

Promoting Environmental Management

Basic Environmental Policy

The THK Group contributes to both society and the economy through our pioneering role as manufacturers of Linear Motion Guides and other products. We also believe that it is a company's social responsibility to leave the global environment in a healthy state for the next generation, which is why we are promoting the following initiatives to continually decrease our environmental impact and to sustain and improve the natural environment.

THK Group's Basic Environmental Policy

Revised on June 3, 2013

1. We consider conservation of the environment to be a major management challenge, and we are striving to accurately understand how our business activities, products, and services impact the environment. All divisions set appropriate environmental goals to address this challenge.
2. In addition to complying with environmental laws, we have set self-imposed standards that are reviewed regularly to improve the efficiency and effectiveness of our environmental management.
3. We will continually promote the development of products that help reduce environmental impact.
4. We will cut down energy use in our business activities and continually promote the reduction of energy consumption and greenhouse gas emissions.
5. With a particular focus on the reduction and recycling of waste from our manufacturing division, we will not only continue to promote the saving and recycling of resources, but also strive to prevent pollution.
6. To achieve greater collaboration with regard to our environmental activities, we provide guidance and support to our affiliate companies and business partners, and also strive to work in cooperation and harmony with the community.
7. This basic environmental policy is disseminated to all divisions in the group through education, training, and awareness campaigns, and we facilitate the timely release of information on the environment both within and outside the Group.

ISO 14001-Certified Facilities

Japan

Production Facility	Country	Certifying Body
Yamagata Plant, Kofu Plant, Gifu Plant, Mie Plant, Yamaguchi Plant, THK NIIGATA	Japan	JQA
THK RHYTHM Headquarters, Hamamatsu Plant, Inasa Plant, Kyushu Plant		JIA
THK INTECHS Headquarters, Mishima Plant, Sendai Plant		ClassNK

The Americas

Production Facility	Country	Certifying Body
THK Manufacturing of America	USA	SAI GLOBAL
THK RHYTHM NORTH AMERICA		SQA
THK RHYTHM AUTOMOTIVE MICHIGAN		DQS
THK RHYTHM AUTOMOTIVE CANADA (Tilsonburg)	Canada	DQS
THK RHYTHM AUTOMOTIVE CANADA (St. Catharines)		DQS

Europe

Production Facility	Country	Certifying Body
THK Manufacturing of Europe	France	AFAQ
THK RHYTHM AUTOMOTIVE GmbH	Germany	DQS
THK RHYTHM AUTOMOTIVE CZECH	Czech Republic	DQS

Asia

Production Facility	Country	Certifying Body
THK MANUFACTURING OF CHINA (WUXI)	China	CQC
DALIAN THK, THK MANUFACTURING OF CHINA (LIAONING)		TUV
THK RHYTHM CHANGZHOU		BUREAU VERITAS
THK RHYTHM GUANGZHOU		SGS
THK RHYTHM MALAYSIA	Malaysia	DQS
THK RHYTHM (THAILAND)	Thailand	URS

Environmental Targets, Environmental Accounting, and Environmental Impact Overview

Environmental Targets

No.	Item	Results
1	Conserving energy and preventing global warming	CO ₂ emissions ratio Target was 0.78*. Result was 0.76. (2.2% decrease) CO ₂ emissions: 91,036 tons (5.2% increase from last year)
2	Conserving resources and achieving zero emissions	Zero emissions rate (%) Target was less than 0.50. Result was 0.13*.
3	Managing hazardous materials	PRTR substance use (kg) Target was 61,673*. Result was 71,113. (15.3% increase)

No.	Item	Main Initiatives for 2017
1	Conserving energy and preventing global warming	1. Control use of energy-efficient facility equipment 2. Change to energy-efficient lighting (LEDs) 3. Upgrade air conditioning units
2	Conserving resources and achieving zero emissions	1. Continue pursuing recycling of all waste 2. Thoroughly separate materials 3. Monitor waste locations
3	Managing hazardous materials	1. Change to electric forklifts 2. Test solvents that do not include PRTR substances 3. Promote green procurement

*Adjusted because data was taken from 12 Japanese production facilities instead of 8

Environmental Accounting

(1 million yen/year)

Type	Investment	Cost	Main Activities
1. Business costs	563	241	
Pollution control	(37)	(63)	Monitoring air and water quality, performing maintenance on washing equipment and sewage tanks
Global environmental conservation	(525)	(57)	Installing energy-efficient facility equipment
Recycling and conserving resources	(1)	(121)	Waste disposal, recycling costs
2. Upstream and downstream costs	0	452	Green procurement activities
3. Management activity costs	2	184	ISO activities, reducing energy use, managing chemical substances
4. Research and development costs	53	526	New product development
5. Community activity costs	0	7	Local activities, PR activities
6. Environmental damage costs	0	0	
Total	618	1,410	

Environmental Impact Overview

INPUT		2015	2016	Change
Main raw materials (t)		84,462	93,213	(+10.4%)
Main indirect materials (t)		3,074	3,211	(+4.5%)
Packaging materials (t)		4,315	4,760	(+10.3%)

Energy Input

		2015	2016	Change
Electricity (MWh)		221,304	228,226	(+3.1%)
Bunker A fuel oil (kL)		3,916	4,572	(+16.8%)
Liquefied natural gas (t)		123	140	(+13.8%)
Propane (t)		894	1,045	(+16.9%)
Kerosene (kL)		27	18	(-33.3%)

OUTPUT		2015	2016	Change
Production volume (t)		71,686	76,202	(+6.3%)

Waste

		2015	2016	Change
Total waste (t)		19,203	19,625	(+2.2%)
Recycled (t)		16,598	17,342	(+4.5%)
Incinerated (t)		2,102	1,780	(-15.3%)

Air Emissions

		2015	2016	Change
CO ₂ emissions (t-CO ₂)		152,453	158,416	(+3.9%)
NOx* (Nm ³)		3,170	2,860	(-9.8%)
SOx* (Nm ³)		2,509	1,922	(-23.4%)

NOx (Nitrogen oxides): Generated by the combustion of fuel in boilers and other sources.

SOx (Sulfur oxides): Generated by the combustion of sulfurous fuel in boilers and other sources.

*NOx and SOx figures are for five THK plants in Japan only.

*This overview of our environmental accounting and environmental impact is based on the following production facilities: Twelve production facilities in Japan: Yamagata, Kofu, Gifu, Mie, Yamaguchi, THK NIIGATA, two THK INTECHS facilities (Sendai and Mishima), NIPPON SLIDE, and three THK RHYTHM facilities (Hamamatsu, Inasa, and Kyushu). Seven production facilities outside of Japan: TMA (USA), TME (France), TMI (Ireland), DALIAN THK (China), Wuxi (China), Liaoning (China), and TMV (Vietnam).

Conserving Energy and Preventing Global Warming

We consider the prevention of global warming to be a common challenge that all of humanity must address. Therefore, we are working to upgrade to energy-saving equipment, with our employees combining their expertise to modify our existing equipment to reduce energy consumption.

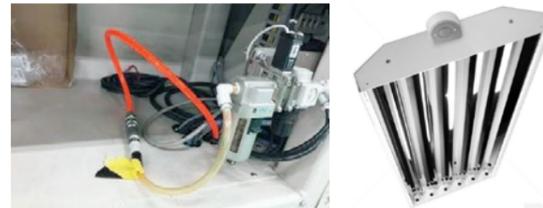
THK's CO₂ Emissions

Our target for reducing our CO₂ emissions is defined in terms of our emissions rate (CO₂ emissions per production volume in yen). With the increase in our production, the CO₂ emissions (absolute emissions) from our 12 production facilities in Japan in 2016 was 91,036 tons, which was a 5.2% increase from the previous year's 86,561 tons. However, our emissions rate was 0.76, so we were able to achieve our goal of 0.78.

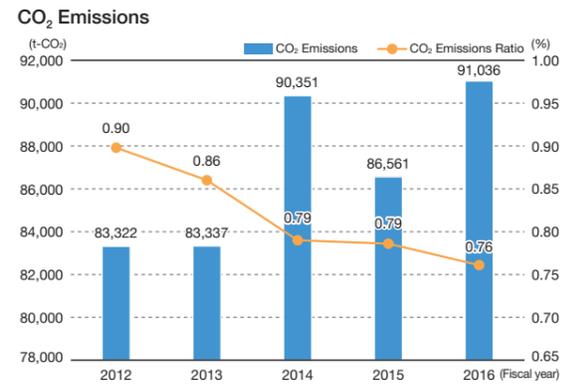
In an effort to reduce energy, we have done the following in every region:

1. Upgraded to LED lighting
2. Upgraded to high-efficiency equipment
3. Improved current equipment
4. Added or switched to energy insulating materials
5. Managed timed shutdowns of air conditioning and lighting, installed lighting equipment with motion detectors and ambient light sensors, and performed maintenance tasks such as inspecting for and repairing gas leaks in air compressor piping.

In addition, through seminars, environmental meetings, and other activities, we make every effort to increase our employees' awareness of the need to conserve energy.



(Left) Gas leak inspection performed at DALIAN THK (tape is placed over a leak, which is later repaired)
(Right) Motion detector used at a TRA facility in the US



Production Facilities That Upgraded to LEDs

Production Facility	Bulbs Replaced
Japan	
Gifu Plant	874
Yamagata Plant	741
Kofu Plant	323
THK INTECHS CO., LTD., Mishima Plant	282
Yamaguchi Plant	209
THK INTECHS CO., LTD., Sendai Plant	134
THK RHYTHM Kyushu Plant	82
THK RHYTHM Headquarters & Hamamatsu Plant	57
NIPPON SLIDE CO., LTD.	36
China	
THK MANUFACTURING OF CHINA (CHANGZHOU)	536
THK MANUFACTURING OF CHINA (LIAONING)	52
DALIAN THK	18
Europe	
THK RHYTHM AUTOMOTIVE CZECH	280
Asia	
THK RHYTHM MALAYSIA	98
THK RHYTHM (THAILAND)	72
The Americas	
THK Manufacturing of America	330
THK RHYTHM AUTOMOTIVE CANADA (St. Catharines)	207
THK RHYTHM AUTOMOTIVE CANADA (Tillsonburg)	30
THK RHYTHM AUTOMOTIVE MICHIGAN	22
THK RHYTHM NORTH AMERICA	22
Total	4,405

Installing High-Efficiency Equipment

At 10 THK Group production facilities, we have installed high-efficiency equipment to strengthen the capacity of the compressors for our air conditioning systems and other ag-

ing equipment. As a result, we were able to reduce our power consumption by about 1,717 MWh/year and decrease our CO₂ emissions by about 2,819 tons.

Examples of New Equipment

Production Facility	Old Equipment	New Equipment
Japan		
Yamaguchi Plant Technical Facility	Compressor (General purpose, 3300V)	Compressor (Inverter, 200V)
Yamaguchi Plant Factory 1	Oil-fired absorption chiller-heater	Vacuum hot water boiler
Mie Plant Factory 1	20 HP floor-standing package air conditioner	20 HP floor-standing package air conditioner
THK NIIGATA	Chiller-heater	Package air conditioner
THK INTECHS Mishima Plant Factory 2	Spot air conditioner/heater	Floor-standing package air conditioner
Europe		
THK RHYTHM AUTOMOTIVE KREFELD GELLEP	R22 air conditioning system	R410a air conditioning system
THK Manufacturing of Europe	60 kW compressor	100 kW air compressor with inverter control
The Americas		
THK RHYTHM NORTH AMERICA	Cation electrodeposition coating equipment tanks 2 & 3	Type that prevents water, chemical, and heating leaks
THK RHYTHM AUTOMOTIVE MICHIGAN	ESD 250 compressor	DSD 250 compressor
THK RHYTHM AUTOMOTIVE CANADA (Tillsonburg)	250 HP compressor (without tank)	275 HP compressor (with tank)

Original Improvements to Existing Equipment

At 12 THK Group production facilities, we have come up with original ways to improve our existing air conditioning systems, compressors, air units, and other equipment. As

a result, we were able to reduce our power consumption by about 332 MWh/year and decrease our CO₂ emissions by about 239 tons.

Examples of Equipment Improvements

Production Facility	Improvement	Details
Japan		
Kofu Plant	Added fuel modifier to bunker A fuel oil used for Factory 3 and 4's boilers	Increased fuel efficiency and decreased substance of concern (SoC) use and maintenance costs
Mie Plant	Began utilizing waste heat from heat treatment facility's compressor	Began utilizing waste heat from heat treatment facility's compressor within the plant
Yamaguchi Plant	Improved Technical Facility's air conditioning system	Modified control system to allow choice between using air conditioning and cooling with outside air
THK NIIGATA	Isolated thermostatic chamber for Factory 2's air conditioning system	Reduced running time by separating air conditioning system
China		
THK RHYTHM CHANGZHOU	Improved compressor room's exhaust system	Added more ventilation to reduce the increase in temperature in the compressor room
DALIAN THK	Modified the air conditioning system's OHU (outside air handling unit)	Improved the OHU's ability to dehumidify and cool air by expanding and increasing the cooling coils
THK MANUFACTURING OF CHINA (WUXI)	Made improvements with energy-saving air conditioning system in Factories 1, 2, and 3	Optimized temperature and pressure of the coolant and steam to reduce energy consumption
Europe		
THK Manufacturing of Europe	Stabilized temperature in wrapping room	Installed automatic shutters at entrances to the shipping warehouse, reducing the amount of time it takes to open and close the shutters
The Americas		
THK RHYTHM NORTH AMERICA	Added switches	Segmented the spraying process to reduce steam and hot water use
THK RHYTHM AUTOMOTIVE MICHIGAN	Stabilized temperature on the production floor	Changed location of the thermostats
THK RHYTHM AUTOMOTIVE CANADA (St. Catharines)	Modified air in Factory 1	Made the temperature settings electric
THK RHYTHM AUTOMOTIVE CANADA (Tillsonburg)	Modified air unit	Increased volume of supplied air

LED Lighting

In 2016, fluorescent and mercury light bulbs were replaced with LED lighting at 20 THK Group facilities. Furthermore, when THK MANUFACTURING OF CHINA (CHANGZHOU) began operations in July 2016, 536 bulbs (out of a total 676 used for illumination) were LEDs.

A total of 4,405 bulbs were upgraded to LEDs, allowing us to save around 2,122 MWh of energy.

We will pursue energy-saving measures next year and in the future by continuing to switch to LED lighting in stages.



Yamaguchi Plant Factory 1

Utilizing Thermal Insulation Materials

In 2016, five THK Group production facilities had work performed on their roofs or other areas to improve insulation. In particular, TMA (THK Manufacturing of America) had this work performed on a large scale.

Production Facilities That Introduced Thermal Insulation Materials

Facility	Type	Location
Mie Plant	Roofing	Roof of Grinding Factory 1
THK RHYTHM Headquarters & Hamamatsu Plant	Roofing	Slate roof of machining and assembly facility
THK RHYTHM MALAYSIA	Roofing	Existing roof
TMA	Roofing	Roof of Link Ball facility
THK RHYTHM AUTOMOTIVE MICHIGAN	Insulation sealing	Trailer shipping area

To reduce its energy consumption, TMA performed work in September 2016 to thermally insulate the 9,290 m² roof of its Link Ball facility, which represents 25% of the entire TMA building. One major consideration for the roofing work was how to minimize the accompanying waste. In the end, they decided to overlay the existing roof with a layer of white material whose reflective surface provides thermal insulation.

By not replacing the roof, they were able to reduce material waste by an estimated 30.5 tons. They have also reduced their monthly power consumption by about 6%, or 6,500 kWh.

TMA will be thermally insulating the rest of its roof and continue to look for ways to reduce its environmental impact.



Link Ball roof before the improvement

Roof after the improvement

Using Solar Panels at the THK INTECHS Mishima Plant

By updating Factory 2's air conditioning equipment in June 2016, the THK INTECHS Mishima plant's monthly energy usage increased by 15,000 kWh. Therefore, they installed 192 solar panels on the roof of the development building in January 2017 and began generating solar power in an effort to reduce their energy consumption as much as they could.

The energy generated is primarily used for the compressors in Factory 2, but it can also be diverted to other electrical systems as needed. An LCD monitor has also been set up in the lobby that makes it easy to see how much energy is being generated by displaying this information in terms of fluorescent bulbs and LCD TVs.

Based on the amount of solar radiation in the Mishima region, they estimate they will generate about 55,622 kWh of energy per year, or an average of about 4,635 kWh (20 average households' worth) per month. Through the end of March, they generated 12,300 kWh of energy, which primarily went to the compressors. They will continue to pursue various measures to reduce their energy consumption.



Solar panels installed on top of the development building



LCD monitor displayed in the lobby

Conserving Resources and Achieving Zero Emissions

Throughout our company, we promote the effective use of resources, thoroughly separate and recycle waste generated by our production activities, and recognize water as the most important natural resource for life on Earth.

Conserving Resources and Achieving Zero Emissions in 2016

By thoroughly separating and recycling waste, we were able to achieve an emissions rate (final disposal volume/total waste volume) of 0.13%, once again reaching our target of less than 0.50%.

New General Recycling Program

TMA had long been recycling its cardboard and waste generated by the production floor, but it expanded its recycling program in June 2016 to encompass the entire facility, including paper and plastic bottle waste generated in the offices. Recycling bins have been stationed throughout the facility in addition to a centralized container for collection. By the end of December, a total of about 1.2 tons of waste had been recycled. Among that, the amount of paper recycled was approximately equal to 24.6% of the paper purchased at TMA.



Recycling bin placed in an office

By implementing this program, all TMA employees gained a greater awareness of the importance of using their resources wisely and how their actions can protect their environment.



Container used by the recycling company to collect waste

Recycling Resources

TALK SYSTEM collectively retains the entire company's confidential documents and has long entrusted the disposition of expired documents to a recycling company. Recently, to understand how much this recycling has contributed to reducing our environmental impact, TALK SYSTEM has been requesting and receiving recycling certificates. The amount of documentation eligible for disposition varies annually, so one cannot do a simple comparison with the previous year, but over the span of several years, one can see a downward trend in the volume as a result of our company-wide paperless office initiatives. At the same time, through actively purchasing Eco Mark-certified products and other activities, our employees' awareness of the environment and conservation has increased.

Environmental Impact of Document Disposition

Paper Volume Disposed	CO ₂ Amount Reduced	Trees Saved	Energy Saved
Approx. 2,510 kg	Approx. 3,750 kg	Approx. 50 trees	Approx. 2,359 kWh

The Liaoning Plant's Water Conservation Efforts

The Liaoning plant has been managing its water use by cooperating with the city of Dalian's water consumption management campaign since 2014. A water conservation expert from the city came to check the plant's current water usage and gave three instructions: (1) quickly take care of water leaks, (2) strengthen awareness campaigns regarding water conservation, and (3) inspect the pipes. Based on the results of that visit, members of the Liaoning plant performed maintenance on the valves for the heat treating equipment's coolant overflow tank (periodically draining it to preserve the ideal water content inside the tank). After checking the water quality of the coolant in the facility's cooling towers used for air conditioning, they also changed the conductivity from 0–100 to 0–170. Additionally, they adjusted the master valve for sink faucets to reduce the amount of water by half. As a result of these efforts, although their 2016 production increased about 6% from the previous year, they were able to limit the increase of water consumption to about a 0.4% increase.

In recognition of their long history of water management, the city presented them with the Water-Saving Company award in August 2016.



Award received from the Dalian city government office

Water Resource Consumption

THK recognizes water as the most important natural resource for life on Earth and an indispensable resource for the survival of businesses. That is why we always strive to practice the 3 R's (Reduce, Reuse, and Recycle) when it comes to using water at our sales offices and production facilities. We understand that water discharged from our production facilities can have a major impact on biodiversity, so we discharge our water into public waterways with an awareness of the water quality standards established by law. For our 12 facilities in Japan, our production increased about 9% in 2016 compared to the previous year, but our rate of water consumption (water use/production volume in yen) decreased about 11%.

Water Consumption Rate (for 12 Facilities in Japan)

	(Fiscal year)				
	2012	2013	2014	2015	2016
Consumption rate	2.99	2.80	2.52	2.70	2.40

Managing Hazardous Materials

We are updating our equipment and reviewing the products we use in order to reduce the usage of substances that may have a negative impact on biodiversity and the human body.

PRTR Substance Use

In an effort to reduce the amount of hazardous materials (materials that can have a negative impact on the human body or an ecosystem) that we use, we are reducing our use of chemicals subject to the PRTR Law^{*1}. The PRTR substances used at THK are primarily those found in the gasoline and heavy oil we use as fuel. Our goal is to reduce the amount we use by 3% each year, but in 2016, an increase in heavy oil used for in-house power generation led to an approximate 11.8% increase^{*2} of 7,532 kg compared to the previous fiscal year, from 63,581 kg to 71,113 kg.

^{*1} PRTR Law: Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management

^{*2} These targets were adjusted because data was taken from 12 Japanese production facilities instead of 8 as in previous years.

Substance	Amount	Air Emissions
Xylene	2,748	27
Toluene	5,425	1,798
Ethylbenzene	926	14
Benzene	221	29
Methylnaphthalene	55,534	257
Other	6,259	—
Total	71,113	2,125

(kg)

HVAC Efficiency Improvements at the Yamagata Plant

In June 2016, Factory 1 of the Yamagata plant underwent work to improve the efficiency of its HVAC system. The facility originally used two 950 USRT oil-fired absorption chiller-heaters all year long, but it switched to using two 600 USRT turbo chillers in the summer and two 2,326 kW vacuum hot water boilers in the winter. By replacing these units, they were able to reduce their emissions of methylnaphthalene by 36%.

As they were unable to use their HVAC equipment for the duration of this process, they packed their HVAC equipment with ice to prevent heat stroke from the potentially rising temperatures in the assembly area.



Turbo chiller



Vacuum hot water boilers

Reducing Substances of Concern (SoC) at the Kofu Plant

The Kofu plant uses bunker A fuel oil to power its HVAC systems. To reduce CO₂ emissions and its use of PRTR substances, as well as to raise the heating efficiency of the boilers and reduce maintenance costs, the plant began using additives in July 2016. These additives (1) absorb large amounts of oxygen, enabling combustion at low temperatures, and (2) break down the sludge in fuel, which works to reduce the impact on the environment. As a result of combining these additives with the bunker A fuel oil at a ratio of 1:5,000 when replenishing these fuel tanks, by the end of March 2017, they were able to reduce their consumption of heavy oil by approximately 22 kl, with a corresponding reduction in methylnaphthalene.



Additives that help reduce SoCs

PRTR Substance Reduction at THK NIIGATA

In an aim to reduce its use of PRTR substances, THK NIIGATA changed the washing fluid used in its washing process. The washing fluid they changed to does not contain PRTR substances and performs better than even the washing fluid used at other THK plants. It washes and prevents rust better, leaves less white residue, and performs better in bubble tests. As a result of making this change, with Manufacturing Division I switching over in July 2016 and Manufacturing Division II that November, they were able to see an approximate 63 kg decrease in polyoxyethylene octylphenyl ether, a PRTR substance.



Washing process using new washing fluid

Green Distribution

In order to reduce CO₂ emissions from distribution, we are working on many initiatives with the purchasing and sales divisions to improve load carrying capacity and implement modal shifts.

Reducing Our CO₂ from Transportation

Our CO₂ emissions from transporting products and components decreased from 4,026 tons of CO₂ last year to 3,647 tons, a reduction of 379 tons (about 9.4%).

However, because of the continued high ratio of diesel-powered vehicles used for transit, our energy consumption (ratio of energy use to freight transport in ton-kilometers) increased by about 5.9%, from 59.5 last year to 63.0.

We hold regular reporting sessions four times per year focused on distribution centers, and we come up with and implement measures to make whatever improvements we can in our distribution system and shipping weights.

	(Fiscal year)				
	2012	2013	2014	2015	2016
CO ₂ emissions (t-CO ₂)	3,842	3,689	4,178	4,026	3,647
Energy consumption ratio	61.6	60.7	57.7	59.5	63.0

Green Distribution

We have made significant changes to the logistics of shipping between DALIAN THK and Japan in order to reuse packaging materials. Originally, Japan would send product materials to DALIAN THK in normal packaging (1), and then DALIAN THK would send customers completed parts in triple-wall packaging (2) through distribution centers in Japan. The triple-wall packaging that was opened by customers

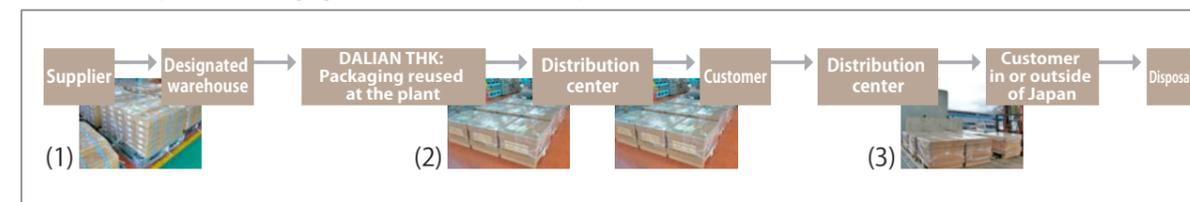
We have been working to reduce CO₂ emissions from truck transportation by decreasing the weight of our shipments. In the past, we used wooden pallets for shipments that were 1 m³ or larger, but the additional weight of those wooden pallets resulted in increased overall shipping weights. However, we began the process of switching to plastic pallets in January 2016, and we have been able to decrease our emissions by 25 tons of CO₂. While this is a small improvement, we believe that the combination of many small improvements leads to significant improvements overall, so we plan to continue pursuing a number of different initiatives.



New plastic pallet

would be collected at our distribution centers, and after these were shipped out to customers in or outside of Japan (3), they would be disposed of. Beginning this year, however, packaging that is collected at our distribution centers (4) is now packed with material (5) and sent to DALIAN THK (6). As a result, we have been able to reduce our use of cardboard boxes by about a third.

Material and Triple-Wall Packaging Process Flow (Old Process)



Material and Triple-Wall Packaging Process Flow (New Process)

