



Product Recycling and Reuse

Product Recycling

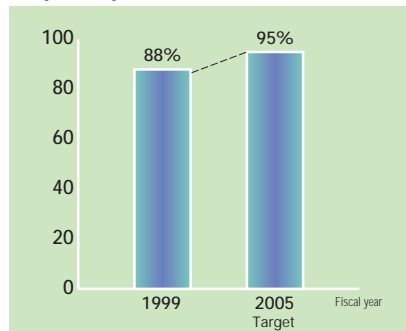
The Japan Automobile Manufacturers Association (JAMA) and automobile makers have formulated and announced action plans on their own initiative to deal with the recycling of end-of-life vehicles. In addition, recently there has been a trend in Europe to stipulate in law what proportion of a car about to be scrapped must be recycled, and the approach of the automobile manufacturing industry to recycling has become more and more important.

DENSO is already accustomed to indicating on its vehicle parts made of plastic or rubber what precisely they are made of and has made great progress in research into recycling technologies. From fiscal 1999, we decided to set numerical recycling targets for each of our products and to turn our attention to developing products that can help to raise recycling rates.

Improving Recyclability

We have formulated a recyclability appraisal method for DENSO products based on the calculation methods outlined in JAMA's Definition of Recyclability Rate set out by their Scrap Car Recycling Initiative. Through more stringent assessment criteria, the intention is to raise from the design stage the recyclability rate of end-of-life vehicles. For more information on our recyclability appraisal method,

Recyclability Rates of DENSO Products

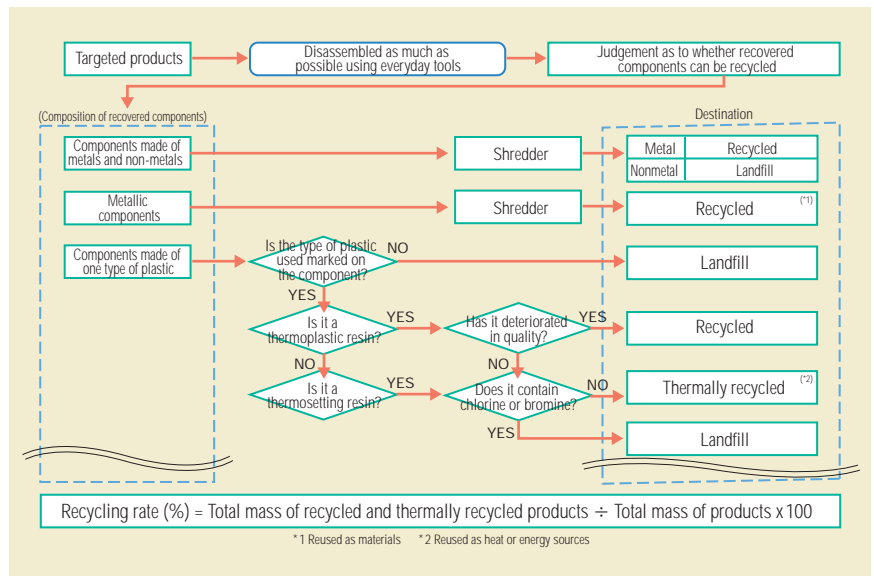


Outline of Numerical Targets Set by the Ministry of International Trade and Industry's Recycling Initiative

Recycling Rate	After 2002	After 2015
End-of-life vehicles (by weight)	A recyclability rate of 85% or more	A recyclability rate of 95% or more
Landfill disposal volume (by area)	Three-fifths or less of 1996 levels	One-fifth or less of 1996 levels
New model vehicles	A recyclability rate of more than 90%	—

Hazardous Substances	By the End of 2000	By the End of 2005
Use of lead (by weight) (not including batteries)	Approximately one-half or less of 1996 levels	Approximately one-third of 1996 levels

DENSO's Product Recyclability Appraisal Method



please refer to the flow chart above. In fiscal 1999, we introduced this appraisal method as an internal standard across all Company design departments. After investigation, we were able to discover that, based on this appraisal method, DENSO automobile components have an overall recyclability rate of approximately 88%. We have set a Companywide target of raising recyclability rates to 95% or above by 2005. Given the introduction in Europe in a few years' time of scrap vehicle recycling regulations and the imminent arrival in Japan of a voluntary industrywide recycling target, we, as a components manufacturer, have to attain almost total product recyclability. As such, we have established objectives for

each of our products to ensure that we reach this higher goal.

In May 2000, we introduced a recyclability appraisal system for product design work and are continually making refinements to this new system.

Development of Recycling Technology

We are aiming to produce components made of fewer types of materials so they are easier to recycle. At the same time, we are reviewing product configurations so that they are easier to disassemble or break down into constituent materials, concentrating on plastic and rubber products, which so often end up disposed of in landfills. In addition, we are

working hard to develop recycling technology applicable to compound materials, electrical components, and bulky parts made of polypropylene that have been commercially recovered.

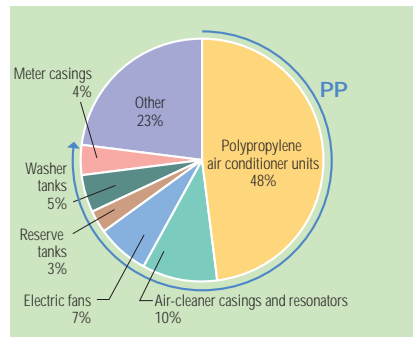
Our plans for the future include a more focused approach to information sharing with vehicle manufacturers, academic bodies, government bodies, and those engaged in the vehicle disassembly business, which we hope will help to raise the effectiveness of recycling as well as total recycling rates. We intend to sustain our commitment to R&D in the field of recycling technology, based on the prevailing conditions in the recycling business and the prospects for subsequent advances in recycling technology.

● Case Study: Research into the Recyclability of an Air Conditioner Unit

Currently, when a vehicle reaches the end of its life cycle, DENSO's plastic components are not recycled but are shredded and used as landfill. Of the volume of plastic used in DENSO products that ends up this way, polypropylene used in air conditioner units accounts for about 50%. (Please refer to the pie chart at the top of the page.)

At DENSO we take air conditioner units that have been recovered on the open market and assess to what extent they have deteriorated. We are also making progress with standardized appraisal tests using recycled materials made from the polypropylene components of these air conditioner units. As can be seen in the illustration and table above, the constituent components of the air conditioner unit are not separated. DENSO has made practicable the technology required to recycle the key components of commercially recovered air conditioner units as material for the casings of new units.

Where Plastics Are Used in DENSO Products (By volume)



Recycling Model for Air Conditioner Units

Components of an Air Conditioner Unit Made of Polypropylene

Name	Material	Relative Amount of Total Polypropylene Used by Weight (%)
Housing	PP-T20	83
Door	PP-Mi40	11
Fan	PP-W10	4
Sealant	Polyurethane foam	2

Recycling an Air Conditioner Unit

Recycling without separating the housing, door, fan, and seal