



**Tsuneichi Fujiyama**  
Born in Saga Prefecture in 1872. After studying electrical engineering at the College of Engineering, Tokyo Imperial University, he was invited to work at Miyagi Bouseki Dento's Sankyoza Power Plant at the age of 30. During this time, he succeeded in producing carbide for the first time in Japan. A bust of him, erected by his fellows and local volunteers after his death, still remains in Sankyoza.

**The energetic inventor who established the foundation of Denka**

**Dr. Tsuneichi Fujiyama**

Dr. Tsuneichi Fujiyama succeeded in producing carbide\* for the first time in Japan, paving the way for industrial production. He is an indispensable figure in Denka's history.

Advances in chemical technology, expansion of agricultural production due to population growth, and increasing demand for nitrogen-based fertilizers. In 1901, Dr. Fujiyama, who was a chief engineer at time, began researching the production of carbide using surplus electricity produced from the Sankyoza Power Plant at night. Working day and night, he managed to produce the first carbide in Japan in 1902. This laid the foundation for Japan's carbide industry.

Afterwards, he moved to Hokkaido and set his sights on the surplus electricity produced by Daio Seishi's Tomakomai Plant. Gathering together a group of junior colleagues, he established the Hokkai Carbide Plant with funding from Mitsui. In 1912, the plant started to manufacture carbide, lime nitrogen, and modified ammonium sulfate, and he invented a unique method to efficiently manufacture lime nitrogen. In 1915, Denkikagaku Kogyo Co., Ltd. (now, Denka Company Limited.) was born from the Hokkai Carbide Plant.

Dr. Tsuneichi Fujiyama came up with the name "Denkikagaku Kogyo," which translates to "electrochemical industries." Although fertilizer was their main product at the time, he didn't include it in the name, since he strongly wanted to develop the company into a general chemical producer.

Until he passed away in 1936, he continued producing carbide and training engineers all over Japan. Denka's new recruits visit Sankyoza to see his bust as part of training sessions. This energetic inventor left the following words: "If there's a reference book, then I'm not interested. I only do what hasn't been done before." Though his body rests in Aoyama Cemetery, I am sure he is still watching over future generations from Heaven.

\*Carbide: Calcium carbide (CaC<sub>2</sub>). It is made by reacting quicklime, which is obtained by heating limestone, with coke. Denka has been manufacturing carbide for over 100 years since its establishment to produce fertilizers and rubber materials.



**Cover photo**  
**The construction of the Otokorogawa Power Plant**

The Otokorogawa Power Plant started operation in December 1923. It has the second longest history among Denka's hydroelectric power plants, including those jointly owned. Even in the days before heavy machinery, predecessors worked steadily to build power plants for the development of the nation.



# The DenkaWay

## Winter

2022 | Vol.10



## Omi Plant

### Coexistence with the Environment and Community

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# Omi Plant Coexistence with the Environment and Community

In 1921, Denka established the Omi Plant and started manufacturing carbide. In other words, Denka has been operating in the Itoigawa area for 100 years. The plant continues to thrive thanks to the abundant resources from Mt. Kurohime, the electricity generated by hydroelectric power plants, and the support of the local community. In this issue, we will look back on the history of the Omi Plant and shine a spotlight on its three treasures – the mountain, the water, and the local people.

Amazing  
the  
World  
with Innovation

## It all started with Mt. Kurohime

Mt. Kurohime is 1221.5 meters high. Located to the south of the plant, it is one of the 300 Famous Mountains of Japan and is registered as a UNESCO Global Geopark. It is unique in that it is made entirely out of limestone. It was originally created about 300 million years ago as a basalt volcanic island near the equator. Later, the island sank into the sea and coral reefs grew over it, creating a limestone seamount. Re-

peated tectonic plate movements pushed it upwards, forming the present-day Mt. Kurohime. It is said to share its roots with Mt. Akiyoshidai in Yamaguchi Prefecture, which is one of the largest karst formations in Japan and has many exposed limestone surfaces.

Limestone caves are often formed where the limestone is eroded. They do not extend horizontally but rather vertically from the surface down into the earth. Mt. Kurohime has many caves, including Byakuren Cave, the deepest cave in Japan at 513 m. This area is unique in that the four deepest

caves are all concentrated around Mt. Kurohime.

You can see Mt. Kurohime from Itoigawa City. It is a symbol of the area and holds a special significance for Denka. Originally, Denka established the plant in this area to utilize the rich water and limestone resources to produce carbide. While many other chemical companies import their raw materials, Denka's Omi Plant uses home-grown materials from this mountain.

Denka has a claim to at least five billion tons of limestone from Mt. Kurohime, so it is estimated that the company could

continue mining for the next 1,000 years and still not run out. About 70% of the Omi Plant's products, including fertilizers, special cement additives, and chloroprene rubber, are made from limestone. Since Denka has benefited enormously from this mountain, it holds ceremonies to express its gratitude to the mountain and pray for continuous operations without accidents twice a year.

Mt. Kurohime is the mother mountain. It has been watching over the Omi Plant for 100 years. Moving forward into the future, Mt. Kurohime will continue to play an important role.

### What is carbide?



Calcium carbide (CaC<sub>2</sub>). It is made by reacting quicklime, which is obtained by heating limestone, with coke. Denka has been manufacturing carbide for over 100 years since its establishment to produce fertilizers and rubber materials.

History



### Limestone mining when the Omi Plant was founded

Since there was no heavy machinery back then, Denka relied on human labor. Workers loaded limestone from mountain onto trams by hand and transported it back to the plant.



## Together with the Mountains

The Omi Plant is surrounded by mountains on three sides. Denka has benefited enormously from these mountains. (Mt. Kurohime is on the left at the back)



A ceremony to express Denka's gratitude to the mountain

# Together with the Water

## 100 years of hydroelectricity

It is no exaggeration to say that hydroelectricity has played a crucial role in Denka's history. Denka has been producing carbide since its establishment. The founders wished to make fertilizers from this product to contribute to solving food shortages during the Meiji and Taisho Periods and developing the country. However, there was one big problem. A lack of electricity. The production of carbide requires a lot of power. Denka, which started operations in Omuta City, Fukuoka Prefecture, initially operated solely on purchased electricity, but the unstable power supply affected its carbide production. Realizing that it was necessary to produce its own electricity, Denka built a hydroelectric power plant near Omuta Plant.

Later in 1921, Denka established the Omi Plant in Itoigawa City, Niigata Prefecture. In addition to having an abundant supply of limestone, the area was also suitable for hydroelectric power generation.

In the same year, Kotakigawa Power Plant also began operations.

One hundred years later, Denka now owns 16 hydroelectric power plants, including those jointly owned, and the Shin-Himekawa No. 6 Power Plant, its 17th, is scheduled to start operation this year. Over the past one hundred years, Denka has continuously been implementing new technologies in the construction and maintenance of hydroelectric power plants. At the Shin-Omigawa Power Plant, which began operations in 2021, the water turbines and other parts that used to be controlled hydraulically have been converted to electric power, and Denka has taken precautions to prevent oil spills in the event of an emergency.

Some of Denka's power plants are located in mountainous areas with heavy snow, so inspection work can be dangerous in the winter. This is where drones come in. Denka uses them to inspect power lines at high elevations to improve efficiency and ensure the safety of workers. Denka is also looking

into automating the monitoring process by introducing digital technology. The amount of water taken from the river is determined by experienced workers based on information such as weather forecasts, water levels, and how muddy the water is. By quantifying and visualizing their instincts, the knowledge of these veterans can be passed onto future generations.

Hydroelectricity accounts for about 40% of the electricity used by Denka (FY2020 results). There is no doubt that owning its own hydroelectric power plants has led to significant cost reductions and improved competitiveness. The proactive use of renewable energy has also led to increased corporate value.

Denka's goal is to reduce greenhouse gas emissions to 50% of the FY2013 level by FY2030, and to achieve carbon neutrality by FY2050. To that purpose, Denka is currently considering building more hydroelectric power plants. Moving forward into the future, hydroelectricity will continue to play an important role.

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History



### Kotakigawa Power Plant celebrates 100 years of operation

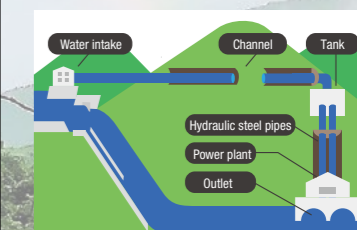
Kotakigawa Power Plant began operation in 1921, the same year that the Omi Plant was established. The generator was made in the U.S. and the waterwheel in Switzerland. The original wooden building has been preserved to this day.



A water channel inside the Shin-Omigawa Power Plant. A road used for construction and maintenance runs alongside it.

### What is run-of-river hydroelectricity?

There are two main types of hydroelectric power generation: run-of-river and dam types. Denka's power plants are all run-of-river types. Compared to dam types, which are large, expensive, and less environmentally friendly, run-of-river types can be constructed at lower costs by taking advantage of steep terrain.



Dami Power Plant, which began operations in 1938, boasts the largest output and power generation among all 16 of Denka's hydroelectric power plants, including those jointly owned.

# Together with the Community



A dump truck for transporting mined limestone. With a maximum capacity of 218 tons, it is one of the largest in Japan. (Photo taken in 2018)

## Moving forward with the Itoigawa community

"To the north lies the rough Sea of Japan. To the south is our treasure Mt. Kurohime. The products of the Denka Plant will cross the ocean and go out into the world!"

These are lyrics from the Omi Yumemachi Marching Song, which is played at the Omi Festival every year. Denka's Omi Plant is so well-known in this region that it even appears in the song's lyrics.

In addition to limestone from Mt. Kurohime and hydroelectricity, there is one other essential element. Denka would not

have been able to continue operating the Omi Plant for so long without the support of the local community. The history of the Omi Plant is a history of coexistence and co-prosperity with the community. About half of the plant's land is leased from about 450 local landowners. In addition, the land where Denka built the electricity towers belongs to 350 people, and the 70 km stretch where the transmission lines run belong to over 2,500 people.

The understanding of the community is also essential for the operation of hydroelectric power plants, which requires regular maintenance including cutting down trees.

Furthermore, dialogue with residents is

important for chemical manufacturing, a business that involves a certain degree of risk. The community is naturally interested in the Omi Plant's products and whether they have any impact on the environment. Denka regularly takes into account their opinions at liaison meetings and roundtable discussions and continue to operate while maintaining safety and security.

To fulfill its responsibility as a member of the local community, the Omi Plant is engaged in a number of activities. About 1,500 people visit the Omi Plant every year. Local children are also invited to tour the plant, where they cheer at the rare sight of the heavy machinery and carbide furnaces

in operation. Denka also actively participates in local events such as the annual Omanta Festival, the biggest event in Itoigawa City. Denka even received the Omanta Award in 2019, when a large group of 150 employees participated in the festival.

Although many events have been canceled since 2020 and opportunities for interaction are decreasing, Denka is confident that the days of local residents and Denka employees interacting with smiles on their faces will return in the not-too-distant future. Moving forward into the future, the Itoigawa community will continue to play an important role.



From left: Akiyama, Shimada, Ogawa. Members of the Omi Plant's General Affairs Department who are dedicated to contributing to the local community.

History



### Company housing for 1,000 families

Until the end of the 1970s, the current tented warehouse area of the Omi Plant was used as company housing for employees. At its peak, it could house 1,000 families and even had a daycare facility and a swimming pool, which was quite rare at the time. Currently, the plant has the Denka Omi Residence (for families), Denka Century Heights (for single transferees), and Seiwa Dorms (for singles).



Denka Big Swan Stadium



### Soccer lessons at Denka Big Swan Stadium

Denka holds the naming rights for Niigata Stadium, the home stadium of the Albirex Niigata in the J2 league. Until 2019, the Omi Plant was hosting the Denka Big Swan Junior Soccer Festival, which was attended by approximately 400 elementary school students and their parents from Niigata Prefecture, and Albirex Niigata players gave soccer lessons and played friendly games. Afterwards, it got a lot of positive feedback from children and parents, including "I was so happy to be able to stand on that field!" and "Please do this again next year!"

### Comments on the 100th Anniversary Celebration



Satoko Ito

Born in Itoigawa City, Niigata Prefecture. She studied sociology in the U.S. in 2002 and has worked as an anchor and commentator. She is very interested in international contribution activities and is currently covering Cambodia and Nepal through JICA. Since 2010, she has served as a visiting professor at the Graduate Institute for Entrepreneurial Studies in Niigata, and she is also the ambassador for Itoigawa Geopark. She has covered a number of companies and has published articles on topics such as regional development and corporate management. She is also a member of the National Advisory Committee and a board member of a company.

### The Omi Plant is the pride of the community Please continue providing a breath of fresh air

Denka's Omi Plant has long been a symbol of this region, and it is burned into my memories as a part of the scenery of my hometown. My grandparents lived in Kotaki, so the retro appearance of Kotaki River Hydroelectric Power Station is one of my fondest memories. Since its establishment, the citizens of Itoigawa have been proud of the company's attitude of constantly taking on new challenges and expanding into new fields that reflect the times. In the wake of the COVID-19 pandemic, people are asking how companies should contribute to the SDGs. I believe that Denka has contributed to people's lives, health, and the creation of a sustainable society by developing its own innovative materials and technologies and generating its own clean energy at the Omi Plant. I hope that you will continue moving forward together with Itoigawa and breathe new life into the world from the Omi Plant.

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# The History of Omi

## Events at the Omi Plant

- 1921 Omi Plant established; production of carbide begins  
Kotakigawa Power Plant completed 
- 1922 Production of calcium cyanamide begins 
- 1938 Oami Power Plant completed
- 1954 Elkem electric furnace completed  
Entry into cement market; production of Denka Cement begins
- 1962 Special synthetic rubbers successfully developed; production of Denka Chloroprene begins 
- 1967 Production of special cement additive Denka CSA begins
- 1982 Production of alumina fiber Denka Alcen begins 
- 1983 Cement carriers Kurohimemaru and Omimaru completed and launched  
Power generation facilities using cement waste heat completed
- 1996 Production of polymer hyaluronic acid preparations begins 
- 2002 Boilers for biomass KPS completed  
Large capacity 218 ton-trucks introduced
- 2014 Denka Omi Residence (for families) completed
- 2015 Kotakigawa Power Plant renovated to improve efficiency  
Denka Century Heights (for single transferees) completed
- 2018 Omi Innovation Hub completed 
- 2019 Production of new special elastomer Evolmer begins
- 2020 Decision to resume production of diethyl malonate, a raw material for Avigan®. Restarted production facilities and shipped the required amount for two million people over five weeks (between April and June).  
Seiwa Dorm (a dormitory for singles) completed 
- 2021 **100th anniversary of Omi Plant**  
Shin-Omigawa Power Plant starts operation  
Omi Sustainability Promotion Division established with the aim of realizing carbon neutrality  
Shin-Himekawa 6th Power Plant to start operation (2022)

## Omi Map

### Toward national prosperity The Efforts of Predecessors

During the pre-war and post-war years when supplies were scarce, Denka employees worked day and night for the development of the nation and the company.



### Growing up in Omi Denka's Children

Denka Nursery School opened in 1929 (authority transferred to Omi Town in 1961). When it opened, 130 employee children were enrolled. Denka and Omi Plant keep close ties with employee families. In some cases, three generations of the same family have worked for the company.



Denka Nursery School

### Protecting nature in the region Development of Tsugami Shindo

Tsugami Shindo is a mountain trail that leads from the sea to the Hida Mountains. The trail ranges from 0 m to 2,500 m above sea level and displays a wide range of topography found at different altitudes. The late Ken Ono, who worked at Omi Plant, carved out the trail through the mountains step by step because he wanted to protect the abundant nature. It was completed in 1971.



### Enjoying the unique nature of the region Registered as a UNESCO Global Geopark

Itoigawa City became the first city in Japan to be registered as a UNESCO Global Geopark. This was due to the international recognition of the region's unique geology, topography, and culture, including Oyashirazu, a precipitous cliff facing the Sea of Japan, and the Kotakigawa Jade Valley, the first jade production area in Japan.



Oyashirazu



### Move freely in the air and underwater! Utilization of Drones



Shin-Omigawa Power Plant (Started operation in 2021)

Drones are actively used for measurement and observation in mines and for inspection of power lines at hydroelectric power plants. Underwater drones have also been introduced to inspect the rivers connected to the plants.

### The largest production area in Japan

## Jade, a Specialty of Itoigawa

Itoigawa is a major jade production area in Japan. The Jade Valley in Kotakigawa and Omigawa is designated as a natural treasure. You are welcome to visit Itoigawa for some treasure hunting!

Photo provided by Fossa Magna Museum

# Omi Topics

## Supporting the development of Denka 16 Hydroelectric Power Plants

**Power Plant** Items marked with ★ are jointly owned.

Starting with the Kotakigawa Power Plant in 1921, Denka now has 16 hydroelectric power plants, including those jointly owned. The Shin-Himekawa No. 6 Power Plant, its 17th power plant, is scheduled to start operation in 2022.

## Displaying steel pipes and dioramas Hydroelectric Power Plant Museum

This museum, which opened in 2018, preserves historical records related to hydropower generation in Denka, passing on the memories of the people involved.



## A railroad in a plant? The Cement Line!



The railroad used for delivering limestone from Mt. Kurohime runs through the plant. There was also a time when it was directly connected to Japanese National Railways' Omi Station (disconnected in 2009).

## The largest event in Itoigawa Omanta Festival

The Omanta Festival is the largest event in Itoigawa (Omanta means "you guys" in the local dialect). At this event, thousands of people form a parade and dance in the area around Itoigawa Station. Of course, Denka's employees also participate!

Let's dance together!





**Think INNOVATION**  
Introducing articles that provide hints for innovation

No. 10

**Toward a Future Where People Contribute to Society Through “Avatars”**

Robot Communicator/  
CEO of Ory Laboratory Inc.



**Ory Yoshifuji**

Born in 1987 in Nara prefecture. He develops robots, electric wheelchairs, and other tools to help eliminate loneliness from the human race. “OriHime,” an avatar robot that has been continuously improved upon since its invention in 2010, enables those who are unable to leave home due to disabilities to enjoy free movement and conversation through remote operation. In June 2021, he opened a permanent robot café called “Avatar Robot Café DAWN ver. β,” where OriHime robots serve customers, in Nihonbashi. The café won the GOOD DESIGN GRAND AWARD in 2021.

**Modern society makes people lonely**

“Eliminate loneliness from the human race.” This is the issue I have been working on for more than 10 years. As a child, I was always uneasy because I had a hard time remembering people’s names and faces. I was unable to attend school for three and a half years and suffered from a sense of helplessness and loneliness that no one needed me. At that time, I relied on origami for emotional support.

I was so happy when people praised my origami creations that I decided to pursue a career in manufacturing and entered a technical high school. In my third year of high school, the electric wheelchair I developed won a prize at ISEF\*1, which made me famous in my hometown overnight. Since then, I’ve been getting such requests from various people to make things for them.

What I remember most is an old woman who said, “I feel lonely living by myself, but I don’t want to bother my daughter.” That reminded me of my old self, and I recognized again that many people suffer from the stress of loneliness. The same goes for people with disabilities. They want to take care of themselves and be helpful to others, but if they can’t move freely, then they are unable to work. That is why I started to develop tools to help them “do something for others.”

**The possibilities of the robot café are beyond what I initially imagined**

“It would be nice to have a café where people can work even if they are bedridden,” said a friend who suffered cervical spine injuries from a car accident at the age of four. The avatar robot café was born from this concept.



Pilots can remotely control the avatar robot OriHime to serve customers.

Prior to that, we had been developing a computer that could be operated by eye movement alone and the Orihime, an avatar robot that users could use to interact with people far away. After repeatedly improving on these devices, we launched a pop-up robot café in November 2018 as the first public experiment. Three years have passed since then, and we were able to open a permanent café thanks to the support of many people, including our staff, company employees, intern students, volunteers, and sponsors. The number of OriHime pilots\*2, which initially numbered 10, has now grown to 70.

I think people support us not only because they sympathize with our efforts to “eliminate loneliness,” but also because of how exciting it is. Here at DAWN, it is possible to fully exercise one’s abilities to solve problems while imagining an exciting new future. It is also possible to make connections that lead to new business opportunities. Some of the pilots working at our café have been scouted by customers who want them to work for their companies, creating an employment support service that matches disabled people with employers. As such, the avatar robot café’s possibilities are expanding beyond what we initially imagined.

I think everyone feels lonely at some point in their lives. There are many reasons why people become housebound, not just disabilities or illnesses. However, even if you can’t go out, you can still find new friends and jobs to participate in society and enrich your life. Avatar robots can serve as a tool for that purpose. While seeking to expand the use of our robots, we hope to encourage the creation of new relationships between people.

\*1 ISEF (International Science and Engineering Fair): Known as “Olympics of science,” where high school students from all over the world showcase their independent research.

\*2 The people who control the OriHime robots via computers from home or hospital.

**Challengers for  
Denka Value-Up**

**On the Frontline  
of the Threefold  
Value-Up**



**Omi Plant**

In this segment,  
we focus on the worksites that are striving to realize the threefold growth vision  
“Denka Value-Up.” In this second edition,  
we will introduce the Omi Plant.





Spot Light  
Omi Plant

Omi Plant, Denka Co., Ltd.

A calcium carbide chain maintained for 100 years

Business Value-Up

Aiming towards further specialization and process reforms as "Team Omi."

Under a policy of "Each and every member playing his or her role and uniting as Team Omi to achieve Value-Up," the Omi Plant has been striving to realize the management plan Denka Value-Up in 2021. In terms of Business Value-Up, it is focusing on further promotion of specialization and process reforms.

For specialization, the plant is accelerating development of new products to focus on businesses in which it can outperform others. In polychloroprene, of which Denka enjoys a leading market share globally, it is developing medical application products that are less affected by market conditions, and in special cement additives, it is developing eco-friendly products. The calcium carbide chain, which utilizes all the by-products generated during the manufacturing process, is one of the strengths of the Omi Plant. On the other hand, since the production line consists of multiple departments,

if even one of them were to stop, the entire plant would be affected. Therefore, the plant is raising awareness of the "the next process is the customer" principle by increasing opportunities for education and training. As Team Omi, the plant has firmly established a system where all processes fully cooperate with each other.

As for process reforms, the plant is tackling optimization and productivity improvements of operations and quality control through digitization. In addition to digitalizing plant monitoring operations, it collects opinions from workplaces and promote labor savings in operations. The plant has also eliminated 3D (dangerous, dirty, demanding) jobs, promoting a more friendly working environment. With the introduction of cutting-edge technologies, full-scale implementation of operational data utilization, environment compatibility, etc., it is striving to become a next-generation plant.

VOICE Taking pride in being part of the calcium carbide chain

All employees at the Omi Plant are proud to work at Denka, as they feel that they are contributing to society through the production of polychloroprene and Denka's special cement additives. Another reason is that they are aware of being part of the calcium carbide chain, which cannot be realized without all the production lines. We will strive to have every employee play his or her role and Denka Value-Up as Team Omi.

Hirohisa Otake  
Assistant Manager,  
Omi Plant



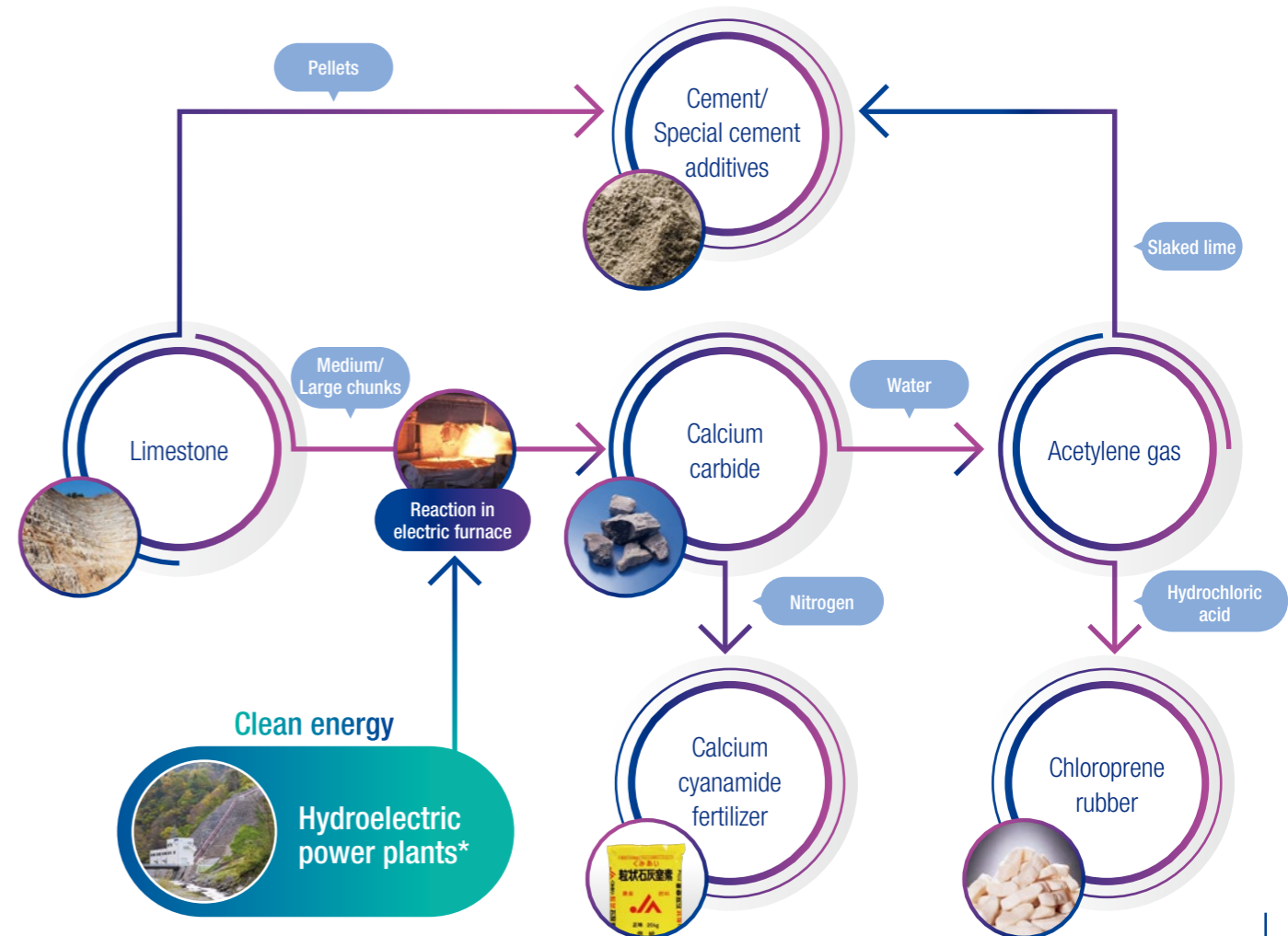
Taking advantage of rich limestone resources and hydroelectric power to produce a wide range of products

The Omi Plant is a major production base of Denka that began operations in 1921. Taking advantage of the 5-billion-ton limestone deposits of Mt. Kurohime and the 126,000-kW generation capacity of Denka's privately owned hydroelectric power plants, it produces about 90% of all the calcium carbide used in Japan. The Omi Plant takes advantage of this calcium carbide chain to produce a wide range of products. Its diverse range of products include polychloro-

prene, cement that contributes to building national resilience against natural disasters, special cement additives, and lime nitrogen fertilizers. The plant also produces macromolecular sodium hyaluronate preparations for use as joint function improvers. Going forward, it will support safe and secure lives through a wide range of technologies from organic to inorganic types and even life sciences.



Calcium carbide chain and main products



\*Hydroelectricity accounts for about 40% of the electricity used by Denka (FY2020 results).



## Challengers for Denka Value-Up



## Environment Value-Up

Environmentally friendly product LEAF

## Reducing CO<sub>2</sub> emissions with special cement additive technology

The Omi Plant manufactures cement and chemical products from limestone. During these manufacturing processes, the generation of CO<sub>2</sub> is unavoidable, which poses a major challenge in terms of reducing emission volumes. Thus far, it has taken numerous measures to conserve energy and reduce the environmental burden. As a new measure, carbon recycling technologies such as CCU\*1 that separates, collects, and effectively uses the CO<sub>2</sub> generated during manufacturing will be essential. The Omi Plant is also currently examining technologies for converting the CO<sub>2</sub> in exhaust gases into inorganic chemicals and other products to utilize it.

At the same time, the reduction of environmental burdens is a challenge for all of society. Denka is striving to develop environmentally friendly products that will reduce GHGs. One such product is the carbonization agent LEAF. This product was developed using calcium waste from the plant as a raw material based on the cement and special cement additive technologies that Denka has cultivated over the years. During the hardening process of concrete, LEAF reacts (carbonizes) with CO<sub>2</sub> and theoretically absorbs and stores about half its weight. This is a truly groundbreaking product that compensates for CO<sub>2</sub> emissions

during the manufacturing process, while increasing the strength of concrete at the same time.

LEAF is mainly used to produce the environmentally friendly concrete CO<sub>2</sub>-SUICOM.\*2 After mixing cement with industrial waste such as blast furnace slag and coal ash, LEAF is added for hardening. The mixture is then left in a carbonization curing unit filled with a highly concentrated exhaust gas for the next week or two, during which it absorbs a large amount of CO<sub>2</sub>. Another point is that since half of the cement normally used is substituted with blast furnace slag and coal ash, less cement needs to be manufactured, and thus less original CO<sub>2</sub> is emitted. As a result, CO<sub>2</sub> emissions when manufacturing CO<sub>2</sub>-SUICOM are reduced to zero or less.\*3 In this way, Denka's special cement additive technologies supports the commercialization of unique carbon negative concrete.

CO<sub>2</sub>-SUICOM and LEAF are currently used to make boundary blocks for roads, foundations for fences, and solar panel foundation blocks, but the number of applications is expected to increase in the future.

\*1 Carbon Capture and Utilization

\*2 CO<sub>2</sub>-SUICOM is jointly developed by Chugoku Electric Power, Kajima, Landes and Denka.

\*3 The amount of actual CO<sub>2</sub> emissions may differ, depending on conditions.

### VOICE

#### Contributing to a recycling society, while working with communities and overseas sites

Reduction of CO<sub>2</sub> emissions is a target that we need to tackle as a society. CO<sub>2</sub>-SUICOM is a concrete that absorbs CO<sub>2</sub>. As a key material to produce CO<sub>2</sub>-SUICOM, LEAF is a product that can contribute to solving the global environmental challenge and paving a new path for CO<sub>2</sub> utilization. By sharing information with local companies and municipalities and working together across the supply chain including overseas sites, we are more determined than ever to contribute to a recycling society.

**Hiroto Sakai**  
Assistant Manager,  
Omi Plant /  
Manager,  
Omi Sustainability  
Promotion Dept.



**Akitoshi Araki**  
Manager,  
Cement/Special Mix  
Research Dept.



About 1,300 employees work at the Omi Plant in the city of Itoigawa, Niigata Prefecture in Japan. This plant is very close to the community, and including subcontractors, the number is over 1,600. Since a diverse range of people work at the Omi Plant, its philosophy is to create an environment where everyone can play an active role. Rather than grouping employees by gender, age, or nationality, the plant believes that respecting them as individuals and supplementing their weaknesses will lead to Human Resources Value-Up.

The foundation of human resource development at the Omi Plant is safety education, which is carried out at the Safety Training Center. This center consists of three facilities: the Ikumai-kan to raise awareness and knowledge of safety, the Anzen-dojo to simulate disasters and learn basic safety actions, and the Yaromai-kan to learn skills to maintain facilities and equipment. With a motto of "Not only awareness and understanding, but also conviction and empathy lead to behavior change," the Omi Plant aims towards education where participants individually think and change their own behaviors.

The Omi Plant's ideal for human resources is "safety-minded." That is to say, human resources who assume responsibility for their own safety

and the safety of their colleagues, thus avoiding accidents and disasters. The Six Principles of Safety define six conditions, including a sense of ethics, the ability to detect danger, and communication skills. Through technical education to cultivate specialized knowledge and judgment, non-technical education to raise awareness of safety, and training by rank based on year of entry, the plant strives to develop safety-minded people.

The Safety Training Center performs a wide range of operations, including managing internal education for 20 departments, external education for partner companies (which can sometimes exceed 100 participants per day), online training, COVID-19 pandemic responses, and establishment of management systems. Ms. Sonoda, who serves as a lecturer, and Ms. Takagi, who provides support for lectures, were assigned to completely different workplaces in the past. Ms. Sonoda was in charge of product analysis for many years after joining the company, while Ms. Takagi was responsible for shipments in the manufacturing department. Having assumed responsibility for this wide range of operations, Ms. Sonoda looks back and comments, "It is necessary to have a broad knowledge of individual departments. By visiting individual worksites and

exchanging opinions in addition to watching videos, I was able to better comprehend their characteristics and risks. I also used online training to improve my public speaking skills." Ms. Takagi says, "Through my work at the Safety Training Center, I would like to continue expanding my range of skills and challenge myself to become more of a specialist." Their activities are also linked to the implementation of Human Resources Value-Up.

In recent years, the Omi Plant has also been trying to increase the number of opportunities for female and senior employees to play more active roles, while at the same time proceeding with labor-saving in operations and the improvement of facilities. Mr. Ishibashi, Safety Officer (SO) who promotes safety education says, "As the name implies, human resources are assets. People who can think and act independently are valued both inside and outside the company. To develop such human resources, we aim to improve the effectiveness of safety education, thereby contributing to Denka Value-Up."



## Human Resources Value-Up

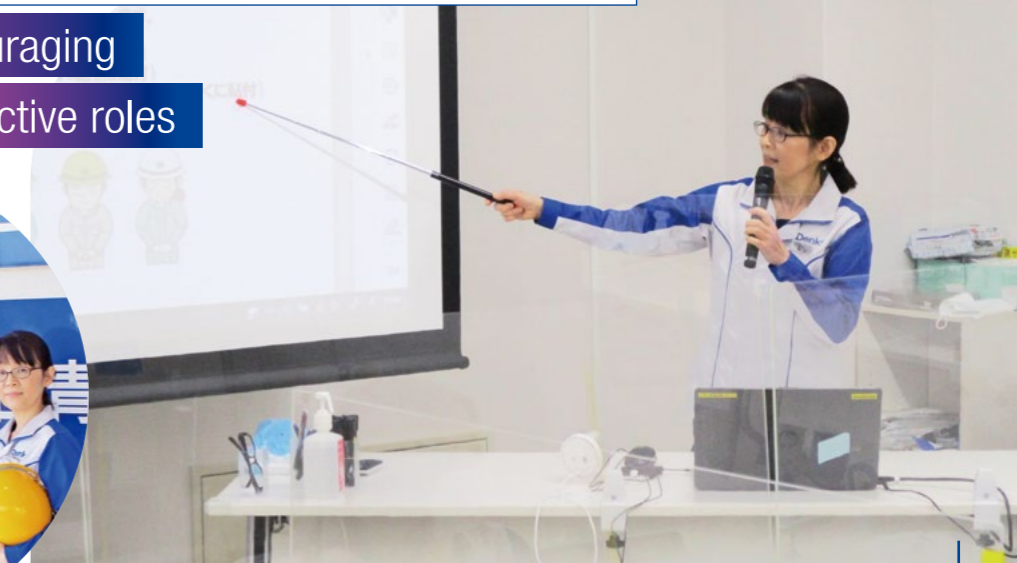


Safety Training Center responsible for the education of approximately 1,600 people

Safety education encouraging all employees to play active roles

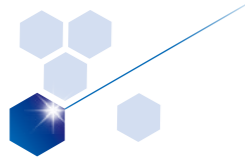


From the left: Takagi, Ishibashi (SO), and Sonoda



\*Face masks were briefly removed only for the purpose of taking this photograph with thorough countermeasures against COVID-19 infections in place.





## A Specialist's Perspective

Denka is striving to become a Specialty-Fusion Company. What do Denka's specialists foresee for the future?

### Steadily Carrying Out Inspections to Deliver Safe, High-Quality Products

Denka Electronics Materials Dalian Co., Ltd. (DEMD) manufactures ALSINK, a heat dissipation base board for power modules used in railroad vehicles. Cong Chunyan, who is in charge of quality assurance and product inspection, always has her eye on quality in order to deliver safe, high-quality products to customers. "I feel a great sense of responsibility, pride, and fulfillment knowing that the products we manufacture and inspect are used in railroad vehicles carrying passengers all over the world."

In 2020, in order to expand its business and improve profitability, DEMD decided to transfer the new inspection process for the ceramic substrate ANP from Japan. While Japanese technicians were unable to visit due to the COVID-19 pandemic, Cong took on the challenge of educating herself and acquiring new qualifications via the internet. The process was successfully transferred, and the system continues to operate stably. "A journey of a thousand miles begins with a single step. I would like to contribute to the specialization of our business and the enhancement of Group value by steadily carrying out inspections every day in pursuit of high quality."

**Cong Chunyan**  
Manager, Quality Assurance and Inspection Section  
Quality Assurance Department  
Denka Electronics Materials Dalian Co., Ltd.

Joined Denka in 2015. Involved in quality assurance and inspections for the heat dissipation base board ALSINK. She is focused on building a robust quality assurance system and acquiring ISO9001 and ISO14001 certifications.



# DENKA TOPICS

Introducing Denka Group news topics from October to December 2021

## Healthcare

Nov.

### Launch of DELYTACT® Oncolytic Virus G47Δ for the treatment of cancer

On November 1, Daiichi Sankyo Company, Ltd. rolled out its oncolytic virus G47Δ Delytact® (product name; generic name: tesserpaturev) in Japan. Denka assumes the role of manufacturing the product. The commercial production technology for G47Δ was jointly developed by Denka and Professor Tomoki Todo, Institute of Medical Science, the University of Tokyo. It has been approved as the first oncolytic virus for the treatment of patients with malignant glioma.



\*Delytact is a registered trademark of Daiichi Sankyo Company, Ltd.

### Reagent to measure sdLDL-C risk marker of heart diseases approved

On November 16, Denka acquired approval for the production and sale of an in-vitro diagnostic reagent, s LDL-EX "Seiken" for the first time in Japan. This product measures sdLDL-C, which is used as a risk marker of heart diseases. It measures risks of developing myocardial infarctions, angina pectoris, etc. in about ten minutes by a general-purpose automatic analyzer without the need for any special equipment.

## High-value-added infrastructure

Oct.

### Launch of Biostimulant Recolt™ across Japan

On October 8, Denka began marketing Recolte™ humic acid liquid compound fertilizer throughout Japan via ZEN-NOH (National Federation of Agricultural Cooperative Associations). This product is a biostimulant that "harnesses the natural strengths of plants and their surrounding environment to positively impact plant health, stress tolerance, yield, and quality." It has achieved favorable results in demonstration experiments.



### Denka agrees to participate in joint research on carbon-negative concrete

In October, Denka reached an agreement with Kajima Corporation and Takenaka Corporation to conduct joint research on making carbon-negative concrete that absorbs more CO<sub>2</sub> than it emits during the manufacturing process. With this development, Denka will offer its LEAF technology, a carbonization additive that is a key material for CO<sub>2</sub>-SUICOM,\* the only commercialized CO<sub>2</sub>-absorbing concrete in the world.

\*CO<sub>2</sub>-SUICOM is jointly developed by Chugoku Electric Power, Kajima, Landes and Denka.

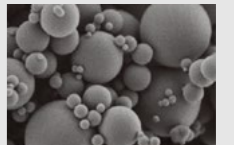
## Environment/Energy

Oct.

Nov.

### Complete launch of fused silica for 5G communication to market

From October, Denka started full-scale marketing of its cutting-edge functional ceramics filler, Denka Fused Silica (DF) Low Loss Tangent Type that contributes to high-speed, large-capacity 5G communication.



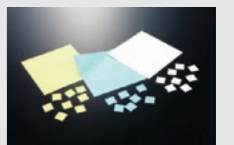
### Reinforcing next-generation highly functional spherical filler manufacturing equipment at Omuta Plant

In October, the reinforcement of manufacturing equipment at the Omuta Plant to strengthen production capability of high-grade spherical silica, alumina and magnesia was concluded.



### Consolidating and expanding production of heat dissipation sheets at the Shibukawa Plant

In November, Denka decided to introduce new production equipment to the Shibukawa Plant. The production of heat dissipation sheets will be transferred to the plant from Kyusyu Plastic Industry Co., Ltd., a group company, to increase production capability.



## Corporate news

Oct.

Nov.

### Denka Chemicals Shanghai Co., Ltd. established to expand and bolster China business

On October 13, Denka announced the establishment of Denka Chemicals Shanghai Co., Ltd., to which the operations of the Shanghai Representative Office and two sales companies in Shanghai were transferred. The company will build an optimal group management and operational system including the implementation of shared services to individual sites, thereby striving to expand the business in China and improve governance.

### Denka Group ESG Basic Policy established

On November 8, the Denka Group ESG Basic Policy, which is a set of basic policies pertaining to ESG issues in business activities for group companies was established.

### President appears in Top Interview on Nikkei CNBC

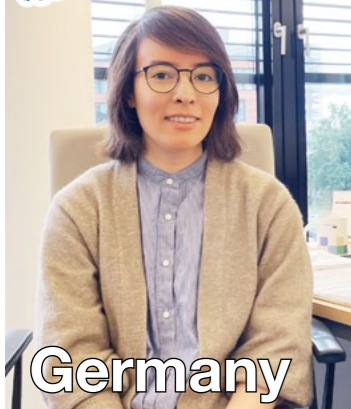
On November 17, President Imai made an appearance on an economic information and news program on Nikkei CNBC.



\*Please scan this QR code to access YouTube and watch the video (available until November 16, 2022).



Think globally,  
act locally.



Germany

**Eri Schrader**  
Back-office  
Denka Chemicals G.m.b.H

I am a huge fan of Denki Groove.

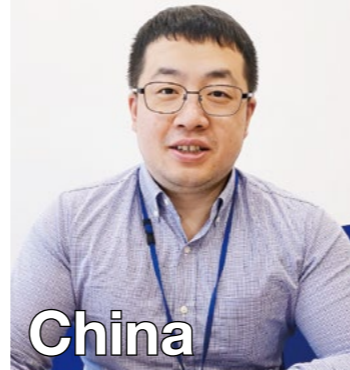
Joined in March 2020. She is in charge of managing sales orders and stock as a back-office team member.

I used to think environmental protection was a major undertaking, but I've realized that I can do a lot of activities on a daily basis even without specialist knowledge. I try to walk, ride my bicycle, and use public transportation when possible. Also, I always bring reusable bags when shopping. This year, I would like to participate in the Rhine CleanUP (an activity to clear plastic waste out of the Rhine River), which I missed due to the COVID-19 pandemic.



Taking Small Steps for the Future!

小さな一歩で未来を拓く!



China

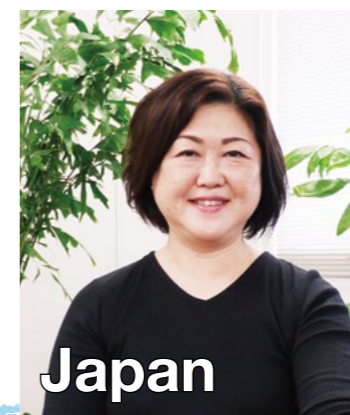
**Qilian Ren**  
Life Innovation  
Denka Chemicals Shanghai Co., Ltd.

How are things in China, Qilian?

I really like muscle training and playing games!  
I want to be able to effortlessly deadlift 150 kg!

Joined in April 2016. He is in charge of sales of in vitro diagnostic reagents (mainly expanding sales of influenza diagnostic reagents in China and some bulk products). He also does information gathering and market research for medical equipment in China.

I properly separate my waste at home and at the office according to the rules laid out by Shanghai city. I have also converted to an electric car. I want to contribute to reducing the environmental burden by reducing CO<sub>2</sub>. Currently, a delivery service called Waimai is popular in China. When I use the service, I try to bring my own reusable chopsticks and containers whenever possible.



Japan

**Yumiko Yamaguchi**  
Sales Department  
Denka Consultant & Engineering Co., Ltd.

Resource Collection 資源回収

I love hot springs!  
I'd like to go on a trip next year.

Joined in 1991. She is in charge of general operational support in the sales department and paperwork and internal administration in the business administration department.

I proactively participate in a resource collection activity held by my neighborhood association. Members of the association collect resources such as plastic bottles and aluminum cans and sell them to vendors. The funds raised here are used for holding the association's activities and events, which also reduces the burden on the local government. Above all, I believe that this is a win-win activity that raises the local people's awareness of waste reduction and recycling.



How are things in Japan, Yumiko?

How are things in Singapore, Hankun?

# LINK GLOBALLY, LINK FUTURE

Group members around the world, working toward the future of Denka

The Denka Group has 6,000 employees around the world. We posed the following question to members from different countries.

Theme What do you do to protect the environment?



Step by Step  
From Tiny Things.



Japan

**Cui Dan**  
Electronic Products Dept.  
Electronics & Innovative Products  
Denka Company Limited

I enjoy building jigsaw puzzles!  
I love nature and travel!

Joined in April 2018. She is in charge of sales of thermally conductive products for Japan and China in the Electronic Products Department of the Electronics & Innovative Products Division.

There are three things that I make a point of doing every day. First, I bring my own reusable bottles to avoid purchasing plastic bottles. Second, I always bring reusable bags to reduce the use of plastic bags. Third, I avoid eating dairy products. Since I noticed that the livestock business has a negative impact on the environment, I have been trying to avoid eating dairy products such as meat, milk, and cheese.

How are things in Japan, Cui?

I am hooked on natural wine!

Joined in August 2019. She is in charge of operational support for the collaboration between Advanced Diagnostics Business Development Department and PlexBio Co., Ltd, as well as finance operations at DCT.

I try to separate my waste properly for recycling purposes. When I eat out, I use my own reusable chopsticks and straws whenever possible. I also make a point of bringing my own bags when I go shopping to minimize use of plastic bags. At home, I am doing my best to prevent global warming by doing things like buying energy-saving home appliances and unplugging devices when they are not in use.



Taiwan

**Rita Lee**  
Denka Taiwan Corporation

How are things in Taiwan, Rita?



Singapore

**Hankun Li**  
Molecular Diagnostics Sepsis  
Denka Life Innovation Research Pte. Ltd.

I can cook great steamed egg custard!

Joined in January 2018. He is in charge of reviewing bioinformatics analysis workflow, developing in-house bioinformatics analysis tools for detecting primers, and designing probes for both Sepsis and Tropical Virus teams.

I am aware of four things every day. First, I use rechargeable batteries instead of normal single-use batteries. Second, when I go outside on weekends, I walk or use public transportation whenever possible. Third, I use reusable bags and check whether products are eco-friendly or not before I buy them. Finally, I try to cook for myself to reduce food waste.



Try Everything!

Be KIND TO OUR PLANET.