Sustainability Management

Contribute to Carbon-Free Society

Materiality

Reduce energy loss

Save Energy for EVs and electrification

The electrification of cars and electric vehicles are essential to achieving carbon neutrality, and the electric drive units needed to power vehicles are becoming more sophisticated and powerful at an accelerating rate. We will contribute to energy conservation for electric vehicles by developing automotive deep groove ball bearings compatible with the miniaturization of electric drive units and the high-speed rotation of motors, as well as modular products that add energy recovery and steering functions to hub bearings.

Providing high-performance bearings (core products)

The electric drive units used in EVs and HEVs are increasingly needed to be more efficient, compact and lightweight. The development of e-axles, in which the motor is integrated with an inverter and reduction gearbox, is gaining momentum. We have already marketed “High Speed Deep Groove Ball Bearing for EVs and HEVs” with a dmn value* 1.8 million, and highly evaluated by our customers. Rolling bearings used in motors and reduction gears, which are becoming smaller and faster, are required to rotate at higher speeds. We have developed a high speed deep groove ball bearing with a dmn* value of 2.2 million under oil lubrication by optimizing the internal dimensions of the bearing through the establishment of a calculation method for the amount of oil supplied to optimize the balance of heat generated by the bearing and its lubrication conditions, and by reviewing the cage shape to suppress deformation caused by centrifugal force.

Furthermore, the housing of the drive unit is thinner, reducing the overall weight of the drive unit. “Creep phenomenon,” in which the bearing gently rotates and shifts on the mating surface between the housing and bearing, may occur due to outer ring deformation caused by the rotational load. We have developed “Creepless bearings” with a relief portion on the outer diameter surface of the bearing outer ring to make the housing and bearing mating surfaces discontinuous, thereby stopping creep and preventing abnormal noise and vibration in the equipment and reducing bearing life.

In the future, the demand for bearings in the automotive market is expected to continue to grow in response to the progress of EVs and HEVs. We will continue to enhance and develop our product lineup that anticipates market needs and contribute to the carbon neutrality of automobiles by leveraging our core competencies and incorporating next-generation technologies.

(*dmn value: Index of the bearing rotational performance Rolling element pitch circle diameter mm x rotational speed min^{-1})

High Speed Deep Groove Ball Bearings for EVs and HEVs

Creepless Bearing

Providing high-performance module products (new areas)

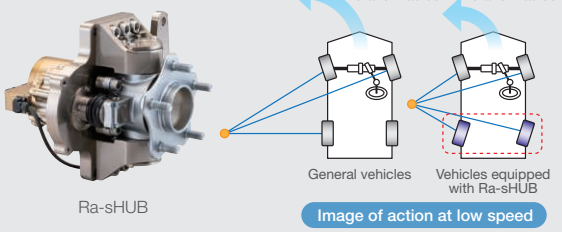
We are developing “Ra-sHUB” hub bearings with a steering function for rear wheels, which individually compensates for the steering angles on the right and left sides by making full use of the technologies we have accumulated in our hub bearings.

The rear-wheel steering systems on the market are limited to some suspension systems, such as multi-link system used in luxury vehicles, and it is difficult to achieve a large steering angle with the existing structure.

“Ra-sHUB” is a module product that adds a steering function to our hub bearings with using our proprietary technologies. They are as small as existing hub bearings, and can be mounted on any type of suspension system, to achieve rear wheel steering. By controlling the steering angle of the rear tires from the steering angle and driving information of the front wheels separately from the left and right sides, the cornering performance and high-speed straight driving stability of the vehicle can be improved. At low speeds, the minimum rotation radius can be reduced to improve the vehicle’s small turning performance and tire traveling resistance. In addition, as the level of automated driving increases, vehicle operation control must become even more sophisticated. “Ra-sHUB” also contributes to safe driving during crisis avoidance.

Characteristics of “Ra-sHUB”

- Module product with steering function for hub bearings
- Controls the rear wheel angle independently on the left and right sides
- Rotation angle +/-10 degree
- Improved cornering performance and high-speed straight driving stability of vehicles
- Reduce the minimum rotation radius of the vehicle



Ra-sHUB

Image of action at low speed

Development of environment-contributing product

We continue unwavering efforts to realize its corporate philosophy by developing and providing higher-grade products that contribute to the environment while quantifying the degree of environmental contribution of our main products, such as bearings and drive shafts, and green energy products.

Trend in achievements and forecasts

Driveshafts and hub bearings, which are our main products and account for about 50% of our net sales, and green energy products contributed 1,474 thousand tons of CO_2 reduction in the fiscal year ended March 31, 2023. Sales of S- to B-eco grade environment-contributing products, which are the result of our recent development efforts, comprised 52.6% of net sales in the fiscal year ended March 31, 2023.

*Products are classified according to environmental factor standards specified for different products in line with technology standards across the world.

Calculation methods for environmental factors and eco-efficiency

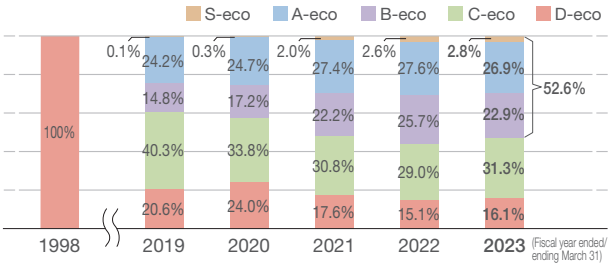
To quantify products' environmental friendliness, NTN adopted environmental factors and eco-efficiency that are defined in formula ❶ and ❷ as follows.

$$\text{Environmental factors} = \frac{\text{Eco-efficiency of developed products}}{\text{Eco-efficiency of benchmark products}^{*1}} \quad \cdots ❶$$

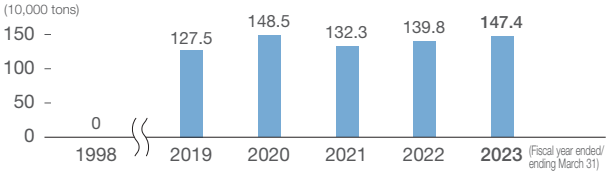
$$\text{Eco-efficiency} = \frac{\text{Product value}^{*2}}{\text{Environmental impact}^{*3}} \quad \cdots ❷$$

*1 D-eco product (Products that help to reduce energy loss of finished products at the same performance level as that of around 1997)
*2 Values are quantified by using the QFD method (including CO_2 reduction contribution of finished products)
*3 From the perspective of evaluating contribution toward measures against climate change, environmental impact is calculated as CO_2 emissions generated throughout the process of raw materials mining to production (using the LCI calculation tool by the Japan Auto Parts Industries Association)

Trend in composition of environment-contributing products by grade (driveshafts and hub bearings)



Contribution to CO_2 reduction*



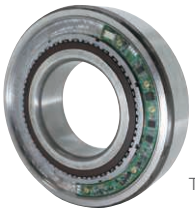
Calculation standard
JAPIA LCI Calculation Guidelines by Japan Auto Parts Industries Association (Consumer Use-phase LCI calculation tool)
*Applicable to S to C-eco products

Increase efficiency of manufacturing equipment

To improve productivity at manufacturing sites, there is a desire to minimize equipment downtime by monitoring equipment operating conditions and accurately and systematically performing maintenance and parts replacement based on the data. Furthermore, in recent years, with the advancement of DX and IoT technologies, there is a growing need for remote and automatic monitoring of equipment that is not restricted by location or time, as well as the stabilization and improvement of manufacturing quality through the use of condition monitoring information obtained.

To meet these condition monitoring needs, we have developed "Talking bearing™," which incorporates a power generation unit and wireless communication device into a standard rolling bearing without changing the bearing dimensions or load capacity and wirelessly transmits sensing information on temperature, vibration and rotation speed. The energy generated by the rotation of the bearings is used to power sensors and wireless communication devices to transmit sensing information automatically. Because the sensor is built into the bearing, the bearing condition can be detected with greater sensitivity than when the sensor is mounted externally on the equipment housing, allowing earlier detection of abnormalities.

This newly developed product will enable advanced condition monitoring. It will help increase the efficiency and productivity of manufacturing facilities.



Talking bearing™

Bearing refurbish business

We are engaged in the business of refurbishing bearings used in various types of machinery and equipment, such as extra-large sized bearings for paper mill, large sized bearings for steel mill, and bearings for railway application. We provide optimal bearing refurbishing services based on our bearing technology know-how in response to these customer requirements. Furthermore, along with training on the proper use of bearings and condition monitoring services, we will expand our comprehensive approach to NTN Group's materiality, which includes "Provide safety and comfort," "Reduce energy loss," and "Resource recycling and pollution prevention."

Extra-large sized spherical roller bearing for paper mill application