and high productivity. I think our automation level is the highest in China. There are lots of automobile manufacturers in China, however, few of them have world-class

automation. Only a few companies such as FAW, Shanghai GM, and Guangzhou Honda have the system equivalent to those of the leading companies in the world, I think.

N Can you please tell me about the current automation situation at FAW Car?

C We have now three assembly factories; the 1st factory, the 2nd factory, and the factory dedicated to the highest-class model "Hongqi". We also have

an engine manufacturing factory and a transmission manufacturing factory. The automated production system in the 1st factory is no longer the state-of-the-art. However, we employed the latest automated system in the 2nd factory, which was built in 2010, and the Hongqi-dedicated factory. For instance, we use the world's latest manufacturing equipment in most of the main production processes. We are using 400 or more robots.

Most important point for selection, "Reliability"

N I have heard that some management issues about production bases are getting raised in China, such as increasing staff cost especially in urban areas. Do you think automation technologies are getting more important in solving these issues?

C Chinese automobile manufacturers face many problems, such as ensuring both productivity and quality while reducing production costs, as they expand their production volumes. Without automation technologies, those problems would not be solved. To solve the problems which are becoming ever more complicated, automobile manufacturers need to cooperate with solution vendors strategically.

I think industrial networks have much to contribute to develop automated systems. Various industrial network standards have already been established. As we create a system, we must consider which standard

we should select or which standards we should combine from them. We pay attention to five points when comparing standards, which are 1) reliability, 2) openness, 3) availability and usability, 4) high market share, and 5) initial cost.

N These five points are exactly what we emphasize when promoting CC-Link. We especially put a great value on "reliability". Specifically, the CC-Link Partner Association has worked to ensure the interoperability between devices of different vendors. For example, we have conducted strict conformance testing. Today more than 1200 CC-Link-compatible devices are on the market, and all of them have passed the strict conformance test which we administer. Therefore, devices of various manufacturers can work properly in any combination. I believe that these activities are important for users to establish a highly reliable system.

In fact, as a result of our activities, more and more companies have adopted CC-Link, especially in Asia. In Japan, CC-Link commands about 60% of the market for industrial networks. CC-Link commands nearly 50 % in South Korea and Taiwan.

C I agree that the technology of CC-Link is excellent. So far, we have adopted industrial networks of various standards, however, nowadays we are adopting CC-Link more widely.

N In what kind of processes is CC-Link used?

C In the 1st factory, for example, CC-Link is used in the welding line, all assembly and the conveyor system. Only a few processes, such as painting and pressing, use networks of other standards because of the specifications of the devices installed on the lines. Since the equipment in the painting and the pressing processes is imported mainly from Europe, we have adopted western industrial networks.

CC-Link contributes to "Informatization"

N CC-Link has evolved constantly and stably. For example, the Ethernet-based network "CC-Link IE", which was based on the technology of CC-Link, was launched in 2007. CC-Link IE can connect information systems and factory floors seamlessly, which helps optimize the whole production system. I would like to ask your opinion about such technologies.

C I think the Ethernet-based industrial network can handle a very large amount of information. This will be a help to computerize production systems. It is getting more complicated than ever to manage the production system recently. For example, to respond to consumers' diversifying needs, automobile manufacturers have developed more and more brands and models. This trend requires a production line to manufacture more varieties of models, and the amount of information the production system needs to handle keeps increasing. As this trend continues, the need for an industrial network capable of handling a large amount of information like CC-Link IE will increase.

N The CLPA willingly helps manufacture.



Ms. Naomi Nakamura
CC-Link Partner Association
Director



Mr. Chen Gang
FAW Car Co., Ltd.
Technical Advisor





The Chinese FPD Industry Continues to Grow. "CC-Link and CC-Link IE Will Meet The Challenge of Production Advancement"

For flat panel display (FPD) production, large-scale equipment and complex processes are required. Production lines for FPDs require the most advanced automation technology. How can automation technology including industrial open networks contribute to their advancement? Ms. Naomi Nakamura, the global director of the CC-Link Partner Association (CLPA), interviewed Mr. Xinqing Liang, the secretary general of China Optics and Optoelectronics Manufacturers Association LCD Branch, which is a business organization for development of the FPD industry in China, which has a strong large-scale FPD sector. Mr. Liang is also the vice chairman of BOE Technology Group which has led the LCD industry from the earliest days.

Ms. Nakamura (hereinafter: N) I would like to hear about the general condition of the FPD industry in China.

Mr. Liang (hereinafter: L) First, I am going to explain the history of the FPD industry in China. Starting from around 2003, Chinese companies entered the FPD industry with LCD panels. This was ten years after the entry of Japanese and Taiwanese companies.

BOE Technology Group (hereinafter: BOE), which I work for, was one of the earliest companies to enter the FPD industry in China. Originally, BOE produced CRTs (cathode ray tube). But we quickly took notice of the movement of the industry shifting from CRTs to FPDs, and entered the FPD industry in 2003 by buying Hyundai Display Technology, an LCD panel manufacturer in South Korea. At the beginning, the 3.5-generation glass substrates were used in production lines at BOE. Then BOE constructed new LCD panel factories for the 5th-generation glass substrates in Beijing in 2005. About that

time, Shanghai Electric Group Co., Ltd. and InfoVision Optoelectronics (Kunshan) Co., Ltd. also established their 5th-generation LCD panel factories. Hence this was the time when the Chinese FPD industry was getting established.

N The Chinese FPD industry is now such a large industry, isn't it?

L Yes, it is. Chinese central government and local governments regarded FPD as an important industry and have provided various supporting measures for FPD manufacturers. This is the reason why the FPD industry has grown greatly in the last decades. Now, there are 14 FPD production lines in China. In addition, six more are planned to be built. As of 2011, China contributes about 6% of the world's LCD production. However, with these new lines in operation, this will rise to about 20%.

Shifting to OLED displays changes production lines

N Various factors are related to the LCD market growth during recent decades, and

I think one factor is that the glass substrate size has been growing. That is, using the large glass substrates improved productivity and reduced production costs, which lead to expansion of the LCD market. Corresponding to this trend, large production equipment started to be used and production processes became more complex. Then even some production control problems emerged. To solve such problems, CC-Link technology contributes in various ways. However, this trend seems to have changed a bit lately, Mr. Liang?

L As you pointed out, the technology to produce large glass substrates has given LCD panel manufacturers competitive strength. However, this trend is changing lately because producing the larger size of glass substrates does not always result in production cost reduction.

On the other hand, the Chinese FPD industry will take a new step, a shift to the OLED display field. Although most OLED displays in the current market are small or medium size, in the near future, large OLED



Mr. Xinqing Liang
China Optics and Optoelectronics
Manufacturers Association LCD Branch
Secretary General

displays will be produced and used for television receivers. Accompanying this trend, the mainstream of FPDs may be changed from LCD to OLED displays.

Actually, some parts of an LCD production facility can also be used for OLED display production. In other words, by replacing some equipment of the LCD production facility and changing the layout of the production line, OLED display production facilities can be set up. In the near future, this trend of production facility shift to OLED displays will be remarkable.

Many of the large FPD manufacturers have employed CC-Link

N I expect that CC-Link will have a greater opportunity to be used when many manufacturers shift their production facilities to OLED display production. CC-Link technology has been already used by many FPD manufacturers. In fact, I heard that CC-Link was used in 80% of the factories of the world's five main FPD manufacturers. I also heard that CC-Link was used in the factories of large FPD manufacturers which already started OLED display production.

CC-Link, which was born in Japan, has gained a large market share in Asia, especially in Japan, Taiwan, and South Korea, the capitals of the FPD industry. One of the reasons for the large market share in

Asia is that the world-famous FPD machine manufacturers located their factories in Japan, where CC-Link was born. After those machine manufacturers had adopted CC-Link, the FPD manufacturers also started using CC-Link. That is why CC-Link is now widely used in Asia.

L What would you say is the reason those machine manufacturers started using CC-Link?

N I believe that it is because such manufacturers valued the high reliability of CC-Link. For example, in a network where CC-Link is used, various information can be transmitted together with control data, but control performance does not change depending on an increase or decrease of data quantity to be transmitted. This is an important point for FPD production systems which require advanced control accuracy to transmit a large amount of information such as recipe data.

CC-Link is an open standard, and thus any vendor can provide products which are CC-Link compatible. Any of those CC-Link-compatible products helps users to build a stable network because the quality of the CC-Link-compatible products is controlled strictly by CLPA, the association to promote CC-Link. I believe that this is also valued by those manufacturers.

Introduction of "CC-Link IE" – 1Gbps communication speed

L As I mentioned before, I expect that some LCD manufacturers will replace their existing production lines with OLED display production lines. Would you think it is possible to introduce CC-Link technology into their facilities at the timing of the renovation?

N Of course. I think that many manufacturers will desire to improve productivity during the renovation. I recommend for those companies to use CC-Link IE, which uses the physical layer of Gigabit Ethernet. Once production processes are highly developed,

information quantity on the network will greatly increase. CC-Link IE enables data transmission at the high speed of 1Gbps. No other industrial network standard but CC-Link IE has achieved data transmission at such a high speed so far. Actually, this specification was developed based on the demand from the LCD industry.

L To produce high-quality FPD panels, an extremely clean environment where no human work is involved is required as much as possible. That is why the FPD industry is one of the industries which especially require automation technology. As FPDs and their accompanying production technology continue to advance, the demands for automation technology will grow more and more. I would like to ask CLPA, through promoting CC-Link technology, to improve the technology to meet such demands.

N I promise that we, CLPA, will definitely respond expectations from the Chinese FPD industry. The Chinese market is important to promote the CC-Link Family, such as CC-Link and CC-Link IE. Our "Gateway to China" programme was created to accelerate the promotion of the CC-Link Family in China, and supports companies whose business is related to CC-Link to enter the Chinese market. I believe that the CC-Link Family will be more and more used in China as a result of this activity. Thank you so much for today's interview.



Ms. Naomi Nakamura
Global Director
CC-Link Partner Association

CC-Link and CC-Link IE were the Hot Topics at the FPD International Event Attendees Saw Technology and Application Examples from the Latest Factories

FPD International China 2012/Beijing Summit, for the flat panel display industry, was held at the China National Convention Center, in Beijing, China on September 18 and 19, 2012. The "Intelligent Fab" technical session saw participation by the CC-Link Partner Association (CLPA), which promotes the CC-Link and CC-Link IE open network, Mitsubishi Electric, key Japanese machine manufacturers and Chinese major FPD panel manufacturers who actually use CC-Link.

FPD International China 2012/Beijing Summit is an event which has been held three times since 2010, with the aim of international exchange between companies and research institutes in the FPD industry. This event is organized by the China Optics and Optoelectronics Manufacturers Association LCD Branch, which is a business organization for FPD industry development, and Nikkei Business Publications, Inc. The event is one of a few FPD-related events held in China and many key persons in the FPD industry participate in it from Japan and other countries. A large number of visitors attend every year and the number has been steadily increasing.

The event is composed of speeches and exhibitions. Many key persons from the companies who play an active role in the FPD industry and from the Chinese

government made speeches about industry trends and the latest technology related to the FPD industry. The adjacent exhibition featured vendors of FPD manufacturing machines and of related materials and companies providing FA-related devices which are necessary for FPD factories.

Various speeches featuring the latest technology

In the keynote speeches on the first day, executives from many organizations, including the Chinese government, industry groups, panel manufacturers, and global equipment and material manufacturers, made speeches. The technical sessions were held on the second day in two meeting rooms, divided into three tracks. One of the tracks was "Intelligent Fab". The main topic of the track was automation technology, for FPD factories. The other tracks were "FPD Manufacturing" with the theme of process technology for manufacturing FPDs and "Touch Panel/OLED", with the theme of the latest technologies for FPDs intended for mobile devices.

Since automation

technology plays an important role in FPD industry development, automation technology for factories featured in the technical sessions of FPD International China 2012/Beijing Summit. In recent years, manufacturing facilities for FPDs are growing larger and larger because of the increasing size of the glass substrates and their effect on improving production efficiency. On the other hand, the manufacturing process is getting more complicated in order to pursue high functionality and high FPD performance. Progress in automation technology is necessary in order to keep high productivity and achieving the targets of both "larger facilities" and "complex processes".

In this track, speeches were made by the Instrumentation Technology and Economy Institute (ITEI), a research institute related to industrial automation, Mitsubishi Electric, CLPA, Beijing BOE Display Technology, a major FPD manufacturer in China, Canon Tokki, a major FPD machine manufacturer, and S.Y. Technology, Engineering and Construction, a major engineering company in China. Mitsubishi Electric described solutions based on CC-Link for factory efficiency. CLPA explained its recent activities and benefits that the CC-Link technology provides for the FPD industry. Finally, Beijing BOE Display Technology and Canon Tokki described actual CC-Link applications.



Keynote speech in FPD International China 2012/Beijing Summit

New FA Concept for TCO Reduction Introduced "CC-Link/CC-Link IE" Reinforces Linkage between Information Systems and Production Sites

Mitsubishi Electric described a new FA system concept "e&eco-F@ctory" in the technical sessions of FPD International China 2012/Beijing Summit. The goal of e&eco-F@ctory is an effective production system which is established by building a system with seamless horizontal and vertical linkages. These allow coverage of an entire factory, as well as connection of production sites to information systems. The enabling technologies for the concept are the industrial open networks "CC-Link" and "CC-Link IE".

Mr. Hideaki Morita, Senior Manager of Mitsubishi's FA System Department, gave the overview of the concept. He began by briefly introducing the position of Mitsubishi Electric in the FA (factory automation) field. Mitsubishi Electric has wide business interests - from private businesses to the space industry. Among the various business fields, Mitsubishi Electric has an especially strong presence in the FA field. "Mitsubishi Electric's FA-related products are highly valued, and command 15% of the world market", he said.

Another important role of Mitsubishi Electric in the FA field is as a leading developer of CC-Link and CC-Link IE, which are global standards for industrial open networks. "Among many standards for industrial open networks, CC-Link has a high market share, especially in Asia. This success is being continued by CC-Link IE, which uses the physical layer of Gigabit Ethernet", he continued.



Exhibition booth of Mitsubishi Electric

Solving both "company" and "social" problems

Mitsubishi Electric's "e&eco-F@ctory", is a new-generation FA system concept that is supported by their various FA devices and the technology of CC-Link and CC-Link IE. Mr. Morita reviewed factory problems to provide a background for the invention of e&eco-F@ctory. "Factory problems can be divided into two types. One is the problem of "factories as companies". This is mainly about improvement of "production value", such as productivity, quality and agility. The other is the problem of "factories as society". This problem is about "symbiosis with the environment and society", such as energy saving, reducing the environmental burden, and ensuring traceability. e&eco-F@ctory provides solutions for these two problems simultaneously", he said. In addition, he emphasized that the FA system based on e&eco-F@ctory also contributed to a reduction of TCO (total cost of ownership) in factories.

The basic idea of e&eco-F@ctory is to establish the "vertical (production sites and host system)" linkage and the "horizontal (equipment in factories)" linkage in the relationship between factories and information systems. This can achieve an efficient information environment where the data of production sites can be collected and analyzed promptly and easily. For creation of such an environment, information-related devices and FA



Mr. Hideaki Morita
Mitsubishi Electric
FA System Department
Senior Manager

products produced by Mitsubishi Electric are available.

MES interface modules and high speed data logger modules, for example, are necessary to establish the "vertical linkage". "Conventionally, to connect the host information system and the FA system, gateway computers were used. Replacing them with our MES interface modules can reduce 70% of the cost for the system construction", he commented.

Various controllers, HMIs, engineering software, and networks using CC-Link and CC-Link IE technologies provided by Mitsubishi Electric can contribute to establishing the "horizontal linkage". "The network especially plays an essential role. It is like the nervous system of e&eco-F@ctory. CC-Link or CC-Link IE can connect an information system, factory controllers and devices, and sensors for monitoring the production process seamlessly to establish an optimal network according to the purpose or the application", he concluded.

Products and solutions related to e&eco-F@ctory were introduced at the booth of Mitsubishi Electric, which was further supported by the speeches.

CC-Link Continues to Grow from its Stronghold in Asia CLPA Showed its Superiority in the FPD industry

CC-Link Partner Association (CLPA), a supporter of the "FPD International China 2012/Beijing Summit" technical sessions, gave an overview of CC-Link and CC-Link IE promotional activities, its recent activities to extend applications of the standard and also explained the key points of the technology. CLPA showed that CC-Link technology, originally from Japan, has been widely adopted in many flat panel display (FPD) factories throughout Asia.

CLPA was represented by Ms. Naomi Nakamura, global director of CLPA, and Mr. Chen Jie, of CLPA-China. Ms. Nakamura first introduced an overview of the CC-Link family of technologies. Several protocols are available, such as the "CC-Link" fieldbus, "CC-Link Safety" fieldbus, and "CC-Link/LT" bit level fieldbus, as well as the "CC-Link IE Control" and "CC-Link IE Field" Gigabit Ethernet versions. Said Ms. Nakamura, "Every protocol can be used to establish seamless communication with the others by using a concept called SLMP (Seamless Messaging Protocol). In other words, a seamless network that connects the whole factory including devices and information systems can be established."

Following the overview, Ms. Nakamura talked about CLPA's activities and the spread of the CC-Link family of technologies. CLPA is running its business globally with eight branches: Japan, Europe, North America, China, South Korea,

Taiwan, Singapore, and newly added India. "As of September 2012, 1742 companies have joined us as CLPA partners, and we are the world's largest industrial open network standard association", she commented. As of September 2012, the number of CC-Link-compatible products is 1253.

In addition, CC-Link has obtained the dominant market share in the FPD industry, which was the target of this event. "CC-Link is employed by 80% of the factories of panel manufacturers in the world. Most of the manufacturers of OLED displays, whose market is expected to expand as a next-generation FPD, have also employed CC-Link", she concluded.

Explanation of key points of CC-Link

Mr. Chen followed Ms. Nakamura, to explain problems related to automation of FPD production lines and solutions provided by the technical features of CC-

Link and CC-Link IE. A key issue is the need for a communication network in which multiple large manufacturing machines operating independently can collaborate with each other in a highly precise way. "For CC-Link and CC-Link IE, a real time peer-to-peer network can be established by multiple controllers



Ms. Naomi Nakamura
Global Director
of CC-Link Partner Association

sharing a common virtual memory", he said. He continued, "The technology is also suitable for building a network in a manufacturing machine. In large FPD manufacturing machines, a network which integrates and controls internal sensors and actuators is now indispensable. Further, the network shared memory technology makes creating control programs easy.", he concluded.

Another significant problem he pointed out is the need for a mechanism to send large amounts of transient (asynchronous) data generated by production lines to upper level information systems. "In FPD manufacturing lines, the linkage with the information system that controls production, product quality, and energy is becoming more important than ever", he said. To respond to this demand, CC-Link IE, which has a high-speed data transmission speed of 1Gbps, has a function that divides the transmission band between cyclic communication for control and transient communication for production control. Features like these are highly suited to the FPD manufacturing process, meaning CC-Link IE will become stronger and stronger in the FPD industry, following the success of its predecessor, CC-Link.



Exhibition booth of CLPA

BOE Presented Application Examples of CC-Link IE in LCD Factories Removing Manual Processes at BOE Has Resulted in Higher Quality and Efficiency

Mr. Xiaogang Liu from Beijing BOE Display Technology Co., Ltd. (BOE), a large LCD panel manufacturer in China, made a speech in the technical sessions of "FPD International China 2012/Beijing Summit". Mr. Liu presented application examples of CC-Link IE, an industrial open network which uses the physical layer of Gigabit Ethernet. Mr. Liu regards automation as necessary to pursue quality improvement and high efficiency of production lines. He explained the benefits of CC-Link IE based on actual examples and also showed a next-generation system idea using CC-Link IE.



Mr. Liu Xiaogang
Beijing BOE Display Technology
Co., Ltd.
Engineer

Mr. Liu is an engineer involved in the development of automation systems at BOE. He began by talking about the purpose of production line automation by showing LCD production lines. First, he pointed out the problems of insufficient automation. In this case, manual processes are required for production process operation, for production condition monitoring, for data recording and for product testing. In some LCD factories where a large-scale production facility is used, the length of a line may exceed 100m. To operate such a line manually, large numbers of staff would be required. "To maintain the production capacity and the production quality, performance of all staff involved in the production must be tightly controlled. But this is not easy", he said.

Furthermore, in a large factory such as an LCD plant, when some problem occurs in a production line, an attempt by field staff to solve the problem may need much time, decreasing production efficiency significantly. "If they cannot solve a problem, specialized engineers need to quickly respond, which takes additional time", he continued.

The purpose of production line automation was to solve this problem and to achieve both high quality and high efficiency, he said. "If we construct a mechanism to collect vast numbers of data using various FA devices and networks or to monitor the conditions of production

lines in real time, we can control the whole production line with only one personal computer", he said.

BOE promotes automation with a ring network

Based on this idea, BOE aggressively promotes automation at their LCD factories. The network system which BOE has employed as the base of their automation system is CC-Link IE. CC-Link IE networks include various connection types; "line" in which devices are connected to a controller in series, "star" in which devices are connected to a controller radially, "ring" in which devices are connected to a controller in a ring pattern, and finally a combination of these types.

BOE uses the ring-type network for its factories. "We divide the hierarchy into three; the field layer involved in the I/O control and the motion control, the controller layer connecting controllers, and the information system handling the ERP (enterprise resource planning) system and MES (manufacturing execution system) to build a system", he said. BOE has established a mechanism for monitoring the operation status of many devices forming the large-scale production system with only one personal computer by using this system.

BOE intends to introduce a video monitoring system

After introducing the overview of the

automation system, Mr. Liu talked about some benefits of CC-Link IE from the user's view point. One of the benefits is that CC-Link IE ensures device compatibility, thus a failed device can be replaced easily. As another benefit, CC-Link IE supports optical communication to transmit data at high speed. Thus, a real-time monitoring system can be constructed. Mr. Liu also added two more points. Firstly, CC-Link IE can provide flexibility for system design because it can establish various different networks. Secondly, with CC-Link IE, an FA system having high compatibility with an information system can be built because it uses the same physical layer as Ethernet, already widely used for information networks.

Lastly, he presented a personal vision of an automation system for which a video monitoring system is used. His idea is to send video of production lines and devices recorded by CCD cameras to a monitoring center via an automation network by using CC-Link IE's capability of transmitting data at the high speed of 1Gbps. "If this idea comes true, staff would not have to walk around in the vast area of the factory," he concluded.

Biggest OLED Display Machine Manufacturer Uses CC-Link for Streamlining its Large-Scale Systems

Canon Tokki Corporation (Canon Tokki), which provides an integrated manufacturing system for OLED displays, has employed CC-Link for its entire system control network. Mr. Sanno Tajima, from the design department of Canon Tokki, talked about the merits of CC-Link for the design of manufacturing systems in the technical session "Application Example: CC-Link for OLED Equipment" at the "FPD International China 2012/Beijing Summit". According to him, CC-Link has been significantly effective for streamlining OLED display manufacturing systems that have been growing in size corresponding to the increasing size of the glass substrates.

OLED displays, which have great display performance and energy saving characteristics, are expected to be used as the next-generation flat panel displays and as an alternative to LCDs in the future. Medium- and small-size OLED displays have already been employed for smartphones and mobile phones and will also be used for large-screen televisions. Canon Tokki is known as the biggest manufacturer of OLED display manufacturing machines. "Canon Tokki dominates the market of OLED display manufacturing machines", said Mr. Tajima.

Canon Tokki launched the first integrated manufacturing system in the industry

At the beginning of the speech, Mr. Tajima introduced the activities of Canon Tokki for OLED display manufacturing machines by reviewing the company history. Canon Tokki was established as Tsugami Specialty Machine in 1967, and began selling machine tools and automation systems. Tsugami Specialty Machine advanced into the FA system field, the robot field, and the vacuum thin-film deposition system field by purchasing affiliated companies. In 1986, Tsugami Specialty Machine merged with several affiliated companies to form the new company Tokki Corporation, Ltd. Canon Tokki completed developing its experi-

mental equipment for manufacturing OLED displays in 1993.

In 1999, Canon Tokki developed and started selling the industry leading "ELVESS" system (organic EL vacuum evaporation and sealing), a mass production OLED display manufacturing system. ELVESS is a fully-automated integrated manufacturing system to manufacture OLED displays without human intervention by evaporating thin films, such as organic EL materials, onto glass substrates in a vacuum and encapsulating them. Canon Tokki now offers three systems; ELVESS OLED Display Mass Production System (for mass production), Small-ELVESS Pilot Production System (for prototypes and small- to medium-volume production), and Try-ELVESS R&D System (for prototypes). Canon Tokki has employed CC-Link to build the control network for the integrated control of a lot of mechanical and processing systems incorporated in these lines. "In one system, including transportation systems and process systems, about 300 nodes are connected to CC-Link", he commented.

Control of equipment exceeding 70m in length

The fully automated manufacturing system provided by Canon Tokki is growing in size according to the expansion



Mr. Miyuki Tajima
CANON TOKKI CORPORATION
Design Division
Sales & Technology
Development Center
Senior Manager

of applications for OLED displays. This aims to meet need for large screens and improvement of production efficiency by making the size of glass substrates larger as well as LCDs. "A system for the major glass substrates, the 5th- to 6th-generation type, needs 50 to 80 chambers. The overall length of the system is 70 to 80m", he noted.

He also noted that one of CC-Link's key benefits is to reduce system wiring. "To transport a large system, it must be divided into several parts. By reducing wiring, we reduced the time for dividing and connecting the system drastically", he said. Specifically, the number of I/O devices to be connected was reduced from about 5000 to 50 by CC-Link. The time needed for dividing and connecting the system was reduced from 14 to 5 days. By the automatic check function of CC-Link, the time for checking the connection status at system rebuild was reduced. A final benefit was the various CC-Link-compatible modules, enabling the construction of flexible control systems.

CC-Link Partner Association (CLPA) Joins FPD Technology Seminar in Taiwan, Addresses Attendees on the Theme of Manufacturing Technology Evolution

The flat panel display technology seminar "FPD International Taiwan 2012" was held at Taipei World Trade Center Nangang Exhibition Hall in Taipei City on August 30, 2012. Co-sponsors were the Taiwan Display Union Association (TDUA), Nikkei Business Publications, Inc. (Nikkei BP), and CC-Link Partner Association (CLPA), an association promoting the industrial open network "CC-Link". The CLPA made a speech about "The evolution of manufacturing technology".

FPD International Taiwan 2012 was held for the first time by TDUA as part of its efforts to assist the Taiwanese FPD industry in gaining a foothold in markets abroad. The event was also supported by Nikkei BP, which has held specialized exhibitions for the FPD industry since the 1990s in Japan. The morning program was devoted to keynote speeches, while in the afternoon two tracks of technical sessions were held separately at each site. One track concerned touch panels, while the other track was divided between "Liquid crystal/Organic EL" and "The evolution of manufacturing technology".

Key industry figures gave keynote speeches. They included: Mr. Paul S.L. Peng, chief director of TDUA, Mr. Xinqing Liang, secretary general of China Optics and Optoelectronics Manufacturers Association LCD Branch, Mr. Shuji Ariga, chief business officer of Japan Display Inc., Mr. Bo Lianming, executive director and COO of TCL Corporation, Mr. Fred Hsieh, AU Optronics VP & GM of Touch Solutions Business Group in Taiwan, Mr. James Yang, director of association of Chimei Innolux Corporation in Taiwan and Mr. Alan T. Eusden, chairman and the president of Corning Display Technologies Taiwan Co., Ltd.

In the touch panel technical sessions, Touchpanel Laboratories, Dow Corning (which handles the surface treatment technology), equipment manufacturer



Ms. Naomi Nakamura
Global Director
of CC-Link Partner
Association

FUK, automation technology provider Siemens Limited Taiwan, coating device manufacturer Applied Materials and Tech & Biz Inc. appeared. In the "Liquid crystal/Organic EL" session, Sony Corporation, Panasonic Liquid Crystal Display Co., Ltd., AU Optronics Corp. (AUO), and First O-Lite Inc., made speeches.

Ms. Naomi Nakamura and Mr. Kazuhiro Kusunoki of the CLPA, the association for promotion of the industrial open network "CC-Link", made speeches in the program "The evolution of manufacturing technology" in the latter half of this session. In the same program, Mr. T.K. Cheng, the president of Unicom System Eng. Corp. in Taiwan, which develops automation systems for factories, also made a speech.

Ms. Nakamura, the global director of CLPA, explained how the activities of the CLPA had resulted in a large Asian market share for CC-Link. She also explained how CC-Link and CC-Link IE had achieved a majority position in the production lines of



Mr. Kazuhiro Kusunoki
Technical Task
Force Chair Person
of CC-Link Partner
Association

the major manufacturers of LCDs from South Korea and Taiwan, and of OLED displays from South Korea. Ms. Nakamura emphasized that CC-Link and CC-Link IE had gained the leading position in the industry.

Appearing after her, Mr. Kazuhiro Kusunoki, the technical task force chair person of CLPA, explained the important points of CC-Link technology. In his speech, he explained the requirements for FPD production systems in detail and showed how CC-Link technology could satisfy these requirements. He also gave some sample system configurations.

After Mr. Kusunoki's speech, Mr. T.K.Cheng, from Unicom System Eng. Corp., described the trend towards automation in FPD production lines, looking back on the history of progress in the Taiwanese FPD industry. Furthermore, he introduced the examples of how industrial network systems conforming to the CC-Link standard are utilized in actual applications.



CLPA Office Locations

CLPA - Japan (Head Office)

6F Ozone-front Building,
3-15-58, Ozone, Kita-ku,
Nagoya 462-0825, Japan
Phone: +81-52-919-1588 Fax: +81-52-916-8655
E-mail: info@cc-link.org
URL: <http://www.cc-link.org>

CLPA - Americas

500 Corporate Woods Parkway,
Vernon Hills, IL, 60061, U.S.A.
Phone: +1-847-478-2341 Fax: +1-847-876-6611
E-mail: info@cclinkamerica.org
URL: <http://www.cclinkamerica.org>

CLPA - Europe (Germany)

Postfach 10 12 17
40832 Ratingen Germany
Phone: +49-2102-486-1750 Fax: +49-2102-486-1751
E-mail: partners@clpa-europe.com
URL: <http://www.clpa-europe.com>

CLPA - Europe (U.K. Office)

Travellers Lane, Hatfield, Hertfordshire, AL10 8XB U.K.
(P.O. Box 50, Hatfield, AL10 8XB U.K.)
Phone: +44-1707-278953 Fax: +44-1707-282873
E-mail: partners@clpa-europe.com
URL: <http://www.clpa-europe.com>

CLPA - Korea

2F, 1480-6, Gayang-Dong,
Gangseo-Gu, Seoul, 157-202, Korea
Phone: +82-2-3663-6178 Fax: +82-2-3663-0475
E-mail: clpakor@meak.co.kr
URL: <http://www.cc-link.or.kr/>

CLPA - China

Headquarters (Tongji University) :
School of Electronics and Information Engineering,
Jiading Campus, Tongji University, Shanghai, P.R.China
Head Office: 4F, Intelligence Fortune Leisure Plaza, No.80 Xin Chang
Road,
Huang Pu district, Shanghai, P.R.China
Phone: +86-21-64940523 Fax: +86-21-64940525
E-mail: mail1@cc-link.org.cn
URL: <http://www.cc-link.org.cn/>

CLPA - Taiwan

6th Fl, No.105, Wu Kung 3rd. Rd., Wu-Ku Hsiang, Taipei, Taiwan
Phone: +886-2-8990-1573 Fax: +886-2-8990-1572
E-mail: cclink01@ms63.hinet.net
URL: <http://www.cc-link.org.tw/>

CLPC - ASEAN (Singapore)

307 Alexandra Road #05-01/02,
Mitsubishi Electric Bldg., Singapore 159943
Phone: +656-470-2480 Fax: +656-476-7439
E-mail: cclink@asia.meap.com

CLPC - India

2nd Floor, Tower A & B, Cyber Greens, DLF Cyber City,
DLF Phase-III, Gurgaon-122002 Haryana, India
Phone: +91-124-4630300
E-mail: clpa@mei-india.com