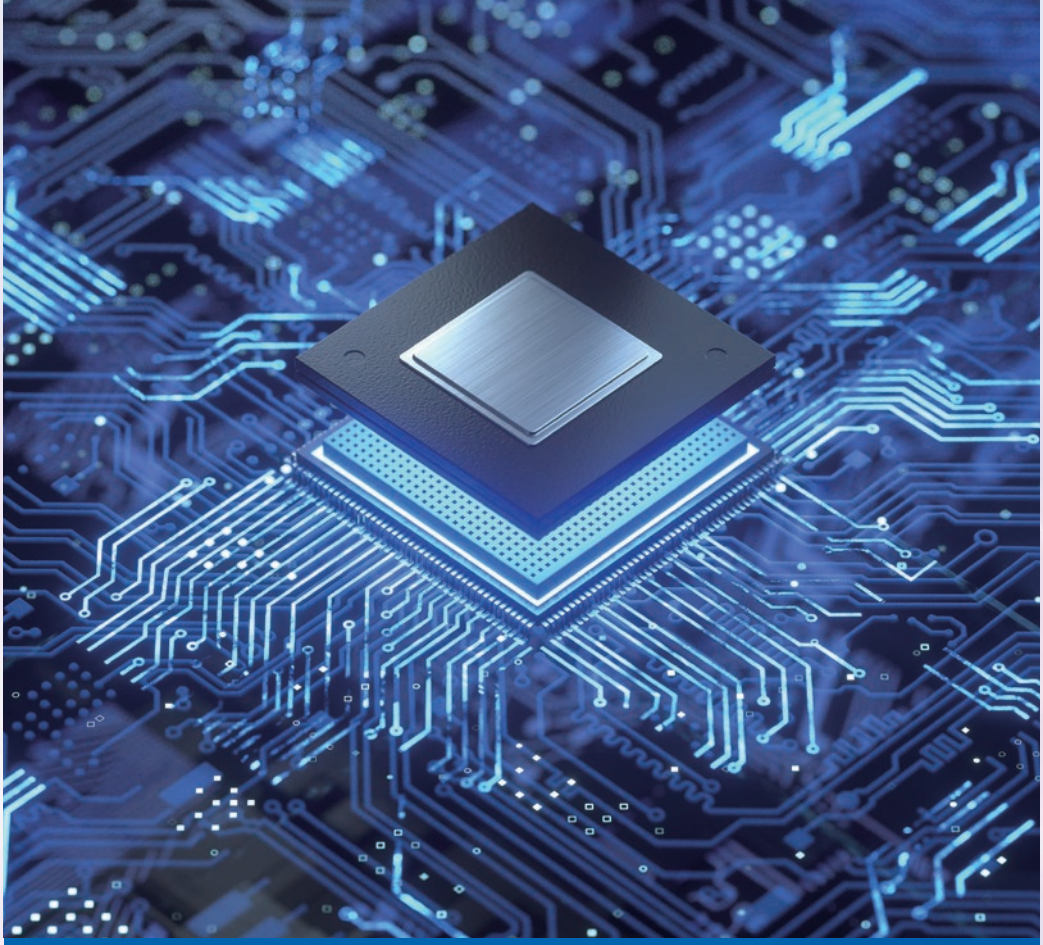
Chapter

2

Businesses

Providing the best products in step with the needs of the times



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Businesses

Mobility & Imaging Business Unit

For automotive safety components, amid the expected growth of inflators centered on China and ASEAN, we will focus on new applications of dye-type polarizers as shades for head-up displays.



Member of the Board
Managing Director, In charge of
Mobility & Imaging Business Unit,
Head of Safety Systems Group

Shigeyuki Kawamura

Contribution to SDGs

Business Overview for FY2023

Net Sales

Safety Systems Business

- Inflators **Strong**
- Micro gas generators and squibs **Strong**
  - Although the domestic business was affected by semiconductors shortages and such at the start of the year, automobile production subsequently recovered and remained firm; sluggishness reappeared in the fourth quarter due to production-line suspensions by certain automakers
  - Overseas sales increased substantially due to strong demand in Europe, the US, China, and ASEAN as well as advantages due to yen depreciation

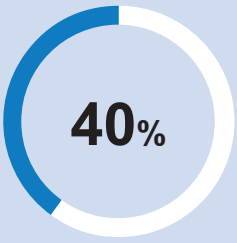
Polatechno Business

- Optical films **Struggling**
  - Sales struggled due to sluggish sales and production discontinuations of existing models using our optical films
- X-ray analyzer components **Steady**
  - Sales held firm

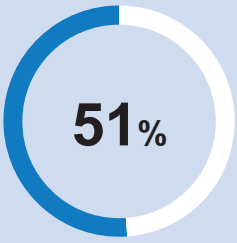
Operating income by industry segment

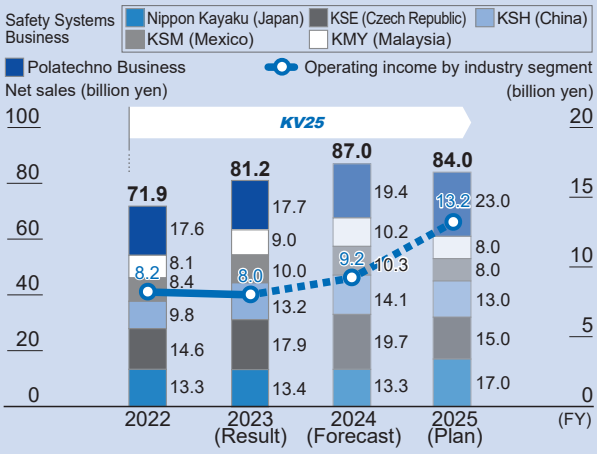
Operating income saw a slight decrease due to increases in raw materials costs and fixed costs

FY2023
Ratio to Total
Net Sales



FY2023
Ratio to Total Operating
Income by Industry Segment





Forecast and plan figures are based on those disclosed in the financial results presentation on May 14, 2024

Growth Story from FY2024 and Beyond

Although profits in FY2023 were affected by the increase in raw material prices and other factors, we are passing on the costs to prices. For FY2024, we expect the domestic market to recover and the overseas market to remain steady.

Growth of inflators centered on China and ASEAN

The installation rate of automotive safety components is expected to continue increasing in the future centered on China, ASEAN, and other emerging countries. We aim to expand the market through new inflators with higher competitiveness.

Recovery of polarizers in the Polatechno business

For high durability dye-type polarizers for vehicles in the Polatechno business, we are focusing on new applications such as for head-up display instead of existing applications in instrument panels, where demand is shrinking. Therefore, we expect a recovery in the Optical Films business.

Together with the Precision Components business, which includes X-ray analyzer components with steady sales, the Polatechno business will contribute toward the performance of the Mobility & Imaging Business Unit.

Launch of new Safety devices for drones

PARASAFE® emergency parachute system for drones is the next area of application for our pyrotechnic safety technology. We will promote commercialization by providing this system to customers in Japan and overseas and contributing toward the social implementation of industrial drones.

Strengths We Possess

Technology for handling pyrotechnics safely

- Specialized technology passed down from the handling of industrial pyrotechnics when the company was founded



Share of automotive safety components

- Micro gas generators for external sales and squibs make up the top share in the global market

Global expansion

- Optimal production and supply structure with five global locations and Himeji Plant as the mother plant



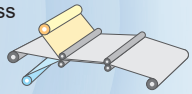
Safety Systems Business — **Polatechno Business**

Synergy with business units

Mutual utilization of distribution channels for automotive components
Sharing of production expertise in the processing and assembly industry

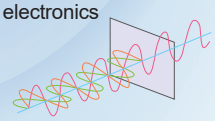
Technology for the manufacturing of high durability dye-type polarizers

- Synthesis of high-performance dichotomous dyes and manufacturing technology using original dye stretching process


Converting technology

Technology for light control in polarizers, X-rays, etc.

- Expertise in light control meeting diverse needs in areas such as electronics

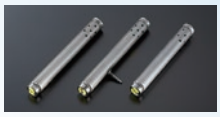

Polarization and retardation control

Current Core Products and Markets

Inflators

Inflators are devices used to instantly inflate airbags. Airbags are loaded with a gas generating agent, which applies explosive technologies to control the speed at which an airbag deploys at within 1/1000th of a second at the point of impact.


Disk-type


Cylinder-type

Micro gas generators

Micro gas generators are compact gas generating devices used for seatbelt pretensioners, which are devices to retract seat belts in the event of a collision, safely restraining passengers in place.



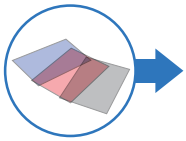
Squibs

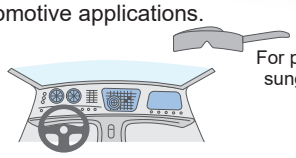
A squib is an ignition device embedded in inflators and micro gas generators. It receives electric signals from impact sensors to operate safety devices.



High durability dye-type polarizers

High-durability dye-type polarizers with excellent resistance to heat and light are used as optical components that can withstand harsh environments such as automotive applications.


High durability dye-type polarizers


For vehicle instrument panels

For polarized sunglasses

X-ray analyzer components

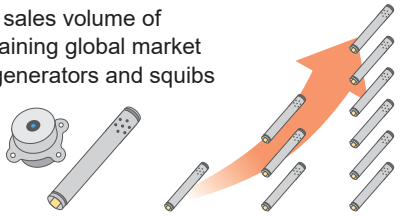
The X-ray analyzer components of US-based Moxtek, Inc. and UK-based RaySpec Ltd. are found in handheld X-ray detectors and such used by airports and border security.


Handheld X-ray fluorescence analyzer

New and Promising Areas, and Key Growth Areas

Expand sales volume of inflators

Target expansion of sales volume of inflators while maintaining global market share in micro gas generators and squibs



Safety devices for drones

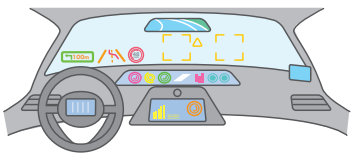
Demand for the expansion of applications such as transportation by the drone and the assurance of safety

- Development that can address diverse needs
- Make it the de facto standard
- Develop larger components



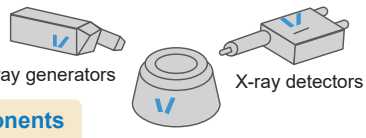
New automotive applications such as HUD shades

Dye-type polarizers respond to the evolution of head-up displays, smart room mirrors, and other vehicle display devices.



Expansion of the X-ray business

Increasing demand of the recycle of rare metals



- **Expansion of components for X-ray analysis systems**

Mobility & Imaging Business Unit

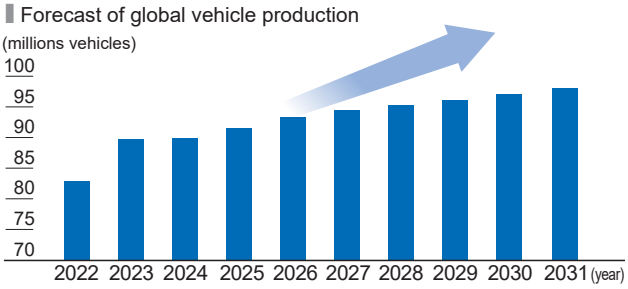
TOPICS 1 New cylinder-type inflator—Initiatives to expand our global share for inflators

The market for automotive safety components is expected to continue to expand in the future due to more vehicles being sold in the medium-to-long term as well as an increase in the number of safety components per vehicle, especially in emerging countries. In this new market opportunity, the Nippon Kayaku Group aims to expand our global share for inflators following the already significant share held by our squibs and micro gas generators by expanding sales of our new cylinder-type inflator.

Disc-type inflators are used in the front airbags for the driver and passenger seats. Meanwhile, thin and long cylinder-type inflators are used in the side airbags that protect the sides of passengers and knee airbags that protect the knees—side and knee airbags being increasingly adopted due to strengthening of safety standards. Production of the new cylinder-type inflator will start in 2025. Besides a product design that offers improvements by simplifying the production processes compared to existing products, this new inflator is 30% lighter, contributing toward improving fuel consumption for gasoline vehicles and cruising range for electric vehicles. Carbon emissions during production is also reduced by 30% due to less metals used, structural design, and other factors, making it a product that is friendly to the environment in the move toward carbon neutrality.

Production of the new cylinder-type inflator will start from our plant in Malaysia. We will also carry out capital investment at other overseas locations to increase the number of manufacturing locations, and we plan to establish a system that allows production to commence production in China from October 2025. We will establish a global supply structure from multiple locations and expand our global share, mainly targeting the markets of China and ASEAN, where robust demand is anticipated.

Forecast of global vehicle production



* Estimated by the Nippon Kayaku Group based on survey data from S&P Global Mobility that was released in February 2024



The new cylinder-type inflator (left), which is lighter and has design improvements in structure and processes, and the existing product (right)

TOPICS 2 High durability dye-type polarizers—Toward application in vehicle head-up displays

High durability dye-type polarizers in the Polatechno business have long been used in vehicle LCDs as materials that can pass tests for long-term durability, or capability of withstanding direct sunlight exposure and high temperature environments. In recent years, we also expect to see growth in new applications centered on shades for protecting projection equipment of head-up displays (HUDs).

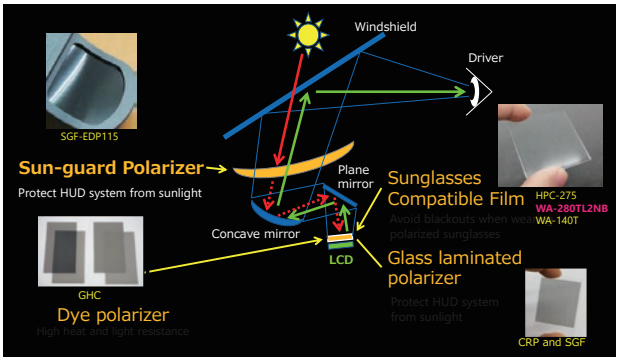
By reducing energy from direct sunlight—which causes the temperature of the projecting part of a HUD to rise—without lowering the display brightness of a HUD, shades can limit the thermal degradation of the light source. We can provide shades with excellent optical properties and long-term reliability as dye-type polarizers have high resistance to heat and light.

Furthermore, if the projecting part of the HUD uses an LCD panel, it will also require materials that have high resistance to heat and light. Therefore, the market for dye-type polarizers and phase different plates used in combination is also expected to expand.

Besides not generating optical degradation in regard to heat and light, our products also have excellent reliability in not generating optical path physical surface distortion under environments with high temperatures. We therefore expect greater demand from automotive manufacturers requiring high quality. In addition, there are several cases of adoption of our products, centered on China where the production of electric vehicles (EVs) is vibrant, and we expect an expansion in demand in China for vehicles installed with HUDs centered on luxury cars.

HUDs are gaining attention in the safety aspect as devices that allow drivers to check information without moving their gazes. We will advance activities to develop markets—including Europe and the US where there is high interest in safety, in addition to China —to help grow dye-type polarizers, the core products of the Polatechno business.

Products of the Polatechno business for HUD systems





Special Feature Safety Devices for Drones

PARASAFE



In the safety systems business, we created the product PARASAFE®, a safety device for drones used in industrial applications as a new air mobility, and launched sales in December 2021.

To PARASAFE®, we have applied our **pyrotechnic safety technology**, which we have cultivated for automotive safety components. When a drone drops from the sky due to unforeseen circumstances, PARASAFE® swiftly deploys a parachute with its pyrotechnic igniter, thus protecting safety at ground level while preventing damage to the drone itself and cameras and other on-board equipment. Also used for drone certification, etc. under the revised Civil Aeronautics Act, this product is expected to contribute to the spread and expansion of Level 4 flights (operation beyond the visual line of sight (BVLOS) over populated areas without pilot action) in the future.

Core technologies that enabled the development of PARASAFE®

1 Pyrotechnic Safety Technology

Industrial pyrotechnics have the outstanding ability to reliably generate a certain amount of energy in an instant. We have handled pyrotechnics since our founding and our extensive expertise in the properties and safe handling of pyrotechnics is a major advantage of Nippon Kayaku.

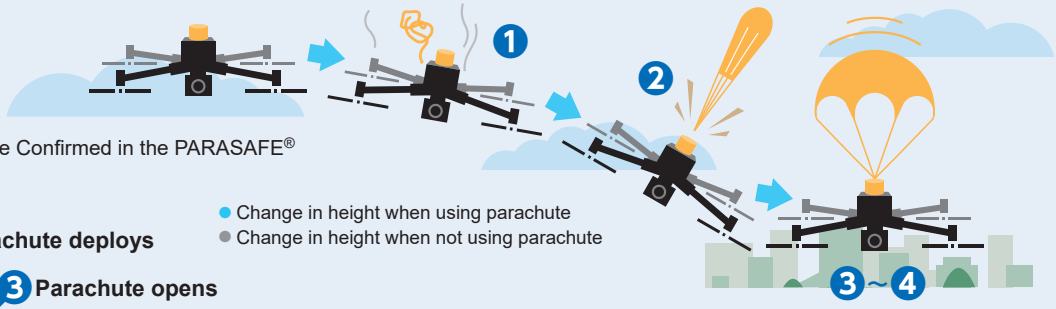
2 High-performance Component Development Capabilities

In addition to materials, another strength of our company is our ability to develop components that offer both high performance and reliability and durability. We manufacture all products inhouse, using our expertise in material and form design, simulation of operation, etc.

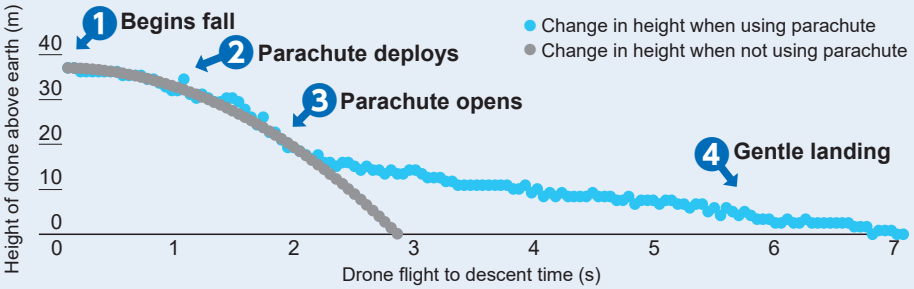
3 Sensing and Programming Technology

A device called an Autonomous Triggering System (ATS) is necessary to activate safety components when a dangerous fall is detected. We select the optimal sensors from drone flight data and simulations, develop an activation program, and are working on other technologies for ATS.

Operating state of PARASAFE® attached to drone



Safe Landing of a Falling Drone Confirmed in the PARASAFE® Demonstration Experiment*

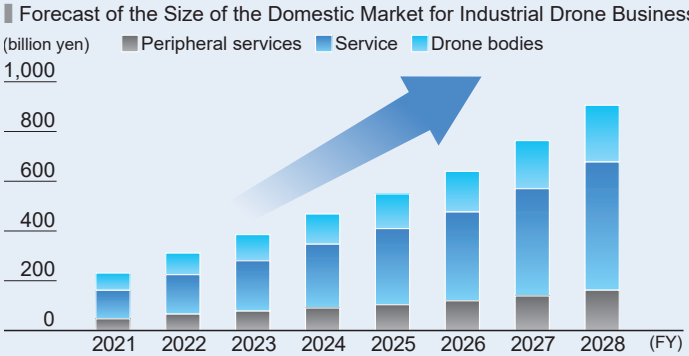


* Data from a demonstration experiment that was conducted in 2021 in Yabu City, Hyogo Prefecture, which is designated as a national strategic special zone

Market for Drones for Distribution and Inspection Expected to Grow Significantly in the Future

The impression is that there is a delay in social implementation in Japan compared to the previous fiscal year. Currently, we expect to commence mass production in line with social implementation around 2025 and start to see contributions to profits in 2026 or 2027. We think there is potential for accounting several billion yen in sales for drone safety components around 2030.

Forecast of the Size of the Domestic Market for Industrial Drone Business



* Partial excerpt from FY2023 data from the website of Impress Corporation

Businesses

Mobility & Imaging Business Unit

Ensuring Safety for the Future of Extensive Use of Air Mobility

The air mobility market has kept expanding globally. Air mobility is expected to be used in various fields, such as agriculture and security, in addition to use in urban areas. Diversification and evolution of aircraft bodies is also anticipated, and various trials are being conducted on a whole range of aircraft, from small models weighing several kilograms to large models exceeding 100kg, and flying cars that can transport people.

The Nippon Kayaku Group will provide optimal safety components in accordance with needs. including products for various weights and ones applying sensing technologies, in addition to the current PARASAFE®. We will thus secure our position as a peripheral device manufacturer and contribute to realizing a society with safe and secure air mobility.

Expansion to logistics use → **Use for inspections, surveys, and security** → **Emergence of flying cars** → **Future**



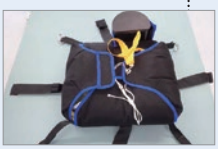
Current PARASAFE®
(for aircraft with gross weight of up to 25 kg)



PARASAFE® for small aircraft
(with a gross weight of up to 15 kg)



ATS : Autonomous Triggering System
A device that detects flight anomalies, which can be used in combination with PARASAFE®



PARASAFE® for large aircraft
(with a gross weight of up to 150 kg)



Safety devices for flying cars

Achieved Level 4 Drone Flights and Working Toward Widespread Use



In 2022, Japan's Civil Aeronautics Act and such were revised, and Level 4 flight of drones (operation beyond the visual line of sight (BVLOS) over populated areas without pilot action) became possible. In response to this revision, in March 2023, ACSL Ltd. (Edogawa-ku, Tokyo), a major drone manufacturer, acquired an official certificate for Level 4 flight for the first with aircraft equipped with PARASAFE® from Nippon Kayaku. Subsequently, the recognition of PARASAFE® as a safety component compliant with Level 4 flight of drones grew. We are cooperating with several manufacturers of drones for logistics and such toward obtaining type certification.

Besides such technological initiatives, in 2023, we also participated together with Tokio Marine & Nichido Fire Insurance Co., Ltd. (head office: Chiyoda-ku, Tokyo) in a project by Hyogo Prefecture and others on promoting the practical use of drones, carrying out verification experiments aimed at establishing better drone insurance. Specifically, through drone free-fall experiments and computer simulations, we were able to collect a lot of data helpful in establishing drone insurance* that comprehensively compensates the liability risks in accidents such as when drones fall while in flight.



The Nippon Kayaku Group hopes to properly fulfill our role toward achieving domestic social implementation while actively participating in various initiatives in the aspects of technologies and systems for industrial drone safety components.

* Official, tentative name: Unmanned helicopter general insurance

Initiatives for Overseas Deployment of PARASAFE®

China has already embarked on the social implementation of drones ahead of others, including uses such as pesticide spraying and food delivery. Most airframes are fitted with parachute-type safety systems, creating a market of the largest scale in the world. To enter this market, besides being a safety system made in China placing emphasis on industrial circular policies, cost competitiveness will be crucial. The Nippon Kayaku Group plans to consolidate resources and develop the Chinese market through sales activities by local subsidiary Kayaku Safety Systems (Huzhou) Co., Ltd. and strengths such as lower costs arising from in-house designing of parachutes.

In Europe, there are strict legal regulations in place regarding drone flight, and currently, operation methods for social implementation are being studied, led by industry parties such as airframe manufacturers. The situation of compliance with legal regulations being crucial to widespread use is similar to that in Japan. We are carrying out marketing while using our knowledge from having acquired certification in Japan.

Furthermore, in the United States, Aero Systems West, Inc. (ASW, California, the United States), which specializes in drone design and development, as well as manufacturing and operational training, joined the group in 2022 through a capital participation. Including exhibiting at Commercial UAV Expo, a large-scale exhibition for unmanned aerial vehicles, we will promote research and activities toward widespread use, such as aiming to satisfy the ASTM F3322 safety standard for drone parachutes designated by civil aviation authorities.





Initiative toward entering the Chinese market (top; exhibiting at UAS EXPO 2024 held in Shenzhen)
Activity for satisfying the US safety standard ASTM F3322 (bottom; exhibiting at Commercial UAV Expo 2023 held in Las Vegas)

Fine Chemicals Business Unit

We will focus on areas where growth is expected—such as semiconductor-related products and industrial inkjet inks—and establish a system for increased production while continuing to work on increasing our profit margins.



Member of the Board
Managing Director, In charge of
Fine Chemicals Business Unit

Shinji Inoue

Contribution to SDGs

Business Overview for FY2023

Net Sales

Functional Materials Business

- Epoxy resins for semiconductor encapsulation and substrates **Sluggish**
  - Sales were sluggish due to a slow recovery in market conditions for semiconductor materials, a decline in demand for consumer electronic devices, and restrained investment in communication infrastructure
- Ultraviolet curing resins for displays **Steady**

Color Materials Business

- Consumer inkjet colorants **Sluggish**
  - Demand was sluggish despite progress in eliminating inventories in the market
- Industrial inkjet inks **Steady**
  - Sales remained steady, just as in the previous year

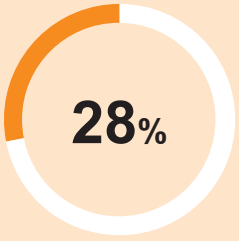
Catalysts Business

- Catalysts for the production of acrylic acid and methacrylic acid for use in new manufacturing **Sluggish**
  - Sales were sluggish during the replacement period

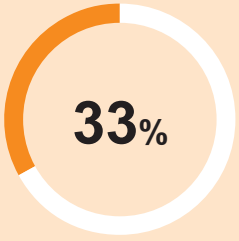
Operating income by industry segment

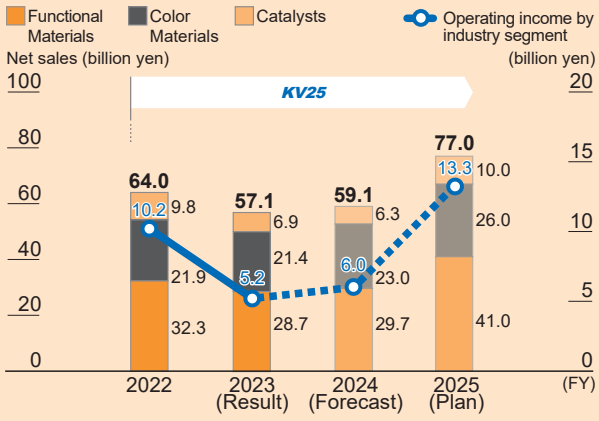
Operating income decreased due to increases in raw materials costs and fixed costs

FY2023
Ratio to Total
Net Sales



FY2023
Ratio to Total Operating
Income by Industry Segment





Forecast and plan figures are based on those disclosed in the financial results presentation on May 14, 2024

Growth Story from FY2024 and Beyond

In FY2024, under Functional Materials, we expect a recovery for semiconductor-related products from the second half. As for Color Materials, we expect a recovery in consumer inkjet colorants and growth in industrial inkjet colorants. For Catalysts, the replacement period continues due to the catalyst replacement cycle at our customers' plants, but it will reverse in FY2025, and on average, we expect a continuation of stable market conditions.

Passing on raw material costs to prices

The Fine Chemicals Business Unit imports many raw materials. Due to pressure on profits from higher raw material prices arising from the exchange rate and the increase in energy costs, we have progressively passed on costs to prices. We will pay attention to the future trend of raw material prices and consider passing on costs to prices again as necessary.

Strategic investment in facilities to increase production

We undertook a large-scale investment to increase production of epoxy resins at Asa Plant and industrial inkjet inks at Fukuyama Plant. We will properly launch these new plants.

Initiatives to increase profit margins

The Fine Chemicals Business Unit will work as a whole on the issue of increasing profit margins. Besides expanding sales and revising prices, we will adopt a multi-directional approach, including reducing costs, improving yields, reviewing production processes, and launching new products as early as we can.

Fine Chemicals Business Unit

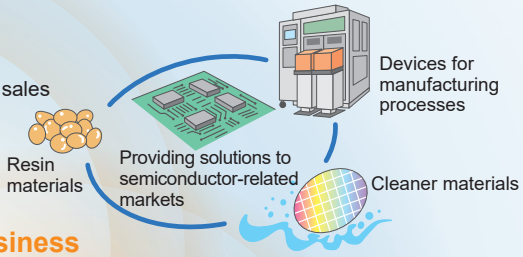
Strengths We Possess

Semiconductor-related product synergies

- Strengths in using epoxy and maleimide resins for 5G, MEMS materials, cleaner materials, semiconductor manufacturing equipment, and other products for reciprocal identification of customer needs and expansion of sales

Functional molecule design

- Enables the design of resins with special functions according to the purpose, such as high-purity, high heatresistance, etc.



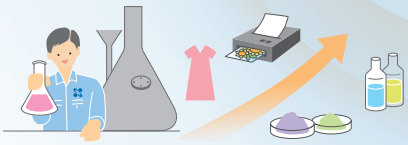
Functional Materials Business

Precise organic synthesis

- Possess expertise in the synthesis of a wide range of color materials, from dyes that were the first in history in Japan, to colorants for inkjet printers and functional colorant materials

Knowledge on inkjet ink performance evaluation

- Accumulated knowledge on evaluating characteristics—including ink discharge performance and fixability—nurtured through the development of consumer inkjet colorants



Color Materials Business ⇔ **Catalysts Business**

Synergy with business units

Dynamic sharing and fusion of management resources, such as unique technologies—including composition design, synthesis, dispersion, and evaluation—as well as human resources, intellectual property, and manufacturing facilities

Optimal catalyst composition design and technical services

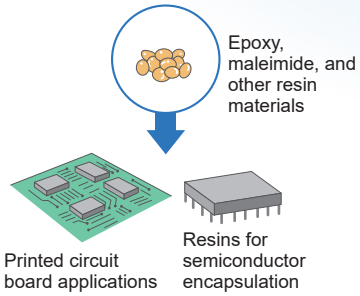
- Creation of high-performance catalysts using expertise in the composition of metallic elements used and grain size design
- Provision of technical services such as filling methods that manifest top performance



Current Core Products and Markets

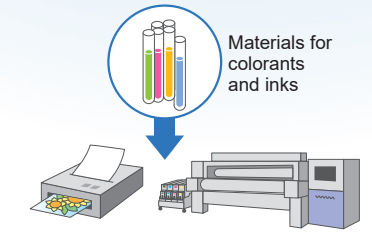
Epoxy resins

The semiconductor market will grow to 1 trillion dollars by 2030.



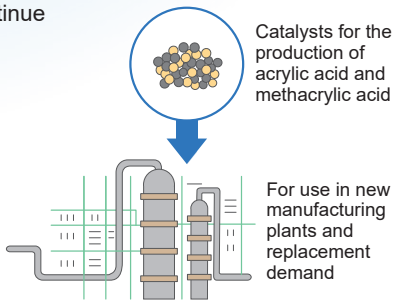
Inkjet inks and colorants

Expect continued expansion of the digital printing market



Catalysts for the production of acrylic acid and methacrylic acid

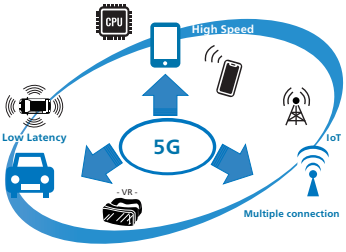
Expect 5% to 6% annual growth of the acrylic acid and methacrylic acid market to continue



New and Promising Areas, and Key Growth Areas

Applications related to semiconductors and LCDs

Capture expansion of semiconductor demand from the proliferation of IoT and nextgeneration high-speed communications



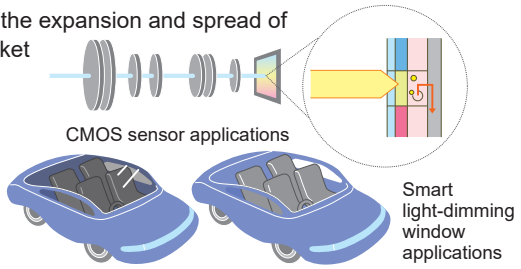
Industrial inkjet applications

Expansion of demand for digital printing for packaging materials, textiles, etc.



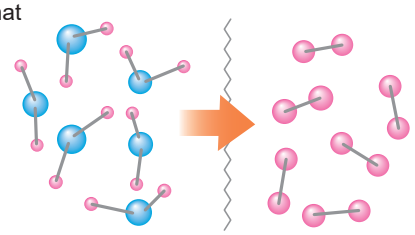
Commercialization of functional colorants

Taking in the expansion and spread of each market



Development of catalysts for hydrogen production

R&D on catalysts that contribute to a zero carbon society



TOPICS 1 Focusing on growth areas—Expansion of industrial inkjet inks and dyes

The growth area for inkjet inks and colorants has shifted from consumer applications for households and offices toward industrial applications. In industrial applications, due to the advantage of being able to print different types in small quantities and short periods, digital printing is expanding as a replacement for offset printing. Digital dyeing of textiles—which is friendly to the environment as it does not need cleaning after printing—is another area that is growing significantly.

The new water-based pigment inks developed by the Nippon Kayaku Group has the feature of being able to directly print on coated paper used for flyers and posters. Coated paper is said to be a medium with poor absorbency that is difficult for inkjet printing as ink does not penetrate easily. With excellent drying performance and discharge stability, our inks can be properly fixated to allow printing with high resolution, quality, and speed.

As a new product group, we are also working on the development of inks for non-absorbent media that do not absorb ink at all, such as films for food and packaging.

At drupa 2024, a large-scale, international printing and media trade fair taking place once every four years and held at Düsseldorf, Germany from May to June 2024, we showcased developmental products for non-absorbent media and print samples at our booth, gaining significant response due to their performance and print quality.

At Fukuyama Plant, the production location, we are undertaking capital investment for increasing production, including the construction of a new building for manufacturing industrial inkjet inks. The new building is scheduled to commence operation in FY2025. We will apply our strengths—including our dye, dispersion, and ink design technologies nurtured so far—to strive and grow our business for industrial inkjet applications to a business with a scale of 10 billion yen in sales by 2030.



Exhibiting at drupa 2024

TOPICS 2 Developing catalysts that help realize a hydrogen-powered society

In recent years, there are expectations for the stable supply of hydrogen as a clean energy source for various applications such as fuel cells, power generation, and automobiles. Our Catalysts Business is working to develop catalysts that contribute towards realizing a hydrogen-powered society.

Our catalyst method for producing hydrogen involves focusing on an environmentally friendly process which thermochemically decomposes water through collecting sunlight and solar heat in a reaction field where water vapor and catalysts coexist. This method is characterized by its ability to use renewable energy and generate economies of scale by employing a three-dimensional reaction field.

In parallel with calculating the cost of hydrogen production based on data from the pilot plant, we are working on establishing technologies for the stable, safe, and affordable manufacture of catalysts, aiming for practical application in FY2029.

Besides catalysts for hydrogen production, we are also exploring the development of catalysts for hydrogen carriers which enable efficient storage, transportation and utilization through dramatic reductions in storage volume. In FY2023, we achieved our target hydrogen production volume on a small scale. Going forward, we will study scaling up toward practical application.

With a view of practical application in the medium-to-long term, we will seek to create catalysts that are indispensable for the future hydrogen society.



Fine Chemicals Business Unit

Special Feature

Semiconductor-related Products

Expansion of Resins for Semiconductors

Market Overview

Demand is growing recently for our high-purity epoxy resins for package circuit boards, in addition to ones for use as materials for semiconductor encapsulation, which must have a high degree of electrical reliability.

Digitalization is making rapid progress due to the development of 5G communication networks and the spread of telework and social media. The increase in demand for semiconductors, GPUs used in AI servers, and other such equipment that form the core of the infrastructure has become a tailwind.

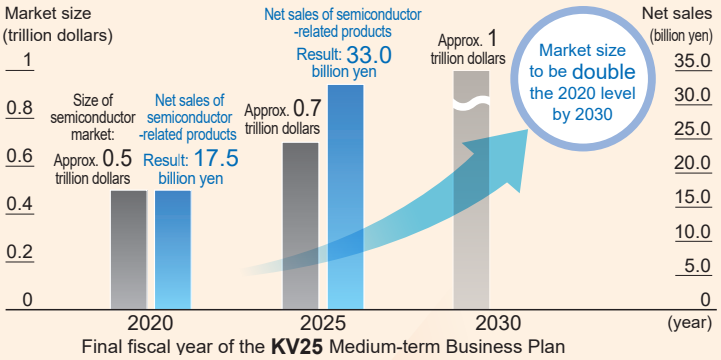


Synergy between the Growing Semiconductor Market and Our Products

KAYAKU Vision 2025 (KV25)

The semiconductor market is expected to grow rapidly to one trillion dollars by 2030. With this opportunity, we engaged in business for semiconductor cleaners and equipment used in semiconductor manufacturing processes.

Fully using this synergy, we plan to achieve sales of 33 billion yen in FY2025 for our semiconductor-related products—which include resins, cleaners, and equipment—and aim for rapid growth together with the market.

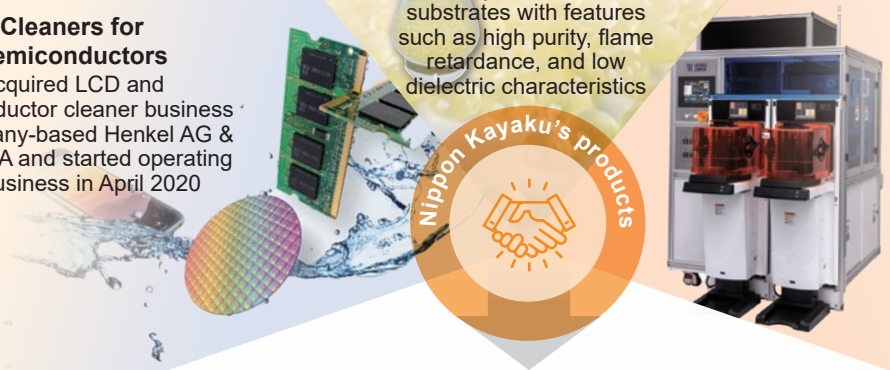


Final fiscal year of the **KV25** Medium-term Business Plan

Numbers for semiconductor market size: Partially excerpted from Handotai Senryaku (Gairyaku) (semiconductor strategy (short summary)), which was published at the website of the Ministry of Economy, Trade and Industry in June 2021

Epoxy and Maleimide Resins
Epoxy and maleimide resins for semiconductor encapsulation and substrates with features such as high purity, flame retardance, and low dielectric characteristics

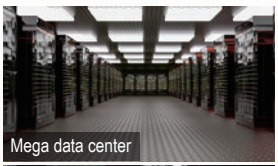
Cleaners for Semiconductors
Acquired LCD and semiconductor cleaner business of Germany-based Henkel AG & Co. KGaA and started operating the business in April 2020



Semiconductor Manufacturing Equipment
Acquired Teikoku Taping System Co., Ltd., which deals in laminators and other equipment used in semiconductor manufacturing processes, and started operating the business as part of the Nippon Kayaku Group in April 2021

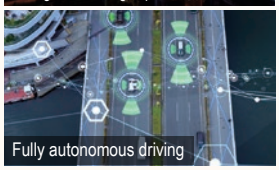
Value Provided to the Future Society Depicted by Synergy

We provide relevant products with high added value to a society that uses electronic devices and semiconductors in all aspects of life, including information, communication, mobility, healthcare, and smart agriculture.


Mega data center


Next-generation high-speed communication


Data-based healthcare


Fully autonomous driving

Showing presence in a society where semiconductors are used everywhere

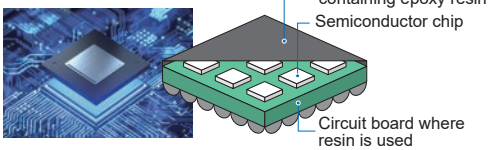
- Semiconductors will become even more important as the near future will be digitalized and electronic devices will be used everywhere.
- The Nippon Kayaku Group sees the strategy of expanding resins for substrates as crucial, and we are advancing research and development of materials for the latest semiconductors besides providing a stable supply of existing materials.
- Seeking sustainable growth, we leverage synergy with cleaners and equipment for manufacturing processes for multi-directional approaches.

Specific Products

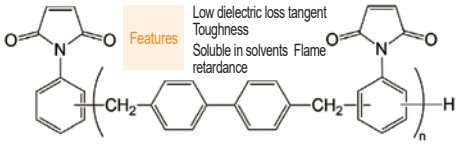
Epoxy and Maleimide Resins

Greater demand for resins with characteristics

- We offer high-quality epoxy resins with characteristics that can also be used for applications requiring sophisticated management, such as in-vehicle devices.
- We launched new maleimide resins in 2018 for areas that require a good balance of characteristics and low dielectric loss tangent, such as 5G semiconductor package substrates.
- Demand for these resins is expected to grow further in applications such as mobile phone base stations and data center servers.



MIR-3000-70MT maleimide resin



Acrylate Resins

- We have a lineup of acrylate monomers, epoxy acrylates, urethane acrylates and other acrylate oligomers as the KAYARAD Series of light-curable resins. We also handle the special methacrylate KAYAMER Series and the KAYACURE Series of photopolymerization initiators and sensitizers.
- Specifically, for displays, these resins are used as components suitable for LCD sealants, hard coats, and color filter resists.

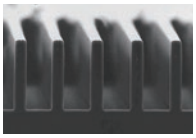


Dry Film Resist for Microelectromechanical Systems (MEMS)

- SU-8 3000CF Dry Film Resist is a film photoresist that can be used in high aspect ratio photolithography process such as that in the production of RF surface acoustic wave (SAW) devices.
- It has a structure in which the resist layer is laminated with a cover film and a support film. This eliminates the solvent removal processes and contributes to process simplification.



SU-8 3000CF Dry Film series



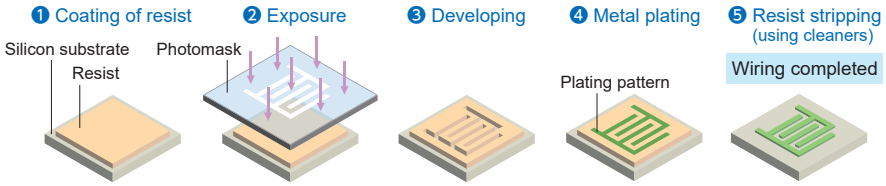
Enlarged image of developed Dry Film Resist

Cleaners for Semiconductors

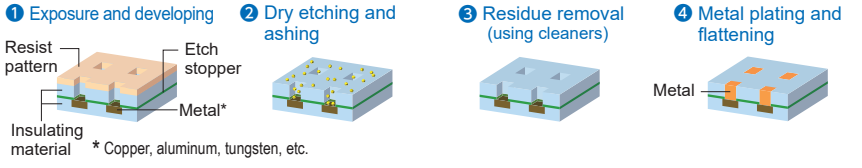
Incorporating demand for cleaners for manufacturing processes

- The LCD and semiconductor cleaner business was acquired with a special focus on semiconductor manufacturing applications.
- With technological knowledge as our strength, we have a lineup of excellent products, including developers and strippers that can be used in high-resolution processes, resist strippers used for wafer-level packaging, and dry etching residue removers.

Semi-additive wiring fabrication



Metal wiring: Residue removal

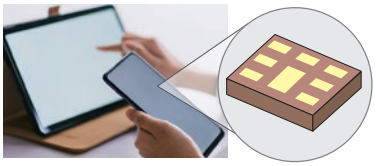


Semiconductor Manufacturing Equipment

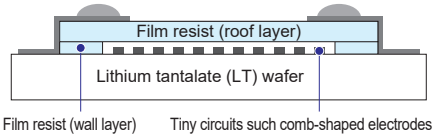
Providing solutions even in manufacturing processes

- We provide equipment used for semiconductor manufacturing, including laminating, stripping, and wafer mounting.
- Among our products, our laminators—which laminates film resist on wafers—have an established reputation for the precision of the conditions that can be configured. An example of their use is for forming hollow structures that protect tiny circuits in RF SAW filters used in communication equipment.
- We can customize products for each customer using hardware and software developed in-house, contributing to foundry operation with high productivity. We will provide solutions even for processes while collaborating with the resin and cleaner business.

RF SAW filter used in communication equipment

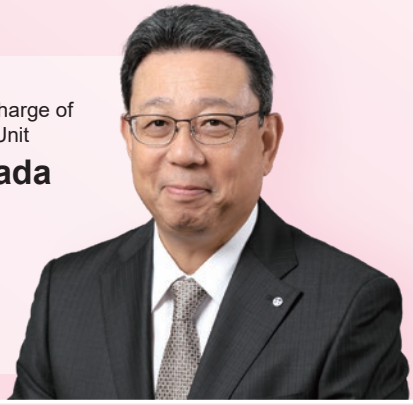


Hollow structure of microelectromechanical system formed using a laminator
(components of SAW filters, etc.)



Life Science Business Unit

Centered on our strength in cancer treatment, besides generic drugs and biosimilars, we will aim for a system that enables a lineup of new pharmaceuticals that fulfill unmet needs.



Member of the Board
Managing Director, In charge of
Life Science Business Unit
Hiroshi Shimada

Contribution to SDGs

Business Overview for FY2023

Net Sales

Pharmaceuticals Business

The impact of drug pricing revisions was covered by higher volume, and sales were basically the same as in the previous year for the business as a whole

- Biosimilars (BS) **Strong**
  - Bevacizumab BS, which treats colon, rectal, ovarian cancers and other indications, penetrated the market and gained a 10% market share (as of April 30, 2023)
  - Launched in 2023, Adalimumab BS, which treats rheumatism and other autoimmune diseases, had a smooth start
- Generic anti-cancer drugs **Strong**
  - Dasatinib, which treats chronic myelogenous leukemia and other such indications, increased sharply in its share of generic drugs after the switch to generic drugs due to the same indications, dosages and administration as the original product

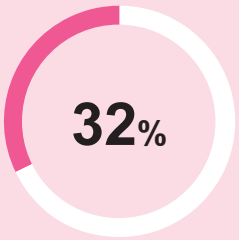
Agrochemicals Business **Steady**

Flometoquin and DIAZINON® grew in overseas sales

Operating income by industry segment

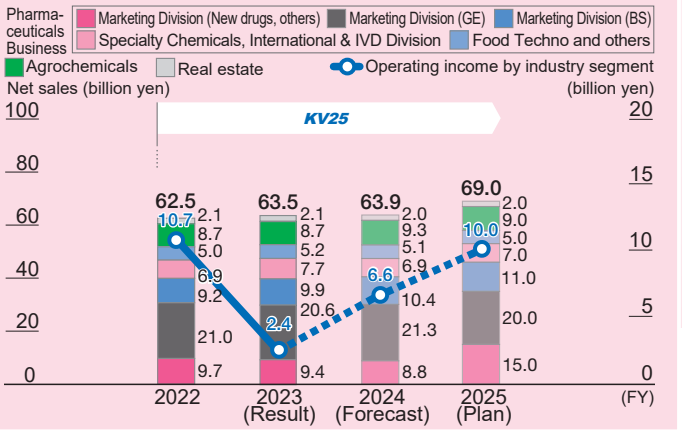
Operating income decreased due to upfront licensing fee of six billion yen recorded in the third quarter for the unmet needs of anti-cancer drugs

FY2023
Ratio to Total
Net Sales



FY2023
Ratio to Total Operating
Income by Industry Segment





Forecast and plan figures are based on those disclosed in the financial results presentation on May 14, 2024

Growth Story from FY2024 and Beyond

In 2024 and beyond, we will continue to seek growth while maintaining the same stable performance so far, using our strengths of trust in the field of cancers and our position as a pioneer in biosimilars for Pharmaceuticals, and our capabilities in developing products—including new products—in Agrochemicals.

Generic drugs and biosimilars

Our business for generic anti-cancer drugs is recognized for its high repetition and stable performance, with strong sales for both new and existing products. For our biosimilars business, we will grow sales of Bevacizumab BS and Adalimumab BS, two products which were launched before FY2023. Regarding the recent issues with generic drugs in terms of supply concerns and quality problems, we will emphasize stable supply and quality assurance, and we will undertake studies that also include the enhancement of production facilities.

Introduction of new drug candidates with a view of the future

We will shift to a product portfolio—which will also include new drugs—that can easily ensure profits for our business in pharmaceuticals for treatment in Japan, which centers on generic drugs and biosimilars that are affected by annual drug price revisions. Regarding the two new drug candidates and one new diagnostic reagent candidate that were introduced in FY2023, we will advance the development stage to turn them into growth drivers.

Growth of Agrochemicals business

In Agrochemicals, amid the shrinking agrochemical market in Japan, the expansion of overseas sales will become the key to growth. Together with striving to expand sales of the existing DIAZINON®, chloropicrin, and the new product FINESAVE®, we will also promote the development of new active ingredients aimed at around 2030.

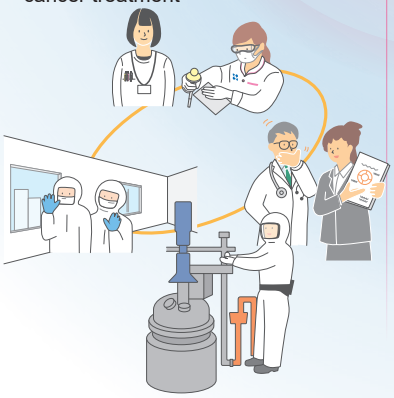
Strengths We Possess

Integrated business operation from R&D to manufacturing and sales

- Domestic manufacturing locations that contribute to a stable supply of high quality pharmaceutical drugs.
- Bidirectional sharing of information between R&D and manufacturing and sales
- Constant promotion of alliance activities with external parties

System for compiling and providing information to medical professionals

- Nationwide stationing of medical representatives who possess advanced expertise and cover information on all products
- Establishment of a Pharmaceutical Information Center for medical professionals and patients, and building of a support system for cancer treatment



Pharmaceuticals Business

Agrochemicals Business



Synergy with business units

Seeking greater efficiency in R&D processes, such as sharing of intellectual property and exchange of researchers for drug creation research

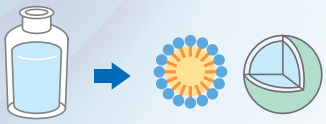
Insecticides for fruits and vegetables, and soil fumigants

- We can provide detailed support of needs for insecticides and soil fumigants, focusing on fields of vegetables and fruits.



Utilization of formulation technology in development

- In addition to the long development period for new active pharmaceutical ingredients, we utilize our extensive formulation technology to enable development of new forms of existing formulations



Surfactant, microcapsules and others

Structure for global provision of agrochemicals

- Provision of insecticides through alliances with local sales companies in Europe, Asia, Africa, Central and South America, and other regions



Current Core Products and Markets

New Drugs

- DARVIAS® for treatment of peripheral T-cell lymphoma;
- Portrazza®, a therapeutic agent for squamous non-small cell lung cancer
- ALAGLIO®, a photodynamic diagnostic agent for bladder cancer, etc.

Generic Anti-cancer Drugs

Paclitaxel, a therapeutic agent for breast cancer and other indications, and Pemetrexed, a therapeutic agent for advanced/recurrent non-small cell lung cancer and other indications



Biosimilars

Infliximab BS, a therapeutic agent mainly for inflammatory bowel disease, Bevacizumab BS, a therapeutic agent mainly for colon, rectal, ovarian cancers and other indications, among other drugs

Active pharmaceutical ingredients (APIs) and diagnostic agents

Contract manufacturing of APIs and intermediates, diagnostic agents for Japan and the U.S., etc.

Insecticides

- DIAZINON®
- FINESAVE®
- FUHMON®
- EVISECT®, etc.



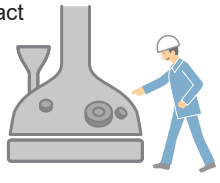
Soil fumigants

- Double Stopper®
- Chlopicflow®
- TERONTM and ASAHI D-D Etc.



Contract manufacturing

- Besides the manufacturing of Nippon Kayaku products, Kashima Plant also engages in contract manufacturing



Life Science Business Unit

New and Promising Areas and Key Growth Areas

Pharmaceuticals developed in-house

New drug development in the cancer field using our R&D platform



Results achieved through alliance activities

Focusing on introduction and other activities to follow DARVIAS®, PORTRAZZA®, ALAGLIO®, etc.



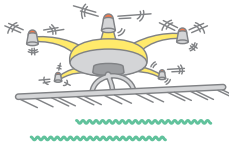
Establish a platform for sustained growth

Ongoing market launches of unique formulations

Reduced toxicity, improved ease of use

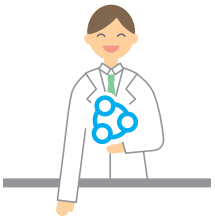


For distribution by drones



Development of new active ingredients for insecticides

Research and develop new active pharmaceutical ingredients over the medium and long term



TOPICS 1 Development pipeline of Pharmaceuticals business

To shift to a system that makes new drugs—instead of a product lineup centered on generic drugs and biosimilars—the key axis of contribution to performance, the Nippon Kayaku Group added the two anti-cancer drug candidates Buparlisib and Taletrectinib to the development pipeline in FY2023.

Development Pipeline (as of August 31, 2024)

	Stage	Development code (Generic name)	Origin	Characteristics
New Drugs	Phase Ⅲ	AN2025 (Buparlisib)	Adlai Nortye (Cayman Islands)	● Disease development: After platinum + ICT treatment, recurrent and transition squamous cell carcinoma of the head and neck ● Mechanism of action: PI3K inhibitor
	Phase Ⅱ	AB-106/DS-6051b (Taletrectinib)	AnHeart Therapeutics (US)	● Disease development: ROS1 fusion-gene positive non-small-cell lung cancer ● Mechanism of action: ROS1 inhibitor
	Under preparation	Product name: Alaglio® (Aminolevulinic acid hydrochloride)	SBI Pharmaceuticals (Japan)	● Photodynamic diagnostic agent ● Characteristics: Emission of red light under a blue light source when incorporated into cancer tissue ● Basic agreement for joint development (2023.9)
Diagnostic agents	Under preparation	VECanDx™	BioCheetah (Singapore)	● In vitro diagnostic products ● Under development in Singapore ● Signed licensing agreement for exclusive development and marketing rights in Japan

Ever since the Ministry of Health, Labour and Welfare embarked on a policy of encouraging the active use of generic drugs in 2002, the adoption of generic drugs has spread due to the national policy. Following this trend, for Pharmaceuticals, we launched a strategy centered on the sale of generic drugs and added biosimilars to the lineup from 2014 to expand the business. However, in recent years, there has been significant impact to the income from generic drugs and biosimilars due to drug price revisions being conducted every year, including revisions in the in-between years. Therefore, to add a foundation for long-term business growth that is not easily affected by drug price revisions, we have carried out a relatively large investment compared to the past and introduced new drug candidates.

Buparlisib is in Phase Ⅲ, which is the final stage of clinical trials. We invested approximately 6 billion yen through third-party allocation in Adlai Nortye, which is

developing this drug, and received a priority right for acquiring sales license in Japan. It has the potential to be the first standardized secondary treatment for recurrent and metastatic head and neck cancers, and it has been given Fast Track—a process designed to expedite the review of drugs to treat serious conditions and fill unmet needs—designation by the U.S. Food & Drug Administration (FDA).

Taletrectinib is a drug candidate for ROS1 positive non-small-cell lung cancer, which makes up a low frequency of approximately 2% of lung cancer in total. The current Phase Ⅱ is in the final stages of clinical trials. Using approximately 6 billion yen, we acquired licensing rights for priority sales in Japan from AnHeart Therapeutics, which is developing this drug. There are limited options for treating ROS1 positive non-small-cell lung cancer, and it has been given Breakthrough Therapy—a process designed to expedite the development and review of new drugs that are intended to treat serious conditions and life-threatening diseases—designation by the U.S. FDA.

Both **Buparlisib and Taletrectinib** aim to be launched by March 2026, and clinical trials are smoothly underway. After sales have stabilized, we expect at least 10 billion yen in sales for both drugs together, contributing to treatment in the area of cancer—in which we are strong in—while sufficiently recovering our investments including those made in the initial phases.

TOPICS 2 Capital investment in Takasaki Plant—Initiative toward stable supply of high-quality pharmaceuticals

In Japan, a new system for co-payment of drugs (selective treatment of existing drugs [long-term listed items] with new comparable drugs) was introduced in October 2024. If a patient chooses prescription of a long-term listed drug when a generic drug is available, except in cases when medically required, the patient will need to co-pay an additional amount equal to a quarter of the price difference as selective treatment. It is expected that the introduction of this system will further encourage the use of new comparable drugs.

In addition, the shortage of new comparable drugs is being prolonged and supply concerns are becoming a social issue. The Nippon Kayaku Group is working on new comparable drugs for which stable supply has become difficult as well as the supply for replacing existing drugs being discontinued with new comparable drugs. There will be increased requirement for supply of our products in the future, and in anticipation of supply consolidation at Nippon Kayaku, we are planning to enhance the production capabilities of Takasaki Plant, which manufactures pharmaceuticals. For FY2024, we have set aside a budget of 20 billion yen as part of this capital investment plan. Through large-scale investment, besides the stable supply of generic drugs, we also plan to add facilities for the manufacturing of biosimilars within Japan, including biosimilars that are currently dependent on imports, and we expect to contribute to their stable supply in the future.

Furthermore, to improve the efficiency and sophistication of quality assurance operations at Takasaki Plant, we have also embarked on the construction of a new integrated quality assurance building scheduled for completion in FY2026. Through initiatives to enhance production and quality at Takasaki Plant, the Nippon Kayaku Group will maintain stable supply of high-quality pharmaceuticals in Japan and contribute to medical treatment.



No. 3 Pharmaceutical Plant of Takasaki Plant

TOPICS 3 Lineup of flometoquin-based products ―Promoting expanded sales of products, from FINESAVE® to Gladius®

Flometoquin is a new active ingredient that obstructs the breathing of pests. It shows excellent effects against thrips and rust mites and is also effective against pests that have resistance against existing insecticides. Another feature is that it has little impact on helpful organisms such as honeybees. Nippon Kayaku has launched insecticides containing flometoquin in Japan. We launched FINESAVE® Flowable for citrus fruits and vegetables in 2018 and FINESNIPER® insecticide for cucumbers in 2022, gaining a good reputation.

Since 2020, we have also been focusing on selling flometoquin-based products overseas. We are selling Gladius® as an insecticide for roses and other cut flowers for export to countries where horticultural products are key exports, such as Kenya. Going forward, we intend to expand the countries where Gladius® is used, centered on countries* like Kenya, where high-quality flowers can be grown throughout the year and there are high needs for agrochemicals for export of cut flowers. We will further expand sales to countries in the Middle East, Africa, and Asia as, similar to Japan, there is strong demand for Gladius® for vegetables such as tomatoes, eggplants, and bell peppers. We hope to support agriculture around the world using Gladius®, which can be widely used, from flowers to vegetables.



* Regions near the equator with high elevations have ideal environments that can grow high-quality flowers throughout the year, including stable temperatures, consistent sunshine, a certain number of sunlight hours, and little strong winds. It is expected that the export of cut flowers to countries such as the Netherlands—the biggest importer of cut flowers—will remain prominent.

Chapter

3

Management Foundation to Support Sustainable Growth

Aiming for the evolution of sustainable management



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Research & Development



Senior Director, In charge of Technology Unit

Yasuhito Kato

The mission of the Technology Unit is to launch new products and businesses that are essential to the company's growth. We plan research and development themes, taking into account factors such as social significance, market size and growth rate, and the competitive advantage of the company's technologies. In **KV25**, we have been actively promoting open innovation and the utilization of data science, such as machine learning, to transform ourselves into the future image of research and development. We will continue to focus on expanding our core business and developing new businesses while removing the boundaries of segments and organizations to generate synergy and bring together the technologies of the Nippon Kayaku Group.

Research and Development Policies

Vision of R&D

Increase our corporate value by creating new businesses and products through R&D

The role of the R&D division is to create new businesses and products through R&D activities and increase our corporate value. We want to be an R&D division that can create and increase corporate value.

R&D activities that simultaneously expand existing core businesses and develop new businesses to continuously increase corporate value

II

R&D to put "ambidextrous management" into practice

Research and Development Strategies

R&D to put "ambidextrous management" into practice	Selection of themes based on marketing	Active use of open innovation

Four Areas Targeted to Contribute to Realization of a Sustainable Society

- Active use of open innovation (partnerships with industry and academia, collaboration and alliance with and investment in venture firms, venture capital, business acquisitions, etc.)
- Selection and planning through marketing and IP landscape

Mobility	Environment and Energy	Electronics	Life Science
■ Emergency parachute for drones used in industrial applications ■ Safety devices for flying cars (corporate research theme) ■ Optical films for windshields, for head-up displays (HUD)	■ Development of AZUL Catalyst* ■ Anion exchange membrane used in water electrolysis for green hydrogen production equipment ■ Biomass epoxy resins ■ Catalysts that contribute to a decarbonized society	■ Organic Electronics Materials (corporate research theme) Will also continue to collaborate with the fine chemicals business unit on planning and marketing	■ About Biostimulants Will also continue to collaborate with the pharmaceuticals group and agrochemicals group on planning and marketing

* Initiatives of business alliance with AZUL Energy Inc.

TOPICS 1 Aiming for new products and businesses that contribute to the environment and energy field

The Group aims to create new products and businesses that solve future issues in the environment and energy field.

In 2023, AZUL Energy Co., Ltd., with whom we have formed a close business alliance, developed AZUL catalyst, which has an organic dye structure in its active center and exhibits higher activity than the platinum-based catalysts conventionally used in fuel cells. This material also boasts superior cost competitiveness, performance, durability, and other properties. The Nippon Kayaku Group is responsible for pilot production, taking advantage of its expertise in precise organic synthesis and material dispersion, and has begun providing samples to customers dealing with next-generation energy devices such as air batteries, water electrolysis for hydrogen production, and fuel cell applications.

In addition, to realize a hydrogen energy society, we are participating in a consortium for the development of water

electrolysis technology centered on the Yamaguchi・Kuroki Laboratory of the Institute of Science Tokyo, with the aim of developing a water electrolysis system that does not use precious metals such as platinum. We will contribute to the realization of a hydrogen society through the development and practical application of highly durable anion exchange membranes by utilizing our technologies cultivated in our functional materials business and Polatechno business, including the synthesis of monomers and polymers, which are the materials for membranes, their formation into films, and precision film conversion.


Anion exchange membrane


Water electrolysis equipment

VOICE **Message from open innovation representative**

The New Business Planning Group is promoting open innovation to create new products and businesses.

In addition to having staff participate in lively information exchange by occupying the Cambridge Innovation Center Tokyo (https://jp.cic.com/), which supports many organizations including startups, companies, local governments, and universities, the company also aims to create specific themes, such as investing in venture capitals, participating in and holding pitch events, conducting training to foster an entrepreneurial mindset, and holding monthly meetings with staff in charge of collaborations with startups from each business unit, the Corporate Planning Division, and the Intellectual Property Division.

As one of the results of these activities, in August 2024, we were able to start a collaboration with iPEACE223 Inc., a venture company that aims to realize carbon neutrality through catalysis technologies. The zeolite catalysis technologies that iPEACE223 owns can produce propylene and its derivatives from ethylene derived from bioethanol, which not only achieves a higher level of yield than conventional production methods but can also reduce energy equivalent CO_2 emissions emitted throughout the process to about one-third that of petroleum. Taking advantage of Nippon Kayaku's catalyst evaluation technology, know-how in production scale-up and mass production, and connections with the acrylic acid and methacrylic acid production industries, we plan to promote development with the aim of bringing products to market around 2030.

iPEACE223

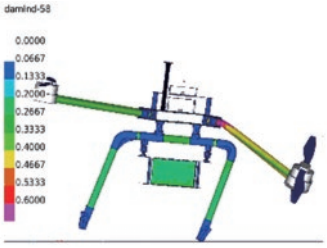


Promoting open innovation requires constantly acquiring new knowledge, and it is difficult because there are no existing theories. However, it is also rewarding because we are in a position to open up new possibilities for the company. We would like to work with enthusiasm to create the second and third themes following zeolite catalysis.

New Business Planning Group, R&D Planning Division, Technology Unit
Makoto Furue (left), Yukihiro Hara (right)

TOPICS 2 Development of safety device technology for Computer Aided Engineering (CAE)

In the field of the automobile industry, safety components will require even higher performance due to changes such as larger airbags and stronger assessments as the interiors of electric vehicles (EVs) expand. In addition, the early popularization and standardization of safety components to ensure public safety is one of the important items for the social implementation of next-generation mobility such as drones and flying cars.



To quickly respond to these issues, the Group has begun considering the establishment of Computer Aided Technology (CAE) technology. CAE is a system that can predict results by conducting various simulations on a computer. It has a wide range of applications, and in the field of the automobile industry, it is being utilized for vehicle body design.

By applying CAE to the development of safety components, we can conduct fluid calculations related to the gas flow inside inflators and airbags and crash calculations in the unlikely event of a flying car crash and obtain the results in the form of images and quantified numerical data. By sharing the results of such highly accurate CAE with airbag module manufacturers and manufacturers of drones and flying cars, we believe we can strengthen our ability to propose solutions to common issues required in the industry. While advancing these studies, we aim to establish CAE technology at a level that can be utilized in practice by around 2026.



Research & Development

Initiatives to Strengthen Intellectual Property

Intellectual Property Policy

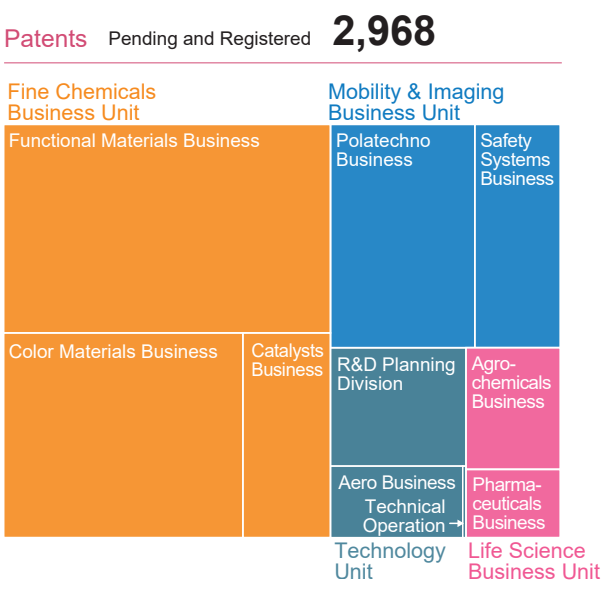
The Nippon Kayaku Group has positioned intellectual property as a business resource for sustained development of the Nippon Kayaku Group.
We actively create and utilize intellectual property while respecting the intellectual property of other companies.

Intellectual Property Strategy

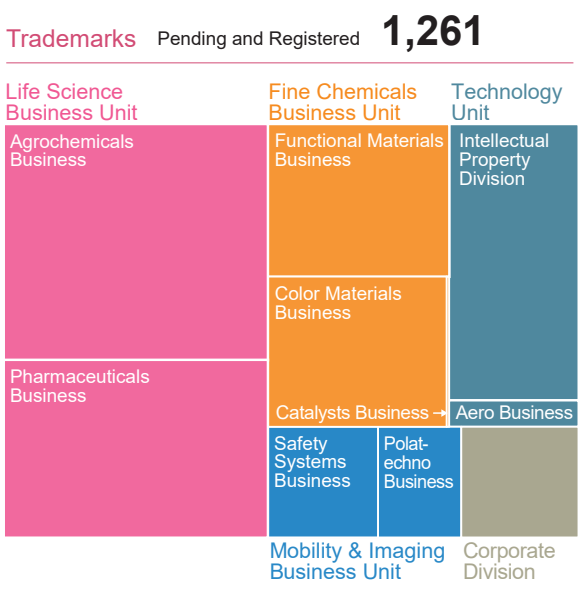
1 Work together with business divisions and laboratories on creating and utilizing intellectual property.
2 Use information to create new knowledge and strategies.
We formulate our intellectual property strategy and pursue intellectual property activities based on the business strategy of each business and the R&D strategy.

The Nippon Kayaku Group possesses extensive intellectual property across its three business units through continuous applications from research and development, production sites, and business units.

Global Patent Application Tree Map (as of March 31, 2024)



Global Trademark Application Tree Map (as of March 31, 2024)



VOICE

Message from patent application award winner*

The Functional Materials Business has a large number of patents held and patent applications each year. In addition to substance patents for developments and products of epoxy/maleimide resins, including the company's representative epoxy resin NC-3000, which has a distinct phenol aralkyl structure, we are also pursuing multifaceted applications, including for parameter patents that suppress peripheral applications such as compound compositions and the characteristics of processing samples for electronics applications, as well as patents related to biomass epoxy resin technology, which is expected to contribute to the environment in the future.

From the time I joined the company until 2022, I was a member of the Fine Chemicals R&D Laboratories, where I contributed to intellectual property through filing applications for the application of new resins for next-generation communications with low inducement and excellent heat resistance. Currently, I belong to the Technical Dept. of the Head Office, where I manage patent strategies for the entire business, including the optimization of rights maintenance costs and the consideration of global application policies that are important for overseas expansion. Although my position will change, I would like to make use of my industry experience as both an application practitioner and overall manager to focus on the optimization of intellectual property that comprehensively increases the added value of products.

* FY2022 Ranked first for cumulative contribution



Functional Materials Group, Fine Chemicals Business Unit
Technical Dept.
Masanori Hashimoto

TOPICS 3 Increasing the number of patents held by the company in the semiconductor market

For the global semiconductor market, which continues to boom worldwide, the Nippon Kayaku Group offers a wide range of products, including resin materials such as epoxy resins, hydrocarbon resins, and maleimide resins, compositions such as resist materials for MEMS and cleaners for LCDs and semiconductors, as well as organic semiconductor-related products, and continues to develop new applications and fields.

As of March 31, 2024, the number of patents held by the company*1 related to these semiconductor products is approximately 300. In addition to epoxy resin technology, which the company holds the most patents for, the number of patents held related to low-inducement maleimide resin, a product and development used for 5G and 6G devices in recent years, has increased approximately sevenfold in the past six years, and the company is strengthening the acquisition and expansion of intellectual property related to next-generation communications.

In addition to resin materials, we are actively promoting applications for semiconductor manufacturing process equipment such as semiconductor cleaners*2 and laminators to strengthen our intellectual property network. With the aim of commercializing new electronic devices, we are also steadily building up intellectual property in organic semiconductors that apply colorant technology.

*1 The number of patents held refers to the number of patent family units of published patents under application and examination and registered patents with existing rights.
*2 Cleaners for semiconductors are organic liquid materials such as developers and resist strippers used in the semiconductor wiring process.

Epoxy, maleimide resin



Cleaners for semiconductors



Devices for manufacturing processes



TOPICS 4 Strengthening the collaboration between intellectual property and business activities

The Intellectual Property Division is working to strengthen collaboration with business activities by stationing employees at business divisions, etc.

In April 2024, a department specializing in intellectual property was established within the Safety Systems Group, with a member of the Intellectual Property Division stationed there. In the automotive safety components industry, intellectual property is playing an increasingly important role, not only in the possession and defense of core technologies but also in patent strategies in each country where customer bases are located and the estimation and research of future products that will be realized by automated driving and other means.

Utilizing this strengthened structure, we intend to engage in even more proactive intellectual property activities, including filing timely and comprehensive patent applications in line with development and sales plans for cylinder-type inflators used in side airbags and knee airbags, which are expected to expand in the future.

In addition, we are working to strengthen intellectual property activities in line with each site by assigning employees to the Fine Chemicals R&D Laboratories to support applications and research as needed, as well as increasing the number of research specialists in the pharmaceutical field to back up the laboratories, which are involved in everything from new drug development to generic biosimilar development.



TOPICS 5 R&D Research training —Developing self-motivated R&D human resources

We provide R&D Research Training with the aim of improving young researchers' research skills, logical thinking, and ability to propose research and development themes.

In this training program, young researchers work closely with advisors in the same department for a significant period of time, or around ten months, to search for research and development themes and conduct research to solve issues. In the process of research, they are given opportunities to look outside their own departments, such as by gathering primary information through conducting interviews with internal and external experts and participating in exhibitions.

Through the training, the participants verify hypotheses established from the perspectives of the theme's marketability, technological feasibility, and intellectual property advantage, and finally propose a persuasive theme to officers and the general manager of the laboratories, giving presentations to increase the company's options for action.

Every year, about 10 to 20 young researchers take this training program, devoting themselves to becoming the human resources that can realize the corporate slogan "Global 'sukima' ideas."



Environmental Initiatives



Senior Director, In charge of Technology Unit

Yasuhito Kato

As a company that aims to realize a sustainable society, the Nippon Kayaku Group recognizes climate change as an important issue facing the international community and believes that we should actively fulfill our responsibility for the global environment. In April 2022, we announced our endorsement of the TCFD* in conjunction with the start of **KV25**, our Medium-term Business Plan to further promote sustainable management. In April 2024, we revised our Medium-Term Environmental Targets to take into account the 1.5°C limit set by the Paris Agreement.

With the basic policy of achieving carbon neutrality by 2050, we have organized four operational teams in Technology Unit to address each of the disclosure items recommended by the TCFD. We are working together as a whole company to achieve this goal, in cooperation with not only our business groups but also with back-office divisions related to purchasing and information disclosure. Currently, in addition to deepening our existing energy conservation activities, we are systematically and steadily implementing environmental investments to introduce new distributed power generation and technical studies for energy conversion.

* The Task Force on Climate-related Financial Disclosures (TCFD) established by the Financial Stability Board (FSB) in 2015.

Environmental Management

Policy and Basic Approach

Our Declaration on the Environment, Health, Safety and Quality

Established: 1995; Revised: January 31, 2024

Under the **KAYAKU spirit** and the spirit of Responsible Care*, we have established our “Declaration on the Environment, Health, Safety and Quality,” which is geared towards guaranteeing environmental protection, safety and health, while maintaining and improving product quality. We shall show a united front in promoting these activities, and this declaration shall apply to every employee working for the Nippon Kayaku Group, including temp staff and subcontractors.

We, the Nippon Kayaku Group, based on the **KAYAKU spirit** of “Continuously providing society with the best products through ceaseless progress and the combined forces of our consciences,” shall conduct business as a company which contributes to the achievement of a sustainable society that “safeguards the life and health of consumers and supports comfortable living.”

Fundamental policies

1. We will strive to maintain and improve the environment, people’s health, and safety across the entire product lifecycle, from R&D to production, distribution, sales, recycling, and disposal.
2. We will strive to prevent pollution, protect biodiversity, and conserve the environment by promoting reduction and proper disposal of waste, reduction of resource consumption (of energy, water, and raw materials), and Climate change measures (toward reduction of greenhouse gas emissions).
3. We will actively provide business partners with information needed for the safe usage and handling of our products and for conserving the environment.
4. We will enhance the quality of not only products, but operating processes as well, and also work to enhance customer satisfaction.
5. We will heighten employee knowledge and skills through education and training and achieve our goal of zero pollution, zero disasters, zero accidents and enhanced quality.
6. We will disclose information so that stakeholders correctly understand our business activities and also strive to engage in dialogue with local communities and government authorities.

* Responsible Care: Refers to companies which either produce or handle chemical substances proactively taking measures which show consideration for the environment, safety, and health, in every process extending from development, sale and use to disposal. Since its launch in Canada in 1985, Responsible Care has gained prominence worldwide, not least in Japan.

Nippon Kayaku Group’s Responsible Care

All Directors and employees share the common understanding that safety takes precedence above all else, and in line with the Declaration on the Environment, Health, Safety and Quality, the Nippon Kayaku Group complies with laws and regulations not only in Japan but overseas, striving to prevent accidents related to the environment and safety. “The Nippon Kayaku Group’s Responsible Care Policy” is based on the policirs we should continue to work on from FY2019 onward. Each fiscal year, in order to ensure “environment, safety, and health,“ Nippon Kayaku’s non-consolidated business and domestic group companies confirm and formulate targets that complement the key sustainability issues and initiatives to achieve them. Going forward, the Nippon Kayaku Group aims to continue advancing its Responsible Care Activities in line with this policy.

The Nippon Kayaku Group's Responsible Care Policy

Excerpt from the FY2024 edition

Targets	Serious accidents and hazards: 0 Serious environmental accidents: 0 Serious traffic accidents: 0
Key Responsible Care Issues	■ Total group Scope 1+2 CO_2 emissions to exceed no more than 111,838 tons (Total group CO_2 emissions to fall at least 15% from FY2019 levels) ■ Domestic zero-emission rates of 1% or less
Promoting Activities Aimed at Achieving Environmental Goals	■ Improved practices for climate-change-related disclosures to external sources ▪ Clarification of risks and impacts, and the setting of targets for TNFD disclosures ▪ Quantification of TCFD risks (flooding) and proposals for future measures ■ Appropriate operation of a cloud-based environmental data aggregation system (groupwide) ■ Every business site to aim for a 3% annual reduction in Scope 1+2 CO_2 emissions (a groupwide challenge, not a binding target) ■ Bolstering the system for calculating individual product emissions (exploring potential systems) ■ Plastic waste recycling rates of 80% or more; final disposal rates of 1% or less

Environmental Management System Certification Status

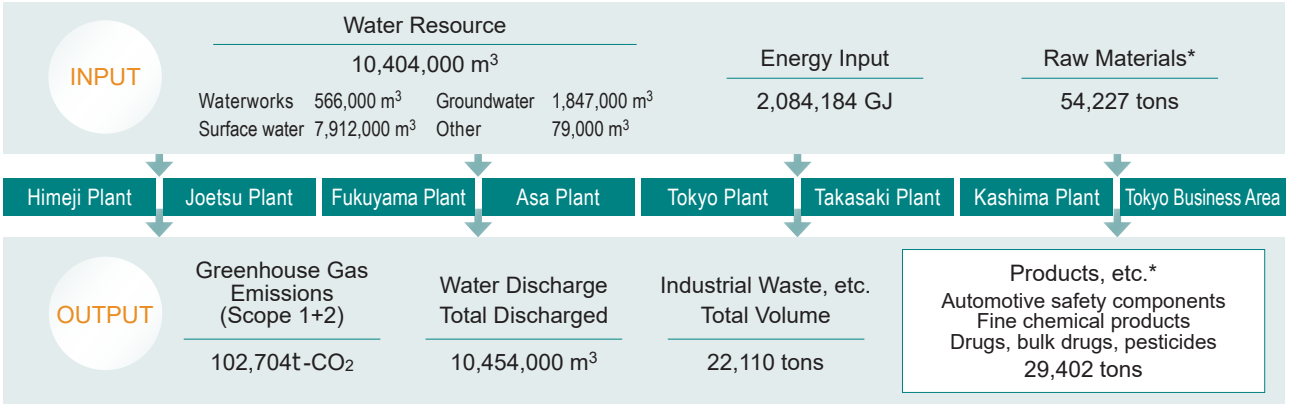
Our current efforts to retain our certification status for ISO14001, the internationally recognized environmental management standard, see us consider the environment during the development and manufacture of products and the provision of services.

Having first gained ISO14001 Certification for Environmental Management Systems in 1998, we have now achieved certification for all seven of our domestic plants and seven overseas group companies. We will continue, going forward, to explore new ISO14001 certification options for group companies, including for those based overseas.

Click URL **Acquisition status of ISO 14001 certification**
https://www.nipponkayaku.co.jp/english/sustainability/other/data/#h-01-08-01

Material Flow of Business Activities

The material flow of business activities for FY2023 is as described below.



* Nippon Kayaku non-consolidated (Items listed without additional notes represent combined domestic and overseas values.)

Use of LCAs (Life-Cycle Assessments)

We are also working to maintain and improve the environment, health, and safety at every step of the product life cycle, from the research and development stage right the way through production, distribution, sale, recycling, and disposal.

We are trialing the design of a process which allows us to visualize the value of every group product or service by assessing and analyzing environmental impacts and potential environmental contributions at every stage of the life cycle.

Part of these activities involves promoting calculation of the carbon footprint (CFP)* of every Nippon Kayaku product, which allows us to not only grasp its environmental impact but also improve the accuracy of our LCA calculations for customer products. We are presently proceeding with such calculations for certain product lines, and are looking at how to systematize this process to enable emissions calculations to be made for every company product.

* An indicator of the total amount of greenhouse gases a product or service emits during the entire process from production to disposal

Environmental Initiatives

Mitigation of Climate Change

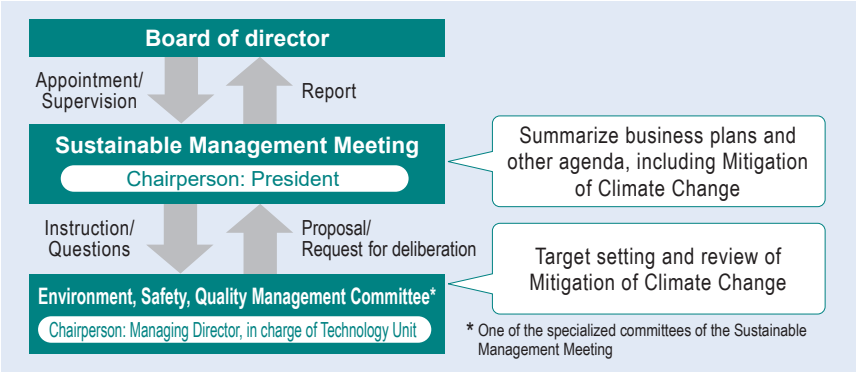
The Nippon Kayaku Group has revised its FY2030 Medium-Term Environmental Targets, which were established in 2020 at the 2°C level, to the 1.5°C level. Looking further into the future, our group has set its ultimate goal the achievement of carbon neutrality by FY2050. We will deliver products geared towards a decarbonized society and, through supplier engagement, aim for decarbonization across the entire value chain.

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

Information Disclosure on TCFD Recommendations

Governance

The Nippon Kayaku Group is addressing climate change from a company-wide perspective through the collaboration of the Board of Directors, the Sustainable Management Meeting (Chairperson: President), and the Environment, Safety, Quality Management Committee (Chairperson: Managing Director, In charge of Technology Unit).



Strategy — Climate-related Risks and Opportunities —

The Nippon Kayaku Group operates multiple businesses globally and various risks and opportunities accompany each business area. We evaluated climate-related risks for the entire group based on the TCFD recommendations to specify the impact of climate change on each business and considered the opportunities for each business area.

We have defined the timeframe for the materialization of risks as follows when specifying climate-related risks and opportunities.

Period		Reason
Short-term	Four years up to FY2025	Set the period for the **KAYAKU Vision 2025 (KV25)** Medium-term Business Plan which began in FY2022
Medium-term	Through FY2030	Aligned with the FY2030 target specified in the Medium-term Environmental Targets of the Nippon Kayaku Group
Long-term	Through FY2050	Referred with Nationally Determined Contribution (NDC) determined by the Japanese government

Climate-related Risks

Business risks related to climate change are based on Representative Concentration Pathway (RCP) 2.6, 8.5 scenarios by the United Nations Intergovernmental Panel on Climate Change (IPCC), Sustainable Development Scenario (SDS) by the International Energy Agency (IEA), and the Stated Policies Scenario (STEPS) for both the 1.5°C and 4°C scenarios.

Risks in Transitioning to a Decarbonized Economy for the 1.5°C Scenario

Category	Major Risks	Period of Risk Emergence	Financial Impact*1	Major Countermeasures
Policies & Regulations	Increased operating costs from tighter emissions regulations*2	Short to long term	Medium	• Implement distributed power sources for each site, such as solar power and high-efficiency cogeneration power generators • Reduce material loss by utilizing material flow cost accounting (MFCA) and implement comprehensive energy-saving activities
	Rising price of electricity, LNG, etc.	Short to long term	Medium	
	Increased raw material costs from tighter emissions regulations	Short to long term	Large	• Encourage suppliers to reduce emissions through engagement activities
Market & Reputation	Increased costs from disclosure of environmental information, life cycle assessment (LCA) calculations, etc.	Medium to long term	Small	• Streamline the emissions calculation method at each site and systemize the LCA calculations

Physical Risks from the 4°C Scenario

Category	Major Risks	Period of Risk Emergence	Financial Impact*1	Major Countermeasures
Acute & Chronic Physical Risks	Increased costs from flood damage caused by typhoons, heavy rain, high tides, etc.	Short to long term	Medium	• Based on the results of flood simulations, quantify financial impact and implement flood countermeasures
	Impact on operations due to water shortage	Medium to long term	Small	• Strengthen efforts to save water used during production, and consider reusing and recycling water
	Reduced labor productivity due to increased temperatures	Medium to long term	Small	• Enhance the work environment by improving air-conditioning, promoting the automation of high-temperature work processes, etc.

*1 Financial impact: Large = 2 billion yen or more; Medium = 0.5 to 2 billion yen; Small = 0 to 0.5 billion yen
*2 Based on carbon tax and energy price projections under the IEA's Net Zero Emissions (NZE) scenario, we have also calculated the risk impact under the 1.5 degree scenario and are considering disclosing information based on the 1.5 degree scenario.

Opportunities in Each Business Area in Transitioning to a Decarbonized Economy for the 1.5°C Scenario

We aim to achieve sustainable growth by creating new businesses and products that solve future social issues, such as environment-related products, while promoting measures to address transition and physical risks related to climate change.

* Financial impact: Large = 2 billion yen or more; Medium = 0.5 to 2 billion yen; Small = 0 to 0.5 billion yen

Business Area		Business Environment		Opportunity	Period of Opportunity Creation	Financial Impact*
Mobility & Imaging Business Unit	Safety Systems	Tightened regulations against greenhouse gas emissions in various countries & regions	• Global expansion of demand for mobility/ transport methods that have relatively low emissions • Significant restrictions on sales of internal combustion engine vehicles, depending on the region	• Rise of EV and automated driving brings increased diversification in smallness of size, lightness of weight, and shape to automotive safety components • Expansion of safety devices for unmanned aircraft such as drones	Short to long term	Large
	Polatechno			• Expansion of sensors, HUD, and other safety display device components, brought on by the development of EV and automated driving • Expansion of polarizing plates that help reduce energy consumption of display devices	Short to long term	Medium
Fine Chemicals Business Unit	Functional Materials		• Advances in social changes, such as growth of smart cities • Heightened demand for increased energy efficiency of electronics products • Increased demand for storage batteries that are able to handle large output fluctuations in response to expansion of renewable energy • Global expansion of demand for mobility/ transport methods that have relatively low emissions	• Expansion of semiconductor-related products from growth of smart cities and DX • Expansion of functional materials that help reduce energy consumption of display devices • Expansion of low-emission materials due to the increased shift toward use of biomass for raw materials • Expansion of resin materials that help make mobility frames more lightweight	Medium to long term	Large
	Color Materials			• Expansion of ink for digital on-demand printing that enables low-carbon printing • Expansion of dimming glass/film that controls incident sunlight	Short to long term	Large
	Catalysts			• Expansion of catalysts for producing green energy, such as hydrogen • Expansion of catalysts for promoting the use of biomass-derived raw materials	Medium to long term	Large
Life Science Business Unit	Pharmaceuticals		• Direct impact is limited	• Reducing greenhouse gas emissions by reviewing packaging formats	Short to medium term	Small
	Agrochemicals			• A certain level of temperature increase is expected even for the 2°C scenario, thus expanding the use of biostimulants that help maintain and improve agricultural productivity • Expanded use of existing agrochemicals to deal with new problems with pests	Medium to long term	Small

Environmental Initiatives

TOPICS 1 Business opportunities arising from the mitigation of climate change

The Nippon Kayaku Group is working to create new business opportunities through environmentally friendly products and research and development.

In recent years, the automotive industry has been accelerating its transition from gasoline and other internal combustion engine vehicles to electric vehicles (EVs), which do not emit CO_2 that causes global warming as well as other harmful gases. Currently, the shift to EVs is progressing mainly in China and Europe, and countries around the world are setting very high targets for the percentage of EVs in future automobile production. Automotive safety components in the Mobility & Imaging Business Unit support an environmentally friendly mobility society through the provision of reliable safety for EVs, just like for gasoline vehicles.

Industrial inkjet inks provided by the Fine Chemicals Business Unit are suitable for small- to medium-volume printing where ink can be used without waste and contribute to a low-carbon society as environmentally friendly materials by reducing wastewater. In addition, the Fine Chemicals R&D Laboratories will actively promote the research and development of catalysts for hydrogen production and themes related to energy conservation and biomass raw materials, aiming to solve future social issues such as the realization of a green energy society.

Even in the 1.5°C scenario, which will gradually suppress global warming, a certain rise in temperature and change in climate are expected, which is predicted to impose significant environmental stress on agricultural crops. In the agrochemicals business of the Life Science Business Unit, we provide “biostimulants,” a new agricultural material that listed in the government’s “Strategy MIDORI.”* Biostimulants are environmentally friendly materials that activate the natural functions of plants and relieve environmental stress. By helping to increase production and the reduce the use of chemical fertilizers, we will contribute to both a decarbonized society and environmental safety.

* The official name of the Japanese government’s global warming countermeasure is “Strategy for Sustainable Food Systems (Strategy MIDORI).”



Risk Management

We have specified “Reducing Energy Consumption and Greenhouse Gas Emissions” as a climate-related key sustainability issue*1.

Our M-CFT Climate Change Response Team has come to play a core role under our governance system*2 comprised of the Board of Directors, the Sustainable Management Meeting, and the Environment, Safety and Quality Management Committee. Established together with the launch of **KV25**, this team both specifies and assesses climate change risks, and implements specific plans to proactively promote energy-saving and green investments.

*1 **KV25** Materiality p.34

*2 Information Disclosure on TCFD Recommendations: Governance p.75

Key sustainability issues Reduction of Energy Consumption and Greenhouse Gas Emissions

Environment-related KPIs for **KV25** Targets

Greenhouse gas emissions (Scope 1+2)	FY2030 Target: 46% reduction or higher compared with FY2019 (70,598 tons or less)
Goal setting in line with SBT* and consideration and implementation of specific measures	Disclose progress
Disclosure in line with TCFD recommendations	Disclose progress
Develop products and technologies with consideration for environmental issues	Disclose progress

* Science Based Targets: Greenhouse gas emission reduction targets set by companies, consistent with the Paris Climate Agreement

TOPICS 2 Countermeasures for flood risks in the 4°C scenario

The Nippon Kayaku Group has sites in regions where flooding is likely to occur, such as in the area of Kita Ward, Tokyo*1 where a Class A river flows. For this reason, in our climate change risk and opportunity analysis, we assumed a physical risk from the 4°C scenario of “Increased operating costs from flood damage caused by typhoons, heavy rain, high tides, etc.” and predicted a medium financial impact*2 if flood damage actually occurs. Since this risk can occur over a wide range of periods and has a relatively large financial impact, in FY2023 we began working on more detailed risk quantification in the event of floods and efforts to reduce them.

An analysis*3 of the possibility of flood damage at 17 of the group’s production sites in the event of a flood of a certain scale or greater*4 under the current climate revealed that four sites are at risk. In addition, an analysis of the situation in the 4°C scenario showed that some sites

may have an increase in flood area and depth due to the overall rise in water levels caused by global warming.

Based on the results of these analyses, we investigated the impact of damage to annual sales and assets held by each site in the current climate, the 1.5°C scenario, and the 4°C scenario*5. We found that although some sites will not be suffering financial damage in any scenario, as global warming becomes more severe, such as in the 4°C scenario, the financial impact will increase from at least several billion to 10 billion yen per year. To reduce these financial impacts, we plan to continue working on flood risk reduction in FY2024 and onward by preparing a roadmap that includes a survey of actual conditions at sites where damage is expected, the setting of targets to assess the degree of damage control, the formulation of specific countermeasures, and implementation timing.

Five sites at high risk of flooding

Tokyo Research Administration Office Area	Including Fine Chemicals R&D Laboratories. Pharmaceutical Research Laboratories, Tokyo Plant (color materials manufacturing) (Kita Ward and Adachi Ward, Tokyo)
Two sites at Asa Plant	Functional materials and catalyst manufacturing; two sites in the Kawahigashi and Kawanishi areas (Sanyo-onoda City, Yamaguchi Prefecture)
Wuxi area	Three companies that manufacture functional materials, color materials, and Polatechno products respectively (Wuxi, Jiangsu Province, China)

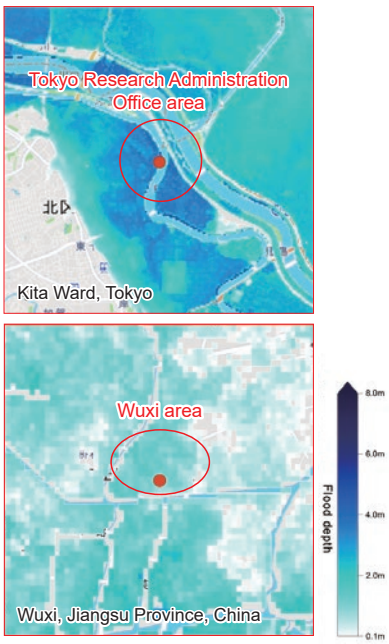
*1 Tokyo Research Administration Office, Fine Chemicals R&D Laboratories, and Pharmaceutical Research Laboratories are located in Kita Ward, Tokyo, and Tokyo Plant is located in Adachi Ward, Tokyo.

*2 Medium financial impact: Impact on operating income of 500 million to two billion yen per year; relatively large impact among the Nippon Kayaku Group's climate change risks

*3 Using Gaia Vision's proprietary high-precision flood simulation system "Climate Vision"

*4 Analysis of 10-year (large-scale floods that have a probability of occurring approximately once every 10 years), 100-year, and 1,000-year floods; generally, the scale of damage is 1,000-year flood > 100-year flood > 10-year flood.

*5 Domestic calculations are based on the damage rate data provided in the Ministry of Land, Infrastructure, Transport and Tourism's 2020 document "Manual for Economic Evaluation of Flood Control Investment," while overseas calculations are based on the damage rate by flood depth provided in the technical report "Global flood depth-damage functions" published by the European Commission's Joint Research Centre in 2017.

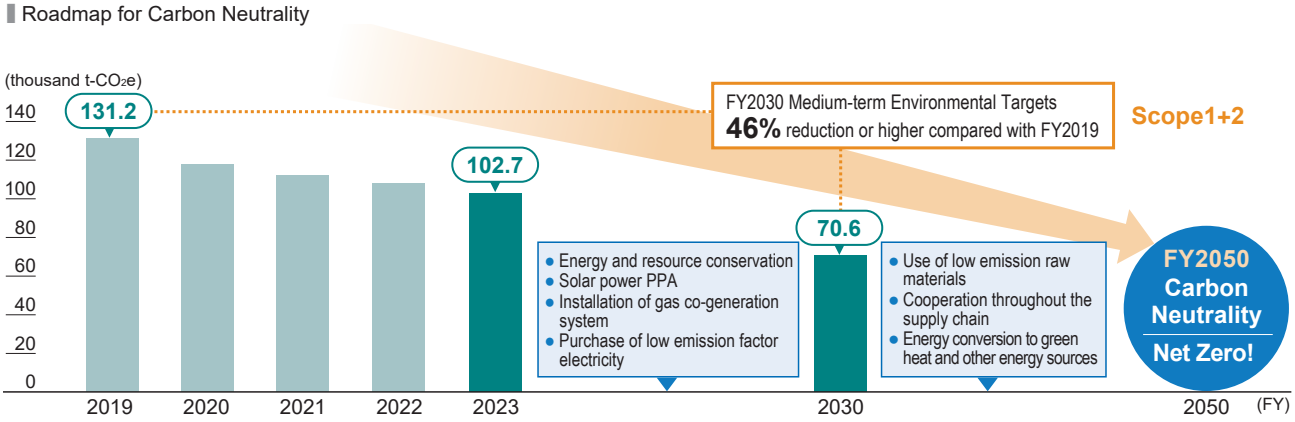


Simulation results of the flood depth of a 1,000-year flood in the 4°C scenario according to "Climate Vision"*4 (top: Tokyo Research Administration Office, bottom: Wuxi area)

Metrics and Targets

As our climate change risk indicator, the Nippon Kayaku Group has set the target of shaving at least 46% off FY2019 Scope 1+2 greenhouse gas emission levels by FY2030. To achieve this goal, we will first aim to reduce greenhouse gas emissions by 3% each year during the **KV25** period. Reaching Scope 1+2 carbon neutrality by FY2050, meanwhile, involves conducting preliminary investigations on switching to green energy sources such as hydrogen and ammonia. Moreover, in order to set future targets which also include Scope 3, we have implemented improvements to our Scope 3 calculation and aggregation method with a view to calculating the emissions (carbon footprint) of each individual product. Our aggregate calculations for Scope 1+2+3 from FY2022 onwards are currently undergoing third-party verification. We will therefore make concerted efforts to link up with suppliers and reduce the environmental burden across the entire supply chain to ensure Scope 3 reductions are delivered.

Roadmap for Carbon Neutrality

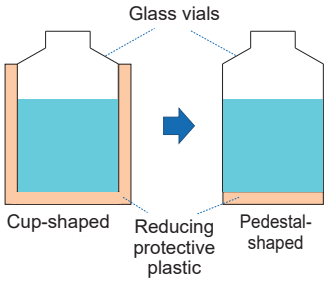


Environmental Initiatives

TOPICS 3 Environmental initiatives in the pharmaceutical business

In the pharmaceutical business, we are striving to reduce greenhouse gas emissions generated by our business activities and protect the environment by devising materials for product packaging and information materials for patients.

Some of our liquid pharmaceutical products use cup-shaped plastic packaging for the glass vials containing the products. As part of our environmental initiatives, we have converted the cup-shaped packaging to pedestal-shaped packaging for some products, significantly reducing the total amount of plastic used in our products. This measure is also expected to curb the waste of petroleum raw materials, which are a finite resource, and reduce greenhouse gas emissions from plastic production, as well as reduce the energy used for transportation by minimizing the weight of products. Going forward, we will consider gradually converting similar cup-shaped packaging to pedestal-shaped packaging for other products.





Adopting paper packaging for syringe and pen formulations

In addition, instead of the conventionally used blister packaging, syringe and pen formulations are packaged in paper, which does not contain plastic. The outer box can be folded compactly after use, eliminating the need to separate paper and plastic and making it more convenient for disposal and recycling.

In addition to gradually converting the paper in individual packaging boxes for pharmaceuticals, cardboard boxes used in shipping, and other information materials for patients to FSC*®-certified paper, we are also gradually expanding the use of environmentally friendly inks that contain almost no volatile organic compounds (VOCs). Of these, we plan to replace 30% of our information materials with environmentally friendly printing products in the three years leading up to FY2026 by proactively replacing them at the right time, such as during reprinting.

* Forest Stewardship Council: An independent, non-profit organization that aims to popularize responsible forest management worldwide and operates an international forest certification system.



TOPICS 4 Aggregation of CO_2 emissions data throughout the supply chain (Scope 3)

In a report published in 2021, the United Nations Intergovernmental Panel on Climate Change (IPCC) sounded the alarm on the frequency and intensity of heat waves, torrential rains, and events caused by global warming judged to be the result of human activities. We must reduce greenhouse gases substantially by acting in cooperation with the chemical industry, which has prospered while using fossil fuels, in order to mitigate global warming and achieve carbon neutrality. The Nippon Kayaku Group calculates CO_2 emissions in our supply chain (Scope 3) in order to ascertain the total volume of greenhouse gas emissions generated in corporate activities and formulate a plan for reducing emissions in the entire supply chain.

From FY2021, we have improved the accuracy of calculations by using more appropriate emissions base units and improved efficiency and reduced the amount of labor involved by automating part of the aggregation work. We also implemented independent verification* of aggregation results. In FY2022, the accuracy of the tabulation of Category 5 “Waste generated in operations” was improved, resulting in even more precise tabulation method. In FY2023, specific initiatives to reduce emissions included switching to low emission factor electricity and utilizing non-fossil certificates in overseas sites such as China. In addition, reduced operation at domestic plants due to the recession in epoxy resins for semiconductors and other factors also contributed to a temporary decrease in emissions.

From FY2024 onwards, we will work to optimize energy across multiple sites, including the utilization of electricity generated by the Takasaki Plant’s cogeneration system at other sites, and deepen internal and external discussions to set targets that encompass the entire supply chain.

Scope 1: Direct emission of CO_2 from emission source that the business owns or manages (emissions from fuel use, manufacturing process, etc.)

Scope 2: Indirect emission from the use of electricity, heat, and steam supplied by another company (use of purchased electricity, etc.)

Scope 3: Indirect emissions outside of scope 2 (procurement of raw materials, employees’ commute, business trips, waste treatment consignment, use of products, disposal, etc.)

* Calculation results for FY2021 onward were independently verified by Sustainability Accounting Co., Ltd.

Category		Emissions (thousand tons-CO_2/year)				
		2019	2020	2021	2022	2023
1	Purchased products and services	243.6	237.3	294.5	275	241.8
2	Capital goods	42.7	42.9	26.8	29.6	33.4
3	Fuels and energy related activities not included in Scope 1 and 2	22.4	21.2	22.3	21.0	20.5
4	Transportation and distribution (upstream)	19.0	17.6	22.3	19.7	16.6
5	Waste generated in operations	26.5	28.8	31.8	16.2	10.8
6	Business travel	0.8	0.8	0.8	0.8	0.8
7	Employee commuting	2.5	2.4	2.4	2.4	2.4
8	Leased assets (upstream)	Not calculated as included in Scope 1 and 2				
9	Transportation and distribution (downstream)	1.0	1.0	1.6	1.5	1.2
10/11	Processing/use of sold products	–	–	–	–	–
12	End-of-life treatment of sold products	15.4	23.2	26.4	23.0	17.6
13	Leased asset (downstream)	0.4	0.4	0.4	0.4	0.4
14/15	Franchise/investment	–	–	–	–	–
Scope 3 total		374.3	375.6	429.3	389.6	345.5
Scope 1		36.2	35.3	37.5	35.5	30.2
Scope 2		94.7	82.5	74.7	72.6	72.5
Total of Scopes 1+2+3		505.2	493.4	541.5	497.7	448.7

Calculation method: As a rule, the amount of CO_2 emitted is calculated based on the General Guidelines on Supply Chain GHG Emission Accounting issued by the Ministry of the Environment and the Ministry of Economy, Trade and Industry, and the emission coefficient listed by the IDEA Research Laboratory at the National Institute of Advanced Industrial Science and Technology's Research Institute of Science for Safety and Sustainability

Consideration for Biodiversity

At the Nippon Kayaku Group, we recognize that biodiversity forms an important base for a sustainable society. However, such biodiversity is currently being lost, in large part due to environmental pollution and deforestation. Thanks to the Nippon Kayaku Group's Responsible Care Policy, environmental considerations, efficient use of resources, climate change initiatives, and preventing pollution of water and air are forever in our minds when we conduct our business activities.

Air pollution prevention and reduction of wastewater and industrial waste

Indicators (KPI)	FY2025 Targets	Results	
		FY2022	FY2023
VOC*1 emissions	(Non-consolidated) Disclose results	(Non-consolidated) 38.7 tons	(Non-consolidated) 32.9 tons
COD*2 emissions	(Non-consolidated) Disclose results	(Non-consolidated) 171.8 tons	(Non-consolidated) 210.9 tons
Total waste output	(Non-consolidated) Disclose results	(Non-consolidated) 27,621 tons	(Non-consolidated) 20,974 tons
Waste recycling rate	(Non-consolidated) 80% or higher	(Non-consolidated) 86.8%	(Non-consolidated) 83.8%
Waste zero emission rate	(Non-consolidated) 1% or less	(Non-consolidated) 0.8%	(Non-consolidated) 0.7%
Develop products and technologies with consideration for environmental issues	Disclose progress	Click URL **The Products and Technologies Creating a Sustainable Future** https://www.nipponkayaku.co.jp/english/sustainability/highlight/innovation/	

*1 Volatile organic compounds *2 Chemical oxygen demand

Environmental Initiatives

TOPICS 1 Color Materials Group, Fine Chemicals Business Unit

Developing water-based inkjet inks for package printing that contribute to safe and environmentally-friendly printing solutions

Our Color Materials Business is developing a revolutionary primer-less (without the need of pretreatment agent) water-based pigment ink which can be printed directly on non-absorbent media.

Our newly developed ink can be printed directly on non-absorbent substrates without the use of primers, making for shorter printing processes while contributing towards reduced energy use. An additional advantage of using water-based inks is being able to significantly reduce the generation of volatile organic compounds (VOCs) while drying. As many inks currently used on non-absorbent media (such as films) are solvent-based, the impact of the high levels of VOCs contained in such inks has become a real issue for user safety and for the environment. By decreasing those VOCs by switching to printing with water-based inks, we can present a solution beneficial to both user safety and environmental protection.



TOPICS 2 Total waste output: approximately 24% reduction (compared to the previous year)

The total volume of waste produced by the Nippon Kayaku Group in FY2023 ran to 22,030 tons, which was 24% down from the 28,934 tons produced in FY2022. In our non-consolidated business, we have also been promoting the recycling of waste previously landfilled or incinerated. Our continued efforts at reducing the environmental burden in this way have yielded a 143-ton (39%) year-on-year reduction in landfilled waste, and a further 0.1% year-on-year fall in zero-emission rates from 0.8 to 0.7%.

We will continue working towards environmental conservation and a sustainable society by promoting waste volume reduction and the effective use of waste and easing the heavy environmental burdens posed by landfilled waste.



TOPICS 3 Fukuyama Plant Initiatives aimed at reducing water use

The Fukuyama Plant has been producing inkjet printer dyes since the year 2000 and has consequently invested effort into improving wastewater treatment methods, looking into individual processes tailored to production type and examining numerous ways of altering production processes to lower environmental burdens.

The fruits of such activities can be seen in the form of phased reductions in contracted industrial water amounts, which fell from 24,000 m³ to 23,000 m³ per day in FY2015, and to 22,000 m³ per day in FY2018. Thanks to further polishing of its wastewater treatment methods, the plant is now able to produce more on the same amounts of industrial water. It is also working on reducing the amounts of regular water used for both production and equipment cleaning.



Fukuyama Plant wastewater treatment facility

TOPICS 4 Takasaki Plant Plant operations in harmony with the natural environment

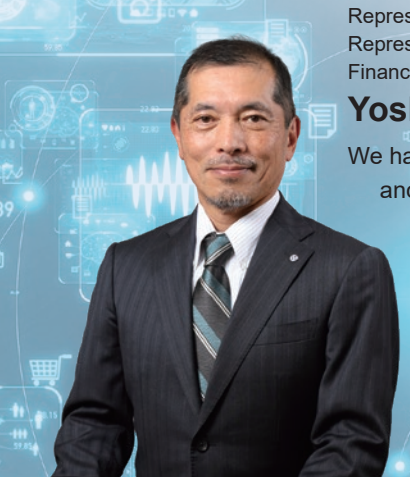
From the outset, the Takasaki Plant aimed for “coexistence with nature,” and secured the ISO 14001 certification in January 2001. Under the slogan, “The Takasaki Plant: Continuing to Protect Life and the Environment,” the plant has fixed its environment policy as: “Each and every person here shall be sufficiently conscious of working in an industry connected to human life, and, based on such consciousness, work towards promoting environmental conservation and plant harmony with the abundant natural environment.”

The Takasaki Plant’s environmental conservation initiatives include measures such as the discharge control of the site’s treated wastewater. As a method of controlling the discharge of treated wastewater from the plant, we have built a dam to divide our on-premises creek into two areas. The first creek temporarily pools plant wastewater which has been detoxified via an activated sludge process. The second creek’s water quality is measured daily and, subject to levels being confirmed as normal, has its sluice gate opened to allow for water discharge of into the river. We are thereby taking every possible measure to prevent environmental pollution.



The site of Takasaki Plant in harmony with nature

DX



Representative Execurive Vice President
Representative Director, In charge of Corporate Planning Division, Corporate Communications Division, Finance & Accounting Division, Information Systems Division and Purchasing Division

Yoshitsugu Ishida

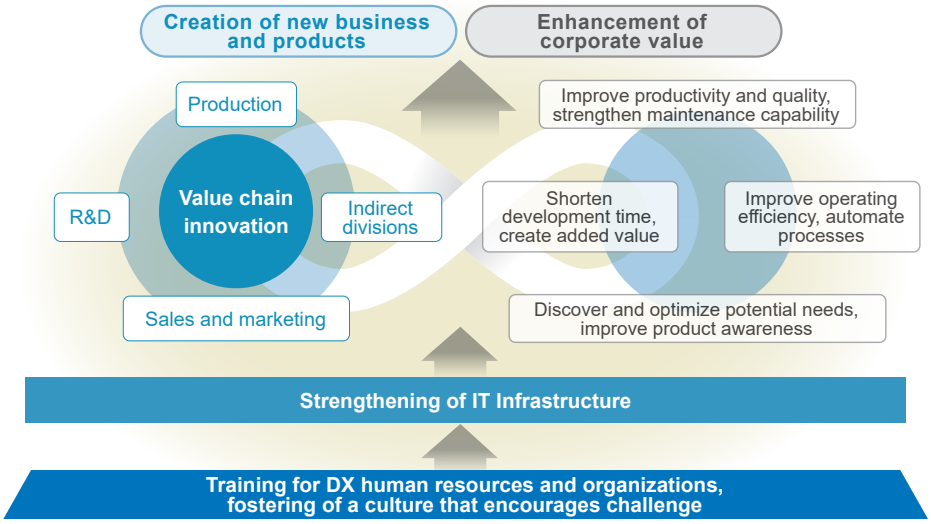
We have positioned DX as a company-wide material issue. We have formed a DX Promotion Team anchored by the Information Systems Division and are continuing activities to make steady progress on developing the groundwork for that challenge by FY2025, the final fiscal year of the Medium-term Business Plan (**KV25**).

In addition to improving each employee's literacy and building IT / network environment, we have begun to make changes happen steadily in each area, such as DX initiatives in manufacturing and R&D, which require speed to keep up with the competition.

We will steadily advance the **KV25** plan toward the ultimate goal of creating new products and services and providing new value to our customers by transforming the entire value chain.

DX Initiatives and Vision of the Nippon Kayaku Group

In anticipation of changes in the value chain of the company as a whole, we have begun to strengthen and establish IT infrastructure and implement production DX linked to workplaces. In research, an informatics environment has begun to be built and used, and progress is being made in initiatives led by researchers and engineers as well as projects.



Strengthening of IT Infrastructure / Cybersecurity

FY2024 Themes for Strengthening IT Infrastructure

Initiatives to improve utilization of the IT environment

- Strengthening of security measures
- Company-wide education to improve IT skills / literacy

DX education and initiatives to improve IT skills

- Implementation of DX education for all employees
- Consideration of development of specialized human resources

Renewal of core operating systems

- Renewal of operating systems centered on ERP

We have almost achieved our immediate goal of establishing a company-wide IT environment that enables secure and speedy communication "anytime, anywhere, and with anyone."

In this fiscal year, we are continuing our initiatives to strengthen cyber security measures. By further improving the company-wide utilization of communication tools and business applications that we have introduced so far, we have also begun initiatives to improve skills to increase work productivity.

We will take sufficient time, including the period of **KV25**, for studying the next core operating system, enterprise resource planning (ERP) so that data from various business activities can be accumulated and used for speedy management decision-making.

In addition, to promote DX company-wide, we have gradually started implementing DX literacy education for all employees and initiatives for the development of specialized human resources.

DX

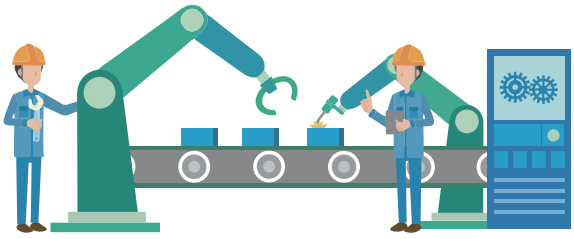
Production DX — DX Linked to Workplaces

FY2024 Themes for Supporting Digital Utilization of Production Operations

Support for smart factory development	■ Fukuyama Plant: System redesign of existing facilities ■ Asa Plant: Digitalization of new building operations ■ Fostering of factory scientists from frontline personnel
Consideration of automation of production processes	■ Automation of inspection process by image recognition, and manpower saving ■ Consideration of application to automotive safety components, functional chemicals, pharmaceuticals, and agrochemicals
Operational technology (OT) network development	■ Development of a network for integrated control and operation of the plant hardware

Promotion of Smart Factory Development

As part of production DX aimed at improving process efficiency and cost competitiveness, we are promoting smart factory development starting with new plants and facilities that have expanded due to the booming economy. At the new plant for the increased production of epoxy resin, which is scheduled to start operation in 2025 within the Asa Plant, as well as at the Fukuyama Plant in conjunction with the new industrial inkjet ink plant scheduled to start operation in the same year, we are preparing to introduce new digital tools and automation equipment that will help improve productivity, save manpower, reduce labor, and strengthen quality and safety management. Utilizing our know-how in these smart factory developments, we plan to work on not only introducing new facilities but also improving efficiency and reducing labor at existing plants from FY2025.





New plant facility AK-11 (in Asa Plant)

Measures for new plant facility AK-11 (in Asa Plant) for epoxy resin production

- Production scheduler ❶
- Semi-automation of the reaction process (raw material filling and transportation) for improved efficiency ❶
- Automatic electronic recording of analog measuring instruments by remote monitoring system ❶ ❷
- Visualization of data collected by automatic recording, trend analysis, and quality control ❶ ❷
- Digitalization of production records ❶
- Video manuals to supplement standard operation documents and help improve work uniformity ❶ ❷

Measures for new plant facility A-I-1 (in Fukuyama Plant) for industrial inkjet ink production

- Introduction of automatic product transfer equipment ❶
- Automatic ink blending equipment ❶ ❷
- Introduction of various BI tools to promote process improvement and energy saving ❶ ❷
- Video manuals to supplement standard operation documents and help improve work uniformity ❶ ❷
- Remote monitoring and process control using explosion-proof tablets ❶



New plant facility A-I-1 (in Fukuyama Plant)

❶ Improvement of productivity, manpower saving and reduction of labor ❷ Strengthening of quality and safety control (Includes schedule)

Fostering of Factory Scientists

In terms of human resources, we are working on developing factory scientists, who drive digitalization of manufacturing sites and serve as the right-hand persons of the plant supervisors. In FY2023, we completed basic lecture training for nine participants from plants in Japan. In the future, we will develop and utilize a community of factory scientists to actively exchange information, such as by horizontally sharing their respective issues and initiatives. We will also promote specialized education and measures, including acquiring knowledge about digitalization in line with the operations of each plant and considering automation of production using robots and other tools, as well as promote the digitalization of indirect division operations.



R&D DX — Improvement and Utilization of the Environment for Informatics

FY2024 Three Major Initiatives for R&D DX

Accumulation of digital data	■ Verification of the introduction of electronic laboratory notebooks ■ Establishment of OT network of each research laboratory
Utilization of digital data	■ Introduction of digital tools for R&D ■ Data analysis support (resident dispatch, external agency collaboration)
Education to improve literacy and skills	■ Provision of training and materials to improve DX literacy and skills for researchers

Promotion of DX Support Tailored to R&D Sites — Research Strategy Group, R&D Planning Division

As part of the Nippon Kayaku Group's activities to promote DX in research, the Research Strategy Group of the R&D Planning Division is playing a leading role in creating an environment where researchers and engineers can freely verify machine learning and cloud computing for informatics. In addition, to enable efficient and speedy research and development, we are providing comprehensive support tailored to the challenges of each business unit and specialized field.

Following the establishment of a system for the utilization of digital tools in FY2022, we focused on sharing education and knowledge in FY2023. Specifically, we introduced multiple data analysis lectures by invited lecturers and computational chemistry exercises through a graduate school program for working professionals. We are also conducting community activities so that those interested can be actively involved in fostering the group's DX culture.

In addition, as a practical initiative in the research field, a representative from the Research Strategy Group of the R&D Planning Division was dispatched to Agrochemicals Laboratories, which is responsible for research and development of agrochemicals, for one year from January 2023 to establish a system to utilize data science in daily research. This activity was shared as a case study with research departments at the KAYAKU Technology Forum 2023, an internal event for research and development and technology exchange.

Since we started promoting DX company-wide during the **KV25** period, the number of research DX issues and discussions within the group has continued to increase gradually. Currently, we are working on the support for introducing advanced informatics and considering future laboratory automation to support changes that will enable each laboratory's research and development to continue demonstrating their competitiveness.

