



The monument to our predecessors, which is shaped like a Möbius strip to represent eternity

### Memorializing Denka's predecessors

## The Mt. Koya Memorial Tower, A Monument to Our Predecessors

Mt. Koya, "The Holy City in the Sky." Kukai, the founder of Shingon Buddhism, opened an Esoteric Buddhist dojo in the mountain-top basin, surrounded by the peaks of Wakayama Prefecture.

The whole Mt. Koya area, which includes 117 temples, forms the Head Temple Kongobuji Temple. As a sacred site representing Japanese Buddhism, it was registered as a UNESCO World Cultural Heritage site in 2004. Mt. Koya, which has long been a place of worship, is also home to the tombs of famous warlords such as Oda Nobunaga and Toyotomi Hideyoshi as well as numerous memorial towers for Edo period feudal lords and leading Japanese companies.

In 2015, when Denka celebrated its 100th anniversary, it erected a memorial tower for the deceased as a monument to our predecessors at Mt. Koya. It exists to pray for the souls of our predecessors who served Denka and laid the foundations for 100 years. Coincidentally, 2015 also marks the 1200th anniversary of the founding of Mt. Koya. The monument to our predecessors is located near the Okunoin Kobo Daishi Mausoleum, where legend has it that Kukai remains alive in a state of eternal meditation.

The bronze object at the center of the monument to our predecessors is a Möbius strip, whose unbroken shape symbolizes eternity and represents a wish for Denka's continued prosperity. A list of 3,500 deceased persons is stored under the pedestal, and the monument has been maintained with the support of many people since it was erected.

The monument to our predecessors has become a deeper shade of bronze with the passage of time and has begun to blend into the ethereal world of Mt. Koya. Denka will continue to remember the achievements of our predecessors and pray for the further development of the company.



**Cover Photo**  
Night view of Denka Singapore's Seraya Plant

The Seraya Plant began operations in 1997 as a polystyrene resin manufacturing site. Currently, as Denka's core resin manufacturing site, it produces three types of resin: MS resin, SBC resin (Clearen), and imidized resin (IP).



# The DenkaWay

## Autumn

2022 | Vol.13



## Growing with Singapore

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# Growing with

Amazing  
the  
World  
with Innovation

# Singapore

Fifteen years after Singapore became an independent republic in 1965, Denka was one of the first Japanese chemical manufacturers to establish a presence in the country. It started with acetylene black and gradually expanded to various other products, including spherical silica, a semiconductor encapsulation material filler with a global share, and spherical alumina, which is widely used as a high thermal conductivity/heat dissipation material for lithium-ion batteries and other parts in xEV and 5G applications. In this special feature, we will cover Denka's challenges as it moves forward together with Singapore.

## Denka

History of Denka in Singapore

1960	1980	1990	2000	2010	2020
<b>Singapore</b> History of Singapore <ul style="list-style-type: none"> <li>1965 Singapore established as an independent republic</li> <li>1967 Singapore Dollar goes into use</li> </ul>	Denka Singapore Pte. Ltd. (DSPL) established Merbau Plant completed. Production of acetylene black commenced Merbau Plant completed. Production of acetylene black commenced	Tuas Plant completed. Production of fused silica commenced Seraya Plant completed. Production of polystyrene resin commenced	Production of Clearen SBC resin and MS resin commenced at Seraya Plant Denka Chemicals Holdings Asia Pacific Pte. Ltd. (DCHA) established as a regional headquarters	Production of Denka IP commenced at Seraya Plant South Plant completed. Production of Toyokalon® commenced Denka Life Innovation Research Pte. Ltd. (DLIR) established as a life science research center Launch of Project Falcon, a five-year project to reform production and operations using digital technology to create smart factories	MS resin production facility starts operation at Seraya Plant New spherical alumina production facilities begin full-scale operations at Tuas Plant Spherical silica production facilities to be expanded at Tuas Plant
	Singapore and parts of Indonesia and Malaysia launch the Triangle of Growth project, a cross-border economic zone initiative	Singapore announces the Strategic Economic Plan, an eight-part economic strategy based on a long-term vision through 2030 First presidential elections	Immigrant population exceeds 1 million Completion of Jurong Island, an artificial island located to the southwest of the main island of Singapore	First casino opened Completion of LNG (liquefied natural gas) receiving terminal on Jurong Island Opening of Jurong Rock Caverns, Southeast Asia's first underground oil storage facility	Singapore announces Research, Innovation and Enterprise 2025 Plan, a five-year plan (2021-2025) formulated by the Research, Innovation and Enterprise Council (RIEC), a public-private partnership under the National Research Foundation (NRF), under the Prime Minister's Office Singapore announces Green Plan 2030

# INTERVIEW



**Micho Kawamura**  
 Managing Director  
 DCHA/DSPL/DAPL  
 Executive Officer

### Profile

Joined the company in 1990. After working at the Chiba Plant, he was assigned to Singapore in 1997. Involved in the launch of Seraya Plant. Afterwards, put in charge of styrene resin manufacturing at Chiba Plant. In 2011, he returned to Singapore as the Managing Director of Seraya Plant. Assumed his current position in April 2022.

## The Key to Sustainable Growth in Singapore Is National Staff

### The Singapore bases are closely collaborating to promote the three Value-Up initiatives

On September 20, 1980, Denka expanded into Singapore to strengthen production of acetylene black, which was used in manganese dry cell batteries and high-voltage cable sheaths. Since then, we have been expanding our business using our proprietary technologies and currently manufacture seven products at four plants. Furthermore, Denka Life Innovation Research Pte. Ltd. (DLIR), a life science research center established in 2016, is taking on the challenge of developing products to combat tropical infectious diseases.

Currently, each of our bases in Singapore is working on initiatives in line with the three Value-Up initiatives set forth in the management plan while sharing information with each other. Our first goal is to improve profitability through Business Value-Up. Our primary example is the launch of new facilities for spherical alumina and expansion of facilities for spherical silica at the Tuas Plant. In recent years, demand for semiconductor-related products and 5G and xEV mega-trend applications has been growing rapidly, and as a production base close to China and South Korea, we must be ready to meet overseas demand.

Another important measure to improve profitability is Project Falcon, a smart factory conversion plan that has been underway since 2017. We will strive to reduce production losses by stabilizing operations through digital technologies and strengthen first-mover sales by building a common platform with our customers for supply chain management.

The second is to ensure the sustainability of the Singapore business through Human Resources Value-Up. From September 2022, Singapore will tighten the requirements for issuing work visas to foreign workers. To ensure the stable continuation of our Singapore operations in the future, we must transfer the tasks traditionally handled by Japanese staff to our national staff.

To that purpose, we are sending management cadets to plants in Japan to acquire skills and taking on the challenge of knowledge management using digital technology. By visualizing the knowledge, tricks, and intuition that veteran staff have acquired over the years, we will promote the efficient transfer of techniques and skills.

The third is to achieve carbon neutrality through Environment Value-Up. Natural resources are limited in Singapore, so environmental measures are important. We are currently focusing on the possibility of installing solar panels as one method of reducing CO<sub>2</sub> emissions. We are also implementing a variety of other initiatives, including discussing the possibility of using more recycled materials with our suppliers.

### Our watchword is “Improve & Upgrade”

It has been over 40 years since we launched the Singapore business. We have overcome many difficulties, including soaring oil prices and the bankruptcy of the Lehman brothers. The key to sustainable growth here in Singapore will undoubtedly be the national staff. I tell my national staff that they can replace “Value-Up” with “added value.” Denka does not produce many final products. However, our materials are used to make many other products that support our daily lives, from automobiles to packaging materials. Our efforts to improve productivity and environmental friendliness may not be immediately noticeable, but they will lead to the creation of new added value required by the SDGs and sustainability and ultimately to the delivery of indispensable products to people around the world.

At our Singapore bases, we often use the phrase “Improve & Upgrade.” Each and every one of us will continue to pursue sustainable business in Singapore with this phrase in mind.

## West area

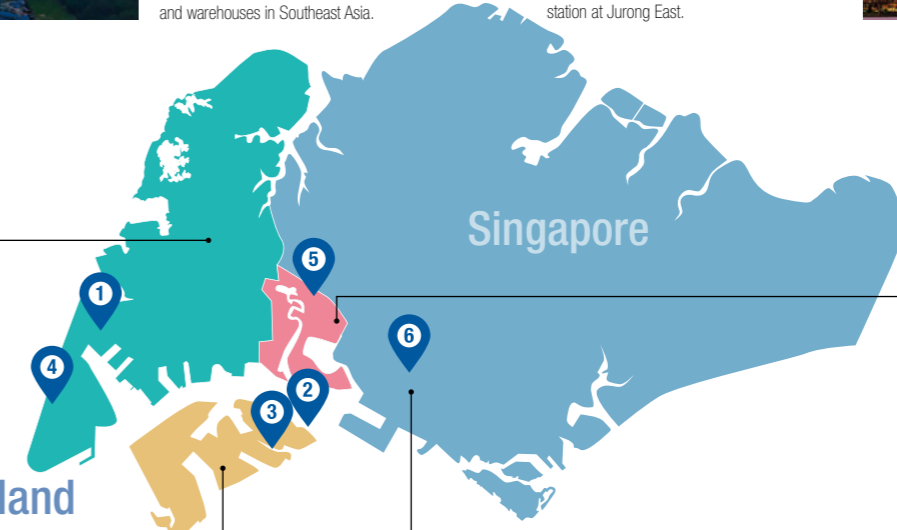


## About Singapore

A suburban area where many Japanese companies have established operations. The DAPL Tuas Plant is located in the Jurong Industrial Estate, one of the largest clusters of factories and warehouses in Southeast Asia.

A central area in the western part of Singapore where many shopping malls and other facilities are located. There are plans for a bullet train from Kuala Lumpur, Malaysia to connect to the station at Jurong East.

## Jurong East



## Jurong Island



An artificial island completed in 2009. It is connected to the main island by a 2.3-km-long land bridge. It contains a petrochemical complex and is the largest chemical and energy hub in Southeast Asia.

## Biopolis



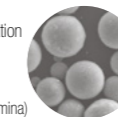
A center of biochemistry R&D in Asia. Located close to the National University of Singapore, it is home to numerous public research institutes and private companies from around the world.



### 1 Denka Advantech Pte. Ltd. (DAPL) Tuas Plant

Manufactures fused silica filler, which is mainly used for semiconductor encapsulation materials and 5G and xEV applications.

No. of staff: 86  
 (Main products: Spherical silica, spherical alumina)



### 3 Denka Singapore Pte. Ltd. (DSPL) Merbau Plant

Manufactures acetylene black, which is characterized by high purity, high conductivity, and high thermal conductivity.

No. of staff: 36  
 (Main product: acetylene black)



### 5 Denka Chemicals Holdings Asia Pacific Pte.Ltd. (DCHA) JTC Summit

Regional headquarters. Responsible for accounting and back-office functions for the Singapore bases.

No. of staff: 41



### 2 Denka Singapore Pte. Ltd. (DSPL) Seraya Plant

Manufactures three types of resins on Jurong Island, with an annual production capacity of 205,000 tons.

No. of staff: 91  
 (Main products: MS resin, Clearen SBC resin, imidized resin (IP))



### 4 Denka Advantech Pte. Ltd. (DAPL) South Plant

Manufactures Toyokalon® synthetic fiber, mainly for African wigs and hairpieces.

No. of staff: 34  
 (Main product: Toyokalon®)



### 6 Denka Life Innovation Research Pte. Ltd. (DLIR)

R&D center of the Life Innovation Division. Responsible for the development of products and diagnostics for tropical infectious diseases.

No. of staff: 13

\*Staff numbers as of March 31, 2022

# Project Falcon

## Further productivity improvement through smart factories

In 2017, a smart factory plan titled Project Falcon was launched with the support of the Singaporean government, and in the latter half of 2021, Project Falcon 2.0 was launched to further promote DX. We asked Deputy Managing Director Horio for an explanation of the project.



**Katsuji Horio**  
Deputy Managing Director  
Technology Division, DCHA

### Profile

Joined Denka in 1990. Worked in the Chiba Plant Manufacturing Dept., Research Dept., Production Control Section, Internal Auditing Dept., and IT/Digital Dept. before assuming his current position in July 2021.

### Launching Project Falcon 1.0 with the Singaporean government

In November 2017, we launched Project Falcon, a smart factory project for our four plants in Singapore. The plan was to tackle four areas—Digital Infrastructure, Digital HSE, Digital Plant, and Supply Chain Management—over a five-year period (2017 – 2022) with the backing of the Singaporean government, which was eager to promote digitalization. Since then, we have been striving to improve productivity and reduce costs and downtime by installing sensors on plant equipment, establishing preventive and predictive maintenance systems, and visualizing planning tasks that had become too dependent on specific personnel. The process is not yet complete, but as of November, we had achieved an 8% reduction in power consumption, a 20.4% reduction in monthly inventory, and an 8% improvement in yield.

### Further DX through Project Falcon 2.0

Project Falcon 2.0 was launched in October 2021. We are now promoting further activities under the four new pillars of Synchronized Planning, Connected Customer, Smart Manufacturing, and Network Operations.

Synchronized Planning refers to an initiative to promote real-time sales and production planning and

advanced revenue/expense analysis based on the Supply Chain Management of Project Falcon 1.0. Anaplan is a cloud system for project management that we introduced at Seraya Plant to improve the efficiency of planning-related operations. Moving forward, we are planning to apply the know-how gained from this system to the Merbau Plant and other production bases involved in the acetylene black business.

Connected Customer is about establishing a new sales and marketing strategy suitable for the With Corona era. About 99% of our customers in Singapore are overseas, so we were faced with the question of how to communicate our technologies and products to our overseas customers after the pandemic. Currently, all sales offices in the resin business are working together to share current issues and customer needs, and we are seeking to establish new sales and marketing strategies utilizing digital technology.

Under Smart Manufacturing, we are promoting Factor Avatar, a project to interview veteran staff and convert their skills into data. With national staff playing an increasingly large role due to stricter visa requirements, it will be essential to pass on skills. This won't happen overnight, but we will do our best to complete this project and achieve a sustainable organization.

Finally, Network Operations is an initiative to promote paperless and automated administrative operations. We are aiming to realize location-agnostic

operations to flexibly respond to changes in the business environment.

### The important thing is maintaining the changes

The goal of Project Falcon is not to implement digital tools; it is to establish a system that ensures the safe and stable execution of factory operations. To that end, the important thing is whether or not we can maintain these reforms. We will aim to establish a culture in which all employees can continue taking on challenges to improve productivity with a sense of satisfaction and create an organization that can maintain the changes.

### 1 Digital Infrastructure

Infrastructure enhancements such as additional Wi-Fi in the plants, cloud storage to accumulate data collected at the plants, and a DSN core to accumulate planning system data were implemented.

### 2 Digital Plant

Sensors were installed on plant equipment to predict abnormalities in advance. Digitalization of measuring instruments and online simulations to estimate the physical properties of products at the manufacturing stage were also implemented.



### Project Falcon 1.0

### Project Falcon 2.0

### 2 Connected Customer

New sales and marketing strategies to create an infrastructure to further retain customers and promote business growth.

### 1 Synchronized Planning

Standardization and automation of analysis-centric planning operations to enable detailed profit-and-loss management (forward-looking).

### 3 Supply Chain Management

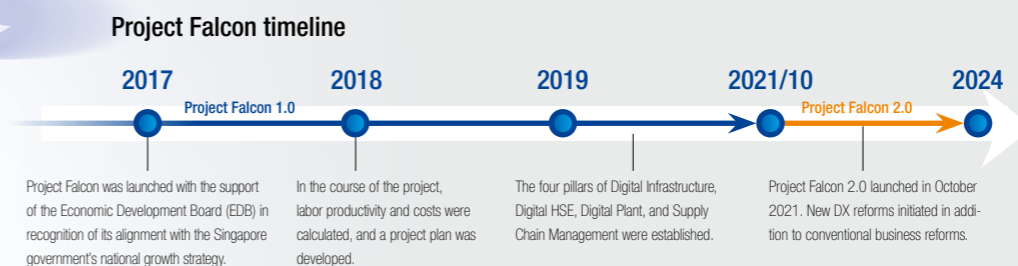
Introduced Anaplan, a cloud system for planning and income/expense analysis, to promote real-time sales and production planning and more sophisticated income/expense analysis.

### 3 Smart Manufacturing

Realization of factory operations that ensure robust quality regardless of changes in the business environment through the use of digital technology.

### 4 Network Operations

Realization of location-agnostic operations through paperless and automated operations.



\*DX Strategy at Denka Singapore. For the purpose of establishing a business structure that can maintain Denka's quality in any business environment through DX.

### Goals

- 3% reduction in energy consumption
- 5% reduction in plant downtime
- 10% reduction in maintenance costs
- 15% reduction in supply chain/logistics costs
- 15% increase in labor productivity

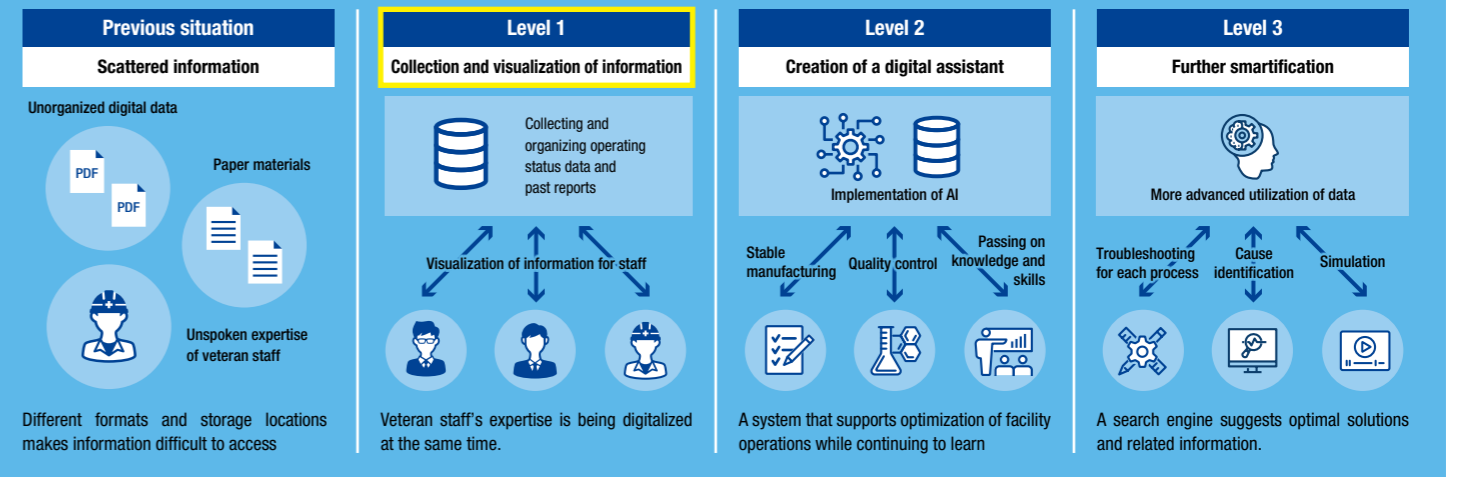


# Smart Manufacturing Factory Avatar

Optimization by Understanding Facility Conditions through DX and Data Visualization



## Denka Singapore's DX goals



### Jeffrey Tok

Production Head  
Seraya Plant, DSPL

#### PROFILE

Joined the company in June 2013. After spending three years at the Chiba Plant to study manufacturing, quality control, and process development, he returned to Singapore in 2016 and started working at Seraya Plant. Since assuming his current position in 2021, he has been involved in promoting digital transformation (DX) for monitoring plant facilities and leading the project "Factory Avatar."

### Visualization of facility operating conditions to predict troubles

One of the pillars of Denka's Singapore's DX strategy "Denka DX 2024" is Smart Manufacturing. In the previous Falcon 1.0 project, they carried out an initiative called Digital Plant, which involved installing sensors to accurately monitor plant facility operating conditions with the aim of reducing costs, energy consumption, and downtime. For Smart Manufacturing, they are aiming to further optimize operations by training national staff, passing on knowledge held by veteran engineers, and upgrading maintenance "from preventive to predictive."

What does "from preventive to predictive" mean? Plant operating conditions are monitored and adjusted through a control system. In the past, data on the operating status of each facility was only recorded in the system and was not effectively

utilized by the operators. "We've been collecting valid data, but it hasn't been shared with or effectively utilized by the system engineers. There is room for improvement." With this idea in mind, Jeffrey and the project members began to consider how to visualize the data to make full use of the information.

After building the system, the operating condition data was organized so that it could be displayed on a dashboard, allowing the engineers to understand the situation at a glance. By checking the dashboard, they can ascertain problems, say, an inefficient process, and then adjust settings to optimize it. Through "visualization of information" and "visual judgment and manual adjustment," they are now able to predict problems in advance and prevent them from happening.

### A digital assistant that will continue to learn in the future

In addition to monitoring facility operating conditions, they are also working on the smartification of the system through the Factory Avatar project. Under this project, they are building a system that digitalizes expertise and provides suggestions on how to improve facility performance. This system will enable engineers to make more informed decisions. Jeffrey explains, "We would like to develop a digital assistant that will allow any operator, regardless of their experience level, to maintain optimal operating levels."

To make appropriate judgments on technical troubles occurring on the chemical line, AI and machine learning functions must be implemented to learn from operating data and past reports and accumulate case studies. The project members are also attempting to collect the knowledge and

skills of veteran staff to have the system learn from human expertise. Currently, they are interviewing engineers of various generations working at the Seraya and Merbau plants. The interviews take the form of specific troubleshooting scenarios that might occur at the plants. "We're not just interested in the procedures," Jeffrey stresses. "We want to know why the engineer might choose to take a specific action in a certain situation."

With the average age of engineers on the rise, passing on knowledge and skills to the younger generation is a major challenge. By verbalizing and accumulating the knowledge and intuition of veteran staff in a database format, younger engineers will be able to continue learning from it. At the same time, the next generation of staff can add new know-how and know-why about a wider range of troubles. Thus, instead of being a mere repository of data, the system can become a living digital assistant that will

continue to learn in the future.

### Applying Smart Manufacturing to each process in the plant

"A search engine that suggests optimal solutions and related information. This is what we ultimately want to achieve," Jeffrey says. It sounds like a dream come true, but there are still problems in coming up with a concrete plan, he says. What is needed to create the database? How can they improve the accuracy of the search engine? And afterwards, it will also be essential to properly train the staff to handle the system. The benefits of Smart Manufacturing can be applied to all processes; not only manufacturing and maintenance, but also quality control and warehouse operations. With this in mind, they will explore the best ways to achieve safer and more efficient operations.



# Supply Chain Management

Visualizing Sales and Production Planning in the Cloud  
Centralized Management from Raw Material Procurement to Income/Expense Analysis



**Yuki Shintani**  
General Manager, Sales  
DSPL Styrene Products Sales

**Profile**  
Joined the company in 2012. After working in the Functional Resins and Chemicals Section of the Osaka Branch, he was transferred to Singapore in 2016, where he was put in charge of sales and purchasing. He has been involved in developing Anaplan since 2020.

## Realization of real-time operations and smooth collaboration with other departments

The Seraya Plant, one of Denka's major resin manufacturing sites, has successfully reformed supply chain management operations by using a cloud system to improve the efficiency of sales and production planning for demand, inventory, and production management. This has resulted in real-time planning and more sophisticated income/expense analysis.

In 2020, the Seraya Plant introduced Anaplan, a cloud system dedicated to business management and financial planning. The reason was that certain tasks were becoming too specialized. While there were many veteran staff members, the number of operations based on rules of thumb and habits had been increasing, making it difficult to pass on knowledge and experience.

In an attempt to solve these problems, sales and production planning was transferred to Anaplan so that it could be carried out in real-time. Anaplan has more than 40 data items representing raw material purchases, sales forecasts, inventory levels, and production plans. All of the forms are connected, so, for example, if the expected sales volume and ship-

ment dates are entered, the system will automatically calculate the amount of raw materials required.

It also allows for more sophisticated income/expense analysis. Previously, an accountant had to calculate all the income and expenses, but Anaplan automatically displays monthly income and expenses and their details, allowing the user to check the budget and actual results for each customer at a glance. The introduction of Anaplan has standardized operations, centralized information, and contributed to the elimination of specialized tasks.

These changes have also led to a change in employee awareness. "The introduction of Anaplan has given everyone a sense of ownership," explains Shintani, General Manager of Sales. By gaining an overall picture of the business, employees are able to visualize their own roles and contribution to the bottom line, which makes them feel more responsible. It has also made it easier to grasp the situation in other divisions, bringing the divisions closer together.

More than 90% of sales and production planning operations have been converted to real-time. Moving forward, they will work on establishing income/expense simulations to further improve analysis and further strengthen responsiveness to the rapidly changing market environment.

**Amazing the World with Innovation**

# On the Frontline of the Threefold Value-Up

No. 04 Singapore

In this segment, we focus on the worksites that are striving to realize the threefold growth vision "Denka Value-Up." In this fourth edition, we will introduce Denka's bases in Singapore.

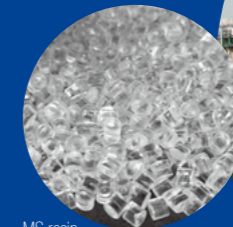
## Challengers for Denka Value-Up



**Business Value-Up**



Lifting a new reactor into the air prior to erecting it



MS resin



Conversion of polystyrene production facilities

## MS Resin Production Capacity Doubled

Seraya Plant converted its polystyrene production facilities to MS resin\*1 production facilities between 2019 to June 2021, with operations beginning in July 2021.

In recent years, MS resin has been used for a wider range of applications, such as light guide plates for LCD TV backlights and cosmetics containers, in China and other countries. In view of the rapid growth in demand, Seraya Plant decided to increase MS resin production.

The plant had previously renovated some of its polystyrene production facilities for MS resin production in 2006, but all of the employees involved back then had retired. This would also be the first renovation project undertaken solely by national staff. With the help of an EPC contractor\*2, they took on the challenge of facility engineering.

The construction consisted of dismantling two existing reactors (which were decommissioned later), erecting a new reactor with a different design, and replacing a devolatilizer\*3.

This work involved hoisting a nearly 30-ton reactor up in the middle of the plant site, and Mujono recalls that coordinating the safe execution of the construction work was more difficult than expected. During the COVID-19 pandemic, it was difficult to get everyone involved on site, and they were forced to communicate with the vendor online for technical discussions. Nevertheless, they succeeded in reducing the construction delay due to the pandemic to six months. The time from commissioning to start-up was also reduced to a few days, which was smoother than the previous renovation project.

When the new facilities are fully operational, MS resin production capacity is expected to be approximately 140,000 tons per year, double the previous amount. This will make a significant contribution to strengthening Denka's specialty business. In preparation for increased post-COVID demand, they will continue to enhance their competitiveness.

### VOICE

Deepening our expertise and bonds with colleagues

It was very challenging to perform the construction work with only national staff, especially when most of us were forced to work from home during the pandemic. In the chemicals industry, a slight miscommunication can lead to unfortunate accidents, so we made a point of communicating even more carefully than when we were at the office. As a result, our members deepened their technical knowledge and developed stronger bonds. Seraya Plant's MS resin production capacity expansion is an initiative to enhance the specialty products of the Denka Group's key operations. We will continue to rapidly ascertain market needs while striving to improve quality and specialization to contribute to Denka Value-Up.

**Mujono Yao**  
DGM, Seraya Plant  
DSPL



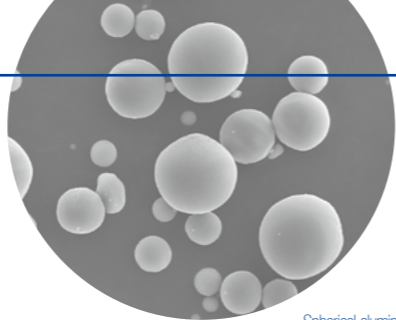
\*1 MS resin is a high-performance transparent resin, made by copolymerizing styrene and methyl methacrylate (MMA). It is characterized by high dimensional stability, low specific gravity, and excellent moldability. DSPL produces MS resin with low contamination and an excellent appearance.

\*2 A contractor responsible for the engineering, procurement, and construction of a project.

\*3 A devolatilizer recovers solvents and unreacted monomers from polymers after polymerization.



New facilities at the Tuas Plant launched in April



Spherical alumina (magnified)



## Business Value-Up



New facilities for Spherical Alumina and expanded facilities for Spherical Silica

Meeting Megatrend Markets Such as xEV and 5G

The Tuas Plant is expanding its production capacity of spherical alumina and spherical silica, which are widely used in megatrend applications related to 5G (high-speed, high-capacity data communications) and vehicle electrification (xEV). Due to the pandemic and rapid digitalization in recent years, demand for these products is growing, and Denka intends to strengthen its supply through a two-site system, one at the Omuta Plant in Fukuoka Prefecture and the other in Singapore.

Spherical alumina is used in lithium-ion batteries and other devices as a high thermal conductivity/heat dissipation material. The new facility at the Tuas plant launched full-scale operations in April 2022, increasing productivity to approximately five times that of FY2018. Another aim was to strengthen BCP (Business Continuity Planning) by establishing a two-site system with the Omuta Plant. While travel from Japan was restricted due to the pandemic, preparations were made in collaboration with the Omuta Plant through daily online meetings and other means.

With the Tuas Plant's new facilities, Denka will become the top manufacturer with approximately 60% of the global market share.

It has also been decided to strengthen the production capacity of spherical silica at the Tuas Plant in 2024, increasing the Group's overall production capacity by approximately 30%. Spherical silica is a product used for semiconductor encapsulation materials due to its insulation properties and low thermal expansion. Currently, it is produced at two sites, the Omuta Plant and the Tuas Plant, and Denka aims to establish a stabler supply system over the medium to long term to respond to strong demand in the future.

Denka has identified the environment and energy fields, especially with relation to xEV and 5G, as priority areas in its Value-Up plan. Mr. Iizuka explains, "These are two of Denka's specialty products, so increasing their production volume is in itself a contribution to the Value-Up plan. Moving forward, we will continue contributing to the growth of the environmental and energy fields."

### VOICE

#### More efficient and higher quality products

Spherical alumina and spherical silica are products that are used in critical infrastructure around the world, and we are seeing the demand for them increase on a daily basis. We are keenly aware of this fact and are committed to delivering more efficient and higher quality products to our customers. In addition, as part of Project Falcon, the Tuas Plant is also working on business process reforms through digitalization, and we would like to share relevant initiatives with other plants.



**Keishi Iizuka**  
Plant Manager  
Tuas Plant  
DAPL

**Takafumi Komaki**  
Head of Technology  
Tuas Plant  
DAPL

**Masataka Shima**  
Head of Technology  
Tuas Plant  
DAPL

The CO<sub>2</sub> Emission Reduction Project was launched at Denka's Singapore sites in May 2022. Under this project, leaders of the four plants in Singapore and Japanese expatriates regularly exchange opinions and information in order to reduce emissions of CO<sub>2</sub>, a major greenhouse gas. Hirokawa, who leads and manages the project, explains, "We organized the project so that all staff members working at Denka's Singapore sites have a sense of ownership and can make continuous efforts beyond their departments."

The basis of this project is Denka's Environment Value-Up. The initiatives proposed, such as the installation of solar panels and reduction of energy consumption at each plant, are in line with the "expansion of clean energy use" and "reduction of greenhouse gas emissions throughout the product life cycle," key points of Environment Value-Up.

The Singapore government is also taking proactive action. It has set the same goals as

Denka: to achieve carbon neutrality by 2050. "Building a new facility, for example, requires us to be mindful of government regulations relating to high-efficiency energy and waste management," explains Fendy, who is in charge of communicating with the government. "So sharing information with each stakeholder is essential."

Regarding the installation of solar panels, they are facing many difficulties such as strict installation conditions and lack of space on site. To solve these issues, the project members are researching the latest technologies and trends of other companies by looking into case studies not only in Singapore but also in other parts of the world. "When we share information, we realize that many companies are facing the same difficulties as we are," says Hirokawa. "This project is still in its early stages, but we are willing to consider a variety of ideas to achieve great results."



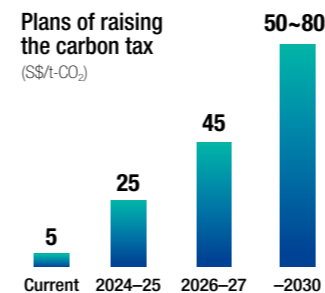
## Environment Value-Up

Reducing CO<sub>2</sub> emissions with the Singapore government

Toward Utilization of Clean Energy

### The Singapore government's policy of raising the carbon tax

The tax is levied on companies that produce at least 25,000t-CO<sub>2</sub>/year of greenhouse gases.



For solar deployment, the Singapore government has set a goal of achieving at least 1.5 gigawatt-peak (GWp) by 2025 and 2 GWp by 2030.

### The Singapore government's actions on environmental issues

Carbon neutrality	The initial target of "as soon as viable in the second half of the century" was changed to "achieving net-zero by 2050."
Carbon tax	Carbon tax to be raised to five times its current level in 2024.
Jurong Island	Announced target figures in November 2021 to make Jurong Island, an area with high CO <sub>2</sub> emissions, a sustainable production and export base
Green Plan 2030	Announced in February 2021. The plan sets five key targets: City in Nature, Energy Reset, Green Economy, Resilient Future, and Sustainable Living.

### VOICE

#### To take an effective step forward despite limitations

The energy-derived CO<sub>2</sub> emissions of Denka's four Singapore plants amounted to approximately 60,000 tons in FY2021, so an increase in carbon tax by the Singapore government will significantly increase our costs. In Singapore, it is difficult to generate hydroelectric, wind, and thermal power, so there are only a limited number of ways to produce electricity domestically. To expand the use of solar power generation, a leading source of clean energy here, we will aim to install solar panels at our plants in FY2023.



**Tetsuo Hirokawa**  
GM, Group Technology  
DCHA



**Fendy**  
MD's Office Leader  
Process Safety, Technology & Compliance  
DCHA



Exchanging opinions



Members of the CO<sub>2</sub> Emission Reduction Project





Tuas Plant members  
(Photographed in  
January 2020)



## Human Resources Value-Up

Flexible support in response to motivation for growth

### Creating a Competitive Workplace through Diversity

Denka's bases in Singapore have a markedly international character, especially in terms of national staff. There are about 300 staff members from various countries such as Malaysia, the Philippines, and India. Of these, approximately 10% are Japanese staff. Since Denka's business in Singapore covers a wide range of supply chains from upstream to downstream, the job types vary widely, including R&D, engineers, sales, and management. Each department appropriately evaluates the motivation and abilities of its employees and provides ample opportunities for skill development.

One such initiative is the Management Trainee System launched in 2013. Under this system, new graduates spend a few years at plants in Japan to learn Denka's technology, culture, Japanese language, and other skills that can be applied to on-site management upon returning to Singapore. Miida, who is responsible for human resource management, explains, "Japanese companies typically spend a lot of time and effort

training up new graduates. We've created this initiative to provide highly motivated staff with the same opportunity."

Jihao, in his seventh year with Denka, spent three years at the Chiba Plant to learn techniques from experienced operators. "Depending on which plant you are at, you learn different things," he explains. "It was a unique experience that you cannot get at school." Aloysius, who used the system the year it was established, recalls, "I developed the routine of Ho-Ren-So\* (報連相) and a focus on harmony." After returning to Singapore, he always tries to communicate logically with engineers, carefully explaining why a certain method was chosen.

"Employee education and training is not only good for Denka, but also for the society," Miida adds. Denka's bases in Singapore also offers flexible support to employees, such as encouraging them to pursue master's degrees at night universities. Moving forward, they will continue to treasure diversity and provide fulfilling opportunities for growth.

\*Ho stands for hokoku ("report"), ren for renraku ("communicate"), and so for sodan ("consult" or "seek advice").



Jihao is involved in DX promotion at the workplace.



Aloysius aims to improve product quality and productivity.

#### VOICE

#### Mobilizing the power of national staff

Since the COVID-19 pandemic has made it difficult for employees in Japan to come to Singapore, national staff have become more involved in site management than ever before, and they are working hard to train up engineers with Japanese expatriates. In order for Denka to survive in the highly competitive Singaporean market, we will need to work together to improve operations using digital technology and provide high-quality products to our customers in a safer and more efficient manner.



**Muneatsu Miida**  
Group HR/Administration DMD  
DCHA



**Jihao Kuo**  
Process Technology Leader  
Merbau Plant  
DSPL



**Aloysius Vu**  
Production Head  
Tuas Plant  
DAPL



## Think INNOVATION

Introducing articles that provide hints for innovation

No. 13

### The Secrets of Approaching Work with a Positive Mindset

Radio Personality / Anchorperson / Narrator



**Jon Kabira**

Born in Okinawa in 1958. After graduating from university, he joined CBS / Sony Records (currently Sony Music Records). There, he was assigned to an international relations department, where he was involved in importing record materials and coordinating artist promotions. He became a radio personality when J-WAVE 81.3FM was launched in 1988. Since then, he has been involved in a wide range of activities, including hosting sports, news, and variety shows, appearing in commercials and magazines, and performing on stage. Currently a DJ at J-WAVE - JK RADIO - TOKYO UNITED.

#### Quizzing coworkers in between broadcasts

"Let's have fun! Let's enjoy ourselves all day long!" I always try to work with a positive mindset. It's completely different from waking up with a sigh and thinking, "Ugh, I have to go to work again." We have to work, so we might as well enjoy it. Also, things are so much better when I can share that enjoyment with my colleagues. We work as a team, so I want to create a studio atmosphere where everyone can have fun.

I think it's especially important to create an environment where everyone can express their opinions freely, regardless of age or career status. If people are afraid of expressing an opinion because they think that someone will get mad at them, then you can't call it a successful workplace atmosphere. So, I frequently make small talk with people and try to get them involved. I ask them questions like, "How's it going recently?" or "What do you think about changing up the plan a little?" Or I try throwing out conversation starters. I often use facts that I discover while preparing for shows. For example, when I was emceeding for the Academy Award ceremony, I suddenly said, "Trivia time! What's the diameter of the Oscar presented to award winners?" to my fellow performers during a break. People appreciate these small surprises, and it helps to create a relaxed atmosphere. I think that doing this sort of thing can contribute to creating an environment where everyone can work comfortably. You should ask my colleagues if my attempts are successful, though (laughs).

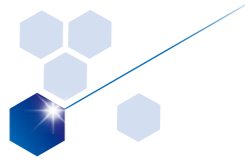
#### Radio is always with "you"

More than 30 years have passed since I got into the radio business. Most radio broadcasts are done live, so there's a real sense of being in the moment. Plus, you can find radio stations all over the country, making it possible to enjoy regional characteristics. One of the things that I like about radio is that they talk to "you," the listener, directly. You can find a voice just by tuning to a certain frequency. Access is easy. These days, you can listen to the radio on a smartphone or by using an Internet radio app, making it even more convenient. You can also listen to it while doing something else. As a radio broadcaster, I feel like I'm with each and every listener. There are people who don't listen to the radio, but I think everyone needs a radio personality who can deliver words that go straight to their heart. Try tuning into different time slots and programs and discover the greatness of radio.

The Denka BUSINESS OUT-LOOK segment on J-WAVE started in 2015 when Denka changed its company name. I served as a host during that milestone, so I feel like I have a connection with your company. Denka delivers electronic materials and healthcare products not only in Japan but all over the world. As an ambassador for Japan, I hope that you'll tell people overseas about the attractive features of our country. I also hope that the people at Denka will seek out fun and enjoy every day.







## A Specialist's Perspective

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

### Towards a Sustainable Workplace and Products

Toyokalon®, the world's first polyvinyl chloride fiber to be successfully industrialized in 1952, is used as a raw material for fashion wigs and is highly regarded worldwide for its natural texture and soft feel. Mr. Oonuki has been involved with this product since he joined Denka. When the production line was launched in Singapore in 2013, he was in charge of training the local employees. "I'd walk around with an electronic dictionary and communicate using gestures," he explains. "If you're enthusiastic, people will respond to your enthusiasm." Currently, he is focusing on creating a safe and secure work environment for on-site workers. For example, he has recently implemented measures to prevent heat and noise-related problems. He is also working on production process reforms, including automation to avoid over-dependency on individual employees and reduce labor requirements. "Using Toyokalon®, I would like to bring happiness to people all over the world. To that end, I am implementing reforms to create a sustainable workplace and passing down the skills to a new generation."

**Masao Oonuki**  
Foreman, Toyokalon Section,  
Production Department No. 2, Ofuna Plant

Involved with Toyokalon® production since joining Denka in 2003. He assumed the position of foreman in 2020 and is currently working on enhancing productivity and product quality.



# DENKA TOPICS

Introducing Denka Group news topics from July to August 2022.

Jul.

Denka participates as a partner in WIPO GREEN, a global platform for environmental technologies

Proud partner of  
**WIPO GREEN**

Denka, which positions environmental management at the core of its management, has joined WIPO GREEN, a global platform for environmental technologies operated by the World Intellectual Property Organization (WIPO), as a partner. Through exchanges with other partners interested in our environmental products and technologies, Denka will create innovation and contribute to the decarbonization of society.

Aug.

Financial results briefing held for first quarter of FY2022  
Operating profit of 4.9 billion yen, down 2.8 billion yen year-on-year

A financial results briefing for the first quarter of FY2022 was held in the form of a telephone conference. Eighty participants, including institutional investors, analysts, and financial institutions attended. Sales increased 7.6 billion yen year-on-year, while operating profit declined 2.8 billion yen year-on-year. Although the segment breakdown was revised, the overall performance forecast was left unchanged at 18 billion yen in operating profit for the first half and 43 billion yen for the full year.



Aug.

Denka Integrated Report 2022 published

Denka has published an integrated report to provide comprehensive corporate information to all stakeholders, with a focus on medium- to long-term value creation from the perspective of ESG management. In addition to a review of the Denka Value-Up management plan, which is now in its final year, the report introduces the preparatory work for the next eight-year management plan starting in FY2023 that seeks to further strengthen ESG management as well as a project by young employees to formulate the vision that will serve as the cornerstone of the plan.



Aug.

Ceremony held to mark the completion of Shin-Himekawa No. 6 Power Plant, Denka's 17th private hydroelectric power plant

A ceremony was held to mark the completion of the Shin-Himekawa No. 6 Power Plant, a new hydroelectric power plant built in the Kotaki district of Itoigawa City by Kurobegawa Electric Power Company, a joint venture between Denka and Hokuriku Electric Power Company. The completion ceremony was attended by more than 40 people, including President Imai, Hokuriku Electric Power Company President Matsuda, Kurobegawa Electric Power Company President Hirai, Itoigawa Mayor Yoneda, and local officials, who celebrated the completion of the power plant with a Shinto ceremony.



Aug.

Commercialization verification of wearable sweat patch sensor launched

Denka concluded a partnership agreement with Epicore Biosystems, Inc., a U.S. biotechnology company. Epicore Biosystems is developing a wearable sweat patch sensor and is planning to begin marketing it in earnest. Marketing and R&D will be carried out in Japan to begin with, and the knowledge gained in the Japanese market will later be used to expand into other Asian markets. Epicore Biosystems will also consider expanding into the healthcare field, including heat stroke and dehydration prediction and testing for disease prevention.



Consortium kicks off project to develop technology for producing concrete and cement using CO<sub>2</sub>

A consortium managed by Denka, Kajima Corporation, and Takenaka Corporation has been making preparations to carry out a proposal that was submitted to the New Energy and Industrial Technology Development Organization (NEDO) for its Green Innovation Fund Project: Development of Technology for Producing Concrete and Cement Using CO<sub>2</sub> and accepted. On June 14, the consortium, which consists of 44 private companies, 10 universities, and 1 research institute, gathered for a kick-off meeting to officially launch the project.



# With You, With Denka. With Society.



Aiming for “coexistence and co-prosperity” with local societies in Singapore

## Supporting Albirex Niigata Singapore, the only overseas Japanese professional sports team

Community contribution is part of the Denka Group Social Contribution Policies. It states: “Paying respect to diverse cultures and customs in countries around the world, the Group will take a community-rooted approach in its efforts to promote the sound development of local societies in which it operates.”

In 2022, Denka Chemicals Holdings Asia Pacific (DCHA), one of Denka’s consolidated subsidiaries, became a main partner of Albirex Niigata Singapore. This club team is an offshoot of Albirex Niigata in Japan that joined the Singapore professional league, S. League (currently Singapore Premier League) in 2004. It won a cup tournament for the first time in 2011 and became league champions in 2016. A women’s team was established in 2022.

DCHA has been a CSR Partner of Albirex Niigata Singapore since 2015 and has supported various activities such as football and dance lessons at elementary schools and events at nursing homes for the elderly. As a main partner, DCHA will continue to contribute to local society’s development through cultural sports activities in Singapore, where it has operated for more than 40 years.

In this installment, we interviewed Mr. Shujiro Namba, CEO of Albirex Niigata Singapore, about local contribution activities in Singapore and his expectations for Denka.



Ceremony to celebrate DCHA’s inauguration as a main partner in May 2022. Before the kick-off, Michio Kawamura, Managing Director of DCHA, handed the match ball to the referee. There was also a uniform giving ceremony.



A football clinic by Albirex Niigata Singapore, the team that Denka is sponsoring.



A dance clinic by Albirex Niigata Singapore, the team that Denka is sponsoring.



### INTERVIEW

**Shujiro Namba**  
CEO,  
Albirex Niigata Singapore

### PROFILE

Joined F.C. Tokyo in the J-League in 2000. After working in club management, he went to the US in 2009. After completing a master’s degree in sports management, he worked for several local companies, including a sports marketing company. He joined Albirex Niigata Singapore in 2014 and assumed his current position in 2020.

## Gratitude and a desire to return the favor to Singapore

As Singapore is a city-state with a small population, it has a policy of inviting overseas teams to participate in its domestic professional soccer league to strengthen it. They approached the Japan Football Association with this idea, and Albirex Niigata joined in 2004. However, in the beginning, there were questions as to why we were competing in Singapore, and the personal goals of the players were unclear. Performances were poor, and the initially large number of spectators gradually declined.

Daisuke Korenaga, President at that time (currently Chairman), established a team slogan titled “The Reason: Why We Play Here” to clarify where we are doing in Singapore, both as a club and as individuals. From the perspective of Singaporeans, we are just foreigners. There’s no real reason to support us if we’re just kicking a ball around. So, we began independently approaching local communities and performing social contribution activities.

Currently, we are making donations to a sports center

in Yuhua, which is located close to our home stadium. We donate one dollar per number of spectators for home games. This idea benefits everyone because the amount of donations will increase if people in the community come out to support us. We also used the donations to establish a soccer academy. This is the first example of a soccer academy jointly opened by the government and a club in Singapore. Many local children enjoy taking part.

This year, Denka, who has been supporting us since 2015, has become a main partner. It goes without saying that we will do our best to give a good performance with the Denka logo on our uniform, but it also means that we will be focusing on community contribution activities now more than ever. We are very grateful for the opportunity to play in Singapore, and we would like to return the favor. There is nothing that pleases us more than contributing to local citizens through our activities, and it is our great pleasure to continuously engage in these activities with Denka.