




>>> Eco-products and technology

Since Shin-Etsu Chemical is the largest manufacturer of polyvinyl chloride in the world, its image is that of a manufacturer in the petrochemical industry. In fact, however, the primary raw material in products such as silicone (silicone resin) and synthetic quartz, which is used to make optical fibers, is silicon, a material that is abundantly present in nature. In addition, the composition ratios of salt and petroleum in chlorinated vinyl are 57% and 43%, respectively, indicating that the petroleum content is remarkably low compared with other plastic products.

| Products | Usage | Ecological function | Point of products |
|---|--|--|---|
| Polyvinyl chloride  | Polyvinyl chloride materials in general (production process) | Energy saving | The material comprises salt (57%) and petroleum (43%); the ratio of petroleum is lower in comparison with other plastic products, with minimal adverse environmental effects in the life cycle assessment (LCA)* in comparison with other materials. |
| | Products such as chlorinated vinyl sash | Energy saving | Compared with other materials, is better able to insulate against heat; accordingly, enables the saving of fuel for air conditioners and electric power. |
| | Products such as chlorinated tube | Excellent durability | Compared with other materials, is more durable in general. |
| Synthetic pheromones  | Mating disruptant | Harmonization with ecosystem, ecological agrochemicals | Since it is a synthetic natural substance with minimal toxicity that also decomposes into water and carbon dioxide in the natural environment, it is environmentally friendly compared with former agrochemicals. |
| Cellulose derivatives  | Admixture for underwater concrete | Prevents water contamination | Prevents water contamination at the time of construction and enables the reduction of the quantity of effluent. |
| Rare earth magnets  | Compressor motors for air conditioners | Resource saving, compact in size, energy saving | Reduces annual electric power consumption. Reduces the quantity of lead. |
| | Wind-power motors | New energy | Compared with thermal power generation, enables a reduction of the amount of CO ₂ , nitrogen oxides (NO _x), sulfur oxides (SO _x), etc., that are generated, and consequently helps prevent global warming and environmental pollution. |
| | Electric vehicle motors | Clean energy | Compared with gasoline, enables a reduction of the amount of CO ₂ , nitrogen oxides (NO _x), sulfur oxides (SO _x), etc., that are generated, and consequently helps prevent global warming and environmental pollution. |
| Epoxy-molding compound  | Resin encapsulating material for semiconductors | Controls chemical substance generation | By introducing a special silicone hard-combustive system, achieves halogen-free and antimony-free operation. |
| Hot melt adhesives  | Magazine recycling | Resource conservation | It is now possible to achieve 100% recycling, including those parts of magazines that could not previously be recycled, such as those containing glue. |

*Life Cycle Assessment (LCA):

Method to evaluate the degree of environmental influence in the process of production through collection and reuse

| Products | Usage | Ecological function | Point of products |
|--|--|--|---|
| Silicone | For plastic (modified resin) | Reduces adverse effects on the environment | By not using environmentally hazardous substances, improves safety and is superior to recyclability. |
| Typical form of silicone | For tires (modified rubber) | Energy saving, improvement in fuel charge countermeasures, dust | By improving fuel charges, enables a reduction in the amount of CO ₂ , nitrogen oxides (NO _x), and sulfur oxides (SO _x), etc., that are generated, and consequently helps prevent global warming and environmental pollution. |
| Form of silicone oil  | Water-repellent agent for construction | Reduces adverse effects on the environment, harmonization with ecosystem | By not using environmentally hazardous substances, improves safety. |
| | Lubrication oil | Energy saving | Superior to lubrication in low temperature. |
| Form of silicone resin  | For addition to paints | Resource saving | Superior to corrosion resistance and weather resistance. |
| | LIMS (for liquid silicone, injection molding system) | Energy saving | Energy saving in the process of the molding and increase in productivity. |
| | For heat radiation and insulation | Energy saving and resource saving | Efficient in energy saving and reduces the quantity of CO ₂ , resulting in the minimal use of products. |
| | For hardening of UV (ultraviolet rays) | Energy saving, non-solvent agent | Saves more energy compared with heat curing type products. |
| Form of silicone rubber  | Non-solvent type products (for release paper, etc.) | Reduces adverse environmental effects, non-solvent agent | Use of both a solvent agent and dilution solvent are unnecessary, and consequently there is a reduction in capacity and saving of energy at the stage of transportation. Organic solvent is not used, thus the product is safe for humans. Enables a reduction of adverse effects on the environment involving discharge into the atmosphere. |



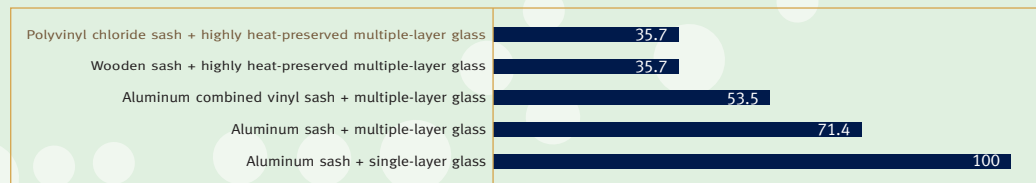
Polyvinyl Chloride Sash

Since polyvinyl chloride is durable against corrosion and climate, it is used widely in the field of architecture. Above all, vinyl sash is remarkable because of its ability to keep a room warm and preserve heat.

Ecological Performance of the Product

This material is superior in retaining heat; in this regard, it is 1,000 times greater than aluminum. When used as a window frame, it enables a reduction in energy consumption by up to half at the stage of heating and cooling in comparison with our former products. As a result, it can effectively save energy, equivalent to 436 liters of lamp oil (per household annually). In Germany, an environmentally advanced nation, its usage for window frames has become common, and the ratio of its usage is over 50%. In Japan, its usage is spreading, mainly among districts that experience comparatively colder weather.

Comparison of the Degree of the Heat Temperature Decrease (Aluminum Sash + Single-Layer Glass = 100)



Source: Japan Building Material Industry Association, "Promotion of Energy Saving Building Materials Diffusion Center."



Control of Destructive Insects

Pheromones represent a revolutionary change from insecticides as a means for controlling destructive insects. Synthetic pheromones, used, for instance, in apple, peach, pear, or plum orchards, reduce the numbers of destructive insects by inhibiting their mating behavior.

Product Eco-performance

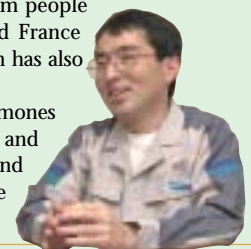
Synthetic pheromones are chemical compounds that chemically resemble the natural pheromones that regulate insect sexual behavior. Only very small amounts are required, and they are far less toxic and much more selective than insecticides or agrochemicals. They also have less of an effect on predators or other beneficial insects. Pheromones biodegrade rapidly, and the by-products are limited to CO₂ and water. Pheromones do not, therefore, cause environmental pollution.

We asked Mr. Fukumoto, manager of the Specialty Chemicals Research Center's Research Department, about the current situation with regard to pheromones.

Pheromones are effective, Mr. Fukumoto told us, above a certain level of acreage under cultivation. In Japan, pheromones are primarily used on apple, peach, pear, and other fruit trees, and in Europe, the use of pheromones on grapes is increasing.

In recent years, a movement has arisen in Europe to curtail the use of existing agrochemicals, which have a large effect on the environment. Shin-Etsu receives many inquiries from people interested in using pheromones to protect their crops. Italy, Germany, and France have taken the lead in pheromone use, but interest in pheromone use in Spain has also been growing recently.

Insecticides are still the primary agents used in the fruit industry; pheromones still occupy a secondary role. However, with the growing use of predators and other natural pest-control methods in the search for environmentally sound agriculture, pheromone usage will become increasingly common. We continue to prepare for that eventuality through our research in this field.



Eco-Friendly Products ③
Rare Earth Magnets



Magnetic compressor

(Rare earth) ND-type magnetic rotor (motor thickness-50%)
Copper wire use-40%



Ordinary AC motor
Ordinary DC motor
New-type DC motor (CWM)

Motors Used for Air-Conditioning Compressors

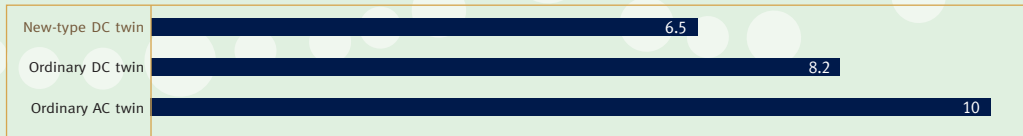
Rare earth magnets are high-performance, permanent magnets whose ingredients are of rare earth type such as neodymium and samarium. They possess a strong magnetic power and are used for the hard disk drives of computers, stereo headphones, as well as motors for factory automation (FA) and office automation (OA) equipment. Also employed for air-conditioning compressors for which a highly efficient motor is essential, they are highly evaluated as a new energy-saving motor.

Ecological Performance of the Product

The reduction of the size and weight of the motors was realized by using rare earth magnets, a high-performance permanent magnet, for air-conditioning compressors. The capacity and weight of the motors was reduced to 85% of the ordinary motors, and the use of copper wire for the motors was reduced 40%.

In addition, the COP (efficiency of energy consumption) was improved by 5% to 10%, and the amount of power consumption was largely reduced. In this way, we contribute to the achievement of energy saving, reduction of the amount of discharge of CO₂ and the prevention of global warming.

Weight Comparison of Compressors (kg)



Cooperation: Sanyo Denki Co., Ltd./Sanyo Denki Kucho Co., Ltd.

Eco-Friendly Products ④
Silicone



Silicone for Plastic

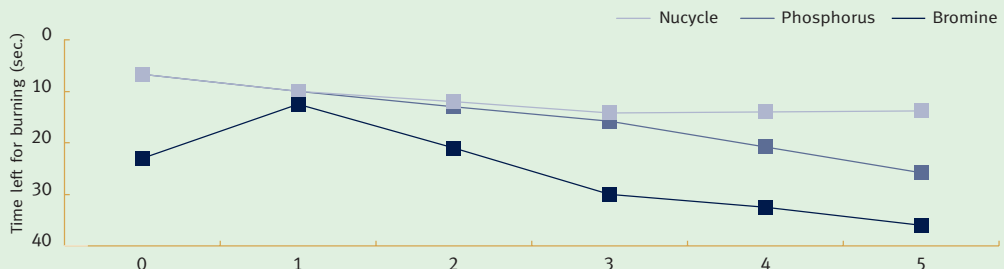
Applications related to modified silicone resin quality improvement have been developed in a number of fields. A typical example is "Nucycle," a product jointly developed and manufactured by NEC Corp. and Sumitomo Dow Ltd.

This ecoplastic, featuring an additive of silicone flame retardant jointly developed by NEC Corp. and Shin-Etsu Chemical, is employed in the housing of liquid crystal displays and the bodies of personal computers.

Ecological Performance of the Product

Nucycle, supplemented by a flame retardant agency of new silicone type, can retard fire to a greater degree than a flame retardant agency adding toxic substances such as halogen (bromine) and phosphorus. Its shock intensity has also been greatly enhanced. Moreover, it can be reused for electric device-related materials such as PC bodies, since it maintains a flame retardant nature even when material recycling is repeated. As such, it contributes greatly to the construction of a "cyclical society."

Flame Retardance of Polycarbonate Added to Various Flame Retardant Agents (Tested by UL, Thickness 3.2mm)



Source: NEC Technical Report, Vol. 53, No. 3/2000 Cooperation: NEC Corp.