Foundation Supporting Sustainability

Core Technologies and Taking Up the Challenge of Creating

“NSK’s Four Core Technologies, and Giving Them Shape Is Manufacturing Engineering”

NSK has relentlessly pursued innovative technologies and focused on improving quality in order to contribute to a safer, smoother society and to protect the global environment, in line with its corporate philosophy. NSK leads the world in the product fields of bearings, automotive components, and precision machinery and parts. The foundation that underpins those technologies consists of tribology, materials, numerical simulation, and mechatronics, which are NSK’s Four Core Technologies.

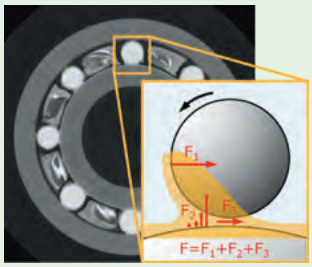
Then there is manufacturing engineering, another important technology and strength of NSK that gives shape to our Core Technologies.

The technologies and products that have been created based on our Four Core Technologies, with the “plus One” of manufacturing engineering, are contributing both to the development of industry across the world and to people’s abundant lifestyles. NSK will continue to engage in advanced technological development and provide highly functional, high-quality products that meet market needs for years to come.

Four Core Technologies + 1

Tribology

Studying, Clarifying, and Controlling Friction



Friction on the bearing’s ball surface

Tribology is the study of friction and wear of contact surfaces in relative motion, such as rotating parts that endure enormous forces with a thin oil film. Severe operating conditions are mitigated through lubrication and surface treatments developed by NSK, resulting in superior performance for applications requiring low friction, high-speed rotation, quiet operation, or enhanced durability.

Materials

Unrelenting Pursuit of Performance Durability and Reliability

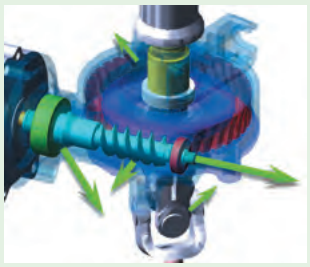
Materials research and development affects nearly every aspect of product performance. Through careful selection of material composition, heat treatment, and ceramic materials, NSK enables optimization of application performance. This may result from improvements in function, endurance, or reliability, or through advancements in cost-effectiveness or production efficiency.

Durability testing machines

Four Core Technologies

Numerical Simulation

Simulated Recreation in Cyberspace to Predict Performance



Simulated example of an automotive component

In the past, accuracy and reliability in product development were achieved with experience-based design and longer testing periods. NSK’s simulation technology allows virtual validation to accelerate design and production. Extreme conditions or innovative designs that defy previous expectations can also be evaluated and analyzed.

Mechatronics

Technology Supports People for a Convenient, Safe, and Comfortable Future

Mechatronics integrates machine elements technology with control technology. By combining bearings, ball screws, and linear guides, together with motors, sensors, and computers, greater mechanical functionality is elicited with computer control. This technology applies new functions and performance to a range of industrial machinery, such as for automobiles and biomedicine. It also contributes to greater reliability, as well as to convenience and safety in daily life.

NSK vibration control actuator for train cars

+1

Manufacturing Engineering

Giving Shape to Four Core Technologies

Contributing to the environment and heightening safety and security through our Four Core Technologies requires something to breathe life into these technologies. In addition, it is essential to consistently produce with high quality. NSK tackles these issues by applying AI to its equipment, utilizing IoT, and optimizing its overall production framework while it works to realize the creation of smart factories that economize on space, save on energy, and reduce manpower requirements.

Cheonan Plant in South Korea

New Collaborative Value

Collaboratively Creating Sustainable Value through Open Innovation

Social Issues and Background

Building a Sustainable Mobility Society with Dynamic Wireless Charging

The need to reduce automotive CO_2 emissions means that electric vehicles (EVs) will soon be mainstream. That said, cruising range and time needed to charge are issues to be addressed. One potential solution is gaining ground: dynamic wireless charging, which can charge vehicles as they move down the road.

Dynamic Wireless Charging

Wireless charging uses a magnetic field to transmit electricity with no hardwired connection. One common use for it today is charging smartphones. In collaboration with the University of Tokyo, NSK continues to conduct research to apply this technology. In 2015, we developed the first-generation system for wirelessly charging in-wheel motors; in 2017, the second generation successfully charged motors in motion, and in 2019 the third generation provided greatly improved performance.

If future EVs can be charged on the road with dynamic wireless charging, drivers could get where they need to go without worrying about the battery dying. This would dramatically increase convenience.

Third-generation dynamic wireless charging in-wheel motor

Growing the Value of EVs

Renewable energy, namely solar and wind power, is becoming increasingly important as a means of generating power, but the challenge is that the power generated fluctuates greatly depending on the weather. Technologies for balancing power supply and demand by utilizing the batteries in EVs are therefore in the spotlight. Realizing dynamic wireless charging would offer the capability of utilizing not only EVs connected to charging equipment but also utilization as batteries of EVs while being driven, making it possible to cope with larger fluctuations in power generation. In this way, EVs will be more than simply another means of transportation and will come to offer society a new way to provide value.

Open Innovation

NSK participates in joint research projects primarily with the University of Tokyo, and in tandem with that, has together with Bridgestone Corporation, Denso Corporation, and ROHM Co., Ltd., established a social cooperation program titled "Open Innovation of Mobility Technologies to Achieve the SDGs," which commenced in December 2020. Under this program, the companies will carry out R&D on technologies for the electrification of mobility, chiefly dynamic wireless charging, and will endeavor to find a way to accelerate the practical use of research results by making part of such results publicly available to support open innovation.

R&D Expenses

Along with R&D expenses based on institutional accounting, NSK recognizes that all expenses involved in the technology divisions are R&D expenses in a broader sense. As part of the 6th Mid-Term Management Plan, NSK intends to make R&D expenses equivalent to 3%–4% of sales (¥30.0 billion–¥40.0 billion annually). This level of R&D investment, which even rivals that of Japanese and overseas bearing competitors, will enable us to quickly supply sophisticated products with new features to the market. Moreover, we will contribute to the realization of a more abundant, sustainable society by engaging in activities to save energy, reduce CO_2 emissions, and conserve the global environment.