GUNMA COMPLEX

Sustainability Activities

Shin-Etsu

To reduce the environmental impact and realize a sustainable society

The Shin-Etsu Chemical Group has made sustainability* a fundamental part of its business activities and aims to contribute to a reduction in the environmental impact and the realization of a sustainable society.
This article introduces the sustainability activities of the Gunma Complex, which is our core production base for silicone products.

* The term *sustainability* is made up of "sustain," meaning "to maintain or continue" and "-able" to indicate a condition in which something can be maintained or continued.

Contents

*This catalog is a compilation of articles on the sustainability activities of the Gunma Complex, which have been published in the PR magazine, *Silicone News*.

Sustainability Activities
of the Gunma Complex

vol. 1

Overview of Plants of the Gunma Complex

Approach to Sustainability by the Gunma Complex

Annaka City is located in the western part of Gunma Prefecture and is surrounded by an environment rich in nature. It is continuously developing as a research and production base for state-of-the-art silicon chemistry and plays a role as the main production hub for the products of Shin-Etsu Silicone. In 1996, the Gunma Complex was the first among major domestic chemical companies to acquire International Standard ISO 14001 certification concerning the environmental management system. Since then, it has positively approached sustainability activities and has steadily obtained good results.

Production System of the Gunma Complex

The Gunma Complex installed new plants to match the expansion of the production scale, and currently produces silicone products under the system of four plants consisting of the **Isobe plant**, **Matsuida plant**, **Goubara plant**, and **Yokonodaira plant**.

1 Isobe Plant

The largest scale plant of the Gunma Complex located nearly in the middle of Annaka City. Birthplace of Shin-Etsu Silicone.
Site: 410,000 m²

2 Matsuida Plant

Plant located in the west of Annaka City. Silicone-Electronics Materials Research Center is at this site.
Site: 210,000 m²

3 Goubara Plant

Plant constructed in Annaka Industrial Park close to the Usui River.
Site: 52,000 m²

4 Yokonodaira Plant

The newest plant located to the south of the Isobe plant to complement the other three plants.
Site: 109,000 m²

Sustainability Activities of Plants

Each plant in the Gunma Complex mainly performs the following sustainability activities to realize a reduction in the environmental load.

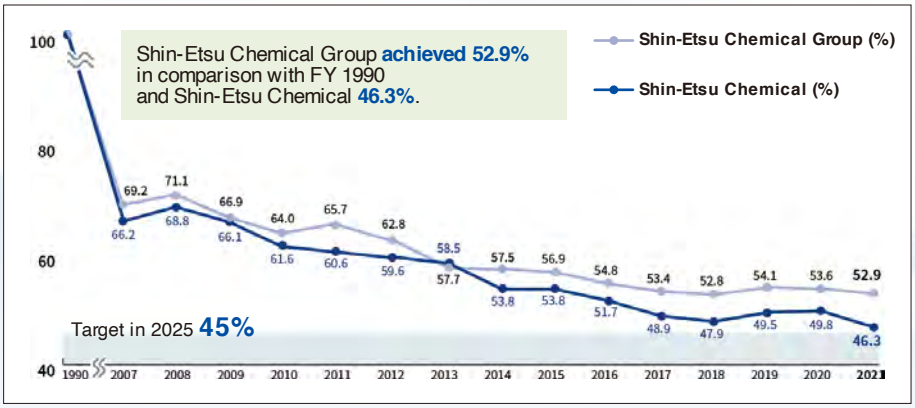
- CO_2
  - Promotion of energy savings
  - Reduction of greenhouse gas emissions
- Preservation of water resources, compliance with the regulation value for water quality contamination substances and further reductions
- Reduction of waste materials
- Compliance with the regulation value for atmospheric contamination substances and further reductions
- Other

Promotion of Energy Efficiency and Reduction of Greenhouse Gas Emissions

The Gunma Complex uses electricity and natural gas with low emissions of greenhouse gases as energy sources to promote efficient utilization. Although energy consumption in this Complex rises as the production of silicone products increases, it approaches the promotion of energy savings (reduction of average annual rate of 1% in original units) and the reduction of greenhouse gas emissions (reduction of 45% in comparison with 1990 by 2025 in original units) by introducing a cogeneration system and renewable energy and by implementing measures to save energy in the manufacturing processes.

*Targets of approach of the company are shown in parentheses ( ).

Trend of original unit index of production amount in 1990 for greenhouse gas emissions



Examples of Efforts at the Gunma Complex

Introduction of Cogeneration System* Isobe Plant Matsuida Plant

Both electric power and steam are generated from the cogeneration system using natural gas as fuel to supply the plants. The electric power is used for motors and lighting, and the steam is used as the heating sources for manufacturing facilities. In addition, power is generated by steam turbines using the pressure difference of steam. The energy utilization efficiency of the system is higher than that of commercial power supply and steam supply from boilers and thus greatly contributes to energy savings and the reduction of greenhouse gas emissions.

Point of cogeneration!

Electric power is supplied from a power company and cogeneration system to the plant in parallel. The system was constructed so that, even if a problem occurred at the power company, the cogeneration system could supply power independently by disconnecting the line to the power company and is useful for emergency measures and continuous production.

* Cogeneration (heat and power supply) system
System where electric power is generated by engines, turbines, and fuel cells using natural gas and petroleum as fuel, and the heat generated at that time is collected as steam and warm water simultaneously. Energy consumption efficiency is higher than that of a power company.

Collection of Waste Heat Isobe Plant Matsuida Plant

The reactive heat generated in the production processes are collected and effectively used as steam generation and product heating. In addition, part of the steam generated in the cogeneration system produces cold water using absorption type refrigerators, and the cold water is used as the cooling source for the manufacturing facility and the air conditioners in the clean rooms.

Introduction of Solar Panels Goubara Plant

Solar panels with a power generation capacity of approx.148 kW were installed at the Goubara plant, and operation started in February 2021. They cover part of the power used at the plant, and the reduction of CO_2 emissions of approx.71.5 tons per year is expected from annual power generation of approx.162 MWh.*

* Trial calculation from sunlight irradiation in Gunma Prefecture

Energy Saving Measures in Manufacturing Processes in Each Plant

Operation aimed at saving energy is promoted in each manufacturing process.

Topics

Approaches Contributing to Carbon Neutrality Enhanced by the Silicone Business

By focusing on carbon neutrality as an important task of management, our company invests a total of 20 billion yen in the Gunma Complex as the major production hub of the silicone business to further enhance the approaches to the reduction of greenhouse gas emissions. See our press release for details.

https://www.shinetsusilicone-global.com/news/2021/07.shtml

Sustainability Activities
of the Gunma Complex

The Gunma Complex utilizes limited water resources effectively and produces high quality silicone products.
This volume introduces the preservation of water resources.

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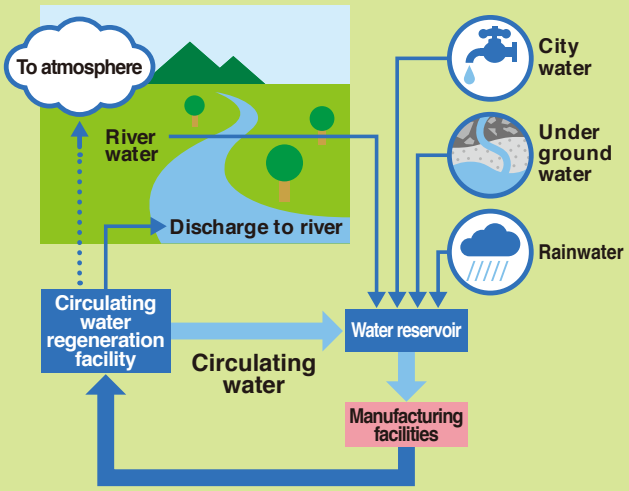
Approaches to the preservation of water resources by the Gunma Complex

The Gunma Complex is surrounded by an environment rich in nature and takes in almost all amounts of the water necessary for the production of silicones from peripheral rivers. Since the manufacturing of chemical products requires a large amount of water, this Complex recirculates the water taken in and reutilizes it for production facilities and cooling water as much as possible in order to minimize the amount of water taken in from rivers. In addition, we perform the purification treatment before discharging water to rivers to control the water quality thoroughly.

■ Flow of water used by the Gunma Complex



Various facilities for preservation of water resources in the Gunma Complex

● Water intake facility

The Isobe and Matsuida plants take in water from the Yanagise River flowing in the plant and a waterway divided from the Usui River in the vicinity of the plant, respectively, to use it as water sources of industrial water for producing silicones. In addition, city water is also partly used.

● Purification facility for river water

River water taken in is subjected to purification treatment similar to that of waterworks to remove impurities for use as industrial water to produce silicones.

● Cooling tower

This is a cooling facility for removing the reaction heat generated during silicone production and the condensing heat generated in the distillation process. Pumps supply water to the production facilities and the water warmed in the cooling process returns to the cooling tower. It is cooled by the tower and supplied again to the production facilities. The tower removes the heat efficiently by using circulating water only by replenishing water that evaporates during heat dissipation.

● Rainwater pit

Rainwater is stored to be effectively utilized for miscellaneous application.

● Installation of detectors (TOC (total organic carbon) meter and oil film detector)

A TOC meter is installed at the end of the discharge port of the plant so that when the leakage of chemical substances to drain ditches for rainwater occurs, it can be detected as early as possible. In addition, continuous monitoring is performed using pH meters. Furthermore, oil film detectors are installed at many places in the plant so that when the leakage of silicone fluid occurs, it can also be detected as early as possible.

TOC meter

* TOC (total organic carbon) meter
This meter measures amounts of organic substances in water based on the amount of carbon used for monitoring contamination.

● Emergency pit

When the TOC meter or the oil film detector operates and an automatic gate shuts off the water in the rainwater ditch, the drainage is temporarily stored in the emergency pit. The stored water is transferred to a wastewater treatment facility and discharged into the rivers after purification.

Topics

Example of effective utilization of rainwater

Asia Silicones Monomer (Thailand)

Asia Silicones Monomer, our main factory overseas, stores rainwater in a water reservoir provided on the premises for use as industrial water and cooling water for gas incinerators. In addition, it is also used as firefighting water for emergencies. Furthermore, this industrial water using rainwater is also supplied to the adjacent affiliated company.

Sustainability Activities
of the Gunma Complex

This issue presents the Gunma Complex's approach to reducing waste materials and preventing air pollution.

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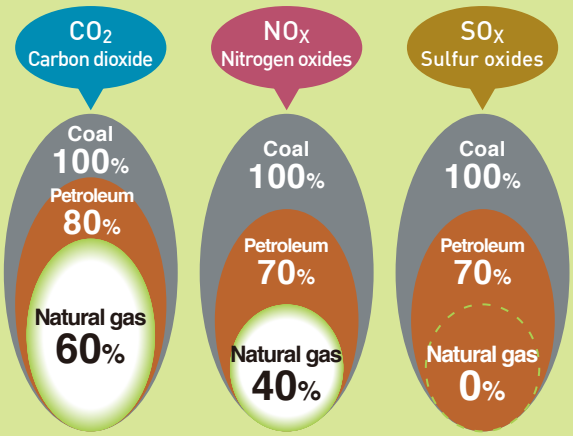
The Gunma Complex's Approach to Reducing Waste Materials and Preventing Air Pollution

Efforts are underway at the Gunma Complex to achieve the Shin-Etsu Group's goal of zero waste emissions (a 1% or less ratio of final landfill disposal volume to waste generation volume). These efforts also include promoting waste generation reduction in terms of emission intensity. Besides, emissions reduction targets have been set to prevent air pollution. Measures to reduce emissions have been implemented, such as switching to fuels with a lower environmental load.

■ Fossil fuels (coal, petroleum, and natural gas) compared for combustion byproducts *Coal = 100%



Data source: Energy White Paper 2013, Agency of Natural Resources and Energy

Examples of Efforts at the Gunma Complex

Incineration Facility

Isobe Plant

Industrial waste materials from each plant are collected for incineration and disposal at the incineration facility at the Isobe plant. To reduce chemical substances emissions from this incineration facility, the Isobe plant is working on operation management optimization through around-the-clock operation and stable incineration at high temperatures. Its efforts also extend to utilizing the heat generated at the incineration facility to produce steam for each plant.

Incineration facility

Switching to Natural Gas for Air Pollution Prevention

Isobe Plant
Matsuida Plant

The Gunma Complex positively uses natural gas as an environment-friendly energy source along with electricity. Natural gas is an ideal energy source: it does not produce much nitrogen oxide (NOx) emissions, which are deemed responsible for acid rain and air pollution, and produces no sulfur oxide (SOx) emissions (see the figure above).

Natural gas-fueled cogeneration system

Promotion of Collection and Recycling of Silicone Components Contained in Exhaust Gases

Isobe Plant Matsuida Plant

The Gunma Complex is among the earliest that started efforts to reduce cyclic siloxane emissions into the air. Its silicone production process produces exhaust gases containing tiny amounts of cyclic siloxanes. Meanwhile, its monomer production process collects cyclic siloxane components and recycles 99% or more of the emissions as raw materials. At the Gunma Complex, most of the tiny amounts of methylsilane contained in exhaust gases from methylsilane production are collected for reuse as the raw material for silicone products, leaving the rest for removal by the scrubber. The Gunma Complex is committed to improving its processes and enhancing its recycling rate to 99% or more.

Sustainability Activities
of the Gunma Complex

In this issue, we introduce our efforts to coexist with the local community near our Gunma Complex.

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Overview of the Matsuida Plant

Approach to Coexist with Local Communities Near the Gunma Complex

The Gunma Complex is located in Annaka City in the western part of Gunma Prefecture, and our employees and the employees of affiliated companies commute from the city and surrounding areas. As a member of the local community, the Gunma Complex engages in social contribution and communication activities as part of living in harmony with the local community.

Examples of Efforts at the Gunma Complex

Comprehensive Disaster Drills

The Gunma Complex conducts comprehensive disaster drills twice a year in the spring and fall. Fall drills are held jointly with the local fire department. Government officials and representatives of local residents are invited to participate in the drills. By extending invitations to them to actually participate in the drills, they can deepen their understanding of our safety management system and initiatives.

Cleanup Activities on the Roads Around the Gunma Complex

Every year, the Gunma Complex Group conducts cleanup activities on the roads around the complex as part of an environmental beautification campaign. Each time, the participants spend about two hours collecting empty cans, plastic bottles, paper scraps, and other items discarded along the road. In addition to contributing to the local community, these activities help raise environmental awareness among employees and educate them in good manners.

Sponsorship of Events by Local Governments

The Gunma Complex sponsors the Ansei Tooashi Samurai Marathon in which runners dress up as samurai, ninja, anime characters, and many other costumes. The event originated as a marathon (excursion) by clansmen held in 1885, which makes Annaka City the birthplace of the marathon in Japan. The event is held every year in May, and many of our employees participate to liven up the competition.

Plant Tours and Participation in Community Events

The Gunma Complex has maintained good interaction with the local community by hosting plant tours and participating in local events. As a community-based business, we continue to sponsor and participate in similar activities so that more stakeholders will understand our business.

Topics

Beautiful rows of cherry trees delight the eyes of visitors and nearby residents

The Matsuida plant at the Gunma Complex is surrounded by an environment rich in nature, such as rice paddies, farmland, and bushes. Every spring during the cherry blossom season, somei-yoshino cherry trees planted along the roads around the Matuida plant are in full bloom, delighting the eyes of visitors and nearby residents.

Silicone that contributes to sustainability

**Silicone is used in environmentally conscious products such as fuel-efficient tires, solar cells, and electric vehicles, contributing to the realization of a sustainable society.
Here are some typical applications of silicone that contribute to the SDGs.**

Application Example	Overview	Related SDGs
Fuel-efficient tires	By using silicone as a modifier for tires, the rolling resistance of tires can be reduced, which helps to improve fuel efficiency.	
Solar cells	Silicone is used as a modifier for resins used in solar cell encapsulants and as an adhesive and sealing material for components, which helps improve reliability.	
Wind power generation	Silicone is used in wings and towers of wind turbine generators, generators and their peripheral parts, and helps improve reliability.	
LED lighting	Silicone is used to protect LED elements and to prevent heat, which helps improve the reliability of LED lighting.	
Hybrid and electric vehicles	The silicone heat dissipation material is used for heat countermeasures for lithium-ion batteries and various electronic control devices and helps prevent malfunctions and failures caused by heat.	
Insulating Glass	Silicone is used as a sealant for double glazing used to insulate residential windows. It is also used as a sealing material for building construction methods that enhance environmental performance.	
Ship-bottom paints	Bottom paint using silicone is useful for improving fuel efficiency in order to prevent marine organisms from adhering to the vessel. (If marine organisms adhere to the bottom of a vessel, the resistance of the vessel increases, resulting in poor fuel consumption.) Silicone is also highly safe and contributes to the preservation of the marine environment.	
Pesticides	The use of silicone as a spreading agent for pesticides makes them easier to spread than ever. As a result, the amount of pesticide sprayed can be reduced.	
Automotive resin windows	Silicone-coated resin windows prevent scratches on the resin surface. Plastic windows contribute to lighter vehicles and improve fuel efficiency.	

Shin-Etsu Group and Sustainability https://www.shinetsu.co.jp/en/sustainability/

Shin-Etsu Silicones and Sustainability https://www.shinetsusilicone-global.com/sustainability/

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