

Aiming to Develop Eco-Products (Development of Technologies)

As a manufacturer, Sanden is dedicated to supplying products that can help solve global environmental problems. One way is by developing environmentally responsible products. However, we also have a strong commitment to developing the environmental technologies required to make these products.

Creating environmental technologies has two benefits. The first is raising the value of products from the standpoint of customers. The second is dealing with environmental issues. Our environmental R&D activities target three themes: technologies to prevent global warming, mainly by conserving energy; technologies to help create a recycling-based society by promoting recycling and using fewer resources; and technologies to replace hazardous substances with materials that are environmentally friendly.

To create these technologies, we use Life Cycle Assessments (LCAs). With LCAs, we monitor and evaluate the environmental burden of a product over its entire life cycle. This begins with the procurement of materials and the product's manufacture and extends through delivery, use, recycling and final disposal. We also use a methodology called quality function deployment for environment (QFDE). With this system, we examine products to identify wasteful components that can be eliminated without affecting the product's performance (loss analysis).

In addition, we have a global chemical management system so that we remain up to date on environmental laws and regulations in Japan and around the world. With this system, we constantly gather the latest information on new restrictions, particularly concerning tighter standards in the EU.

Reducing the Environmental Impact of Products through Life Cycle Assessments

Sanden has learned through the analysis of LCA results that the most effective way to reduce the impact of its flagship products on global warming throughout the product life cycle is to improve energy efficiency during product use.

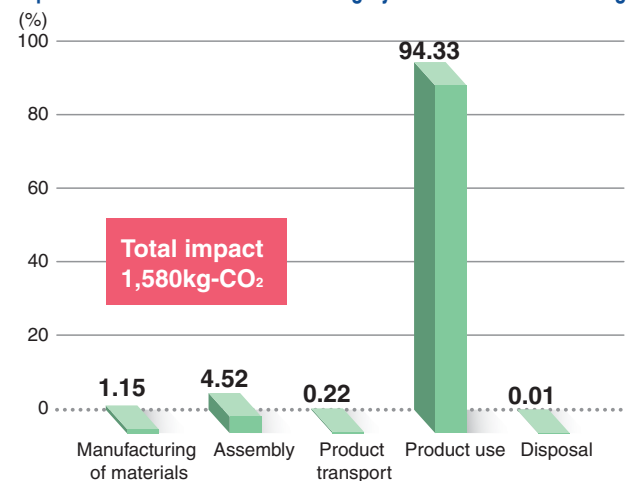
We measure the environmental burden of our products based on CO₂ emissions, which are linked to global warming.

Sanden evaluates the environmental impact of its products in terms of CO₂ emissions—an indicator of global warming.

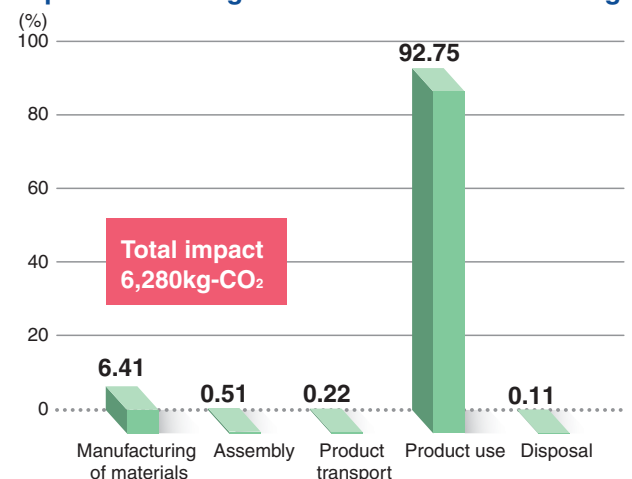
Our development of environmentally advanced products, however, is anchored in product assessments that provide a multifaceted evaluation of environment-friendliness in terms of energy and resource conservation, product weight reduction, and reducing the use of hazardous substances. In addition, we have applied JEPIX, an index used to assess total environmental impact, to the production stage of development and are working to apply a similar index at the product level to quantify the environmental impact of individual products to guide improvement from the initial stages of product development.

In addition, since fiscal 2004, Sanden has collected life cycle inventory data on vending machines as a participant in Phase II of the LCA Project being headed by the New Energy and Industrial Technology Development Organization (NEDO) along with the Japan Environmental Management Association for Industry (JEMAI). In fiscal 2004, we collect a variety of data on inventories of vending machines. In fiscal 2003, the Akagi Plant compiled data based on actual assembly operations. In fiscal 2004, we collected inventory data concerning vending machines in use. With this information, we were able to collect metal processing data that has more applications. In fiscal 2005, the last year of OEM vending machine operations, we began collecting inventory data concerning end-of-life vending machines. We use all this information to prepare reports on vending machine inventories.

Impact of Automotive Air Conditioning Systems on Global Warming



Impact of Vending Machines on Global Warming

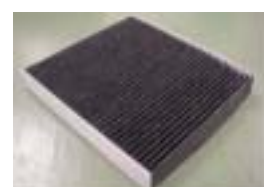


Filter to Reduce VOC Emissions

Volatile organic compounds (VOCs) are generally defined as organic compounds that can evaporate at room temperature. Two widely used VOCs are formaldehyde and toluene. Both compounds are a cause of so-called "sick house syndrome," where VOCs cause poor air quality in new or renovated homes and buildings.

In the automobile industry, manufacturers are

taking voluntary actions to bring down the amount of VOCs used in car interiors. As one way to solve this problem, Sanden has developed a filter that removes VOCs from the air in car interiors. By using a newly developed material, this filter is even able to eliminate aldehyde gas, a type of VOC that is difficult to remove using activated charcoal.



VOC filter

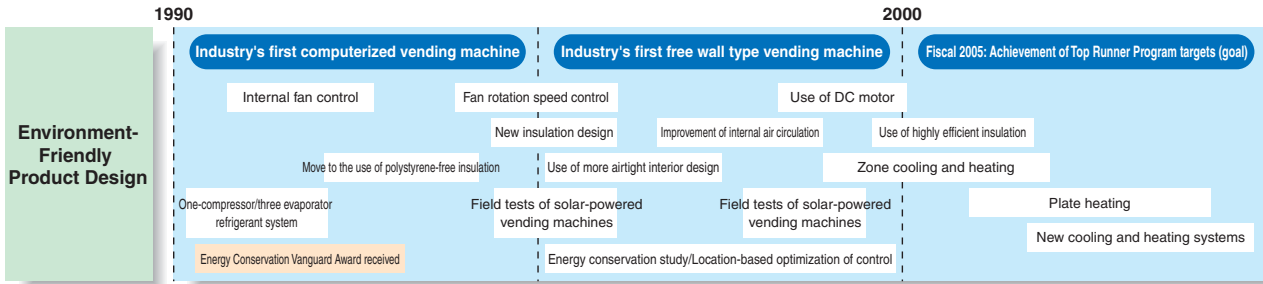
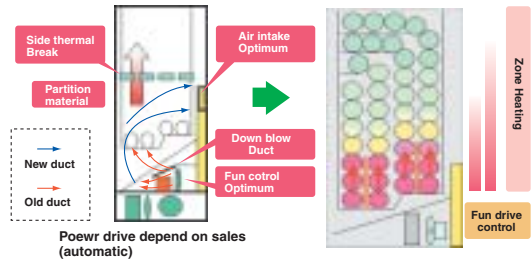
Developing Energy-Efficient Vending Machines

In 1992, Sanden led the industry by conducting an LCA analysis on vending machines as part of collaborative research with the National Institute for Environmental Studies. We have worked to put the insight that we gained from this research to use in technological development (please refer to the figure below). Sanden is a leader in energy efficiency and supplies the market with equipment that meets the Top Runner targets announced in fiscal 2003.

Moreover, we are working to develop zone temperature control technologies that regulate temperature only in required areas-in contrast to conventional vending machines wherein temperature is regulated throughout the entire machine interior-without compromising the ability of vending machines to provide customers with cold and hot beverages.

Sanden is cutting vending machine energy consumption in many ways. Advances include the development of cooling methods that use new refrigerants, new heating methods and energy-efficient lighting systems. We also make extensive use of chrome-free steel panels. Through these activities, we are making our vending machines even friendlier to people and the environment.

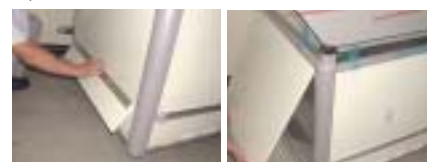
Zone Heating Technology



Developing Resource-Conserving Open Refrigerated Showcases for Convenience Stores

The Refrigeration Systems Division worked to reduce the use of resources in open showcases for convenience stores through the following measures:

- ◆ Reducing the use of metals
We worked to achieve a 26% reduction in product weight through design changes and the use of thinner materials
- ◆ Promoting the use of simple packaging
We reduced the packaging material weight of our products by a substantial 91% by switching from conventional wood packaging to simpler packaging.
- ◆ Extending product life
We eliminated the need for product disposal due to external damage and enabled on-site replacement of external parts by making all external parts replaceable. In addition, we recycle products and parts at our client center.



Reduction of Hazardous Substances Used in Products

Hazardous substances used in products impact the environment when the products are used, recycled, and disposed of. To minimize this impact, we are working on the elimination of ozone-depleting compounds. Moreover, we are working hard on the creation of techniques for substituting heavy metals, which have a substantial environmental impact, with other materials.

To supply customers with products they can use with confidence, we conduct a green procurement program that extends these environmental activities to include parts manufacturers.

As a global organization, Sanden must comply with the strict standards of the EU (notably, the ELV and RoHS directives) in order to raise the recycling rate of Sanden products. That means eliminating the use in products of all designated hazardous substances (heavy metals like mercury, lead, cadmium, and hexavalent chromium).

Lead incorporated in solder and coatings as well as hexavalent chromium contained in chrome plating for ferrous parts must be eliminated. Demands from customers are becoming greater, too. In response, we established a collaborative framework with surface-treatment specialists and suppliers of surface-treatment agents used for automotive products. Together, we solved technological issues and achieved quality targets. In February 2003, Sanden began selling a number of production models that met customers' environmental specifications and complied with the EU directive prior to its enactment.

We are also developing technologies to allow products sold in Japan to comply with EU restrictions. For example, we replaced the lead-tin solder that was the industry standard with a lead-free solder made of tin, silver, copper, and other materials. We also finished work on a technology that will permit the use of chrome-free steel panels. We have already started introducing products that use this new technology. Replacing CFCs, which lead to both ozone depletion and global warming, is another goal. We are determined to eliminate CFCs in refrigerants and thermal insulation as soon as possible. Work is proceeding on technologies for new refrigerants and natural refrigerants. To gather the latest information on new regulations worldwide and comply quickly, we have adopted the global chemical management system.

