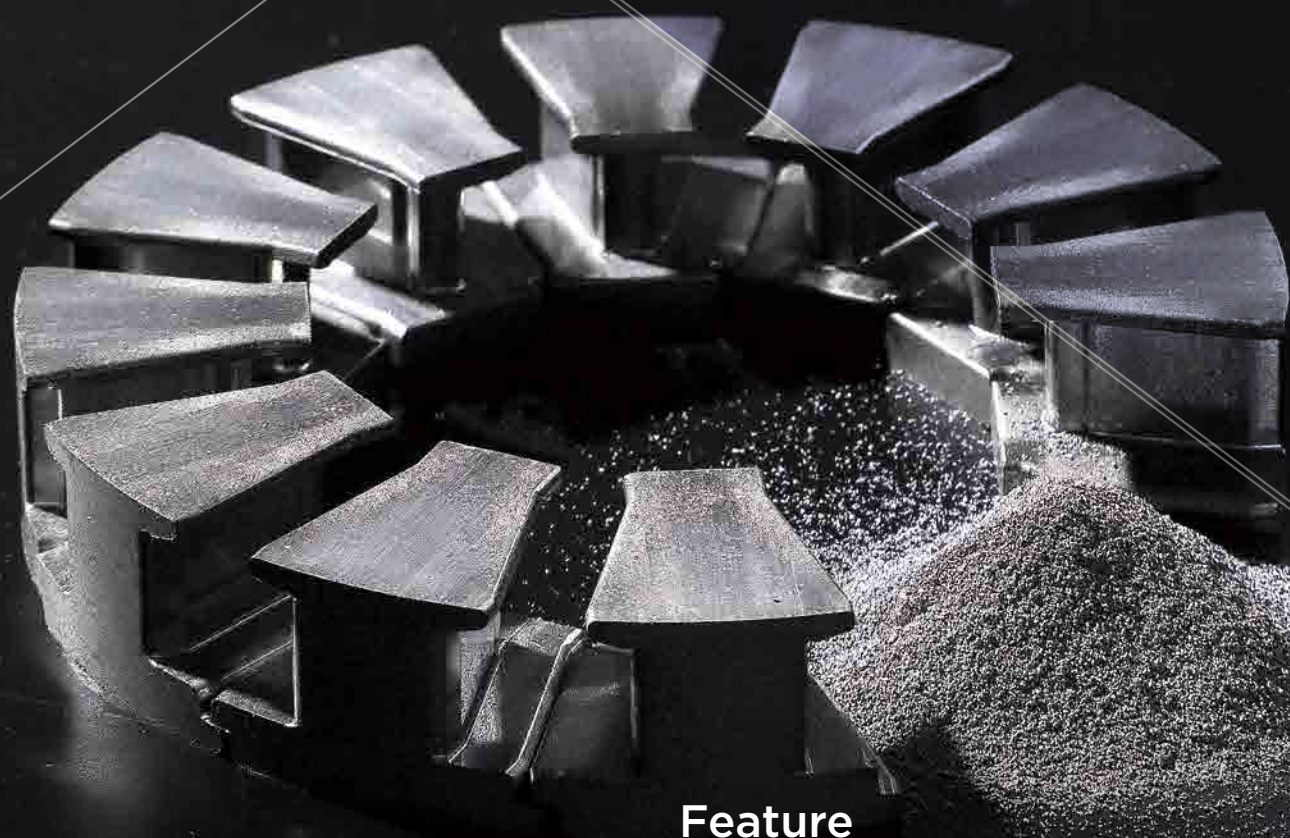


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Sumitomo Electric Group Magazine

vol. **26**

Innovative Development,  
Imagination for the Dream,  
Identity & Diversity



Feature

## The World of Soft Magnetic Composites Supporting a Sustainable Age





# Fundamental Support for Energy Efficiency and Electrification, Contributing to Carbon Neutrality

— The potential of soft magnetic composites in areas ranging from industrial machinery to home appliances and automobiles —

Measures against global warming are underway around the world, and achieving carbon neutrality is becoming a critical issue.

To balance the emission and absorption of greenhouse gases, energy efficiency and electrification are needed. Electronic products are equipped with electric actuator and power supplies, with electromagnetic conversion components using soft magnetic composites (magnetic material/magnetic cores) being positioned as particularly important components.

Unlike the previously mainstream radial flux motors, axial flux motors with soft magnetic composites are compact, lightweight, and capable of high output. The Sumitomo Electric Group, which has been paying close attention to this technology from an early stage, was a pioneer in the industry by bringing its soft magnetic composites for axial flux motors to market in 2020. This issue reports on how the potential and widespread use of this technology will support a sustainable society through the efforts of the Sumitomo Electric Group.



# Soft Magnetic Composites Enabling Flexible Shapes, Compact Design, and Weight Reduction

— Exceptional characteristics open up new markets —

## Sumitomo Electric's Sintered Metal Components Boasting Over Half a Century of History and the World's Second Largest Share

The sintered metal components handled by the Sintered Metal Components Division of the Sumitomo Electric Group are manufactured by placing powdered iron, copper, or other materials into a mold, compacting it with a pressure of approximately 3 to 10 t/cm<sup>2</sup>, and bonding the powder together at temperatures below the melting point (approximately 1,100 to 1,300°C) to form a solid product. Compared to forging and casting, this method has many advantages, including higher productivity, lower energy consumption, and the ability to form complex shapes. Currently, sintered metal components are primarily used in automotive components. The division's sintered metal components are used in engine oil pumps, variable valves, transmissions, and various components that make up automobiles.

The manufacture and sale of these sintered metal components began in 1948 at the Itami Works of Sumitomo Electric Industries, Ltd. Okayama Sumiden Seimitsu Ltd. was founded in 1972 with two manufacturing sites: the Head Office/Okayama Plant and the Itami Plant. Afterward, as Japanese automobile manufacturers expanded their overseas production, the company expanded its business by establishing production sites in the United States, Mexico, China, Thailand, Malaysia, Indonesia, and other countries. Currently, the company holds the top market share in sintered metal components in Japan and the second largest market share in the world.

## Soft Magnetic Composites Made by Insulating Each Individual Grain of Magnetic Powder

This issue focuses on soft magnetic composites, which are components formed by molding soft magnetic iron powder into a three-dimensional shape using a molding press. The company's

efforts in soft magnetic composites began in the early 2000s, as it focused on properties not present in conventional sintered metal components.

These soft magnetic composites use iron powder coated with an insulating film. This insulation coating is one of the key characteristics of these composites.

Conventional magnetic cores, made of laminated electrical steel sheets, can provide insulation only between the layers. In a soft magnetic composite, each particle of powder is coated with an insulating film, allowing the core to achieve both high electrical resistance and high magnetic force. This will enable units equipped with soft magnetic composites to achieve high power, smaller size, and reduced energy loss.

The first product to adopt soft magnetic composites with these outstanding characteristics was introduced to the market in 2003. Specifically, this product was the common rail fuel injection valve for clean diesel engines. Due to the soft magnetic composite, the product contributed to improved fuel efficiency.

## Sumitomo Electric's Five Strategies for Its Sintered Metal Components Business



In addition, the ignition performance of the gasoline engine's ignition coil was improved, resulting in enhanced fuel efficiency. Mass production of reactors began in 2012, and in 2020, the product expanded to include axial flux motors.

## Developing New Markets Under the Theme of "Drive"

The person in charge of steering the sintered metal components business, including soft magnetic composites, was Hideo Kobayashi, who was then in the Sintered Metal Components Division's Strategic Planning Department, which was newly formed in July 2023. Kobayashi became

General Manager of the department in October that year. The new department was formed due to major changes occurring in the automotive industry.

"More than 90% of our sintered products department's customers are in the automotive industry, which is facing a once-in-a-century period of great change with the emergence of the concept of 'Connected, Autonomous, Smart/Shared & Services, Electric' (CASE). This department was established to develop and implement future strategies and plans. In the sintered products department as a whole, about three-quarters of production is done overseas, so we need to optimize our manufacturing

sites, including supplementing production, from a global perspective. An even bigger challenge is the demand for automobiles in the near future. On the one hand, the popularity of EVs will grow; on the other hand, the demand for gasoline-powered vehicles will continue to decline. In this context, we are considering supplying sintered metal components, including soft magnetic composites, to markets other than the automotive industry. As a component necessary for drive, we intend to approach new markets, including new mobility (next-generation transportation means and services)." (Kobayashi)

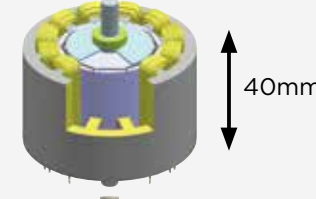
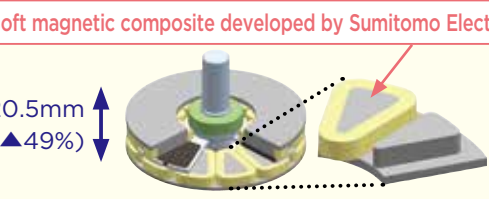

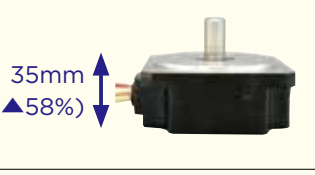
## Milestone: Use in Axial Flux Motors

Most of the moving components in a car are equipped with a motor. It is a device that uses magnets to convert electrical energy into motive energy. When an electric current flows, a magnetic field is generated, and the poles attract and repel each other, creating rotation. A magnetic field is generated by coiling copper wire. The magnetic field is made stronger by wrapping the wire around a magnetic core, which helps maximize efficiency and power output.

Until now, most motors have had a radial flux structure, and the material for the magnetic core has largely been electromagnetic steel sheets. In recent years, axial flux motors have been attracting attention as small, high-power motors in fields such as automobiles and industrial robots.

"Our company has developed and supplied products that use soft magnetic composites, such as fuel injection valves, ignition coils, and reactors. A major feature of these products is that the material itself is functional, which makes these products one of the pillars of our business. Furthermore, the adoption of soft magnetic composites in axial flux motors, a pioneering technology in the industry, marks a major milestone for soft magnetic composites, and the marketing of these composites will become extremely important in the future. What markets will we serve? This will lead to the creation of new business models. We need to find new demand and applications, not just in the automotive sector, and link them to sales by highlighting the advantages of soft magnetic composites. I believe we are at a critical juncture." (Kobayashi)

## Proprietary Soft Magnetic Composites Help Achieve a Thinner, Lighter Motor With the Same Performance as a Radial Flux Motor.

	Radial flux motor (conventional motor)	Axial flux motor
Shape/ Appearance	 40mm	 20.5mm (▲49%)
Weight	 83mm 1.7kg	 35mm (▲58%) 0.95kg (▲44%)



Hideo Kobayashi  
General Manager (at the time)  
Strategic Planning Department, Sintered Metal Components Division





Soft magnetic composite after heat treatment



Molding machine

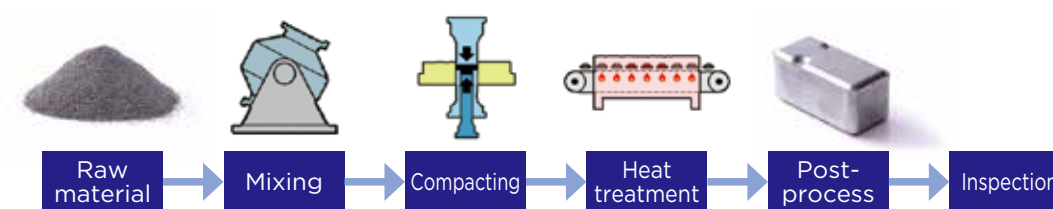


Compacting



Inspection

## ■ Soft Magnetic Composite Manufacturing Process



# Commitment of All Employees at Sumitomo Electric Focused on the Production of Proprietary Soft Magnetic Composites

## — Reactors designed to be compact, lightweight, and optimized for efficient production —

### Advanced Technology in the Manufacturing Process of Soft Magnetic Composites

Let's take a look at the manufacturing process of soft magnetic composites. First, additives are mixed into magnetic powder coated with an insulating layer, and the mixture is press-molded. After that, unlike sintering, which bonds the powder grains together, heat treatment is carried out at low temperatures of about 400 to 800°C to release the strain caused by molding. The low-temperature heat treatment saves energy, and the powder particles do not bond together, making the product highly recyclable. Compared to magnetic cores made of laminated electromagnetic steel sheets, the soft magnetic composites formed in this way have high magnetic flux density (a quantity that indicates the strength of magnetic force), freedom in terms of shape, and excellent high-frequency characteristics. They also contribute to reducing the environmental impact by enabling products to be more compact, lighter, and have higher output.

### Reactors that Boost and Smooth Voltage

In recent years, the electrification of vehicles has progressed rapidly due to environmental concerns and a desire to save energy. There is a need for the

entire system to be more efficient and more compact and lightweight in order to further improve fuel efficiency. Meanwhile, higher voltage is also required to achieve driving performance on par with that of gasoline-powered vehicles. One of the techniques for achieving this is to use a boost converter, the key component of which is the reactor. The device boosts and smooths the battery voltage to supply a stable voltage. By providing the optimal voltage boost according to the driving conditions, it plays a role in improving the performance of the motor and the efficiency of the entire power control unit. In response to this need, the Sumitomo Electric Group has brought



Reactor and soft magnetic composite (in the foreground)

to the market a reactor that uses soft magnetic composites.

### Maintaining Inductance at the Required Level

It was back in 2012 that the Sumitomo Electric Group began mass production of reactors using soft magnetic composites. Since then, there has always been demand for smaller and lighter devices. To meet this demand, the new focus it tackled was on improving inductance, a measure of performance. It is an indicator of magnetic energy storage; the higher this value, the more energy can be stored. However, depending on the driving conditions, inductance may decrease. To achieve a smaller reactor while maintaining inductance within the required range under various driving conditions, it was necessary to increase the saturation magnetic flux density of the soft magnetic composite.

The saturation magnetic flux density is the maximum magnetic force that a magnetic material can handle; the higher the saturation magnetic flux density, the more compact the magnetic core can be made.

To achieve this, pure iron powder, which has a high saturation magnetic flux density, was used, and a three-dimensional shape utilizing the characteristics of the soft magnetic composite made it possible to further

reduce the size. In addition, improvements in heat dissipation and a lighter plastic case have achieved a 10% reduction in size and weight compared to previous models.

This research and development initiative is being carried out through the collaborative efforts of the Sumitomo Electric Group. Sumitomo Electric's Automotive Business Unit is responsible for customer negotiations. Design and development efforts by AutoNetworks Technologies, Ltd. respond to these customer needs. The reactor windings (copper wire) are made by Sumitomo Electric Wintec, Inc.; the soft magnetic composites are produced by Sumitomo Electric Sintered Alloy, Ltd.; and the assembly is undertaken by Sumitomo Wiring Systems, Ltd. The manufacturing base for these soft magnetic composites is located at the Itami Plant of Sumitomo Electric Sintered Alloy, Ltd.

Reiko Okuno, currently the Assistant Manager of the Development Group in the Itami Manufacturing Department, has worked in product design for sintered metal components and plant production technology before taking on a role in the development and production of soft magnetic composites.

"I joined in 2018 when the second phase of mass production of reactors began. I have been involved with sintered metal components since joining the company, and in 2018 I was put in charge of magnetic materials for the first time and learned about them from scratch.

Soft magnetic composites are made by pressing iron powder with an

insulating coating into a mold. However, friction when removing the core from the mold could damage the insulating layer, causing electrical conduction between adjacent iron powder particles and increasing iron loss.\*

The excellent performance of the soft magnetic composite is achieved by insulating each individual grain of iron powder. Therefore, we began looking into how to prevent damaging to the insulating layer during the press molding process." (Okuno)

### Application of the Revolutionary Manufacturing Technique Core Float

In the first phase of reactors, to prevent iron loss caused by damage to the insulation layer, laser processing was used to generate iron oxide, which blocked the flow of electricity. However, this process resulted in a significant increase in costs due to the additional process steps.

So for the second phase of reactors, the engineers came up with a revolutionary solution: using a floating mold to prevent damage to the insulation layer during removal. This improved the productivity and a patent was obtained. The performance expected of a reactor changes with the times, but the technology is not one that matures. What Okuno is currently focusing on is materials.

"How are customers using reactors? By accurately grasping this and realizing the performance that customers require, we aim to develop the materials themselves, including the composition of magnetic powder and insulation methods. By conducting

magnetic analysis in parallel with our customers, we believe this will enable us to provide something extra with our solutions." (Okuno)

### Thorough Adherence to Quality Standards

Masanori Kubo, who was the General Manager of the Itami Manufacturing Department at that time, has been involved in the production of sintered metal components for many years. He has also been involved with soft magnetic composites from the beginning.

"As a plant operator, I always strive to meet quality standards. These are the conditions necessary to achieve the right results in the workplace, such as producing products of guaranteed quality.

In the production of soft magnetic composites, we consider both cost and productivity, such as the quality of raw materials, the movement and pressure of the mold, shape, dimensions, and surface finish, while strictly adhering to quality standards, which leads to providing the products that customers want. I expect that demand for reactors will rise as automobiles become more electrified. To that end, I see it as my responsibility to establish a stable mass production system." (Kubo)

It can be said that the reactor, which the Sumitomo Electric Group is collaboratively working on, has established a significant presence in the world of soft magnetic composites. The insights gained through this development and production process will contribute to the development of soft magnetic composites used in axial flux motors.



Reiko Okuno  
Assistant Manager  
Development Group, Itami Manufacturing  
Department, Sumitomo Electric Sintered Alloy, Ltd.

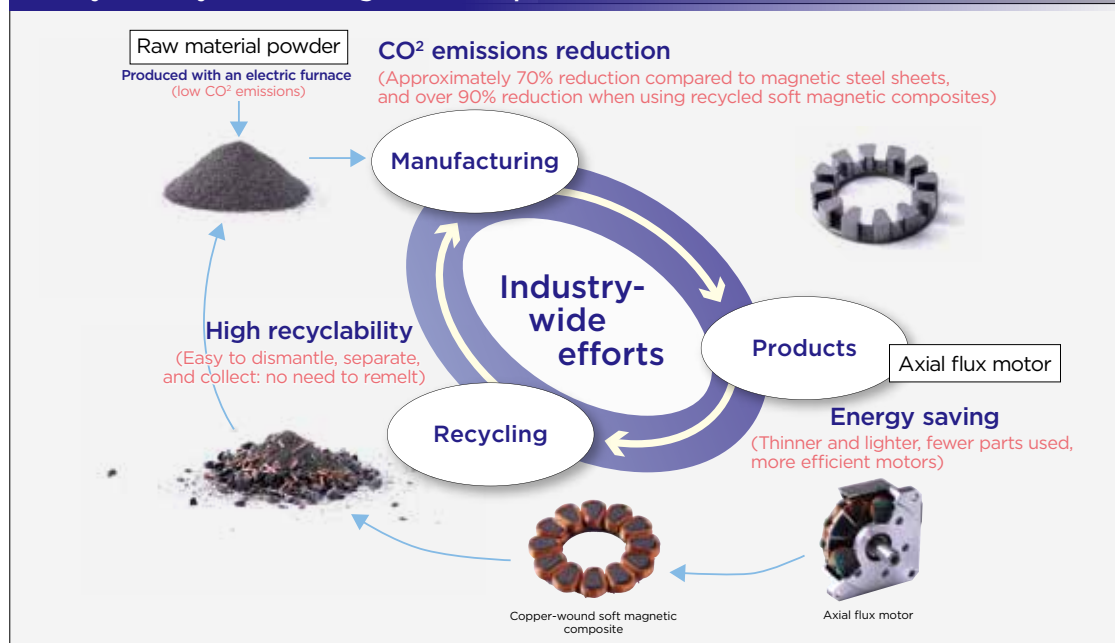


Masanori Kubo  
General Manager (at the time)  
Itami Manufacturing Department, Sumitomo Electric  
Sintered Alloy, Ltd.

\* Iron loss: The loss of power as heat in the iron core of devices such as transformers and electric motors.



## Recyclability of Soft Magnetic Composites



Enthusiastic development meeting

## High Performance and Lightweight Disk Structure

Since around 2005, the Sumitomo Electric Group has been conducting research and development of soft magnetic composites for axial flux motors. Tomoyuki Ueno has continued to be involved in the research and development since that time. He has been involved with soft magnetic composites since his days at the Advanced Materials Laboratory. In 2023, he took up the post of General Manager of the Electric Module Development Department at Sumitomo Electric Sintered Alloy, Ltd., which was newly established with the aim of expanding the use of soft magnetic composites in axial flux motors.

"In 2005, when motors were installed in hybrid vehicles, we started to look into the possibilities for axial flux motors. The soft magnetic composites available at the time had poor insulation performance, heat resistance, and strength, and did not meet the required performance. Then, around 2014, against the backdrop of environmental concerns, including improving fuel efficiency and combating global warming, the market once again demanded smaller, lighter motors.

We believed that soft magnetic composites would have an advantage over magnetic steel sheets in terms of

compactness and light weight, so we restarted our research and development. We repeatedly constructed prototypes and accumulated knowledge.

The motor market is huge, providing significant business opportunities, and we believe that the widespread use of axial flux motors equipped with soft magnetic composites, which are highly energy-efficient, will contribute to a sustainable society, which is why we have accelerated our research and development." (Ueno)

The soft magnetic composite developed by Ueno and his team changed the basic structure of the motor from cylindrical to disk form, achieving a lighter and thinner design. Compared to conventional radial flux motors, it has achieved a reduction in weight and thickness while maintaining performance equivalent to that of conventional radial flux motors in terms of torque and maximum efficiency.

## Significantly Reducing CO² Emissions and Recyclable

The soft magnetic composites were

first used in axial flux motors for industrial machinery in 2020. Tatsuya Saito, who works in the same Electric Module Development Department as Ueno, has been involved with the soft magnetic composites since joining the company and has proactively approached customers to encourage them to adopt soft magnetic composites for axial flux motors.

"I accompanied the sales representative and highlighted the advantages of soft magnetic composites to a customer. The magnetic core determines the performance of a motor. The soft magnetic composite has properties not found in electromagnetic



Tomoyuki Ueno  
General Manager  
Electric Module Development Department, Sumitomo Electric Sintered Alloy, Ltd.

steel sheets, such as being compact, enabling high torque, low energy loss, and the ability to form three-dimensional shapes. I stressed these properties to the customer.

We then created further prototypes and made repeated design changes to meet the customer's needs. Furthermore, soft magnetic composites also have advantages from a sustainability perspective. Because the raw material is a powder, it can be crushed and recycled.

Furthermore, CO² emissions can be reduced by approximately 70% when using new powder for soft magnetic composites compared to magnetic



Tatsuya Saito  
Assistant Manager  
Electric Module Development Department, Sumitomo Electric Sintered Alloy, Ltd.

steel sheets, and by more than 90% when using recycled soft magnetic composites. The customer recognized the value of these diverse properties and decided to adopt the product. I felt that we had taken a solid step forward." (Saito)

It was Masaaki Eida who considered manufacturing and mass-producing soft magnetic composites for customers. He has been involved with soft magnetic composites since the startup.

"The timeframe for starting mass production was tight, making close collaboration crucial. Based on preliminary shape proposals from the



Masaaki Eida  
Assistant Manager  
Electric Module Development Department & Development Group, Itami Manufacturing Department, Sumitomo Electric Sintered Alloy, Ltd.

# Opening Up a New World of Soft Magnetic Composites

— Development of soft magnetic composites for axial flux motors —

Axial flux motor and soft magnetic composite  
(in the foreground)



Research scene of soft magnetic composites

research department, we studied the costs and quality that would be viable for mass production, designed molds, and created prototypes. We cycled through this process quickly.

We particularly focused on improving the molding accuracy. Through repeated discussions within our team, we succeeded in achieving high precision by ensuring uniform filling of the magnetic powder in the molding process using a molding press. Not only did we respond to the customer's request, but we also proposed our own pioneering technology and brought it to mass production. This achievement brought us great joy." (Eida)

## Demand for High Motor Efficiency and Energy Saving

Motors have long been recognized as a challenge due to their energy consumption, which is said to account for nearly half of the world's electricity consumption. By improving the efficiency and energy-saving features of motors, this reduction in power consumption leads to a decrease in CO² emissions, contributing to the mitigation of global warming.

"We believe that soft magnetic composites, which help achieve a small size, light weight, and high output, offer a major advantage in creating more efficient motors. Furthermore, going forward, we will need to provide added value. Establishing recycling technology is one aspect of this. In addition to simply supplying magnetic cores, we also want to gain a deep understanding of the motors themselves, so that we can identify issues before our customers do and enhance our proposals for axial flux motors. We are committed to remaining at the forefront and providing new value to the world." (Ueno)



# Soft Magnetic Composite Products Create a Sustainable Future

— Taking on the challenge of creating a market for axial flux motors —

## A Specialized Sales Group Aiming to Drive Increased Adoption

As the development of soft magnetic composites intended for incorporation into axial flux motors progressed, a specialized group was formed. This group was established as the New Business Sales Group. Daichi Azuma, who has long been involved in materials research and development, has taken on a role in charge of soft magnetic composites. The reason for his transfer to the sales department was that in-depth knowledge was essential to encourage the use of soft magnetic composites.

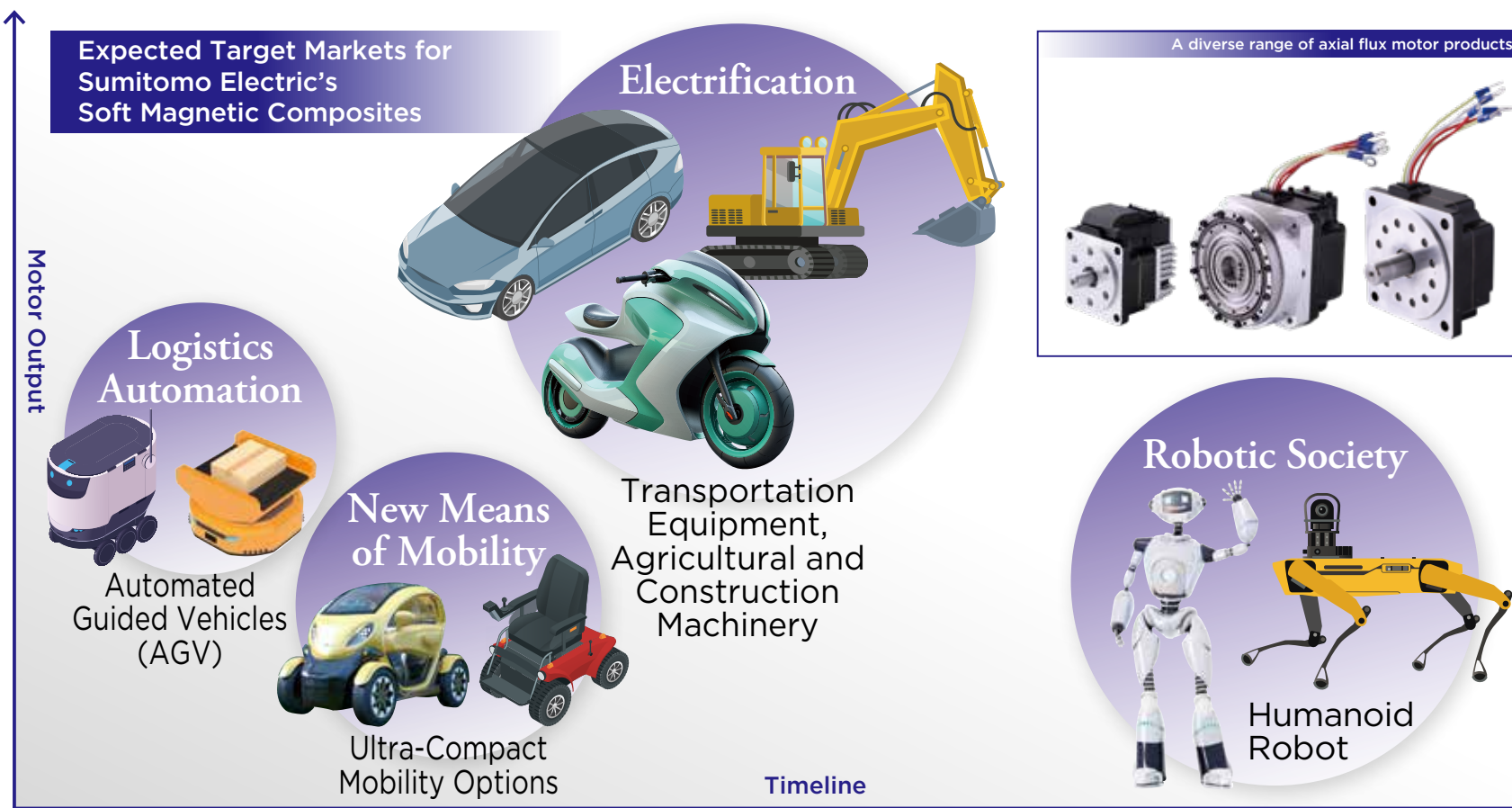
"This position is best described as technology development sales. I serve as a liaison between the research department and our customers and am currently working to enhance the recognition of soft magnetic composites. Soft magnetic composites have potential for adoption in various industries where motors are used and where there is a need to reduce size and weight, such as in home appliances, industrial machinery, and automobiles.

We are promoting activities to generate interest and highlight the advantages of soft magnetic composites, including product promotions at exhibitions, and on our website, and through our internal network. Most of our customers are engineers in the design and development departments. We listen to each customer's needs, present them to the development department, and then proceed with creating prototypes and making proposals." (Azuma)

In the course of these activities, we learned that Daikin Industries, Ltd. (hereinafter referred to as Daikin), a global leader in air conditioning manufacturer, was preparing to develop an axial flux motor. As Azuma continued to communicate with Daikin's designers, he sensed a positive response to the adoption of soft magnetic composites. The person who took over the helm from Azuma was Midori Nakae.

## Axial Flux Motors Installed in Home Air Purifiers

"The entire sintering department came together, determined to ensure that the product would be adopted. We were already doing business with Daikin for sintered products, including bearings, and had contact with their procurement department. However, as this was a new initiative, we asked a



member of the design department to join us in the meetings. We also organized a technical exchange session for the engineers from Daikin, which included discussion on soft magnetic composites. Daikin was proactive about developing the axial flux motor, and I believe the engineers were able to understand each other and reach an agreement quite smoothly." (Nakae)

Unlike the automotive industry, where the adoption of soft magnetic composites can take more than a couple of years, an extremely tight schedule of just one year from development to mass production was required. To achieve this, close cooperation between the manufacturing and development departments was necessary. There was also a possibility that electromagnetic steel sheets, used in previous models, would be adopted. Nakae emphasized

the superiority of soft magnetic composites, namely their freedom in terms of shape. A further challenge arose, which was the need for a soft magnetic composite with a flange shape on both end faces, a feature patented by Sumitomo Electric Industries. This soft magnetic composite would make it possible to make the device thinner while maintaining its performance. However, since it had no track record of mass production, research into how to make it a reality was conducted at a rapid pace. In this way, the company was able to quickly receive an order in January 2023 and start mass production in May of the same year. Nakae said she felt a great sense of relief.

Mr. Yoshinori Takayama, a Daikin representative, said the following: "When we started developing the axial flux motor, we intended to

incorporate new technological elements. During this process, we came across Sumitomo Electric's soft magnetic composites, which offer high design flexibility and are well-suited for small-scale production.

One of the key features is the incorporation of a flange shape on both ends. This allows us to shorten the average winding circumference while maintaining the area facing the magnet, thereby achieving a thinner motor and improved efficiency.

We hope that Sumitomo Electric will continue to propose one-of-a-kind products in the future. Additionally, to further expand the use of soft magnetic composites for motors, we would like to see them challenge themselves in developing both cost-effective materials and manufacturing processes." (Mr. Takayama)



Product line of soft magnetic composites products

## Soft Magnetic Composites Catering to Robust Demand for Motors

The mass production of soft magnetic composites for axial flux motors represents a pioneering effort not only domestically but also internationally.

"At our company, the history of soft magnetic composites spans a quarter century, during which time they have consistently evolved in terms of efficiency and energy conservation. My mission is to promote the transition from magnetic steel sheets to soft magnetic composites in the design and development of motors. Axial flux motors are ideally suited to leverage the properties of soft magnetic composites, and they represent a very large market. Our goal is to identify the challenges that hinder our customers' design and development processes, and create new markets for soft magnetic composites." (Azuma)

The sales department of the Sintered Metal Components Division is led by General Manager Hiroyuki Shibai. Shibai is responsible for overseeing the sales of all sintered metal components manufactured by the Sumitomo Electric Group, and has great expectations for soft magnetic composites.

"Initially, the markets we will approach will include industries such as industrial equipment, home appliances, and automobiles. In particular, as the electrification of automobiles is accelerating, we believe there is significant demand for compact and lightweight axial flux motors.

Furthermore, humanoid robots are gaining popularity. Humanoid robots equipped with advanced technologies like generative AI are now being developed one after another in Japan and overseas. The era when robots will take over various kinds of labor is not far off. Movements such as walking, as well as motions of the arms, elbows, fingers,

feet, etc. are all controlled by motors, and ultra-small motors are required for the joints of the fingers. I believe soft magnetic composites we have been pioneering will demonstrate their potential, creating a great business opportunity." (Shibai)

Sumitomo Electric's soft magnetic composites, which have a history of a quarter century, have entered a new phase. The widespread use of soft magnetic composites will surely change the world of motor development. The time is not too far off when compact, lightweight, high-output, and recyclable energy-saving technologies will play a part in supporting a sustainable society.

## Awarded the Grand Prix at the 46th JPMA Awards in 2024

Sumitomo Electric won the 46th Japan Powder Metallurgy Association (JPMA) Grand Prix in 2024 for its development of integrated double-flange soft magnetic composites that contribute to improving the performance of axial flux motors.

In this development, the soft magnetic composite was designed with overhanging flanges on both the top and bottom sides of the section where the copper wire is wound. The integrated double-flange soft magnetic composite was found to demonstrate high dimensional precision along its entire length and to have superior quality compared to magnetic steel cores.



Left: President Shuzo Sonoda, Japan Powder Metallurgy Industry Association (Chairman of Fukuda Metal Foil & Powder Co., Ltd.) Right: Yuki Hirao, Electric Module Development Department, and Development Group, Itami Manufacturing Division, Sumitomo Electric Sintered Alloy, Ltd.



Integrated double-flange soft magnetic composite



Daichi Azuma  
Senior Assistant General Manager  
New Business Sales Group, Sales Department,  
Sintered Metal Components Division



Midori Nakae  
Osaka Sales Group, Sales Department, Sintered Metal  
Components Division



Mr. Yoshinori Takayama  
Daikin Industries, Ltd.



Hiroyuki Shibai  
General Manager  
Sales Department, Sintered Metal Components Division





# Experience the Sumitomo Pavilion at Expo 2025 Osaka, Kansai, Japan

Osaka-Kansai Expo Official Character: MYAKU-MYAKU © Expo 2025

Opening  
on April 13



Provided by the Japan Association for the 2025 World Exposition

Expo 2025 Official Website



Period: April 13 to October 13, 2025

Venue: Yumeshima, Osaka

Event hours: 9:00 am to 10:00 pm

Theme: Designing Future Society for Our Lives

The World Expo 2025 in Osaka, Kansai, Japan has “life” as its central theme and provides an opportunity for the world to come together in one place.

By enabling the exchange of diverse values from around the world, promoting new connections and creativity, overcoming global crises, protecting each and every life, and reexamining the nature of life and how we live, the Expo aims to show the world hope for the future.



## Domestic Pavilions (hosted by central government, local governments, etc.)

The Japanese government and local governments are exhibiting at the Japan Pavilion, Women's Pavilion, Osaka Healthcare Pavilion, and Kansai Pavilion. The Kansai Pavilion features an exterior design based on a lantern theme, and is adorned with paper cutout images symbolizing various parts of the Kansai region.

## Official Participants' Pavilions

Overseas pavilions are places where you can experience the unique characteristics of countries around the world through exhibits that represent future societies, technologies, and cultures. In particular, the sculpture Farnese Atlas in the Italy Pavilion is on display in Japan for the first time!

## Pavilions for Private Sectors

There are 13 pavilions for private sectors, including the Sumitomo Pavilion, which are full of the originality that can only be achieved by private exhibitors. Through each experience, we hope you will sense the exciting future ahead and become more aware of social issues.



## Experience the Sumitomo Pavilion: Toward a Future from the Forest



© Sumitomo EXPO2025 Promotion Committee

Sumitomo Pavilion Official Website



Sumitomo Pavilion Map



## UNKNOWN FOREST Stories Waiting to Be Discovered

A forest that embraces a wide variety of life. It is a place that is home to vibrant life bursting with uniqueness and the joy of celebrating diversity. We hope to speak through this experience in the UNKNOWN FOREST about the values and the teachings that could only be told by a forest.



© Sumitomo EXPO2025 Promotion Committee

## Experience the Plant-a-Tree Event

The foundation of the Sumitomo Group's development is the Besshi Forest in Shikoku, which Sumitomo has carefully nurtured. After cutting down trees for construction, new seedlings will be planted in the cleared site, creating a forest that will continue into the future. A tree-planting event will be held within the Sumitomo Pavilion for children, who will lead the next generation, and everyone else, to take part in.

For more details, scan the QR code.



© Sumitomo EXPO2025 Promotion Committee © Lito

## Large-scale Innovative Collaboration Project Seeds for the Future

We are implementing a major interactive project, Seeds for the Future, in which anyone can participate. This project is an interactive project centered around a web platform that enables anyone to generate ideas for the future—which are seeds for the future—based on a database of over 700 cutting-edge technologies and initiatives from the Sumitomo Group companies. Our company, Sumitomo Electric, is also participating in this project.

For more details, scan the QR code.



For more details, scan the QR code.

## Virtual Sumitomo Pavilion

We have opened the Virtual Sumitomo Pavilion in Virtual Expo, Yumeshima Islands in the Sky, a virtual site that is a part of the Expo 2025 Osaka, Kansai, Japan. The Virtual Sumitomo Pavilion is a digital space where visitors can experience the Sumitomo Group's approximately 400-year history and its ambitions for the future.





# New Redox Flow Batteries

— Improved output and energy density for low cost and space savings —

The new redox flow battery (hereinafter referred to as the “RF battery”) has achieved significant improvements in output and energy density due to refined components, while also achieving cost reduction and space savings. By using long-life materials, it is possible for the system to operate for up to 30 years.

We plan to start accepting orders in fiscal year 2025. As a storage battery suitable for grid-scale energy storage and auctions for long-term decarbonization power sources, we will continue to leverage the RF battery’s features such as safety, flame retardancy, and environmental friendliness, to contribute to a wide range of applications, such as microgrids and backup power sources for public facilities in preparation for emergencies.



[Website on RF batteries](#)

[id vol. 19 feature article: Supporting Renewable Energy — The Mission of RF Batteries](#)

[Please view our press releases for more details.](#)

# Sumitomo Electric Wins Record-Breaking Water Treatment Membrane Order for Indonesian Sewage Plant

The Republic of Indonesia has the world’s fourth-largest population (approximately 270 million people), and while the economy continues to grow, the capital’s Jakarta Special Region, with a population of over 10 million, has

a low sewage system coverage rate, which is causing serious water quality problems. To address the problems, the Jakarta Sewage Management Master Plan has been formulated, dividing the sewage treatment districts into 15 zones and promotes the development of sewage systems in stages.

In particular, in the first construction zone, which has a high population density and many commercial facilities, a sewage treatment plant is required, capable of treating a water volume of 240,000m<sup>3</sup>/day (planned population: 1.24 million) under severe site constraints. For this

reason, the Membrane Bioreactor (MBR)\* was selected as the sewage treatment process because it saves space and achieves high treatment performance. We have received an order for PTFE POREFLON™ hollow fiber membrane modules as equipment for MBR.

\* Membrane Bioreactor (MBR)  
One of the “activated sludge methods” that are effective in purifying sewage and industrial wastewater. This method uses a filtration membrane to separate the treated water, in which microorganisms (activated sludge) have decomposed the organic matter contained in the wastewater, from the fine particles present in the wastewater and the microorganisms themselves.



Rendering of completed sewage treatment plant (provided by JFE Engineering Corporation)

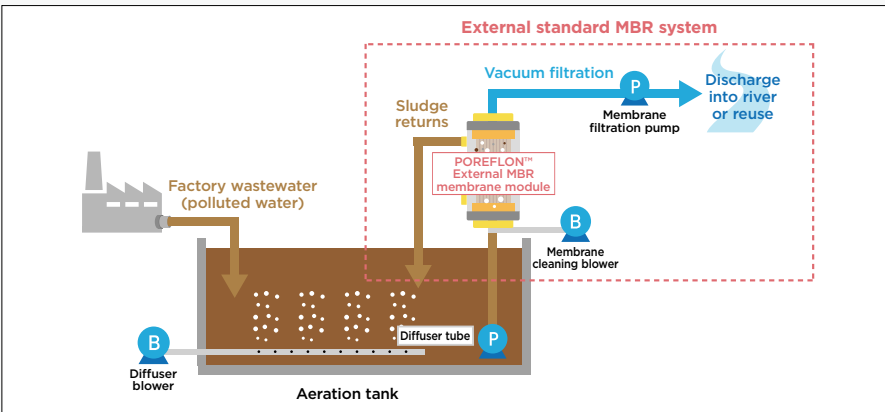
[Please view our press releases for more details.](#)

# Sumitomo Electric Develops and Receives Initial Order for an External Water Treatment Membrane System with Short Installation Time

— Contributing to increasing wastewater treatment capacity at Mizkan Holdings Co., Ltd.'s Minokamo Factory —

Sumitomo Electric’s POREFLON™ External MBR System is a new product for small to medium-scale use. It is based on the MBR process and can be used as an external attachment to the aeration tank of a wastewater treatment facility. In the past, we used our proprietary POREFLON™ microfiltration membrane module to provide customized MBR systems tailored to customer needs for large-scale wastewater treatment. In contrast, this new product is a standardized packaged system that can be delivered in a shorter time and at a lower cost than customized equipment.

We received the order in December 2024, with operations scheduled to begin in the first half of 2025 at Mizkan’s Minokamo Factory.



[Website on water treatment membrane POREFLON™ module](#)

[id vol. 4 feature article: The Future of a “Water Planet” Created with Water Processing Technology](#)

# Six Track and Field Athletes Join Sumitomo Electric

The Sumitomo Electric Group aims to contribute to the development of sports and local communities through its initiatives to support sports. In particular, the track and field team is intensifying its efforts with the goal of “producing athletes who can compete on the world stage.”

This year, six track and field athletes (Yota Ifuku, Yuto Kajitani, Haruki Sato, Kosei Shiraishi, Akimu Nomura, and Kota Yamasaki) joined our company. The six athletes have achieved outstanding

results in numerous competitions during their time as students and are expected to excel in the future. Our track and field team’s strength will be enhanced by welcoming new athletes. The team will focus on developing athletes who will take on the challenge of competing on the world stage.

We hope that you will continue to watch over the future growth and achievements of each athlete, as well as to support our track and field team.

## Profiles of new athletes



Yota Ifuku

[Personal Bests]  
10000m: 28:55.78  
Marathon: 2:09.26

[Major Results]  
2024 Nobeoka Nishinippon Marathon: Championship (new record in the meet)  
2024 Kanto Intercollegiate Half-Marathon: 5th place  
2024 All-Japan University Ekiden: 10th place in Leg 6  
2025 Hakone Ekiden: 11th place in Leg 8



Yuto Kajitani

[Personal Bests]  
5000m: 13:45.56  
10000m: 28:27.77

[Major Results]  
2024 Hakone Ekiden: 9th place in Leg 6  
2024 All-Japan University Ekiden: 17th place in Leg 3



Haruki Sato

[Personal Bests]  
5000m: 13:41.55  
10000m: 28:13.02

[Major Results]  
2024 World University Cross Country Championships: Japanese representative  
2024 All-Japan University Ekiden: 4th place in Leg 3  
2025 Hakone Ekiden: 15th place in Leg 3

# id TOPICS

Topics from the future-shaping Sumitomo Electric Group



Kosei Shiraishi

[Personal Bests]  
5000m: 13:44.25  
10000m: 28:21.57  
Marathon: 2:08:42

[Major Results]  
2024 All-Japan University Ekiden: 2nd place in Leg 6  
2024 Hakone Ekiden: 9th place in Leg 7



Akimu Nomura

[Personal Bests]  
5000m: 13:33.88  
10000m: 29:39.23

[Major Results]  
2024 Izumo Ekiden: 6th place in Leg 2  
2024 All-Japan University Ekiden: 4th place in Leg 1  
2025 Hakone Ekiden: Winner of Leg 6 and MVP



Kota Yamasaki

[Personal Bests]  
5000m: 14:11.97  
10000m: 28:54.55

[Major Results]  
2023 All-Japan University Ekiden: 18th place in Leg 2  
2024 All-Japan University Ekiden: 27th place in Leg 2

[Sumitomo Electric Track and Field Team](#)

[X \(formerly Twitter\) : @sei\\_trackfield](#)

[Instagram : @sei\\_\\_trackfield](#)





# Technology for Better Days

We connect people, information  
and energy to make everyday life more  
comfortable and fulfilling.  
That's why we embrace challenges  
and explore new possibilities.  
We may not stand out, but with  
our cutting-edge technology, we will keep  
helping you make every day a good one.

 **SUMITOMO  
ELECTRIC**  
Connect with Innovation

A new advertisement, "Technology for Better Days," is displayed at Yumeshima Station on the Osaka Metro Chuo Line, which is the closest station to Expo 2025 Osaka, Kansai, Japan. Please be sure to check it out if you visit Expo 2025.

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Information and videos not posted in this magazine  
are found on the "id" special site

<https://sumitomoelectric.com/id>



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