

## Living & Environment Systems Division

Sanden's basic approach to product development in the Living & Environment Systems Division is to thoroughly identify and analyze end-user needs to create high-quality, environment-friendly products equipped exclusively with needed features. For instance, the Living & Environment Systems Division developed a rotary gas burner that saves energy, does not contain consumable parts, and comes with a three-year warranty due to its high quality and reliability.

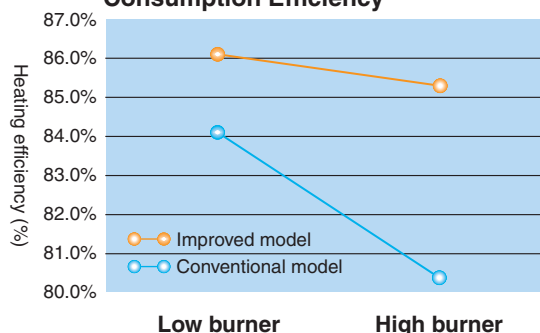
In fiscal 2005, our environmental activities were focused on cutting energy consumption of heaters and boilers and on reducing the use of hazardous substances. We will continue to base product development activities on requirements of users and on global environmental issues. Our goal is to achieve further improvements in environmental quality.

### Energy Conservation (energy-efficient boilers)

Oil-burning heating units are one of the major products of the Living & Environmental Systems Division. By increasing the thermal transmission surface area of the heat exchange unit, we increased the standard energy consumption efficiency from 83.3% to 85.3%. Due to this advance, our outdoor heating units now meet energy-conservation standards just as our interior units already did. As a result, all Sanden oil-burning heating units now bear the Green Mark for energy conservation.

To cut electricity consumption, we have cut standby-mode power to less than one watt, use energy-efficient control for the recycling pump (stops the pump once water has been heated), and equip products with an energy-saving mode that uses an eco-timer remote control. This control system monitors room temperature and shuts down the boiler accordingly to prevent overheating.

#### Comparison of Boiler Standard Energy Consumption Efficiency



### Lowering Use of Hazardous Substances (Lead) (Lead-Free Design for Boiler Heat Exchangers)

Conventional models use a copper heat exchanger that undergoes a lead solder dip treatment to increase corrosion resistance. This treatment is needed to extend the life of heat exchangers. When used for a long time for heating, these elements are exposed to highly acidic water produced by the sulfur in kerosene and nitrous oxides in the heater exhaust gas.

Replacing the lead solder, which has a lead content of more than 85%, is virtually impossible due to technological issues. Consequently, this use of lead is exempt under the Annex of the RoHS directive\*. Nevertheless, to reduce our environmental burden, we conducted a comparative analysis of three countermeasures. After studying performance, productivity and other issues, we decided to use a lead-free dipping treatment to apply a lead-free copper anti-corrosion coating.

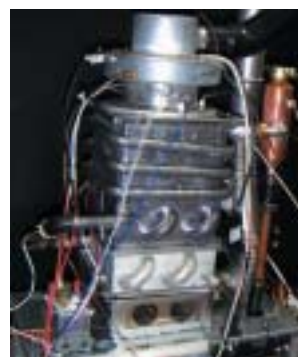
\* RoHS directive: A European directive restricting the use of certain hazardous substances contained in electrical and electronic products.



Heat exchanger made using no lead

### Development of Technologies (Reduction of NOx Emissions and Substitute Recovery Heat Exchanger)

Burners are one of the key components used in environmental systems for the home. We are working on a burner that produces less than 50ppm of nitrous oxides compared with about 100ppm for conventional burners. Another Sanden development project involves a substitute recovery heat exchanger for a boiler that may raise heating efficiency from the current 85% to more than 90%. This is accomplished by using a secondary heat exchange unit to recover evaporative latent heat from water in exhaust gas. These advances will further enhance the environmental quality of Sanden products.



Latent heat recovery heat exchanger