Nippon Kayaku Group Products and Technologies for Creating a Sustainable Future

The Nippon Kayaku Group aims to be a company that is essential to the world, by developing high value-added products based on "Global SUKIMA Ideas" which may even come to prominence in niche areas. We contribute to the resolution of social issues by providing the best products, technologies and services for the creation of a sustainable society.

Mobility & Imaging Business Unit
Safety Systems Business
PARASAFE

Outline of Products and Services

PARASAFE® ("PARASAFE") is an emergency parachute system for industrial-use drones. When a drone is about to fall due to unforeseen circumstances, the PARASAFE system fires a parachute to slow the drone's speed of descent and reduce the shock of impact upon collision with the ground. The Nippon Kayaku Group is a global supplier of explosives and gas generators for automotive airbags, and PARASAFE uses the same technology as automotive safety components that achieve high reliability. Using PARASAFE enables safe and secure use of drones.

Innovation and Novelty

PARASAFE and its use combine know-how cultivated in the pyrotechnics safety and automotive safety components businesses, which Nippon Kayaku has inherited from the time of its founding, and our new specialist technologies.

1. Pyrotechnics safety: industrial explosives are excellent materials that generate constant energy, instantaneously and reliably. However, one wrong step in handling these explosives can lead to a major accident or disaster. Having been involved with explosive products for many years since our founding, our thorough knowledge of their properties and safe handling is a major advantage for Nippon Kayaku.
2. Development capability for high-performance parts: Our advantage lies not only in our ability to develop materials, but also safety components combining high performance with reliability and durability. We make all parts ourselves, leveraging know-how cultivated through the development of automotive safety components, such as material component shape design, simulations of movement during operation, and prototype construction and evaluation.
3. Sensing programming technology: A device called ATS (Autonomous triggering system) is required to detect dangerous drops in altitude and activate safety components. We are also working to deliver an ATS that is optimal for PARASAFE operation, such as selecting necessary sensors from drone flight data and simulations, and developing operating programs for safety components.

External Environment Factors

- Looking ahead, industrial drones are expected to play an active role in various applications such as logistics, inspection, measurement and surveying, and disaster relief operations to create a more convenient society. In Japan, we took a step toward practical application in December 2022 with the enactment of Level 4 legislation for unmanned aerial vehicles (flight outside of visual sight, without assistance, in populated areas).
- Industrial drones are expected to achieve rapid widespread use in the future, and the overall market scale for airframes, peripheral devices, and services for logistics and inspection applications which are the key target markets for PARASAFE is expected to reach 250 billion yen by 2025.
- As a new initiative, the development of flying cars is also underway as the next advancement in air mobility through the application of drone technologies, and the exploration of new social concepts shifting from logistics and inspection applications to transporting people has begun.

As described above, the scope of business relating to aerial drones is rapidly increasing.
At the same time, ensuring safety is the most important factor, and it is necessary to take appropriate measures.

Environmental Value

- When a drone falls during flight at sea, in some cases it may lead to marine pollution due to the scattering of materials being transported, or gasoline from hybrid drones themselves. Even in such cases, marine pollution can be prevented through the use of PARASAFE.
- When a drone falls while flying in the mountains, in some cases it may lead to forest fires due to ignition and batteries caused by fallen equipment, etc. Even in such cases, forest fires can be prevented through the use of PARASAFE.
- By utilizing PARASAFE when a drone falls, damage to the drone body can be reduced, so the generation of waste can also be reduced.
- By encouraging the adoption of drones equipped with PARASAFE in society, the use of clean energy will increase because CO2-emitting vehicles currently used for logistics and transportation will be replaced with energy-saving drones and other aircraft.

Social Value

The practical application of drones will make it possible to finish various tasks efficiently in a short period of time, and it is expected that this will contribute to increasing convenience in society. But no matter how high the reliability of flight may become, the risks in the unlikely event of a fall (crash) cannot be underestimated.

- In the event of accidents in drone-related businesses, installing PARASAFE on drones will help to reduce collision damage not only to the drones themselves but also to people, buildings, automobiles, etc., on the ground, and to reduce credit and credibility risks such as compensation for damages and criminal penalties.
- Encouraging the adoption of drones equipped with PARASAFE in society will be useful for a stable supply of daily necessities and pharmaceuticals to depopulated areas.
- Encouraging the adoption of drones equipped with PARASAFE in society will also enable response in areas where it is difficult for humans to conduct inspections in person, which will help to improve safety and reduce costs.

Contribution to the SDGs

Relation to *KV25* Materiality

- Company-wide Material Issues: Creation of New Business and Products
- Company-wide Material Issues: Mitigation of Climate Change
- Key Sustainability Issues: Reducing Energy Consumption and Greenhouse Gas Emissions
- PARASAFE product information

Mobility & Imaging Business Unit
Polatechno Business (MOXTEK)
Portable X-ray Sources for Border and Airport Security

The Mox140G is a compact, lightweight, portable X-ray source that can operate at a high voltage potential of 140kV. It is ideally configured for portable X-ray backscatter imaging, and is used particularly in the security market, such as for border security and airport security applications.

External Environment Factors

Demand for security screening equipment is increasing due to recent increases in terrorist attacks and illegal immigration, increases in the deployment of security solutions for border and airport security applications, and increases in narcotics smuggling.

Innovation and Novelty

The security market demands solutions that can see through a variety of objects, including backpacks, car seats, tires, and exterior metal panels. Seeing through thick objects or objects made of heavy elements such as iron by X-ray backscattering requires an X-ray source that can emit higher energy X-rays. In order to emit high-energy X-rays, the X-ray source must operate at a high voltage, but using a high-voltage X-ray source tends to make the device larger and more cumbersome. Having a small, lightweight, portable X-ray source can greatly reduce restrictions on the range of locations where inspections can be conducted. The Mox140G has a major advantage in the security market because it is portable in size and weight, yet can operate at a high voltage of 140kV.

Portable X-ray backscatter imaging
* Image used courtesy of Viken Detection.

Environmental and Social Value

Use of the Mox140G significantly reduces illegal financing, narcotics and weapons trafficking, and contributes to the eradication of all forms of organized crime, including terrorism.

Contribution to the SDGs

Relation to *KV25* Materiality

- Company-wide material issues: Creation of New Business and Products

Mobility & Imaging Business Unit
Polatechno Business (MOXTEK)
Environmental Monitoring by XRF (X-ray Fluorescence)

MOXTEK offers high-performance, high-durability X-ray sources, highly durable window materials with high X-ray transmittance, and competitively priced detectors—all key parts of XRF analysis devices.

External Environment Factors

There is growing social interest in safety, such as in the regulation of environmental pollutants (heavy metals, etc.) Devices for use at scrap sorting sites (for the purpose of mineral recycling) and soil testing sites must be easily portable (lightweight) and enable inspections to be completed very rapidly.

Use

Common applications of XRF include the analysis of petroleum and other fuels, plastics, rubber and textiles, pharmaceuticals, food products, cosmetics and body care products, fertilizers, geological materials, mining samples, slag, cement, heat-resistant materials, and glass. XRF is also used for monitoring contaminated solid waste, wastewater, cleaning fluids, pools and filters, as can also be used for sorting materials such as minerals with high speed and accuracy. A selection of detectors is also available depending on the usage environment, ranging from bench-top to handheld types. XRF is widely used at laboratories, various facilities, outdoors, and at various sites in the field.

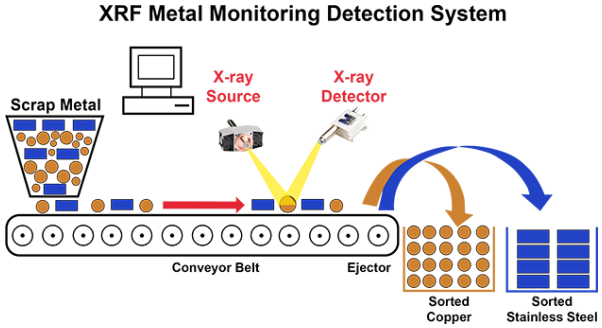
How XRF (X-ray Fluorescence) Works

When X-rays are fired at an object, X-rays with energies specific to the elements that make up that object are returned. The X-ray detector analyzes the elemental composition of the object based on the energies of these returned X-rays. This method of elemental analysis can be used for all basic states of matter (solids, liquids and gases), and is one of the techniques used in day-to-day analysis.

Innovation and Novelty

MOXTEK offers high-performance, high-durability X-ray sources, highly durable window materials with high X-ray transmittance, and competitively priced detectors—all key parts of XRF analysis devices. The handheld Magnum (a lightweight, compact X-ray source), window coverings with DuraCoat technology offering superior performance in harsh environments, and customer-friendly XPIN detectors are used in a range of applications, including environmental monitoring and material sorting.

Soil tests



Material sorting

Environmental and Social Value

Through rapid elemental analysis, we can analyze the environment in which we live and contribute to a more comfortable and livable global environment. In sorting of materials for recycling, XRF sorts more materials faster. MOXTEK pursues and provides even higher performance parts for an earth-friendly environment.

Contribution to the SDGs

Relation to *KV25* Materiality

› Company-wide material issues: Creation of New Business and Products

Fine Chemicals Business Unit
Catalysts Business
Development of Catalysts that Contribute to the Realization of a Hydrogen Society

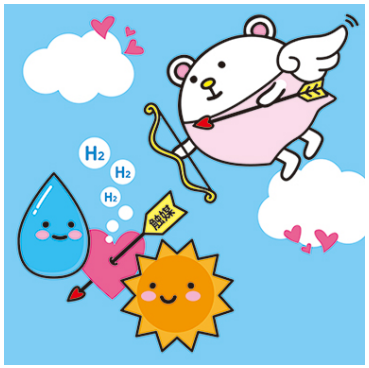
In the Catalysts Business, we work on developing catalysts that contribute to the creation of a hydrogen society.

External Environment Factors

Deadliest natural disasters related to extreme weather have increased, and this seems to be caused by global warming derived from ever-increasing amount of carbon dioxide and other greenhouse gasses generated by the consumption of fossil fuels such as petroleum and coal. Under these circumstances, there is a need for the development of new energy sources which do not emit greenhouse gases.
Hydrogen, which does not emit carbon dioxide on combustion, has been attracting attention as a clean source of energy, and its stable supply is expected to various applications such as fuel cells for automobiles and power generators.

Innovation and Novelty

For producing hydrogen using catalysts, we focus on an environment-friendly method that thermochemically decomposes water by concentrating 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 to generate cost advantages by employing a three-dimensional reaction field.
In October 2021, taking advantage of our expertise and technology, we developed a catalyst for hydrogen production and provided its prototype to our partner's pilot plant. Production of hydrogen will be carried out there, and the acquisition of initial data including economic efficiency will be completed by the end of FY2023. We will subsequently proceed with scale-up studies based on the data, and a commercial plant using our catalyst is expected to start its operation from 2025 onwards.
Furthermore, discussions are underway to develop catalysts for hydrogen carriers which enable efficient storage, transport and extraction of hydrogen by significantly reducing its volume. We continue to explore how we make most of our catalyst technology and contribute to the entire hydrogen energy system.



Environmental and Social Value

Hydrogen can make a significant contribution to the fight against global warming as a clean energy source which does not emit carbon dioxide when combusted. In addition, hydrogen can be produced and procured from a variety of resources, thus contributing to energy diversification and energy security.

Contribution to the SDGs

Relation to *KV25* Materiality

- Company-wide material issues: Mitigation of Climate Change
- Key sustainability issues: Reducing Energy Consumption and Greenhouse Gas Emissions

Life Science Business Unit Agrochemicals Business
Introduction of Biostimulant materials

In the Agrochemicals Business, we began handling Biostimulant materials to help achieve sustainable agricultural production.

External Environmental Factors

As area of arable land is limited despite the continued trend of worldwide population growth, at this rate per-capita food production is undoubtedly expected to decline. Moreover, climate change caused by global warming and other factors reduces agricultural production efficiency. Compounded with sharply rising material prices, there are concerns that food security will be increasingly threatened. Biostimulants are now attracting attention as materials that could help solve these issues.

Innovation and Novelty

Biostimulants act upon on plant physiology along a different path to nutrients, as agricultural materials that enhance plants' resistance to "abiotic stresses" such as drought, cold weather, salinization and physical damage (hail and wind damage), improving yields and quality as a result. Seaweed extract, amino acid materials and humic acid are some specific examples of Biostimulants. These materials are expected to have effects such as promoting the nutrient absorption, activating photosynthesis or accelerating flowering and fruit setting. In the Agrochemicals Business, we believe that our expertise in evaluation and formulation technologies will maximize the efficacy of Biostimulants, aiding in the further progress and widespread adoption of Biostimulant materials.

Our Biostimulant items

The plants to the left of the entrance have been treated with Biostimulant materials. The plants on the right are untreated.

Environmental and Social Value

Biostimulants are expected to draw out the inherent qualities of crops and soil environments and reduce the excessive use of agrochemicals and fertilizers, thereby reducing the negative impact on the environment and preserving ecosystems at crop production sites.

Contribution to the SDGs

Relation to *KV25* Materiality

- Company-wide Material Issues: Creation of New Business and Products
- Agrochemicals Group Website (Japanese)