The Products and Technologies Creating a Sustainable Future

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The Nippon Kayaku Group, through its “Global SUKIMA Ideas” initiative, aims to produce products offering high additional value and the potential to stand out even in niche markets in its quest become indispensable to the world. Through providing the best products, technologies and services for the creation of a sustainable society, we will contribute to resolving social issues.

Mobility & Imaging Business Unit
Safety Systems Business
PARASAFE

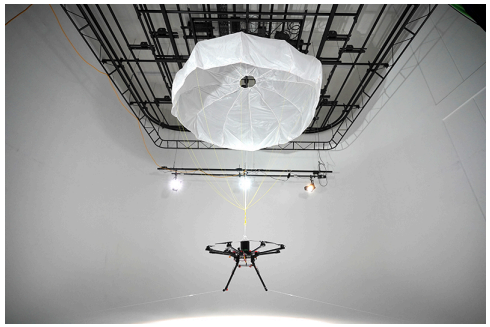
Outline of Products and Services

PARASAFE® (“PARASAFE”) is an emergency parachute system for industrial-use drones. When a drone seems set to fall due to unforeseen circumstances, the PARASAFE system launches a parachute to slow the drone’s descent and reduce the shock when it impacts the ground. The Nippon Kayaku Group is a global supplier of explosives and gas generators for automotive airbags, and PARASAFE makes use of the same technology for its highly-reliable automotive safety components. In short, use of PARASAFE makes it possible to fly drones more safely and securely.

Novelty and Innovation Details

PARASAFE and its applications combine specialist new technologies with Nippon Kayaku knowhow from the pyrotechnics safety and automotive safety components business cultivated since the time of our foundation.

1. Pyrotechnic Safety: Industrial explosives are truly excellent materials for the generation of constant energy in an instantaneous and reliable fashion. However, only one wrong step in the handling of these explosives can trigger a major accident or disaster. Nippon Kayaku’s thorough knowledge of explosive properties and safe handling methods, developed over many decades of involvement with explosives since our foundation, represents a major company advantage.
2. Development Capability for High-performance Parts: Our strengths not only lie in our materials, but in our ability to develop safety components combining high performance with reliability and durability. We make all of our parts in-house through leveraging our knowhow cultivated through developing automotive safety parts, concerning material component shape design, simulations of movement during operation, and prototype construction and evaluation.
3. Sensing Programming Technology: In order to detect dangerous drops in altitude and activate the relevant safety components, a so-called “Autonomous Triggering System (ATS) Device” is required. We are thus working on delivering the optimal ATS for PARASAFE through selecting the necessary sensors from drone flight data and simulations, and developing safety component operating programs.




External Environmental Factors

- Looking ahead to the advent of a yet more convenient society, industrial drones are expected to play an active role via their application to logistics, inspections, measurements and surveying, and disaster relief operations. December 2022 saw Japan introduce a new system for Level 4 Flights (unassisted flights Beyond the Visual Line of Sight in populated areas). The country's first Level 4 flight delivery was successfully completed by a PARASAFE-installed industrial drone in March 2023.
- The market for industrial drones is expected to easily outstrip that for general-use drones and be worth over 50 billion dollars by the year 2030.
- In terms of new initiatives, we can see plenty of moves to deploy drones over expanses of water, for example for inspections of floating solar panels and offshore windfarms, and the distribution of items over rivers and seas.

As described above, the scope of business for aerial drones is rapidly growing. At the same time, the most important element is safety, and we must respond appropriately.

Environmental Value

- Drones that crash and sink into the sea are connected to marine pollution. This can be prevented, however, in the form of a PARASAFE Floating Parachute System, which integrates floating functions with reduced crash-impact functions.
- There are cases in which drones that crash into mountains may cause forest fires due to batteries or devices igniting. The use of PARASAFE, however, can prevent even those situations from occurring.
- Deployment of PARASAFE on a crashing drone can reduce damage to the drone body and, consequently, waste.
- Accelerating the popularization of PARASAFE-installed drones across society will lead to improved green energy usage rates, as energy-saving flying objects gradually replace the CO_2-emitting vehicles currently used for logistics and transportation.

Social Value

The practical application of drones will render it possible to finish all kinds of tasks in short periods of time, triggering hopes of a yet more convenient society. But however reliable drone flights may become, the risks in the unlikely event of a fall cannot be overlooked.

- When an accident occurs during drone-related business, the installation of PARASAFE will reduce the impact of collision damage not only on the drone itself but on people, buildings and automobiles positioned on the ground, thereby reducing the credit risks associated with compensation and criminal punishments.
- Popularizing PARASAFE-installed drones throughout society will aid efforts to deliver stable supplies of daily necessities and pharmaceutical drugs to depopulated areas.
- Popularizing PARASAFE-installed drones throughout society will increase the possibilites for inspections in areas difficult for humans to enter, thereby helping to improve safety and reduce costs.

Contributing to SDGs

Relationship with *KV25* Materiality

- Important Groupwide Issue: Creation of New Business and Products
- Important Groupwide Issue: 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 and 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 particularly used in the security market for operations pertaining to border and airport security.

External Environmental Factors

Demand for security screening equipment is increasing due to recent upsurges in terrorist attacks and illegal immigration, expanded use for border and airport security solutions, and increased incidences of drug smuggling.

Novelty and Innovation Details

One demand placed on the security market is the ability to see through all manner of objects, including backpacks, car seats, tires and exterior metal panels. The act of using X-ray backscattering to see through thick or heavy-element-made (e.g. iron) objects requires an X-ray source capable of emitting higher energy X-rays. That kind of X-ray source must operate at a high voltage, which tends to entail enlargement of the overall device. On the other hand, a small, lightweight, portable X-ray source can greatly loosen physical restrictions within areas to be inspected. The Mox140G holds a major advantage in the security market due to its ability to operate at high voltages while remaining portable in size and weight.

Portable X-ray backscatter imaging
*Photograph courtesy of Viken detection.

Environmental and Social Value

The use of the Mox140G significantly reduces illegal financing, and the trafficking of drugs and weapons, thereby helping eradicate all forms of organized crime, including terrorism.

Contributing to SDGs

Relationship with *KV25* Materiality

› Important Groupwide Issue: Creation of New Business and Products

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

MOXTEK provides “high-performance and durability” X-ray sources, highly durable window materials with high X-ray transmittance, and competitively priced detectors, which are all key components of XRF analysis devices.

External Environmental Factors

Interest is currently growing in the safety of everyday community, including matters such as the regulation of environmental pollutants (heavy metals, etc.) Devices to be used at scrap sites for scrap sorting (for the purpose of mineral recycling) and soil testing must have good portability (lightness) and enable rapid completion of inspections.

Uses

XRF is commonly applied in 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. It is further used in the monitoring of contaminated solid waste, wastewater, cleaning fluids, pools and filters, and can also be used for sorting materials such as minerals with high speed and accuracy. From benchtop to hand-held types, a different detector can be selected according to the environment. XRF is widely used at various facilities, both indoors and outdoors, including research labs.

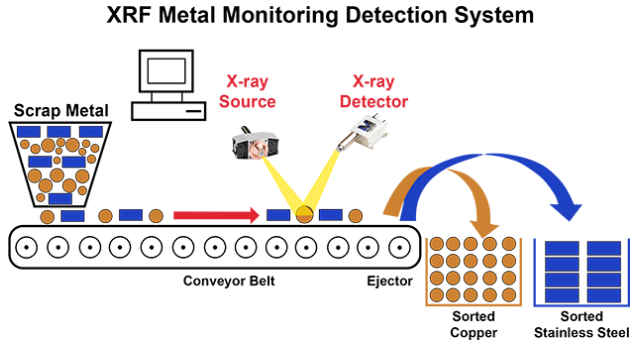
How XRF (X-ray Fluorescence) Works

The launching of X-rays at an object causes X-rays with energies peculiar to the object in question to bounce back, thereby allowing the X-ray detector to analyze that object’s elemental composition. 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 everyday analysis.

Novelty and Innovation Details

MOXTEK provides “high-performance and durability” X-ray sources, highly durable window materials with high X-ray transmittance, and competitively priced detectors, which are all key components of XRF analytical devices. Our handheld Magnum (a lightweight, compact X-ray source), window coverings which boast DuraCoat technology offering superior performance even in harsher environments, and customer-friendly XPIN detectors have numerous applications, including in the fields of environmental monitoring and material sorting.

Soil testing



Material sorting

Environmental and Social Value

Through rapid elemental analysis can we analyze the environment in which we live and contribute to a more livable global environment. XRF will fulfil the function of sorting greater numbers of materials in lesser amounts of time. For the sake of securing an environment which is kind to Planet Earth, MOXTEK will strive for yet higher-performance parts.

Contributing to SDGs

Relationship with *KV25* Materiality

› Important Groupwide Issue: Creation of New Business and Products

Fine Chemicals Business Unit: Color Materials Business
Developing water-based inkjet inks for package printing, for safe and environmentally-friendly printing solutions

Our Color Materials Business is developing high-quality water-based pigment inkjet inks for the package printing market, that are safe and environmentally friendly.

External Environmental Factors

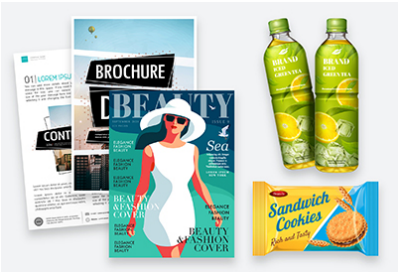
The printing industry is currently facing a diverse array of issues. One is the environmental and safety impacts of the large quantities of organic solvents and chemical substances used in the manufacturing and cleaning of printing plates for analog printing. One solution for this is the transition to digital printing which is easier to operate and does not require printing plates. This transition also allows users to reduce their production lead tme, which can lead to lower stocks, reduced generation of waste, and improvements to the working environment.

Novelty and Innovation Details

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. While conventional water-based pigment inks tend to run when directly applied to non-absorbent media (such films), resulting in blurry, unclear images. Solving this problem usually requires the use of a primer (pretreatment agent) to create an ink-receptive layer on the printing surface. However, 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.

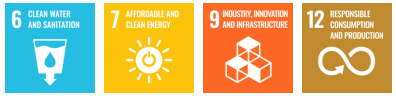
In general, water-based inkjet printing has been thought to fall short of current printing methods, such as flexographic printing, in terms of coloring capacity and picture quality. However, the inks we have developed through our partnership with a printing device manufacturer has rendered possible the technically difficult feat of clean dot formation on non-absorbent media without using a primer, thereby elevating inkjet printing's coloring capacity and picture qualities to levels equal to or better than those of flexographic printing.



Environmental and Social Value

The waterbased design of our inks allows for a higher level of user safety and environmental protection. , Additionally, the benefits that inkjet printing can provide, such as lower stocks and reduced generation of waste, can help the package-printing market realize Just-in-Time operations (making only what is needed, only when needed, only in the amount that is needed what is necessary, when necessary,).

Contributing to the SDGs



Relationship with *KV25* Materiality

- Important Groupwide Issue: Mitigation of Climate Change
- (Key Sustainability Issues) Reducing Energy Consumption and Greenhouse Gas Emissions
- (Key Sustainability Issues) Reduction of Wastewater and Industrial Waste

Fine Chemicals Business Unit: Catalysts Business
Developing Catalysts that Help Realize a Hydrogen-powered Society

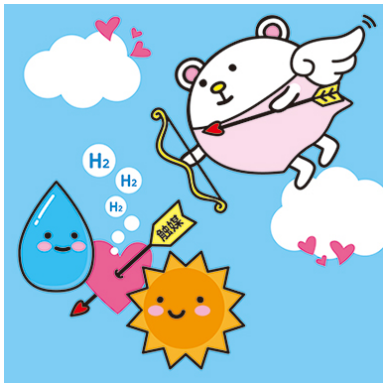
Our Catalysts Business is working to develop catalysts that contribute towards realizing a hydrogen-powered society.

External Environmental Factors

The deadliest forms of extreme-weather-related natural disasters are increasing. One key reason seems to be the progression of global warming stemming from the continual increase in carbon dioxide and other greenhouse gases pumped into the atmosphere through the consumption of fossil fuels such as oil and coal. Against this backdrop are we required to develop new energy sources which do not emit greenhouse gases. Hydrogen, which emits no carbon dioxide even when burned, has been gathering attention as a clean energy source, and expectations abound that it can be stably supplied for use in automobile fuel cells and power generators.

Novelty and Innovation Details

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 cost advantages by employing a three-dimensional reaction field. October 2021 saw us utilize our expertise and technology to develop a catalyst for hydrogen production and forward its prototype to our business partner's pilot plant. Our plan is to actually make hydrogen at the plant together with our partner and acquire initial data on economic efficiency during FY2024. We will use the initial data gained as our base for exploring production scale-ups and commercialization as we aim for practical application sometime post-2025.
In addition to hydrogen production, we are also exploring the development of catalysts for hydrogen carriers which enable efficient storage, transportation and hydrogen extraction through dramatic reductions in volume. We are also searching for ways to deploy the core technologies of our catalyst business across the entire hydrogen energy system.



Environmental and Social Value

As a clean energy source with zero carbon dioxide emissions during combustion, hydrogen can contribute significantly to the fight against global warming. It can also be produced and procured from a variety of resources, thereby contributing to diversified energy supply lines and overall energy security.

Contributing to SDGs

Relationship with *KV25* Materiality

- Important Groupwide Issue: Mitigation of Climate Change
- (Key Sustainability Issues) Reducing Energy Consumption and Greenhouse Gas Emissions

Life Sciences Business Unit: Agrochemicals Business Introduction of Biostimulant Materials

Our Agrochemicals Business began handling biostimulants to help achieve sustainable agricultural production.

External Environmental Factors

The world's population continues on an upward trend yet arable land remains limited, meaning that as things stand, per capita food production is predicted to certainly decline. Moreover, with agricultural production efficiency dropping due to climate change effects caused by global warming, and with ingredient prices sharply rising on top, there are real concerns that food security will be increasingly threatened. Biostimulants are therefore being spotlighted as part of the solution to these problems.

Novelty and Innovation Details

Biostimulants act upon plant physiology via a different path to nutrients. As agricultural materials that enhance plant resistance to so-called "abiotic stresses" such as drought, cold weather, salinization and physical damage (from hail and wind), they can consequently improve crop yields and quality. Specific biostimulant examples include seaweed extract, amino acid materials and humic acid, and the hope is that they deliver effects to the tune of accelerating nutrient absorption, activating photosynthesis and speeding up flowering and fruiting. In the Agrochemicals Business we believe that our expertise in evaluation and formulation technologies will maximize biostimulant efficiency and aid further advancements and popularization of biostimulant materials.

A biostimulant item we handle

The plants left of the entrance have been treated with biostimulants. The plants on the right have not.

Environmental and Social Value

It is hoped that biostimulants will draw out the inherent qualities of crops and soil environments, and lead to a reduction in overuse of agrochemicals and fertilizers, thereby decreasing the environmental burden and preserving ecosystems at crop production sites.

Contributing to SDGs

Relationship with *KV25* Materiality

- Important Groupwide Issue: Creation of New Business and Products
- Our Agrochemicals Business Website (Japanese)