In the business environment surrounding NSK, technological innovation is rapidly advancing in all industries, including the spread of AI, IoT, and 5G, as well as automotive electrification and automation. In particular, the issues that NSK is working to address are ever expanding. These include efforts in the renewable energy field and the accelerated shift to eco-friendly electric vehicles given the increased importance of addressing climate change and environmental issues, as well as rapidly increasing remote and non-contact needs due to the COVID-19 outbreak. NSK aims for sustainable growth by contributing to technological innovation in these areas.

The “electrification” of various applications is progressing with the automotive industry shifting from conventional gasoline and diesel vehicles to hybrid and electric vehicles. For example, just as power steering has switched from hydraulic to electric power, electrification is expected to progress in brakes and other areas. Elsewhere, higher demand for onboard motors looks promising as functions increase in such areas as headlights that change lighting direction while driving and electric sliding doors. In the field of industrial machinery, automation and electrification are advancing based on overall connectivity through the spread of 5G and IoT. As a result, cooling fan demand is expected to rise as data centers and communication base stations increase.

Against the backdrop of this demand growth, NSK expects demand for small ball bearings to increase. NSK established the E&E DHQ to expand its core ball bearings business. In so doing, NSK will integrate production, sales, technology, and management departments to keep up with its rapidly changing customers. Along with strengthening its supply system, NSK will contribute to electrification by improving product appeal, cost competitiveness, and quality.

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The need for automation and labor-saving at production sites is increasing with working populations shrinking mainly in developed countries and COVID-19 increasing the need for remote and non-contact services. Improving machine tool and robot performance is essential to achieve “automation and labor-saving.” Particularly for machine tools, there has been a progressive shift from 3-axis to multi-axis (e.g., 5-axis) and combined machine tools to consolidate processes and improve machining accuracy. Further growth looks likely as this is an area of demand where NSK can provide value by leveraging its strengths in precision technology (precision machinery products centered on precision bearings and precision ball screws). In addition, the adoption rate of NC (numerical control) for machine tools is expected to increase in China, the largest producer and seller of machine tools. Ball screw accuracy will become more important as NC takes hold, so we expect demand for NSK products to grow further in the Chinese market.

NSK’s precision bearings and precision ball screws will become important as elemental technologies for high-performance machine tools. NSK will continue contributing to advanced manufacturing by making proposals to customers that utilize its precision technology.

CO₂-free and highly efficient wind power generation has been growing steadily in Europe—where environmental awareness is high—and in China—where demand for electricity is brisk—while in Japan growth looks promising as one green energy growth strategy. Along with expectations over such market growth, the level of technical difficulty for bearings is also increasing. For example, wind power generation is being used on a larger scale and more offshore to improve power efficiency, but the conditions under which bearings are used have become more severe, thus requiring high durability and high reliability. To address these difficult technical challenges, NSK will apply the “digital twin” concept for proposing optimal designs not only for bearings but also for peripheral components, with the aim of realizing a decarbonized society.

Railways are also expected to grow as a market that contributes to decarbonization. Railways have established a foothold as a means of transportation with lower CO₂ emissions than airplanes and automobiles in Europe. Railways are also expanding in China and Southeast Asian countries amid economic development there. Leveraging its expertise accumulated over many years, NSK will continue to develop products and technologies that contribute to rolling stock safety, comfort, reliability, and environmental impact reduction.
Toward the Era of Auto Electrification

With the shift from ICE to BEV, the number of bearings installed in a vehicle decreases. The major reasons for this are the engine used in gasoline vehicles being replaced by a motor in BEVs, and the transmission changing from a complex multistage gearbox to a simple reduction gear. However, there are zones where the number of bearings will increase, as electrification results in the use of more on-board motors. In summary, bearings are expected to decrease by about 20% in BEV compared to ICE. While depending on the mechanism, in HEVs, however, bearings will rise by roughly 10% due to the increase in motors.

Against this backdrop, the global auto electrification rate is expected to rise rapidly. In 2019, the electrification rate was around 10%, but this will surpass 50% by around 2030, when regulations in various countries start to take effect, and could approach 100% by around 2050. Until 2030 or so, however, the electrification rate will likely increase due to significant growth in both HEVs and BEVs, though with some regional differences.

With electrification accelerating, NSK expects sales to grow steadily until around 2030 as both HEVs and BEVs increase. However, we are pursuing the development and release of new products for electric vehicles as we see potential for bearings sales to subsequently decrease as BEVs become mainstream.

The Impact of Electrification on NSK

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New Products for Growth in the Electrification Era

As electric vehicles are equipped with many batteries, technological issues and needs include “downsizing powertrains,” “improving driving power and maximum speed,” and “increasing cruising range.” NSK aims to achieve sustainable growth in the age of electrification by proposing new technologies and products to our customers that meet these needs. As the mobility society evolves, we will continue to proactively create value and, in turn, expand our automotive business.
As performance requirements accelerate, “digital twin” is being promoted as a concept that emphasizes realism to ensure efficient and high-quality development. One such initiative is the third generation ultra high speed ball bearing for EV motors developed in March 2021. The product’s cage utilizes “topology optimization” technology. Conventional cages are thick to prevent deformation and breakage due to centrifugal force. Using topology optimization, however, we have succeeded in decreasing weight while increasing strength and rigidity, potentially enabling high-speed rotation of more than 200% compared to conventional products. In addition, we were able to quickly solve problems and develop the product in a short period by conducting evaluation tests using high-speed cameras to observe the behavior of the cage during high-speed rotation.

Application of Digital Technology

Bearing design and development based on the “digital twin,” a concept that emphasizes the real

What is topology optimization?

Topology optimization aims to find a given product’s optimal geometric shape under specific usage conditions. For example, in an airplane, unnecessary parts that do not impact rigidity can be cut down to more aerodynamic shapes that are both strong and lightweight.