

Measures for Resource Conservation and Recycling

There is growing concern around the world that an economic system based on mass production, mass consumption, and mass disposal will end up depleting a wide range of resources in the future. Against this backdrop, companies are required to help build recycling-oriented societies by ensuring the efficient use of resources throughout the entire product lifecycle—from the extraction of resources, to product use, to disposal. Additionally, there is concern that the increase in worldwide demand for water will lead to the depletion of water resources in the future. Companies must therefore make efficient use of water resources.

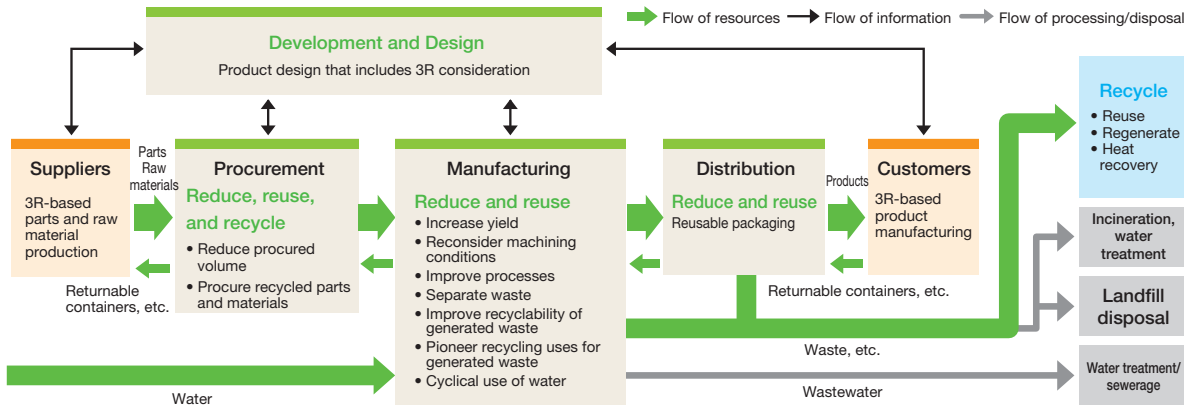
NSK's Approach

The NSK Group aims to make efficient use of the resources it requires for raw materials and is working on reducing, reusing, and recycling (the 3Rs), striving to do its part in building recycling-oriented societies around the world. The Group's development and design divisions strive to develop products that can be produced with the minimum amount of raw materials and that can be easily recycled when disposed after use. In order to reduce environmental impact, the Group's manufacturing and distribution divisions attempt to reduce the generation of waste and also work to reuse and recycle waste that is generated, aiming to eliminate landfill waste disposal.

To ensure the proper disposal of waste, the Group conducts regular audits of contract industrial waste processors and strives to enhance management using information systems.

As for water, the NSK Group has judged that there is a low possibility—under existing conditions—of it being impacted by water shortages, based on the volume of water it uses and where its business sites are located. Still, the Group remains committed to the efficient use of water, realizing that the future may bring a serious global shortage of water resources.

● 3Rs to Help Build Recycling-Oriented Societies



Mid-Term Targets (FY2016-2018)

The NSK Group is strengthening its initiatives to achieve the rigorous goals it set for the effective utilization of resources, recycling rate, and landfill disposal rate. The Group constantly pursues higher performance on the 3Rs.

Manufacturing sites in Japan have achieved “zero landfill disposal” with a 100% recycling rate at the end of fiscal 2015. Going forward, NSK will keep working to make effective use of resources, for example by improving productivity to reduce waste emissions. Manufacturing sites outside Japan have set recycling rate targets by plant, in light of the characteristics of each region and plant. The overall target for fiscal 2018 is 97.5%. Furthermore, these sites will make even greater efforts to promote recycling.

Fiscal 2018 Targets	
Development and design, manufacturing	
Reduce waste of steel and auxiliary materials by changing processing methods	
Manufacturing	
In Japan: Achieve a recycling rate*1 of at least 100% for waste and maintain zero emissions*2	
Reduce industrial waste per production unit*3 by 29.5% compared to fiscal 2011	
Reduce water withdrawal per production unit*4 by 30.5% compared to fiscal 2011	
Outside Japan: Achieve a waste recycling rate of at least 97.5%	
Reduce water withdrawal per production unit by 23.6% compared to fiscal 2011	
Distribution	
In Japan: Reduce packaging material waste per production unit*5 by 27.9% compared to fiscal 2007	

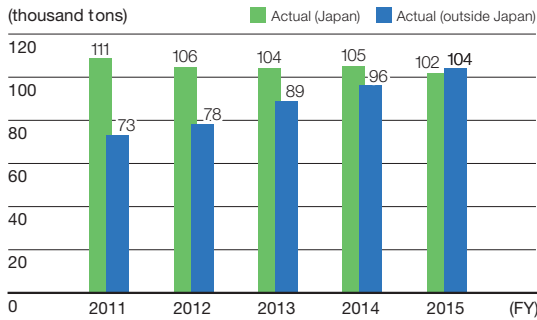
*1 Recycling rate = $\frac{\text{Recycled amount}}{\text{Total waste} - \text{reduction amount}} \times 100$
 *2 The NSK Group has defined zero emissions as “zero landfill disposal.”
 *3 Industrial waste per production unit = $\frac{\text{Industrial waste}}{\text{Value-added production}}$
 *4 Water withdrawal per production unit = $\frac{\text{Water withdrawal}}{\text{Value-added production}}$
 *5 Packaging material waste per production unit = $\frac{\text{Packaging material waste}}{\text{Production output}}$

FY2015 Activities

NSK has steadily reduced steel material waste by changing the forging shape for parts. The NSK Group's plants in Japan achieved a waste recycling rate of 99.9999% and a landfill disposal rate of 0.0001% by thoroughly sorting waste and expanding the channels for use of recycled waste. This performance met fiscal 2015 targets, and "zero landfill disposal" was achieved by the end of the fiscal year. On the other hand, although plants outside Japan did manage to increase their recycling rate to 96.1%, they did not attain their target of at least 99.0%. Globally, the recycling rate was 98.0%.

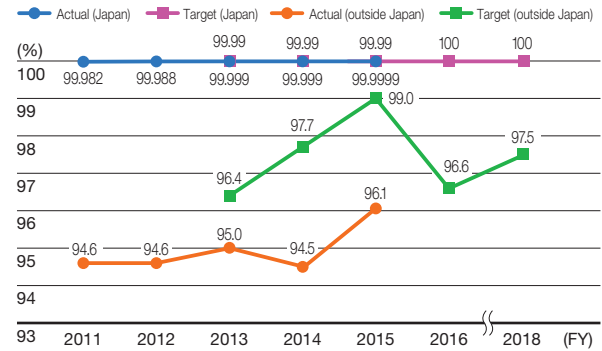
Plants in Japan reduced industrial waste per production unit by 27.4%, achieving the initial target of a 4% reduction from fiscal 2011 levels but not achieving the stretch goal of a 32% reduction. They also reduced packaging material waste per production unit by 24.9% compared to a target of an 8% reduction from the fiscal 2007 level.

Total Waste (Manufacturing)

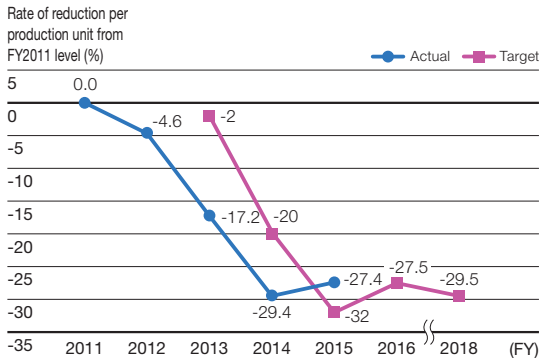


* Due to a change in calculation criteria, the data was recalculated back to 2011.

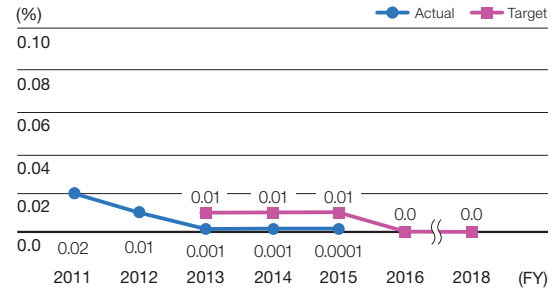
Recycling Rate (Manufacturing)



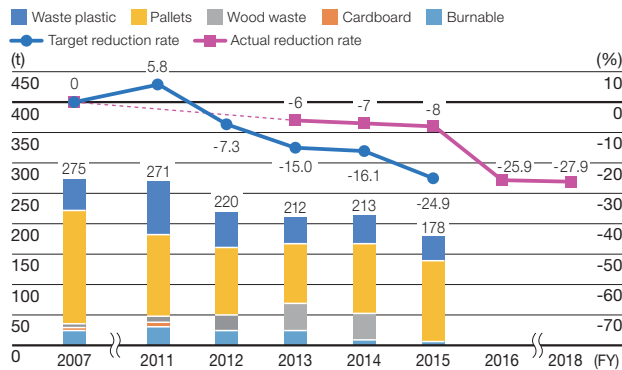
Industrial Waste per Production Unit (Plants in Japan)



Landfill Disposal Rate (Plants in Japan)

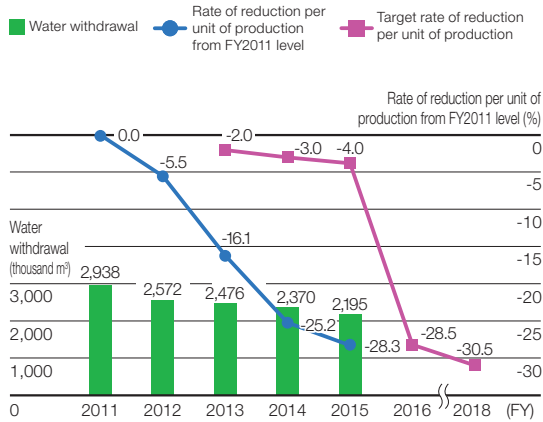


Amount of Packaging Material Waste per Production Unit (Distribution in Japan)

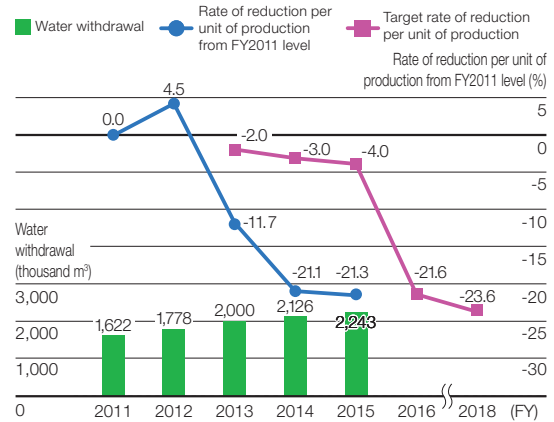


With respect to water withdrawal per production unit, plants in Japan achieved a 28.3% reduction and plants outside Japan achieved a 21.3% reduction compared to a target of a 4% reduction from fiscal 2011 levels.

● **Water Withdrawal per Unit of Production (Plants in Japan)**



● **Water Withdrawal per Unit of Production (Plants outside Japan)**

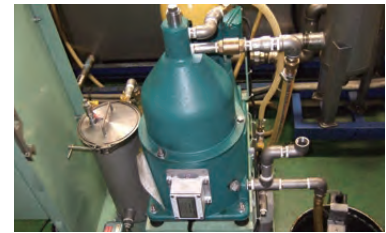


Manufacturing 1 Reducing Use of Steel Material by Increasing the Productivity of Automobile Engine Bearings

Tappet roller bearings are used in the rocker arm that operates the valves in automobile engines. Conventionally, the outer ring of these bearings was machined by turning. Technological development pursued by NSK with the aim of saving resources and achieving highly efficient production resulted in the elimination of turning with the adoption of cold forging. This reduced the use of steel material.

Manufacturing 2 Initiatives to Reduce Waste in Japan

NSK's Saitama Plant washes oil and other grime off containers for transporting parts after anti-rust oil has been applied, and then reuses the containers. The washing fluid used to be changed every day, but the installation of a centrifuge for removing oil and sludge has greatly reduced the frequency of washing fluid changes. This in turn has reduced waste by about 20 tons per month.



Centrifuge that separates oil and sludge from waste liquid

Manufacturing 3 Initiatives to Reduce Waste Liquid in China

In China, the unit cost to process waste liquid is increasing due to the effect of the tightening of regulations to protect the environment. Meanwhile, the amount of waste liquid produced at Zhangjiagang NSK Precision Machinery Co., Ltd., has been increasing with expansion of production scale. The company responded by installing a vacuum concentrator to make effective use of resources and control waste liquid processing costs, reducing the amount of waste liquid sent to a contract processor to 8%. The other 92% is recovered and reused or discharged to drainage after detoxification. This reduced the waste liquid processing cost by 74%.



Vacuum concentrator for waste liquid

Distribution Increasing Reuse and Recycling of Used Packing Materials

The NSK Group is working to use fewer packaging materials by meticulously sorting used packaging.



Conventionally, recycling of wood pallets was considered difficult due to the nails, etc. In fiscal 2015, however, NSK implemented thermal recycling of wood pallets, enabling a reduction of around 25 tons of waste pallets compared to the previous fiscal year.

Manufacturing 4 Cyclical use and Reduction of Grinding Fluid and Cooling Water

The NSK Group uses grinding fluid to reduce the heat generated during the grinding of bearings and other parts and to increase lubricity. It also uses water to cool production equipment as well as ancillary equipment such as air conditioners and compressors that make compressed air. The NSK Group's business sites monitor water withdrawal and have implemented measures aimed at reducing it. All grinding fluid is cyclically used and efforts are being made to move to air cooling using air conditioners and to circulate cooling water.

Some plants in Japan used to discharge cooling water for quenching oil in the heat treatment process after one use. However, in conjunction with changes made to production lines, cyclical use of this water has been introduced in phases since fiscal 2012.

Water withdrawal and withdrawal per unit of production have been steadily decreasing in Japan. Outside Japan, withdrawal per unit of production was flat. Going forward, the Group will continue to pursue efficient use of water and reduction of use.

 Reference data is available on NSK's website.	www.nsk.com > Sustainability > CSR Reports > CSR Reports & Reference Data
	 Water Withdrawal, Wastewater Amounts and Waste Emissions