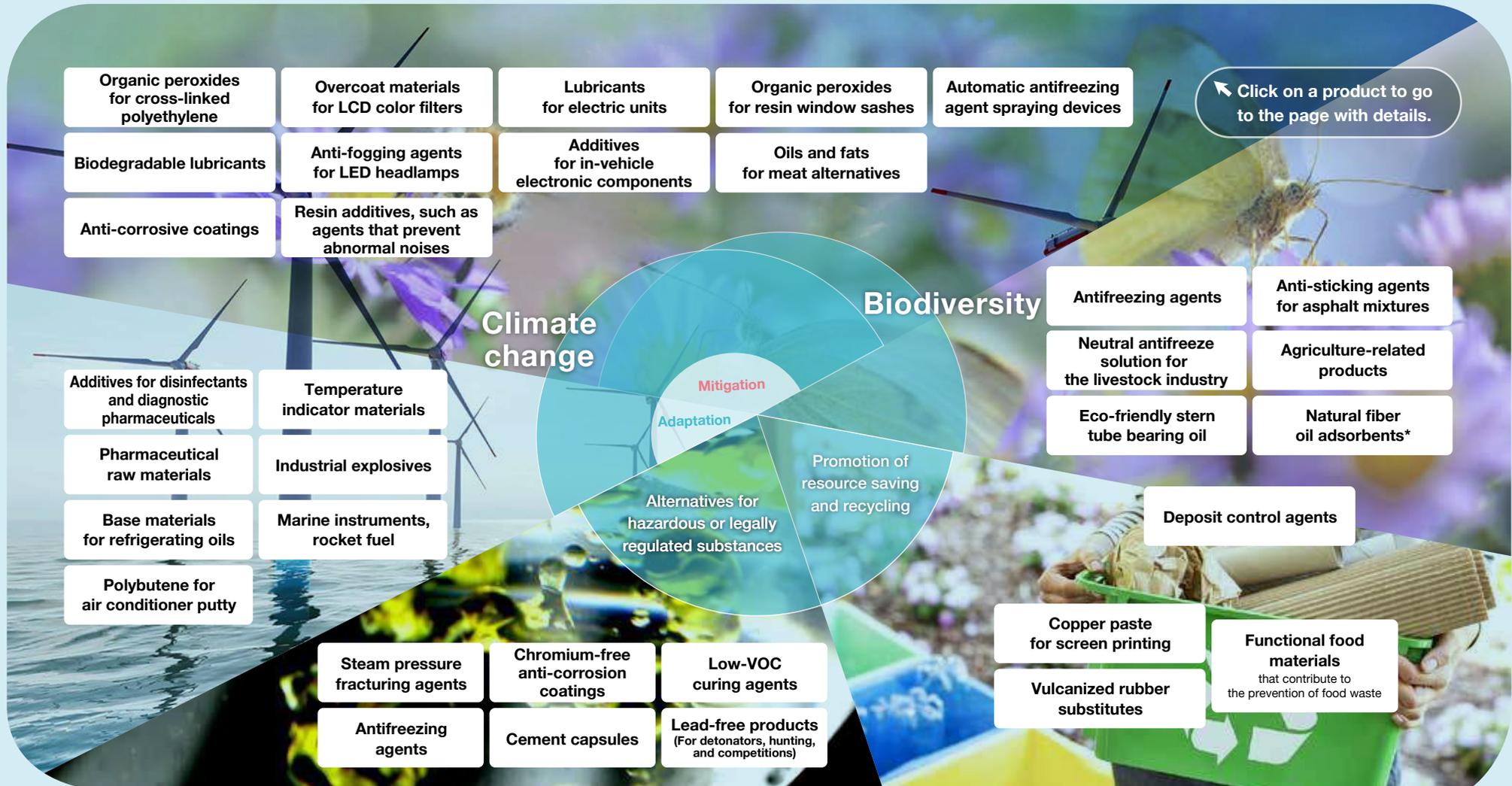


We in the NOF Group are always asking ourselves, “How can we utilize our technology in order to reduce our environmental loads to the possible minimum?” and are earnestly meeting many different requests from diverse fields.

 Response to climate change (TCFD) |  P.088-099

 Biodiversity conservation |  P.110-115

**Technologies related to climate change and biodiversity among NOF's clean tech-related products**



\*Sold by sales agents

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to the shift to EVs

Functional Materials business    Metal Coatings business

- Additives for in-vehicle electronic components
- Overcoat materials for LCD color filters
- Lubricants for electric units
- Resin additives, such as agents that prevent abnormal noises
- Anti-corrosive coatings
- Anti-fogging agents for LED headlamps



Electric vehicles (EVs) contribute to climate change mitigation because they generate less greenhouse gas emissions than gasoline-powered vehicles. In addition, compared to gasoline-powered vehicles, EVs are expected to require more electronic components (passive components), electric units, screws to hold the components in place, LCD panels, very quiet components, and power-saving components. Thus, the NOF Group's products used in these applications provide positive contributions in this area. Climate change mitigation also contributes to biodiversity because it reduces the ecological imbalance caused by global warming.

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to renewable energy

Functional Materials business    Metal Coatings business

- Organic peroxides for cross-linked polyethylene
- Biodegradable lubricants
- Anti-corrosive coatings



Oil readily biodegradable in the environment (Biodegradability 60% or more in 28 days) (Under OECD 301C tests)

Eco Mark Certification Number  
08110006

Name of utilizing contractor:  
NOF CORPORATION

Product: MILLUBE® Series

Renewable energy such as wind power and solar power are becoming increasingly important because they do not produce greenhouse gases. Our anti-corrosive coatings and biodegradable lubricants used in wind turbine blades and gears provide positive contributions in this area. In addition, ultra-high voltage and high-voltage electric wires are indispensable to transmit electricity from wind and solar power generation sites. Thus, our organic peroxides for cross-linked polyethylene used as a coating material provide positive contributions to the spread of renewable energy.

Climate change Biodiversity Promotion of resource saving and recycling Alternatives for hazardous or legally regulated substances

## Products that contribute to reducing greenhouse gas emissions and securing water resources

Functional Foods business

- Oils and fats for meat alternatives



Plant-derived meat alternatives such as soy meat hamburgers are attracting attention from the perspective of increasing environmental awareness and health consciousness, including reducing greenhouse gases from livestock and excrement and securing water resources. Our oils and fats for meat alternatives contribute to improving the flavor and texture of these meat alternatives.

Climate change Biodiversity Promotion of resource saving and recycling Alternatives for hazardous or legally regulated substances

## Products that contribute to the spread of energy conservation

Functional Materials business

- Organic peroxides for resin window sashes



Window sashes made using vinyl chloride resin contribute to the spread of energy-efficient housing because of their excellent heat insulation. Organic peroxides are used as polymerization initiators for the vinyl chloride resin, and thus contribute to the spread of energy conservation.

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to biodiversity, climate change mitigation, and environmental conservation

Explosives & Propulsion business

HOKKAIDO NOF CORPORATION

- Antifreezing agents
- Automatic antifreezing agent spraying devices



KAMAGU®, together with AUTOKAMAGU® JET, is proving highly effective against the freezing of road surfaces.

Antifreezing agents, such as calcium chloride conventionally used on road surfaces in cold areas, have posed the problem of “salt damages.” NOF’s antifreezing agent KAMAGU®, an acetic acid-derived chemical containing no chloride, poses no fear of salt damages. It is also an eco-friendly anti-freezing agent with minimal impact on plants. AUTOKAMAGU® JET, an automatic antifreezing agent spraying device, is a sensor-based system that automatically sprays KAMAGU® onto snowy or frozen roads. It works using 100% natural energy (solar energy), and thus contributes to climate change mitigation. It can also perform advanced road surface management via remote monitoring and control, and therefore contributes to both environmental conservation and road safety along with the antifreezing agent.

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to the prevention of ozone layer depletion

Functional Materials business

- Base materials for refrigerating oils



HFC (Hydrofluorocarbon) refrigerants, which do not deplete the ozone layer, are increasingly used as refrigerants for air conditioners and refrigerators. Eco-friendly base materials for refrigerating oils enhance co-solubility with HFC refrigerants and improve its thermal stability, electrical insulation performance, and other factors. Moreover, the low viscosity contributes to saving energy consumption. In recent years, refrigerants with a smaller global-warming potential compared with previous products are required. NOF is now supplying refrigerating machine oil for refrigerants with a low global-warming potential.

Climate change   Biodiversity   Promotion of resource saving and recycling   Alternatives for hazardous or legally regulated substances

## Products that contribute to climate change adaptation (air conditioners / refrigerators)

Functional Materials business

- Base materials for refrigerating oils
- Polybutene for air conditioner putty



As temperatures rise, there is an increasing need for air conditioners and refrigerators around the world, including in developing countries. Base materials for refrigerating oils, which are used for refrigerator lubricants, as well as polybutene for putty used for air conditioners, which fills in gaps in outer walls, provides positive contributions in this area.

Climate change   Biodiversity   Promotion of resource saving and recycling   Alternatives for hazardous or legally regulated substances

## Products that contribute to climate change adaptation (diagnostic pharmaceuticals / pharmaceutical raw materials)

Functional Materials business

Life Science business

- Additives for disinfectants and diagnostic pharmaceuticals
- Pharmaceutical raw materials



If tropical infectious diseases and other diseases and disorders spread due to the effects of climate change, then positive contributions in this area will be made by our disinfectants for infectious diseases and additives for diagnostic pharmaceuticals as well as our pharmaceutical raw materials that combat diseases and disorders.

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to climate change adaptation

(environmental information / disaster prevention and mitigation products)

Explosives & Propulsion business    NiGK Corporation

- Marine instruments, rocket fuel
- Industrial explosives
- Temperature indicator materials



As climate change progresses, there may be an increase in the need to survey the entire world, including seawater temperatures. In addition, there may be an increase in embankment construction to safeguard against the risk of storm surges and other such conditions. Marine instruments and rocket fuel for these environmental surveys, as well as industrial explosives used to procure rocks and sediment from the mountains, will make positive contributions in this area.

Climate change    Biodiversity    Promotion of resource saving and recycling    Alternatives for hazardous or legally regulated substances

## Products that contribute to conservation of marine environments

Functional Materials business

- Eco-friendly stern tube bearing oil

MILLUBE® ST-100U	Mineral oil	Eco-friendly lubricants supplied by competitors	
		Company A	Company B
After 30 days	After 30 days	After 7 days	After 5 days
No rust or corrosion	No rust or corrosion	Visible rust, corrosion	Visible rust, corrosion

Results of anti-corrosive coatings (The shafts were soaked in a 60°C mixture of lubricant (95%) and natural seawater (5%) for a certain period of time to compare anti-corrosion performance of lubricants.)

After a major oil spill in the Gulf of Mexico in 2010, the United States' 2013 Vessel General Permit (VGP) regulations came into effect for all vessels in 2013. This regulation has led to growing global demand for biodegradable, eco-friendly lubricants. We developed MILLUBE® ST-100U stern tube bearing oil that meets the needs of the market by greatly improving the lubrication and anti-corrosion performance of conventional biodegradable lubricants offered by other companies. The product, which satisfies 2013 VGP regulations in terms of high biodegradability, low toxicity, and low bioaccumulation, is a superior lubricant that can help conserve marine environments.

Climate change | **Biodiversity** | Promotion of resource saving and recycling | Alternatives for hazardous or legally regulated substances

## Products that contribute to protection of animals (disinfectants)

Explosives & Propulsion business | HOKKAIDO NOF CORPORATION

- Neutral antifreeze solution for the livestock industry



Barns, vehicles, etc. are disinfected for hygienic livestock management, but the disinfectant freezes in the winter, so it must be mixed with antifreeze. We contribute to protection of animals with Viva Frostir®, a neutral antifreeze solution for the livestock industry that is gentle to animals and humans.

Climate change | **Biodiversity** | Promotion of resource saving and recycling | Alternatives for hazardous or legally regulated substances

## Products that contribute to protection of animals (weak calves, dirt removal)

- Agriculture-related products (NEODRINK®, Za Yoroi-Otoshi)

NEODRINK® is a nutritional supplement for maintaining the physical strength of weak calves, and Za Yoroi-Otoshi helps reduce stress in cows by quickly removing stubbornly-stuck dirt from the cows' bodies.

Functional Materials business



Climate change | **Biodiversity** | Promotion of resource saving and recycling | Alternatives for hazardous or legally regulated substances

## Products that contribute to environmental conservation

- Anti-sticking agents for asphalt mixtures | Functional Materials business

In road construction, asphalt mixtures often stick to the cargo beds and hoppers used within plant facilities, and to prevent this trouble, petroleum-derived adhesion preventers have been used. However, conventional adhesion preventers are not friendly to the environment; they contaminate soil and/or water. ASPHARAB®, made from natural oil, contributes to environmental conservation as a highly biodegradable product.



Eco Mark Certification Number: 12110001 / 09110001  
 Name of utilizing contractor: NOF CORPORATION  
 Product: ASPHARAB® series ASPHASOL® series



**Climate change** **Biodiversity** **Promotion of resource saving and recycling** **Alternatives for hazardous or legally regulated substances**

### Products that contribute to the utilization of recycled paper

- Deposit control agent

Recycled paper resources contain numerous impurities, including sticky substances such as adhesives. These impurities lower the efficiency of the paper recycling process and impact the quality of the product. The pitch control agent MILLSPRAY®, SPANOL® and DETAC® and the removing agent BIOREX® have solved these problems and promote the recycling of waste paper.

**Functional Materials business**  
**YUKA SANGYO CO., LTD.**



These products demonstrate their superior performance in reducing impurities that generate in the paper-making process.

**Climate change** **Biodiversity** **Promotion of resource saving and recycling** **Alternatives for hazardous or legally regulated substances**

### Products that contribute to recycling

- Vulcanized rubber substitutes

While large quantities of vulcanized rubber are used in auto parts and sealing materials, which have to be highly resistant to heat and oil, vulcanized rubber can never be molten once it is molded, and therefore cannot be recycled. Unlike this, the NOFALLOY® TZ series, which can be heated for re-melting as many times as wanted for recycling, is extensively utilized as a substitute for vulcanized rubber.

**Functional Materials business**



Products made recyclable by the use of NOFALLOY® TZ series

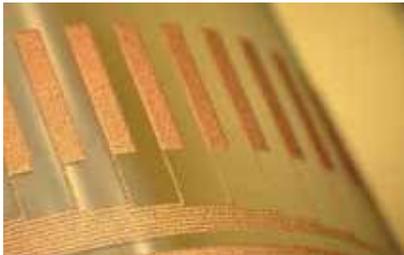
**Climate change** **Biodiversity** **Promotion of resource saving and recycling** **Alternatives for hazardous or legally regulated substances**

### Products that contribute to efficient resources utilization

- Copper paste for screen printing

Etching is the standard method for forming copper wiring on electronic circuit boards. However, this method requires waste fluid processing because copper waste fluid is generated as most of copper foil is dissolved. The copper paste developed by NOF makes it possible to directly draw copper wire on the necessary areas through the screen printing method. For this reason, it is possible to form copper wiring that is not wasteful without generating waste fluid, which in turn makes it possible to use resources efficiently and contribute to environmental preservation.

**Functional Materials business**



Example of use in printing of copper paste by screen printing

**Climate change** **Biodiversity** **Promotion of resource saving and recycling** **Alternatives for hazardous or legally regulated substances**

### Products that contribute to reducing environmental impact

- Low-VOC\* curing agents

Bath tubs are manufactured by thermally curing unsaturated polyester resin. PERHEXYL® A is a curing agent that can shorten the molding cycle and moreover significantly reduce the VOC, an environmental load that remains in the molded product.

**Functional Materials business**



\* Volatile Organic Compounds

Climate change	Biodiversity	Promotion of resource saving and recycling	Alternatives for hazardous or legally regulated substances
----------------	--------------	--	--

### Products that contribute to environmental conservation and health maintenance

**Metal Coatings business**

**NOF METAL COATINGS ASIA PACIFIC CO., LTD.**

- **Chromium-free anti-corrosion coatings**

The chromium-free anti-corrosion coating GEOMET® is a water-based anti-corrosion coating which contains no chrome compounds. Satisfying the requirements of Europe's ELV and RoHS directives, GEOMET® treatment parts are used by automakers across the world.



Parts treated with GEOMET® anti-corrosive coating

Climate change	Biodiversity	Promotion of resource saving and recycling	Alternatives for hazardous or legally regulated substances
----------------	--------------	--	--

### Products that contribute to environmental conservation and health maintenance

**Explosives & Propulsion business**

- **Lead-free products (detonators, hunting, competitions, etc.)**

We are promoting the removal of lead from detonators, ammunition, and small arms that have long contained a large amount of lead. Lead can cause poisoning of birds of prey as well as soil and water pollution. Lead in detonators can vaporize during firing and cause health damage to the human body. Therefore, making such products lead-free contributes to environmental preservation and health maintenance.



Climate change	Biodiversity	Promotion of resource saving and recycling	Alternatives for hazardous or legally regulated substances
----------------	--------------	--	--

### Products that contribute to reducing environmental impact

**Explosives & Propulsion business**

**NiGK Corporation**

- **Cement capsules**

A cement capsule is an (inorganic) adhesive-based capsule anchor for post-installed application intended for typical use in anti-earthquake reinforcement work. This product is more resistant to fire than resin products, and excels in safety as it contains no harmful chemicals, which might lead to sick house syndrome.



Example of use in an actual project (anti-earthquake reinforcement of Shinkansen bridge piers)

Climate change	Biodiversity	Promotion of resource saving and recycling	Alternatives for hazardous or legally regulated substances
----------------	--------------	--	--

### Products that are gentle on the surrounding environment

**Explosives & Propulsion business**

**Nippon Koki Co., Ltd.**

- **Steam pressure cracking agent, GANSIZER®**

GANSIZER® uses high vapor pressure that is generated during the thermolysis of the agent to crush bedrock, stone, and concrete structures with low vibration and low noise. It has gained a strong reputation as a crushing agent not containing explosives that is friendly towards the surrounding environment. It has a strong track record in situations such as crushing concrete and excavation works near rivers, and it was also used for underwater crushing of breakwaters that were destroyed in the Great East Japan Earthquake.

