

MyAdvantech

The Magazine for Global Advantechers and Partners

Spring 2017 No.20

Putting Intelligent
Manufacturing into Practice:

Big Steps into Industry 4.0

Accelerating Industry 4.0 - Singapore in the Fast Lane
Creating Smart Factories Through Equipment Networking
Increasing the Efficiency of Information Management with
Seamless Data Integration

World's Fastest Storage Server Has Arrived





■ Power Insight

Accelerating Industry 4.0 -
Singapore in the Fast Lane



■ HBR Select

9 Sustainable Business Stories
that Shaped 2016



■ Technology Forum

World's Fastest Storage Server
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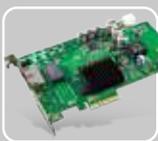
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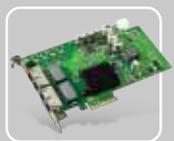
PCIE-1172
2-port PCI Express
Intelligent GigE Vision
Frame Grabber



PCIE-1174
4-port PCI Express
Intelligent GigE Vision
Frame Grabber



PCIE-1672E
2-port PCI Express
GigE Vision Frame
Grabber



PCIE-1674E
4-port PCI Express
GigE Vision Frame
Grabber

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Industry 4.0 – Past, Present, and Future

Making smart cities and factories a reality is bringing about a transformation in our work and lives.

Over the past few decades, the Internet and the WWW have become the dominant communication and content delivery channels for most people. This major transformation has also had a huge impact on industry with the Internet of things (IoT) increasingly influencing decisions for investment in factories and in smart city infrastructures. IoT's network of machines, devices, and "things" has opened up new opportunities for cross-industry platform and application development. This new application space is where all kinds of technologies are consolidating and proliferating into what we now know as Industry 4.0, which is often termed as the forth industrial revolution.

Industry 4.0 and current automation manufacturing processes are quite different in terms of technology consolidation. Current manufacturing equipment and data are stand alone and independent, meaning machines run and operate individually on dedicated processes and data is manually input into the system. But Industry 4.0 consolidation allows different machines, equipment, and devices to communicate with each other independent of human operators, with data being processed and analyzed from a central control hub so management decisions can be directed in a much more considered and targeted way. And with all equipment mutually communicating and sharing data, the manufacturing process can be more nimble and flexible.

The exponential growth of manufacturing in China, combined with the increased cost of raw materials and labor saving automated processes, means many industries around the world are feeling under pressure and that has created a more challenging manufacturing environment. Industry 4.0 promises smarter manufacturing, which means taking advantage of advanced computing and manufacturing technologies for increased production efficiency and flexibility. And as the development of sensing, data acquisition, and wireless communication technology evolves, more and more Industry 4.0 practices will become a reality.

Implementing a smart Industry 4.0 strategy that addresses the needs of a dynamic and global market will be the subject of this month's MyAdvantech magazine. From intelligent sensing, to seamless data transmission from edge devices and cloud-based management systems, our Linkou campus was designed as a living demonstration and future insight to Industry 4.0. We will be looking at green transportation and smart parking solutions, and software and hardware platforms such as Advantech's WebAccess IoT application software, as well as and the world's fastest storage servers. A new era of smart manufacturing has arrived as we work towards an Industry 4.0 transformation. ■



KRTC Multi-Card Pass for MRT and Carbon-Free CityBike Creates Green Transport Solution

By Yu Hsiao Ching with images provided by Kaohsiung Rapid Transit Corporation
Interview with Kuo Yao-Lin, Manager of Public Bicycle Department, Transportation Affairs Bureau, KRTC

Using Advantech's professional services and products, KRTC Taiwan provided Kaohsiung and Pingtung with low-carbon and carbon-free services for public transportation. Both parties will continue cooperation to promote green transportation systems in other cities and counties.

In order to create a low-carbon city environment, the Kaohsiung city government in southern Taiwan proactively developed an integrated transportation service to alleviate traffic with the launch of two new MRT lines which were officially opened in 2008. Recently, the establishment of a multi-card pass system was completed to allow users to access the MRT with electronic ticketing using either iPASS, EasyCard (Metro Taipei), icash issued by icash Co., Ltd., or HappyCash of Yuan Hsin Digital Payment Co., Ltd. Back in 2009, the city established a public bicycle rental system (CityBike) in the hope that people might forgo the use of petrol-based vehicles and use carbon-free bicycles for short-distance journeys to promote energy saving and reduce carbon emissions and pollution.

Kaohsiung Rapid Transit Corporation (KRTC) who

handles government projects was originally a private enterprise established for the purpose of constructing and operating the MRT system in Kaohsiung. The company has now transformed into a diversified organization and they successively took over the operation, administration and maintenance of Kaohsiung's Circular Light Rail, City Public Bicycle Rental System, as well as the establishment and operation of Pingtung's City Public Bicycle Rental System. Kuo Yao-Lin, manager of the Transportation Affairs Bureau said, "The design and development of the public bicycle rental system, integration of software and hardware, and system administration, are all handled by KRTC. We aim to follow the city government's year-by-year planning and establish rental stations everywhere." So far, the accumulated bike usage of CityBike Kaohsiung has exceeded 10 million rides since KRTC took over.

And, the accumulated reduction of carbon emissions has broken through the 8,000 ton milestone. As a result, rental stations around the city will increase from 185 at present to 300 in June 2017.

Advantech's professional services

Whether it's the MRT auto ticket-checking and auto ticket-vending machines, or the central console of the bicycle rental systems, KRTC adopted industrial control PCs and embedded PCs (Box PC) from Advantech including products lines such as IPC, ITA and ARK series as central hubs for system control. Kuo Yao-Lin said, "To ensure stability, every system developed by KRTC should uniformly adopt products from well established brands. In the past, we often saw that as soon as the warranty period of some products expired, the maintenance service vanished with it. So we decided to choose leading manufacturers from Taiwan Advantech in particular." Furthermore he said, "The cooperation between KRTC and Advantech started early on before the completion of the MRT from MRT gates to ticket vending machines and other equipment. Throughout these years, our departments always had high praise for Advantech's technical strengths and professional services whenever internal evaluations were conducted. As a result, we considered Advantech a premier partner when we took over the operation of Kaohsiung's Bicycle Rental System. During the period of construction, Advantech not only provided sample models for trial tests by KRTC, but they offered three phases of service according to the severity of the problem. First, phone calls were made to initially understand the issues. Then, problematic or inappropriate products would be replaced immediately. And lastly, repetitive problems would be quickly sorted out during the internal revision of products." Kuo Yao-Lin further indicated that, "When KRTC had questions about products from our suppliers; some of them simply threw back the questions to us. But Advantech not only confronted the problems, they actively dealt with them without constantly asking us questions. So you see, the most eligible solutions can be found quickly if we develop close interaction between parties."

Customized rugged PCs meet critical requirements

Kaohsiung MRT is a public service so extreme product reliability is essential. Take Kaohsiung Bicycle Rental System for example, the internal temperature of the cabinets covering the outdoor central consoles can easily

reach up to 50-60 °C after being exposed to sunlight all day. And the dew formed during early mornings when temperatures decline can also cause damage to electronic components or PCBs. So Advantech developed the ARK series fanless embedded PC with a wide temperature range, moisture-proof components, and shock resistance features to meet those critical environments where 24-hr non-stop operation is required. The operation of the entire system was dependent upon an automatic bicycle unlock module activated via an ARK embedded box PC, and connected to a multi-card swipe module via Ethernet LAN. When a customer wants to rent a bicycle they swipe their card and the information from different types of card will be transmitted to an administration center via 3G module for verification and processing. Upon completion, the message is instantaneously returned to the console to unlock the bicycle. This fast and convenient rental process can be done in only a few seconds. Due to the success of this public bicycle rental project, Advantech were also asked to provide the government with additional products that complied with strict governmental specifications including ARK-2121L, ARK-2120F, and ARK-2230L. Advantech provided customized images and the OS were optimized by getting rid of unnecessary portions of Windows Embedded to accelerate startup and improve system stability. Kuo Yao-Lin emphasized, "All systems designed by KRTC were customized on demand. Products from Advantech were customized and adjusted in every aspect from processors, memory, heat resistance, and more. The hardware has been very stable with 99.99% reliability and so far, backed up by Advantech's professional services, we are very satisfied with Advantech's contribution."

Future cooperation on transportation projects

With the aim of long-term economic development, in parallel with reductions in air pollution and traffic congestion, many governments have started to promote low-carbon or carbon-free solutions in an attempt to change commuting habits and improve air quality. KRTC now actively promotes green transportation services to other cities and counties. Kuo Yao-Lin said, "We are negotiating on major projects with public bureaus in large industrial parks, and although the news cannot be told in advance, Advantech will be our priority choice of partner for future projects with KRTC." ■

Accelerating Industry 4.0 - Singapore in the Fast Lane

By Mr. Oliver Tian, President, Singapore Industrial Automation Association (SIAA)

Industry 4.0 is an opportunity, but also a challenge for global manufacturing. As the Singapore manufacturing sector continues to face the global economic headwinds of labor shortages and high production costs, SIAA believes that there is utmost urgency for Singapore manufacturing to move towards Industry 4.0. The emerging concept of production without mass demand will require technology that is ready to go the extra mile in tackling constraints and creating new opportunities for innovation in production and business models.

I would estimate that some of the manufacturing companies and service-related businesses in Singapore have already embarked on the journey to Industry 4.0. They are leveraging technologies such as statistical process control for production lines, which involves big data and analytics; augmented reality for smart retail; additive manufacturing for bio medical; and 3D printing in medical science. This would also include autonomous robots—for example, Automated Guided Vehicles (AGVs) in manufacturing and in-hospital robots that are used for medicine dispensing, dispatching of medical supplies, and even catering food for patients.

Industry 4.0 has also spearheaded innovation within the industrial Internet of Things, involving driver-less vehicles, smart transportation systems, flight and logistics simulations and training, and cloud- as well as cyber security. Singapore companies can gain a competitive advantage when they adopt Industry 4.0, as companies can leverage technologies to create innovative products and services that fit well in an innovation-driven economy.

As such, we find that early adopters are able to address various impacts resulting from labor shortages and increasing land costs. By combining the most advanced, cutting-edge technologies and a

diversity of culture and talents, Singapore is in an ideal position to become a test bed for Asian markets and a springboard to the countries in this region.

How to Speed Up Industry 4.0 Adoption

Industry in Singapore enjoys an edge in accelerating towards 4.0 as we have a well-trained workforce that is continually upskilling. I believe that this allows Singapore companies to understand Industry 4.0 and its implications for their businesses, and makes them ready to adopt and leverage relevant technologies to their advantage. To accelerate Industry 4.0 adoption, companies need to understand the impact of creating new applications that are relevant to their customers and profitable in the marketplace; they also need to invest in building up capabilities for longer term needs.

At the same time, companies can also ride on government initiatives, including the program on Industry Transformation Maps. SIAA has organized several activities to support the agencies in achieving this goal. From here, they can leverage the existing, well-developed infrastructures for information and communications, and also the improved networks that are now fast, secure, and reliable enough to support the billions of industrial devices and sensors that will connect through to the global industrial Internet of Things.

Three Pillars to Embrace Emerging Technologies

SIAA homes in on three technology pillars that guide our programs and directions, namely: Automation, Internet of Things (IoT), and Robotics. These pillars form the basis of how our programs are shaped, and in turn help our members embrace emerging technologies.

On the Automation front, SIAA has been leading the Singapore delegation to regional shows for trade and business opportunities. With a lean capacity in the secretariat, we organize up to 15 missions a year, and the estimated trade adds up to SGD 500 million in the last year alone. In collaboration with a government agency, IE Singapore, we have also started to study missions to the European Union to learn about the latest trends in Industry 4.0.

SIAA is the founder and has been a co-organizer of the IoT Asia Conference and Exhibition since 2014. Within this trade conference, we have worked with our co-organizer Singex to bring notable speakers and practitioners of IoT to share their global experiences with a strong element of Industry 4.0. We have also formed alliances and partnerships with local and overseas research institutes to facilitate the meeting of supply and demand specifications. I am aware that some of our members have teamed up with these research institutes to evaluate and commercialize emerging technologies for competitive gains. I am happy that our programs have served as viable catalysts for our members to explore new market segments for their innovative efforts.

Robotics has been dear to our heart. Yet, there are real assimilation issues of which we need to be mindful, such as new work patterns between people and machines. SIAA is organizing the Singapore International Robo Expo (SIRE) to bring together conference speakers and technology exhibitors both locally and from abroad to showcase their products and applications. We have also established trade missions to countries on Northeast Asia as well as Europe, and we continue to host roundtables between visiting foreign delegations and local business owners to explore opportunities for collaboration.



To accelerate Industry 4.0 adoption, companies need to understand the impact of creating new applications that are relevant to their customers and profitable in the marketplace; they also need to invest in building up capabilities for longer term needs.

The Next Step in Advancing the Industry 4.0 Vision

SIAA's next step to advance the Industry 4.0 vision will involve several directions, such as commercializing an advanced manufacturing platform, connecting to regional and global technology talents, and cultivating the mind-set required for a roadmap to the next generation workforce.

First, SIAA will play a critical role in helping Singaporean companies get involved in test-bedding and gaining knowledge, skill sets, and valuable know-how. These companies will consequently build capabilities leading to technology-driven innovation. Second, we are forming regional networks, and building strategic

alliances within the region and internationally. It is through these alliances that our partners provide SIAA with privileged "Need/ How to factor" information. This leads to Singapore companies providing Industry 4.0 solutions that not just harness, but actually evolve along with the growth opportunities in the region. Third, SIAA believes that Autonomous Robotics (hardware) and IoT (software) form the empowering core of Industry 4.0, which leads to Ubiquitous Automation beyond the factory floor. We plan to establish a framework to accommodate a robotics eco-system through a Seek-Design-Place approach to empower the industry with practical knowledge, while hoping to encourage disruptive innovation and members that will take bold steps to adopt these innovations into their businesses.

In the IoT arena, IoT Asia has provided and remains a proven platform for home-grown technology companies to reach out to opportune Asian markets. Coupled with an international interlock of great minds, we believe we can spawn creative innovations that will drive the economy, such as components in our Smart Nation Initiative. The recognition of excellence and commitment to quality standards for IoT applications will be pivotal to innovation. SIAA will build an assortment of innovative case studies to encourage ever deeper and better innovation. ■

9 Sustainable Business Stories that Shaped 2016

By Andrew Winston for the Harvard Business Review

In 2015, the world pivoted in a historic way towards sustainability. Debates about climate change melted away. Every country committed to action in the form of the Paris Agreement. Even the Pope spoke on the issue, reminding us that we are all connected. It was a productive 12 months, to say the least!

Then came 2016.

Every year, I find big themes or specific company stories that I feel are impressive, important, or indicative of where the world is going. In 2016, two stories dwarf the rest – the election of Donald Trump and significant action on climate change. The context for sustainable business in 2017 may center on the competition between these two stories; that is, how will Trump and his team impact or impede progress on climate change and other sustainability issues? So let us focus on these two first, and then run quickly through seven other interesting stories.

1. Trump Shocked the World

It is not yet clear what Trump's election means for issues that impact companies' efforts to manage environmental and social issues. Climate change, building a clean economy, reducing inequality and raising wages, providing healthcare to support general wellbeing – all are big unknowns now. The early signs from the Trump team are not promising, in my view. He wants to appoint as head of the EPA a man who denies climate change and has led legal battles against the EPA. His pick for Labor Secretary is staunchly opposed to covering overtime pay or increasing minimum wages

(something many leading companies have been doing on their own since 2014). His choice for Secretary of State is the CEO of ExxonMobil, a company that has, for decades, attacked climate science when it knew better. A leaked memo from the Trump transition team shows an intention to move away from the Paris Agreement and almost all climate and clean economy action.

In response to Trump's election and his statements doubting climate change, many countries that signed the Paris climate accords in 2015 have made it clear that they would power on (China in particular – see story number three below). Former French president Nicolas Sarkozy even proposed taxing U.S. goods if the country pulled out the Paris Agreement. Also throwing his weight in, former New York Mayor Michael Bloomberg publicly declared that cities would fight on, with or without Trump. Finally, hundreds of companies signed the latest declaration from Ceres showing their support for Paris. This is all promising. For this and many other reasons, the sustainability journey in business will continue.

However, given Trump's likely stance, any global progress on climate will happen in spite of headwinds from the U.S. federal government. In the U.S., the action will have to move to the state and city level and the private sector. Businesses in particular will need to lead in a way they never have before – and they will.

2. Increased Public and Private Sector Action on Climate Change

For most of 2016, the world moved quickly on climate.



I have already mentioned the historic Paris Agreement, but there are more positive steps worth noting. With the support of chemical companies, more than 170 countries have agreed to phase out HFCs, the high global-warming-potential chemicals used in air-conditioners and refrigerators everywhere. The United Nations has also agreed to slash emissions from the airline industry. Norway has banned deforestation, and both Norway and Germany have moved towards banning fossil fuel-powered cars. This week, Canada also announced that it would tax carbon nationally by 2018.

In the U.S., the Obama administration started to incorporate the “social cost of carbon in decision-making, and the Pentagon made climate change a military priority. President Obama, together with his counterparts in Canada and Mexico, agreed to a number of aggressive regional targets on renewable energy and efficiency. At the state level, New Jersey has recently passed a big gas tax increase, and Oregon, Illinois, and California have developed robust energy and climate policies. All of this will affect companies of all stripes.

Business itself has not been quiet on the climate front either. Many invested heavily in renewable energy (see number five on this list), and several big companies dove into policy debates this year. More than 100 companies called for action on the Clean Power Plan (Obama’s big move to reduce power sector emissions), with tech giants Apple, Google, Amazon, and Microsoft even filing a legal brief in support of the policy. Nine big brands with operations in Ohio publically pressed the state

to reinstate energy efficiency and renewable energy portfolio standards. Finally, many previously quiet companies, like food giant General Mills, have spoken out about how important it is to their business to tackle climate change.

Why all this progress? First, evidence of a radically altered climate system has become crystal clear. After 2015 shattered climate records, 2016 got even hotter and more extreme, creating weather events that brought physical destruction, massive economic costs, and loss of life. Second, the financial world is getting better at evaluating what’s at stake. The World Bank estimates that assets worth US\$158 trillion are at risk from increased natural disasters. The London School of Economics also reports that trillions of financial assets are vulnerable. And in the U.S. alone, floods in Louisiana and North Carolina have caused US\$10 to 20 billion in damage.

3. China Stepped Up

While many countries accelerated their climate and clean economy work in 2016, China is a special case. Early in the year, China said it would halt new coal mine approvals, close 1,000 mines, and increase wind and solar power by 21% in 2016, and even eat less meat to control carbon emissions. However, last month the country also indicated that coal use would rise until 2020 (albeit at a slower rate than the growth of renewables), so it is not totally clear where China’s emissions will head. But the country clearly wants to lead the world in the clean economy transition. Speaking from this year’s U.N. global

climate meeting, which happened to coincide with the U.S. election, Chinese ministers sent a message to Trump that climate change is no hoax. Then China's President Xi announced that he would be attending the annual bigwig gathering in Davos for the first time, with reports highlighting China's interest in filling trade gaps left by Brexit and possible leadership gaps on climate left by Trump.

4. Renewables Kept Growing and Getting Cheaper

Renewables have been trouncing fossil fuels for a few years as the costs of newer technologies have dropped remarkably fast. The world record for cheapest solar plant was set in Mexico... and then broken within weeks in Dubai with a bid of 2.99 cents per kilowatt-hour. Countries with big investments in renewables are reaping the rewards. For four days in May, Portugal was 100% powered by renewables, and on a single windy day Denmark's windfarms gave the country 140% of the power it needed. The U.S. has finally got into offshore wind near Rhode Island. In a subtle tipping point, the total global generating capacity from renewables surpassed coal this year.

As prices dropped, companies noticed, and corporate purchases and commitments to clean energy grew. Walmart set a 50% renewable target for 2025. In the last few weeks, Microsoft and Avery Dennison have announced big purchases of clean power, while GM and Google have committed to a target of 100% renewable energy within one year. A growing number of companies have signed the RE100 commitment to go for 100%. And in Nevada, both MGM and Caesars filed papers to stop purchasing power from their utility, NV Energy, because it does not support renewables. New capital is still flowing into clean tech – Bill Gates, Jeff Bezos, and other business leaders recently announced a US\$1 billion fund for investing in “next-generation energy technologies.” All of this activity convinces me that Trump cannot stop the clean economy.

5. Investors Focused on Climate, Sustainability, and Short-Termism

Larry Fink, the CEO of Blackrock, the world's largest asset owner, followed up his 2015 letter to S&P 500 CEOs with another treatise against short-term focus. He disparaged the “quarterly earnings hysteria” and asked companies to submit long-term strategy plans and address environmental, social, and governance (ESG)

I do believe companies will expand their horizons, looking more at systems, not just their operations and value chains. They will increasingly partner to tackle big global targets like the U.N.'s Sustainable Development goals.

issues. BlackRock also issued a “climate change warning,” telling investors to adapt their portfolios to fight global warming. Many banks heeded the advice and pulled funding from coal. The London School of Economics has estimated that climate change could slash trillions from financial asset values. Because of this economic and systemic risk, a high-powered task force from the G20's Financial Stability Board issued important guidelines for companies to make climate-related disclosures. To help investors evaluate their holdings, Morningstar launched sustainability ratings for 20,000 funds, and 21 stock exchanges introduced sustainability reporting standards. Finally, to educate the next generation of analysts, the CFA exam will now include a focus on ESG issues.

6. Business Defended Employees' and Customers' Human Rights

Companies are getting more vocal on human rights issues for many reasons. For some companies, it's about the commercial opportunity to appeal to a new or growing market of rights-focused consumers. Other companies want to attract and retain diverse talent. Nonetheless, in general, society is expecting companies to broaden their mission. In one survey, 78% of Americans agreed that “companies should take action to address important issues facing society.” Millennials feel even stronger. A global survey conducted this year showed that 87% of Millennials around the world believe that “the success of business should be measured in terms of more than just its financial performance.” This

generation – which will be 50% of the workforce by 2020 – seeks employers that share their values.

And so, after a divisive U.S. election, many CEOs felt the need to email employees, restating their commitment to diversity and inclusion. Earlier in the year, when Gov. Pat McCrory of North Carolina passed a bizarre law to control which bathroom transgender people use, many companies spoke up. The CEOs of dozens of big brands, including Alcoa, Apple, Bank of America, Citibank, IBM, Kellogg, Marriott, PwC, and Starbucks, signed an open letter to defend “protections for LGBT people.” PayPal and Deutsche Bank canceled plans to expand and hire in the state, and the NCAA actually relocated some championship events. (In an important side note, after costing the state US\$600 million in business, the law is widely credited for losing McCrory his reelection bid.)

7. More Evidence Emerged That Economies Can Grow Without Increasing Carbon Emissions

So far this century, more than 20 large countries, as well as 33 U.S. states, have “decoupled” GDP growth from greenhouse gases. One energy hog, the IT sector, has managed to level off energy use in data centers. There is serious talk again about “peak oil” – not of supply, but of demand.

We are seeing a fundamental shift in our relationship with energy for multiple reasons, including the improving economics of efficiency and clean tech (see story number five). But companies are also becoming more systematic, strategic, and fun – yes, fun – in slashing energy. More organizations are using old tools like “treasure hunts” and reimagining them as “energy marathons” (26.2 days of innovation). Others are competing to slash energy use (the Hilton and Whole Foods energy teams are set to go head-to-head in a streaming reality show).

8. Levi’s Shared What It Knows about Water

Big themes are great, but periodically a specific example of leadership seems worthy of extra attention. In this case, Levi’s had spent a decade identifying great ways to cut water use in the apparel value chain. Realizing that water issues are too big to tackle alone, Levi’s celebrated World Water Day this year by open sourcing its best practices in water management. In essence, the company decided to promote system change and even invited competitors to its innovation lab for the first time in its history.

9. The Circular Economy Inched Closer

With a growing population and ever-rising demand for resources, it’s becoming necessary to find ways to eliminate waste and reuse valuable materials endlessly. We are seeing interesting innovation in policy and business practice. Sweden is planning to offer tax breaks for fixing things instead of throwing them away, and six EU countries have started a four-year project to help small and medium-size enterprises move to circular models.

A number of companies also made moves into this space. A supermarket opened in the U.K. filled with only food that would have been thrown out. IKEA is expanding its circular offerings by reselling used furniture and creating new products from leftover textiles. More than 25 companies in Minnesota, including 3M, Aveda, and Target, launched a circular initiative to share expertise. The Ellen MacArthur Foundation and Kering both created curricula in circular thinking for fashion and design students. And finally, the Closed Loop Fund, which invests in recycling infrastructure (using funds from large retail and CPG brands), reported substantial progress, including the launch of single-stream recycling across Memphis.

What’s in Store for 2017?

Given how far off pundit and prognosticators were this year, I have to proceed with caution. Who really knows what a Trump presidency will bring to the U.S. and the world, or what the corporate sustainability agenda will look like amid so much uncertainty?

I do believe companies will expand their horizons, looking more at systems, not just their operations and value chains. They will increasingly partner to tackle big global targets like the U.N.’s Sustainable Development goals. Demands for more transparency regarding how everything is made – from consumers, employees, investors, and other stakeholders – are unlikely to slow down. The food and agriculture sectors in particular will feel even more pressure to cut carbon and food waste and simplify ingredients.

And no matter who’s in charge politically, macro trends are hard to stop – a changing climate; increasing challenges around water and other resources; higher expectations of companies; rising concern about inequality and wages; and technological disruption from AI, machine learning, and autonomous everything. These trends will continue and companies will need to adapt, fast! ■



Putting Intelligent Manufacturing into Practice: a Big Step into Industry 4.0



With the advent of the IoT, industrial applications have begun to integrate a variety of technologies that set off a new industrial transformation leading to Industry 4.0; also known as the fourth industrial revolution. After years of continuous ferment, countries around the world now attach great importance to the development of Industry 4.0 and intelligent manufacturing is the first step towards this.

For Advantech, Industry 4.0 drives the needs of many clients from different industries. Previous customers were mostly equipment manufacturers, system integrators, military, and education, but now the client base has expanded to include household appliances, the food industry, and others that were not easy to access in the past.

Among them, take Bao Cheng for example, a successful, major OEM sports brand that has adopted Advantech's Sensors and Gateways to create intelligentized sewing machines that record motor status, temperature, and so on, thereby providing manufacturers such as Nike or Adidas with a clear, real-time picture of their production facilities. However, this is merely a preliminary application of the core technologies of IoT using sensors, embedded computing, the cloud, and big data analysis. It's clear that Industry 4.0 presents huge potential business opportunities, and this age of revolution represents a major change with a potential impact on all kinds of industries.



Advantech's Construction of Linkou Smart Factory Accelerates Implementation of Industry 4.0

In order to accelerate the advancement of Industry 4.0, Advantech built its Linkou and Kunshan Manufacturing Centers as Industry 4.0 smart factory showcases and opened them to external visitors in an attempt to assist manufacturers looking to transform themselves into smart factories through one-stop services including software and hardware integration, experience sharing, consulting and planning.

By Liao Peijun with images provided by Advantech
Interview with Jonney Chang, Vice President of Advantech Automation Systems & Solutions;
Lingo Lin, Vice President of Advantech Taipei Manufacturing Center

Advantech's manufacturing centers began their active, intelligence-oriented transformation years ago, collecting information from sensors at operating sites and uploading it to the cloud for real-time analysis with visual presentation. Now factory directors and leaders can see the current status of production lines no matter where they may be located. Previously, data monitoring in a factory required manual operation, which not only wasted time but also resulted in higher error rates. Machine failures and unsuccessful staff dispatch, if any, affected factory production schedules. Generally, yield statistics would only be available when production was completed or at the end of the month, when work order progress could finally be understood and operation results be reviewed. But now, since the digital production line management upgrade has been completed, the benefits of Industry 4.0 are obvious: reduced production time, reduced manufacturing costs, and improved capacity and quality yield.

Construction of Model Factory Showcases Industry 4.0

Smart factory manufacturing describes the collection, integration, and analysis of all factory information using sensors, the cloud, big data, and other technologies to realize the combined goals of enhancing efficiency and reducing costs. The overall concept of Industry 4.0 is not difficult to understand, but the actual implementation does involve a variety of challenges.

According to Lingo Lin, Vice President of Advantech's Taipei Manufacturing Center, the key in acting on Industry 4.0 is determination. Each factory has its own production line configuration, production processes, and equipment. It is crucial that those engaged in the industry dare to accept the pain and challenges of transformation and face the truths revealed by the data after introducing new systems. Industry 4.0 is not simply the introduction of an information system or the construction of hardware equipment. It is a staged

development process; comprehensive factory equipment perception, data collection, and networking produce optimized automation and labor savings. Integration and analysis plus data visualization enable decision making based on data analysis, and help develop the factory's required smart services. These stages must be developed gradually in order to achieve factory intelligence.

Cloud-linked Control of All Factory Information

"The cloud strategic situation room is the most obvious change in Advantech's upgrade to Industry 4.0," said Jonney Chang, Vice General Manager of Advantech's Automation Systems & Solutions. "The strategic situation room can be physical or virtual," added Lingo Lin.

Advantech collects, integrates and uploads data produced by sensors, along with general factory information, to a cloud platform and presents the above to management in the strategic situation room. Due to the link with cloud technology, management can connect with the Industry 4.0 information platform online without time and space constraints to grasp production line information in real time, including equipment status such as which operators are at which production stations, which products are being made, progress of work order execution, production yield and so on, so as to implement decisions more easily. Both factory and management evolve together when senior executives and grassroots employees cooperate closely with each other.

According to Jonney Chang, the strategic situation room is different from a central control room in a traditional factory. A traditional factory collects data for the purpose of monitoring. As soon as a problem arises, management retrieves data in the central control room to determine reasons for the problem, somewhat similar to the role of a data storage center. In contrast, the strategic situation room is an oriented, decision-making center that collects and analyzes factory production and operation data and displays the factory environment and equipment status to facilitate decision-making. If an abnormal situation arises, the system automatically alerts the relevant leaders. It is the soul of factory management and operation.

SRP Software and Hardware Integration

For those in manufacturing with the intention of transformation to Industry 4.0, Jonney Chang advised them to think about what problems they want to solve before making plans. Advantech, for instance, identified

production waste as a potential target, and expected to make further improvements. However, it turned out that the original data collected was insufficient to produce a clear cut path. As a result, it embarked on planning for its own Industry 4.0 transformation.

Therefore, data collection is deservedly called the foundation of Industry 4.0. Though data collection is not difficult, the depth and breadth of collection decides the scope of data application. Thus, where the amount of data is found insufficient, it is necessary to decide whether that data insufficiency is in production lines or equipment.

If production line data is insufficient, it will be necessary to add an action in the production line. For two examples, Advantech has introduced an auto labeler in a production line to replace a manual labeling operation; it has transformed its original process of manual steel plate number painting to automatic infrared scanning to reduce operation time. If equipment replacement is impossible on the production line, equipment data will be insufficient. In that case, an enterprise may be able to upgrade by adding external equipment that collects data from the original equipment. At present, Advantech supports over 450 controller drive programs/communication protocols and all kinds of I/O sensing interfaces to fully meet demands of data collection of different manufacturing devices.

Jonney Chang mentioned that Advantech has a history of over 30 years of devoting itself to industrial automation. From basic data collection to equipment networking, it has developed a series of complete solutions. In recent years, more resources have been concentrated in the roll out of smart factory SRP (solution ready platform) software and hardware integration solutions, emphasizing equipment networking and production visualization programs, providing one-stop services to manufacturers, and avoiding obstacles that may be encountered in the introduction of Industry 4.0 and accelerating the construction of smart factories.

"Industry 4.0 is a dynamic process with no downtime that is constantly advancing and changing, Advantech is still continuing the planning of Industry 4.0. The next step is expected to integrate information from external suppliers or logistics information into the platform. In the future, Industry 4.0 should drive upgrades and growth of the entire industry through applied experience and solutions that jointly usher in a data-driven, intelligent world," said Jonney Chang. ■

Creating Smart Factories Through Equipment Networking

Building Visualizations, and Real-time, Paperless Production Management

Advantech's WebAccess platform is the core of a solution that helps system integrators and manufacturers rapidly build smart, networked, equipment systems. These systems optimize the existing manufacturing processes, and gradually transform the production line from manual to automated control.

By Sharlene Yu with images provided by Advantech
Interview with Marco Chen, Senior Sales of Advantech Industrial IoT Group

Through the influence of Industry 4.0 and IoT, manufacturing industry is ready to transition to smart factories. The first step in the process of transformation is to collect production line data from the automated equipment network.

Marco Chen, Senior Sales of Advantech Industrial IoT Group stated that capacity and quality are the keys to the competitiveness

and profitability of a company. Although some manufacturers have introduced MES, ERP or other manufacturing management systems, they still rely on manual transcription and data entry for information about factory equipment, or assign workers to conduct onsite inspections to confirm the status of production line equipment. Managers have no way of knowing the true



status of their production lines in real time using such manual modes of operation. Therefore, equipment networking is an essential link for companies that want to strengthen production management and effectively control production equipment.

CASE I: Juyao Automation's Smart Platform Weight Scale System Stabilizes Food Quality with Auto Batching Program

In recent years, a number of food safety issues have occurred. When problems are exposed, not only do consumers panic, but the food processing industry also fears that momentary negligence or other shortcomings may have caused damage to business reputation and sales may decline. To maintain the brand name and build a good reputation that strengthens consumer confidence, prominent food manufacturers in Taiwan have decided to automate their production processes to reduce errors caused by manual operation, and to build traceability into their production by maintaining complete records of the manufacturing processes.

The system integrator, Juyao Automation, responsible for this particular project for a food manufacturer,

recognized that if a barcode machine and platform weight scale were installed on the production line it would help with accurate raw material additions, and all work order information and formula data could be assigned to the product line from the central remote control room. However, the factory environment was not suitable for wiring to the network and production line staff included both local and foreign laborers, so there were language challenges involved too. Therefore, the system needed to be equipped with a voice module in multiple languages to remind workers about correct operating procedures using wireless technology for communication.

Fortunately, through Advantech's EKI series wireless network module, a touch panel computer and browser-based InduSoft WebAccess software, Juyao Automation developed a smart platform scale and batching solution, through which the work order information and formula data could be smoothly transmitted to the processing site via a wireless network, so no network cabling was required. All peripheral devices such as barcode scanners, voice modules, PLC controllers, and platform scale modules were easily connected to the system. The formula management system inside the central control

room also benefitted from the browser-based WebAccess interface, both for data analysis and generating production records, and it also allowed managers to understand production status at anytime and anywhere via their mobile phones, tablet computers, or other devices.

Marco Chen compared the difference before and after introducing the smart solution by taking an instant noodle seasoning packet as an example. “Previously, charging baskets above the production lines distributed materials according to different formulas for each batch and materials were then mixed manually by eye, but this easily led to inhomogeneous mixing or other errors. Inaccurate mixing could lead to an off flavor for the instant noodles, which was only revealed when tasted by customers. This could lead to poor reputation and even loss of our customer base. But with this smart platform scale and ingredient batching system, the contents and weight of the seasoning packet always matched the formula, reducing human error and ensuring product quality,” said Marco Chen.

**Case II:
Streber-Tech Smart Formula Management System
Delivers Precise Control of Chemical Wash Ratios to
Maximize Yield**

During the IC manufacturing process, much effort is expended on achieving cleanliness to ensure product yield, quality, and reliability. With integrated circuit components rivalling or surpassing dust particles for thinness, all contaminants must be rigorously eliminated. Clean air is important; so are solvent washes. Purity testing is performed for each step of the manufacturing process, both before and after each operation. The concentrations of solvent solutions and composition of the various chemicals determine whether zero-particle, zero-metal impurities and zero-organic residues can be achieved during closed testing after cleaning.

Using Advantech’s UNO-2483G industrial computer and InduSoft WebAccess, with EKI series Ethernet switches and a wireless bridge, and the ADAM series of digital and analog I/O modules, system integrator Streber-Tech Semiconductor developed a smart formula integration system for testing of wet cleaning work. With this system, the formula is confirmed by barcode scans and chemicals flow from selected chemical tanks into a mixing tank and are combined, then the solution is discharged into rinse tanks, with related flow data

uploaded to the system. Meanwhile, load cells, solenoid valves, pumps, flowmeters and other devices are automatically monitored. If any abnormality occurs in the cleaning operation, an alarm is issued immediately to alert the manager.

“Previously, cleaning agents were mixed manually, but the concentration ratio of each chemical could not be accurately measured. One time an accident happened when a defective batch was produced. It was discovered only after goods had been delivered and caused a significant loss to the manufacturer. After implementing the automation control solution that Advantech built jointly with Streber-Tech, the factory fully mastered the closed-test cleaning operation and also improved their qualified manufacturing yield,” said Marco Chen.

WebAccess Platform Makes Integration Easier

The so-called equipment network is intended not only to capture machine data; in fact, any data related to the manufacturing process that can be converted into digital signals can be included in the target data collected. So in our examples, data from the smart platform weight scale system and the smart formula system mentioned above includes information from all related sensors: the barcode machine, the platform scale, voice module, PLC, load cell, solenoid valves, flowmeters and other peripheral devices. The entire manufacturing process becomes transparent, resulting in more efficient and flexible production.

“The key to the correct implementation of Industry 4.0 and IoT lies in Integration,” said Marco Chen. For system integrators, the WebAccess solution, plus a wide range of hardware products and real-time monitoring in the central control room can satisfy the demands of data capture from the production line. The dashboard development tool in WebAccess allows developers to more easily design a system with a simpler interface; it also supports OPC, SQL, ODBC and other standards, which makes it easier to aggregate various underlying data into the system.

From the manufacturer’s point of view, rapidly introducing equipment networking solutions in response to customer demand can remove the problem of non-real time and error-prone manual operations, and also help to fully master work scheduling and production delivery, dashboard visualization, and real-time and paperless operating modes which help improve production capacity and quality. ■

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WebAccess/HMI **WebAccess/SCADA** **WISE-PaaS/RMM**



UNO-2271G
Intel® Atom™ Pocket-Size IoT Gateway with 2 x GbE, 1 x mPCIe, HDMI, eMMC



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Increasing the Efficiency of Information Management with Seamless Data Integration

Advantech's data acquisition solutions enable equipment data to be automatically collected and transmitted to manufacturing execution systems, enterprise resource planning systems, and other management systems. Production information transparency promotes production and management efficiency and improves the management of front-end production data.

By Sharlene Yu with images provided by Advantech
Interview with Tim Chan & Guey Huang, Supervisor of Advantech Industrial IoT Group

Since the 1960s, the manufacturing industry has used computers to control cost and production to optimize company resources and efficiency. The rapid development of information technology has resulted in the creation of a wide range of information systems, such as enterprise resource planning (ERP) systems, manufacturing execution systems (MESs), and digital systems for managing customers, supply chains, products, manufacturing processes, and equipment. However, regardless of the type of system, data and statistical analysis provides the basis for operation. And although many companies have implemented digital management systems, rather unfortunately, they still rely on manual collection and entry for data acquisition.

Automatic Data Acquisition

For most factories (especially in traditional industries), production line operations involve management printing out work orders via a digital management system. After completing tasks, operators fill in a daily worksheet, which is then submitted to the production managers to be input into the system. Tim Chan & Guey Huang, Supervisor of Advantech Industrial Automation Group believe that this method of operation wastes considerable time and resources, and increases the potential for data errors. Additionally, data is typically only entered into the system at the end of the shift or during the following day. This means that in the event that production operations do not accord with the

system data, managers' decision making and production scheduling could be based on incorrect information, potentially resulting in excess inventory, incomplete work orders, and delivery delays. These negative outcomes may lead to business losses for manufacturers.

However, as Tim said, "Advantech's data acquisition solution is capable of automatically collecting equipment information and instantly uploading it to an MES, ERP, or other management system. Time-consuming, manual, paper-based operations with a high potential for error can be transformed with automatic data collection and real-time uploads. Production information transparency can effectively increase production efficiency and enable real-time management." Guey added, "The lack of standard protocols hinder data collection in traditional industries. Advantech's WebAccess IoT platform solution not only provides a standard transmission interface and supports numerous drivers, but it can also be connected to various devices for seamless data integration across management systems. This allows developers to collect front-end data easily."

Tim and Guey presented two successful case studies involving VIP members of the WISE-Paas/IIoT Alliance. In both cases, system integrators, with assistance from Advantech, were able to extend the functionality of their management systems to enable management of front-end production information.

CASE 1: RuiDing Introduces an Intelligent Reporting System for Presenting Production Information in Real Time

Although most people, even those in the technology or manufacturing industries, are relatively unfamiliar with hand tools, Taiwan is one of the world's leading suppliers of hand tools, even earning a reputation internationally as the "Kingdom of Hand Tools".

The hand tool industry covers all hand tools used for repairing, adjusting, or dismantling, such as electric drills, hammers, wrenches, and screwdrivers. Hand tool manufacturing typically involves multiple processes, including forging, heat treatment, grinding, polishing, electroplating, painting, and engraving. Because toolboxes generally contain various tools, numerous finished products may be required to fulfil a single production order. Moreover, the production order may involve both in-factory and outsourced manufacturing processes, increasing the complexity of production

management.

To assist the RuiTai Group with managing its hand tool manufacturing plant, RuiDing Technology independently developed a data collection system (DCS) using Advantech's WebAccess/SCADA browser-based software package, an ACP-4000 industrial computer chassis, an EKI-5528 Ethernet switch, and a WebOP-2070T human-machine interface (HMI) WVGA operator panel.

The DCS was implemented to automatically collect and transmit factory production data to the ERP management system. The system can display all production line information, such as the equipment operating status, operator behavior, work order numbers, production quantity, and production schedule, on digital signage that provides managers with a real-time overview of the production situation.

The core hardware of this DCS system is Advantech's WebOP-2070T operator panel, which offers durability, compatibility, scalability, and easy integration. This HMI product is suitable for operation in extreme environmental conditions, such as high temperatures, humidity, oil and dust exposure, and can support hundreds of industrial PLC communication protocols to facilitate the collection of CNC machine and equipment data. The built-in USB interface allows all work order data stored on handheld barcode machines to be read directly and uploaded without necessitating an additional network converter.

"The introduction of an automatic front-end data collection solution provides immediate management benefits. Previously, the factory experienced at least a one-day lag in terms of information availability. With this new solution, real-time monitoring can be conducted, greatly improving management overall," said Tim.

The innovative intelligent reporting system developed by RuiDing is suitable for more than the hand tool manufacturing industry. Manufacturers of bicycles, automobile parts, hardware, furniture, machine tools, measuring tools, etc. have also implemented this system to address ERP deficiencies and increase real-time management efficiency.

CASE 2: Alpha Information Systems Implements Paperless Production Management by Introducing a Dedicated MES System

For manufacturers, the introduction of an MES can streamline production, reduce inventory, ensure on-time delivery, and improve product quality. The

manufacturing sector in Taiwan includes a wide range of industries. According to the Executive Yuan's Directorate General of Budget, Accounting and Statistics, the manufacturing industry in Taiwan comprises nearly a hundred categories. MES solutions are ideal for manufacturers because they optimize management of the entire production process, from order receipt to product delivery. However, because production methods, along with manufacturers' expectations of management systems, differ between manufacturing industries, MES systems must be configured to specific customer needs or integrated with additional features to maximize functionality.

To address the requirements of factory operations, Alpha Information Systems developed a unique MES (AlphaMES) aimed at a few key manufacturing processes. This system also included Advantech's WebAccess/SCADA browser-based software package, as well as its HPC-7242 industrial rackmount server chassis, PWS-870 rugged tablet computer, EKI-6332GN Wi-Fi network client, EKI-5728 Ethernet switch, WISE-4012 IoT wireless I/O module, and EIS-FEC310-H embedded computer.

This integrated software/hardware system provided the ideal solution for a factory that must make frequent dynamic adjustments to its production lines. Besides allowing managers to quickly understand the production and order processing status via data displayed on digital signage, the system transformed their paper-based order processing operations into digital processes involving barcode scanners and electronic forms, ultimately reducing data collection costs, accelerating the output of reports, and providing traceable production records.

Guey commented that Alpha Information Systems, using its strong customization capabilities, was able to integrate several standardized subsystems into a comprehensive solution by adopting a modularized system design. The combination of Advantech's WebAccess platform and industrial hardware products enable AlphaMES to deliver its front-end data collection functionality. More specifically, the PWS-870 rugged tablet computer allows production line staff to complete work reports electronically, the WISE-4012 IoT wireless I/O module facilitates automatic collection of equipment data, and the EIS-FEC310-H embedded computer enables real-time equipment monitoring and maintenance.

Considering the AlphaPMQ subsystem for example, this intelligent predictive maintenance system monitors

the equipment operation status by measuring equipment vibration. Alpha Information Systems adopted the high-performance EIS-FEC310-H to collect machine data, and then created a dynamic display output using WebAccess/SCADA's user-friendly dashboard development tool. This display output provides managers a clear overview of the control center systems' dynamic uninterrupted power supply (DUPS), allowing them to assess potential risks and schedule early maintenance to prevent catastrophic failure and interruption of the production line. This predictive maintenance function is highly valued by semiconductor manufacturers, and a number of manufacturers in Taiwan and China have also installed this system in their wafer manufacturing factories.

Cooperation to Achieve Early Implementation

Information systems that enable digital management play a significant role in business decision making and the management of daily operations. Although information technology and industrial control systems have not traditionally been integrated, the arrival of Industry 4.0 has necessitated cross-system data communication. Accordingly, developers are facing urgent demands for a comprehensive industrial control solution for conveniently and rapidly integrating production information.

"Because system integrators have professional knowledge of specific industries, and Advantech has a diverse product portfolio and extensive experience with industrial control and integration platforms, cooperation and collaboration is the key to accelerating the realization of Industry 4.0. Advantech's scale and prestige in the industrial control market offers attractive advantages for potential partners," said Tim.

Guey added, "System integrators will implement Industry 4.0 solutions with the technical support of original equipment manufacturers. Despite the diversity apparent in the manufacturing industry, Advantech's numerous data acquisition solutions enable system integrators to develop unique systems customized to the production processes of specific industries. Furthermore, because these solutions integrate both software and hardware, they can significantly shorten development time, facilitate early completion, and accelerate the implementation of smart factory applications." ■

Modular Panel Platforms

Visualizing Smart Factories to Enable Industry 4.0



WebAccess/HMI

WebAccess/SCADA

WISE-PaaS/RMM



Industrial Web Terminal and Monitor

Industrial Thin Client

Control Panel

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TPC Series of Modular Industrial Panel PCs

With the arrival of Industry 4.0, conventional all-in-one automation panels lack the flexibility to meet industry requirements. To address this need, Advantech created its TPC series of modular panel PC solutions based on three performance-segmented computing box modules — a control panel, industrial thin-client, and web terminal. The modular design of the TPC series allows the computing box modules to be interchangeably combined with Advantech's display panel modules to provide comprehensive platform solutions for specific field applications.

The incredible flexibility, serviceability, and modularity of Advantech's TPC series provide numerous performance and cost-saving advantages, including complete HMI control and monitoring, customization according to application requirements, rapid integration and deployment, reduced system downtime and maintenance costs and support for future expansion.



Control Panel TPC-5000

- Latest Intel® Core™ i processor
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- Isolation power design
- iDOOR, 1 X PCIe



Industrial Thin Client TPC-2000

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- Wide temperature range
- PXE boot ready



Industrial Web Terminal & Monitor TPC-1000

- Risc-based web terminal
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- Easy fit iDOOR module in box.
- iLINK for long-distance transmissions



Wireless AGV Application Meets Demands for Smart Factories to Smart Parking

Smart Factories have been the focus in manufacturing in recent years. In addition to smart production line equipment and data collection, Automated Guided Vehicles (AGVs) that shuttle parts and materials have also garnered some engineering mind share. Combining industrial computers and wireless communication technologies, AGVs not only accelerated factories toward realizing their automation goals, but also helped develop a brand new application area—smart parking.

**By Liao Peijun with images provided by Advantech
Interview by Raymond Lee, Product Manager of Automation System & Solution**

“Oh, my God! I forgot where I left the car!” “Left...stop! Align your steering wheel upright and back up,” “Oh, Gosh! It is too close on the right. The car doors won’t open. Everybody, please exit on the left!” This kind of conversation should be quite familiar. It is inevitable that you may occasionally forget where you parked your car, or you may have to adjust your vehicle’s parking position repeatedly before you get it right.

However, since a parking robot was introduced in certain parking lots in Nanjing in Mainland China, in those places the above conversations are no longer heard. Drivers just leave their cars on the entrance platform, and the parking robot automatically parks them, perfectly. When drivers are ready to re-claim their vehicles, they

just take out their mobile phones, activate the parking robot app, and the vehicle arrives at the exit gate within two minutes.

Advantages: Cost Effectiveness and Quality

Unlike commercial robots of today, the parking robot introduced in this parking lot is the comb-type smart parking AGV developed by Shenzhen Yeefung Robot Technology Co., Ltd. in 2016.

Founded in 2014, Yeefung Robot successfully developed its comb-type smart parking AGV management system within a brief two years, thanks to its focus on AGV and the years of experience in multi-story parking lot development and manufacturing of its parent

company, Shenzhen Yeefung Automation Technology Co., Ltd. The new system is marketed as requiring 40% less parking area, with accelerated parking and pickup operations. As a result, it has attracted much attention in the parking lot management industry. Alarmed by that first parking lot in Nanjing, parking lots in the United States, Singapore, the Middle East, and other locations have expressed strong interest.

Compared with parking robots launched by other manufacturers, this comb-type smart parking AGV made by Shenzhen Yeefung is not only more compact, it also features smoother handling at high speeds. Using a Wi-Fi module and laser navigation, comb exchange and other technologies, AGV automatically handles movements forward, backward, and sideways; left and right turns; 180 degree spins; as well as terrain adjustments, completing parking or delivery for pickup in less than 120 seconds. And the key to the reliable operation of the Yeefung smart parking AGV is Advantech's wireless control platform.

In the past, AGVs mostly used PLCs for application control. However, smart parking AGVs demand full range monitoring and a large number of path operations while a PLC seems slightly deficient in both instruction cycles and functions. If you choose a single board with adapter card and the module is selected, it will have inferior protection of the host shell and be prone to unexplained problems; and if an expensive controller is chosen, the overall cost will increase, thus affecting the competitiveness and acceptance of the new product.

Yeefung Robot evaluated a variety of solutions in the market and ultimately selected Advantech's wireless control platform as the controller of its smart parking AGV. The platform includes a UNO-2272G embedded computer and two iDoor modules (wireless communication, and CANOpen bus protocol). The system features anti-collision sensors, 360° laser emitter, and magnetic scanner in the AGV body; it follows instructions from the central dispatch system to automatically move vehicles from the entrance of the parking lot to designated parking spaces, then back again.

AGV Shares Features with Smart Factory

In the past, AGV systems were mostly used for transporting and loading of parts and materials. Yeefung's practice of combining the industrial computer and wireless technology to control the AGV not only builds a brand new application area for AGVs but also



reflects the current trends in smart factory development.

In the past, when the AGV had no communication capabilities, management had no choice but set the route in advance, from point A to point B to point C, then back to A. Once it arrived at a station, staff loaded or unloaded it, then pressed a button that made it advance to the next station. The AGV would travel its circuit over and over again. At that time, the AGV was just a parts or materials porter, but it was a useful part of factory automation.

However, after adding wireless communications technology, the AGV became more flexible and efficient. In addition to transporting things, it can receive remote control instructions, and upload loading and unloading data to the material management system in real time, which facilitates back-end data analysis, thereby enhancing production line management and efficiency.

For instance, when a workbench runs out of materials, the operator just needs to press a button. The AGV responds automatically, transporting raw materials to the workbench in need and uploading information to the back-end material system. This eliminates manual key-in errors and information uploads are instant, facilitating efficient material management. Managers can even install sensors at workbenches to track material usage status; crossing a preset threshold triggers the AGV to automatically execute material delivery.

Advantech provides a full range of wireless AGV solutions, including wireless AP, wireless serial port servers, WebAccess configuration software, industrial computers, and industrial switches, and also provides technical support and after-sales service. In this particular case, Advantech helped with special project development, field surveys, and field signal measurements (for the wireless app setup).

This case illustrates the transformation from factory automation to factory intelligence. Coupled with iFactory SRP software and hardware integration, Advantech's one-stop solutions help the manufacturing industry successfully build comprehensive, new-generation smart factories. ■

Efficient, Small, and Flexible

MIC-7500 a New Standard for a New Generation of Industrial Computers

In recent years, driven by trends in Industry 4.0 and intelligent factories, manufacturers have expanded the depth and breadth of automation equipment to meet a whole new range of targets. Consequently, increased development of automatic control systems were required to satisfy market needs.

By Minde with images provided by Advantech
Interviewed with David Jen, Senior Manager of Advantech Intelligent System Group

Currently, the smart phone segment is the IT industry's highest value sector. Before leaving the factory, every smart phone must have its software updated and hardware tested. However, if an operator were required to manually test and update every phone individually, the entire production line would grind to a halt. Instead, operators needed to be able to test several smart phones simultaneously—but how?

Manufacturing Demands Diversified

Advantech noted that the adoption of automation control has accelerated in recent years. Considering current development, automation equipment has two main applications. One is assembly movement control. This application of automation technology is focused on motion control, which involves the use of rapid and highly accurate robotic arms and shafts to accelerate production line speed, optimize yield and throughput, and reduce resource costs. The second application of automation technology is machine vision, with emphasis on detection and positioning. The machine vision operational framework involves using industrial cameras to capture images that are transmitted to an industrial computer

for analysis.

With the increasing use of automation systems, and the rapid increase in the introduction of machine vision, there are more and more types of items being tested using high accuracy video, therefore, the resolution of the industrial cameras is rapidly rising and the image files returned by high-pixel cameras naturally require more storage area. So the traditional back-end systems are insufficient for these high-speed production lines. Industrial computers must be improved synchronously so that the whole system can perform accurate, real-time accurate analysis of all production targets, which is essential to the whole automation control system.

With the demand for production systems becoming diversified, automation equipment must deliver high-performance, small size, and flexible design, so MIC-7500 compact fanless system was recently launched by Advantech to meet such needs. Machine vision technology has been with us for a long time, and there are several trends in machine vision. One of them is the increasing number of virtualization technologies; another is the increasing number of core processors and their speed. MIC-7500

Revolutionary Industrial PC for IoT Era

Flexible Expansion with Innovative i-Module



Modularized



Ruggedized



Customized



Performance



uses Intel's® Core™ i framework. Core™ i is designed for high performance, so it successfully meets these demands. In addition, Advantech is also developing multi-core products, different from Core™ i, with up to 4 cores. The maximum number of multi-cores is 12. The low-core and high-core systems meet the requirements of different types of machine vision systems.

Manufacturing automation control systems have similar demands in terms of power consumption, processor, memory, etc., but different demands for extensibility. Because the number of cameras, communication interface, and I/O vary widely, these variations must be designed into the product. MIC-7500 allows for different interface slots with variable expansion options built in to meet customer needs.

i-Modules Make the System More Flexible

To meet extensibility requirements, Advantech designed the MIC-7500 i-Module, which consists of the MIC-7500 plus an i-Module. Customers can select the appropriate i-Module, with slot and function card in accordance with their particular needs.

i-Module brings two resilient design advantages to system integrators and manufacturers. The first is that manufacturers can freely select the instruction cycle and slot type for the processor of the equipment. The second is that the customization design time can be shortened

from what used to take a whole year down to just three months. Because industrial computers typically have a certain amount of customization needs, this type of demand lies mainly in the choice of slot. The slot of traditional industrial computers is fixed and changing the design affects everything. i-Modules separate the processor and the slot with PCI Express as the bus, which allows customers to quickly adjust the equipment to meet customer demands. System integrators can get their products ready for testing in a very short time.

MIC-7500 is designed for automation control equipment with machine vision. Its application mainly focuses on PCB detection and electronic assembly, such as for smart phones. So going back to our initial problem, how do operators update and test 20 smart phones at the same time? Simple, design twenty USB ports on an i-Module equipped with a high-speed multi-core processor that supports synchronous multi-tasking.

Advantech points out that with the rapid expansion of automation technology, there will be expanding demands in the future, but small size, flexibility, and high performance will be continuing goals for automation equipment. Advantech will continue to observe the market and strengthen the different functions of MIC-7500 to help customers quickly develop appropriate, optimized systems. ■

Advantech's ASR-3100 presents huge business opportunities

World's Fastest Storage Server Has Arrived

Access speed is an important design consideration for current server storage systems. Advantech's ASR-3100 is the first of a new generation of storage platforms that deliver high speed, balanced operation, and flexibility.

By Minde with images provided by Advantech
Interviewed with Magic Pao, Director of Advantech Intelligent System Group

Nowadays in restaurants, the first action for diners when their meals are served is not to pick up their knife and fork but to take and upload pictures of their food. When at the gym, the songs that men and women listen too while weight training or running on the treadmill are typically not downloaded in advance; instead, they are obtained from online streaming music platforms with real-time listener selections. The popularity of various types of intelligent devices and the rapid expansion of cloud computing applications has already transformed traditional data storage modes. Numerous access-intensive apps have overwhelmed traditional computer storage technology, leading to the gradual formation of a brand new storage concept.

Only High IOPS Can Meet System Requirements

The storage needs of IT computer room systems are commonly driven by existing data traffic throughputs. Generally, enterprises categorize data into the following 3 "temperature" groups according to access frequency and demand response time: cold data, warm data, and hot data. As the category name suggests, cold data is data with the lowest access frequency, followed by warm data and then hot data, which has the highest access frequency. Hot data involves high input/output operations per second (IOPS) and often presents the biggest challenge when constructing corporate IT systems. Architects must purchase high-performance storage devices to prevent system delays during high-frequency access periods.

To handle such demand, current enterprise grade IT systems require high-intensity storage devices and Advantech's ASR-3100 is one of the best. Advantech

introduced ASR-3100 as "the world's fastest IOPS compact server", which was their original intention when developing the product specifications. With ASR-3100, Advantech has reached a new milestone in the field of server storage.

When designing "the world's fastest IOPS compact server", the first challenge the R&D team faced was that the hard disk needed to support the latest NVMe interface. Currently, storage ports have three mainstream standards; specifically, SAS, SATA, and NVMe. SAS and SATA are quite mature standards, only NVMe is a new technology. The largest difference between NVMe and SAS and SATA standards is the operating mode. When data is received from the PCIe channel, a controller is required to convert the data into SAS or SATA format, whereas the NVMe standard directly transmits data to the hard disk for access. Because NVMe does not require a controller, the data access latency is significantly less than that of SAS and SATA, and is not limited by the controller performance. Compared to SAS, which is faster than SATA, NVMe offers at least 10 times faster speed.

NVMe Speed Has Changed Everything

Advantech's high-speed ASR-3100 storage server permits a new range of applications. In the past, when limited to low IOPS, system architects had to stack multiple hard drives and scatter high level access across various hard drives. With NVMe's high access speed, ASR-3100 only needs one-tenth of the hard drives required by an SAS port for HDD performance. Therefore, the extended performance with NVM far exceeds that of a hard disk with an SAS or SATA port. For example,



in a 1U space, the installation of 16 ASR-3100 ports is equivalent to 160 SAS ports. Systems with this access performance and space ratio are well beyond the capability of previous servers.

Although the NVMe port gives ASR-3100 its high access speed, allowing a larger number of hard drives to be installed in the same space, it also causes mechanical design problems, such as the need to install 16 hard drives in a 1U space.

Considering the potential of hot swap capabilities, Advantech designed ASR-3100 with eight drives at the front of the machine and eight drives at the back, accessible via a unique lifting tray. However, because the power cord, network cable, and other connectors located at the back of the machine are likely to obstruct the withdrawing of rear hard drives, the R&D team specially designed a “cable arm” at the rear of the machine. When the cabinet is opened and pulled forward, the cable arm ensures that the cables at the back move forward together. This represents progress compared to previous methods, where the system had to be turned off before opening the cabinet to prevent the cables from detaching.

Safety and reliability were the second and third design aims. Because the chassis is lifted manually, to prevent internal components from colliding, the back part that rises upward stops first. When the operation is complete and the raised part is reset, the system closes slowly to avoid vibration, which may affect the reliability of internal components. Advantech has applied for a patent for this unique design.

The high access speed of NVMe necessitates a processor with equivalent performance. Advantech equipped ASR-3100 with two CPUs that are responsible

for a row of eight NVMe hard drives each. Although this approach seems simple, the wiring is complex. The LAN length will differ because of the differing locations, resulting in different data access times for each hard disk, which thereby affects overall performance. However, with a number of adjustments, the R&D team was able to balance the data access operations of both rows of hard drives to achieve a superior design.

Another notable feature of ASR-3100 is its flexible design. Because of diversified market demands for networks, a single interface standard can no longer meet all design requirements. Consequently, Advantech designed ASR-3100 with two expansion slots to provide system designers with sufficient application flexibility according to their needs.

Real-Time Transactions Become a Key Application

Because the design of ASR-3100 is focused on hot data processing, future applications will also emphasize this functionality. Advantech believes that real-time transactions, such as those of stock markets and retail stores, will become ASR-3100’s key application, with existing owners applying the system to their large stores located in the U.S. Consequently, when customers make credit card payments, the system will immediately send relevant data to the back-end server, and that data will be transmitted in real-time to the customer’s mobile phone to prevent credit card fraud. Besides transactions, Advantech believes that live video streaming is another application with high potential. In the future, Advantech will continue to emphasize Industry 4.0 development and support customers by providing smart technology and services that improve their market competitiveness. ■



Advantech Industry 4.0 Asia Forum

Consolidation of Resources for Industry, Government, and Academia

Advantech recently hosted the Industry 4.0 Asia Forum. This touring event showcases the latest Industry 4.0 project applications and technologies, while also bringing representatives from industry, government, and academia together to create an Industry 4.0 development blueprint aimed at consolidating resources from various industries to establish a local Industry 4.0 ecosystem.

**By Peijiun Liao with images provided by Advantech
Interview with Sherry Lin, Marketing Manager of Industrial IoT Group**

Industry 4.0 is now big business. Since Germany announced the concept to the world in 2011, the U.S., Japan, Korea, China, Taiwan, Singapore, Malaysia, and Thailand have all aligned with this smart manufacturing trend to fine-tune their industrial structure. The intention is to propel their national manufacturing infrastructures toward intelligent transformation. According to a PWC report titled “2016 Global Industry 4.0 Survey”, before 2020 the global manufacturing industry will be investing more than US\$900 billion annually in Industry 4.0. This staggering number is evidence enough of the development potential of Industry 4.0.

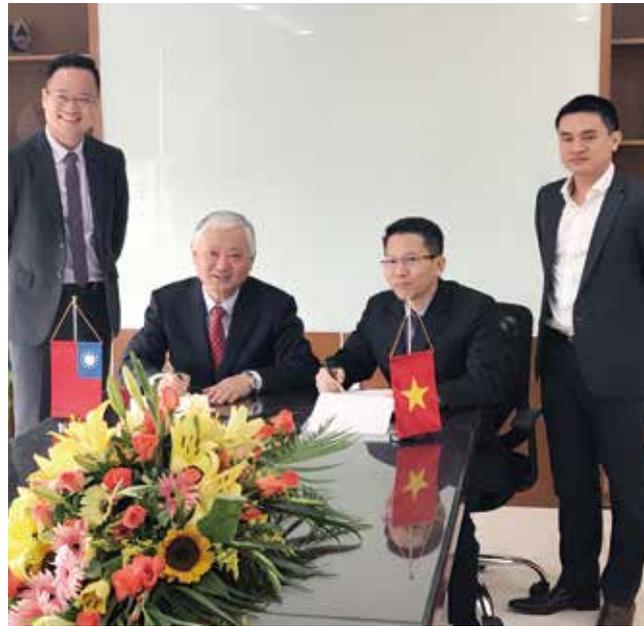
Realizing Industry 4.0: Execution and Localization

Although market demands for Industry 4.0 are high, in the six years since its introduction, only a limited number of companies have achieved successful implementation. The deployment of a smart manufacturing strategy, from conception to execution, is

not an easy task.

Industry 4.0 consolidates technologies from the manufacturing side and internal production, to external logistics and sales channels, such as the Internet of Things (IoT), big data analysis, and robotics. The aim is to link all systems and equipment and increase automation to enhance productivity and quality throughout the manufacturing value chain. Diverse production equipment that uses multiple data formats and information protocols must be able to communicate with each other. Moreover, implementing data collection and consolidation presents several challenges.

To provide a tangible example of intelligent technologies, Advantech built smart manufacturing plants in Kunshan, China, and Linkou, Taiwan, to demonstrate actual applications of Industry 4.0 concepts, from automation through to energy conservation, advanced equipment communication, data collection, production data visualization, and production workflow



optimization; all backed up with big data analysis, preventative maintenance, and service innovation.

Local Problem Solving and Environmental Circle

In addition to interconnectivity, Industry 4.0 emphasizes localization. However, the motives for developing Industry 4.0 vary substantially between countries, all of which have unique and diversified manufacturing industries. Consequently, Advantech provides not only integrated hardware and software solutions, but also problem-solving assistance in an effort to overcome the challenges of smart manufacturing and establish a localized Industry 4.0 community. The goals are to consolidate resources, connect supply chain manufacturers, and collaborate with local industries, government, universities, and relevant institutions to realize Industry 4.0 in compliance with local government strategies and development targets.

To promote the aforementioned aims, Advantech organized its Industry 4.0 Asia Forum, which toured through Malaysia, Singapore, and Korea in 2016. In 2017, the forum traveled to Thailand, followed by Japan and Vietnam. With this approach, the forum could be adjusted to the specific Industry 4.0 strategies of Advantech’s Asian partners. Every event received significant support from Advantech’s local partner companies and attracted

the attendance of more than 250 government officials, as well as numerous labor association representatives, Advantech employees, and valued customers.

Focused on strengthening its relationship with its partners, Advantech is inviting its global strategy partners, such as Intel, Microsoft, ARM, IBM, and Bosch, to share strategies for leveraging the latest technology and application solutions to generate future business opportunities. While in Malaysia, Advantech signed collaboration contracts with a machine vision and imaging company, Soda Vision, and an industrial internet safety management company, Innergia Group. In Thailand, Advantech signed a collaboration memorandum with an industry-leading systems integrator, Computer Union. Furthermore, Advantech is currently developing local industry connections, for example, with the Penang Skills Development Center and German-Malaysia Institute in Malaysia, the Ngee Ann Polytechnic in Singapore, as well as GM, while also working with various academic institutes to promote key Industry 4.0 technologies and innovations. In the future, Advantech plans to tour its Industry 4.0 Forum around Brazil, Europe, and the U.S. to further promote Industry 4.0 and encourage worldwide collaboration. ■



Jeffrey Li
Mechanical Engineering
Advantech Headquarters

Hi everybody! I am very glad to have the opportunity to introduce myself. My name is Jeffrey Li. I have worked in Advantech's mechanical engineering department for 12 years. My responsibilities include system design and integration, through which I create added value for customers. I take great pride in my work. However, I also believe that perfection does not exist - you can always do better and you can always grow. In my opinion, we should never ignore suggestions; they are opportunities.

Outside of my job, I have some special interests. On the weekends, I like to take my mind off work by going hiking. I enjoy getting away from the city and being close to nature. Breathing fresh air in the woods is supposed good for you; you can call it "forest bathing". While hiking, you can discover how a large area of grass looks like a green carpet, or see the beauty of a tree in changing light, and in the ripples in a lake. Serenity can be built in the mind that provides places of mental calm.

I hope that in the future, we can increase our mutual understanding and cooperation. Good luck! All the best!

Hi Everyone! My name is Helen Eveleigh. Based in AESC in Eindhoven, I am Sales Support Coordinator for Europe IIOT Sector. I joined the company just over 2 years ago and have had a great opportunity to grow with the company. I work with the French Market as Sales Coordinator supporting both major Key Accounts and the Channel Partners. Alongside this, I am responsible for working closely with our operations team to drive process changes within our organization and I am managing the local Sales Coordinators based in Eindhoven.

My favorite part of my job is building strong relationships with both customers, various internal departments and our team. We have many daily challenges and it is rewarding to overcome these together. We have a very multicultural international team, which creates a great working environment where we can learn from each other. Advantech is constantly changing and moving forward in both products and processes this drives us to change also as individuals. The work is varied; no two days are the same, constantly required come up with best solutions to support both our colleagues and customers.

I am originally from the UK and now settled in the Netherlands for 6 years. In my spare time I love to cook and bake, I am a member a cooking club. I love to travel; I was 2 years in Australia and South East Asia before coming to the Netherlands now I take advantage of being so close to many beautiful places in Europe that are just a short drive or flight away. I like to stay active; I run, cycle and climb, challenging myself to push my personal boundaries. My 2 years in Advantech have definitely contributed to helping me grow both professionally and personally and look forward the years ahead.



Helen Eveleigh
Sales Support Coordinator
Advantech Europe BV

Seamlessly Connect Automation Systems



ADVANTECH

Enabling an Intelligent Planet

Optimized automation with integrated PROFINET, EtherNet/IP and Modbus/TCP entry-level managed switches

- Compatible with SIMATIC step 7 and TIA portal (PROFINET compatible models)
- PROFITNET models support Media Redundancy Protocol (MRP)
- Faceplate compatible with Rockwell FactoryTalk® View (Ethernet/IP compatible models)
- Easy and fast deployment from Advantech IXM technology

PROFINET			EtherNet/IP			Modbus/TCP											
																	
<p>EKI-5528-PNMA EKI-5526/I-PN EKI-5528/I-PN 16/8 port entry-level managed switch supporting PROFINET</p>			<p>EKI-5526/I-EI EKI-5528/I-EI 16/8 port entry-level managed switch supporting EtherNet/IP</p>			<p>EKI-5526/I-MB EKI-5528/I-MB 16/8 entry-level managed switch</p>			<p>EKI-5626C/CI-PN EKI-5629C/CI-PN 16/8 + 2G combo ports entry-level managed switch supporting PROFINET</p>			<p>EKI-5626C/CI-EI EKI-5629C/CI-EI 16/8 + 2G combo ports entry-level managed switch supporting EtherNet/IP</p>			<p>EKI-5626C/CI-MB EKI-5629C/CI-MB 16/8 + 2G combo ports entry-level managed switch</p>		

Partnering for Smart City & IoT Solutions

驅動智慧城市創新 共建物聯產業典範

Industrial Cloud
& Cloud Networks

Private Cloud

iConnectivity

Transportation IoT Devices Computer On Modules Video and RFID
Power & Energy Environmental & Facility Monitoring Embedded Software
iBuilding/BEMS Industrial HMI Embedded Design-in Services Intelligent Display
Intelligent Systems iRetail & Hospitality iHospital Image & Video Processing
Machine Automation WebAccess+ Digital Healthcare Digital Logistics Industrial PCs

ADVANTECH

Enabling an Intelligent Planet

Partnering for Smart City and IoT Solutions

Advantech holds “Enabling an Intelligent Planet” as our corporate vision, and “Partnering for Smart City & IoT Solutions” is our concrete goal; we will continue collaborating with various partners to build new paradigms in each vertical field. Advantech will consistently follow our LITA (Altruistic) spirit, positively cooperating with partners and engaging in innovation to develop every Smart City opportunities.

研華科技 推動智慧城市創新 共建物聯產業典範

研華以「智能地球的推手」作為企業願景，將「驅動智慧城市創新」作為具體目標，並與各產業夥伴協同合作深耕各垂直領域，共建各式物聯產業典範，期望能持續以利他的精神，積極創新並與夥伴共創智慧城市的每一個可能。