

# Japan takes on the infrastructure challenges of the 21st century

Greener, stronger, and more resilient to natural disasters, when it comes to infrastructure, Japanese companies have gained considerable expertise in maintenance and repair, disaster prevention and carbon-reducing technologies, and are ready to take their know-how globally to countries facing similar issues as Japan.

From a Shinkansen railway system boasting zero passenger fatalities in 50 years of operation to the world's longest suspension bridge connecting Awaji Island to Kobe, Japan is recognized as a global leader in construction and infrastructure. Since the country's first construction boom prior to hosting the 1964 Olympics, Nippon enterprises have been admired not only for their ability to build engineering marvels, but for their capacity to do so in one of the world's most inhospitable environments, marked by tectonic activity and mountainous regions. It is therefore no surprise to find that since 1990, the 'land of the rising sun' has consistently ranked amongst the Top 5 in the WEF's 'quality of infrastructure' assessment.

Today, the Japanese construction market has matured. With the oldest population in the world, Japan's demographic line has been sharply declining since 2011, which has lowered the amount of new projects. The Japanese market is currently sustained by the rising need for maintenance and repair of aging infrastructure, which also includes leveraging the latest disaster prevention technologies to enhance resilience to natural disasters. And with Japan looking to reach carbon neutrality by 2050, the environment is also a major priority for those in construction and related industries.

"One aspect is that the market is definitely faced with aging infrastructure and facilities, and how to deal with that issue. The second aspect is the strengthening of buildings towards mitigating earthquake damage, and the third aspect is preventing disasters apart from earthquakes, such as the flooding of rivers. Creating infrastructure to be resilient in the face of these three aspects is the primary aim of projects nowadays, and there is a big demand for projects in this field," says Takasuke Nakano, President of Mitsui Consultants.

"As for technologies that we can provide in order to prevent and reduce disasters, we are focused on the conservation of coasts, river channels, and groundwater tables in order to mitigate the effects of events such as tsunamis, floods and landslides. One specific technology developed by our company is called RRI (Rainfall-Runoff-Inundation), a flood predic-

tion system using a flood analysis model developed by ICHARM (The International Center for Water Hazard and Risk Management). We have developed a real-time flood prediction system for floods all over Japan using a supercomputer."

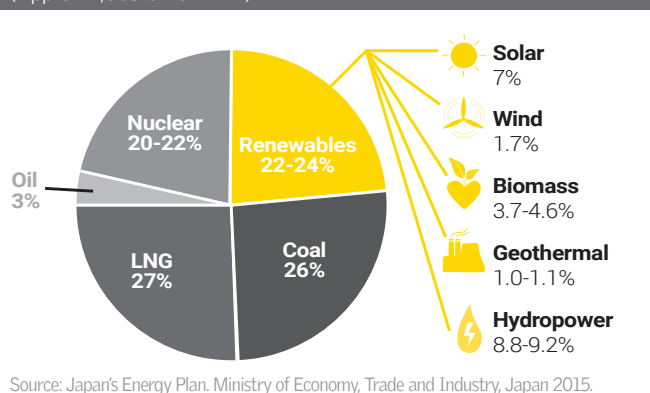
Indeed, Japanese companies like Mitsui Consultants have gained considerable expertise and knowledge when it comes to disaster prevention technologies and are ready to share those technologies with other countries facing increasing natural disasters due to climate change. Chuo Kaihatsu has also developed state-of-the-art technology to mitigate the impact of landslides, with its Kantaro early warning system (EWS) utilized globally.

"In recent years, many preventive conservation projects are needed, such as flood improvement in watersheds, prevention of landslides and other measures due to the frequent occurrence of torrential rain due to climate change," says Makoto Tanaka, President of Chuo Kaihatsu. "Especially in the past decade, there have been many natural disasters that have resulted in the loss of precious lives and valuable property. Situations like this make us reflect, and I want to utilize the technology we have accumulated here at Chuo Kaihatsu and deliver that internationally. We also have various maintenance and management technologies that we have accumulated over the past 76 years. We wish to contribute overseas by putting together a set consisting of our infrastructure and our technology."

Yasuhiro Tochimoto, President & CEO of Kawasaki Geological Engineering (KGE), highlights that the Sagami Tunnel collapse in the Yamachi Prefecture in 2012 triggered a shift in emphasis from new construction to maintenance and management of aging civil engineering structures. "As a result, the number of surveys, inspections, diagnostics and designs for maintenance and management has increased compared to civil geological surveys of new construction projects, and the renewable energy field has also become active. Therefore, the content of our business has diversified," he explains.

"The aging of civil engineering structures is inevitable, but the policy

**Japan's Projected Energy Mix for Fiscal Year 2030**  
(Approx. 1,065 billion kWh)



has shifted from corrective maintenance, in which repairs are conducted after the infrastructure is damaged, to preventive maintenance, in which measures are taken to extend the life span of the infrastructure before it breaks down. In preventive maintenance, it is important to accurately assess the topographical and geological conditions at the time of construction and maintenance management."

Even ATOX – a company principally engaged in the maintenance, management and deactivation of nuclear power plants – has become involved in the maintenance of public infrastructure, leveraging its know-how in X-ray technology to develop non-destructive inspection systems for large-scale structures. "It's a unique technology that we obtained over the years in the nuclear field. By using X-ray technology, we can visualize the inside of concrete that is over one-meter thick, and this visualization technology should contribute greatly to maintaining the integrity of bridges in the future," explains ATOX president Toshikazu Yaguchi.

"This technology is used to conduct a demonstration project for integrity verification of precast concrete bridges for expressways. Like human beings, social infrastructures need to be maintained for their health and longevity. Our technology will be needed not only in the field of nuclear energy, but also in the fields of people and social infrastructures, and I hope this infrastructure-related technology will spread around the world in the future."

One of Japan's largest expressway operators, the East Nippon Expressway Company (E-NEXCO) is engaged

in maintenance and management of expressways. With the shift towards electronic and autonomous vehicles, president Toru Obata says the company is "sincerely looking toward the future", where E-NEXCO will play a vital role as the number and nature of expressways continue to advance around the globe. "In the last 10 years, we diversified our activities and began conducting maintenance and renovation projects. Rather than overseeing new construction projects, we have developed leading technologies to update and enhance the performance of existing expressways," says Mr. Obata, who also points to the important role the company can play in reducing carbon emissions.

"The first way to reduce carbon missions is to ensure that our highways are in great condition. This includes managing construction and conducting highway redevelopment so that the maintenance is up to date. With regard to highway redevelopment, increasing the number of lanes to four, for example, reduces congestion and directly leads to reducing CO<sub>2</sub> emissions. To support the switch to electric cars and renewable energy, we will increase the number of EV (electric vehicle) chargers in parking and service areas. Utilizing our R&D capabilities, we want to develop a technology that enables EVs to charge while driving. We are currently working towards testing this technology."

With the Japanese government's plan for Japan to reach carbon neutrality by 2050, the role of power generation and related equipment companies will indeed be vital, while institutions such as the New Energy

and Industrial Technology Development Organization (NEDO) and the Mitsubishi Research Institute (MRI) will provide support to companies looking to reduce their carbon footprints. The leaders of both organizations point out the importance of close collaboration between the public and private sectors regarding to the 2050 goal.

"In line with Japan's policy of realizing carbon neutrality by 2050, NEDO has received significant funding to implement the Green Innovation Funding Program. Under this program, concrete goals shared by the public and private sectors for realizing carbon neutrality have been established," says Ishizuka Hiroaki, Chairman of NEDO.

"At this time (February 2022), 11 projects have been launched under this program. These projects focus on areas for promising growth identified in Japan's Green Growth Strategy, such as the creation of large-scale hydrogen supply chains, development of advanced aircraft and shipping technologies, and development of advanced solar cells."

Giving his take on the 2050 target, MRI president Kenji Yabuta says: "For example, in reaching carbon neutrality, optimizing human resources to improve the economy and energy is the challenge. Both the public and private sectors will need to work together."

"Our role in the issue of carbon neutrality would be on putting emphasis on solar, wind and renewable energy, and reducing coal-generated power. To create this shift, it is very important for us to work closely with the public sector," adds Mr. Yabuta.

"Building a number of solar, wind and other renewable energy power plants falls under the private sector. We can contribute by creating solid networks between the private and the public sectors, which will allow us to help make policies with the public sector and make sure the private sector can implement these projects to completion. The experience and knowledge we have gained through our work in the public sector enables us to effectively provide consulting services to the private sector."

Mitsubishi Heavy Industries Environmental and Chemical Engineering (MHIEC) operates several waste-to-energy (WtE) facilities in Japan and Singapore, incorporating the technology of its parent company, Mitsubishi Heavy Industries. With the push towards carbon neutrality, the company is working to develop



**Kotaro Hirano**, President,  
Hitachi Construction Machinery

carbon capture and other technologies in a bid to boost the green credentials of its WtE plants.

"We focus on increasing power generation from waste. Efficient power generation requires high-temperatures and high-pressure boilers. It is not easy because waste energy's crude gas is more hazardous and the boiler tube melts and erodes at higher temperatures. We are developing technologies to solve this challenge," explains MHIEC president and CEO Takayuki Hishinuma.

"We are pursuing higher temperature and pressure to achieve higher efficiency of power generation. Our technology is called an exhaust gas recirculation system. All exhaust gas has low oxygen content and we can reduce harmful nitrogen oxides. Flue gas can also be recycled and reduced. This is a very important technology."

MHIEC also has carbon capture technology that it plans to use for CO<sub>2</sub> recovery at its Tsuzuki WtE plant in Yokohama. "The captured CO<sub>2</sub> will be sent to one of the biggest gas utility companies in Japan, and they will convert the CO<sub>2</sub> to methane through methanation," adds Mr. Hishinuma.

Also involved in the operation of WtE plants (including biomass) in Japan, TRE HOLDINGS specializes in waste management, metal recycling, renewable energy and environmental engineering. As part of its plan to support the creation of a circular economy, the company aims to support countries in Southeast Asia in their quest to diversify and expand their energy mix.

"Currently we have six power generation plants in Japan, and through these we have been able to accumulate knowledge on power generation. From here onwards, we want to focus mainly on Southeast Asia, where we can utilize our know-how," says TRE's chairman and CEO, Matsuoka Naoto. "It's not only biomass power generation, but we also utilize solar power generation as well. I believe there are a number of countries in Southeast Asia that are lacking power. Therefore, by creating a presence there, we hope to contribute to the development of those countries."



**Kazuo Kobayashi**,  
President, Aichi Denki

"I think another focus we have lies in former prime minister Suga's commitment to reduce CO<sub>2</sub> emissions by 46% in 2030, compared to 2013 levels. I would like to think that TRE HOLDINGS can become a leader in this commitment," adds company president and COO, Abe Mitsu. "I will be working very diligently with Mr. Matsuoka to tackle decarbonization, protect the environment and create a Japan that we will be proud to hand to the next generation."

A reputed supplier of power products, including transformers, power converters and control equipment, to Japanese electricity utility companies, Aichi Denki has responded to increasing demand for renewable energy-related technologies, as explained by president, Kazuo Kobayashi. "With the rising demand for renewable energy, electric power companies are looking for a way to maintain the stability of transmission and distribution networks. Our strength is in technologies for automatic voltage regulators and thyristor-type step voltage regulators that can balance out the grid and make the electric supply stable. We are forerunners in this field, and we are trying to develop a product to ease voltage control on the Japanese grid. Japan is aiming to achieve carbon neutrality by 2050. In line with this, we have established new teams to focus on small-scale hydro plants and bio-gas plants."

For its part, cable manufacturer SWCC worked in conjunction with NEDO and BASF Japan to develop a tri-axial superconducting cable that can reduce power transmission energy loss by more than 95%. "Our developed tri axial superconducting cable is thought to greatly contribute to reducing CO<sub>2</sub> emission," says Takayo Hasegawa, Chairwoman and CEO of SWCC. "With regards to the way in which electricity is delivered from power plants to everyone's homes, in Japan there is a 5% annual loss that comes about as a result of utilizing conventional metal cables. This 5% of energy loss is lower than the global standard of energy loss which is around 10%. I truly believe



**Ishizuka Hiroaki**, Chairman,  
New Energy and Industrial  
Technology Development  
Organization

that while 5% may seem small, it is actually equivalent to the annual energy production of five nuclear power plants. I believe achieving a total reduction in transmission loss would be an extremely important contribution to the environment."

When it comes to infrastructure, Daiki Axis is another Japanese company looking to make a big impact globally, with its expertise being in wastewater treatment. Daiki Axis president and CEO Hiroshi Ogame aims to bring the company's Johkasou wastewater treatment system (a system unique to Japan) to South-east Asia and beyond.

"Internationally, with our main priority being to contribute to sanitation and treatment of wastewater, our strength greatly expands through collaboration. Currently, we are looking for partners in India," Mr. Ogame reveals. "We are looking into expanding to Africa, and we are looking to work together with local distributors. Moreover, I want to increase our company's brand awareness in Southeast Asia. We want to be truly well established in that region. Johkasou is not known in overseas markets. Therefore, it starts with promoting its many qualities."

Union Corp, a company well known for manufacturing highly-crafted door handles, also has an eye on establishing a bigger presence in Southeast Asia, as well as Africa and the Middle East. "Our company's future sales will depend on where there is growing demand for new buildings. Therefore, we are targeting emerging economies or developing countries in Southeast Asia, the Middle East and even Africa," says president Junzo Tateno. "We have a 90% market share in the domestic market. There is no general construction company in Japan that is not familiar with Union Corporation. Since we want to achieve similar success in foreign markets, we want to improve our brand awareness. The dream is that one day our door handles will be installed more in the U.S. and Europe."

# MRI: Tackling today's needs and tomorrow's challenges



Mitsubishi Research Institute Website

Through its Value Creation Process, Mitsubishi Research Institute (MRI) works alongside public and private actors in designing far-reaching solutions to global challenges.

Of all the theories advanced to account for Japan's reluctance to embrace digitalization, perhaps the most persuasive is that the country's analogue systems were so efficient that it had no need to go digital. Covid has changed all that, however, and a concerted effort is now underway to bridge the gap between the physical and digital worlds.

Enter the Mitsubishi Research Institute (MRI), a Japanese think-tank of more than 50 years standing, which, thanks to its innovative business model, finds itself perfectly placed to meet the challenges presented by factors such as the country's aging population and low birth rate.

According to President Kenji Yabuta, MRI provides two core solutions to these issues: "The first is optimizing human resources to enhance productivity; the second is improving wellbeing through initiatives in the health-care sector based on our unique value creation process (VCP)."

While maintaining its consulting work in the public sector, which remains at the core of its business, MRI is extending its range of activities to offer the same to the private sector, and to further take on the real-world applications of the solutions it proposes. For example, in the field of digital transformation, Mr. Yabuta describes how MRI helps companies evolve as the "DX journey". The process of transformation itself is "an adventure", with MRI lending a hand in both charting the way forward and guiding companies along the way.

A shared spirit of action across the company led to the creation of its Value Creation Process (VCP), a singular model that enables MRI to provide consultation research and policy-making advice, which it can then help implement in the real world. Mr. Yabuta adds: "We launched our VCP Management program to facilitate the efficient flow of this process

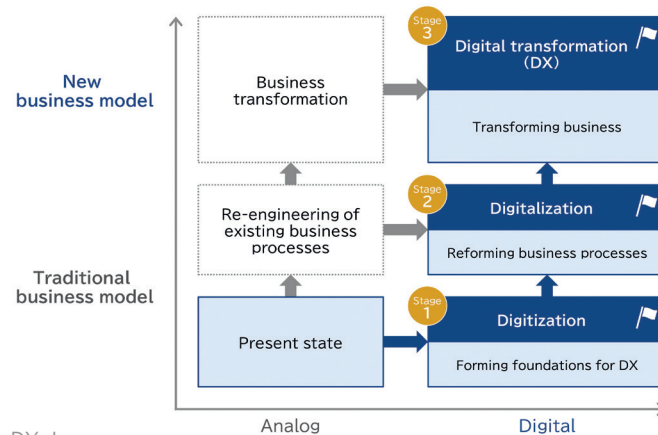


VCP diagram



"Japanese innovation plays a key role in generating social value for people around the world."

Kenji Yabuta,  
President, Mitsubishi  
Research Institute, Inc.



DX Journey

from upstream to downstream. Our upstream work consists in recommending policies to attain the most ideal solutions. Downstream, we implement solutions ourselves in collaboration with business partners or by supporting other businesses to do so."

In practice this process serves to create synergies between the public and private sectors, building solid networks which foster collaboration and mutual growth. A striking example of this is in the field of renewable energy, an area of increasing importance as Japan moves towards carbon neutrality. Focusing on electricity-trading specifically, MRI identified a gap in the Japanese market and began working in tandem with Dutch-based KYOS Energy Consulting with the aim of leading the emerging market in Japan.

The partnership shows how research and consultation (upstream) can lead to real-world application (downstream). As Mr. Yabuta states, "MRI forecasts the kind of work that will be required by our society 30 years from now", harnessing their research to "enhance people's quality of life".

Looking to the future and alongside existing opportunities in the energy and healthcare sectors, the company is turning its focus to wellbeing. "The idea," Mr. Yabuta says, is "to enable more people to live more active lifestyles." Accordingly, MRI has created a structure within the local community involving the transportation and infrastructure sectors: the Region Ring service, a regional digital currency geared towards supporting active lifestyles.

Outside of Japan, MRI is also looking to expand its interna-

tional network, with offices recently established in Hanoi for Southeast Asia and Dubai for the Middle East. The purpose, according to Mr. Yabuta, is two-fold: "to create a network with the governments and Japanese companies in those regions, and to address various societal issues that these regions will face." Underlying this dual purpose, of course, is the knowledge that having experienced many of these problems itself, Japan is in an excellent position to share its expertise with the rest of the world.

Meanwhile, as evidenced by their recent collaboration with KYOS, MRI is also clear on the importance of European and North American countries in addressing issues such as carbon neutrality and digital transformation. Helping Western start-ups establish their business in Japan and provide their services to the country's population will, in time, mean the introduction of cutting-edge technologies and new innovations. Most recently, MRI began working in the field of data analytics with OVHcloud, Europe's largest cloud-service provider, to accelerate digital transformation in APAC markets.

Addressing prospective future partners about the unique opportunity that working with MRI provides, Mr. Yabuta says: "We at Mitsubishi Research Institute address various societal challenges and have advanced technical expertise. We are committed to accelerating and improving the digitalization of Japanese society, and would like to work together with companies that are interested in expanding their businesses in these fields within Japan, South-east Asia and the Middle East."



Envisioning the future,  
leading change

[www.mri.co.jp/en](http://www.mri.co.jp/en)



# E-NEXCO: A clear vision for the future of transportation infrastructure

One of Japan's largest expressway operators is developing next-generation monitoring and maintenance technologies for overseas markets.

Boasting nearly seven decades of experience, the East Nippon Expressway Company (E-NEXCO) specializes in the construction, management, and maintenance of expressways in eastern Japan. It currently monitors some 4,000km of roadway.

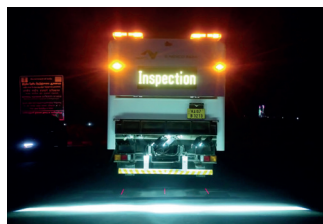
"We were founded in 1956 as the Japan Highway Corporation," says President Toru Obata. "In 2005, the company was privatized and E-NEXCO was established. In the first few years, we focused on managing and organizing expressways and overseeing the construction of routes and transportation infrastructure. In the last 10 years, however, we've diversified our activities and begun conducting maintenance and renovation projects, developing leading technologies to update and enhance existing expressways."

In 2019, E-NEXCO's growing global influence saw it establish an Indian subsidiary, E-NEXCO INDIA (ENI). "ENI is currently bringing E-NEXCO technologies to India, conducting related research, and providing support for Japanese companies entering the Indian market," Mr. Obata says. Among the technologies introduced in India is the E-NEXCO Eye, a Network Survey Vehicle tasked with detecting and measuring road conditions—including International Roughness Index data (IRI; an index of ride quality), cracks, and rutting. "ENI took E-NEXCO Eye equipment that's actually used on Japanese expressways and customized it to local specifications together with Indian road operators and others," Mr. Obata explains.

"The E-NEXCO Eye's most important feature is that it provides both availability and accuracy. Conventional methods require manual work during the daytime and under traffic restrictions. This leads to various problems, including obstruction of traffic, danger to workers, and prolonged work periods. However, the E-NEXCO Eye can accurately acquire data in just one trip while traveling at a maximum speed of 100km/h. What's more, it uses lasers that can



Network Survey Vehicle "E-NEXCO Eye"



Measurement at night



IRI (International Roughness Index) data



Lecture by JICA experts



Technical assistance in India take measurements at night and is equipped with rotating lights and indicator boards for safety. E-NEXCO Eye's advantages of speed, safety and precision make it the best measurement method



Training in Japan for bridge inspection

in India, a country experiencing growing demand for advanced pavement management."

Internationally, E-NEXCO's expertise has led it to consult on official development assis-

tance (ODA) projects in developing countries such as India and Myanmar. "As an example, we worked with local government ministries and agencies to execute a capacity-building project for sustainable mountain road development in India," Mr. Obata says. "We have also dispatched long-term experts on highway construction, maintenance, and policy support through the Japan International Cooperation Agency (JICA). Moreover, we accept road engineers from developing countries through the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and JICA, and provide them with training in Japan."

"In addition, we work with ASFINAG of Austria, with whom we have a technical cooperation agreement, as well as road-related organizations in various countries to inspect sites and exchange views on on-road technology."

In FY2021-22, employees of E-NEXCO and its Group companies participated in various international conferences. They included such academic gatherings as an international road conference of the World Road Association (PIARC) in Calgary, a technical seminar organized by the Indian Road Congress (IRC), and the Japan-India Road Exchange Conference. The participants used those opportunities to gather information on the world's expressway technologies and disseminate information on E-NEXCO Group technologies and know-how overseas.

"Looking at the future, we're sincerely interested in rolling out such technologies internationally, with a special focus on Southeast Asia," adds Mr. Obata. "We will continually strive to take our overseas business even further by making maximum use of our expressway technology and know-how."



[www.e-nexco.co.jp/en](http://www.e-nexco.co.jp/en)



# Geological surveys to meet the needs of society

Kawasaki Geological Engineering specializes in geological surveys which are critical for offshore resource exploration, civil engineering works, and preventive maintenance of Japan's aging infrastructure.

Kawasaki Geological Engineering (KGE) has been engaged in marine geophysical surveys since 1970 and built up experience in submarine resource surveys, submarine active fault surveys, and geological surveys related to the construction of submarine tunnels and strait crossing bridges.



Sonic exploration using a ship

The company's skills contributed significantly to the continental shelf extension in the delineation of Japan's continental shelf.

"We also conduct offshore bore-hole surveys and soil tests in our laboratory. We are now enhancing the system, and expanding our sales channels for offshore

wind farm projects for renewable energy," says Yasuhiro Tochimoto, president of Kawasaki Geological Engineering, whose company slogan is the "Earth Doctor". KGE is striving to improve the quality and expand the scope of marine surveys by enhancing its sonic survey analysis technology and developing a large scaffold available for depths of up to 50 meters.



Maritime boring

On land, KGE participates in the aging diagnosis of civil engineering structures, as well as repair, reinforcement, and other maintenance projects. Japanese policy has shifted from corrective

maintenance, in which repairs are conducted after the infrastructure is damaged, to preventive maintenance



Vehicle-towed ground penetrating radar exploration vehicle

nance in which measures are taken to extend the life span of the infrastructure before it breaks down. "Our survey technologies, such as chirped ground-penetrating radar exploration, etc. can contribute to preventive maintenance by detecting risks that could lead to future road cave-ins at an early stage," explains Mr. Tochimoto.

"Although surveys differ between land and offshore, topography and geology should be evaluated seamlessly. Our



"Our company has grown as a geological survey expert and we have developed our technologies to coincide with the needs of society."

**Yasuhiro Tochimoto,**  
President & CEO, Kawasaki  
Geological Engineering Co., Ltd.

greatest strength is our ability to provide advanced solutions, both surveys, and evaluations, for land and ocean."

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## Takeuchi providing the foundation for the next generation of low-cost, short-period and ecological construction **TNF**



"We propose simple and innovative new technologies in the areas of ground improvement and foundations to meet the new challenges required of the times."

**Kinji Takeuchi, CEO,**  
Takeuchi Construction Inc.

A pioneer in foundation construction, Takeuchi Construction developed the TNF method for low-rise buildings in soft ground areas. "Buildings often don't need piles so there were demands for

Since 1993, Takeuchi Construction has undertaken approximately 1,600 projects (totalling in excess of 3.8 million square meters), including factories, warehouses and shopping centers throughout Japan.

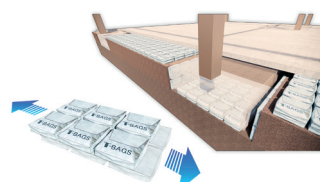


TNF improved ground

construction methods without the use of piles, which are costly and time-consuming to install," explains company CEO Kinji Takeuchi. "The TNF method is one that maximizes the use of the original ground. In our research, we found that the TNF is also effective in suppressing seismic vibration and liquefaction."

Given geographical challenges in Japan, the 2011 Tohoku earthquake being one example, the company's TNF method and T-BAGS seismic base isolation system have shown amazing results.

The T-BAGS system is a very simple system in which two layers of sandbags are spread under the buildings. In the case of an earthquake, sandbags suppress the seismic energy by sliding horizontally. Unlike commonly used rubber seismic isolation devices, T-BAGS, which are made of sand and polypropylene cloth, are durable and do not require maintenance.



Schematic view of the T-BAGS system

"Unfortunately, like with any technologies, we can't prevent disasters completely, so we

needed to develop a design method to manage the risks," says Mr. Takeuchi. "We have introduced FEM analysis, which allows us to simulate with a high degree of accuracy the ground settlements and seismic effects."

With nearly three decades of experience and a focus on non-residential and commercial facilities, Takeuchi Construction is eyeing overseas growth following success in Vietnam.

"The U.S., Iran and some Southeast Asian countries such as Indonesia, are promising locations. Creating franchises with local partners having the technical standards necessary is one approach," states Mr. Takeuchi.

 **株式会社 タケウチ建設**  
Takeuchi Construction Inc.  
[www.takeuchi-const.co.jp/en](http://www.takeuchi-const.co.jp/en)

# The leader in slope-related disaster prevention technology

With the increase in landslides and slope-related disasters due to climate change, Chuo Kaihatsu aims to bring its state-of-the-art disaster mitigation technology to Southeast Asia, South America and beyond.



**Makoto Tanaka, President,**  
Chuo Kaihatsu Corporation

Since its establishment in 1946, Chuo Kaihatsu has performed geotechnical surveys, measuring, analysis and design of the ground that supports structures such as roads, bridges, dams, ports and buildings across Japan. Having spent over 75 years studying Japan's disaster-prone topography and geology, the company has gained immense expertise in disaster prevention



[www.ckcnet.co.jp/global](http://www.ckcnet.co.jp/global)

technologies and now aims to take this technology global.

"We want to contribute to prevention and mitigation of landslide disasters in South America and China, where we have our bases, by utilizing our tilt sensor-based slope monitoring technology, which has been recognized by international academic societies," says company president Makoto Tanaka.

When it comes to disaster prevention, early warning systems (EWS) are the starting point. Among Chuo Kaihatsu's flagship EWS technologies is the Kantaro, which monitors the behavior of the ground and issues an advance warning when there is a threat of collapse, thus giving precious time for evacuative action before disasters occur. "We are the only company in the world that has control thresholds for predicting slope failure. The Kantaro, our EWS for slope disaster prevention, has been installed in many countries, such as China, Australia, Bhutan, Sri Lanka and Brazil," adds Mr. Tanaka.

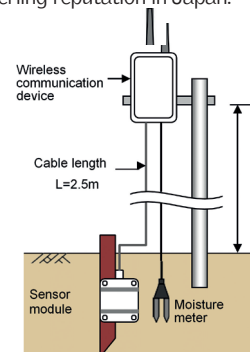
Chuo Kaihatsu today provides cutting-edge geotechnical analysis and disaster mitigation services, providing geological information through the internet, ground and structure simulation using big data and AI, ground risk assessment using point cloud data from drones, and ground and structure maintenance using sensor technology. "We want to install our Kantaro tilt sensors in various conditions around the world. By doing so we can prevent as many slope disasters as possible," adds Mr. Tanaka.

Due to climate change, natural disasters are becoming ever-more frequent. From South America to Southeast Asia and beyond, Chuo Kaihatsu will play an important role

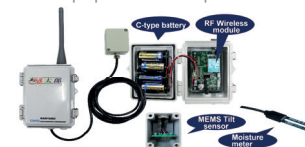


Equipment installation site

in keeping societies safe in the face of increasing slope disasters, thanks to long-cultivated technology and expertise in geotechnical analysis that has earned the company its sterling reputation in Japan.



Equipment composition



Interior and exterior view of equipment

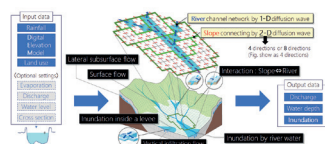
# Averting disaster with digital flood prevention technology

Flooding is an increasing occurrence in many parts of the world, causing untold damage. Mitsui Consultants' unique System utilizing RRI can forecast major floods and help save millions of lives as a result.

In 2020, floods caused the deaths of more than six thousand people across the globe, the second largest figure recorded in a decade as adverse weather events linked to climate change increased worldwide. Faced with this challenge, one company in Japan – a country which suffers disproportionately from the damage caused by flooding each year – has developed a new flood prediction system that aims to prevent and reduce such disasters.

"We are focused on the conservation of coasts, river channels and groundwater tables in order to mitigate the effects of events such as tsunamis, floods and landslides," explains Takasuke Nakano, President of Mitsui Consultants. "Our company developed a flood prediction system utilizing RRI (a Rainfall-Runoff-Inundation analysis mod-

el developed by ICHARM – The International Center for Water Hazard and Risk Management)."



Schematic drawing of flood prediction system using RRI

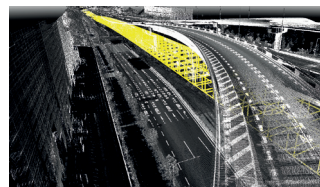
Using a supercomputer, the RRI system forecasts not only river flow rate and water level through integrated and dynamic analysis, but also the inundation area and level. The platform is a one-stop system, made possible by inputting rain data, DEM data, and land-use data and is enabled for real-time use. Whilst Mitsui Consultants has already developed a system that covers the entirety of Japan, the

system is also open-sourced and reprogrammable for use in diverse countries where flooding causation varies in nature.

"This means our RRI system can be used anywhere in the world," says Mr. Nakano. "It is not yet there, but we are starting to test it on specific geographical areas and create simulation models around them."

In doing so, Mitsui Consultants eventually aims to provide solutions for global water problems, aligning with the Sendai Framework for Disaster Risk Reduction (SFDRR) and U.N. Global Sustainable Development Goals (SDGs) by utilizing its highly accurate RRI model.

"Ultimately, our goal with this technology is to accelerate the calculation speed and make it possible for people throughout the world to be able to utilize it, and, in doing so, save as many lives as possible from



Road alignment study utilizing DX technology

flooding. We are also ready to provide solutions on DX (Digital Transformation) technology to accurately assess things like the gap between buildings or what might become a potential obstacle or obstruction, helping to make construction in these areas more safe, secure, and speedy."

**MCC**  
MITSUI CONSULTANTS  
[www.mccnet.co.jp/en](http://www.mccnet.co.jp/en)



# New merger sets out on sustainable mission



The newly formed TRE HOLDINGS CORPORATION is embarking on a strategy to promote carbon neutrality by taking on the challenge of developing new technologies.

"We will be working together diligently to tackle decarbonization, protect the environment and create a Japan that we will be proud to hand to the next generation."

**Matsuoka Naoto**, Chairman and CEO; **Abe Mitsuo**, President and COO, TRE HOLDINGS CORPORATION

Climate change, depletion of resources and energy, and marine plastic problems have become universal issues in recent decades. With a first-hand sense of these crises, last year TAKEEI CORPORATION and REVER Hold-



Biomass power plant

ings Corporation merged to form TRE HOLDINGS CORPORATION; a new company that hopes to help solve the problems that impede global sustainability.

"What we at TRE HOLDINGS want to achieve is to fully utilize limited resources and to produce as many solutions as possible to problems for which currently there are not any appropriate answers," says Matsuoka Naoto, Chairman and CEO of TRE HOLDINGS, a Group of businesses specializing in waste management,

metal recycling, renewable energy and environmental engineering.

"The awareness of society as a whole to the environment is now undergoing a dramatic change," says Abe Mitsuo, President and COO.



Dismantling of PCs

"It is our duty to produce various technologies to lead the industry, and to that end, we are working on three growth strategies: deepening our recycling business for a sound material-cycle; promoting carbon neutrality; and taking on the challenge of developing new environmentally-friendly technologies."



Refuse paper & plastic fuel

In helping make this transition from a linear economy to a circular economy, the executives at TRE HOLDINGS affirm that the recent merger of their two companies is not the goal, but rather the beginning of a journey that will help protect the planet. The Group is open to further partnerships in pursuit of this noble mission.



Dismantling of automobiles

"We will consider collaboration and partnerships with like-minded companies to solve environmental issues and to realize a sustainable society," says Mr. Abe.

**TRE HOLDINGS**  
未来へ、捨てない創造力を。  
<https://tre-hd.co.jp/en>

## MHIEC: A leader in waste-to-energy technologies

A company that has supplied hundreds of waste-to-energy facilities in Japan and overseas, MHIEC is embracing digital transformation and a greener future as it looks to expand its global reach.

Specializing in the design, construction, operation and maintenance of waste-to-energy (WTE) plants, Mitsubishi Heavy Industries Environmental & Chemical Engineering



Nishi Plant, Nagasaki City, Japan (MHIEC) has delivered over 300 such facilities both in Japan and abroad, supplying more than 20 to China alone since the 1980s.

As Japan's aging population decreases, MHIEC's aim is to continue to grow its global presence, says President and CEO Takayuki Hishinuma. "The Japanese market is shrinking, so expanding our business overseas is very important," he says, pointing to the Middle East as a particular target. "The



"We're focused on increasing power generation from waste."

**Takayuki Hishinuma**, President and CEO, Mitsubishi Heavy Industries Environmental & Chemical Engineering Co., Ltd.



Shanghai Laogang Renewable Energy Utilization Center, China

waste volume is directly related to the population. If the population drops, waste drops too."

Japan's demographic decline has also led MHIEC to embrace digital transformation to combat the shortfall in available workers. "Skilled operators' know-how should be digi-



Waste-to-Energy Plant in Xiaogan, Hubei Province, China

talized so that even unskilled laborers can operate a plant or it can be operated autonomously," Mr. Hishinuma says. For example, MHIEC has developed MaiDAS™, an AI-based remote monitoring and operational support system utilized in their Tsuzuki Plant in Yokohama, among others.

MaiDAS™ helps to increase energy efficiency – a key benefit as Japan seeks carbon neutrality by 2050. In its commitment to cutting emis-



Electro-Chlorination: utilizing electrolyte technology

sions, MHIEC has also developed systems such as its advanced exhaust gas recirculation, and is collaborating with other MHI Group companies. For instance, it has launched a demonstration carbon capture and recycling project with MHI Engineering as part of a local government CCU campaign. "The captured CO<sub>2</sub> from the flue gas of waste combustion will be sent to one of Japan's biggest gas utility companies to be converted into methane," Mr. Hishinuma explains.

**MITSUBISHI HEAVY INDUSTRIES**  
ENVIRONMENTAL & CHEMICAL ENGINEERING  
[www.mhiec.co.jp](http://www.mhiec.co.jp)



# SWCC: Providing next-generation social infrastructure

Electrical wires and cables provide the critical social infrastructure that keep our economies powered, with SWCC delivering the latest technologies to meet the needs of our times.

Worldwide, data centers are a critical enabler of the global digital revolution. However, a common challenge for these vital digital

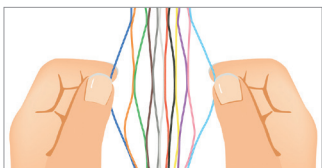


Rollable ribbon "e-Ribbon®"

hubs is that as processing speeds of servers and network switches evolve, they have to be replaced every few years. For this reason, optical fiber cables are today being installed in massive quantities thanks to their ability to enable optical transmission technology for several generations to come.

"One such product that can help in that respect is our Rollable Ribbon (e-Ribbon®) which enables high-capacity communication and efficient installation," says Takayo Hasegawa, Chairwoman and CEO of SWCC Showa Holdings Ltd, the Nikkei Asia-listed manufacturer of electric wires and cables.

Given that optical fibers are critical to telecommunications performance, they must be small in diameter, lightweight, yet as dense as possible. e-Ribbon® meets these demands and is attracting a great deal of attention globally due to its ability to accommodate a large number of fiber-optic installations.



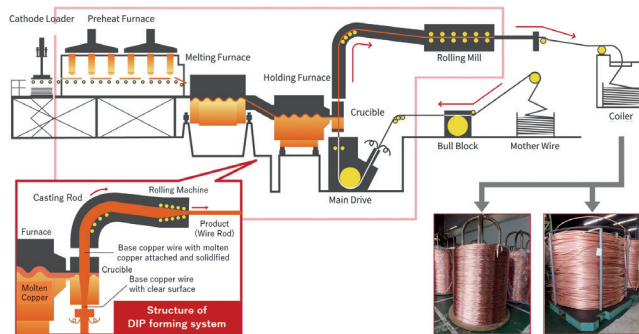
Deformable and flexible "e-Ribbon®"

"Hyperscale data centers with high processing power and enormous storage will be the norm in years to come and like any other business, they will be subject to stiff price competition and thus there will be a need to reduce operating



"We want to produce products that support the safety, security and comfort of people's lives."

**Takayo Hasegawa,**  
Chairwoman and CEO,  
SWCC Showa  
Holdings Co., Ltd.



The only Dipforming system in Japan for making MiDIP®

costs," explains Dr. Hasegawa. "e-Ribbon® allows for more optical fibers to be installed in a fast and efficient manner, all while reducing construction costs."

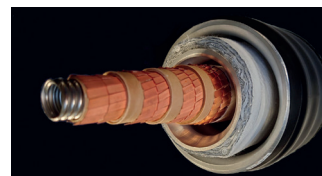


Oxygen-free copper MiDIP®

Through its innovative technology and focus on R&D, SWCC is not just well placed to meet the challenges of the global telecommunications industry, but also the great transformation underway in the automotive sector with the transition to electric vehicle (EV) manufacturing. The company's MiDIP® is an oxygen-free copper wire used in electronic and automotive components.

"In order to meet the needs for miniaturization of motors for EVs at a high level, we pursued technologies to reduce oxygen content to as close to zero as possible and to eliminate impurities such as copper oxide powder, resulting in the birth of our brand MiDIP®," says Dr. Hasegawa. "This oxygen-free copper MiDIP® is made using equipment that is unique to our company and only available in Japan. Believing that the time would surely come when quality oxygen-free copper would be in demand, we introduced GE's dip-forming system which has evolved significantly over the years. As a result, with the spread of electric vehicles, the demand for oxygen-free copper of high purity with excellent workability in the manufacture of motors to replace engines has increased, and MiDIP® has been able to establish its position in the industry."

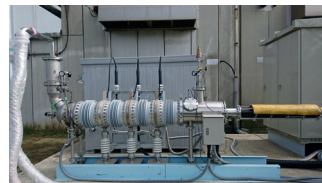
In addition, there are innovations that could contribute to the realization of a decarbonized society by providing cleaner transportation. SWCC has recently developed a tri-



Tri-axial superconducting cable

axial superconducting cable with NEDO (New Energy and Industrial Technology) and BASF Japan that can reduce power transmission energy loss by more than 95%. As a highly efficient power supply technology that does not cause power loss due to its zero electrical resistance, superconductivity technology has attracted a lot of attention from various fields such as energy, electronics, medicine and transportation.

"The greatest strength of this cable is that the conductor itself has no electrical resistance, so large energy can be carried with minimum energy losses. Our developed tri-axial superconducting cable can greatly contribute to reducing CO<sub>2</sub> emissions," says Dr. Hasegawa.



Terminal of tri-axial superconducting cable

"I do believe that as Japan moves towards a carbon-neutral society through the various policies and goals it has set for 2050, we will see more and more policies that enable these types of technologies, and I believe that our superconductivity technology is going to play a big role."

# Unparalleled technology and human expertise to ensure safe and stable energy

**ATOX provides human and technological assets supporting the nuclear power industry and is pioneering medical applications based on its decades-long experience.**

Boasting over 60 years of experience, ATOX is a leading Japanese specialist in the maintenance, management and deactivation of nuclear power plants. Notably, the Tokyo-based company brings crucial know-how to the decommissioning and decontamination of the Fukushima Daiichi Nuclear Power Station.

"Our strongest traditional business is decontamination," says ATOX President Toshikazu Yaguchi. "For obvious reasons, once a decommissioning project happens, decontamination is an essential part of that – and it's one of our big strengths. That's why we're involved in many decommissioning projects across Japan."

ATOX works with French nuclear company Orano in Fukushima, as part of a joint venture established in 2014. The company's international collaborations also include a developing partnership with U.K. firm Createc, which provides unique radiation analysis technology. In addition, ATOX is the sole distributor in Japan for telemanipulators manufactured by Central Research Laboratories in the United States, and for power manipulators produced by PaR Systems, also a U.S. enterprise.

"We're putting a lot of focus into partnerships with overseas companies," Mr. Yaguchi says. "We want to utilize their technology and experience in Japan." ATOX has itself also developed state-of-the-art equipment, such as an aerial vehicle and a robot – the latter dubbed

"We're leveraging all available engineering resources to regain the public trust in nuclear energy in Japan."

**Toshikazu Yaguchi,**  
President,  
ATOX Co., Ltd.

"Raccoon" – that are designed for remote decontamination.

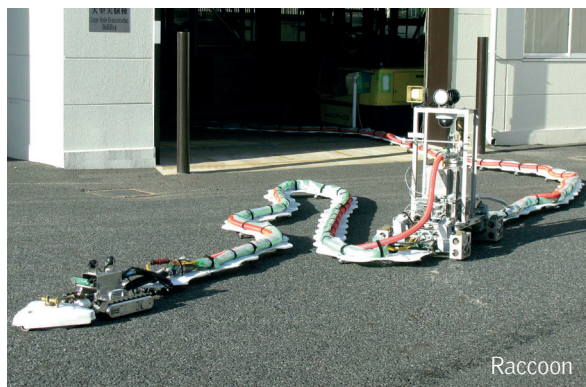
Meanwhile, the firm has branched out into nuclear medicine. In an industrial-academic collaboration with Japan's National Institutes for Quantum Science and Technology, ATOX has co-developed Vrain, the world's first helmet-type device for positron emission tomography (PET)

brain scans. By arranging detectors in a hemispherical shape so they are close to the patients, the machine offers a high-resolution image despite its low number of detectors.

ATOX is also working with RIKEN, a Japanese scientific research institute, on the development of targeted alpha therapy, and is the exclusive distributor in Japan for

the 68Ge/68Ga generator, a device made by the Belgian company IRE ELiT to manufacture radioisotopes for nuclear medicine.

"Our priority is to increase the lineup of products in our nuclear power and medical business areas," Mr. Yaguchi says. "We're actively searching for equipment abroad that can be used in Japan."



Raccoon



Aerial vehicle

**Brain-dedicated PET that achieves space savings but high resolution**

**Vrain** Vision+Brain

The world's first Helmet-type PET with high resolution



**ATOX**  
ATOX CO., LTD.  
atox.co.jp/en



# Shikoku Welding Electrode: Fusing innovation with quality

**For 75 years, Shikoku Welding Electrode has been providing high-quality welding solutions for large-scale projects.**

An object is only as strong as its weakest link, and for thousands of years humans have been working to strengthen these links through welding metals together. At an industrial scale, welding is imperative to keeping the global supply chain moving, especially through its contribution to shipbuilding, and Japanese firm Shikoku Welding Electrode is one of the firms pushing this sector forward with its innovative solutions.

Founded in 1947, the company is oriented towards large-scale projects such as shipbuilding and construction, providing state-of-the-art welding solutions for its customers. A good example of its forward-thinking products is the TAS-10 flux cored wire for all-position welding. Applicable

to both ship and bridge building, the TAS-10 uses low-hydrogen type flux, mainly rutile, and was created for speed of use and a wide current range. The product also works to tackle spatter, a prominent problem in welding. Shikoku Welding president Yuichi Murakami explains that the company offers more services to help improve its customers' experience: "Our staff sometimes go to shipyards to teach workers about how to more effectively use

our products."

Shikoku Welding has expanded from its original base in the shipbuilding city of Imabari, building a factory in Vietnam as the company looks to expand its presence in Southeast Asia with the help of sales partners. Vietnam is in a period of rapid industrializa-

tion and reviving its shipbuilding industry for the future. And so the Southeast Asian country particularly suits Shikoku Welding and its broad goal to contribute to society with its products that provide solutions in developing countries.

Welding has traditionally been a male-dominated industry, but Shikoku Welding is working to address this imbalance especially in the face of Japan's aging population. Mr. Murakami says: "I've held meetings to discuss bringing in more women to our staff, asking what kind of a working environment would be best for them to feel comfortable and to work most efficiently."

This commitment to ensuring safe working conditions extends to Shikoku Welding acting as a trading company that purchases personal protective equipment (PPE), including specialized masks for welding. Through its fusion of innovation, quality and diversity, Shikoku Welding aims to continue making a positive impact as it expands.



**Yuichi Murakami,**  
President, Shikoku Welding  
Electrode Co., Ltd.

The Welding Solutions  
**Sweco**  
Shikoku Welding Electrode Co., Ltd.  
[www.sweco.co.jp/en](http://www.sweco.co.jp/en)



Headquarters



Various welding materials



Rewinding process

## Providing tailored solutions to meet market needs

**In an industry transitioning towards growth in sustainable products, Soda Nikka continues to succeed through its customer-centric approach to targeted business expansion.**

Founded in 1947, Soda Nikka has grown into a trading house focused on meeting the wide-ranging distribution and logistics needs of its clients, often small and medium-sized companies that require specialty chemicals. Takahiko Nagasu, President and Chief Executive Officer explains more.

"Specialty chemicals meet very specific needs, and trading companies who deal with more generic products would often no longer be necessary. However, even basic chemical products can have different client specifications.

"We recognize that one of our roles is to deliver such basic chemicals to meet the needs of our customers in Japan, and in a timely manner."

This desire to do what is best for its clients has led

"We look to contribute to society through repeated co-creation with manufacturers and partner companies."

**Takahiko Nagasu,**  
President,  
SODA NIKKA CO., LTD.



Soda Nikka to work with manufacturers to ensure that even low demand chemicals are not discontinued to the detriment of others.

"We take a detailed picture of the customer's needs and share it with chemical



Bottle made from mostly limestone

manufacturers," Mr. Nagasu says. "Then we engage with them to create the right product."

Finding a viable transition material to replace plastics will play an important role for Soda Nikka as part of its strategy for sustainable growth, with the company's current focus being biodegradable resins.

"We are working with manufacturers to develop applications and build platforms

for reducing resin content and recycling resin products," says Mr. Nagasu, who also highlights successes such as the re-pelletizing process for multi-layered plastic bottles.

Building on international opportunities, including flood defense systems in Indonesia, one area in mind is the advancing education sector in developing countries, which has increased infrastructure demands. As the president says, "our goal is to provide solutions tailored to the needs of the market."

And to help with this objective, Mr. Nagasu has forged a clear path for his employees, encouraging them to "think outside the box and keep their senses active at all times to capture what society needs, so that both they and the company can stay relevant."

**SODANIKKA CO.,LTD.**  
[www.sodanikka.co.jp/english](http://www.sodanikka.co.jp/english)



Limestone as a raw material



# Daiki Axis: Wastewater treatment as the basis for clean and sustainable lifestyles

Daiki Axis is looking to expand on its success in Japan by providing efficient and made-to-order wastewater treatment solutions to Southeast Asia and other emerging markets.

Water is an absolute necessity for the survival of all living things and one of the most essential sources of global economic activity. But currently the world is facing a serious water problem due to population growth and economic development. As well as water shortages due to climate change, another major problem faced worldwide is water pollution. In areas where sewerage systems are not widespread, human waste and other wastewater is discharged directly into waterways, contaminating our rivers and oceans.

In Japan, *Johkasou* is a facility that treats wastewater before discharging it safely and cleanly back into nature. *Johkasou* products are approved by the government of Japan and are extensively deployed across the country as part of government policy. As a matter of fact, about 10% of sewage in Japan is treated through *Johkasou* systems, with over 8 million running successfully in Japan.

"When it comes to wastewater treatment technology, *Johkasou* is unique to Japan," says Hiroshi Ogame, President of Daiki Axis, one of Japan's leading manufacturers of *Johkasou*. "However, since it is easy to imitate the technology, there is a fear that this business can be recreated by other companies. At the moment, there are already 11 local companies in Indonesia which have done so, but their products are offered at a much lower price and are of poorer quality. We are confident of the quality of *Johkasou* that we manufacture using Japanese technology. Quality is definitely our strength in this industry."

With the quality of wastewater inflow to *Johkasou* usually not constant, regular maintenance is essential to the treatment process. For this reason, as well as manufacturing *Joh-*



"We're looking to Southeast Asia, India and Africa as we develop the best wastewater treatment solutions."

Hiroshi Ogame,  
President & CEO,  
Daiki Axis Co., Ltd.



Community plant



Indian construction site



Factory (Japan)



Visiting lecturer discussing BDF kasou, Daiki Axis also provides maintenance services throughout Japan. And though in the domestic market it is already



Online meeting with the government of Haryana (India)

considered an industry standard in providing maintenance – not to mention a requirement to meet policies of the Japanese

government – its services have yet to become the norm in various overseas markets.

"This is something we are continuing to roll out slowly by conducting surveys and expanding our promotion and marketing in that field," says Mr. Ogame. "*Johkasou* is not known in overseas markets. Therefore, it starts with promoting its many qualities. It is less expensive than public sewerage improvement, and its system is capable of treating wastewater onsite at a regional level. We urge governments to regulate maintenance by law and support the rolling out of this system."

Since its establishment in 2005, Daiki Axis has ambitiously engaged in the creation of new business ventures, such as undertaking projects to make groundwater potable and residential drinking water projects.

"Thus we have both technologies, a wastewater treatment system and a system that can provide potable water. Looking towards the future, we would like to build this integrated system to contribute to environmental sustainability and to use it as a source of renewable energy," says Mr. Ogame.

A good example overseas of where the company's technologies have already been integrated and implemented into society is sprinkler water in parks in India. "We are actively working to make further expansions overseas as well, with our domestic base of operations providing the footing," says Mr. Ogame. "We aim to protect the world's environment and create a sustainable society and future, with water-related business as our central focus."

PROTECT × CHANGE

**Daiki**  
**AXIS**

[www.daiki-axis.com/en/](http://www.daiki-axis.com/en/)



# Handled with care

A company committed to bringing creative ideas to life through meticulous craftsmanship, Union Corporation has established itself as Japan's premier provider of door handles since it was founded more than 60 years ago.

Guided by its 'Artware' company philosophy, Union Corporation specializes in the manufacture of architectural components – chiefly door handles, an area in which the Osaka-based firm boasts a 90% market share in Japan. "Although it's a product that may seem simple, its indispensability gave rise to Union's founding," President Junzo Tateno says. "We've built the reputation as being the world's first hardware manufacturer specializing in door handles."

A concept cultivated by the company since its founding in 1958, Artware "fuses the spirit of 'art' and 'hardware'", Mr. Tateno explains. It's a philosophy Union particularly began to embrace as it responded to the economic downturn caused when Japan's price bubble burst in the early 1990s. "Artware is a keyword that denotes aesthetic sense, craftsmanship and design that resonates in the hearts of the customers," Mr. Tateno says. "After the bubble economy collapsed, the company shifted from mass production into more unique

and creative product designs. A simple door handle emerged as an innovative art form. That new philosophy marked the turning point for our business and propelled us to reach a new level of perspective."

As many countries, including Japan, target carbon neutrality by 2050, Union is

playing its part in a greener, more sustainable future. "We've been working on several

"We've built a reputation as being the world's first hardware manufacturer specializing in door handles."

Junzo Tateno, President, Union Corporation



initiatives," Mr. Tateno notes. "We use long-lasting materials such as stainless steel, brass and cast iron. Depending on the life cycle of the building, 50

lect used handles to be refurbished or re-cast. We seek alternative sources of energy, like propane gas, which is believed to be more environmentally-friendly than crude oil. We purchase used baseball bats from Mizuno, a sports equipment company, to be recycled and used in our wooden door handles. There have been many instances where we repurposed products from our clients instead of disposing of them."

With the exception of its China factory, opened in 2004, Union is a 'fabless' company – it outsources the manufacture of its designs. As it targets continued global growth, the firm plans to harness this commitment to establishing third-party partnerships. "Having a fabless production necessitates cooperation with external individuals, engineers or organizations to mutually come up with better solutions," Mr. Tateno says. "We've been thinking about a number of co-creation and research endeavors with foreign companies and architectural institutes. We truly believe there is a way to grow with affiliates around the globe." He adds: "Our company's future sales will depend on where there's a growing demand for new buildings – therefore, we are targeting countries around the world, including emerging economies or developing countries in Southeast Asia, the Middle East and even Africa."

to 100 years on average, our products maintain their quality. For renovations, we col-



Union began manufacturing the closet door for the first time in Japan



Door handle made by fusion of metal 3D printing and traditional crafts



Lineup of about 3,000 types of handles

**UNION  
ELMES**  
ARTWARE  
UNION CORPORATION JAPAN

[www.artunion.co.jp/en](http://www.artunion.co.jp/en)