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**JAPANESE SMALL AND MEDIUM
ENTERPRISES LEADING THE WORLD**

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THEME FOR JULY:

Japanese Small and Medium Enterprises Leading the World

Many Japanese small and medium enterprises (SMEs) are developing world-leading technologies. Many of these companies are discovering potential needs from an SME perspective and making their presence felt in low-volume product and niche markets. These one-of-a-kind companies and startups are using advanced technology to meet the customer's needs of around the world. This issue of *Highlighting Japan* introduces a number of Japanese SMEs that have unique technological capabilities they are proud to offer to the world. Included are companies offering precision polishing technology used in space development, a palm-sized lightweight drone with an expanding range of applications from facility inspections to disaster damage situation checks, and one of the world's lightest ultra-thin textile materials.



A single CREWBO can control four robots from different manufacturers. Here, a needle threading operation is realized.

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Japanese names in this publication are written in Japanese order: family name first, personal name last.

FEATURES

Japanese Small and Medium Enterprises Leading the World



Above left: The CD Dryer, a conductive heat transfer drying device by NISHIMURA WORKS Co., Ltd. Above right: Components featuring mirror surfaces realized with original ultra-precision polishing technology

Middle left: This ultra-lightweight and extremely thin fabric, developed by Amaike LLC, is known in Japan as 'Tennyō no Hagoromo' (feathered robe of a heavenly maiden) and internationally as 'Amaike Super Organza.' Middle right: A palm-sized indoor inspection drone

Below left: Heat resistant barcode label with QR codes used by Godo Steel, Ltd. Osaka Works Below right: The Kuroshio Sea tank at Okinawa Churaumi Aquarium features a large acrylic panel for viewing.

Many Japanese small and medium enterprises (SMEs) are developing world-leading technologies. Many of these companies are discovering potential needs from an SME perspective and making their presence felt in low-volume product and niche markets. These one-of-a-kind companies and startups are using advanced technology to meet the customer's needs of around the world. This issue of *Highlighting Japan* introduces a number of Japanese SMEs that have unique technological capabilities they are proud to offer to the world. Included are companies offering precision polishing technology used in space development, a palm-sized lightweight drone with an expanding range of applications from facility inspections to disaster damage situation checks, and one of the world's lightest ultra-thin textile materials.



Japanese Small and Medium Enterprises Spreading Their Wings to the World:

Outstanding New Technologies Developed by One-of-a-Kind Companies and Their Potential

Japan is home to many small and medium enterprises (SMEs) that, while small in scale, have been developing world-leading technologies. We interviewed ARAI Tamio, Emeritus Professor at the University of Tokyo — who also serves as selection committee chair for awards¹ that recognize outstanding technologies and products developed by such businesses — about the current state of Japanese SMEs, notable new technologies they have developed, and their potential.



ARAI Tamio
Emeritus Professor,
University of Tokyo

Japan has many small and medium enterprises (SMEs)² that have been developing unique, original technologies and products. What are the actual technological development out of Japanese SMEs, as well as the socio-economic background that support this development?

In Japan, 99.7% of businesses are actually SMEs. They vary widely in scale as well as corporate structure. While some are very small with less than 20 employees, others have close to 300 employees and solid organizational structures. Also, while some companies are preliminary subcontractors to large corporations, others are creating unique, original technologies and products. With insufficient funds and human resources in research and development, compared to large corporations, they tended to experience challenges in developing new technologies in a timely manner. Therefore, not a few of them had to see them behind market changes.

However, in recent years, frameworks for open innovation³ have been established, providing easier access to external resources for SMEs in working on technologies and products that would be challenging for them to develop all on their own. These resources include universities, the National Institute of Technol-

ogy, and public testing and research institutions. Also, taking approaches like crowdfunding⁴ to raise funds from a broad base of contributors offers the added benefit of making it possible to build networks of supporters as well. The environment for motivated businesses is improving more and more in Japan.

One-of-a-kind companies and startups are taking advantage of such frameworks to engage in ongoing research and development. This has enabled some of them to keep pace with current trends and successfully create unique, original technologies and products.

What are the characteristics unique to Japanese SMEs that enable them to develop outstanding technological?

First of all, where the ownership and management are often the same, they tend to have simpler organizational structures than large corporations. This makes it more likely that the top-level managements' skills and ambition to grow are reflected in front-line operations, and if the top management has excellent qualities, they can be a major driving force for technological development.

Another characteristic of many of SMEs is that they have a presence in small-lot production and niche markets⁵ by identifying latent needs from a perspective unique to small and medium enterprises. In specialized fields, production and services tend to have inefficient, so large corporations tend to avoid them. In fields like this, harmoniously integrating diverse technologies by combining inventions, designs, and improvements specialized for the field can enable the creation of technologies with high degrees of perfection that satisfy market demands. We often see examples of one-of-a-kind companies have come out with new technologies in this way, working in limited

fields. One more aspect of such companies is that, with the addition of their top-managements' skills and ambition — a topic I mentioned earlier — they can be guided to success relatively easily.

Could you introduce a few examples of technologies developed by Japanese SMEs that would attract notice worldwide?

One that is attracting attention in the biotechnology field is the 'On-chip Droplet Selector' microorganism screening system developed by On-chip Biotechnologies Co., Ltd. Many production processes for medicinal, pharmaceutical, and food products require the use of microorganisms. Detecting microorganisms and cells that are beneficial to humans' health or useful in countermeasures against climate change from among the vast number of unknown microorganisms in existence, however, requires a great deal of time and human resources. This microorganism screening system separate water droplets containing microorganisms and cells into individual microdroplets of a few tens of micrometers, encapsulate them, and culture and analyze them within those microdroplets. It can also further separate and dispense⁶ intended droplets one by one. This system can considerably shorten the time required to discover useful microorganisms.

An example from the semiconductor field is AiOnIc, a high-performance, low-power AI chip developed by ArchiTek Corporation. This semiconductor chip is specifically designed for processing in edge devices, which are types of devices such as smart-



On-chip Droplet Selector, a microorganism screening system developed by On-chip Biotechnologies Co., Ltd.

Photo: On-chip Biotechnologies

phones, digital cameras, and IoT equipment used for collecting and transmitting data at points of contact between the Internet and the physical world. It achieves parallel processing performance surpassing that of GPUs⁷ and features low power consumption. AiOnIc is expected to make significant contributions in developing IoT networks, including applications in self-driving vehicles, hazard-sensing systems, and agricultural and livestock management, with chips installed in Internet-connected terminals.

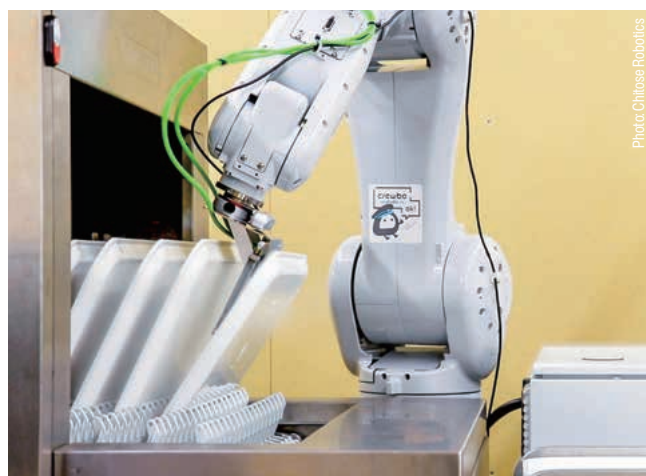
A very interesting example in the robotics field is CREWBO, industrial robot control software developed by Chitose Robotics Inc. that enables robot-arm control in real time with high precision using cameras. The "visual feedback" control technology used in this product will contribute to increased productivity in manufacturing and logistics sites in the future as it comes to be used in robotics more. (see "High-Precision Robot Control Software without Need for Time-Consuming Manual Adjustments")

Also, MITAKA KOHKI Co., Ltd. has received high



CREWBO, industrial robot control software developed by Chitose Robotics Inc.

Photo: Chitose Robotics



An arm robot equipped with CREWBO the camera information-based visual feedback control system.

Photo: Chitose Robotics



Photo: MITAKA KOHKI Co., Ltd.

MIPS, a surgical assistance device developed by MITAKA KOHKI Co., Ltd.

acclaim for its Medical Imaging Projection System (MIPS), a high-precision optical measuring device the company jointly developed with i-PRO Co., Ltd. and the Kyoto University Faculty of Medicine. MIPS uses projection mapping technology to project surgical guidance information onto patients' body surfaces or internal organs directly in real time. The system can provide increased surgical accuracy, operability, and safety during surgeries, and shortens operation time.

A noteworthy case from the service sector is a monthly subscription-based clothing rental service offered by airCloset, Inc., taking a forward-looking approach to DX⁸ promotion for a company in the fashion industry. Primarily targeting working women, the service delivers several pieces of clothing selected by professional stylists each month, to subscribers' homes, at reasonable rates starting at 7,800 yen per month. This year, the company has been actively adopting information technology (IT) as well, working with a university lab to jointly develop an interactive styling proposal system using general-purpose generative AI.

If Japanese SMEs are to expand their business further with a global perspective, what are some chal-



Photo: airCloset

airCloset, Inc. is an early adopter of DX technology within the fashion industry.

lenges they will need to overcome and expectations of what they might achieve?

Expanding globally requires more than simply having a unique, original product. Acquiring relevant intellectual property rights is vital as well.

It is also said that Japanese SMEs are lagging behind in terms of internationalization and DX adoption. In

our current global society, new fun and convenient systems can spread around the world in a matter of days, thanks to the spread of various social media that make full use of photos and videos. Considering what value one's company's well-developed technologies and products might provide to users and identifying markets where the company's technologies and expertise are likely to be accepted can lead to further leaps forward.

Moreover, to make a successful international expansion, it is important to secure and cultivate necessary human resources. This is to be able to respond to demands for language abilities enabling discussions with other businesses and related public institutions from foreign countries, to establish frameworks for handling maintenance issues following the sales of products, and to properly understand partner countries' business practices, for example. Additionally, strategic public relations can be realized by combining an evidence-based approach with IT utilization. It is important to ensure that selling points of the company's products and services are clearly and accurately communicated to users abroad who have related needs.

What do you think about the potential of Japanese SMEs?

One-of-a-kind companies are working to create products that are the best in Japan, or the best in the world, by attempting to respond specifically to users' needs. Such ambitious objectives generate enthusiasm and lead to successful outcomes. If Japanese SMEs with advanced technological abilities maintain such awareness, along with a perspective focused on how their technologies and products will be evaluated globally, I think they can expect to be able to make considerable expansions of their businesses overseas in the future.

While the social conditions differ from our current

era, in the past, Japanese SMEs that made great strides on the world stage. Two that achieved worldwide name recognition are Sony and Honda, both established shortly after World War II, are among those that have achieved global recognition. Another example from the past approximately 40 years is UNIQLO (FAST RETAILING CO., LTD.). Each of these companies was motivated by the ambition and enthusiasm of its founders to develop products and services in demand. They not only have outstanding products to offer; they also have world-leading appeal in their service provision, including distribution and advertising.

Today, frameworks for providing support to SMEs expanding internationally have been established by organizations including SME SUPPORT JAPAN (Organization for Small & Medium Enterprises and Regional Innovation, Japan), JETRO (Japan External Trade Organization), and JICA (Japan International Cooperation Agency). Financial institutions are providing support as well, making barriers to overseas expansions lower than ever. In addition, with cross-border e-commerce becoming easier to engage in and other factors, there are now increasingly diverse methods of expanding internationally. Cross-border e-commerce (electronic trading of products across national borders) based in Japan enjoys a high degree of international credibility. This makes it possible to capture large shares of niche markets worldwide. It is important by taking approaches such as partnering with other countries. And also, obtaining support from financial institutions and support organizations are moving forward. Japanese SMEs have earned high levels of trust worldwide in terms of quality and delivery times. If they properly grasp the needs and demands of the world, they will be able to sell their products and services at high prices. I believe that Japanese SMEs have tremendous potential to expand their business internationally. 

1. The SME Excellent New Technology/New Product Awards. The awards are held annually by The Resona Foundation For Small And Medium Enterprise Promotion and the Nikkan Kogyo Shimbun, Ltd. with objectives of promoting technologies developed by SMEs and contributing to the development of Japanese industries. The awards were established in 1988. In April 2024, the 36th awards were held.

2. Under Japanese law (Small and Medium-sized Enterprise Basic Act), SMEs are defined as companies in the manufacturing, construction, transportation, and other industries with total capital or investments of 300 million yen or less, or 300 or less regular employees. Similarly, in the service industry, SMEs are defined as companies with total capital or investments of 50 million yen or less, or 100 or less regular employees.

3. A method of creating innovative value in developing technologies and products, relying not only on the company's own management resources and research and development, but utilizing knowledge and technology from external sources as well, including other companies, universities,

and research institutions.

4. An approach in which a broad base of unspecified people offer donations or funding in small amounts through the Internet for certain organizations or projects.

5. Literally a "gap"; a small-scale in-between space in the market with special potential that large corporations tend to avoid.

6. To output certain volumes of sample liquids using a pipette or similar dropper.

7. Abbreviation of Graphics Processing Unit. A type of processor (semiconductor chip). Originally a device specifically designed to perform real-time image processing in applications such as computer gaming, providing high-speed processing, unlike CPUs. GPUs are indispensable particularly in the AI field.

8. Abbreviation of Digital Transformation. Refers to companies' utilization of data and digital technology to transform their products, business, operations, etc. to gain or strengthen their competitive advantage. (Remarks: "Trans-" is often abbreviated as X)

World-leading Precision Polishing Technology, Even Used for Space Development



Photo: TDC



Photo: ISHIZAWA Yoji



Photo: TDC

Components featuring mirror surfaces realized with original ultra-precision polishing technology

Polishing equipment

Ultra-precision polishing can be applied to any material, from metal to ceramics and glass.

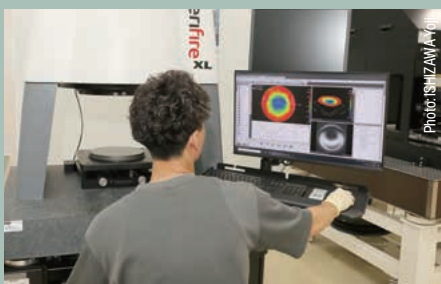


Photo: ISHIZAWA Yoji

Workers use high-precision measurement equipment to measure surface roughness immediately after polishing.



Photo: TDC

TDC achieved precision polishing of long-format foil over 100 m in length through its development of original polishing machinery.

One company in Japan has the technology enabling precision polishing under 1 nanometer (“nm”¹ hereinafter) for any type of material and any shape. This is TDC Corporation. The company has received much praise both in Japan and around the world for this technology, which has been adopted for use in both domestic and international space projects.

(Text: SAKURAI Yuko)

Many components of precision equipment used in the semiconductor, medical, aerospace and other fields require surfaces polished to levels of smoothness with surface roughness less than 1 nm (one billionth of 1 m). We interviewed President and CEO AKABANE Yuko of TDC Corporation, which developed fully original technology capable of meeting such demands in the field of ultra-precision polishing.

One strength that sets TDC apart is the suitability of its ultra-precision polishing for application to any type of material, including metal, ceramics, and resin. This technology, capable of achieving surface roughness Ra values² below 1 nm to realize mirror-like surfaces in a diverse range of materials, differs from other methods such as surface-grinding or precision-cutting.

“In between the polishing plate installed in the polishing device and the material being polished, we insert a polishing solution made of a combination of abrasive grains (general term for powdered materials used for cutting, grinding, polishing, etc.) and lubricating liquid (general term for the liquid used to provide moderate lubrication during polishing). As the two are rubbed together, the abrasive grains are made to float freely across the surface of the material to polish it. We use materials including diamonds and ceramics for the abrasive grains, and their size is tiny – on the nano-level. Mechanical and chemical actions occurring with the material being processed and the abrasive grains enables nano-level polishing.”

The company has taken on challenging requests from clients requiring ultra-precision processing at the nano level with special materials, complicated shapes, and so on. Consequently, the company finds solutions to what once seemed impossible, while engaging in repeated trial and error to improve machining processes. Through maintaining this spirit of challenge, TDC has found the way to repeated successes.

“While our focus is on customers in fields of advanced technologies, we work with any market scale, even undertaking development for a customer. Still, we strive to make information concerning these new technologies we develop available worldwide through our website. This is because we understand that there may be others out there who face challenges demanding the same technological solutions.”

Along with its precision machining technologies, TDC maintains a strong commitment to precision measurement as well. World-leading measurement equipment provides support for the company’s technological

capabilities. An on-site precision measurement room where a controlled temperature of 20°C is maintained throughout the year provides an environment in which changes as minor as several atoms being removed can immediately be measured and evaluated in their own facilities.

“While surface changes realized with nano-level processing are invisible to be seen with the naked eye, precision measurement can make even the smallest variations visible. This enables efficient ultra-high-precision processing. And such data evaluated with top-class equipment also helps in building relationships of mutual trust with customers.”

TDC Corporation is also set apart by its friendly work environment. Company employees are of a wide range of ages, from their late-teens into their 70s, and are gender balanced well with a male-to-female ratio of around 6:4. The job turnover rate is also extremely low. The organization of the company has no official positions either, and is flat instead, encouraging lively communication between fellow workers, no concerns of overly long work hours, and high productivity. The work environment has also helped individual employees acquire skills and increase their technical abilities. At present, TDC Corporation has dealings with approximately 4,000 companies in 19 countries.

Recently, the company’s technologies have even been adopted for use in space development projects. The company says that it has polished the sample containers for sample return missions such as JAXA’s³ Hayabusa2 and MMX (Martian Moons eXploration) missions.

“It is our pleasure to be of service to our customers. Our client’s issues are the source of our growth. We will continue to take on such challenges accordingly.” **J**



TDC’s technologies are used in a part of sample return missions for space exploration projects.

Photo: ISHIZAWA Yoji



President and CEO AKABANE Yuko with a female employee. The company has a male-to-female ratio of around 6:4.

Photo: TDC



Head Office in Rifu Town, Miyagi Prefecture

Photo: ISHIZAWA Yoji

1. International unit of length. 1 nanometer (nm) is one billionth of a meter.
 2. Surface roughness expresses the degree of unevenness (roughness) in a surface after it has been processed, based on various criteria. Ra represents one formula for calculating such measurements, expressing surface roughness in the height direction.
 3. An abbreviation of Japan Aerospace Exploration Agency, a Japanese governmental organization.

FEATURES

A palm-sized indoor inspection drone

Photo: Liberaware



A Drone That Takes Clear Images in Tight Indoor Spaces

Liberaware Co., Ltd., based in Chiba City, Japan, has developed and is marketing a palm-sized drone that uses a built-in camera to capture images of tight indoor spaces. The drone's features include its small size, stable flight in indoor spaces, and the use of a high-sensitivity camera to capture clear images.

(Text: MOTEGI Shunsuke)

Above: Two built-in headlights are turned on during a ceiling space inspection.

Below: Stable flight is possible even in limited spaces such as duct interiors.

Liberaware Co., Ltd. has developed the IBIS2 ultra-small inspection drone for narrow and limited spaces. It's palm-sized at about 20 cm² and lightweight at a mere 243 g.

MUKAIYAMA Takuya, public relations representative in the company's Smart Industrial Safety Dept., says proudly, "It's one of the world's smallest drones for industrial use. It weighs about the same as a peach, and it can enter a 30-cm access hole and can even inspect the interior of a 50-cm diameter duct."

This tiny, lightweight drone can fly into tight spaces and capture clear images with its highly sensitive built-in camera. In environments that radio waves can't penetrate, you can install a special antenna inside the space and have a person outside operate the drone, which can fly for up to 11 minutes on battery power.

The drone takes over inspection duties for narrow, dark, and dangerous facilities, such as ceiling spaces and duct interiors, and can be operated remotely from a safe location. East Japan Railway Company is currently using IBIS2 to inspect ceiling spaces in its station facilities.

"Even where it's possible for a worker to enter a ceiling space through an access door, there is the risk of breaking through and destroying the ceiling. On one hand, looking over a ceiling space through an access door and checking the surroundings will limit the scope of the inspection. However, a drone enables you to run a wide range of inspections with less effort," MUKAIYAMA explains.

This drone is advantageous for indoor inspections due to its small size and light weight, as well as its flight stability.

"Small drones usually stop moving when they hit the side of a space during flight, but you don't have to worry about this with our drones, because they are equipped with attitude control technology that allows them keep flying horizontally," says MUKAIYAMA. Thus, another feature of this drone is its side crash innovation already in place—it can sustain flight even after impact.

Another strength is the camera built into the body

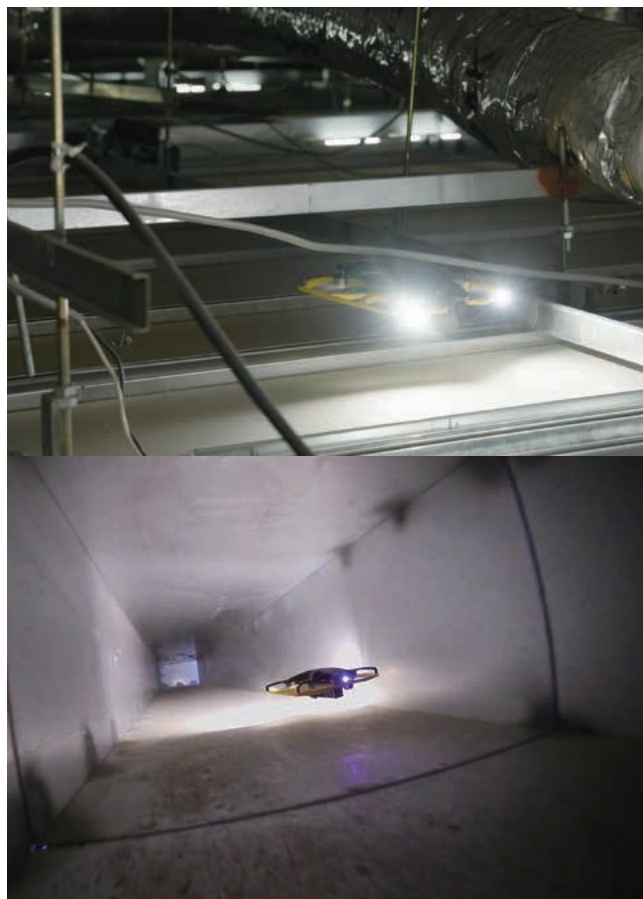



Photo: Liberaware

of the IBIS2. Since the photo-taking environment is often dark—as with a ceiling space—the camera must be sensitive enough to capture clear images even in such an environment. To meet this need, the company developed its own high-sensitivity, wide-angle camera that incorporates technology from the Sony Group, a world leader in image sensor¹ technology for security cameras. This camera is built into the front of the drone body and captures images in the direction of movement.

The use of drones for indoor inspections has been expanding in recent years. For example, MUKAIYAMA stresses that drones can be used to search for missing persons in a disaster, or to survey the damage situation inside a damaged house. "Our drones are being used not only to inspect familiar infrastructure facilities, but also to survey damage inside collapsed buildings hit by the January 2024 Noto Peninsula earthquake, and in a growing variety of other places that humans can't safely enter. We hope you'll remember our drones whenever you may have a difficulty, perhaps related to an inspection inside a facility." 

1. The image sensor is the "eye" of a digital camera. Its role is to convert light coming through the camera lens into electrical signals and then transmit the data. Security camera image sensors use cutting edge imaging technology to capture images in dark places and other harsh environments.

High-Precision Robot Control Software without Need for Time-Consuming Manual Adjustments



Photo: Chitose Robotics

An arm robot equipped with the camera information-based CREWBO visual feedback control system.

Many companies are considering introducing robots to reduce labor and streamline processes when manufacturing certain products in factories. However, having to spend a great deal of manpower to coordinate the actual operation of such industrial robots when they are built into the manufacturing system has been a major challenge. One Japanese company has solved this challenge by developing CREWBO, a robot control software that enables the construction of a high-precision robotic system. On top of that, the cost of introduction of this robotic system is reasonable. We interviewed the developer about this technology, which is getting worldwide attention.

(Text: SAKURAI Yuko)

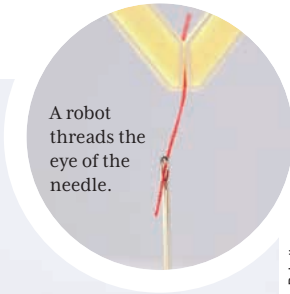
Various manufacturing industries in Japan have seen the introduction of robots into the production process. However, robots have so far only been able to perform certain set operations. In assembling components for industrial products, for example, humans have had to make adjustments to ensure that the robot fingers that take over the tasks of human hands will accurately reach the exact target position. It is crucial to set the position and angle of the base of the robot arm precisely. This is because slightest difference will result in the robot's fingers missing their mark and unable to grasp the target. It was therefore necessary for humans to spend a great amount of time performing calibration (adjusting basic coordinates) and teaching (instructing movements).

“If a robot, which is supposed to cover for labor shortages, requires adjustments that involve signifi-



Photo: Chitose Robotics

NISHIDA Ryosuke, president of Chitose Robotics Inc



A robot threads the eye of the needle.

Photo: Chitose Robotics

A single CREWBO can control four robots from different manufacturers. Here, a needle threading operation is realized.

cant labor and costs, then we have a contradiction.” With this thought in mind, NISHIDA Ryosuke, president of Chitose Robotics Inc., developed an innovative robot control technology that enables high-precision operation without the need for minute adjustments.

Says NISHIDA, “When humans grasp something, we have a rough idea of where it is, and then we control our movements with high precision as we move our own hands. I thought that robot control should also be possible based on uncertain information, just like that of humans.”

CREWBO is a control software developed by NISHIDA that realizes a visual feedback control system that instantly feeds back image information captured by multiple cameras to the robot, and continuously moves the robot toward its goal. A robot equipped with this software can automatically follow a moving object or grasp an irregularly shaped one. Even if the robot’s position deviates somewhat, there is no problem because it will analyze multiple image data to follow along its path. In fact, this software eliminates the need for adjustment costs that had been necessary until now.

“Many of Japan’s manufacturing industries are going through a severe labor shortage,” says NISHIDA. “By providing robot labor, we hope to maintain the vitality and scale of our markets. We set the price at 1,100,000 yen for the minimum components (control PC with software, 2 cameras, etc.), so that the robot can be widely used at SME-scale manufacturing sites.”

Right now, CREWBO is in use at automobile, electrical, and food manufacturing sites, as well as distribution in Japan, Europe, the United States, and Asia,



Photo: Chitose Robotics

Placing fried chicken in individual containers. There’s no need to rewrite the program for different sizes and dimensions, even when grasping soft foods.

where it is contributing to factory floor automation and productivity enhancement.

NISHIDA confidently declares, “Going forward, we will continue to provide high-quality, vastly unique technology.” We have hopeful expectations for the future of this up-and-coming company. ▮



Photo: Chitose Robotics

An automobile manufacturing site. Performing position-indeterminate work (automatically following a moving object or grasping an irregularly shaped object) on an assembly line.

FEATURES

This ultra-lightweight and extremely thin fabric, developed by Amaike LLC, is known in Japan as 'Tennyō no Hagoromo' (feathered robe of a heavenly maiden) and internationally as 'Amaike Super Organza.'

One of the World's Lightest Fabrics Woven from Ultra-Fine Threads Measuring 1/40th of a Millimeter

Ultra-fine thread, approximately one-fifth the thickness of a human hair, is so delicate that it can be cut off by static electricity, making it extremely challenging to weave into fabric. Amaike LLC spent several years developing the weaving technology for this ultra-fine thread. This thin, lightweight, and shiny fabric has captivated fashion brands both domestically and internationally and is widely used as material for clothing, stage costumes, and more.

(Text: SAKURAI Yuko)

Photo: KOMATSUMATERE Co., Ltd.

Photos: KOMATSUMATERE Co., Ltd.

This extremely thin fabric, which moves softly with air, is known in Japan as ‘Tenryo no Hagoromo’ (means ‘feathered robe of a heavenly maiden’ in Japanese) and internationally as ‘Amaike Super Organza².’ Woven from ultra-fine threads about one-fifth the thickness of a human hair (approximately 1/40th of a millimeter), this fabric is incredibly light, weighing only five grams per square meter (100 cm x 100 cm). We spoke with AMAIKE Yuki of Amaike LLC, who developed the weaving technology for these ultra-fine threads.

“This thread was originally developed for use in plasma TVs³, but it was so thin that it would break easily, making it difficult to weave. Our company, known for its expertise in developing weaving techniques for challenging new materials, received an inquiry from a thread manufacturer about realizing successful weaving with this thread. With our state-of-the-art weaving machines already in place, we began working on developing the weaving technology needed for this thread,” says AMAIKE.

It was determined that the main cause of the ultra-fine thread breaking was static electricity generated by the friction during weaving. To overcome this, the temperature and humidity in the weaving area were carefully managed to reduce static electricity. At the same time, various thread densities and weaving techniques were experimented with, and repeated prototyping and evaluation were conducted. The weaving machines were also upgraded, and their parts modified to handle the ultra-fine thread more effectively.

“In 2006, after several years of such effort, we succeeded in weaving ultra-thin fabrics and expanded our facilities to begin production. However, about a year later, the client went bankrupt. As a result, we decided to target the fashion industry and undertake product development and sales in-house,” explains AMAIKE.

Since dyeing and sewing are necessary for fashion applications, we tried to outsource these tasks



Above: Process of winding the warp threads for the weaving machine. 10,000 warp threads are needed for a single piece of fabric.

Below: Using tweezers-like tools to handle and position the threads, the weft threads are woven into the warp threads.

Photo: KOMATSU MATERE Co., Ltd.

to specialized contractors. However, because the thread was too specialized, it could not be handled effectively by the contractors. As such, dyeing and sewing techniques had to be developed in-house. Adjustments to dye types, moisture levels, and fabric quantities were made through repeated trial and error. For the sewing threads, a thread suitable for ultra-thin fabrics was developed to avoid visible seams, and adjustments to the sewing machines were carried out. As a result, by around 2010, integrated manufacturing from weaving to dyeing and sewing was achieved.

“After receiving positive feedback from showing our products to international brands, we began exhibiting at overseas trade shows. This led to an

increase in international clients. The unique movement and shine of the fabric have been highly praised, and in recent years, our fabrics have been used by well-known European fashion brands, in costumes for the Paris Opera, and for figure skaters,” says AMAIKE.

In fact, the company is currently suffering from the aftereffects of the major earthquake that struck in January 2024 (the Noto Peninsula Earthquake). The earthquake damaged the factory and equipment, causing production and shipments to stop temporarily. Although production has resumed, repairs to the factory are not yet complete. Nevertheless, the company must continue to move forward with reconstruction, so it is seeking support through crowdfunding services⁴.

“We will continue to develop new products utilizing our unique fabrics, engaging in communication with our customers, and aim to bring them joy,” says AMAIKE confidently. 🍀



AMAIKE smiling as he talks in front of a display of development fabric samples.

Photo: KOMATSU MATERE Co., Ltd.

Left page (P16)

Left and middle: A scarf with a transparent and shiny appearance. Amaike's products can be found at locations such as Haneda Airport.

Right: Creating a subtle, shining effect with two-color dyeing.

1. Amaike LLC is a group company of KOMATSU MATERE Co., Ltd.
 2. Organza is a thin, lightweight, and transparent fabric with a crisp texture. In contrast, Amaike Super Organza, also known as Tenryo no Hagoromo, features even greater shine and softness.
 3. Introduced in the late 1990s, plasma display televisions were known for their slim profile and high resolution. Although they were considered the mainstream choice for large TVs, by the late 2000s, the shift towards larger LCD displays, due to factors such as cost and energy efficiency, led to LCD displays becoming the dominant technology.
 4. Currently featured on the crowdfunding platform ‘Makuake,’ which supports new products and experiences, are scarves and pocket squares from the Tenryo no Hagoromo collection.



Photo: YStech Co., Ltd.

Heat resistant barcode label with QR codes used by Godo Steel, Ltd. Osaka Works

Heat Resistant Barcode Labels Enable Management of High-Temperature Production Processes

HEATPROOF labels provide manufacturers with the ability to use barcodes and other labeling to control production processes that reach temperatures as high as 1,000°C. These products, which boast a 100% share of the global market for labels that can be applied directly to extremely hot materials, are currently in use in 36 countries around the world. (Text: SAKURAI Yuko)

Today it is common for factories around the world manufacturing various products to use barcodes and other labelling methods (refer to the column) to help manage the production process. Despite the need for similar methods to help manage metal and ceramic manufacturing, using ordinary barcode labels has not been feasible in these situations due to the extremely high temperatures involved in manufacturing and processing. HEATPROOF heat resistant barcode labels from YStech Co., Ltd. solve this problem. We spoke with OKAYAMA Taichi, Director and Sales Manager, about these groundbreaking labels.

“The cause of developing this product came about 20 years ago when an aluminum smelter in Canada asked us for a label that could be applied directly to aluminum heated to 500°C. No such label existed at the time, so we took up the challenge of developing one. We repeated trial after trial, selecting new base and ink materials, formulating and processing each of these materials. At the time, there was no equipment capable of automatically applying labels to hot objects, so we decided to develop the required equipment as well. We hired a design engineer and started from

scratch developing the machine we needed. Since we had no experience in equipment manufacturing or installation, producing the machinery in-house was actually more challenging than developing the heat-resistant labels. We repeatedly tested the product at our customer’s plant overseas. We spent a great deal of time and money to achieve this, but this experience was helpful when it came to subsequent development.”

In 2004, the company had successfully developed



Photo: ISHIZAWA Yoji

Heat resistant barcode labels can be applied directly to high-temperature materials, enabling consistent control during heat treatment processes.



YStech Co., Ltd. - Head Office
(Suita City, Osaka Prefecture)

Photo: SHIZAWA Yoji

barcode labels able to withstand high temperatures up to 500°C, and the machinery needed to apply them. This system not only facilitates production process management, but is also helpful in managing shipments. For certain customers and products, YStech labels also serve as shipping labels. Conventional shipping labels could not be applied to metal products until the extremely hot material had cooled down. Waiting prolonged periods between processing and applying labels can result in major issues, such as applying labels to the wrong products, or shipping products to incorrect destinations. These mistakes can now be prevented by applying labels during high-temperature processing or immediately after casting. Additionally, unlike handwritten labels, printed labels are not, of course, as readily misread. Moreover, barcode information can be printed on heat-resistant labels using commercially available thermal transfer printers¹. Do note, however, that when printing on the company's heat resistant labels, it is recommended to use ink ribbons designed by YStech, which provide ink that does not burn off when exposed to high temperatures and does not fade when left outdoors for up to a year.

As these labels were adopted by more and more manufacturing plants, YStech noticed more diverse needs among their clients. Some customers needed labels that could be used at even higher temperatures; others needed labels that could be heat-treated after being applied at room temperature; still others needed to apply labels to more specialized metals and non-metallic materials.

“Over the past 20 years, we have continued to respond to the needs of various companies by developing products with even greater heat resistance and products that can be used under a range of different

conditions. Today, we offer products that can withstand temperatures up to 1,200°C as well. We are the only company in the world with technology that enables labels to be directly applied to objects at such high temperatures.”

The recent global trend is toward stronger traceability², requiring that companies are able to trace raw materials from procurement to production and disposal. Using HEATPROOF not only facilitates traceability, but also shortens production processing times and reduces hazardous operations by eliminating the need for humans to be in hot environments and near hot objects. Recognized for these advantages, HEATPROOF is currently in use in 36 countries and regions around the world.

“We will continue to work in each region to raise awareness of our products and promote the use of HEATPROOF labels for barcode management,” says OKAYAMA. With an increasing number of customers adopting their products, YStech anticipates strong growth in the future. **■**

1. A printer that employs a printing method in which ink is transferred via a heated printhead that presses an ink ribbon against paper
2. The system for tracking and documenting the processing of goods through all stages from production to consumption



Inside of a thermal transfer printer. The white roll in the foreground is label material, and the black roll in the upper left is the ink ribbon. Both are heat resistant, preventing the ink from burning off even when exposed to high temperatures.



HEATPROOF barcode labels can be printed on commercial thermal transfer printers.

Photo: SHIZAWA Yoji

Photo: SHIZAWA Yoji

BARCODES

A barcode represents information such as the alphabet and numbers using a combination of parallel vertical black lines (bars) and white space. Data is represented by varying line width and spacing, and these labels are used for most manufactured products and commodities. Specialized devices called barcode readers or barcode scanners recognize barcode information and convert it into digital data that can be imported onto computers. While conventional barcodes (1D codes) store information in only one horizontal direction, QR codes and other 2D codes are bidirectional, storing information both vertically and horizontally, to allow large amounts of information to be contained within a small print area.

A Giant Acrylic Aquarium Created with Four Exceptional Techniques

NIPPURA Co., Ltd., based in Kagawa Prefecture, makes the most of the characteristics of acrylic plates, the ease of processing and transparency, to develop techniques for creating huge aquariums. And the company is using the techniques to expand its business both domestically and internationally. They have repeatedly set records for the world's largest exhibition aquariums in terms of water volume. (Text: MOTEGI Shunsuke)

Often referred to as “one of the world’s leading aquarium nations¹,” Japan boasts numerous notable aquariums, with Okinawa Churaumi Aquarium in Okinawa Prefecture standing out as a top recommendation. One of its highlights is The Kuroshio Sea (10m deep, 35m wide, 27m long). This massive tank features approximately 70 species of fish, including several meters-long whale sharks and manta rays. The aquarium holds an impressive 7,500 tons of water.

This acrylic aquarium is a flagship project in Japan designed and constructed by NIPPURA Co., Ltd. The acrylic panels are an impressive 60cm thick. With

such thickness, acrylic panels tend to exhibit a yellowish tint due to their natural color, but these panels maintain their transparency without losing clarity.

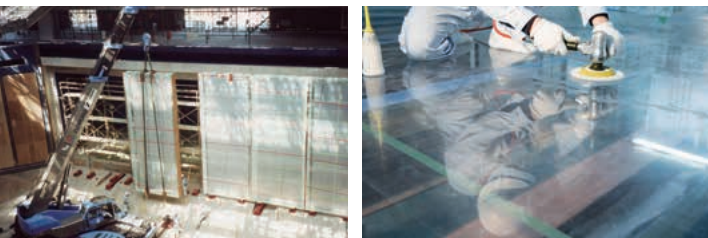
One reason for this is in the material preparation. President and Representative Director of NIPPURA, SHIKIYAMA Yasuhiro, explains, “We commission the production of the raw acrylic panels to a major comprehensive chemical manufacturer. To achieve transparency like crystal glass, we deliberately add special colors at this stage.”

Furthermore, ensuring safety and durability is highly important. To prevent incidents like cracks in public facilities or premature aging compared to



Photo: NIPPURA

The Kuroshio Sea tank at Okinawa Churaumi Aquarium features a large acrylic panel for viewing.



Photos: NIPPURA

Left: The process of bonding acrylic panels as well as the following stages occur at the actual site.

Right: The polishing process, using a hand polisher.

buildings, acrylic aquariums must meet these two performance criteria, even on a massive scale.

NIPPURA achieves this through four exceptional techniques: cutting, bonding, polishing, and heat treatment.

The first technique, cutting, involves machining the raw acrylic panels to achieve a uniform thickness. When specifying the finished accuracy to the manufacturer commissioned for panel production, costs can escalate. To control costs, NIPPURA manages the process of ensuring uniform thickness in-house.

The second technique is bonding. The standard sizes for panels are 3.5m × 8.5m, available in thicknesses of 30mm and 40mm. These are laminated or joined together using specially developed high-strength adhesives produced in-house.

The third step is extremely important for enhancing transparency: polishing. In this process, employees rely on their senses of sight and touch to manually polish the surfaces. It was concluded after trial and error that manual labor is best suited for ensuring

the quality of special-order products.

The fourth step, heat treatment, involves applying vibrations to the molecules of acrylic resin and adhesives to strengthen their bonds. This process significantly enhances the transparency and strength of the panels. By heating the acrylic resin until just before softening, the vibrations between molecules are maximized, and returning to room temperature ensures a highly uniform molecular bonding state. These exceptional techniques have gained international recognition, with a track record spanning over 400 projects across 63 countries in design and construction.

As SHIKIYAMA passionately states, “Our acrylic aquariums represent Japan’s finest products. Moving forward, we will continue to uphold our dedication and cherish our pride in craftsmanship.” ¹

1. There is a research report stating that Japan has the highest number of aquariums per square kilometer in the world. In addition to aquariums certified under Japan’s Museum Act, there are numerous related facilities of various sizes, highlighting the advanced breeding techniques in the country.



Photo: NIPPURA

Giant aquarium at King Abdulaziz International Airport, designed and constructed by NIPPURA.

Innovative Drying Equipment Unique in the World

Among the waste generated during the manufacturing process, some materials have value and can be sold for profit. By monetizing these valuable materials, the amount of waste is reduced. Supporting the realization of such a circular economy¹ is the innovative Compact Disk (CD) Dryer[®] by NISHIMURA WORKS Co., Ltd., based in Saga Prefecture.
(Text: MOTEGI Shunsuke)

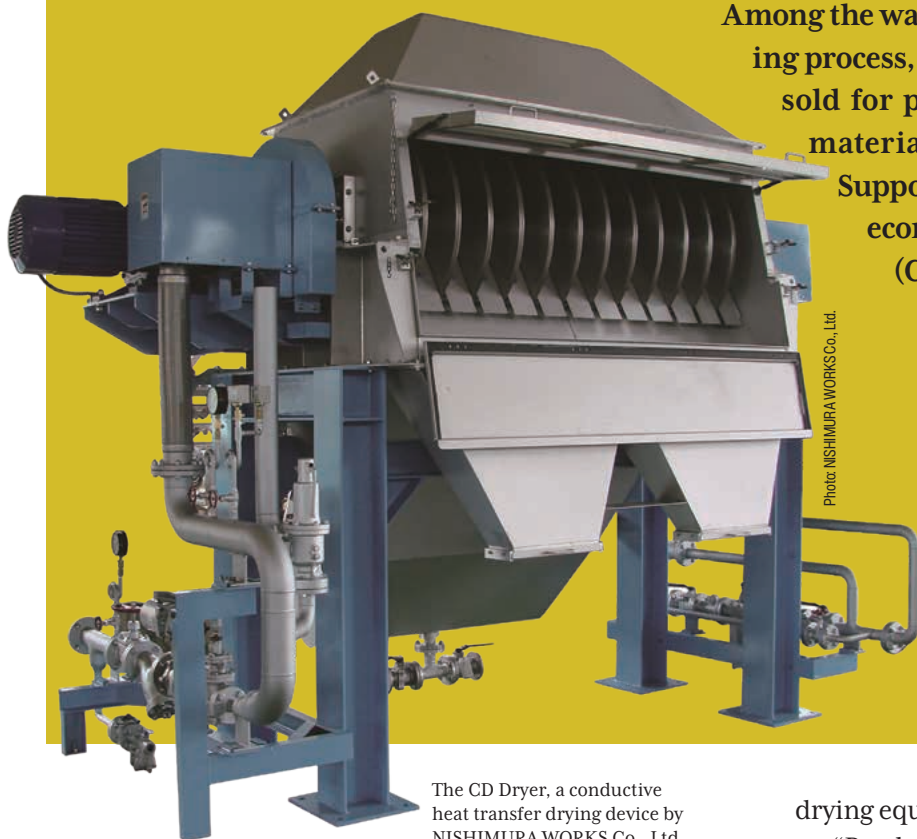


Photo: NISHIMURA WORKS Co., Ltd.

The CD Dryer, a conductive heat transfer drying device by NISHIMURA WORKS Co., Ltd.



Photo: NISHIMURA WORKS Co., Ltd.

Head Office of NISHIMURA WORKS Co., Ltd. (Ogi City, Saga Prefecture)

Kyushu, located in the southwestern part of Japan, is renowned for its shochu (Japanese distilled spirit), a popular distilled spirit. After distillation, a liquid containing organic matter², known as “shochu lees,” is produced. The CD Dryer by NISHIMURA WORKS was originally developed to evaporate the moisture from shochu lees, allowing the dried product to be sold as fertilizer and feed, thereby generating revenue. We interviewed IZUMI Akira, Director and General Manager of the Sales Division, to learn more about the development of this innovative



Photo: NISHIMURA WORKS Co., Ltd.

An example of a dried product produced by the CD Dryer, which is also used in powder manufacturing.

drying equipment.

“Production began in 1987. At that time, shochu lees were disposed of through ocean dumping, which was cost-free, so the CD Dryer was not used by shochu manufacturers. However, about 20 years later, the adoption of the London Protocol strengthened restrictions on ocean dumping of waste, leading to increased demand from shochu manufacturers for the CD Dryer. The equipment gained recognition for its capability to significantly reduce waste by evaporating the moisture from shochu lees,” says IZUMI.

With the changing times, the purpose of using the CD Dryer evolved significantly in the shochu industry from monetizing valuable materials to reducing disposal volumes. In addition, it has supported a range of applications, including metal recovery from waste liquids at rare metal recycling plants and the production of powdered feed³, leading to numerous successful implementations.

“For example, a company engaged in rare metal recovery was discharging around 10 tons of copper-containing wastewater daily and spending 90 million yen annually on disposal costs after dewatering.



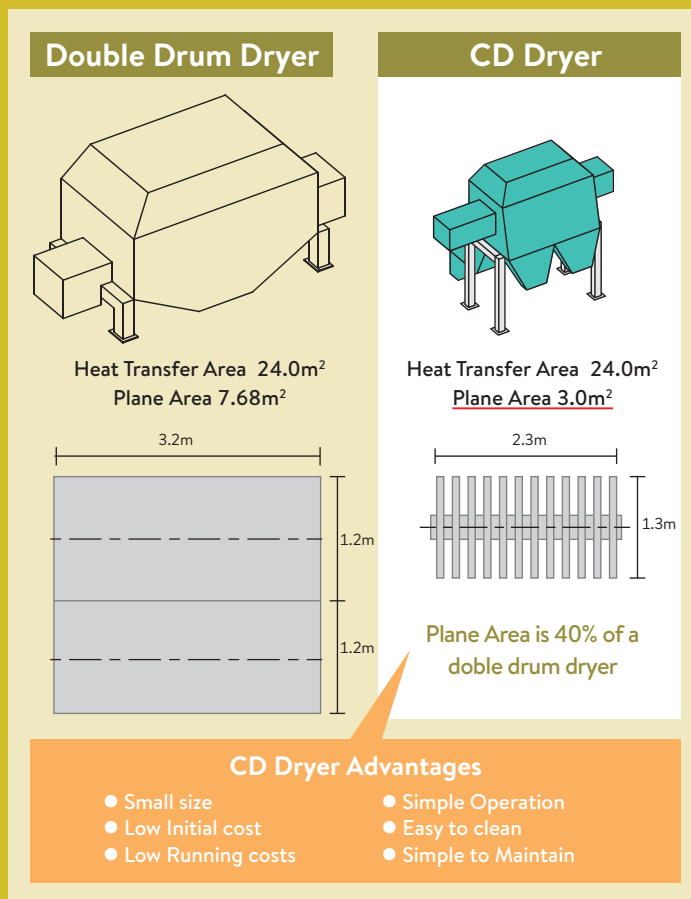
Photo: NISHIMURA WORKS Co., Ltd.

The process of pouring the target liquid onto the rotating disk.



Photo: NISHIMURA WORKS Co., Ltd.

The CD Dryer model with 12 disks arranged inside the unit.



On the left is a typical drying device. The CD Dryer utilizes both sides of multiple disks as the heat transfer surface for heating the target material. This design allows for the same heat transfer area to be achieved with a smaller installation footprint.

However, by introducing the CD Dryer, they were able to extract copper from the wastewater, reducing disposal costs by 60 million yen per year and generating 5 million yen annually from copper sales. Notably, over the past three years, the equipment’s adoption has increased significantly overseas, expanding to more than 10 countries, primarily in Asia,” explains IZUMI.

The drying technology is characterized by its innovative design. “Using heat conduction⁴ to indirectly heat the material and evaporate moisture is a common approach, but the specific method employed here is born from a unique concept. The system utilizes metal disks, approximately 1 meter in diameter and 2 cm thick, which are central to the process. These disks rotate up to 20 times per minute inside the device. The disks are heated internally by steam to temperatures exceeding 100°C on the surface. When the target liquid is poured onto the rotating disk, the moisture evaporates, leaving the dried material on the surface, which can then be collected. This method is unparalleled worldwide, with patents granted for both the disk’s structure and the heat source used.”

The key feature of this technology is the use of both

sides of the thin disks for heating the target liquid. By arranging up to 16 disks in a line, the device increases the heating surface area, resulting in a more compact and thermally efficient system compared to traditional equipment.

“This drying equipment is the result of our research and development based on the idea that it functions as a heat exchanger⁵. By improving thermal efficiency, we have also achieved strengths in energy savings and reduced operational costs. Our company philosophy is ‘Challenge and Create.’ Since our founding, we have focused on the challenge of creating industrial machinery that does not yet exist in the world,” says IZUMI.

This company philosophy led to the creation of the innovative drying equipment utilizing disks.

1. A circular economy system aims to continuously create new value while consistently recycling resources (including products and components).
2. Compounds that contain carbon.
3. A process that improves handling and preservation by converting raw materials into powder or granules.
4. The phenomenon where heat transfers through an object from a high-temperature area to a low-temperature area.
5. A device that promotes efficient heat transfer by utilizing the property of heat moving from high to low temperatures.



Group photo at the PALM10

Report on the Tenth Pacific Islands Leaders Meeting (PALM10)

The Pacific Islands Leaders Meeting (PALM) provides a platform for Japan and Pacific Island countries and regions to engage in candid discussions at the leadership level. The summit aims to contribute to regional stability and prosperity while enhancing mutual partnerships. The PALM10 was held in Tokyo from July 16 to 18, 2024. This report highlights the key discussions and outcomes of the meeting.

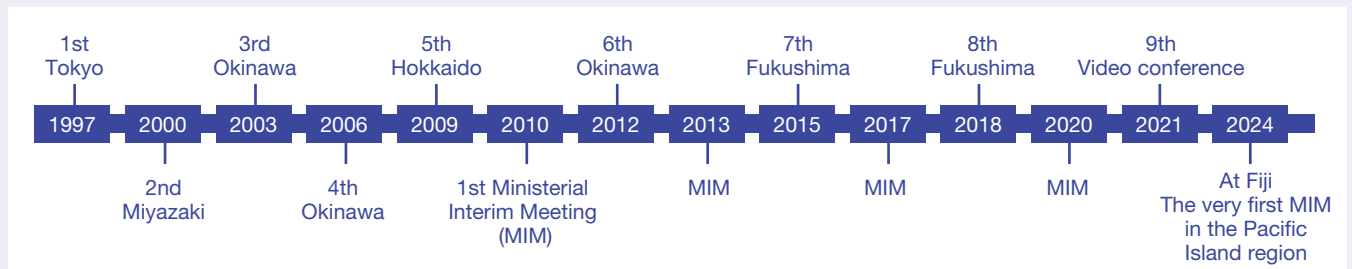
Pacific Island countries and regions in the three sub-regions of Micronesia, Melanesia, and Polynesia, are important to Japan due to their friendly disposition, as well as our sharing common value and principle, close coordination in various areas and activities at the international arena. PALM was first held in 1997 with the aim of strengthening Japan’s relations with these countries. Since then, it has been hosted in Japan every three years. Pacific Island countries face challenges such as limited and dispersed land, isolation from international markets, small populations and economies, and being surrounded by vast oceans. In addition, they are also vulnerable to environmental changes such as natural disasters and climate change. The PALM meetings address these various issues by seeking solutions together and discussing ways to achieve stability and prosperity in the Pacific Island region at the leadership level.

For the 10th Summit, leaders and other representatives from Japan, 14 Pacific Island countries, two French

overseas territories, Australia, and New Zealand—totaling 19 countries and regions (see the map on P27)—gathered, along with the Secretary-General of the Pacific Islands Forum (PIF)¹. The previous summit was held online due to the COVID-19 pandemic, making this the first in-person meeting in six years.

At the opening session of the Leaders Meeting held on July 18, the co-chairs, Mr. KISHIDA Fumio, Prime Minister of Japan, and Hon. Mark Brown, Prime Minister of the Cook Islands, the PIF Chair for this year, delivered the opening remarks. Following this, discussions were organized into three sessions and a Working Lunch, focusing on the seven areas outlined in the PIF’s “2050 Strategy for Blue Pacific Continent².” At the conclusion of the sessions, the leaders adopted the “10th Pacific Islands Leaders Meeting (PALM10) Japan-Pacific Islands Forum Leaders’ Declaration” and the accompanying “PALM10 Joint Action Plan” as the outcomes of the discussions³.

History of PALM



Since the 1960s, numerous independent nations have emerged in the Pacific Island region. Japan had already established close relationships with these countries, including through people-to-people exchanges, even before their independence. For Japan today, Pacific Island countries are key international partners and important

sources, as well as overseas shipping routes of natural resources (such as fisheries and energy). Through the triannual PALM meetings and the Ministerial Interim Meetings held between them, Japan and the Pacific Island countries have deepened their ties, “KIZUNA”.

PALM10 Meeting Schedule

July 16	Welcome reception hosted by Chief Cabinet Secretary HAYASHI Yoshimasa and Mrs. HAYASHI. Bilateral meetings (Japan with Tuvalu, Vanuatu, Niue, and Papua New Guinea). Courtesy call on Prime Minister KISHIDA by the PIF Secretary-General.
July 17	Banquet hosted by Prime Minister KISHIDA Fumio and Mrs. KISHIDA. Bilateral meetings (Japan with Palau, Marshall Islands, Fiji, Samoa, Cook Islands, Tonga, and the Solomon Islands). Courtesy call on Prime Minister KISHIDA by representatives from New Zealand and the Commonwealth of Australia.
July 18	Leaders Meeting (Sessions 1-3, Working Lunch), and joint press conference. Bilateral meetings (Japan with the Federated States of Micronesia and Nauru), and the Partners’ Program. Courtesy call on Prime Minister KISHIDA by the representative from French Polynesia.

Related events included a luncheon hosted by the Japan-Pacific Island Countries Parliamentary Friendship League, the 3rd meeting of the Pacific Islands Leaders Meeting and Governors (PALM&G), an event co-hosted by the Ministry of Foreign Affairs and Japan International Cooperation Agency (JICA) titled “KIZUNA between Pacific Island Countries (PICs) and Japan through People-to-People

Exchange,” and an event co-hosted by the Ministry of Foreign Affairs, Ministry of Economy, Trade and Industry and (Japan External Trade Organization (JETRO) titled “the 4th Japan-Pacific Island Countries Economic Forum”. The Emperor and Empress hosted afternoon tea at the Imperial Palace, inviting leaders and representatives that attended at the PALM10 on this occasion.

Overview of each session

Session 1: Vision for the PALM Partnership towards 2050, Striding forward Together

Prime Minister KISHIDA noted that Japan successfully implemented robust development cooperation and people-to-people exchanges and human resource development for 7,500 individuals, exceeding the target set under the “Japan’s Pacific Bond (KIZUNA) Policy” announced at PALM9. He emphasized that it is of utmost importance that each of these

cooperative efforts serves as a source of strength for Pacific Island countries and regions. The leaders of the Pacific Island countries and regions expressed their appreciation for the pioneering role of PALM, gratitude for Japan delivering its commitments from PALM9, and their willingness to continue further developing cooperation with Japan.

Session 2: “Climate Change and Disasters” and “Ocean and Environment”

Prime Minister KISHIDA stated that Japan and the Pacific Island countries and regions fully share the sense of crisis regarding climate change, described as “the single greatest existential threat” to the region. He announced the “Pacific Climate Resilience Initiative” as an “All Japan” initiative mobilizing Japan’s technology, know-how, and financial

resources, which consists of three pillars, (1) strengthening disaster risk reduction and response capacity, (2) promoting decarbonization, and (3) supporting Pacific-led efforts. The leaders of the Pacific Island countries and regions welcomed Japan’s efforts and expressed their willingness to continue cooperation with Japan.

Session 3: “People-Centered Development,” “Resources and Economic Development,” and “Technology and Connectivity”

Prime Minister KISHIDA stated that to protect and strengthen “human dignity,” Japan would continue to promote cooperation in the fields of education and health, and further expand people-to-people exchanges through the current human exchange and human resource development programs between Japan and the region and a recently

decided human resource development program for young government officials from Pacific Island countries. The leaders of the Pacific Island countries and regions welcomed Japan’s efforts and expressed their expectations for further cooperation with Japan in finance, trade, investment, and infrastructure development.

Working Lunch Agendas: Cooperation in International Fora, “Peace and Security” and Way Forward from PALM10

Japan and the Pacific Island countries and regions reaffirmed their shared values and principles and concurred on the importance of a free and open international order based on the rule of law. Additionally, Prime Minister KISHIDA expressed Japan’s commitment to promoting robust development cooperation and people-to-people exchanges and human resource development for more than 6,500 people over the next three years. He also proposed holding the Sixth Ministerial Interim Meeting before PALM11.

In conclusion, the leaders reaffirmed their commitment to striding forward together towards realizing a shared vision for the future between Japan and the Pacific Island countries and regions. They also renewed their determination to further strengthen their mutual *KIZUNA* (bonds). The PALM10 summit was then adjourned.



Prime Minister of Japan KISHIDA Fumio and Prime Minister of the Cook Islands Hon. Mark Brown, who served as co-chairs, exchange a firm handshake.

Note: This article has been prepared based on publicly released materials from the Ministry of Foreign Affairs, with their approval.

1. The forum is a platform for dialogue among leaders of Oceania countries and aims for regional cooperation. It includes 16 countries and two territories: Cook Islands, Commonwealth of Australia, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu (some country names have been abbreviated).
2. In 2022, the Pacific Island countries and regions developed a common strategy for the future, which encompasses seven key areas: (1) Political Leadership and Regionalism, (2) People-Centered Development, (3) Peace and Security, (4) Resources and Economic Development, (5) Climate Change and Disasters, (6) Ocean and Environment, and (7) Technology and Connectivity. This strategy reflects the collective concerns and priorities of the Pacific Island countries and regions.
3. The Leaders’ Declaration and Joint Action Plan can be referenced on the Ministry of Foreign Affairs website: https://www.mofa.go.jp/a_o/ocn/pagewe_000001_00022.html



Official Logo for PALM10

The letters “PALM10” in the logo show elements of leave and water, and the design of the “0” (zero) represents PALM partners, the 19 countries and regions. Also, the upper part of the logo symbolizes the Pacific Islands and the lower part consists of the image of waves which represents the image of a “palm”. Following a selection process from logo design submissions, the design by graphic designer ISHIDA Hironobu was chosen.



A scene from the Leaders Meeting held on July 18.



The banquet hosted by Prime Minister KISHIDA and Mrs. KISHIDA on July 17 featured dishes prepared with local ingredients from the Noto region of Ishikawa Prefecture, reflecting Japan’s commitment to backing disaster recovery.



Later in the evening, the guests experienced a traditional Japanese “summer festival,” embodying the spirit of people-to-people exchanges.

Photos: Courtesy of Cabinet Public Affairs Office

PALM10 Countries and Regions(①② chair countries)



Prepared based on material from the Ministry of Foreign Affairs



Japanese Wedding Attire — Gorgeous Beauty and Deep, Rich Traditions

Kaaisan

Kaaisan is a Kyoto-based creator who promotes Japanese culture in English day-by-day. In this month's issue, Kaaisan talks about Japan's wedding attire.

Bride in traditional Japanese wedding attire *shiomuku*. The *uchikake*, which is worn as the outermost layer of the kimono, is also white. Photo: PIXTA

Did you know that one of the accessories of the traditional Japanese bridal attire is a smallish short sword? This is a leftover from a society where samurai warriors were prominent. As you can see, even an aspect of wedding costume can reveal traditions, aesthetics, and beliefs that have been passed down from generation to generation in Japan. Welcome to the gorgeous, rich, and complex world of Japanese wedding attire.

Bride's attire

Similar to the image of Western wedding dresses, in Japan white is considered a sacred and pure color, and an outfit called *shiomuku* (literally “pure white”), which consists of a white kimono, white *obi* (sash), and white accessories is the most classic bridal attire. Recently, it has become fashionable to wear a colorful kimono under the white kimono or, conversely, to choose a vibrantly colored and patterned *uchikake*, a gown-like garment with a long hem that is worn as the outermost layer of the kimono.

Just as a veil is worn over a wedding dress, the bride in Japan wears a white hat (*wataboshi*) or a kind of headdress (*tsunokakushi*) to cover her head. In fact, the hairstyle hidden under such headgears is also unique. The *bunkin takashimada*¹ hairstyle, which was popular among women in the late 19th century, has become a standard for brides. But today, it is common to wear a wig with this hairstyle.

A smallish short sword for protection called a “*kaiken*” and an accessory pouch are tucked into the folds of bride's her robe. Both are believed to have been carried by women of the samurai class around the 17th century, and they were incorporated into the traditional bridal attire as accessories beginning in the 19th century. The accessory pouch was likely used to carry a handkerchief, medicine, cosmetics, etc.

The patterns on wedding kimonos are not purely decorative. They are chosen for their auspicious nature, which has been passed down as part of ancient beliefs and traditions. Such patterns include cranes, a symbol of longevity and vitality, and *seigaiha*

(literally “blue ocean waves”),² a symbol of permanent peace.

Groom's attire

The traditional wedding attire for the groom is called *kuromonpuku* (or “black *haori* and *hakama* with five crests”). This formal outfit consists of a black kimono, *hakama* pants with striped pattern, and a black *haori* (overcoat). The overcoat has a *kamon* (family crest) embroidered on five places. This crest is a symbol of the family lineage and social status inherited from his ancestors.

Attendees' attire

In modern Japan, Western-style attire has become the norm for attendees, with many men wearing suits and a growing number of women wearing classical and formal day dresses, although white is avoided. However, female relatives of the couple are more likely to wear kimonos. The mothers of the groom and the bride wear *kuro-tomesode*, a type of black kimono with shorter sleeves and elaborate designs on the



Kaaisan

Creator of English-language short film introductions to Japan. She manages an online community for like-minded people interested in Japanese culture and worldview to meet and learn together. She also plans and organizes various events on an irregular basis.



Bride wearing an *uchikake* of vibrant colors and patterns. You can catch a glimpse of the *kaiken* smallish short sword and the accessory pouch tucked into the folds of her robe.

Photo: Kaaisan

Bunkin takashimada, the standard hairstyle for brides wearing traditional Japanese attire.

Photo: PIXTA



Iro-uchikake (colored *uchikake*) with crane patterns, a symbol of longevity and vitality.

Photo: Kaaisan

lower half only. Married women wear *iro-tomesode*, a colored kimono with shorter sleeves and no designs on the upper half. Unmarried women wear *furisode*, a colored kimono with elaborate designs on both the top and bottom, and long sleeves that reach down to their feet.

the home, in wedding halls or shrines. Also, due to the new custom of taking commemorative wedding photos on occasions separate from the actual wedding ceremony, there are more opportunities to see people in various Western and Japanese wedding attire on the streets of Japan today. If you are traveling in Japan and come across such couples, be sure to quietly congratulate them with the Japanese phrase “*Omedeto*” (unless they are in the middle of their severe wedding ceremony).



The groom (right) is wearing *kuromonpuku*, a traditional wedding outfit. The bride is wearing *shiromuku*.

Photo: Kaaisan

Originally, many Japanese weddings were held at home, but since the 20th century it has become common to hold weddings outside



person from the right is the bride, who is dressed in a gorgeous patterned *uchikake*. The person on the far right is the mother of the groom or the bride. She is wearing a *kuro-tomesode* (black formal kimono with shorter sleeves).

Photo: Kaaisan

The type of clothing of attendance at a wedding varies depending on their blood relationship with the bride and groom, etc. (The photo is an example from an actual wedding ceremony.)

The woman on the far left is wearing a *furisode* (long-sleeved kimono), usually reserved for young, unmarried women. The second woman from the left is wearing *iro-tomesode* (colored kimono with shorter sleeves), typically worn by married women. The third person from the left is the father of the groom or the bride. He is dressed in a Western-style morning coat. The man next to him is the groom. He is wearing a traditional wedding outfit called *kuromonpuku*. The second

1. One of the traditional Japanese hairstyles. There are different theories about its origin. In modern Japan, it is a typical hairstyle for brides wearing traditional Japanese attire (see photo).
2. A traditional fan-shaped geometric pattern representing ocean waves, which has been used in Japan since ancient times. The endlessly repeating wave pattern is an expression of hope for a peaceful life and long-lasting happiness.



(An example of a *Seigaiha* pattern)



Geimon crest created by KATSURA Fukuryu for use as a *Rakugo* storyteller. The design features a dragon, which appears in his stage name, a maple leaf inspired by the national flag of his home country, Canada, and a *hanabishi* diamond-shaped flower motif in the center – the crest of the Katsura School.

Photo: Katsura Fukuryu Office



KATSURA Fukuryu wearing a kimono adorned with his own crest

Photo: Katsura Fukuryu Office

The Charms of Japanese *Monsho* Crests: Simple Designs Infused with Traditional Beauty

Rakugo storyteller KATSURA Fukuryu, originally from Canada, designed a crest of his very own, featuring motifs based on his stage name, when he was still performing as an amateur. In this issue, he shares his thoughts on the appeal of Japanese crests, including *kamon* family crests and *geimon*¹ artistic performers' crests.

KATSURA Fukuryu

In Japan, most families have crests (*kamon*) that have been handed down from generation to generation. You can see them featured on kimonos worn by members of the extended family on ceremonial occasions like weddings and funerals, for example. While the family crests found in the West are often colorful and complex, with images of lions, unicorns, and so on, Japanese *kamon* tend to feature simple black-

and-white designs. Many have motifs based on flowers, plants, birds, the moon, and so on, with easily recognizable forms. There are said to be over 30,000 designs, and it seems really fascinating that each of them has some significance related to the family's roots.

Each school of *Rakugo* actually has its own crest, called a *geimon*, too. These crests are handed down from teachers to generations of their disciples and displayed on their own kimono, as well. In my case, though,

I was familiar with that culture from the time I was an amateur *Rakugo* storyteller, so when I had my kimono made, I designed my own *geimon* crest for it.

At the time, I was using the stage name Duke Canada, picking out kanji characters for it that could be read with similar pronunciations: Ryuku Kanada, written as “龍来彼方”. The first two characters mean “dragon” and “come,” and the last two together would ordinarily be read as *kanata*, meaning a distant direction or foreign



KATSURA Fukuryu

He is a *Rakugo*² storyteller originally from Canada. In October 2016, he joined the KATSURA Fukudanji Ichimon (House), and became the 11th disciple of KATSURA Fukudanji. He is based in the Kansai region³, and performs at *Yose* (*Rakugo* theaters) throughout Japan. With the goal of showing the charm of *Rakugo* to the world, he has appeared in shows in Las Vegas, San Francisco, and Hawaii in the United States, as well as in Canada and the Philippines.

Q KATSURA Fukuryu



Tenugui hand towel decorated with a variety of different Japanese *kamon* family crests. Each features a simple design consisting of a motif based on items like a flower, plant, bird, or the moon in the small circular space of the crest.

Photo: PIXTA



Kamon crests can also be seen adorning *yane-gawara* roof tiles used in Japanese structures, including castles, temples, shrines, and houses built with traditional techniques. Shown in the photo is a *kiri-mon*⁴ crest.

Photo: PIXTA

land. By voicing the T as a D, I made it refer to Canada specifically, so all together, the name suggests “A dragon from Canada.” The dragon here also relates to my family’s Scottish origins and the lizard featured in my ancestors’ family crest. I designed my own *geimon* crest based on this name that I made up. The way the dragon holds its tail in its mouth to form a circular arc expresses the concept of eternity. I also placed a maple leaf, as featured on the Canadian flag as well, in the middle of it. While it was challenging to incorporate these humorous and complicated double meanings with a simple design, it was also fun.

Later, I became a disciple of *Rakugo* master KATSURA Fukudanji, seeking to become a professional *Rakugo* storyteller. Then, I was given the stage name KATSURA Fukuryu, with Fukuryu written as “福龍,” combining *fuku* (good fortune) from my teacher’s name with *ryu* (dragon) from my original amateur stage name. The *geimon* crest for our school of *Rakugo* features

a *hanabishi* pattern with a flower petal pattern arranged around a diamond shape. My teacher took a liking to my original crest design, though, and I was given approval to use a crest combining my original design with the official crest of the *Rakugo* school after I became an apprentice. So, at this point, I revised my original design to include a *hanabishi* flower pattern in the middle of the maple leaf. When I perform together with others from our *Rakugo* school, I wear a kimono featuring the *hanabishi* crest to show unity with the group. When I give solo performances, however, I wear a kimono adorned with my own original crest.

When you live in Japan, you might notice various crests all around the cities and streets. These include not only *kamon* family crests, but a variety of other crests as well, associated with prefectures, schools, companies, and so on. I like how, even without Japanese language skills, you can seem to imagine something about



Blossoms and leaves of the *kiri* (paulownia or empress tree), the basis of the *kiri-mon* crest’s design

Photo: PIXTA

their significance by considering the motifs they use.

For anyone thinking it would be fun to design an original *kamon* crest of their own, I might recommend considering designs that express something about your home country or your family’s roots. It can be challenging to create designs that incorporate multiple motifs in a small round space, but you will be sure to end up with a totally unique crest.

1. In Japan, *monsho* (crests) are also referred to as *mon*.

2. *Rakugo*: Traditional storytelling art of Japan created over 400 years ago. For a more detailed discussion, see the May 2024 issue of “HIGHLIGHTING Japan.” (⇒https://www.gov-online.go.jp/hlj/en/may_2024/may_2024-11.html)

3. Kansai region: The area roughly around Kyoto, Osaka, Kobe, and their neighboring prefectures

4. Typical example of a Japanese *kamon* family crest, featuring a design with a motif based on the blossoms and leaves of the *kiri* (paulownia or empress tree)

Long sword signed Sanjou (celebrated Mikazuki Munechika)



The sword's maker, Munechika, was a well-known swordsmith thought to have lived in Kyoto's Sanjo district. He used two different inscriptions: "Munechika" and "Sanjo." The Mikazuki Munechika is inscribed "Sanjo." (Dimensions: approx. 80-cm blade length with approx. 2.7-cm curve)

Photo: ColBase (<https://colbase.nich.go.jp/>)

The celebrated Mikazuki Munechika long sword (*tachi*) signed "Sanjo," a National Treasure, is thought to have been crafted between the 10th and 12th centuries. Its maker, Munechika, was a famous swordsmith known as Sanjo Munechika, as a Muromachi-period (1392–1573) work listing swords and swordsmiths describes him as a resident of the Sanjo district of Kyoto around the beginning of Emperor Ichijo's reign (986–1011 as the 66th emperor of Japan). He used two different inscriptions: "Munechika" and "Sanjo."

This blade is representative of those with the Sanjo signature and was regarded as one of the "Five Famous Swords of Japan" (Japanese: *tenka goken*) during the Muromachi period. Its distinctive form bespeaks the old style of Japanese sword making: a strong curvature from the tang through the lower half of the blade (*koshi*), but almost no curvature in the upper half (*saki*). The crescent-moon-shaped pattern (*mikazuki*) of the tempering gives the work its name, "Crescent-Moon Munechika" (Mikazuki Munechika).¹

The sword was left to Kodai-in — the primary wife of Toyotomi Hideyoshi, the Sengoku military commander who united all of Japan — and next to Tokugawa Hidetada (Reign of Shogun:1605–1623), the second shogun of the Edo shogunate, after which it was passed down through the Tokugawa shogun family. Today, it is in the Tokyo National Museum's collection.



The Mikazuki Munechika features a particularly minute and complex *hamon* temper pattern. The pattern, consisting of several white lines curved like a crescent moon (*mikazuki*), gives the sword its name.

Photo: ColBase (<https://colbase.nich.go.jp/>)

1. Quoted from the explanatory text on the e-Museum website (from "This blade is" to "(Mikazuki Munechika.)" (<https://emuseum.nich.go.jp/top?langId=en&webView=>)

Reference: Terms used in this text

Muromachi period: In this article, the Muromachi period is defined as from 1392 (the year when the Northern and Southern Courts were united) onwards. Generally considered to refer to the roughly 240-year period from 1336 to 1573 when the Ashikaga clan had a shogunate established in Kyoto, although various interpretations exist.

Tenka goken: Five specific swords considered to be the greatest masterpieces among all the many Japanese swords ever crafted

Nakago (tang): The portion of a sword blade that fits into the handle (*tsuka*)

Hamon (temper patterns): White, wave-like patterns applied to Japanese sword blades during tempering or hardening (*yaki-ire*), a stage in the sword-making process in which the sword steel is rapidly cooled from a high-temperature state to increase its hardness. The patterns appear in a variety of different forms depending on the era or school of sword-making. They are one of the highlights of Japanese swords' features that reveal swordsmiths' individual characters.

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