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Editor's Note

After a summer in which Japan saw record temperatures and a record number of typhoon landfalls, fall seems to have finally arrived. Just as this unusual weather brings the power of nature to light and makes everyone think about the global environment, those in the converting industry have a particularly high interest in environmental initiatives in general, and in terms of materials specifically. This fact was on display everywhere at TOKYO PACK, held this past October, where ink, film, and other materials producers exhibited under the concepts of biomass and botanical. In general, however, these exhibits tended to focus on either reducing CO₂ emissions or establishing recycling systems through the use of bio-materials.

Similarly, the logistics industry is turning its attention to how packaging can be used to ship merchandise in a more environmentally-friendly manner. The cardboard boxes used to ship merchandise ordered over the internet serve as a good example. Although cardboard boxes are effective in protecting their contents, after delivery the bulkiness of cardboard boxes makes disposal and recycling difficult. As such, packaging formats used in the logistics industry offer the potential for further evolution.

In terms of printing, TOKYO PACK also saw many exhibitors display inkjet and digital printing concepts as a means of managing high-mix, low-volume production. Although these printing technologies have been applied in a practical manner for some time for printing light packaging, these exhibitions showed how digital printing has matured. In one case, for example, digitally printed packaging is coated with a special material that enables the production of food packaging that can be boiled for 30 minutes at 100°C. Other displays showed that combining digital printing with water-based inks and solvent-free lamination adhesives offers the potential to tackle the high-mix, low-volume product market while offering a new level of value.

Meanwhile, the converting industry is also starting to be affected by IoT and AI technologies. Given the fact that simply using high quality equipment and materials fails to guarantee 100% yields, these technologies are becoming essential as a means of quantifying the various phenomena that occur under different conditions, accumulating these data, and utilizing the results to forecast potential issues in advance. In this way, IoT and AI will also enable a greater degree of automation in the industry. Although such automation offers the potential to expand the use of machines and robots in place of human labor in Japan and other countries faced with serious labor shortages, such a transition would also mean a complete dependency on electric power. So we must also question the pit-falls of a fully electrified manufacturing system.
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Although it is one of the major slitter manufacturers in Japan today, Hagihara Industries Inc. was actually founded as a synthetic plastics business in 1962. As such, its entry into Japan’s slitter manufacturing industry some 24 years ago makes it a latecomer. Likewise, this position has impressed upon the company the fact that taking the same path as their competitors will place them last. From this perspective, they have pursued the development of easy to use equipment that incorporates the demands of their customers. In turn, the slitters they have developed and delivered in line with the needs of markets around the world have been highly accepted, and have driven them to the forefront of the ten or so major slitter manufacturers that hail from Japan today. They have also aggressively undertaken international expansion that has spread throughout the world. We spoke to Yoshitaka Hina and Hitoaki Tansyo of the Global Sales Division about the company’s international expansion initiatives.

First International Launch in 2011

Although the financial crisis of 2008 froze markets around the world, it had little direct effect on markets within Japan itself. However, the global downturn hit Japan’s export industries hard, which eventually led to a major economic recession in Japan as well. Ultimately, Japan’s converting industry was also strongly affected, thereby driving related companies to diversify from the domestic market to the international market. Hagihara Industries was no exception, and in 2011 the company spent a year conducting market surveys in Singapore, Malaysia, Thailand, and Indonesia. Along with making these surveys, they also marketed high-spec and Japan-targeted equipment to local companies. Although Japan-affiliated companies entrenched in these markets...
Growing Anticipation for Compact, Low Installation and Running Cost Solventless Laminators on the Light Packaging Market

Ri-tech Japan

When considering the installation of additional laminators, solventless lamination equipment offers advantages over dry lamination equipment in terms of its compact design, low installation costs, and greater environmental-friendliness. Moreover, solventless lamination equipment is able to play an important role when the primary purpose of use is light packaging. In this light, we spoke to Toshikazu Ishida of Ri-tech Japan, the exclusive agent of Italy-based Nordmeccanica—one of the leading laminator manufacturers in the world—about the latest trends in solventless lamination equipment.

Lamination Market in Europe and Japan

“As an Italian laminator manufacturing company,” says Mr. Ishida, “Nordmeccanica has found that 60% of the laminator market in Italy and the rest of Europe is solventless. This high ratio stems from the demand for solventless lamination from converters, particularly from their need to take measures to prevent environmental damage in the areas around their plants and to improve the working environment of the operators, for example. In contrast, only 7–8% of the market in Japan was solventless as recently as four to five years ago. However, the awareness of solventless lamination has started to change. For example, we have seen the number of inquiries regarding this type of equipment increase over the past four years,
Nordmeccanica also offers the Labo Combi, a test laminator designed specifically for developing adhesives, the machine is narrower (450 mm width) and slower than production models actually used by converters, which means that the test and production conditions differ during lamination. As such, there are some cases where the adhesives do not function well during actual lamination despite having been used successfully during testing. For this reason, more recently adhesives producers throughout the world have generally started to use production models to develop new adhesives. Essentially, however, we do not introduce adhesives producers to customers who have installed equipment through us. Instead, we feel that users should consult with the adhesive producers regarding the equipment they are using and the substrates with which they are working as a way of selecting the optimal adhesive. Naturally, I don’t think there is a problem with laminating substrates like CP and OP that are easy to work with, but we do not recommend that converters try to immediately work with substrates that are difficult to handle, like metallized film and aluminum. Instead, we recommend that they gain experience and develop a track record in solventless lamination by first working with easy-to-use substrates, and then move on to working closely with an adhesive producer before taking on the challenge of more difficult substrates.

**Coexisting With Dry Lamination**

“The adhesives used when laminating substrates for the purpose of providing durability to packaging for boil and retort foods, for example, are coated thickly,” explains Mr. Ishida. “Given the properties of the solventless adhesives, however, solventless laminators have difficulty in applying such thick coatings. In these types of cases where dry lamination is more suited, we feel that dry laminators should be used. Meanwhile, in cases where solventless lamination is sufficient, for example with light packaging, we feel that solventless laminators should be used because of the environmental advantages and cost reductions. In this way, the two technologies can coexist and should be used for different purposes. Likewise, although converters were able to respond to the specific environmental demands of brand owners using dry lamination alone in the past, today solventless lamination offers a potential direction for converters to thrive in the future given the environmental and cost advantages. Specifically, by using these advantages skillfully, they can promote the technology’s ability to address environment concerns and to produce profits.”
FUJI KIKAI KOGYO Enters the Final Stage of Its Gravure Printing Equipment Assembly Capacity Enhancement Projects

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

In recent years, FUJI KIKAI KOGYO Co., Ltd. has seen growth in demand for gravure printing equipment and laminators designed to produce flexible packaging from Japan, Southeast Asia, and elsewhere in the world, as well as strong demand from China for thin-film coaters designed to produce lithium-ion battery (LIB) components. As part of its move to address this demand, FUJI KIKAI KOGYO completed construction of its expanded Head Office and Hachihonmatsu Plant this past May, thereby enhancing assembly capacity, which had become a production bottleneck. In addition, they plan to complete a new logistics warehouse within the year, which will enable them to centralize their previously distributed warehousing functions and further improve efficiency.

With its sights set on the mid- to long-term over the next three to ten years, FUJI KIKAI KOGYO has been working to further ensure safety by more effectively utilizing its current plants and by optimizing personnel placement. At the same time, they have been working to further improve production efficiency and to investigate a plant organization that will enable business continuity. In the short term, however, they have been working to address the positive business environment related to gravure printing equipment, dry laminators, and coaters, which led them to begin construction of the expansion to their Head Office and Hachihonmatsu Plant in April 2016. Along with the plant expansion, they have also been investigating other aspects of a system that will best enable them to increase production capacity to meet the aforementioned demand.

Although the main goal of this move has been to expand the plant itself, in order to do so within the limited site area, in January 2017 FUJI KIKAI KOGYO began construction on a new six-story, steel frame administration building (building footprint: 750 m², total floor area: 4,134 m²). Completed later that year in November, the new administration building has allowed them to centralize the production office, design unit, development unit, general affairs division, and other divisions that had been split between the old demolished administration building and another office building. After completing this move, they were able to renovate the old empty office building, during which time they removed the floor of the second-story so that they could transfer the receiving inspection center for outsourced parts and the parts storeroom into this space. This move provided them with enough space to expand the assembly plant and install two new assembly lines, which consist of a set of rails used for final assembly. As a result, they now operate a total of 12 assembly lines and can assemble a maximum total of 12 gravure printing machines, dry laminators, and coaters at
one time. Moreover, this move has enabled the assembly and shipment of three to four standard gravure printing machines per month.

With this part of the project complete, FUJI KIKAI KOGYO entered the final stage of its expansion plans. Specifically, in June 2018 they began building a steel frame single-story structure on a 14,700 m² site on a neighboring piece of land they purchased earlier. When this structure is completed at the end of November, it will serve as a 2,998 m² logistics warehouse that will ensure stable parts supply, allow them to adopt just-in-time (JIT) production, and eliminate the warehousing costs of renting from outside warehousing service providers.
Aiming for Growth in an Evolving Market by Realizing High-order Processing, Aggressively Adopting Automation, and Revamping Approaches to Personnel

Okura Industrial Co., Ltd.
www.okr-ind.co.jp

As a supplier of flexible packaging films, optical films, agricultural films, and a wide range of other films for sectors across the board, led by Susumu Kanda, Okura Industrial Co., Ltd. launched a new business structure this past March that covers a wider range of engineering and manufacturing aspects, automation, and a new approach to personnel. Throughout his nearly 40 year history in sectors related to the company’s Plastic Film Division, Mr. Kanda has contributed to the growth of this Division by aggressively incorporating new technologies and businesses, and by playing a leading role in the expansion of the scope of business for their shrink films, one of their mainstay products. In this light, we spoke to Mr. Kanda about the strengths of the company, the future development themes being undertaken by the Plastic Film Division, and the Division’s future outlook.

Majority of Products Are Customized

Counting from the founding of its predecessor in 1947, Okura Industrial entered its 71st year in business in 2018. Primarily involved in housing related sectors at the time of its founding, Okura Industrial took its current name after it began to produce and convert polyester (PE) films in 1955. At present, Okura Industrial is based on three core divisions: the Plastic Film Division, which primarily produces and converts films for flexible packaging, industrial materials, and agricultural materials; the New Materials Division, which supplies functional materials like optical films to sectors that are expected to grow in the future, including electronics and IT, automobiles, and medicine and healthcare; and the Housing Materials Division, which supplies core products like particleboard.

Unlike the previous president and current chairman, Kazunori Takahama, who established the New Materials Division and led its growth into a core business for Okura Industrial, Mr. Kanda primarily developed his career within the Plastic Film Division following his hiring by the company in 1977. Based on his experience over his time in this Division, this past March Mr. Kanda established a new structure for the company that includes engineers with expertise that lies outside these three core divisions, a focus on automation, and a new approach to personnel.

“I think that one of our greatest strengths,” says Mr. Kanda, “is the experience that we have accumulated in working with customers from an extremely diverse range of industries over our roughly 70 years of history. The demands for quality and...
As a manufacturer of extrusion coating lines, sheet lines, cast film lines, and blown film lines, Sumitomo Heavy Industries Modern, Ltd. (SHI Modern) boasts one of the strongest sales records in Japan for film and sheet forming lines. Although the company’s strength lies primarily in machines designed to produce food packaging films, more recently the company completed an update to its Technical Center located at its Headquarters Plant in 2017 to address new demands stemming from the continuous growth in advanced films. By updating all of the extrusion machinery, dies, and other equipment at the Center, the company has enhanced its ability to undertake a greater range of testing requests. Moreover, this past June the company also expanded its Futtsu Plant, one of its production bases. With the new plant online, they are now able to assemble large-scale blown film lines in-house and test the performance of the equipment before shipment to the customer. In this way, SHI Modern has established a system that allows them to provide a higher level of service than in the past in all areas, from support for developing new products to putting production lines into operation. Given his goals of fully capturing the growing demand for extrusion related equipment on the Asian market and drastically expanding business, we spoke to Yukio Kurokawa, president of SHI Modern, about the company’s current initiatives and future outlook.

**Strong Outlook for Achieving ¥7 Billion in Sales This Fiscal Year**

In its three-year medium-term management plan formulated in 2017, SHI Modern indicated its intent to grow sales from the ¥6 billion it recorded in FY2016 to ¥8.0 billion in FY2019. “As of September 2018,” explains Mr. Kurokawa, “SHI Modern’s core business is based on building and delivering equipment used to produce general-purpose food packaging. Given that this type of equipment accounts for 40–50% of our total sales, it will remain unchanged as a core segment. But we have seen rapid expansion in the demand for advanced film related equipment, including machines for producing the process films used in the electronics, display, and construction fields as protective films, as well as machines for producing laminated lithium-ion battery sealant films. In fact, the pace of growth looks as though it will drive demand for these types of machines beyond that for food packaging related machines in the future.”

SHI Modern primarily does business in Southeast Asia, Japan, and elsewhere in East Asia, where it has segmented this region into two different target categories. In terms of Southeast Asia and the surrounding region, where populations are large and lifestyles are rapidly undergoing modernization, the company’s main area of focus is food packaging related equipment. Meanwhile in terms of the East Asian market, which includes Japan, China, Korea, and Taiwan, it is putting its energy into capturing the needs for advanced film production facilities given this region’s focus on advanced technologies for displays, batteries, and high-barrier food packaging.

“Currently, the market for extrusion coating lines in both Japan and the rest of the world is unquestionably growing,” says Mr. Kurokawa, “so we feel that building a system that can firmly incorporate this demand is essential for us to achieve

Yukio Kurokawa, President of Sumitomo Heavy Industries Modern: “Despite the attention placed on our ambitious medium-term targets, we must not pursue numbers alone. Instead, we must work to achieve these targets by realizing greater technical capability and by offering a higher level of quality in service”
SPECIAL INVITATION

A PAMERINDO INDONESIA TRADE EVENT

PLASPAK INDONESIA 2018

THE 5th INTERNATIONAL FOR THE PLASTICS PACKAGING AND PRINTING INDUSTRIES

14 - 17 NOVEMBER 2018

JAKARTA INTERNATIONAL EXPO KEMAYORAN

This is only a small sample of the hundreds of new products which will be on display at the show. It is based on information provided by exhibitors as at September 5, 2018.

Note: this list is NOT comprehensive
PlasPak Indonesia provides a dedicated specialist platform for packaging technology and solution suppliers targeting the largest sector within Indonesia’s plastics industry.

“Trends and Opportunities in the Indonesian Packaging Industry: Analysis of changing packaging trends in the Food, Cosmetics and Toiletries, Beverages and Other Industries” magnify the decision making potentiality and helps to create an effective counter strategies to gain competitive advantage.

The Indonesian Packaging market was valued at 101,232.4 million units in 2016 and is estimated to grow at a CAGR of 5.2% to reach 130,325.8 million units in 2021. Flexible Packaging is the largest packaging type accounting for 42,538.6 million units 2016, while Rigid Plastics is estimated to witness the highest CAGR of 7.7% during 2016-2021. Strong favorable demographic factors such as increasing disposable income levels and spending capabilities, rising consumer awareness and a hectic lifestyle of busy professionals are driving the growth of the packaging industry in Indonesia.

Source: Orbis Research

Exhibitor Profile

- Additives
- Bag and sack making equipment
- Coding, marking and printing equipment
- Cutting machines
- Embossing Equipment
- Extruders
- Extrusion Lines
- Flexible Packaging
- Flexographic and rotogravure printing technology
- Labellers/labels
- Laminating technology
- Mixers
- Packaging Materials
- Palletizers
- Plastic Packaging
- Plastic Packaging Machinery
- Preprocessing
- Presses
- Quality Control & Testing
- Robotics and automation systems
- Slitter rewinders
- Thermoforming
- Thermoplastics
- Winding Equipment

Focused Exhibitors

ALTECH ASIA PACIFIC INDONESIA PT
Booth No. D-8518
ALTECH, based in Japan, China, Thailand, Vietnam and INDONESIA, connects leading technology innovators with leading converters in plastic & rubber processing industries, with reliable local technical support. We are exhibiting many ACTUAL DEMO UNITS, or the latest information, from following partners from JAPAN: - 100% Camera Inspection System: from DAC ENGINEERING, JAPAN - Viscosity Controller: from MEISEI CORPORATION, JAPAN - Ozone Generator: from MUSASHINO KIKAI, JAPAN - Extrusion Laminator: from MUSHINO KIKAI, JAPAN - Ultrasonic Cylinder / Anilox Cleaner: from SAWA CORPORATION, JAPAN

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JYOHOKU’s Wide Experience,
And High Precision Processing Technology

T-Die for Extrusion Coating

JYOHOKU’s actual achievement and original technology have been highly acclaimed at home and overseas.
Interest Shifts to Environmentally-friendly Packaging and High-mix, Low-volume Digital Printing at TOKYO PACK 2018

TOKYO PACK 2018 Report

Held from October 2nd to October 5th, 2018, at Tokyo Big Sight, TOKYO PACK 2018 hosted many exhibitors who focused on the growing awareness of the environment under the theme “Let’s Create Packaging for All Our Tomorrows.” Although the exhibits under this theme attracted significant interest, digital printing with its ability to effectively handle high-mix, low-volume production was another strong draw for visitors. As a result, the total number of visitors to the four day event reached 62,488, of which 3,881 came from outside Japan.

Also on display during the event were the winners of the Japan Packaging Contest, which is held each year to promote the development and spread of high-quality packages and packaging techniques. The following introduces a few of the winners whose products are expected to contribute to the development of packaging that pursues ecology, convenience, and design.

aibo Package
(Minister of Economy, Trade and Industry Award)

Many people in Japan and around the world are familiar with the aibo AI robot dog, but during this event it was the package in which aibo is sold that was so unusual. Unlike standard packaging, Aibo is sold in a package designed to create the impression of a birth and an encounter with new life at the moment the package is opened. The package is also made from materials of which 50% originated from recycled plastic (PET) bottles as a future image of packaging.

Uncrushed Cushioning Partition Using the Springiness of Cardboard
(Director of General, Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry Award)

WASHLETS, advanced toilet seats with an array of functions until recently only sold in Japan, are now exported to countries around the world in cardboard boxes. Given the sophisticated nature of these WASHLETS, their cardboard shipping boxes must be able to protect and deliver these sophisticated electronic devices despite sometimes severe transport conditions. In general, cardboard boxes absorb impact by collapsing, and thus lose their shock absorption property over time. In contrast, this new cardboard box is designed with a folded over-
Stand-out Packaging Configurations That Fuse Packaging Technologies With Packaging Materials

Packaging technologies and packaging materials are always paired, and thus serve as a mirror that reflects the comprehensive needs of the market. In fact, successful results of this pairing create a strong sense of presence on the market. In this light, the International Food Machinery & Technology Exhibition (FOOMA JAPAN 2018), held at Tokyo Big Sight from June 12 to June 15, presented several outstanding examples of this fusion of materials and technologies, thereby hinting at the extended potential of packaging configurations for the future. This report introduces a few of the more surprising products on display at the Taisei Lamick Co., Ltd., Omori Machinery Co., Ltd., CKD Corporation, Sanyo Gravure Co., Ltd., and KYOWA Limited booths.

Specialized Retort Films for DANGAN

Taisei Lamick displayed its retort films designed specifically for the DANGAN pouch forming, liquid filling, and sealing equipment. These films are made by dry laminating layers of LLDPE having an excellent low-temperature seal property, and are used for making small liquid-filled pouches that can withstand retort treatments at 120°C. These films are also available in transparent and aluminum film laminated grades.

One issue that arises when filling small pouches with salad dressings, sauces, and other liquids that contain tiny solids is heat seal contamination. Although these solids often become trapped in the heat seal section, the small size of the pouches means that such contamination rarely affects the heat seal strength. The problem, however, is the poor appearance that results from this contamination. Therefore, Taisei Lamick equipped DANGAN with an ultrasonic type squeeze board that emits ultrasonic waves from behind the pouches after the contents are filled and just before the pouch is heat sealed. As a result, these waves force the solids towards the top of the liquid, and thereby prevent them from traveling downwards towards the seal section. In this way, the solids, like sesame seeds or basil, are unable to reach and contaminate the seal section. This unit was on demonstration during the event. However, the results of the ultrasonic waves have not been observed for all types and sizes of solids.

Liquid-filled Packaging Samples Made From Retort Films (seasonings, sauces, porridge, etc.)
BON CURRY, the world’s first commercially available retort food, welcomed its 50th anniversary in February 2018. As one of Otsuka Foods Co., Ltd.’s top-selling brands, BON CURRY still boasts deep-rooted popularity even today. Although BON CURRY was originally developed under the concept of a single-serving curry that could be prepared by anyone simply by heating in boiling water, with the increased use of microwave ovens, the trend in individual family members eating different meals at the same time, the increase in double-income households, and other changes in society, BON CURRY has undergone many changes in flavor and cooking methods over the years. Throughout its 50 year history, Otsuka Foods’ development of BON CURRY has been infused with the desire to produce safe, worry-free, delicious foods. We recently spoke to Chiaki Nakashima of the Product Marketing Department, Ichiro Komatsu of the Food Development Office, and Kazuhiko Horiuchi of the Public Relations Office about the technological revolution that has occurred alongside BON CURRY since 1968 when it was first sold, as well as the future of the retort food market.

Recognizing the Need for Single-serving Curry From Curry Sold by Weight

Otsuka Foods got its start in the curry business when it acquired a stake in an Osaka-based producer of curry powder in 1964. As a medical business, this move into the food industry was a completely new endeavor for the Group. Moreover, they were entering a field where there were already many competing companies that offered curry at the time. As such, they needed to take a previously unseen, revolutionary approach to product development.

“At this time,” says Ms. Nakashima, “curry was popular throughout Japan and was primarily made from scratch using solid roux or curry powder. At the outset of development, the person in charge of creating the new product came across an article about a vacuum packaged sausage used as a portable military ration in Modern Package, a US packaging related trade magazine. Taking a hint from this article, he came up with the idea of filling single-servings of curry into pouches and sterilizing the curry for long-term storage at room temperature.”

At the time, curry was generally
FLAT EXPANDER

Wrinkle Removal Roller
This straight, non-bowed roller removes wrinkles without applying any deflection to the web. The roller does not cause any excessive stretching in the web center or sagging at the edges, as often seen with bowed rollers.

Wrinkle Removal Principle

Tighten the adjusting bolt at web Leading Edge A and loosen bolt at web Trailing Edge B. In this way, the rubber cord will contract at Point A and extend at Point B as the roller rotates. As such, the web wrapped over the roller at Point C will expand at Point D to remove the wrinkles from the web.

Flat Expander (FE)
This is a straight, non-bowed rubber band type wrinkle removal roller.

Miravo (MRV)
This wrinkle removal roller consists of a straight, non-bowed roller.

Applicable Machinery

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株式会社 三橋製作所 MITSUHASHI CORPORATION

□ Head Office/Factory
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Due to product improvements, please note we may make changes without prior notification.
The engine driving the printing market has fully shifted from offset to digital. Although offset printing continues to play a major role in the printing industry, with the rise of digital printing it will no longer serve as the lead. Held from July 26 to July 31 in Tokyo, the International Graphic Arts Show (IGAS) served to cement this image in the minds of its 55,863 visitors. Unlike previous shows, however, digital printing exhibitors went beyond simply displaying hardware as they shifted their focus to displaying how this technology can create new markets. In particular, these displays hinted at the emergence of at least one growth market for digital printing—packaging. In fact, everywhere one looked during the event, exhibitors were offering concepts for the paper packaging market in the near future and the flexible packaging market further down the road. As demonstrated by the event, flexible package printing also stands to serve as a nexus for the technologies of digital, inkjet, biomass, and electron beam curing. In this light, we covered some of the more forward-looking concepts for digital printing applications, environmental inks, and offset printing inks on display during IGAS2018.

Water-based Inkjet Inks

Kao Corporation

Several of the inkjet printing presses already using Kao’s LUNAJET water-based inkjet pigment inks include MasterMind Inc. compact desktop printers and wide-format printers, IWAT-SU ELECTRIC CO., LTD. Label Meister EM-250H digital label printers.

Printed Film Samples: The Three Samples on the Left Were Printed With LUNAJET and the Two Samples on the Right Were Printed on a Liquid Toner HP Indigo 20000

Attractive Water-based LUNAJET Colors
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.

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**NI SERIES**
Nireco Intelligent Camera NIC100
Nireco Intelligent Panel NIP100
During IGAS2018, Miyakoshi Printing Machinery, Co., Ltd. (Miyakoshi) displayed a demonstration model of its MJP30AXF, a new water-based inkjet printer that the company is currently developing for flexible packaging printing applications. With their sights set on reverse printing jobs, Miyakoshi is working to deliver a 5-color printing press that utilizes CMYK and a double layer of white (WW) for an improved concealing property. During the event, they also demonstrated the machine at a printing speed of 70 m/min., displaying its higher level of productivity than conventional digital printing machines.

Miyakoshi has worked on several digital printing technologies for use in the flexible packaging industry, including the MJP20W full-color LED-UV inkjet printer that they jointly developed with FUJIFILM Corporation. More recently, Miyakoshi announced that they are also working on the development of the MDP2500, an electrographic digital press that uses liquid toner. As explained by the representative, the water-based MJ-P30AXF inkjet printer, which they unveiled during the event, is currently being developed for the purpose of establishing a lineup of various types of printing machines intended to enable them to deliver the optimal digital technology for the individual user. For example, water-based inkjet printing offers a greater level of safety, which they expect will attract interest from the food packaging printing field.

Moreover, the MJP30AXF utilizes a next-generation KYO-CERA Corporation printhead with excellent deposition reliability, which enables higher printing speeds than the MJP20W and the MDP2500, which currently only has a maximum printing speed of 50 m/min. To highlight this capability, Miyakoshi demonstrated the MJP30AXF at 70 m/min. during the event. The maximum feed rate listed on the specifications is 100 m/min, indicating an outlook for even higher speeds, although the top printing speed has yet to be determined. Meanwhile, the printing resolution is $1,200 \times 1,200$ dpi, the maximum substrate width is 775 mm, the print width is 495–750, and the substrate thickness is 12–150 μm. At present, the machine is...
being tested using PP and PET film substrates.

According to the representative, the most common approach to applying digital equipment to flexible packaging printing today is based on the concept of printing ultra-short runs of under 3,000 meters in length as a replacement for gravure printing. Although the MJ-P30AXF is naturally able to handle such ultra-short runs, it is also being designed with the performance to cover runs in the short- to medium-run range.

In order to achieve this goal, the MJ-P30AXF is equipped with an inline corona treatment system, a primer applicator consisting of a flexo coating unit and an infrared heater, and a new drying method that ensures a lower-temperature and longer drying time than the heater drums typically used for drying in water-based inkjet printing. In this way, they have successfully increased the anchorage of the ink on films and synthetic paper. They also adopted a 5-color printing (CMYK + WW) configuration, where two layers of solid white are printed in order to realize a higher level of concealment and more vivid colors during reverse printing.

The representative says that their display during the show was focused on exhibiting the technological aspects, which have currently been developed to a level where they can now print film samples. However, he goes on to say that it will likely still be several years before they formally introduce the MJ-P30AXF to the market given the need for further development. For example, although the double white approach has been fairly successful in improving the concealing property at this point, the representative says that there is still room for further improvements. In addition, they still need to investigate the lamination strength.

To promote its most recent initiatives related to the future of flexible packaging, during the event Miyakoshi also announced a private show for the fall regarding a semi-rotary offset press designed to print thin-film flexible packaging and a private show for the winter regarding a 1,300 mm wide water-based flexo rotary press. According to the representative, the water-based flexo printing press is a stack-type, and is designed with specifications that are specialized for a particular job.

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

<table>
<thead>
<tr>
<th>Specifications</th>
<th>TOF-4R</th>
<th>TOF-5R</th>
<th>TOF-6R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement length</td>
<td>10-10,000 mm</td>
<td>10-10,000 mm</td>
<td>10-10,000 mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>AC 100-240V ± 10% 50/60 Hz</td>
<td>AC 100-240V ± 10% 50/60 Hz</td>
<td>AC 100-240V ± 10% 50/60 Hz</td>
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<tr>
<td>Temperature/Humidity</td>
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<td>10-40 ℃ / 35-80 % (no condensation)</td>
<td>10-40 ℃ / 35-80 % (no condensation)</td>
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<tr>
<td>Resolution</td>
<td>0.5 µm</td>
<td>1.0 µm</td>
<td>0.1 µm</td>
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<tr>
<td>Accuracy set (20℃)</td>
<td>±2.0 µm</td>
<td>±(0.8±0.1) µm</td>
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<td>Measuring force</td>
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<td>0.8 N or less</td>
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<tr>
<td>Measurement range</td>
<td>0.03-3 mm</td>
<td>0.02-0.2 mm</td>
<td>5-100 µm</td>
</tr>
</tbody>
</table>

Precise Thickness Measurement and Control

YAMABUN Electronics Co., Ltd.
2-13, Shinjonishi, Higashi-osaka, Osaka 578-0964, Japan
TEL. +81-6-6745-3048  FAX. +81-6-6745-8482
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Exhibit
9th Film Tech JAPAN
Date: December 5-7, 2018  Venue: Makuhari Messe
Our booth number :17-42
Introducing Two New Prepress Products for the Transition to Factory Automation in Japan's Printing Industry

Agfa-Gevaert Japan, Ltd.
NISHIKAWA Co., Ltd.
www.apogee-users.jp
www.nishikawa-gr.com

One of the major themes during drupa 2016 was Print 4.0, in other words the application of Industry 4.0 to the field of printing. In a similar vein, one of the challenges being faced by the printing industry in Japan is the introduction of smart factories. As one approach to this issue, during the first day of IGAS2018 Agfa-Gevaert Japan, Ltd. announced that NISHIKAWA Co., Ltd. will be the first business in Japan to adopt AutoPilot, a new expansion module for the Apogee Drive file storage service offered by Agfa Graphics. Similarly, NISHIKAWA will also be the first company in Japan to install an Expert Loader, a unit designed to automate pallet loading in the CTP process. During the press conference, Seiichi Nishikawa, president of NISHIKAWA, expressed their desire to move ahead with prepress factory automation by including these two new options together with the Agfa Graphics equipment that they already operate.

Labor Saving Processes Are Essential for Survival

During IGAS2018, Agfa-Gevaert Japan designed its display around the concept of prepress factory automation and announced two new products, namely the AutoPilot cloud system and Expert Loader for automating CTP pallet loading. In this way, they promoted the company’s focus on advancing Print 4.0 and providing support for factory automation.

Meanwhile, as the core of the NISHIKAWA Group, which offers planning and production services for all types of information media, NISHIKAWA is primarily focused on commercial printing. The other three companies in the Group—NEXMEDIA Co., Ltd., GAO-COMPANY Inc., and NISHIKAWA PRINTING—produce sales promotion campaigns in the Tama region of Tokyo, as well as provide planning and production services in support of local communities; handle 3DCG and animation production; and provide printing and converting services for commercial material, respectively.

Frederik Dehing, vice president of Agfa Graphics (Belgium), was also in attendance during the joint announcement. He commented that the purchase of these two products by the NISHIKAWA Group is the core of a move aimed at transforming its printing plants into smart factories. As such, Agfa Graphics sees it as their role to fully support this move. Similarly, Katsuhiro Okamoto, general manager of Marketing at Agfa-Gevaert Japan, explained that the printing industry today is faced with labor shortages and employment difficulties. Which, he states, will require companies to adopt labor saving
Energy-conserving Wastewater Treatment System for the Water-based Flexo Printing Industry

Cosmotech Co., Ltd.
www.cosmotech-jp.com

Water-based flexo printing has recently attracted attention as a more appropriate printing method for items like disposable diaper backsheet films. In response to the growing presence of flexo printing, Cosmotech Co., Ltd., a manufacturer of printing related equipment, took advantage of IGAS2018 as an opportunity to exhibit a treatment system for water-based flexo ink wastewater, a type of industrial waste. Comprised of the company’s FRIENDLY water-soluble wastewater treatment system and their NON-OIL200 simple emulsion wastewater treatment system, the combined system first extracts solids and other ink components from the wastewater, after which it separates out a concentrated liquid waste, thereby enabling the remaining treated water to be either reused or disposed of as sewage. In some cases, the system can even reduce the volume of industrial wastewater generated per day that must be disposed of accordingly to about one-sixth the volume.

Water-soluble wastewater contains chemical substances such as dissolved pigments, dyes and other colorants, resins, surfactants, additives, and oil, so this type of wastewater is typically handled as industrial waste. In response, the FRIENDLY water-soluble wastewater treatment system was designed to separate water-soluble wastewater into a concentrated liquid waste that contains a high concentration of dissolved chem-

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**Flexo Printing Wastewater Treatment System Consisting of NON-OIL200 and FRIENDLY**

![Diagram of the wastewater treatment system](image-url)
In the fall of 2017, major convenience store chains in Japan began selling products packaged in flexible packaging printed with gravure inks made in part from renewable biomass resins. Although this trend has been limited to Japan, many of Japan’s ink producers have applied for and obtained Japan Organics Recycling Association Biomass Mark certification. One of these companies, TOYO INK CO., LTD. (formerly Toyo Ink Manufacturing Co., Ltd.) has been involved with environmentally-friendly inks for many years, and has commercialized several inks that reflect interest in the environment, including water-based gravure inks, water-based flexo inks, electron beam curing inks, and biodegradable gravure inks. In fact, the company drew up an approach to realizing a low-carbon society nearly 10 years ago that included the concept of biomass inks made from natural materials and that were free from fossil-based components. As an extension of this concept, in April 2016 they succeeded in using biomass resins to produce a reverse printing gravure ink for lamination, the most commonly used type of ink for flexible packaging in Japan. Later, in the summer of 2016, TOYO INK began selling this ink under the name LB BIO in the Hokuriku region of Japan. Although the company has faced criticism in that switching to biomass inks alone will do little to increase the extent of biomass used in flexible packaging as a whole, as the world is increasingly faced with the urgent challenges of petroleum exhaustion and global warming, TOYO INK sees biomass inks as a doorway to attracting the attention of consumers to biomass. In other words, ink will serve as an eye-catching approach to bringing about action to the challenges faced by the global environment.

Petroleum Exhaustion and Global Warming

The global business conditions encompassing flexible packaging are not necessarily working to the advantage of Japanese industry. Rather, all types of one-way disposable plastic containers and flexible packaging are lumped together, and regularly receive negative news in the media. Exacerbating the negative impression of these is the Paris Agreement, which was adopted during the 2015 United Nations Climate Change Conference (COP21), held from November to December 2015. Specifically, the Paris Agreement is designed to implement global measures aimed at mitigating climate change with the long-term target of keeping the average global temperature rise to 2°C, and if possible, below 1.5°C. A major part of doing so will require reducing the use of petroleum-based products, like plastic films, extrusion resin, adhesives, PSAs, release agents, coatings, inks, and other chemicals, despite their importance to supporting human activity, because their production relies on fossil-fuel energy sources that emit carbon dioxide (CO₂), such as coal, petroleum, and natural gas. On the other hand, these petroleum-based products also face the persistent risk of resource exhaustion. Although it manufactures some of the most advanced packaging in the world, Japan actually lacks these resources, meaning that it is faced with the challenge of both managing resource-related risks and working to reduce CO₂ emissions. As such, both the government and private companies in Japan have made some of the most daring promises to the world.
Biomass-sourced PP YUPOGREEN to be Released in FY2018

YUPO CORPORATION
japan.yupo.com

One of the most common uses for synthetic paper made of plastic in Japan is election posters and national election voting forms, but in more recent years synthetic paper has made deep inroads into other markets in recognition of its capabilities, which differ significantly from standard paper and film. Just a few of the items for which synthetic paper is used today include banners, hiking maps, bathtub-use picture books, hazard maps, clean room adhesive rollers, and in-mold labels for health care bottles. As the manufacturer of YUPO synthetic paper and the largest producer of synthetic paper in Japan, YUPO CORPORATION held a printing and converting gathering for 300 attendees in Tokyo this past May, during which they announced YUPOGREEN, a new type of YUPO made using biomass-sourced resin. YUPOGREEN is scheduled for release during FY2018. At the same time, they also revealed their direction in commercializing the next-generation of synthetic paper for use with standard offset printing inks for double-sided printing, for example. In light of this expected growth, Yupo Corporation is focusing on the development of new products having capabilities that will be required by new users in the future. In order to discover these needs, over the year and a half starting in 2016 Yupo Corporation held exhibitions throughout Japan, from Hokkaido to Kumamoto. As a result, they found that the top three demands for YUPO were: ① YUPO for laser printers, ② YUPO for double-sided printing using standard inks, and ③ YUPO made of biomass-sourced materials and biodegradable YUPO. Since this time, the company has made intensive development work in these three areas.

Keeping Costs Down

Katsuhiro Naito, executive director and general manager of Sales, provided details on YUPOGREEN as a biomass-sourced synthetic paper under the title “Environmentally-friendly Product Initiatives.”

Standard YUPO is produced from polypropylene (PP) pellets that contain inorganic fillers and a small amount of additives through a process that utilizes three extrusion units. The first of these units extrudes the middle layer of the film, which is then stretched in the machine direction (MD). The next two extrusion units then extrude the two surface layers on the top and underside of the base film to

Annual Growth of 6–8% in Asia

The history of YUPO dates back to May 1968, during the height of Japan’s rapid economic growth after World War II. In response to a report discussing the development of the synthetic paper industry given the future uncertainty of paper pulp released by the Science and Technology Agency at this time, in May 1969 the Oji Paper Company (currently Oji Holdings Corporation) and Mitsubishi Yuka KK (currently Mitsubishi Chemical) entered into a fifty-fifty joint venture to establish the Oji-Yuka Synthetic Paper Research Institute Co., Ltd. and produce paper from plastic. Later, in 1971, the new company chose the name YUPO for the new brand of synthetic paper. The name YUPO was based on the idea of an employee for linking the YU of Mitsubishi Yuka and the O of Oji Paper using the P of Paper. In 1973, the company was merged with Oji-Yuka Synthetic Paper Company and in 1982 it was merged again with Oji-Yuka Synthetic Paper Co., Ltd. In 2001 the company changed its name to Yupo Corporation.

At the start of the printing and converting gathering lecture session, Hideyuki Fujwara, president of Yupo Corporation, revealed that the global synthetic paper industry is growing at 3% annually, whereas the Asian synthetic paper industry is growing at 6–8% annually. These high rates stem from the growing number of applications based on the water-resistance and durability of synthetic paper, as well as its various other capabilities. In light of this expected growth, Yupo Corporation is focusing on the development of new products having capabilities that will be required by new users in the future. In order to discover these needs, over the year and a half starting in 2016 Yupo Corporation held exhibitions throughout Japan, from Hokkaido to Kumamoto. As a result, they found that the top three demands for YUPO were: ① YUPO for laser printers, ② YUPO for double-sided printing using standard inks, and ③ YUPO made of biomass-sourced materials and biodegradable YUPO. Since this time, the company has made intensive development work in these three areas.
MothMach GEM444 Printer Enables Direct 3D Modeling From Plastic Pellets Instead of Plastic Filaments

S lab Corp.
slab.jp

During the Mechanical Components & Materials Technology Expo (M-Tech) held at Tokyo Big Sight this past June, the 3D printer manufacturer S lab Corp. exhibited its domestically produced series of fusion deposition modeling (FDM) MothMach GEM444 3D printers. Unlike standard FDM 3D printers, the MothMach GEM444 utilizes commercially available plastic pellets without any kind of modification instead of plastic filaments.

Feeling doubtful of the potential of existing 3D printers because of restraints on the ability to choose the plastic used for modeling, Seiichi Yuyama, CEO of S lab, created a new design using his own expertise in extrusion equipment. Since initiating sales in the fall of 2017, his design has attracted interest from plastics producers, molding companies, automobile manufacturers, and other companies from a wide range of industries, indicating the high demand for 3D modeling using commercially available pellets. We spoke to Mr. Yuyama and Kazuko Tachibana, S lab Sales Chief, about the GEM444 and the recent trends in 3D printers.

Starting as a Table-top Extruder Manufacturer

During M-Tech, S lab displayed a large-scale 3D printer (maximum modeling size: $800 \times 1400 \times 1100$ mm) that towered over the visitors. They also demonstrated the machine, modeling a cylindrical sample to show how the nozzles located in the center of the machine extrude the resin and build the structure up one layer at a time. The pellets from which the machine produced the object during the exhibition could be seen in the hopper (provided by MATSUI MFG. CO., LTD.) located off to the side. According to the representative, the plastic used during the demonstration was a grade of olefin elastomer, but the machine can model 3D objects from standard plastic pel-
Making White Titanium
for Highly Aesthetic, Discreet Dental Prosthetics

Department of Materials and Synchrotron Radiation Engineering,
Graduate School of Engineering, University of Hyogo

www.eng.u-hyogo.ac.jp/msc/emiura

In addition to being light-weight and strong, titanium is used in dentures, implants, and other dental prosthetics because of its excellent corrosion resistance and biocompatibility. Although its high durability and toughness is an advantage over plastics, titanium has several problems unique to metals, for example the noticeable metallic color when smiling.

After a conversation with a colleague about the potential benefits that a white metal would offer over standard titanium, Associate Professor Eri Miura of the Department of Materials and Synchrotron Radiation Engineering in the Graduate School of Engineering at the University of Hyogo began working on whitening titanium for dental-use. Although she had been involved in research on metals since her time as a student, she only began researching titanium as an assistant professor at the School of Dentistry at Nagasaki University, where she first came across the field of dental material science and engineering, which is focused on research into dental materials. Later, she succeeded in whitening titanium using a metal film forming technology. Specifically, this technology oxidizes titanium at high-temperature, which in turn forms a film of titanium oxide on the surface of the titanium base. Using this approach, she is developing highly aesthetic dental prosthetics that are discreet when used. We spoke to Assistant Professor Miura about her research in pursuit of a stronger, more attractive metal for dental prosthetics, which must be both functional and improve appearances.

Research in Dental Material Science and Engineering at Nagasaki University

―Your research into metallic dental materials has led to the successful development of a white, highly aesthetic titanium. Most people have a tendency to think of silver teeth, gold teeth, and braces when they hear the term dental prosthetic, so tell us about the background that led you to developing white titanium.

Profile: Associate Professor
Associate Professor Eri Miura, Dr. Eng.

Associate Professor Miura graduated from the Department of Material Science and Engineering at Nagoya Institute of Technology in 1994, and received her Ph.D. from the Department of Materials Processing in the Graduate School of Engineering at Tohoku University in March of 1999. In April of that year, she joined the Dental and Biomedical Materials Science Group in the School of Dentistry at Nagasaki University as an assistant professor. She also served as a visiting research at Oak Ridge National Laboratory in the MST division X-ray and Thin film physics group from 2005. In 2009, she joined the Department of Mechanical Engineering at Nagoya Institute of Technology as a project associate professor. In 2011, she joined the Division of Materials Science and Chemistry in the Graduate School of Engineering at the University of Hyogo as an associate professor. She has held her current position since 2015.
Beyond dental prosthetics, what are some other possible applications?

Miura: We are also looking into the possibility of applying this technology to jewelry, like earrings. If we can make a white metal for the wire and clasp in earrings, we might be able to open up the potential for designs that have never before been seen. As a metal, titanium is already seen as safe for those with metal allergies, but covering the surface with an oxide film may further improve its safety.

—What are some issues in moving towards practical application?

Miura: Because this is a self-oxidizing technology in which the base titanium itself is oxidized to form the film, the base material necessarily affects the properties of the resulting film. For example, when we used this approach to whiten cast titanium denture bases, we found that the resulting white color was slightly darker in this case. This turned out to be a result of impurities in the titanium caused by components in the die used to cast the original dentures transferring to the titanium. In other words, when using titanium in dental prosthetics for practical applications, stabilizing the base material characteristics becomes an essential element.

Please tell us about the future direction of your research.

Miura: Because the resulting film properties are affected by the base material, this also means that we can modify the base material to provide the film with various capabilities. The high temperature oxidation process itself is simple, but it is an area of research that has surprisingly not previously been undertaken, so should yield a broader range of possibilities depending on which direction we take.
In discussing TEIJIN LIMITED’s future in composite materials, Akio Nakaishi, general manager of the TEIJIN Composites Business Unit, stated that TEIJIN’s expansion in the field will not be based on acquisitions of materials producers to entrench its position as an upstream materials supplier. Instead, the company is seeking to acquire downstream Tier 1 suppliers to provide the company with the ability to make direct delivery of parts made of composite materials to automobile manufacturers. In this light, their opening move in Europe was the acquisition earlier this August of all shares of Inapal Plasticos, a Portugal-based automotive composite parts supplier, placing the company under their control as a wholly-owned subsidiary. As a result, TEIJIN has now established a three-front system for composite material production and application in North America, China, and Europe.

Aiming for Tier 1 Status

On the occasion of its acquisition in January 2017 of Continental Structural Plastics Holdings Corporation (CSP), one of the largest automotive composite parts suppliers in North America, TEIJIN clearly defined its future direction as a Tier 1 supplier. In this way, Mr. Nakaishi explains that their shift away from expanding solely as an upstream material supplier to a downstream Tier 1 parts manufacturer, is being made to enable TEIJIN with the ability to ensure a stable supply of parts to automobile manufacturers and to deliver solutions in a concrete manner. Moreover, TEIJIN also aims to expand its business as a parts supply partner with advanced design capabilities over the medium- to long-term.

Following its acquisition, this past July CSP announced the opening of a new Glass Fiber-Sheet Molding Compound (GF-SMC) production facility at CSP Europe (France), the company’s research and development site in Europe. GF-SMC is a sheet-type intermediate molding material made of a film base laminated with a sheet of thermosetting resin paste impregnated glass fiber. This new GF-SMC supply system is expected to produce 20,000 tons annually by the fall of 2019. CSP Europe, however, does not possess the facilities to mold the GF-SMC into final automotive parts on its own, so the material was initially targeted entirely for sale to outside manufacturers. The GF-SMC application projects being implemented by CSP and TEIJIN over the past few years in Europe have been coming to fruition at a higher pace than expected, however. As such, the two companies found themselves faced with a more immediate need to deliver plans to customers that include how the material will ultimately be formed. This situation is what led to the acquisition of Inapal Plasticos.

Class A External Panels and Parts

Inapal Plasticos has operated as a Tier 1 supplier of GF-SMC parts for automobile and truck manufacturers since the 1980s, and holds a range of technologies, including CF-SMC (Carbon Fiber-Sheet Molding Compound: a sheet-type intermediate molding material made by impregnating glass fibers with a thermosetting resin paste), PCM (Prepreg Compression Molding: a forming method that uses preforms made from a...
Global Optical and PE Film Markets
Forecast to Grow Significantly From 2017 to 2022

This past July, Fuji Chimera Research Institute, Inc. conducted a survey of the market trends in plastic films and sheets, and published the results in a report covering the state and future outlook for plastic films and sheets for 2018. According to this report, the growth in demand for containers and packaging in developing markets is expected to drive revenue growth from PE film sales on the global market by 3% annually from 2017 to 2022. Likewise, revenues from PE film sales will reach ¥5.2 trillion in 2022, a 14% increase compared with 2017. Moreover, both global markets and markets in Japan are expected to see healthy sales revenue from COP and COC film sales given the increasing use of these films in the production of OLED phase difference films.

Optical Acrylic Films to Reach ¥40.5 Billion by 2022
The total global market for all 39 types of films and sheets covered by the survey is estimated at 558.4 million tons and ¥15.552 trillion as of 2018, but the report indicates that these figures are forecast to increase to 630.4 million tons and ¥17.2

![Trends in Growth Rates by Product Type in Japan](chart.png)

Top five films/sheets in terms of growth rate from 2017 to 2022.
Figures for 2018 are estimates, whereas those for 2019 and on are forecasts.
Compiled based on a Fuji Chimera Research Institute, Inc. press release.
Large-size LCD-TVs Help Drive Annual FPD Area Basis Growth Rates to 4%

35th IHS Markit Display Japan Forum

Over two days this past July, IHS Markit held its 35th IHS Markit Display Japan Forum in Tokyo, where it revealed its long-term demand forecasts through 2025. According to these forecasts, average annual growth rates for FPDs on an area basis will be driven to 4% in part by large-size LCD-TVs. Likewise, this growth is expected to expand FPD production to 266 million square meters by 2025. In its most recent forecasts, IHS Markit also adjusted the 2018 forecast for LCD-TVs higher on a unit basis by three points over its forecasts released in January 2018. Similarly, they adjusted the area basis forecasts for LCT-TVs slightly higher for 2018–2020, and adjusted these slightly lower for 2021–2024.

Meanwhile, FPD for all models of smartphones and mobile phones reached a level of 2 billion panels on a unit basis in 2017, whereas sales of OLED equipped smartphones underperformed the initial forecasts. As such, IHS Markit adjusted sales of OLED lower by just over 10% from their forecasts released in January 2018. As a result, units sold in 2018 are forecast to reach only 1.956 billion panels, a level that falls below the previous year. On a shipped value basis, FPD for mobile phones reached US$44.1 billion in 2017, but with the stagnation in demand for high-value flexible OLED screens and the drop in price per OLED panel as a result of increased production volume, IHS Markit expects the shipped value of AMOLED (active matrix OLED) to fall from US$19.436 billion in 2017 to US$17.7 billion in 2018. As such, the forecast for 2018 is lower than 2017 at US$39.5 billion.

FPD used in automotive displays, including center stack displays, cluster displays, monitors, and head-up displays, maintain a strong position, so IHS Markit expects this segment to exceed 200 million panels in 2022. Automotive FPD are also expected to see continued growth in later years.

### Long-term FPD Panel and Component Delivery Volume Forecast

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
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<th>2019</th>
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One issue that has recently become a topic of conversation among investors is corporate ESG, which is short for Environment (reduction of CO2 emissions and management of chemical substances), Social (human rights issues among workers and social contribution activities), and Governance (corporate management and compliance). Likewise, the Government Pension Investment Fund (GPIF) of Japan, one of the world’s largest institutional investors, announced in July 2017 its intention to make ESG assessment-based investments a priority. As such, this move has stimulated the adoption of ESG in Japan, where companies are now prioritizing their contribution to the Sustainable Development Goals (SDGs), one of the benchmarks for ESG. With these movements as a backdrop, this past June the Japan Food packaging Association held a seminar in Tokyo covering the social responsibility of packaging. Lectures were given by experts in flexible packaging and the printing industry.

Standards for Milk Containers/Packaging
Kazuya Ono, Technology Management Committee Chair of the Japan Association of Milk Packaging and Machinery, spoke on the trends in legal regulations related to milk containers and packaging in Japan. The first regulation in Japan related to milk beverages and milk containers/packaging was the Milk Industry Regulatory Rules issued by the National Police Agency in 1885. More recently, the Ministerial Ordinance on Milk and Milk Products Concerning Compositional Standards, etc., was revised in 1979 to cover PE laminated paper cartons, revised again in 1985 to cover room-temperature storable products, and a third time in 2007 to include PET as a synthetic plastic for milk containers. Currently, the Food Sanitation Law is being revised with a target completion date of 2020. Revisions are also being made to the regulations for implements, containers, and packaging used for milk products. The results of the 2017 Review Meeting regarding food implements and containers/packaging and the results of the 2017 Review Meeting regarding international standardization of food hygiene management were combined as a draft revision, which passed the Diet in June 2018. Because Ministry of Health and Welfare Notification No. 370 and the Ministerial Ordinance on Milk and Milk Products Concerning Compositional Standards, etc., Annex Table 4, must be referenced and are difficult to understand, the draft revision indicates that the implements and container/packaging standards defined in these should be combined with the standards for other implements and containers/packagings. Moreover, it indicates that it would be best to combine Annex Table 4 with Notification No. 370 (No. 3 Implements and Containers/Packaging) in order to create a unified standard for the synthetic plastics used in containers and packaging. Future issues include managing active substances used for the purpose of extending shelf-life, such as oxygen scavengers, intelligent substances with the ability to monitor the condition of food, and nano-particles of 1–100 nm in size.

Moreover, the Ministry of Health, Labour and Welfare proposed a new standard on March 12, 2018, for liquid milk (including formulated liquid milk). In this case, containers are defined as being applicable for storage at room temperature if they take the form of metal cans, pouches, or paper cartons, for example, that have undergone retort sterilization at 120°C for four minutes and have been aseptically filled. Revisions to the Ministerial Ordinance will be made after health impact evaluations by the Food Safety Commission and public comments. The revision is scheduled for enactment as a new standard.

Proprietary Ink Contributes to Five SDGs
Shinji Moriyama, General Manager of the Kao Corporation Chemical Division Advanced Printing Solutions (APS) Business Development, explained the degree to which water-based inkjet pigment inks can reduce environmental impact. In order to realize this type of ink, the company applied the nano-dispersion surface chemistry technology originally developed by the company for its clothing detergents to its pigments. In the case of clothing detergents, the surfactant molecules adhere to the surface of oily-dirt that has stuck to clothing, thereby allowing the dirt to separate from the fibers and dissolve in water. In the case of
Against the backdrop of the impact that the fourth industrial revolution is expected to have on the industrial world, the Society of Packaging Science & Technology, Japan, held its 76th Symposium in Tokyo this past June. Specifically, the event set out to discuss the future of packaging materials in the context of the fourth industrial revolution, where speakers during the event introduced the support strategies the Ministry of Economy, Trade and Industry (METI) is deploying for domestic industries, the greater use of IoT systems and robots in Japan, and packages made using the latest printing technologies.

Support for Smarter Small- and Medium-sized Manufacturing Companies

Yoko Ikeda of the Policy Planning and Coordination Division, Manufacturing Industries Bureau, METI, spoke about the METI Connected Industries domestic industry support strategy aimed at addressing the impacts of the fourth industrial revolution. Ms. Ikeda explains that the evolution of IoT and artificial intelligence (AI) is significantly reducing the movement cost of things and ideas around the world. More importantly, however, these lower costs are enabling the experience of advanced countries to be transferred to developing countries, and are thus minimizing the gap in technological capability between countries and regions. As this gap narrows, companies will increasingly cross borders and enter different industries, thereby increasing competition at all levels of industry.

Japan has also taken steps to utilize IoT in the industrial world, and according to a survey of manufacturing sites conducted in December 2016, 66.6% of domestic factories are already collecting some kind of data. This figure is significantly higher than the 40.6% of domestic factories that reported doing so the previous year. Ms. Ikeda states that although there are still few cases in which such data is being applied, the interest in collecting data through IoT is very high. In this light, METI initiated the Connected Industries project to support domestic industries. Specifically, the project addresses the five critical challenges of (1) autonomous vehicles and mobility services, (2) manufacturing and robotics, (3) plant and infrastructure security, (4) biological materials, and (5) smart life. The project also includes a Connected Industries tax system that offers a 30% special depreciation or 3% tax deduction when purchasing systems required to link and utilize data, sensors, and robots, for which a certain degree of cyber security measures have been taken. The project also certifies initiatives undertaken by private companies that utilize data and certifies supporting industry data.

Since FY2016, METI has also worked to support smart manufacturing at small- and medium-sized companies by providing advice on improvement measures and technology to address specific challenges, such as on how to utilize IoT, robots, and other technologies (Support Teams for Smart Monodzukuri). There are currently 25 locations throughout Japan, but METI plans to increase this number to 40 within the current fiscal year. Some examples of small- and medium-sized companies that have taken advantage of this advice include IBUKI, a die-mold manufacturer from Yamagata Prefecture that is using sensors to convert the movement of resin flow within die-molds into data and to help transfer skills to the next generation; HILLTOP, a metal working company from Kyoto that is creating a system to use machinery to work metal at night based on data designed and programmed during the day so that products can be finished by the next morning; and ASAHI TEKKO, an automotive parts manufacturer from Aichi Prefecture that is utilizing a system to visualize problematic points during the parts manufacturing process as a way of rapidly improving productivity and greatly reducing labor costs.

QuiCCA Greatly Reduces Costs in the Food Industry

Although it is believed that global companies in the electron-

Japan Food Packaging Association

In a surprise move, Walmart Inc., an American multinational operator of hypermarkets, discount department stores, and grocery stores, recently announced the sale of the Seiyu Group, a Japanese group of supermarkets, shopping centers, and department stores, initiating its withdrawal from the Japanese market. One of the reasons for this move was the limited outlook for economic growth given Japan’s contracting population. The urgency of addressing the shrinking Japanese market, however, is not just one for Walmart. Without the luxury of withdrawing to other markets, as Walmart has done, companies whose dominant markets lie in Japan have been working to vitalize the domestic food industry with attention-getting new packaging designs. In this light, the Japan Food Packaging Association annual research seminar, held this past July, presented several examples of novel packaging design approaches and discussed the importance of color in packaging design.

Next-generation of Attention-grabbing Plastic Bottles

Ikumi Tanaka of the Research Laboratories for Packaging Technology, part of the Research & Development Division at Kirin Co., Ltd., spoke on the development of a new bottle for their Gogo-no-Kocha brand. First sold in 1.5 L plastic bottles as far back as 1986, Kirin’s Gogo-no-Kocha brand is one of the company’s longest selling lineups. Although the market for black tea in Japan has trended downwards slightly in recent years, in 2017 the Gogo-no-Kocha brand still managed to record its highest number of units shipped in history. In order to capture new customers and vitalize the overall market for black tea, however, in 2018 the company designed a new plastic bottle that appears more adult and sophisticated.

Prior to renewing the bottle, the company conducted interviews regarding consumer attitudes, and selected “fashionable,” “new,” and “modern,” for example, from among the more than 100 images of items they aimed to enhance. Conventionally, immediately after a company has selected the image for a new product, designers set to work to bring the image to life. In this case, however, Kirin introduced “affective engineering” based on the selected image prior to working out the actual design itself. Specifically, the company first established scientific data that linked the selected image and ultimate form before designers set to work creating the new bottle. As a result, the new bottle design departs from the previous design and adopts a novel crystal cut appearance for the shoulder and bottom that expresses a sense of authenticity and style. Moreover, the curved geometry of the body works to expand...
20 Viscoelasticity and Printing Performance

20.1 Defining Viscosity and Viscometers That Cannot Measure Viscosity

There is no method for accurately measuring the hardness or softness of liquids and solids. As such, we typically measure either the viscosity, in other words the resistance to flow, and the elasticity, in other words the resistance to deformation. The inks and pastes used for screen printing, however, clearly consist of both viscous and elastic properties, so it is important to accurately understand both of these. Although many readers likely understand the concept of viscosity, in other words the viscous property, different viscosity units, measurement methods, and measurement conditions are used, so we will provide some additional explanations because these differences can cause confusion.

Viscosity expresses the ease or difficulty with which a fluid flows, and can be calculated by measuring the shear velocity and shear stress of the fluid. As shown in Figure 75, shear velocity can be measured by filling the fluid to be measured between two plates, where one of these plates is fixed and the other plate (on the facing side) is moved. In this case, viscosity is calculated from the velocity of the moving plate and the height of the gap between the two parallel plates. For example, when gap height \( h \) between the two parallel plates is 100 \( \mu \text{m} \) and the top plate is moved to the right at a velocity of 1,000 \( \mu \text{m/sec} \), the shear velocity is 1,000 \( \mu \text{m/sec} \) \( \div \) 100 \( \mu \text{m} = 10/ \text{sec} \) (second inverse). In other words, the shear velocity equals the distance moved per unit of time divided by gap height \( h \) between the two plates. Even when the velocity of the top plate moving against the bottom plate is the same, a narrower gap between the two plates will result in a greater shear velocity. Similarly, even when water passes through a hollow tube at...

About the Author

After working for the mask maker Tokyo Process Service Co., Ltd. from 1990 and the printing machine manufacturer Micro-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.
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.
1. Introduction

When we discuss approaches to PSA tape property evaluation, JIS Z 0237, PSTC TEST METHODS for Pressure Sensitive Adhesive Tapes, and other such testing standards tend to come to mind. These, however, are testing standards for quality management purposes and are not standards for evaluating product performance itself. In this session, we will provide an overview and an explanation of the testing methods for the three elements of pressure-sensitive adhesion—namely peel adhesion, tack, and holding power—covered by these standards. The goal in writing this session, however, is to more widely broadcast the recent research results on the three elements of pressure-sensitive adhesion, described in the second half after each section describing these elements. By applying standardized testing methods and measuring the results of changing the peel temperature and time frame, we can obtain the temperature scale, time scale, and peel speed scale of the PSA properties. From these scales, we can identify the essence of the PSA properties, in which rheology and surface chemistry intertwine in a complex manner. We feel this approach will be helpful in PSA design. In this session we will use terms such as peel adhesion, tackiness, and adhesion strength. These, however, are engineering measurements, and are not physical values from physiochemistry. In this sense, we cannot look disapprovingly on those that think that peel adhesion is an industry term.

1.1 Overview of the Three Elements of Pressure-sensitive Adhesion

Pressure-sensitive adhesion is a phenomenon typically seen in high-viscosity fluids, and is also the representative property of PSA products, such as PSA tapes. According to JIS, pressure-sensitive adhesion is a type of adhesion that enables a substance to adhere instantly to an adherend under a tiny amount of pressure at room temperature and without the use of water, solvents, or heat. In the past, JIS included the ability to peel from hard, smooth surfaces as one aspect of pressure-sensitive adhesion, but this part of the definition was removed in response to the expanded use and functionality of PSAs from peelable PSA tapes, such as adhesive bandages and masking tape, to permanent adhesion, such as PSA tapes for packaging and double-sided PSA tapes.

Despite both falling under the category of adhesion, PSAs and adhesives are quite different. Adhesives are coated to surfaces as fluids so that they easily contact and wet the adherend. Afterwards, a thermal or chemical reaction is used to convert the fluid into a solid, which achieves a strong binding force at the interface and resists peeling. In other words, adhesives wet the interface as fluids and resist peeling as solids.

In contrast, PSAs are soft, gel-like solids when they are applied to the adherend, and thus wet the adherend in this state. Afterwards, they resist peeling without undergoing a change in state. Moreover, the adhesion strength of PSAs is capable of withstanding practical use immediately after application.
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***Premium positions are filled on a first come first serve basis
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