Recycling End of Life Vehicles (ELV)

ELV recycling made possible through cooperation

Nissan has been very successful in the way we have addressed each of the three Rs of "reduce, reuse, and recycle." Our Recycling Promotion Department is at the center of envisioning the most appropriate methods for handling recycling in the future, and is working to standardize recycling techniques to incorporate them at the design stage.

Approaches to recycling ELVs at Nissan can be divided into four main areas.

The first two happen at the new vehicle development stage. The first approach is to avoid using heavy metals, which have a serious impact on the environment, such as lead, mercury, cadmium, and hexavalent chromium.

The second is to design for ease of recyclability and try to improve products. Nissan has been performing dismantling research for these reasons, and has put forward new proposals to our design team.

The third approach is to reduce waste at the manufacturing stage. And finally, the fourth approach is to recycle without downcycling, or without losing any material quality. Conventionally, high-value resources such as precious metals have been recycled. Nissan goes one step further.

We continue to recycle iron, aluminum, and lead, but there has been a problem with quality because these materials get mixed with impurities. Even if they are recycled, they end up being used as lower-value materials. In response, through careful separation and collection of aluminum road wheels, we have been able to reuse these once highly pure, high-value-added materials.

Another example of a win-win relationship is in aluminum recycling. We are working with dismantlers all over Japan who collect and separate the aluminum road wheels from ELVs to recycle them at Nissan's plants. Our original monthly recycling target was set at five tons in 2001, the year that the project was launched. But in fiscal year 2003, as a result of our collaboration with dismantlers, Nissan was able to collect an average of 200 tons per month. Aluminum road wheels are made from high-cost aluminum that can be reused for parts such as suspensions after it is collected, separated, and recycled. One result of our efforts to establish management and logistical networks that collect and separate Nissan's aluminum road wheels is that we have been able to reduce our use of virgin raw materials.

The amount of ASR generated from a single March vehicle (previous model)

Recycling End of Life Vehicles (ELV)

Collaboration with the design department

In May 1996, Nissan became the first automobile manufacturer in Japan to establish a Recycling Promotion Department. We initiated dismantling research in recognition of the importance of understanding the actual conditions under which vehicles are dismantled. The ideas gained through this research for improving recycling efficiency have been developed into Design Guidelines, the framework for Nissan's recycling system, which introduces recycling issues at the vehicle design stage.

Collaboration with the dismantler

It is not only crucial to cooperate within Nissan, but it is also a necessity to form partnerships with external recyclers to process ELVs appropriately.

Nissan Green Parts is one successful example of Nissan working in cooperation with dismantlers. Through this program, dismantlers carefully collect, separate, and remove parts from Nissan cars, which we then resell. It is a win-win relationship for dismantlers, customers, and Nissan: dismantlers see reduced costs in parts processing, customers can purchase parts for one-third to one-fifth the price of new parts, and Nissan can offer our customers a number of alternatives. Through this business model, we have created a network of dismantlers, allowing information exchange on logistics and other issues. The knowledge gained over the years and through trial and error have led us to improvements and as a result, we have reduced the amount of waste by 210 tons.

Collaboration with Renault

Nissan collaborates with Renault in the area of recycling as well. Renault and Nissan jointly developed a recycling simulation system called OPERA, which was launched in 2003. By entering data such as component materials and dismantling time, OPERA can simulate the recovery rate and costs of recycling ELVs during the early stage of vehicle design. This enables us to establish management and logistical networks that collect and separate Nissan's aluminum road wheels. It is not only crucial to cooperate within Nissan, but it is also a necessity to form partnerships with external recyclers to process ELVs appropriately.

Dismantling Research and Recycling ASR

In order to move forward with ELV recycling, Nissan's basic belief is that it is important to design and manufacture vehicles that are easily dismantled. But in addition to this, we are aware of the problem of how to
manage automobile shredder residue (ASR), or in other words, what is left over after reusable parts and recyclable materials have been removed. It has become necessary to develop ways to recycle ASR in preparation for the Automobile Recycling Law that will come into effect in Japan in January 2005.

Dismantling research

Nissan is researching efficient ways to dismantle ELVs in order to effectively recycle materials and reuse parts.

The research until now has focused on ways to manage substances that have an impact on the environment, such as waste oils, efficient, and lead. But for the last few years, we have been researching ways to increase the recovery rate, with a focus on the reuse of high-value-added materials. In particular, we have examined methods of efficiently dismantling the wirer harness, as well as the recycling of aluminum, plastics, and glass.

The results of this research are reflected in our actual recycling operations. Because of technological developments, for example, we have reduced the time needed to drain liquids from the vehicle (such as water from radiators, window washing fluid, and oil) from 40 minutes to within seven minutes. This is the result of our efforts to improve dismantling technology while at the same time providing feedback from our research to the development department, which is then reflected in materials selection and vehicle design for easier dismantling.

Recycling ASR

Recovery rates have increased every year to the point where more than 80% of ELVs are currently recycled and reused. The remaining 20% is in the form of ASR, and is usually landfilled.

At our Oppama plant, we launched a program in the fall of 2003 to recover energy from ASR, through which we modified a portion of the energy recovery facility for processing industrial waste. ASR has a very high heat index when incinerated and controlling temperature during incineration has proven difficult. In addition, there were other problems, such as the adhesion of products to the inside of the furnace, the boiler’s evaporation pipes, and other components. However, optimum temperature control has now alleviated these problems, and steam produced by the boiler is now recovered and used in providing humidity for the plant’s pre-painting process.

Japan’s Automobile Recycling Law, coming into effect in January 2005, requires the implementation of ASR recycling. To encourage efforts within the automobile industry, Nissan has entered into an alliance with 10 other automobile companies called the Automobile Shredder Residue Recycling Promotion Team (ART). ART has a collaborative role in planning operations and examining operational efficiency in the succession of operations involving ASR, from take-back and recycling through management. Nissan has taken a leadership role in ART, promoting activities while applying our know-how from past experience.

Promoting the Use of Reusable Parts

Reusable parts taken from ELVs are sold under the name Nissan Green Parts. Nissan Green Parts are available as reusable and rebuilt parts. Reusable parts are those that are reusable after washing and performing a quality check, while rebuilt parts are those that are dismantled, washed, inspected, and fitted with replacement parts.

There are 31 different reusable parts, including headlights, combination lights, and other front and back vehicle components that are prone to damage in accidents and collisions.

Eleven items are available as rebuilt parts, including engines and automatic transmissions.

Fifteen Nissan parts dealers nationwide manage the inventory of Nissan Green Parts, while 31 Nissan parts dealers in seven regions in Japan supply them.

Sales of Nissan Green Parts in fiscal years 1998-99, when they were first made available, amounted to two million yen. However, sales grew to more than one billion yen by fiscal year 2002, and 1.3 billion yen in fiscal year 2003, proving that customers recognize Nissan Green Parts as a viable option when making repairs. In cooperation with our dismantlers, we intend to do even better in the future at matching parts to the needs of our customers.

A Global Approach

Differences in the laws and infrastructures of various regions and countries pose a challenge to efforts to recycle ELVs on the global level. Materials considered valuable in one country may be treated as waste in another. For that reason, Nissan considers it necessary to develop systems appropriate to the characteristics of each region. As a result, Nissan promotes recycling based on the principle of “Making products globally, treating ELVs locally.” While using common design standards, we have decided on using management methods for ELVs that are appropriate to each country and region in which we operate.

In recent years, awareness of automobile recycling has increased, as has the rapid introduction of legislation. This is happening not only in areas with well-established recycling efforts such as Japan and Europe, but also in Asia, such as in China and Taiwan. Nissan believes that our main issue for the future is to meet standards set forth by law without falling behind the current trends, while continuing to promote recycling objectives and activities that go above and beyond the regulations.
Response to the Japan Automobile Recycling Law

The role of automobile manufacturers regarding the Automobile Recycling Law, which will take effect in January 2005, is to collect and properly recycle Freon gas, airbags, and automobile shredder residue (ASR) generated from end of life vehicles (ELVs).

Nissan is pursuing ways to recycle Freon gas, airbags, and ASR by: participating in the formation of a center to collect Freon gas and airbags; participating in ART, a recycling promotion team; and through vehicle design and development to improve the recyclability of ELVs.

### Measures for Three Mandatory Items to be Recycled by Automobile Manufacturers

<table>
<thead>
<tr>
<th>Subject Items</th>
<th>Airbags</th>
<th>Freon Gas</th>
<th>ASR</th>
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<tbody>
<tr>
<td>Airbag</td>
<td>Appropriate treatment of unused airbags in ELVs is required.</td>
<td>Since specified CFCs cause ozone layer depletion and HFC substitutes produce a global warming effect, recovery and destruction of CFCs and HFCs are required.</td>
<td>As the rate of illegal dumping and inappropriate treatment of ASR increases due to limited capacity at landfill sites, collecting and treating ASR appropriately is required.</td>
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<td>Driver airbag</td>
<td>Simultaneous deployment connectors, which facilitate easy on-board airbag deployment, have now been adopted in nearly all vehicles.</td>
<td>The X-TRAIL FCV is equipped with an air conditioning system that uses carbon dioxide (CO$_2$) as the refrigerant. Because CO$_2$ refrigerant produces less of a global warming effect compared to the previously used HFC substitute, research and development is in progress with the aim of installing CO$_2$ air conditioning systems on gasoline-powered vehicles.</td>
<td>To carry out ASR recycling, Nissan has modified the waste incinerator at the Oppama plant and has begun energy recovery from ASR. Collected data is analyzed and will help in making design improvements to new model vehicles.</td>
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<tr>
<td>Passenger airbag</td>
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<td>Side airbag</td>
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<td>Side airbag</td>
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<td>Curtain airbag</td>
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<td>Side airbag</td>
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### Outline of the Automobile Recycling Law

- **Outline of the Automobile Recycling Law**
  - Collection and recycling of Freon gas and airbags
  - ASR recycling
  - ART

### Management

- **Outline of the Automobile Recycling Law**
  - Collection and recycling of Freon gas and airbags
  - ASR recycling
  - ART

### ASR Recycling Facility at the Oppama Plant

- **ASR Recycling Facility at the Oppama Plant**
  - To carry out appropriate and efficient collection and recycling (destruction) of airbags and Freon gas, Nissan has joined other automakers and import traders in creating the Japan Automobile Recycling Partnership (JARP), which acts as a common take-back center. Through collaborative efforts, we have achieved economies of scale, which has led to a reduction in recycling costs as well as increased smoothness in business operations.

### Stemming from the Importance of Creating a System to Properly, Smoothly, and Efficiently Implement ASR Recycling

- **Stemming from the Importance of Creating a System to Properly, Smoothly, and Efficiently Implement ASR Recycling**
  - Nissan has been part of establishing the Automotive Shredder Residue Recycling Promotion Team (ART) with 10 other automobile manufacturers. While complying with legal requirements, this organization ensures transparency in all activities while working to attain improvements in the recovery rate and recycling efficiency.