# Core Technologies and Taking Up the Challenge of Creating New Value

NSK's Four Core Technologies

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. The technologies and products that have been created based on our four core technologies 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 in the years to come.

Tribology

Tribology is a technology that controls the friction and wear of sliding surfaces of materials that are in contact while in relative motion. This is the key technology for bearings that support the rotational or linear motion of machinery. The principle of bearings traces its origin to ancient Assyria, where the method used for transporting gigantic stones with relative ease involved placing logs underneath them. It can thus be said that the technology is based on human wisdom and ingenuity that date back to before the Christian era. Referred to as the jewels of tribology technologies, bearings are used in the rotating parts of various machines. Bearings contribute to reducing friction and friction-induced wear and preventing machine galling caused by frictional heat while contributing to energy-saving, long-serving and more reliable machines.
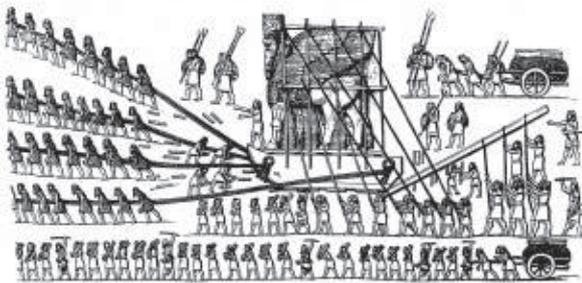
From a mural unearthed at Nineveh, the capital of ancient Assyria

Materials

Materials play a key role in enhancing the functionality and durability of bearings subjected to harsh operating environments.

If there are impurities contained in the bearing materials, these will cause the bearing to break. For that reason, a special steel known as bearing steel is used in bearings that is practically free of impurities.

Aiming to develop products with even greater durability and reliability, NSK uses a wide variety of performance assessments and analytical technologies to develop new materials with optimal compositions and new heat treatment processes with optimal conditions. Moreover, the Company engages in technological developments in which new materials, such as ceramics and high polymeric materials, are utilized.

Ceramic ball bearings

Numerical Simulation

Numerical simulation is an essential technology used in the optimal design of bearings and product development. For example, there could be a thousand ways for a parts combination to meet a certain condition. Finding the optimum combination would require the making of 1,000 types of trial products and one million experiments, an enormous amount of time and funds. Computer simulations, backed by NSK's 100 years of data from R&D in bearings, help solve difficult problems like these. Taking advantage of NSK's advanced numerical simulation also enables performance evaluations under which the testing of actual machinery is conducted under extremely difficult conditions.
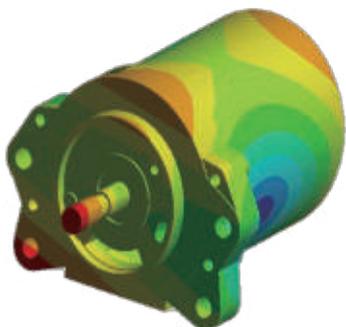
Mechatronics

Mechatronics refers to technologies that combine mechanics and electronics. Placing part of the control of a machine onto electronic circuits and combining them with sensors and actuators achieves complex movements and enables the realization of difficult functions merely by combining machine elements.

Based on technologies in the mechanical field fostered through product development and at production sites, NSK has been honing its proprietary mechatronics technologies in combination with electronics and creating new products that exemplify Motion & Control™. A representative example is electric power steering (EPS).

Modularization-compatible, high-performance EPS