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Please return this form to:
Converting Technical Institute
VORT Iwamotocho 1-3-4-6 Iwamoto-cho, Chiyoda-ku, Tokyo 101-0032 Japan
Phone: +81-3-3861-3858     Fax: +81-3-3861-3894     Email: econvertech@ctiweb.co.jp     Website: www.ctiweb.co.jp
Editor's Note

From February 14 to February 16, 2018, we held the Converting Technology Exhibition at Tokyo Big Sight (this year’s event included neo functional material, 3DecoTech Expo, and Printable Electronics). In the next issue we plan to include a more detailed report, but our immediate estimates indicate that the exhibition as a whole, including several other consecutively held shows, saw roughly 45,000 visitors and a significant amount of business related to equipment, material, and converting technologies linked to growth industries. During one of my more memorable conversations with an exhibitor, I was told that the spread of manufacturing in Korea, China, and other parts of East Asia has differed from its emergence in Japan. Although Korea and China are making particularly large capital investments, unlike the concept of developmental manufacturing that evolved in Japan, these investments are more focused on making what is demanded by the market at the time instead of on pursuing ways to create new markets. As such, little is done to improve upon the equipment purchased during capital investments into the latest technology of the time. In highly competitive markets where the fundamental concept is to make investments early, produce quick results, and leave when there is no further outlook for profit, there is little question that it is unlikely for companies to put down roots and improve older investments for new markets.

Many of the exhibitors and attendees with whom I spoke during the event were also focused on current market needs and existing problems in the industry as they searched through the exhibits for the materials and technologies that would respond accordingly to these areas. Meanwhile, there were also some exhibitors who had clearly shifted their approach from simply introducing technologies to showing how their technologies could develop markets in a more proposal-based approach. In short, our exhibition as a whole seems to be moving towards a more collaborative approach to introducing more comprehensive converting processes.

These changes hint at exciting new markets that are being created and a new Japan that is emerging as we head towards the 2020 Tokyo Olympics.
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The Industry’s First
Reheatable Disposable Plastic Coffee Bottle

ITO EN, LTD.
www.itoen.co.jp

Hot beverages are highly welcome on cold, winter days. But until relatively recently, consumers could only get hot drinks on the go from coffee shops and fast food restaurants in foam cups. Today, however, the convenient, recappable, transparent plastic bottles used to sell hot beverages at convenience stores allow such beverages to be carried around and have thus become more popular. In fact, a new plastic bottle first released in 2016 for green tea now allows leftover beverages to be reheated in a microwave oven, a first for the industry. Last October, ITO EN, LTD. also began selling “TULLY’S COFFEE Smooth black MEDIUM” coffee in this bottle, so we spoke with them about their reasoning for developing the new bottle and some of its features.

Popularity of Recappable, High-volume Beverages

Originally based in Seattle, Washington, Tully’s Coffee has been expanding in Japan since 2006 as Tully’s Coffee Japan, Co., Ltd., a fully-owned subsidiary of ITO EN. In 2007, ITO EN began selling Tully’s Brand products in convenience stores under the supervision of Tully’s baristas. According to the Japan Soft Drink Association, since 2007 the production volume of coffee beverages has only grown slowly, whereas ITO EN has been able to rapidly expand revenue through sales of a range of coffee products, including chilled cups, short SOT (Stay on Tab) cans, and bottle-like cans. In fact, ITO EN has seen strong growth since the period ending April 2015, during which they posted growth of 9.1% over the previous year. During the following two periods growth reached 21.2% (period ending April 2016) and 3.1% (period ending April 2017).

TULLY’S COFFEE Smooth black MEDIUM is the first product from the Tully’s brand to be sold in a plastic bottle. The bottle is unique, however, in that it can be both heated using in-store warmers at convenience stores, for example, and used to reheat the leftover coffee in a microwave oven. In fact, this is the first plastic bottle in the beverage industry to have this capability.

The trigger for the development was the voices of the consumers. According to Akihiro Murase, group leader of the Public Relations Department, purchasing rates of recappable 500 mL plastic bottle beverages that are consumed slowly over time by sipping have seen rapid growth. Until now, however, Tully’s Coffee series products were typically sold in 200 mL or less, or at most 390 mL, containers to allow for complete consumption in one sitting. These changes in consumer behavior, however, led the Customer Opinion Office at ITO EN to receive many comments stating the desire for a larger volume coffee that can be sipped.
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  *It is affirmed dust particles of 0.5 μm or larger in shaft itself are less than 100/ft³

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□ Head Office/Factory
  1 Sekizan-cho Yamanouchi Ukyo-ku Kyoto
  615-0082 Japan  TEL:+81-75-316-3300  FAX:+81-75-313-7595

□ Tokyo Office/Overseas Sales Division
  Yoshikuni Komagata Bldg. 8F 2-4-11 Komagata
  Taito-ku Tokyo 111-0043 Japan  TEL:+81-3-3847-9751  FAX:+81-3-3847-9753

□ Kyushu Office
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Japan Food Packaging Association
shokuhou.jp/

The roles undertaken by food packaging continue to expand in variety and importance, and have evolved so far as to become part of product rebranding, food loss reduction, and sustainability. In this light, the Japan Food Packaging Association (JFPA) held its November research meeting in Tokyo, during which presenters introduced packaging applications used to rebrand products with metallic films that provide a more luxurious appearance, functional packages that enable long-term food storage, environmentally friendly packages, and paper cartons utilizing universal design.

Digital Printing Enables More Than 2 Million Designs

Takashi Fukuda, Xylitol Brand Team Manager of the Lotte Co., Ltd. Marketing Division, Brand Strategy Unit, Chewing Gum Planning Office, introduced the packaging used for Lotte’s XYLITOL Gum X Mint, released in 2017. Xylitol is a natural sweetener that was certified as a food additive in 1983 by the World Health Organization (WHO) and the Food and Agricultural Organization (FAO) of the United Nations because it does not cause bacteria to produce cavity-causing acids. In 1997, Lotte kicked-off sales of XYLITOL gum, the first gum to use this sweetener, in Japan. Although the gum has sold well for the past 20 years, Lotte’s most recent data show that average consumer ages have been increasing, and that the image of the gum as being youthful and playful has faded over the years.

Therefore, on the twentieth anniversary of the gum’s release in 2017, Lotte began selling a new gum, XYLITOL Gum X Mint, targeted at younger consumers in their 20s. As part of the promotional campaign, the company printed the packages with 2 million different designs produced from combinations of different images created by 20 popular actors, athletes, pop singers, and other youth icons in their 20s. To handle the variable data required to produce the packages, TOPPAN PRINTING CO., LTD. used the HP Indigo 20000 digital printing press and HP SmartStream mosaic software. As anticipated, the new gum saw a greater number of younger consumers, primarily those in their 20s, than in the past, with many of these being first time buyers.
Initial Tests on the watergreen Flexible Packaging Water-based CI Flexo Printing Machine Lead to Unexpected Inquiries

SOBU Machinery Co., Ltd.  
www.sobukikai.co.jp

Water-based CI flexo printing machines have yet to capture a significant part of the flexible packaging market. Moreover, the few such machines employed in Japan are typically built by European manufacturers, while Japanese machinery manufacturers have been hesitant to tackle this field. Despite the uncertainty of the initiatives future, SOBU Machinery Co., Ltd. has been developing a water-based CI flexo printing machine, nicknamed “watergreen,” with the ultimate goal of flexible packaging printing. By going out of their way to take this risk, however, they have discovered some unexpected business opportunities. Several customers who have visited the research facility in which the test unit is located have even approached them about utilizing watergreen for special pattern coating, disposable diaper back sheet printing, and cardboard printing, indicating a greater potential to commercialize the machine earlier than planned. Along with developing watergreen, the company has also taken steps to expand overseas. These moves have led them to hire several foreign staff in quick succession over the past year to secure the necessary personnel, which has also helped them put in place an organization with its sights on future international business deployment.

Unexpected Applications

According to Shigeyoshi Ohtake, president of SOBU Machinery, the watergreen water-based CI flexo printing machine has become a topic of interest in the converting industry, which has led him to receive many inquiries into the progress of development wherever he goes. In fact, when they unveiled sample printings (four-color on film) during JAPAN PACK 2017, held this past October, he says they received strong encouragement from many of the visitors. As Mr. Ohtake says, “we barely completed the sample in time, but we put in our best effort, technically speaking, so the print quality assessments weren’t all that bad. We were very grateful.”

Mr. Ohtake goes on to say that although their ultimate goal is still to achieve the packaging printing quality of gravure printing, when the company began allowing customers to test the machine at their research facility this past summer, they received several proposals to use the machine for applications besides flexible packaging. For example, one of the several inquiries for special applications was flexo pattern coating using water-based coatings. “These applications differed greatly from what we had initially envisioned,
ing the internet. She had worked for a printing company in the US, and had the clear goal of joining a Japanese printing equipment manufacturer. When we first met, she was full of passion and exceptionally talented, so I decided to hire her right away.” Although they had the personnel they needed in place, they were not free from problems. “Allison Bauman is not able to speak any Japanese and at present our overseas business is not very large, so we only hired her as a contract employee for the moment. This situation, however, does not allow us to fully utilize her skills.”

Around the time they hired Allison Bauman, they also hired Tarjan Chauhan from Nepal for electrical equipment design. “Tarjan Chauhan’s background is in electrical engineering. He graduated from an overseas university, but had also worked in Japan. When I first met him through the intermediary, he had a calm, intellectual demeanor, and it may look as if we are reaching too far from a bystanders viewpoint. But I feel that simply focusing on the work that is right in front of us will only lead us gradually to hardship. If we desire to grow in the future, we must take on challenges, which requires people and cost. Naturally, we must produce results and give back to all of our employees. In this respect, having discovered unexpected needs through the watergreen test unit is a welcome miscalculation.”

“The different initiatives we are working on may not appear to suit our size, and so I hired him immediately. Besides being a skilled engineer, he has a sufficient command of Japanese and English, so has also helped us to communicate with the other foreign staff. At some point we want to put him in charge of testing watergreen, but right now we primarily have him on-site to acquire experience in electrical installations.”

“Tarjan Chauhan From Nepal Is Becoming Increasingly Familiar With On-site Electrical Installation

**Contact Type Desk-top Film-Sheet Thickness Measuring System**

**YAMABUN**

**Specifications**

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* Export permission is necessary. (Japanese Govt.)

**Measurement Screen**

**YAMABUN**

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https://www.yamabun-ele.co.jp  E-mail: yamabun@mxa.mesh.ne.jp

Exhibit

9th Film Tech JAPAN

Date: December 5-7, 2018   Venue: Makuhari Messe
Recently, texturing has become an increasingly prominent aspect of decoration technology as a means of providing products with a unique feel as well as a better appearance. In response, the CASIO COMPUTER CO., LTD. Digital Art Division developed “Mofrel,” a digital inkjet printing system that is capable of both forming textures using patterned bumps and images on a special paper “Digital Sheet” for decorating surfaces. Until now, creating raised textures on flat substrates utilized die-molds, screen printed foamed ink, or electrostatic flocking, but all of these approaches require time and cost. Mofrel, however, is able to form textures and print images on-demand, so is even able to produce product mock-ups as soon as a new idea emerges. Although the machine is only available in Japan, CASIO COMPUTER is targeting sales at automotive and home appliance manufacturer design centers and design firms.

Applying CASIO ART Technology

Mofrel is based on “CASIO ART” digital imaging technology, which CASIO COMPUTER originally developed in 2013. Like Mofrel, CASIO ART both forms the raised bumps and prints the image on a special paper. According to Masatoshi Maruyama, department head of the Digital Art Division’s Design and Technology Office, although perfecting the approach was important, when they first developed the technology they had yet to establish a specific business for it. Eventually, however, they came up with the idea of producing and selling textured art, which led them to establish the business as CASIO ART.

Initially, CASIO ART was sold as individual pieces of artwork that included manga and anime characters for which the company received the reproduction rights, and Ukiyoe prints under the CASIO brand name. Although the business was fairly successful, its scale did not achieve a level that would allow it to stand on its own.

Example of a CASIO ART Ukiyo-e Print (The Great Wave off Kanagawa, Katsushika Hokusai)

* Digital Sheet is a registered trademark of Casio Computer Co., LTD.
Founded in 1954, Nissio Gravure Co., Ltd. has provided gravure package printing and laminating services since the dawn of the gravure flexible packaging industry, and has developed and sold many unique peripheral devices to respond to the changing needs of converters over this time. Today, however, the flexible packaging industry is faced with a range of new, more serious issues, including an increasing number of high-mix low-volume jobs, shorter delivery deadlines, strict quality requirements, and pressure to lower costs. Given this situation, we spoke to Masayuki Ako, president of Nissio Gravure since 2000, about the problems faced by the flexible packaging industry and the initiatives his company has been taking as a smaller player in the field.

♦ From Bridgestone to a Flexible Packaging Gravure Printing Manager

—What was your background before becoming president of Nissio Gravure?

Mr. Ako: In 1978 I joined Bridgestone, a fairly large company, at which I intended to remain for the rest of my career. When I got married, I knew my wife was the only child of the previous president of Nissio Gravure, but I had almost no interest in her father’s company. I was involved in material development, so I was well versed in chemicals, but knew nothing about gravure printing. Her father was concerned about who would take over the company as the next president, so when his health worsened, I ended up joining Nissio Gravure as his successor in 1992. I started out as a kind of apprentice, and became president in 2000. Because my father-in-law and chairman passed away two years later, we only actually operated as an organization with both a president and chairman for two years.

♦ Uncertainty of Small and Medium Companies

—When you took over the role of president of Nissio Gravure, what did you feel were the major differences between large-scale and small-scale companies now that you had seen how both worked?

Mr. Ako: Large-scale companies basically operate with solid organizations. People are assigned to work. If you think of the bullet trains in Japan, for example, the train will still arrive at its destination on time even if the engineer is replaced. In the case of many small and medium sized business, however, work is assigned to people. This causes a problem when a specific job or skill is dependent on the individual employee. For example, the company will be fine and stable while that individual is around, but if he or she retires, that job or skill, which is kind of a black box, will also leave the company. If that happens, the technological strengths and capabilities of the company will degrade. Although we have a long history as a gravure printing company, I was aware of the instability caused by assigning work to people.
Gravure Proofing Equipment Line-up
Attachments for each machine enable for lamination

GRAVO-PROOF MULTI
Supports the greater productivity of printing machines by optimizing for small lots of jobs in all aspects from color proofing attendance up to making laminated samples.

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Also ideal for test coating

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http://www.nissio.co.jp/
Expanding the Potential for Plastic Printing and Transfer Technology Decoration

ROYAL INDUSTRY CO., LTD.
www.royal-ind.co.jp

In 1962, ROYAL INDUSTRY CO., LTD. was established to produce plastic playing cards, but has since evolved to become known widely today for its unique converting work and specialization in printing vivid colors on flexible PVC and other plastics. ROYAL INDUSTRY has also developed different types of heat transfer films used to apply images onto miscellaneous goods. More recently, the company has expanded into the automotive and home appliance industries, and now prints in-mold films, insert films, and other films used to decorate three-dimensional industrial parts. In this light, the company has continued to develop new technologies based on the transfer and plastic printing experience it has accumulated over the years. As part of their development efforts, ROYAL INDUSTRY also cooperates with companies in other industries. In one case, they jointly developed a unique transfer film used to apply a chemical plating catalyst, thus simplifying the plating process for providing products with a metallic, glossy appearance. Given his position in supporting the future of the company, we spoke to Kohei Fujimoto, general manager of ROYAL INDUSTRY, about their most recent initiatives. Mr. Fujimoto joined ROYAL INDUSTRY in 2005 after working for a gravure cylinder making company since his graduation from university.

Printing Plastic Playing Cards
When it was originally founded in Kyoto, Japan, the previous president of ROYAL INDUSTRY used sheet-fed gravure printing machines to print plastic Royal Playing Cards. In fact, the name of the company comes from these very playing cards. Eventually, their skill in printing rigid PVC using these sheet-fed gravure printing machines was recognized, and in the 1970s they began to receive jobs for printing thin, flexible PVC using their sheet-fed gravure and sheet-fed offset printing equipment. Today, the company continues to print PVC magnetic pencil cases, for example, but they now handle all of the pro-

The ROYAL INDUSTRY Name Comes From the "Royal Playing Cards" It Produced in the Past

Kohei Fujimoto, General Manager of ROYAL INDUSTRY

ROYAL INDUSTRY Produces Nearly 500,000 Magnetic Pencil Cases a Year (imaged is blurred for copyright reasons)
Developing Original Rubber Rollers
To Meet the Needs of a Diversifying Industry

MIYAKAWA ROLLER Co., Ltd.
www.miyakawa-r.co.jp

The unique functionalities of rubber rollers, an essential aspect of web and sheet handling, are difficult to discern based simply on their appearance. Yet the precision of handling webs and sheets throughout the printing, coating, laminating, slitting, and other converting processes is highly dependent on the quality and functionality of these rubber rollers. In other words, rubber rollers can be considered the basis for improving converting quality. Given the range of demands for quality and functionality from the customer, the primary goal of rubber roller producers is coming up with new concepts that meet these needs. In this light, MIYAKAWA ROLLER Co., Ltd. has developed a unique variety of rubber rollers as one of Japan’s foremost rubber roller manufacturers. We spoke to Tadayasu Miyakawa, executive vice president of MIYAKAWA ROLLER, at the company’s Tokyo sales offices about the history of the company and some of its more original concepts.

MIYAKAWA ROLLER was founded in 1927 in Tokyo as a manufacturer of the natural gum rubber rollers used in letterpress printing machines, the most commonly used printing technology at that time. Chuhachiro Miyakawa, Mr. Miyakawa’s grandfather and the founder of the original company, also served as the chairman of the Japan Roller Trade Union Confederation, hinting at the strong position of the company even then. Natural gum rubber rollers had poor weather resistance, however, so roller producers were necessarily part of the local industry and were thus located near the printing companies. After suffering major damage during World War II, his grandfather revived the company in Niigata, Japan, where he had taken refuge during the war. Later, Tadayuki Miyakawa, Mr. Miyakawa’s father and current chairman, left to establish Miyakawa Roller Manufacturing Co., Ltd. in Sendai, Japan, in 1956.

According to Mr. Miyakawa, towards the end of the 1950s and earlier 1960s, printing machines were becoming faster and synthetic rubber was starting to be used in place of natural gum for the rollers. His father, however, was a complete newcomer to synthetic rubber. As such, the source of his knowledge came entirely from rubber technology manuals. In
DPC Design Position Control System

Correct for meandering, based on pattern criteria!

Uses pattern matching
The system takes basic positions from within the entire image (such as the line, edge, pattern and text) and stores them in memory, detects web meandering and sends out correction signals.

Uses ZNCC (Zero-mean Normalized Cross-Correlation)
Stable detection is assured, even if there are variations in external light and print density.

Easy Search function
Simply specify the reference position from within the entire image and press the Search button to record the reference position in memory and start the detection.

NI SERIES
Nireco Intelligent Camera NIC100
Nireco Intelligent Panel NIP100
New Models of the "New FX" Fully Automated Laser Gravure Cylinder Making System Better Enable Users to Realize Its Benefits

THINK LABORATORY CO., LTD.
www.think-lab.com

During last February’s Converting Technology Exhibition, THINK LABORATORY CO., LTD. unveiled the latest model of its “FXIJ” water-based digital inkjet flexible packaging printing system, developed together with Kao Corporation. Although THINK LABORATORY took this occasion to kick-off its full-scale marketing activities for the FXIJ, they are also focused on further developing their “New FX Series” of fully automated laser gravure cylinder making systems, their core product. Using the standard “New FX3” line as a foundation, they have put together a lineup of upgraded models to meet the various needs of converters, printers, and cylinder makers around the world, thus enabling these users to fully utilize the system’s potential to reduce ink volumes and volatile organic compound emissions, as well as realize high-speed printing. Including new New FX Series machine orders and refitting of older “Boomerang” gravure cylinder making systems, Tatsuo Shigeta, president of THINK LABORATORY, states that international sales have already or will be installed in India, China, Indonesia, Vietnam, Taiwan, Korea, the Philippines, Malaysia, Spain, Chili, and Dubai.

New FX3 Domestic Installations

Nabe Process Corporation, a Japanese cylinder maker, installed a New FX3 at its Tokyo Branch (Kashiwa, Chiba) this past September. The New FX3 was purchased to replace an existing cylinder making line, however, so during installation Nabe Process was unable to make cylinders using their older equipment. In response, THINK LABORATORY offered Nabe
polishing units this September. This move, which is aimed at updating their existing Boomerang system, advancing automation, and reducing costs, will allow them to copper plate more than 200 cylinders per day.

**Printing at 450 m/min With DIC FINART Ink**
In collaboration with several converters and ink makers, THINK LABORATORY has been conducting various printing tests with printing cylinders made on the New FX. According to Mr. Shigeta, they have discovered several possibilities through their tests using FINART general-purpose lamination gravure inks made by DIC Corporation. For example, when DIC analyzed the results of samples printed on an ORIENT SOGYO CO., LTD. gravure printing machine at 350 m/min (175 line engraved cylinders) and at 450 m/min (250 line New FX3 cylinders), they found that there were no major differences in the tonal reproduction. In other words, cylinders made on the New FX, which have shallower cells and higher line numbers, enable a 15% reduction in gravure ink and roughly 30% higher printing speeds than engraved cylinders without sacrificing quality. Higher line numbers also produce smaller dots, which are easier to dry. This ability to print at higher speeds and reduce ink volumes will be particularly advantageous in international markets where flexible packaging is produced in longer runs.

**Cooperating on Next-generation Technological Developments**
THINK LABORATORY is also collaborating with several companies to develop next-generation flexible packaging printing and converting systems. In November of last year, for example, THINK LABORATORY spoke with Hidenori Harada, president of ORIENT SOGYO, about developing technologies to automate water-based gravure printing, lamination, water-based inkjet printing, and gravure printing cylinder replacement. Following this discussion, the two companies agreed to proceed with joint development.

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**THINK LABORATORY**

New era of new gravure Proposal.

Fully Automated Gravure Cylinder Making System

**New FX 3**

400 m/min high speed supported
25% ink reduction

improve on crawling
improve on highlights

For free cylinder making test, please contact the following contacts

**FXIJ printer. New in world. Coming soon**

**FXIJ**
Ink Jet Printer for Water Based Ink only

THINK LABORATORY Co., Ltd.

URL http://www.thinklab.com/  e-mail think@thinklab.co.jp

Head office 1201-11 Takada, Kashiwa, Chiba 277-8525, Japan
Tel +81-47143-6760 Fax +81-47146-0566
Working to Expand Water-based Printing
From the Stance of Gravure and Flexo

Chukyokagaku
www.chukyokagaku.co.jp

Compared to oil-based gravure printing, water-based gravure printing uses fewer volatile organic compounds (VOC), so began to attract attention in the early 1990s. At the time, several converters in Japan put their efforts into research and development, and eventually brought the concept into practice for flexible packaging over the next few years. Although the technology attracted further attention from the flexible packaging industry and some food producers after 2000, within 10 years interest in water-based gravure printing had faded. Despite this situation, Chukyokagaku, a converter based in Aichi, Japan, feels that water-based gravure printing holds the potential to improve the printing plant environment and may thus attract young people to the flexible packaging and gravure printing industry, a challenge that is being faced in Japan as younger people tend to avoid work that is considered dirty or dangerous. In this light, the company installed one of the latest water-based gravure printing machines in October 2017 to complement its steadily expanding water-based flexo printing business. In January 2018, the company put the machine into full operation and has been working diligently to increase the ratio of jobs printed using water-based gravure printing.

Kitashikoku Gravure Printing
www.kitashikoku-g.co.jp

Shikoku, one of the four main islands of Japan, is home to Kitashikoku Gravure Printing, a local gravure printing company and flexible packaging converter that has walked a unique path over the course of its history. As the next step in its growth, the company has taken an unusual move for a converter that has only ever worked with gravure printing. In April 2017, to expand revenue the company installed and began operating a Jet Press 540WV (originally called MJP20W) flexible packaging UV inkjet digital press sold by Fujifilm Graphic Systems (FFGS). They have also been cooperating with Kagawa University, a university in Shikoku, to eliminate defects during the production process, as a result of which they are already starting to see fewer laminated film rewinding defects. In cooperation with Shikoku Hitachi Systems, Ltd., another local company, they also updated their core business process system. Last year, Shikoku Hitachi Systems began selling this system, which was originally developed for internal use, after determining it would sell well based on its convenience. We spoke to Shikoku Gravure Printing about their unique evolution as a flexible packaging converter and their unique approach to dealing with changes in the industry at their Shikoku plant last December.

Improving Gravure Printing Machine Operational Rates

Four or five years ago, Takumi Okuda, president of Kitashikoku Gravure Printing, was on the verge of purchasing a digital printing machine. The more he listened to the comments from the manufacturer and companies that had already installed such a machine, however, he recognized that there were still technological problems. Along with the initial and running costs being high, these concerns led him to change his mind.

Takumi Okuda, President of Kitashikoku Gravure Printing

Kitashikoku Gravure Printing Headquarters and Plant
As the top gravure printing machine manufacturer, on January 13, 2018, Fuji Kikai Kogyo Co., Ltd. held an inaugural ceremony to celebrate the opening of a new office building, which was built on the site of its main plant. Approximately 140 suppliers and neighbors from Hiroshima prefecture attended the event.

At the start of the ceremonial address, Takamasa Wada, president of Fuji Kikai Kogyo, stated that “We have experienced difficult times over the years, but we have fortunately passed through these hardships and rough times to stand where we do today.”

In fact, Fuji Kikai Kogyo continues to receive a steady stream of machine orders, and annual revenues reached 16.03 billion Japanese yen last year, the highest record in its history.

Given their strong standing, the company built the new office building to further expand their production capability. Furthermore, Fuji Kikai Kogyo purchased a 16,528m² parcel of land adjacent to the head office, which will be used for a parking area and distribution center. As part of their future vision, Mr. Wada also stated their intention to consider enhancing both independent and joint development through a new technology research center.

Their head offices are located at the Hachihonmatsu plant, the manufacturing base for growth in printing machines, laminators, coaters, and machine processing. The total Hachihonmatsu plant occupies 26,000m² and is divided into seven buildings with the ability to assemble twelve 10-color gravure printing machines simultaneously. The company plans to relocate the material space to the facing warehouse so that the assembly space can be expanded to accommodate 14 machines. The coater plant and machine processing plant, where six five-face machine centers are running, are located beside the gravure printing factory. The machine centers enable the continuous processing of 70 aluminum guide rollers.

During the reception following the opening ceremony, Tatsumasa Wada, managing director and general manager of the Planning and Management Division, stated that “Our goal is to continue to build relationships of mutual dependence and respect with those in attendance.”

FUJI KIKAI KOGYO Co., Ltd.
www.fujikikai.co.jp

Tatsumasa Wada,
Managing Director of FUJI KIKAI KOGYO (currently 36 years old)
FL2 series is the latest dry laminator fully equipped with new features.

Dry laminator is mainly used for food packaging and can glue materials together with different properties, such as tin foil and plastic films. The FL2 series is equipped with a chamber doctor and LOSLES winding system. This is the latest dry laminator to bring together a range of technologies in minimizing material waste. It is easy to operate and achieve higher operating rates.

Closed chamber doctor has many advantages: no adhesive splashing, no solvent odor, easy doctor setting, fewer viscosity changes, less solvent consumption for dilution (30% less), etc.

The latest “Brush Cutter” is employed to prevent wrinkles near paper cores, which can be a cause of waste.

Direct Coupled AC Servo Motor
Eliminating the need for timing belts and reduction gears, our machine allows for precision printing cylinder phase control. The printing cylinder phase origin is the motor origin. This machine also does not require an initial registration bar or laser pointer, allowing printing to be started as soon as the printing cylinders are set.

Stable Register Precision
Equipped with the latest tension and color control, the printing machine maintains stable register precision even with conventional printing cylinders. When targeting high precision registration (±0.05 mm), we will suggest the necessary conditions for printing cylinder precision, etc.

Significantly Reduced Loss Rates
The highly functional operational control system reduces loss to within a few meters. Therefore, the product rate is nearly 100% and waste is significantly reduced.

High Operational Rate
Utilizing blank printing, free printing, and the operational management system, greatly increases operational rates, making the machine ideal for short runs.

Water-based Gravure Printing, Process Printing
By changing out the dryer and doctor, etc., the system can be used for water-based gravure printing and process printing.
Expanding the Potential for Short-run, Rapid Delivery Film Offset Printing

Links Corporation
www.links-net.co.jp

Although the high quality of gravure printing has enabled its continued domination of printing in Japan’s flexible packaging industry, gravure printing faces several problems when it comes to the increasing number of short-run printing jobs. In this light, the technological revolution in inkjet and other forms of digital printing have led some to believe that digital printing offers a better alternative for short-run printing. However, digital printing still has issues with cost and quality that have prevented its full-scale entry into the flexible packaging industry, providing offset film printing with the opportunity to begin making inroads into the film printing market.

As one example of this, Links Corporation installed a Miyakoshi Co., Ltd. film offset printing machine in 2014, which it has used to successfully expand its packaging film printing business. More recently, Links has installed laminating and slitting equipment designed to work with the offset printing machine to ensure that it will be able to respond to the increasing number of short-run jobs in the flexible packaging industry.

The Variety of Film Offset Printing Jobs Has Increased 10 Times Over the Past Three years

Special Order Dry Laminator Installed for Short-run Offset Printing Jobs

The Expanding Short-run Film Printing Market

Several years ago, Links began receiving inquiries into printing film from the paper packaging industry (paper, paper cartons, container bands, etc.) following the industry’s shift to plastic. This demand led them to consider installing an offset film printing machine given their desire to print short-runs and handle...
The world around us is full of industrial products made of relatively thin materials, including paper, textiles, plastic films, thin-film glass, nonwoven fabric, and metal foils. Although this variety shows that these materials are essential to our daily lives, they are also critical in furthering the development of high-tech industries that will eventually form the core of the global economy. Some examples from the IT, energy, and medical fields include optical films for flat panel displays, solid polymer membranes used in fuel cells, and artificial biological membranes for medical applications. During the manufacturing process, however, we call these materials webs.

Web manufacturing technology relies on the converting technologies of coating, laminating, and printing, as well as on web handling technology (here we include unwinding, slitting, cutting, drying, and rewinding, etc.). Among these, coating and printing have established themselves as cutting-edge technologies, for which academics have shown great interest. In contrast, web handling technology has conventionally been refined through production plant experience; although the technology itself has reached a fairly advanced level, its academic understanding is poor.

At the strong behest of the industry, the author has spent the past 20 years working to theoretically understand the physical phenomena related to web handling, and predicting and preventing the problems that occur during manufacturing. Our research has been studied widely in Japan by industries that utilize web handling technology, and has been praised for the help that it has provided in eliminating defects and developing new products.

On the other hand, we have also received strong interest from around the world in publishing our results in English given the desire to understand the strength of Japan's web handling technology. Given that the theoretical research into web handling began outside of Japan, we are elated to be able to publish an English version of our work as it will allow us to repay our debt to those who came before. At the same time, nothing would make us happier than to see this work contribute to the opening of new horizons for readers around the world involved in web handling technology.
Unwinding and rewinding technology is essential for handling webs as they are processed throughout the converting line and building the converted web into a precise, ideally shaped roll. Although most interest has been focused on control technology to achieve this goal, a surprisingly unrecognized aspect of web handling is the shaft and chuck used to support the roll core. In this light, HIMECS, INC. turned its attention to the issues found with the air shaft in pursuit of a unique, customized approach to manufacturing that places their customers first in order to reach a new level of customer satisfaction. We spoke to Toshihide Nakajima, representative director of HIMECS, about the company’s unique history and approach to its original roll shafts.

A Remote Control Car Tire Leads to the Air Capsule Concept

As part of his work in control, Mr. Nakajima’s father, Seiji Nakajima, visited a plant one day in 1985 and realized that although the steel air shafts used to support the roll enabled precise web handling control, they were heavy and were thus a major burden on the workers. He wondered if there was something he could do about this, and after a period of trial and error, he came up with the concept for the Air Capsule. Surprisingly, the original idea came to him while he was looking at the tire of a remote control car. After successfully applying this concept to an air shaft, the company began manufacturing and selling the Air Capsule in 1988.

According to Mr. Nakajima, the first company they delivered an Air Capsule to was a factory that produced sandpaper in Saitama, Japan. At the time, the factory was faced with frequent air shaft punctures, so they were readily accepting of the ability of the Air Capsule to smoothly overcome this problem, which was part of their reason for being the first to adopt it. HIMECS was only aware of a few potential customers to which they could sell the Air Capsule at the time, so this was also a period during which they struggled with expanding sales routes. After becoming associated with the Converting Technical Institute (the publisher of this magazine) through one of their customers, they exhibited at CMM Japan, a converting equipment related exhibition, which served as an important step in increasing the awareness of the Air Capsule. “I was in my final year of high school then,” says Mr. Nakajima, “but even now I remember participating in the event and explaining the Air Capsule to visitors at our booth.”

Problems with Lug-type Air Shafts

According to Mr. Nakajima, steel and air shafts have several hidden shortcomings. Around the time Mr. Nakajima’s father developed the Air Capsule, the most commonly used steel shafts were equipped with lugs, so if the precision of the chuck was poor, the shafts would prevent precision tension control even when using a tension control system. Moreover, because the steel shafts were heavy, users were in demand of a lightweight shaft that was easier to handle and offered high precision. In the case of lug-type air shafts, the lug essentially bites into the cardboard core to transmit torque from the shaft to the roll, so this sometimes causes problems with dust originating...
younger staff do not have enough knowledge about unwinding and rewinding, so we have installed test machines to help them learn as they research." The test machine is equipped with an unwinder and rewinder, and is able to handle webs of one ton in weight at up to 400 m/min. At this point, the company does provide testing services for outside companies, but in the future they hope to invite customers to their plants for web handling test purposes. Specifically, handling large rolls, for example, often results in dust, slippage, and deflection, so they are aiming to provide testing services that will visualize these issues.

**Overseas Business Concept**

Currently, air shafts and chucks account for 80–90% of the company’s revenue, and roll handling equipment accounts for the remaining 10–15%. Although 80% of their business stems from Japan—with the remaining 20% coming from elsewhere—Mr. Nakajima says that when considering indirect business, about 45% of their revenue comes from outside of Japan.

The company’s first overseas work was in Korea, where they expanded their sales network to reach large-scale electronics manufacturers through trading companies during the LCD television boom. These relationships remain in place, but recently they have also been expanding in Taiwan. Over the past 20 years they have also worked with a materials trading company, with whom they are now slowly developing a system by which they can outsource overseas maintenance of their shafts to the trading company.

In this vein, Mr. Nakajima says that as they put more energy into overseas expansion, the company aims to provide reliable support locally. Specifically, responding locally instead of from Japan reduces loss in a variety of ways when a problem occurs in a shaft sold overseas. Neglecting support will result in local users choosing to purchase local shafts in the future, and in some cases will result in copy-cat shafts. “We are not sure yet how far we can provide such support, but we want to be satisfied with and not regret the support system and mechanism we put together.”

One problem often faced by Japanese companies as they expand overseas is that although local users are aware that Japanese quality is good, they do not necessarily know where to get Japanese made equipment. In this way, Mr. Nakajima says expanding their business will be dependent on keeping in mind where companies are located that would be interested in their equipment.
Joining Dissimilar Plastics Using the Anchor Effect of Glass Fibers

Polyplastics Co., Ltd.
www.polyplastics.com

Dissimilar material joining technologies used to combine metals and plastic are urgently being developed given the need to light-weight automobiles. Similarly, new dissimilar plastics joining technologies must also be developed because existing approaches often result in low joint strength caused by the tendency of dissimilar plastics to have poor compatibility at the melted interface. In this light, the engineering plastics producer Polyplastics Co., Ltd. set out to solve this problem by developing a new insert molding technology that enables joining of dissimilar plastics. Called “AKI-Lock” (Advanced Knitting Integrated-Lock), this technology utilizes the anchor effect of the glass fiber (GF) in glass fiber reinforced plastic (GFRP) to enable the high strength joining of dissimilar plastic combinations that had previously been difficult to join using conventional insert molding and welding. More specifically, AKI-Lock uses lasers to expose the GF at the surface of the GFRP molded insert, which then function as a physical anchor during secondary molding. Kohshi Mioki, who is in charge of the development at the Technical Solution Center, Research and Development Division, explains that as a plastics producer they set out to develop the AKI-Lock* insert molding technology to enable the joining of previously unusable plastics so that their customers will be able to realize product developments that had been shelved.

Joining Strength and Interface Airtightness

Polyplastics produces and sells engineering plastics under product names* such as DURACON (polyacetal: POM), DURANEX (polybutylene terephthalate: PBT), DURAFIDE (polyp-henylene sulfide: PPS), and LAPEROS liquid crystal polymer: LCP). These engineering plastics are already used in automotive parts, electronic devices, camera lenses, food containers, and many other products. In this light, Polyplastics originally set out to develop the AKI-Lock* insert molding technology to expand the application fields for these plastics by enabling

*DURACON, DURANEX, DURAFIDE, LAPEROS, and AKI-Lock are registered trademarks of Polyplastics Co., Ltd.
closed ECU case was immersed in water and filled with air.

Mr. Mioki explains that AKI-Lock can join parts that could not have been joined in the past, which means it should enable companies to realize product developments that had been shelved in the past because of joint failure. In many such cases customers did not even have the option of joining dissimilar plastics because welding and insert molding had been assumed to be inapplicable. However, after explaining the new technology to their customers, Mr. Mioki says that some of them are beginning to consider using AKI-Lock to work on previously unseen product developments. In this way, he states that they feel AKI-Lock will be helpful in creating new value that cannot be achieved with any other technology.

Table 1 Standard Insert Molding Joint Strength (Unit: MPa)

<table>
<thead>
<tr>
<th>Insert</th>
<th>Secondary</th>
<th>POM</th>
<th>PBT</th>
<th>PPS</th>
<th>LCP</th>
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<tr>
<td>Glass</td>
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<tr>
<td>Fiber</td>
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<td>Reinforced</td>
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</tr>
<tr>
<td>LCP</td>
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<td>No</td>
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</table>

Table 2 AKI-Lock Equipped Insert Molding Joint Strength (Unit: MPa)

<table>
<thead>
<tr>
<th>Insert</th>
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<th>POM</th>
<th>PBT</th>
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<tr>
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JYOHOKU’s actual achievement and original technology have been highly acclaimed at home and overseas.
Indonesian Market Continues to Focus on Price Over Quality

Given the uncertain outlook for domestic demand in developed countries, the converting industry is acutely aware of trends in Southeast Asia as a new outlet for business. Similarly, many Japanese food packaging converters operate in the region with a focus on Thailand, which is assumed to be the most advanced country in the region in terms of packaging. With a population of 260 million, however, many companies feel that Indonesia is also an attractive market. In this light, PLASPAK INDONESIA, a plastics and packaging technology exhibition, was held last November along with the 30th PLASTICS & RUBBER INDONESIA at the Jakarta International Expo. The combined exhibitions covered 21,659 m², hosted 586 exhibitors from 24 countries, and saw an attendance of 12,851 visitors. Pavilions from Germany, India, Italy, Korea, and Taiwan also hinted at the strength of interest in Indonesia from Europe and Asia, in particular. Most of the exhibitors from Japan were converting machinery and equipment manufacturers, with only a few materials producers in attendance. The local subsidiaries of several trading companies represented many of the machinery exhibitors. We spoke to Ichiro Uesaka (vice president of ALTECH ASIA PACIFIC) with his in-depth knowledge of Southeast Asia about the trends of the local market.

What are some of the more recent trends in the Indonesian packaging industry?

Uesaka: Unfortunately, the industry seems to be economically weak at this point. For example, we have only seen a few of our customers post growing revenues recently, whereas somewhere around 20 other companies that we work with have recorded lower production volumes compared with the previous year. In many cases, large-scale companies generally dominate jobs because large-scale brands and large-scale converters are connected. As such, smaller brands seem to be struggling. That said, the US market is extremely strong, and some converters who take on jobs bound for the US market have seen fairly strong revenues.

What industries are driving the Indonesian market?

Uesaka: Based on the information we have collected during our sales activities, miscellaneous consumption goods targeted at Japan seem to be driving demand. This seems to have led to increasingly intense competition in terms of both quality and production volume. The current economic growth rate in Indonesia, however, is not able to absorb the growing labor force, so the resulting high unemployment rate has suppressed the purchasing strength of everyday consumers domestically. Given this situation, brands have been adopting smaller volume packages in the past for domestic sale. Despite the fact that large-scale, market leading brand owners have taken this approach, we are in a buyers market, so quality has also become a part of competing domestically in terms of differentiation. In this respect, multinational corporations are driving competition based on quality instead of price. Japanese companies are taking part in this drive, but when it comes to cosmetics, US and European multinationals hold a dominant share. As a whole, these companies are demanding better packaging quality for their products sold both at home and in foreign countries. In the case of Indonesia, demands...
China and Japan Exchange Information on Drug Regulations and Injection Technology

Aimed at facilitating drug packaging information exchange and business intercourse between Japan and China, the “2nd Japan China Drug Packaging Technology Exchange Seminar” was held this past summer. The first seminar was held in October 2016 in China. Organized jointly by the Asian Society of Innovative Packaging Technology (ASIPT) and Mitsui Chemicals, Inc., the event was held at the Mitsui Chemicals head offices, and welcomed the China National Pharmaceutical Packaging Association (CNPPA), which had come to Japan to tour a drug related exhibition. During the event, the CNPPA presented on the two topics of “Legal Regulation and Standards for Drug Packaging in China” and “Introduction to Chinese Drug Packaging and Compatibility Research.” The three presentations from Japan included “Transitions in Injection Kit Containers,” “Injection Vial Plastic Cap Development,” and “Glass Container Aluminum Elution Blocking,” which were followed by a question and answer session and dialog. Including the 35 members from China, a total of 150 individuals participated in the event, making it meaningful for those related to both markets. At the end of the event, CNPPA’s Cai Hong, an intimate friend of Hideo Miura, chairman of ASIPT, for more than 20 years, expressed her gratitude, saying “we have built the foundation for exchange between professionals in Japan and China, so I hope we can continue to build a relationship of trust between professionals in both countries.”

No Business Without Trust

At the start of the seminar, Takayoshi Shimogori, a member of the board at Mitsui Chemicals and the head of the Food & Packaging Business Sector, explains that Mitsui Chemicals is expanding its business for water-based blister sheet heat sealants used in environmentally friendly drug packaging in China. Given this connection, Mitsui Chemicals also supported the first exchange event in 2016. He goes on to say that the original event was extremely meaningful for the exchange of information related to drug packaging regulations in both Japan and China, and on blister sheet technology. Similarly, the second event also aims to help share information on the state of and latest trends in drug packaging in both Japan and China. Moreover, he states that exchange between key persons in the drug packaging industry, such as the participants, will significantly help develop the drug business between the two countries going forward.

In his opening comments, Mr. Miura states that this event has implications in terms of organizing an environment to expand and develop business exchange between Japan and China. Likewise, the event aims to stimulate discussion between the two countries and to provide information on legal restrictions from China as well as injection related technology from Japan. Although information on technology and legal regulations is important for expanding and developing business, Mr. Miura explains...
A total solution event for Vietnam’s food, drink & pharmaceutical industries
ProPak Vietnam 2018 is the largest and most international trade event for the rapidly expanding processing and packaging industries in Vietnam and Indochina. This annual event is dedicated to technology suppliers involved in the food, drink and pharmaceutical processing and packaging, plus the printing and labeling industries, bringing together thousands of industry leaders and professionals from all segments of the supply chain under one roof.
Not only sourcing the best-of-breed products and technological solutions, visitors to ProPak Vietnam 2018 will also have the opportunity to network with over 380 high-profile exhibitors from around the world, discuss potential business partnerships, as well as exchange knowledge and perspectives with a plethora of thought leaders and industry experts.

Show Title: The 13th International Processing and Packaging Exhibition and Conference for Vietnam
Date: 20 - 22 March, 2018 (Tues - Thurs), 9:00 am – 5:00 pm daily
Venue: Saigon Exhibition and Convention Center (SECC), 799 Nguyen Van Linh Parkway, District 7, Ho Chi Minh City, Vietnam
Organisers: UBM Asia

Exhibitor Profile

- Aseptic Processing & Packaging
- Automation and Robotics
- Bottling Technology
- Brewing and Beverage Technology
- Canning & Can Making
- Coding, Marking, Labelling, Printing Materials & Technology
- Confectionery Equipment
- Cosmetic & Personal Care Processing and Packaging
- Dairy & Liquid Processing Technology
- Facilities Equipment, Systems and Supplies
- Fish & Seafood Processing Technology
- Flexible Packaging Technology
- Food Ingredients, Additives & Flavourings
- Food Processing Machinery
- Food Safety & Hygiene Technology
- Laboratory, Testing & Measurement Equipment
- Logistics & Production Facility Equipment
- Machinery Controls & Components
- Materials Handling, Logistics & Storage Equipment
- Meat Processing & Packaging Technology
- Measurement & Weighing
- Packaging Accessories
- Packaging Machinery
- Packaging (Cardboard, Glass, Metal, Plastic, Paper, Wood)
- Palletizing and Conveying Equipment
- Paper & Corrugated Box Making Technology
- PET & Plastics Packaging Technologies & Materials
- Pharmaceutical Processing & Packaging
- Quality Control
- Production Machinery
- Raw Materials & Consumables
- Refrigeration Systems / Cold Storage / Air Conditioning
- Service Companies
- Solids and Bulk Handling
- Trade Publications
- Waste Management & Environmental Technology
CONG TY TNHH ALTECH CHAU A THAI BINH
DUONG VIET NAM Vietnam

Booth: E7

SAWA CORPORATION
Exhibit: Ultrasonic Gravure Cylinder Cleaner

MEISEI (Japan)
Exhibit: Viscosity controller unit, with automatic washing
MEISEI’s Automatic Viscosity controller for inks, coatings, and adhesives is the best selling system for the past 30 years, has more than 80% market share in Japan, and more than 17,000 systems has been sold so far in Japan and 19 countries. Newly developed unit with automatic washing function will be exhibited in coming Propak VN 2018.

THINK LABORATORY
Exhibit: Offline Cr Paper Polishing Unit
Cr Paper polishing unit is, for preventing from printing defects and maintaining gravure cylinder to be same best quality all the time. You can customize the angle and frequency of times to have same quality Cr surface finish. There is also a fully automated type to work with new FX3, producing 80 cylinders a day with one operator.

DAC ENGINEERING CO., LTD (Japan)
Exhibit: Web inspection system “CROSSOVER”
High performance print inspection system “CROSSOVER” is the best selling model in South East Asian countries. Controller-less unit for industry use, amazing user-friendliness, fast and easy automatic setting, newly developed special detection circuit and powerful image stabilizer, are equipped.

FUJI KIKAI KOGYO CO., LTD
Booth: H1
Fuji Kikai Kogyo Co., Ltd. is a Japanese company that leading in Rotogravure Printing Machine Manufacture and applies to wide-ranging products: various type of printing machines, laminators, coating machines and so on.
Main Products: Rotogravure Printing Press, Dry Laminator, Coating Machine, Metal Printing Machine (PRIMEX)

HAGIHARA INDUSTRIES INC
Booth: H1
Exhibit: Slitter Rewinder and Inspection Rewinder
Diplex Center Drive Slitter Rewinder “HDF-406-1300/T”, One Side Inspection Rewinder “RSS-108VI-1300”
20-22/3/2018
WWW.PROPAKVIETNAM.COM
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Many different bio-refining technologies have been developed to produce fuels and chemical products from renewable biomass resources. Of the biomass resources available for these technologies, however, Professor Junichi Hayashi of the Department of Chemical, Energy and Environmental Engineering, Faculty of Environmental and Urban Engineering at Kansai University, has turned his focus to the huge volume of bananas consumed globally. More specifically, he has set his sites on the banana peels, which account for 30–40% of the weight of the bananas, yet are currently discarded in high volumes and not used for any purpose.

By carbonizing these discarded banana peels, he has successfully developed a humidity control material that is ten times more effective than standard charcoal. Part of the reason for this advanced humidity control function is the ash component (potassium chloride) contained in banana peels, which absorbs water vapor from the air. Professor Hayashi’s research has also shown that the carbonized banana peels are able to either trap or breakdown hydrogen sulfide, a malodorous substance, and cadmium, a toxic substance. Oddly, it is this ash component, something that had been considered “trash among trash,” that Professor Hayashi feels offers significant value in discovering new potential for banana peel waste.

Banana Peels Account for 30–40% of Total Banana Weight

Many researchers are conducting research into bio-refining, but your focus on bananas is unique. How did you come to this idea?

Professor Hayashi: One day during a group discussion within the bio-refining research group that we established at Kansai University, the huge amount of discarded banana...
New Anti-fogging Treatment for Swimming Goggles Lasts Longer When Rubbed

TABATA Co., Ltd.
tabata.jp

Conventional wisdom states that swimmers must not rub their plastic swimming goggle lenses to ensure a long-term anti-fogging effect. In contrast, TABATA Co., Ltd., one of Japan’s leading manufacturers of swimming goggles, has developed a new technology that turns this wisdom on its head. Called SWIPE ANTI-FOG, this is the first technology in the world that enables swimmers to rub their goggle lenses in order to recover the anti-fogging effect. TABATA has already adopted this new technology for some of its swimming goggles that went on sale in March 2018. The timing the company chose to introduce the technology is perfect given the upcoming Tokyo Olympic and Paralympic Games, whereby TABATA hopes to increase sales of their goggles among swimmers from around the world.

Olympic Swimmers Among Customers

Utilizing underwater mask technologies originally developed for scuba diving and snorkeling, in 1975 TABATA began producing FALCON, Japan’s first domestically made swimming goggles. In 1988, they began selling VIEW Series V1 goggles, the first goggles to use a face pad made of soft plastic instead of sponge, the most commonly used face pad material at the time. In 1991, they began selling V3, the first replaceable prescription lens goggles in the world. These were a major hit at the time, selling more than 600,000 units per year. In 2004, they began selling Blade, a racing model that reduces flow resistance by 47%. On the 65th anniversary of their founding, Kenichiro Tabata, president of TABATA, states that VIEW is a brand concept that functionalizes design and has thus continued to lead to a range of new products. “In fact,” says Mr. Tabata, “of the 34 Olympic athletes from Japan that participated in swimming events at the Rio de Janeiro Olympic Games in 2016, 13 used our goggles. But our customers are not just athletes, they include everyone, including school children.”

Swimmers Provide a Hint

Over the years, the company has developed several swimming goggle anti-fogging technologies. For example, in 1985 they applied a technology similar to that for skiing goggles, which utilizes moisture absorption to prevent fogging, for their first generation of anti-fogging goggles. This treatment was insufficient, however, because water saturation eventually prevents the anti-fogging effect from functioning. Moreover, the treated surface becomes softer as it absorbs moisture, which causes the lenses to scratch more easily when rubbed.

The second generation of anti-fogging goggles, first sold in 1991, used a water-film anti-fogging treatment. In this case, the hydrophilic anti-fogging treated surface forms a film of water when it is exposed to water. Currently, this technology is now used on the swimming goggles made by many of their competitors. “This approach is not perfect either,” states Shunji Fukazawa, general manager of the Planning and Development Department. “Because the approach relies on a hydrophilic treatment, dirt tends to stick on the film and the film itself tends to dissolve in water.” As such, touching the inside surface of these second-generation goggles will diminish the anti-fogging effect.

In response, TABATA includes a warning to avoid rubbing the goggles in the user instructions and catalog. “However,”
Session 13

Plastic Surface Decoration Technology

Overview of Recent Trends and the Future Outlook for Plastic Decoration Technology and the Decoration Field

Chapter 4 Overview of Recent Trends and the Future Outlook for Plastic Decoration Technology and the Decoration Field

In the first three chapters of this series, we included as much of the latest information on decoration as possible, and provided an explanation of plastic decoration technology as a whole. Over the two years since we began this series, decoration technology has continued to evolve, and there were aspects for which we could not necessarily include the most recent information.

In this chapter, we will provide an overview of the latest in plastic decoration technology and the decoration field.

1. Latest Trends in the Overall Decoration Field

The following provides a list of the overall decoration trends in Japan of which the author is aware as of this writing (July 2016).

(1) There is an accelerating shift away from basic decoration towards functionalized decoration.
(2) There is increasing interest in paint-free (plating-free) decoration.
(3) There is now a greater potential to deploy plastic decoration to automotive exterior panels.
(4) Inkjet printing decoration is increasingly being used as a technology that is easy to apply to on-demand work.
(5) There is an increasing interest in decorating fiber-reinforced thermoplastic (FRTP).
(6) The decoration field is expanding into replaceable parts, coordinated interiors and exteriors, and cute animation characters.
(7) The world’s first plastic decoration technology exhibition was held in 2015 and The Association of Decoration Technology was relaunched in 2016, indicating greater depth in the plastic decoration field.

The following provides a general overview of each of these trends.

About the Author

In 1965, Shohei Masui began working for Sumitomo Chemical Company, Limited. Engaged in research and development of plastic materials and molding technologies, Mr. Masui was involved in the development and commercialization of glass fiber composite materials, injection press molding technology, and skin material lamination/integration molding technologies, among others. After later working for LPM Co., Ltd., Mr. Masui established the MTO Technology Research Laboratory in 2005. Today, he speaks, writes, and provides technical support to individual companies, primarily in the fields of decoration technology and CFRTP molding technologies as a technical consultant. He has provided his services globally in countries such as Taiwan, Korea, and China. He has also authored many works focused on areas related to plastic decoration techniques.
In the previous session, we covered the problems related to dust and contaminants that adhere to substrates and the need for cleaning. In this session, we will look at the different types of cleaning methods, their characteristics, and the cleaning technologies provided by RAYON INDUSTRIAL CO., LTD., along with a test result as a specific example.

Advantages and Disadvantages of Contact and Non-contact Methods

Dust, dirt, and contaminants come in a variety of sizes, weights, and shapes, so various cleaning technologies have been developed to remove these. These cleaning technologies can be broadly categorized into contact and non-contact types. Tables 1 and 2 summarize the types of cleaning technologies along with their major advantages and disadvantages.

Contact Cleaners

Contact cleaners consisting of a rubber roller with an adhesive surface are manufactured and sold by both cleaner manufacturers and rubber roller manufacturers. Although these rollers are inexpensive and easy to install, if they are used individually they hold certain risks because the rollers continue to revolve even after contaminants have adhered to their surfaces, which can potentially damage the substrate surface when the contaminants come back into contact with it. As such, these require frequent maintenance. One solution is to use a set of two rubber rollers, in which one acts as a cleaning roller and one acts as a transfer roller. This approach reduces maintenance frequency and running costs, but there are cases where the transfer roller does not fully collect the contaminants.

A further improvement to this approach is the combination of a rubber cleaning roller and an adhesive transfer tape. In this case, the adhesive tape collects almost all of the contaminants from the rubber roller, so the rubber cleaning roller remains free of contaminants and will not cause further problems. Moreover, maintenance is simple and consists primarily of removing a layer from the surface of the adhesive tape after it has collected the contaminants from the rubber roller. The adhesive tape is a consumable, however, and once it is fully used the roll must be replaced. As such, the running costs are higher to this extent.

Brush cleaners use a variety of different brush materials to brush contaminants off of the surface, enabling these to clean uneven substrate surfaces, unlike rubber rollers. The brush comes into contact with and rubs against the substrate, however, which risks damaging the substrate. Moreover, there is necessarily a gap between the bristles, so these types of cleaners are limited to cleaning large contaminants.

Other approaches use a fluid to wipe and wash off the contaminants. These fluids are mixed with chemicals to clean off various chemical substances, such as oil. This approach also includes additional costs, such as the cost of installing the washing equipment, drying after washing, and treatment of the waste cleaning fluid.

Non-contact Cleaners

In terms of contaminant removal rates, contact cleaners are believed to be more effective, but non-contact cleaners are used when contact with the substrate must be avoided. Non-con-
4. Reports on Increased Automotive Secondary Battery Separators Production and Development Status

4.1 Reports on Increased Secondary Battery Separator Production Capacity

The shift to electric vehicles in the automotive industry has been heating up around the world, leading to continued reports of expanded production of secondary battery separators. Table 3 summarizes the status of separator production. For example, forecasts show that the total production capacity of Asahi Kasei Corporation, Sumitomo Chemical Company, Limited, and Toray Industries, Inc. in 2020 will increase to 2 billion m², which is expected to cover a large share of global demand.

Asahi Kasei announced on September 28, 2015 that it would increase annual production capacity of lithium-ion battery separators (insulators) by approximately 20% to 550 million m². At an investment of roughly ¥5 billion, the company added a new production line in Huya City, Miyazaki Prefecture, Japan, and is also working to expand production at its existing facilities. These moves were in response to expanding demand from consumer electronics, such as smartphones, as

<table>
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<th>Plant Name</th>
<th>Plant Production Capacity</th>
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| Asahi Kasei Total of Moriyama/Hyuga Plants and US/Korea | 550 million m²/year as of spring 2016
  Plans to double production capacity by 2020 to 1100 million m²/year |
| Sumitomo Chemical Korea (Daegu) Plant | 100 million m²/year as of 2016
  Plans to quadruple capacity compared to 2016 by the middle of 2018 to 400 million m²/year
  Although the original expansion completion target was 2020, this has been pushed forward two years.
  The investment value is ¥20 billion. Capable of supplying battery materials for 500,000 EV.
  Plans to increase capacity to 1 million EV by 2020 |
| Toray Plant recently opened in spring 2016 in Korea | 290 million m²/year as of spring 2016
  Capacity increase of approx. 70% by 2018 to 500 million m²/year
  The investment value is ¥20 billion, but Toray has already determined that further increases will be necessary to keep up with the high demand |
| Asahi Kasei, Sumitomo Chemical, Toray Total of the three companies | Total production capacity for the three companies by 2020 is expected to increase to 2000 million m²/year
  The share of automobile secondary battery separators held by Japanese companies is high |

Note: According to the US research firm IHS Automotive, the number of EV sold globally will rapidly increase from 350,000 vehicles in 2015 to 2.56 million vehicles in 2025. In response, the market for the main component materials of lithium-ion batteries is expected to increase 2.4 times from 2015 to 2020, and by 5 times for some materials in terms of automotive batteries alone.
9. The Concept of "Assuming the Existence of Optimal Printing Conditions"

In 1994, the author left his position at a screen mask maker to join a printing equipment manufacturer, at which he was placed in charge of test printing and providing printing instructions to customers in the electronics field as a process technology supervisor. At this time, he found that having a clear standard in regard to the screen mask based on his experience at his previous position at the screen mask maker was extremely helpful. By helping the customer optimize the screen mask specifications and printing conditions using this experience, he was able to create his own standard for the screen.

About the Author

After working for the mask maker Tokyo Process Service Co., Ltd. from 1990 and the printing machine manufacturer Mirco-tec Co., Ltd. from 1994, Mr. Sano established SP-Solutions Co., Ltd. in October 2000 as a screen printing technology consulting company. Over the following 17 years, he has provided 20 companies with technological support for high-quality screen printing in the fields of plasma display panels, ceramic components, printed circuit boards, flexible devices, graphics, and decorative printing. Today, based on his “Paste Process Theory,” Mr. Sano is collaborating with mesh producers and printing equipment manufacturers to promote the standardization and improve the image and position of screen printing.
1. Introduction

Along with resistors and coils, capacitors, a type of electronic component that acts to cancel out noise and store electric charges, are one of the three major passive electronic components. Multilayer ceramic capacitors (MLCC) have a multilayer structure consisting of alternatively stacked dielectric layers, made of a ceramic material, and internal electrode layers (Fig. 1). Because of their ability to miniaturize and increase the capacities of capacitors, MLCC have become widely used in all types of electronic devices. Moreover, the increased functionality and faster communication speeds of smartphones and tablet PCs, in particular, has led to a dramatic increase in the number of MLCC packaged in these different types of devices. The rapid growth in the use of wearable devices has also increased the number of miniature MLCC produced globally on an annual basis.1

The degree of electric charge stored by capacitors can be expressed as capacitance using Equation (1).

\[ C = \varepsilon \times S / d \]  

\[ C: \text{ Capacitance (F)} \]

\[ \varepsilon: \text{ Dielectric constant (F/m)} \]

\[ S: \text{ Conductor area (m}^2\text{)} \]

\[ d: \text{ Distance between electrodes (m)} \]

As such, there are three approaches to increasing capacitance, namely:

1. Using a material with a high dielectric constant,
2. Increasing the area of the electrode, and
3. Narrowing the distance between the electrodes.

The dielectric constant 1 is a characteristic property of the material. Two low dielectric constant materials include titanium oxide and aluminum oxide, whereas one of the most widely used high dielectric constant ceramic materials for MLCC is barium titanate. The most effective means of increasing capacity, however, is to 2 increase the number of stacked dielectric layers and internal electrode layers and 3 reduce the thickness of the dielectric layers.1

Using these approaches, improvements in the material design and manufacturing process technologies have led to miniaturized and higher capacity MLCC. In this session, we will report on release films as an essential part of the MLCC manufacturing process, and look in detail at the required characteristics of these release films and the development trends.

2. Processes Using Release Films

MLCC are manufactured through the following processes:

1. The dielectric slurry (slurry) is first coated and dried onto the release layer of the release film to form a ceramic green sheet (green sheet).
Session 4
Coating Theory and Phenomenon for the Plant, Chapter 4
Nanotechnology and Coating

Professor Akira Kawai
Nagaoka University of Technology


4.1 Introduction
Microscopic particles are required to fully realize the potential of functional coatings. As we explained in Chapter 1 Section 1, as particles decrease in size and enter the microscopic region, their surface properties become the governing physical properties. Likewise, regardless of whether we are talking about solids, liquids, or gases, particles have unique properties at the microscopic scale.

In the technological fields of toner inks and pigments, which contain microscopic particles as the main component, it is important to analyze the cohesion property and adhesion behaviors of the particles. Moreover, adhesion control of microscopic particles with diameters of around 50 nm becomes important during the rinsing and lithography processes used to produce electronic devices.

At present, however, particle counting methods based on the principle of light diffusion are not sufficiently capable of detecting microscopic particles of under 50 nm in diameter that have adhered to solid substrates. In addition, photo-lithography involves several wet processes, during which development, etching, and plating defects will occur if microscopic bubbles adhere to the photoresist pattern.

Atomic force microscopes (AFM) are effective for analyzing the properties of these types of microscopic particles. AFM allow us to both utilize image observation and analyze the cohesion property and the force of interaction. In this session, we will cover the technology for observing and analyzing the cohesion property for a wide range of materials, including nano-particles, nano-bubbles, and nano-droplets.

4.2 Microscopic Particle Properties
4.2.1 Dispersion and Cohesion Analysis
In general, the adhesion and cohesion behaviors of microscopic particles can be analyzed using surface free energy, elastic modulus, and other physical properties based on the JKR and DMT theories. Therefore, we can use an AFM to measure the adsorption force between a micro-probe and PSL (polystyrene latex) nano-particles, and thereby analyze the cohesion behavior of these particles. Moreover, we can use a micro-probe to conduct a scratch test for the PSL agglomerates in order to

Figure 4.35 AFM Observation Image of 136 nm Diameter PSL Nano-particles
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Contact Information

**JAPAN/INTERNATIONAL**
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VORT Iwamotocho I, 3-4-6
Iwamotocho, Chiyoda-ku, Tokyo 101-0032, Japan
Tel: +81-3-3861-3858, Fax: +81-3-3861-3894
E-mail: econvertech@ctiweb.co.jp
URL: www.ctiweb.co.jp/eng/

**Indonesia**
PT Victory Blessings Indonesia
Franky M. Hutapea, President Director
Redwood Business Center Block A No. 5
Jl. Ganesha—Kota Deltamas,
Cikarang Pusat—Bekasi
Tel: +62-21-2909-3839, +62-21-37-1111-40
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**KOREA**
KOREA PACKAGING INSTITUTE
Yeoung Ho Kim
Lotte IT Castle 2-1313
98, Gasan Digital 2-ro, Geumcheon-Gu
Seoul, 153-803 Korea
Tel: +82-2-2026-8166
Fax: +82-2-2026-8169

**Taiwan**
Worldwide Services Co., Ltd.
Robert Yu
11F-2, No. 540
Wen Hsin Road, Section 1
Taichung, 408, Taiwan
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