Environmental and safety efforts

The Showa Denko Group, recognizing that environmental conservation is a global issue, is strongly committed to cutting back on emissions of chemical substances and generation of industrial waste. Similarly, occupational health and safety and Responsible Care represent key components of the management policy. In this way, the Group is striving to eliminate accidents.

Environmental accounting

Showa Denko is committed to ongoing environmental investment designed to reduce energy consumption and minimize the environmental impact of our operations. Since 2000, environmental investment and associated expenses and outcomes have been subject to evaluation in the form of environmental accounting.

In 2006, we invested in improvements of exhaust gas processing facilities at the Yokohama and Omachi plants, as well as wastewater treatment systems at the Oita Complex and Kitakata Plant. These key investments are already paying dividends through year-on-year reductions in environmental impacts in terms of soot and dust, CO2, and landfill disposal.

Resource use and environmental impacts

The diagram below summarizes resource use and environmental impacts associated with the operations of Showa Denko and its Group companies.

In order to reduce impacts on the environment, the Group is making efforts as described in the following pages.

### Environmental accounting for 2006

#### Cost

<table>
<thead>
<tr>
<th>Cost within business site</th>
<th>Cost with business site</th>
<th>Pollution prevention</th>
<th>Capital investment and expenses associated with prevention of atmospheric/water/soil pollution, noise, visual, odor, etc.</th>
<th>Air emissions of PRTR listed substances (t/year)</th>
<th>Greenhouse gas (CO2eq)</th>
<th>SOx</th>
<th>NOx</th>
<th>CO2</th>
<th>Total</th>
<th>Total cost</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SOx</td>
<td>3,698</td>
<td>750</td>
<td>522</td>
<td>2,307</td>
<td>283</td>
<td>188</td>
<td>716</td>
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<td></td>
<td></td>
<td>NOx</td>
<td>3,522</td>
<td>2,307</td>
<td>373</td>
<td>297</td>
<td>428</td>
<td>2,077</td>
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<tr>
<td></td>
<td></td>
<td>Soot and dust</td>
<td>283</td>
<td>188</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD</td>
<td>716</td>
<td>543</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total nitrogen</td>
<td>657</td>
<td>736</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
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<tr>
<td></td>
<td></td>
<td>Total phosphorus</td>
<td>61</td>
<td>12</td>
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<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Landfill disposal</td>
<td>19,733</td>
<td>2,195</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td>Energy consumption reduction</td>
<td>1,096</td>
<td>76%</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental conservation</td>
<td>272</td>
<td>2006</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
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<tr>
<td></td>
<td></td>
<td>Renewable recycling</td>
<td>48</td>
<td>2006</td>
<td>428</td>
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<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>Waste reduction</td>
<td>38</td>
<td>2006</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>362</td>
<td>2006</td>
<td>428</td>
<td>2,077</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>571</td>
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</tbody>
</table>

#### Cumulative investment since 1990

<table>
<thead>
<tr>
<th>Cumulative investment (million yen)</th>
<th>0</th>
<th>2,000</th>
<th>4,000</th>
<th>6,000</th>
<th>8,000</th>
<th>10,000</th>
<th>12,000</th>
<th>14,000</th>
<th>16,000</th>
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</thead>
</table>

#### Economic benefit

<table>
<thead>
<tr>
<th>Economic benefit</th>
<th>1,000 yen per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy conservation</td>
<td>272</td>
</tr>
<tr>
<td>Renewable recycling</td>
<td>48</td>
</tr>
<tr>
<td>Waste reduction</td>
<td>38</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>362</td>
</tr>
</tbody>
</table>

#### Typical environmental impact indicators at Showa Denko Group in 2006

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Total value for applicable companies</th>
<th>Reference value for Showa Denko K.K.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emissions (to CO2)</td>
<td>193</td>
<td>2,893</td>
</tr>
<tr>
<td>Final volume of waste disposal (t)</td>
<td>1,715</td>
<td>2,195</td>
</tr>
<tr>
<td>Emissions of PRTR listed substances (t)</td>
<td>76</td>
<td>427</td>
</tr>
</tbody>
</table>

* Total value for 13 consolidated manufacturing subsidiaries in Japan
Measures to prevent global warming

Promotion of energy conservation
The Group considers energy conservation to be an important topic from the viewpoint of preventing global warming and preserving resources. The Group is taking various measures to conserve energy by reviewing and optimizing production processes and modifying facilities.

In 2006, the Group was able to reduce energy consumption to 76% of the 1990 level, through such means as improving industrial furnace efficiency and reducing utility consumption. The Company aims to reduce its rate of energy consumption by basic energy unit by 1% every year in the period from 2007 through 2008.

In addition, the Company has hydroelectric power plants located nearby its inland operation sites. Approximately 20% of our total electricity requirements are now met by our hydroelectric power plants, a clean source of energy.

Reducing greenhouse gas* emissions
Emissions of greenhouse gases by Showa Denko are currently up 1% relative to the base year (1990). We will strive to achieve the target of an overall reduction of 6% from the 1990 level within the timeframe of 2008-2012 under the Kyoto Protocol.

Showa Denko has set numerical targets for reduction of emissions—in manufacturing and filling processes—of carbon dioxide, nitrous oxide, and CFC substitutes such as HFC and PFC. To achieve these targets, we have established a systematic program for collecting gases emitted during filling processes and installing greenhouse gas decomposition and treatment lines.

By developing and supplying products such as CFC substitutes for organic solvent washing agents, PFC substitute etching gases, PFC decomposition units, and nitrous oxide decomposition systems for medical warming and preserving resources. The Group is taking various measures to conserve energy by reviewing and optimizing production processes and modifying facilities.

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Environmental and safety efforts

Reducing environmental impacts through supply chain management (SCM)*

Efforts to improve distribution efficiency

The Group has worked to reduce environmental impact, establishing SCM Centers at respective business divisions to improve distribution efficiency. Examples of improvement, achieved with the consent of customers, include reductions in the frequency of transport services due to higher loading efficiency for organic-chemicals-carrying tank trucks and ceramics-carrying vehicles. Furthermore, the Sakai Plant has replaced road transport with more environment-friendly rail transport for shipment of its products.

The Aluminum sector uses the return space of ships that deliver aluminum metal, making shipments of its products. Efficiency-improvement measures are taken at all workplaces, including better coordination of loading patterns (both in road and marine transport), collection of pallets and containers on return trips, and a higher proportion of direct deliveries to end customers.

Working together with transport operators, we have introduced energy-saving measures, including reductions of idling and route optimization, in conjunction with various road safety initiatives.

Companywide optimization

In addition to the efforts of each SCM Center, the Company as a whole is working to improve transportation efficiency through initiatives such as delivery of mixed cargoes from different business sectors, use of the space of return trips from other workplaces, and shared use of logistics centers with other business sectors.

Showa Denko is also striving to reduce the overall environment impact of Company operations by conducting promotional campaigns to highlight successful initiatives at SCM Centers and compiling a database of strategies and programs, as well as by promoting Company-wide sharing of information on initiatives in distribution (including effective use of packaging materials and pallets), and production.

Amendments to the Energy Conservation Law

In accordance with the amendments to the Energy Conservation Law introduced in April 2006, Showa Denko has conducted a study of transportation volume as a shipper. According to the study, our total annual transportation volume is approximately 670 million ton-kilos (weight in tons multiplied by distance transported in km).

Under the new Energy Conservation Law, businesses with a transportation volume in excess of 30 million ton-kilos are classed as “designated shippers” and required from FY2007 onwards to report on energy consumption and CO2 emission levels associated with transportation operations. Designated shippers are also required to formulate programs for reducing unit energy consumption and to demonstrate a commitment to reducing energy consumption.

Showa Denko will continue working to reduce unit energy consumption in line with our responsibilities as a designated shipper.

PRTR* as a member of the Japan Chemical Industry Association (JCIA), since 1996 the Company has voluntarily conducted surveys into volumes of chemical substances discharged and transferred.

In 2006, Showa Denko surveyed 480 substances, including PRTR-listed substances, and reported to JCIA on 94 substances (of which 66 were listed). Total annual emissions of these substances in 2006 stood at approximately 427 tons, down 13 tons from 2005.

Showa Denko will continue to make efforts to reduce discharge volumes by preparing reduction plans for each operation site, covering substances subject to the PRTR Law and substances with high annual discharge volumes.

The Company is assessing effects on the communities surrounding its operation sites and endeavoring to communicate with local residents and authorities with a view to reducing discharge volumes further based on mutual understanding.

Reduction of chemical substance discharges

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PRTR-listed substances released and transferred (2006)

Since 2004, the number of substances reported has increased from 294 to 491. Figures for the Tokuyama Plant are included from 1999 and onwards; those for the Oyama, Hinone, and Sakai plants from 2001 and onwards, and those for Showa Denko Elastomer from 2004 and onwards.

Statistics for release and transfer of PRTR-listed substances and amount of release at individual operation sites can be viewed on the Showa Denko website. Click on the link to Social and Environmental Measures. URL http://www.sdk.co.jp/html/english/csr/index.html

PCB control

The status of the storage of polychlorinated biphenyl (PCB) waste is checked regularly based on the Company’s PCB control checklist, and such waste is stored appropriately in adequate facilities to prevent leakage. In addition, each business unit reports the status of its storage of PCB waste and related matters to its prefectural governor in accordance with the Law Concerning Special Measures Against PCB Waste. The processing of PCB waste is to be carried out in a systematic manner, effectively utilizing the waste-processing facilities of Japan Environmental Safety Corporation.
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Twelve harmful atmospheric pollutants
The 12 harmful atmospheric pollutants designated by the chemicals industry for its voluntary control are: acrylonitrile, acetaldehyde, vinyl chloride monomer, chloroform, 1,2-dichloroethane, dichloromethane, tetrachloroethylene, trichloroethylene, 1,3-butadiene, benzene, formaldehyde, and ethylene oxide.

Environmental consideration: Atmosphere

Reducing discharge of harmful atmospheric pollutants
Having completed the phase-2 voluntary program for reducing discharge of the 12 harmful atmospheric pollutants, the Showa Denko Group is now working toward a new target of a 10% year-on-year reduction in the amount of discharge of atmospheric pollutants with relatively large volumes. In 2006, the total amount of discharge of nine substances—handled by the Group out of the said 12 substances—declined by approximately 2% from 2005 levels, to 88 tons, falling short of the 10% reduction target. Nevertheless, the Group remains committed to achieving this target through a combination of measures such as switching to substitutes and boosting recovery and recycling rates.

Reducing environmental impact on the atmosphere
The Group is working to reduce emissions of SOx (sulfur oxides), NOx (nitrogen oxides), and soot and dust through a combination of countermeasures, including:
- Fuel conversion
- Modification of combustion processes (such as low NOx burners)
- Appropriate operation and management of desulfurization and denitration equipment
- Reducing fuel consumption through an exhaust heat recovery system
- Strengthening the monitoring system

The amount of SOx and NOx discharge increased marginally from 2005, while that of soot and dust discharge decreased. The Group will continue working to reduce environmental impacts on the atmosphere.

Environmental consideration: Water

Reducing environmental impact on water quality
The Group is working to reduce environmental impact on water quality in terms of chemical oxygen demand (COD) values, nitrogen, phosphorous, and other substances through a combination of countermeasures, including:
- Improvement of manufacturing processes
- Improvement in wastewater processing equipment and proper operation control
- Promoting reuse of water
- Strengthening the monitoring system

Discharge of total nitrogen and total phosphorous remained almost unchanged from 2005, while COD values declined. The Group will continue working to reduce environmental impact on water quality.

Measures to prevent soil and groundwater pollution

On such occasions as a change in the use of plant site and discharge of soil, the Group surveys and takes measures in line with the Soil Contamination Countermeasures Law and the regulations of local authorities.
In order to reduce its waste-disposal volumes, the Group is aiming to restrict the volume of waste generation, promote reuse, and find effective use.

- Use of waste acids and waste alkalis
- Using waste oil and waste plastics as fuels (heat generation, promote reuse, and find effective use.

In 2006, the Company’s final volume of waste disposed of in landfill fell by around 185 tons relative to the previous year. However, waste from the Oita Complex rose during the same period, mainly due to maintenance shutdown of its ethylene plant, preventing us from achieving the 2006 target of 1,800 tons.

The Group is now working toward a target of 1,600 tons in 2007, aiming to further achieve the 2008 target of 1,100 tons. We are also aiming to increase the number of operation sites with “zero emissions”, defined as the share of waste disposal in landfill being 1% or less of the total volume of generated waste.

In addition, the Company is inspecting the firms it entrusts with intermediate processing and final disposal, to ensure that wastes are processed and disposed of appropriately.

With regard to discharge of bauxite residue* into the sea, in 2006 the Company maintained the volume of such discharge at a level 10% lower than the 2000 results. The Company plans to completely terminate the discharge of bauxite residues into the sea by 2015. The Company will continue to work to reduce the discharge volumes.

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Environmental and safety efforts

**Reducing wastes and promoting recycling**

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**Environment-friendly ECOANN™ ammonia**

ECOANN™ is an innovative form of ammonia produced from waste plastic. While its quality is just the same, the product can be manufactured with significantly less environmental impact. ECOANN™ has already been accredited as a green procurement item by Tokyo Electric Power Co., and other regional power companies in Shikoku, Chubu, and Tohoku.

We use waste plastic as feedstock at our Kawasaki site, recycling it for use in synthesis gas for ammonia production. The waste-plastic gasifying plant was built in line with the Kawasaki Eco-Town Program promoted by the City of Kawasaki. ECOANN™ production represents a zero-emission recycling process, where waste plastic, recovered under the Containers and Packaging Recycling Law, are crushed, molded, and converted into synthesis gas.

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**Aluminum can recycling**

As part of an ongoing commitment to corporate citizenship, the Group is promoting aluminum can recycling* with the participation of all employees. In addition to saving resources and reducing waste, the recycling enables a 97% reduction of energy compared to the production of aluminum from bauxite residue. The diagram below shows the typical collection process for recycling used aluminum cans into new cans.

* Page 31 provides further information on aluminum can recycling at the Showa Denko Group.
Disaster-prevention efforts

Equipment safety
The Showa Denko Group has set a target of eliminating equipment incidents altogether and is continually implementing equipment modifications and enhancements designed to minimize risk factors. Regular safety checks are conducted during installation of new equipment, modification of existing equipment, and major changes to manufacturing conditions. New equipment is pre-screened by internal experts, while existing equipment is subject to voluntary SPS maintenance programs.

A checklist for the prevention of recurrent equipment failures was developed in 2005, based on records of internal accidents—that exceeded a certain level—in the past nine years. The checklist was distributed to all workplaces for confirmation.

Utilization of MP Information System
The maintenance prevention (MP) information system is a system for sharing equipment-design know-how and troubleshooting measures obtained from actual cases of equipment trouble and accidents at each of the Group’s facilities and from around the world. It is used for preventing accidents and communicating information on equipment technology, in pursuit of even safer and more stable operation.

Autonomous safety measures
The Company identifies sources of danger at all facilities to promote continuous improvement. Together with these efforts, the Company uses periodic internal audits to ensure the effectiveness of its autonomous safety measures.

Under the system of safety inspections and approval based on the High Pressure Gas Safety Law, the Company is permitted by the Minister of Economy, Trade, and Industry to operate its ethylene plant at the Oita Complex for four consecutive years.

This permit is given after assessment of the control levels of operation/equipment/disaster-prevention measures. In this capacity, the Company conducted its autonomous safety inspection in 2006.

Occupational safety and hygiene efforts

Occupational safety
Despite an ongoing decline in workplace accidents due to continued safety campaigns over the years, we were unable to achieve the target of zero workplace incidents in 2006. We will continue working to incorporate feedback from workplace incidents into individual activities plans developed for respective workplaces. Occupational safety and health management systems will be introduced to all workplaces in order to further improve the efficacy of safety measures.

- Activities to improve the level of awareness of each employee
- Implementation of safety measures based on risk assessment

Changes in frequency rates of lost time injuries*

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<tr>
<th>Year</th>
<th>Chemical industry</th>
<th>All industries</th>
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<tbody>
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<td>70</td>
<td>80</td>
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<tr>
<td>2001</td>
<td>60</td>
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<td>2005</td>
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<td>30</td>
</tr>
<tr>
<td>2006</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

*Frequency rates: Number of deaths and injuries that have occurred during one million working hours, as calculated by the following formula:

Lost workday rate: (Number of deaths and injuries) / (Total number of working hours) × 1,000,000

Column: Oyama Plant receives Occupational Safety and Health Management System (OSHMS)* accreditation

The Oyama Plant started preparing for the introduction of OSHMS in 2003. This plant represents the first operation site in the Showa Denko Group to be awarded third-party accreditation for OSHMS under the Japan Industrial Safety & Health Association (JISHA) scheme.

Considerable effort was required in the area of document management, where existing systems were not deemed consistent with the OSHMS criteria. While a risk management system was developed on the basis of existing procedures, third-party accreditation was formally awarded in March 2007. The aim now is to apply the new risk management system to workplace safety management to a higher level.

Column: Hikone Plant and Corporate R&D Center win prestigious safety awards

The Hikone Plant was awarded first prize in the Workplace Safety Awards sponsored by the Japan Aluminum Association, while the Corporate R&D Center in Chiba received the 2007 JSC/JRCC Safety Award.

Furthermore, the Corporate R&D Center has had no lost time injury since 1993. The focus of safety education in recent years is on the Four S’s initiative to keep the workplace clean and tidy by removing all unnecessary and surplus machinery and chemicals.

Therefore, the Corporate R&D Center has had no lost time injury since 1993. The focus of safety education in recent years is on the Four S’s initiative to keep the workplace clean and tidy by removing all unnecessary and surplus machinery and chemicals.

Column: Oita Complex wins Excellence in Boiler Management award

In November 2006, the Oita Complex received honors in the Excellence in Boiler Management awards, hosted by the Japan Boiler Association. The award was based on two main factors: the absence of any incidents involving a Type 1 Pressure Vessel boiler since the start of operations in 1989, despite the extremely large scale of boiler operation at the facility; and successful Grade 1 Boiler accreditation for four years of consecutive operations.
Environmental and safety efforts

Chemical safety efforts

Safety information
The Group provides its customers with information on any risks or hazards of its products by preparing MSDS*1 for all products based on JIS standards. By 2008, we will revise all MSDSs to include GHS*2 information. To provide against accidents involving chemical substances during road transport, the Group prepares yellow cards*3 and ensures its truck drivers keep these with them at all times.

Japan Challenge Program
The Japan Challenge Program is an initiative in which government authorities and private sectors jointly collect safety information on existing chemical substances for dissemination to the general public. In 2005, Showa Denko registered itself as a sponsor for six substances. In the following year, the Company began collecting and evaluating safety information and submitted a plan for one substance.

Responding to international activities and trends
HPV Program
The HPV (High Production Volume) program is designed to promote the collection and evaluation of safety information for high-volume toxic chemicals (defined as those with annual production volumes in excess of 1,000 t).

Showa Denko is a participant in the HPV Program, providing information on 12 substances, including allyl alcohol. Safety evaluations have already been completed for ten of the substances. The findings of the safety evaluations are incorporated into MSDSs and other literature, along with results from the Japan Challenge Program. In this way, the information generated in these programs is actively disseminated to the general public.

Foreign laws and regulations
To respond to the new chemicals legislation in Europe (Registration, Evaluation, Authorization and Restriction of Chemicals: REACH), the Company, as a member of the JCA’s REACH Council, participates in the activities of working groups and taskforces. The Group maintains its legal compliance structure through efforts to respond swiftly to international trends.

ISO14001 (International standard for environmental management system)

ISO9001 / TS16949 (Quality management systems)

Facilities certified under management systems

*1 Material Safety Data Sheet (MSDS): This refers to a written document provided from suppliers to consumers (customers), covering such matters as the name of chemical substances, information on hazards, physical and chemical characteristics, precautions for handling and storage, and first aid.

*2 Globally Harmonized System of Classification and Labeling of Chemicals (GHS): This refers to a globally harmonized system covering criteria for classifying chemical substances according to their physical and chemical hazards and their impacts on human health and the environment, and matters related to communication of information via labels and safety data sheets.

*3 Yellow card: This refers to an emergency contact card briefly describing measures that transportation company personnel, police, and fire fighters should take in the event of an accident with regard to hazardous or toxic substances.

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