

# 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 (Tiltsburg)	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<sup>1,2</sup>

No.	Item	Results
1	Conserving energy and preventing global warming	CO <sub>2</sub> emissions ratio Target was 0.75. Result was 0.71. (6% decrease) CO <sub>2</sub> emissions: 100,624 tons (11% increase from last year)
2	Conserving resources and achieving zero emissions	Zero emissions rate (%) Target was less than 0.50. Result was 0.14.
3	Managing hazardous materials	PRTR substance use (kg) Target was 68,979. Result was 73,017. (6% increase)

No.	Item	Main Initiatives for 2018
1	Conserving energy and preventing global warming	1. Modify current equipment to save energy 2. Upgrade HVAC units and lighting 3. Monitor energy use
2	Conserving resources and achieving zero emissions	1. Continue pursuing recycling of all waste 2. Thoroughly separate materials 3. Manage water resources
3	Managing hazardous materials	1. Reduce use of PRTR substances 2. Reevaluate which solvents are used 3. Promote green procurement

## Environmental Accounting<sup>2,3</sup>

(1 million yen/year)

Type	Investment	Cost	Main Activities
1. Business costs	86	130	
Pollution control	0	12	Monitoring air and water quality, performing maintenance on washing equipment and sewage tanks
Global environmental conservation	79	58	Installing energy-efficient facility equipment
Recycling and conserving resources	7	60	Waste disposal, recycling costs
2. Upstream and downstream costs	0	21	Green procurement activities
3. Management activity costs	121	128	ISO activities, reducing energy use, managing chemical substances
4. Research and development costs	136	536	New product development
5. Community activity costs	0	5	Local activities, PR activities
6. Environmental damage costs	0	0	
<b>Total</b>	<b>343</b>	<b>820</b>	

## Environmental Impact Overview<sup>2,3</sup>

### INPUT

	2016	2017	Change
Main raw materials (t)	93,213	106,838	+15%
Main indirect materials (t)	3,211	3,541	+10%
Packaging materials (t)	4,760	6,164	+29%

### Energy Input

	2016	2017	Change
Electricity (MWh)	228,226	256,167	+12%
Bunker A fuel oil (kL)	4,572	4,912	+7%
Liquefied natural gas (t)	140	200	+43%
Propane (t)	1,045	1,045	0%
Kerosene (kL)	18	16	-12%

### OUTPUT

	2016	2017	Change
Production volume (t)	76,202	81,799	+7%

### Waste

	2016	2017	Change
Total waste (t)	19,625	20,048	+2%
Recycled (t)	17,342	17,628	+2%
Incinerated (t)	1,780	1,371	-23%

### Air Emissions

	2016	2017	Change
CO <sub>2</sub> emissions (t-CO <sub>2</sub> )	158,416	175,540	+11%
NO <sub>x</sub> * (Nm <sup>3</sup> )	2,860	3,872	+35%
SO <sub>x</sub> * (Nm <sup>3</sup> )	1,922	2,053	+7%

**NO<sub>x</sub> (Nitrogen oxides):** Generated by the combustion of fuel in boilers and other sources.

**SO<sub>x</sub> (Sulfur oxides):** Generated by the combustion of sulfurous fuel in boilers and other sources.

\*NO<sub>x</sub> and SO<sub>x</sub> figures are for five THK plants in Japan only.



<sup>1</sup> Environmental target data was taken from 12 Japanese production facilities.

<sup>2</sup> Data covers the period from April 1, 2017, through March 31, 2018.

<sup>3</sup> 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



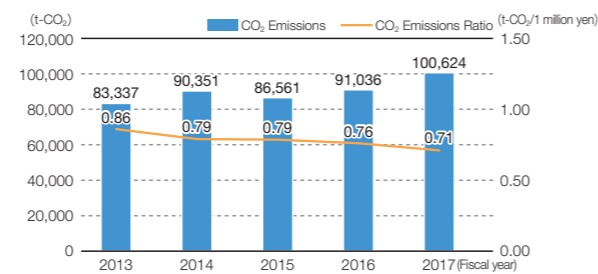
## THK's CO<sub>2</sub> Emissions

Our target for reducing our CO<sub>2</sub> emissions is defined in terms of our emissions rate (CO<sub>2</sub> emissions per production volume in yen). With the increase in our production, the amount of CO<sub>2</sub> emissions (absolute emissions) from our 12 production facilities in Japan in 2017 was 100,624 tons. However, our emissions rate was 0.71, so we were able to achieve our goal of 0.75. In our effort to reduce energy use, we have taken the following steps at our production facilities in every region:

1. Upgraded to LED lighting
2. Upgraded to high-efficiency equipment
3. Utilized renewable energy
4. Promoted activities to reduce energy use
5. Monitored our usage of air conditioning and lighting

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

### CO<sub>2</sub> Emissions



\*The data for each year covers the period from April 1 to March 31.

## Upgrading to LED Lighting

In order to reduce energy consumption and curb CO<sub>2</sub> emissions, the THK Group manufacturing facilities have been switching from fluorescent and mercury lighting to long-lasting, high-efficiency LED lighting. The lighting upgrade has been proceeding systematically at all facilities, and a total of 28,696 bulbs have been replaced with LEDs as of December 2017.

All lights that were scheduled for replacement at the THK INTECHS Sendai plant and TME have been switched to LEDs, and the improved illumination has made these facilities considerably brighter.

Throughout the THK Group, we will pursue energy-saving measures next year and in the future by proactively switching to LED lighting in stages.



(Left) Removing mercury bulbs at the Sendai plant  
(Top right) Lighting after the LED upgrade  
(Bottom right) Newly installed LED light

### Bulbs Replaced with LEDs at THK Production Facilities

Production Facility	Bulbs Replaced
<b>Japan</b>	
Kofu Plant	532
Yamaguchi Plant	1,400
Yamagata Plant	1,308
Mie Plant	570
Gifu Plant	468
THK NIIGATA	797
THK INTECHS Mishima Plant	1,482
THK INTECHS Sendai Plant	583
THK RHYTHM Headquarters & Hamamatsu Plant	427
THK RHYTHM Inasa Plant	18
THK RHYTHM Kyushu Plant	499
NIPPON SLIDE	36
<b>China, Asia, and Other</b>	
DALIAN THK	3,111
THK MANUFACTURING OF CHINA (LIAONING)	1,348
THK MANUFACTURING OF CHINA (WUXI)	1,850
THK MANUFACTURING OF CHINA (CHANGZHOU)	1,454
THK RHYTHM (CHANGZHOU)	1,840
THK RHYTHM GUANGZHOU	430
THK RHYTHM MALAYSIA	543
THK RHYTHM (THAILAND)	108
<b>The Americas</b>	
THK Manufacturing of America	413
THK RHYTHM NORTH AMERICA	19
THK RHYTHM AUTOMOTIVE CANADA (St. Catharines)	4,390
THK RHYTHM AUTOMOTIVE CANADA (Tillsonburg)	205
THK RHYTHM AUTOMOTIVE MICHIGAN	450
<b>Europe</b>	
THK Manufacturing of Europe	2,104
THK Manufacturing of Ireland	90
THK RHYTHM AUTOMOTIVE GmbH	2,004
THK RHYTHM AUTOMOTIVE CZECH	217

(As of December 31, 2017)

## Parking Lot Light Timers

As of November 2017, all of the lights that illuminate Parking Lot 1 at the Kofu plant are now operated with timers instead of being turned on and off manually. Previously, the lights remained on from the end of the workday at 5:00 p.m. until the beginning of the next workday at 6:00 a.m., a total of 13 hours. Considering the lack of people at night, however, the Kofu plant began using timers to keep the lights on for a total of 7 hours instead: 5 hours from 5:00 p.m. to 10:00 p.m. and 2 hours from 4:00 a.m. to 6:00 a.m. The lights illuminating the pedestrian walkways in the parking lot continue to stay on to eliminate security concerns.

By shortening the amount of time the lights are on, the Kofu plant was able to reduce its annual energy use by approximately 1,058 kWh, or 0.51 tons of CO<sub>2</sub>. The Kofu plant will adjust the timers to account for seasonal changes in the time the sun rises and sets.



Parking lot light that is now set by a timer

## Insulating Coating

At the Mie plant, the Quality Assurance Section office attached to Factory 1 and the Manufacturing Section II production floor office building (about 46 m<sup>2</sup> and 50 m<sup>2</sup>, respectively) face the south, so the temperature in those rooms rises because the air conditioning is not fully effective. Bamboo screens were set up and other measures were taken, but they did not solve the core problem. To prepare for the summer, the Mie plant painted the roofs of both structures with a mild solvent silicone roof coating in January 2017. The end result was a reduction in room temperature during the summertime, which decreased CO<sub>2</sub> by 2.17 tons.



Quality Assurance Section office (left) and Manufacturing Section II production floor office (right) with coated roofs

## THK Headquarters

THK moved into a new headquarters building in Shibaura in the Minato ward of Tokyo in October 2017. Containing the old headquarters, part of the Technology Center, the old Tokyo and Ueno branches, and the TALK SYSTEM and INTECHS headquarters, this new headquarters has a staff of approximately 620 people. A number of eco-friendly measures were incorporated into this seven-story building, including the use of insulated glass<sup>1</sup> for all of the walls, Ecolumi LEDs<sup>2</sup> for the lighting in each room, and motion-activated lighting in stairways and restrooms.

<sup>1</sup> Multi-layered glass with an airtight middle layer between panes that insulates heat while still letting light pass through  
<sup>2</sup> Overhead lighting that drastically decreases energy consumption while providing the required amount of illumination



Rooftop garden at the headquarters

## New Transformer

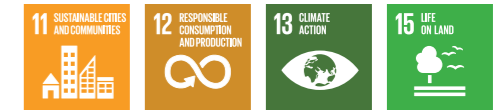
With the transformers used for lighting and machine power at THK NIIGATA's Factory 1 getting older, they were upgraded to a high-efficiency type in August 2017. Two transformers were scheduled to be replaced, but with the successful LED lighting upgrade on the production floor, THK NIIGATA was able to go from using two transformers to one. By eliminating no-load loss from the one transformer and switching over to a high-efficiency type, the plant was able to reduce its energy consumption by approximately 3,200 kWh (roughly equivalent to 0.8 kL of crude oil).



Electrical room with new transformer



# Conserving Resources and Achieving Zero Emissions



## Updating HVAC Equipment

In June 2017, the Gifu plant updated its HVAC equipment to maintain a consistent temperature and level of humidity in the precision measurement room. The old equipment used an electric heater to reheat air to the specified temperature, but the new HVAC equipment uses waste heat generated during cooling to reheat air, resulting in significant energy savings by eliminating the need to power the electric heater.



New HVAC unit for the precision measurement room

As a result, the Gifu plant was able to reduce its energy consumption by about 247,782 kWh/year and decrease its CO<sub>2</sub> emissions by about 120 tons/year.

## Updating the HVAC's Heating System

In July 2017, the Yamaguchi plant upgraded the Factory 1 HVAC's heating system to use one inverter turbo chiller instead of the two absorption chillers it had previously used.

The new chiller does not use heavy oil for fuel. As a result, the Yamaguchi plant was able to reduce its annual energy use by approximately 137 kL of crude oil, or 368 tons of CO<sub>2</sub>.



New inverter-type turbo chiller

## Updating the Air Compressor

To reduce energy consumption by consistently supplying compressed air and maximizing compressor utilization, the Yamaguchi plant upgraded the air compressor in Factory 3 to a high-efficiency, energy-saving unit in June 2017. As a result, the Yamaguchi plant was able to reduce its energy consumption by about 28.6% in comparison with the old unit, a reduction of about 44.7 kL/year. The facility also decreased its CO<sub>2</sub> emissions by approximately 120 tons/year.



New air compressor in Factory 3

## Boiler Heat Control Improvement

In November 2017, the Kofu plant upgraded the control panels for its four boilers to digital panels. Previously, temperatures were adjusted in increments of 5°C by using a dial, but the upgraded panels can be used to adjust temperature in 1° increments.

In addition, depending on the outdoor air temperature, the boiler's temperature is regularly monitored by being checked twice a day (at 9:00 a.m. and 4:00 p.m.).



New digital control panel

## Conserving Resources and Achieving Zero Emissions in 2017

We promote the conservation of resources and the achievement of zero emissions by thoroughly separating and recycling waste. In 2017, we were able to achieve an emissions rate (final disposal volume/total waste volume) of 0.14%, once again reaching our annual target of less than 0.50%.

## Coolant Unit Improvement

The coolant units that were used for LM rail cutting machines at TME had magnetic separators installed on top of the tanks. While the magnetic separators could remove metal shavings produced during the LM rail cutting process, abrasive grains would remain, settling in the tank and turning into sludge, which would contaminate the coolant with bacteria formation. Every time a coolant tank got dirty enough, TME would need to clean the tank and replace the coolant.

To solve this problem, five coolant units were upgraded in 2017, and the magnetic separators were replaced with paper filters. This method filtered out the cutting shavings and grains, dramatically reducing the amount that settled in the tank. After this change, the tanks only need to be cleaned and have the coolant changed periodically, which has improved efficiency and reduced the amount of (undiluted) cutting fluid used.



Metal shavings and grains are now filtered and stay on top of the paper

## New Semi-Centralized Coolant Tank

Each of the 22 cylindrical grinders used to grind shafts in the ball screw manufacturing process at DALIAN THK had an attached cooling tank. This setup required a



Newly installed semi-centralized coolant tank

total of around 6,500 L of coolant. Furthermore, shavings would get mixed with the coolant because magnetic separators were used for filtration. As a result, the coolant had to be replaced three times per year, which meant that around 19,500 L of liquid waste would be discharged. To reduce the amount of coolant, DALIAN THK installed a 17,900 L semi-centralized coolant tank. In addition to achieving stable coolant concentration and temperature, this unit features a paper filter, which reduces the shavings that get mixed into the coolant. Since the tank's installation, the coolant has not needed to be replaced.

## New Press

In the past, when the aluminum chips generated by TRA CZECH's production process were collected by an industrial waste contractor, they contained liquid waste. After considering the effect on the environment, however, TRA CZECH installed a press in November 2017 to separate the chips from the liquid waste and reduce the frequency of disposal. Since introducing the new equipment, pressed aluminum chips have been kept separate from liquid waste, and the frequency of waste collection decreased to a third of its previous level.

Decreasing the frequency of collection has led to an approximately 8-ton reduction in CO<sub>2</sub>.



Newly purchased press

# Managing Hazardous Materials



## Managing Hazardous Materials

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.\* 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 2017, an increase in heavy oil used for in-house power generation led to an approximate 2.6% increase of 1,904 kg compared to the previous fiscal year, from 71,113 kg to 73,017 kg.

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

Substance	Amount	Air Emissions
Xylene	2,582	247
Toluene	5,052	2,220
Ethylbenzene	858	45
Benzene	183	33
Methylnaphthalene	57,926	499
Other	6,417	—
<b>Total</b>	<b>73,017</b>	<b>3,044</b>

Data covers the period from April 1, 2017, through March 31, 2018.

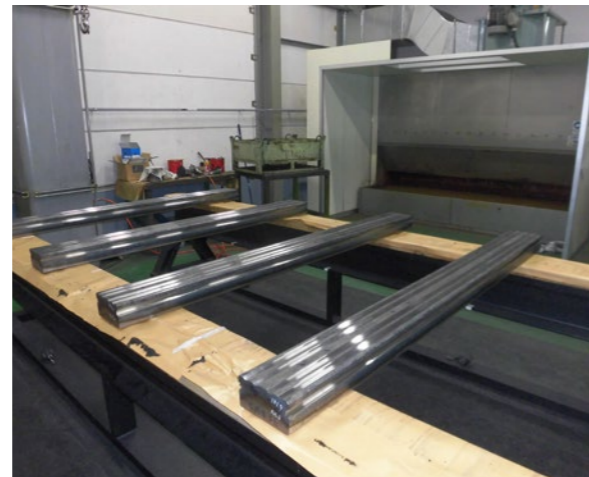
## Reducing Heavy Oil with a New Hot Water System

As part of its efforts to reduce its heavy oil use, the Yamaguchi plant worked to cut its use of boiler fuel. Previously, the hot water used for the air conditioning system in Factory 1's assembly room, final inspection room, and clean room would first be collected in the hot water tank and then circulated through the air conditioning equipment. With this system, multiple boilers were run to maintain the water temperature. When the air conditioning was upgraded in July 2017, the hot water tank was removed. The system was changed so that hot water is supplied to the air conditioner directly. Because it is no longer necessary to keep the hot water tank warm, only one boiler needs to be run. This change led to a decrease of approximately 3,960 L of heavy oil used per month, reducing methylnaphthalene by around 48 kg/month.

## Degreasing Solvent for Large LM Guide Model JUP Switched to Non-PRTR Substance

In consideration of its impact on the environment, the Gifu plant changed the degreasing solvent it used in the coating/degreasing process for the Large LM Guide Model JUP (which involves wiping grease off the product with a rag soaked with thinner) to a non-PRTR organic degreasing solvent in May 2017.

Although it is not a direct comparison with the previous year in terms of total volume because of the change in the fiscal year, the Gifu plant did decrease its use of toluene by approximately 49 kg.



LM rails at the degreasing process

## Changing the Cleaning Solution

The Mie plant investigated using an alternative cleaning solution because the one used at their support unit washing process contained less than 4% of n-hexane, a PRTR substance. After trying out and confirming the effectiveness of a solution used at other THK facilities that does not contain PRTR substances in November 2017, the Mie plant decided to make a switch to that alternative for all processes in February 2018.



Solution that does not contain PRTR substances

# Green Distribution



## The Distribution Division's Environmental Activities

The departments in charge of shipping at each THK factory, as well as the Sales Support Department, promote green distribution to reduce the environmental impact of all of our distribution activities. They promote various initiatives aimed at reducing our CO<sub>2</sub> emissions, environmental impact, and waste. Going forward, they will investigate optimal shipping methods that utilize AI to be environmentally friendly.

In terms of employing modal shifts, we had three routes running between Kitakyushu and Tokyo (daily), Ube and Kofu (weekly), and Kitakyushu and Narita (thrice weekly); one route for the THK INTECHS Sendai plant running between Sendai and Hiroshima (monthly); and two routes for the THK

RHYTHM Hamamatsu plant running between Hamamatsu and Kitakyushu (daily) and Hamamatsu and Hiroshima (daily) in 2017.

### 2017 Activities

Activity	Description
Reducing CO <sub>2</sub> emissions	Expanding modal shifts
	Consolidating transport trucks
	Improving transportation efficiency
Reducing environmental impact	Transitioning to eco-friendly forklifts
Reducing waste	Utilizing reusable containers

\*Modal shift: Shifting from trucks to railway freight and coastal shipping, which emit less CO<sub>2</sub>

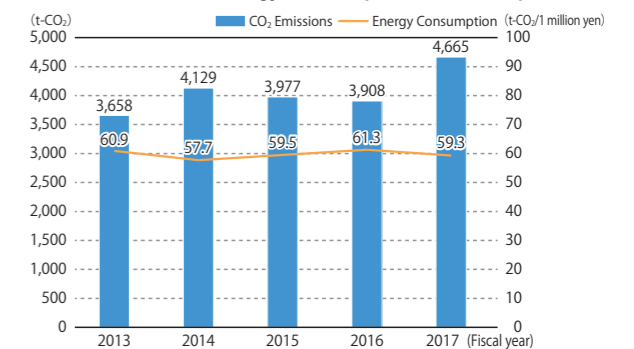
## Reducing Our CO<sub>2</sub> from Transportation

Our CO<sub>2</sub> emissions from transporting products and components rose from 3,908 tons of CO<sub>2</sub> last year to 4,665 tons, an increase of 757 tons (about 19.4%).

Despite our high production volumes and high ratio of diesel-powered vehicles used for transit, our energy consumption (ratio of energy use to freight transport in ton-kilometers) decreased by about 3.1%, from 61.3 last year to 59.3.

We hold regular reporting sessions four times per year led by our distribution centers, and we create and implement measures to make whatever improvements we can in our distribution system and shipping weights.

### CO<sub>2</sub> Emissions and Energy Consumption from Transportation



The data for each year covers the period from April 1 to March 31.

## Switching to Low-Pollution Forklifts

As of the end of December 2017, the 12 Japanese production facilities possessed a total of 150 forklifts (including those used in the distribution centers inside the factories). We have been systematically switching to low-pollution forklifts at all of our facilities. A total of six were replaced in 2017: one at the Mie plant in July (changing from gasoline to battery power), one at the THK RHYTHM Hamamatsu plant in June (changing from gasoline to LPG), and four at the Wuxi plant in October (changing from gasoline to LNG). With this change, all seven forklifts at the Wuxi plant have been replaced with low-pollution forklifts. Replacing the forklifts decreased our use of toluene by 372 kg and xylene by 245 kg, both of which are PRTR substances. We are planning to introduce more low-pollution forklifts in 2018 and beyond.

## Consolidated Packing Improvement

DALIAN THK implemented a number of improvements to respond to the Chinese government's call to promote activities that conserve materials. They reevaluated their packaging materials and changed the packaging for their smaller product models (with shaft diameters from 8 to 25). As of September 2017, products that used to be packed with two pieces per box now are shipped in boxes of twenty pieces, reducing packaging materials by around 80%. Moving forward, DALIAN THK will make packaging improvements for their medium and large products (with diameters of 32 and 40, respectively).



Old packaging



Improved packaging