

# NSK's History of Creating Value

Since NSK's start as Japan's first bearing maker in 1916, we've challenged ourselves to develop innovative technologies for over 100 years. Over time, we've produced new value in many areas.

NSK's mission statement guides us to "contribute to a safer, smoother society," "help protect the global environment," and "work across national boundaries." Put simply, we aim to support society through our work. As such, we've played a role in developing various industries and have grown as a corporation.

As industries have matured in Japan and across the world, bearing applications have also grown and changed. For example, military uses accounted for most bearing needs before and during World War II. After the war, social development in Japan was supported by domestic demand for machinery and equipment. With this change, bearings were needed everywhere. Fabric spinning machines supported Japan's post-war economy. Meanwhile, rolling stock and steel aided in Japan's economic recovery. Home appliances and automobiles drove high economic growth, while Japan's manufacturing strength advanced thanks to machine tools and semiconductor production equipment. We began to play a role in these and other industries, and we continue to expand our businesses today. Now, we offer a wide product lineup including linear motion products, mechatronics, and steering and automatic transmission components based on our refined bearing technologies.

## 1915

### Japan's First-Ever Bearings

**First in Japan to mass produce bearings needed for industrial development**

Just before NSK Ltd. was founded in 1916, prototype angular contact ball bearings were completed by NSK's predecessor Nippon Seiko Limited Partnership Company in 1915. These were the very first bearings to be produced in Japan. Bearings are said to be a key machinery component alongside screws and gears. Now, rotating machinery components could be supported by a Japan-made bearing prototype for the first time. The subsequent launch of NSK in 1916 led to the mass production of bearings.



## 1958

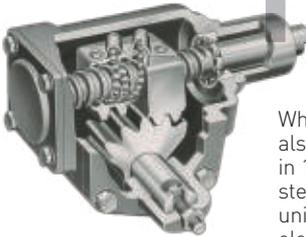
### Ball Screw Steering Gears

## 1959

### Ball Screws for Machine Tools

**Helping make automobiles safer and machine tools more sophisticated**

While rolling motion in machines was realized through rolling bearings, commercial applications also grew. NSK developed ball screw steering gears in 1958 and ball screws for machine tools in 1959, marking an expansion of our non-bearing product lines and businesses. By starting the steering gear business, we could expand into steering components such as steering columns, universal joints, and R&P gears. In turn, these advancements have led to a dramatic expansion of electric power steering (EPS) in recent years. Through these efforts, we help make automobiles safer. In addition, products such as ball screws and linear guides help with precise positioning. XY tables and MONOCARRIER™ units that combine a ball screw and linear guide have become sophisticated, high-value solutions. All of these precision machinery components are crucial for machine tools, also known as the mother machines for manufacturing industries, and semiconductor/LCD manufacturing equipment.



## 1963

### Bearings in the 0 Series Shinkansen (Bullet Train)

**Expanding overseas high-speed rail via essential technology**

Rolling stock bearings were the first to enter full-scale production at NSK after World War II. They were needed for the axles, main motors, and transmissions for the then-named Japanese National Railways and private regional railways. The world-renowned Japanese Shinkansen (bullet train) commenced operations on October 1, 1964, just before the Tokyo Olympics. A year earlier in 1963, the Shinkansen set a speed record of 256 km/h, with NSK lending its support to the project from the development stage. For more than 50 years since the rollout of the initial 0 Series, NSK bearings have been used in all Shinkansen models and have helped maintain safe and comfortable rail travel. We have honed our technologies via the Shinkansen to be faster, more compact, lighter, and more durable. Based on our track record, we have expanded businesses to include high-speed railways in China and South Korea, as well as the TGV in France.



Photo provided by Central Japan Railway Company

**Fiscal 1960**  
**¥10 billion**

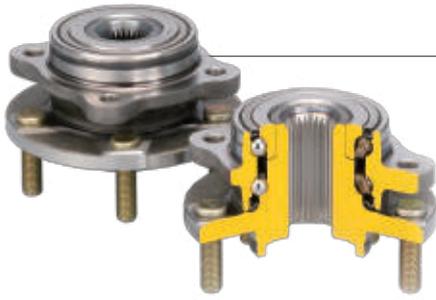
### Net Sales for NSK Over Time



# 1987

## HUB III Development

Using units to make vehicles lighter and improve workability



The shift to units has progressed dramatically thanks to the rapid spread of front-wheel-drive vehicles since the start of the 1980s. Units help make vehicles more compact, lighter, and easier to assemble. HUB III (third-generation hub unit bearings) units are equipped with dual flanges that can be mounted to brake rotors, wheels, and the vehicle chassis itself. These kind of units initially took hold in the U.S., so NSK first developed and commercialized HUB III for American customers. With success, we later expanded this business to Japanese and European automobiles. NSK then improved HUB III with high-performance seals, low-torque bearings, lower vibration during braking, lighter weight, and sophisticated ABS sensors. In addition, we established overseas production facilities to tackle our global expansion. We currently supply products to major global automakers from 10 factories in nine countries.

# 1999

## Large Wind Turbine Bearings

Using analysis technology and material engineering to increase wind turbine output, turbine size, and offshore applications

NSK's purchase of U.K. bearing maker UPI in 1990 gave us a foothold in the conservative European market. Since then, NSK has put great value on European industrial machinery manufacturers who have extended their businesses on a global scale. We're worked to strengthen ties with these manufacturers with the aim of sales expansion. Many big players in wind turbines were based in Europe where wind power was spreading as an effective form of renewable energy. However, durability was an issue amid the trend toward higher output, larger machines, and offshore facilities. Seizing this opportunity, we used our highly rated advanced analysis technologies to launch into this market. We solved the durability issue by proposing optimal combinations of higher durability materials with different types of extra large bearings. Through our efforts, we gained the trust of the European wind turbine market and expanded this business worldwide.



# 1999

## Half-Toroidal CVTs

Overcoming two decades of difficulties to achieve high-efficiency CVTs



Continuously variable transmissions (CVTs) and step ATs are just two of several types of automobile automatic transmissions. In particular, step ATs have driven NSK's growth in the Automotive Business. We started developing half-toroidal CVTs in 1978. By overcoming many difficulties over 20 years, we became the first and only manufacturer in the world to produce these items in 1999. A key technical hurdle was how to efficiently control power transmission between the power rollers and disks in these CVTs. To solve this, we used products that leveraged the science of tribology, which forms the technological basis for bearings. Commercializing CVTs involved joint development with customers focused on vehicle installation. At the same time, we worked to solve many development issues together with business partners including traction oil makers and steel suppliers. Although the mass production of vehicles using NSK CVTs has finished, lately the technology has gained attention again. Many customers are focusing on EV (electric vehicle) deceleration mechanisms\* based on this technology's efficient power transfer functionality.

\* Please see P. 19 for more details on EV deceleration mechanisms (Traction Reducer).

Fiscal 2017  
**¥1 trillion**

Fiscal 2000  
**¥500 billion**

Fiscal 1974  
**¥100 billion**

1970 1975 1980 1985 1990 1995 2000 2005 2010 2017 (FY)