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INTRODUCTION



BEARINGS

NSK holds more than 2,700 patents and produces over one billion bearings into more than 200,000 part numbers annually. Almost a century of manufacturing and real world experience has made NSK a leader in product innovation with the highest quality bearings in the world.



PRECISION MACHINERY & PARTS

NSK is the largest producer of rolled and precision ball screws worldwide. With five different series of linear guides and innovations such as NSK's patented K1™ lubrication technology, NSK provides customers with unparalleled linear motion technology.



AUTOMOTIVE PRODUCTS

As the world's top supplier of automotive bearings and components, NSK offers everything from hub units to water-pump bearings, needle roller bearings, to tensioner and idler bearings.

NSK APPLICATION GUIDE

CORPORATE

Leading the way for nearly a century.

AGGREGATE, MINING, & CONSTRUCTION

Conquering the world's harshest environments.

GEARBOXES

Powering up and driving efficiency in power transmission.

METAL MACHINING & FORMING

Providing unparalleled high-speed, precision products.

PRIMARY METALS

Making contaminated environments more productive.

PUMPS & COMPRESSORS

Providing smooth and efficient operation behind the scenes and around the clock.

PULP & PAPER

Overcoming heat challenges in making paper.

FOOD & BEVERAGE

Serving up optimum performance that meets hygiene and safety standards.

AUTOMOTIVE

Winning the race for consistent, high-quality automotive technology.

ELECTRIC MOTOR

Operating in more homes than any other manufacturer.

CORPORATE

TECHNICAL TRAINING

For our customers we offer an extensive array of onsite seminars and comprehensive programs on bearing and linear technology. These seminars and programs cover topics such as bearing basics, handling, mounting and unmounting, lubrication, and maintenance of both radial and linear bearings. All can be customized to meet various levels of expertise.



WE ARE LEADERS

The NSK Group is one of the world's premier manufacturers of bearings, precision machinery and parts, and automotive components. For almost a century, we've led the way for innovation in the field of motion and control technology. Over that time, we've come to realize that not only have our superior products made differences to our customers, but our people have too.

We don't just produce motion and control products; we produce whole solutions. Our engineers have the expertise to offer recommendations on a variety of issues, as well as design new products to meet customers' specific challenges. Our devotion to engineering research and modern manufacturing processes has placed NSK solutions in some of the world's best-known brands across a wide range of industries.

AROUND THE GLOBE

The NSK Group is a global company.

- Operations are divided into four main groups, including NSK Americas, NSK Europe, NSK Asia, and NSK Japan.
- There are more than 20,000 employees working at 55 ISO certified manufacturing facilities and 124 sales operations in 27 countries around the world.
- NSK has been manufacturing in North and South America since 1972 with eight separate companies throughout the region.
- Global sales nearing \$6 billion.

THE NSK ADVANTAGE

- **Research & Development:** More than \$120 million are invested annually in the pursuit of bearing innovation. NSK sets the benchmark in R&D with pioneering designs and specialized steel formulas to give our bearings incomparable quality.
- **Customer Service:** Our customers are supported 24/7 with 13 dedicated technical centers, Customer Service Teams, and an integrated global logistics computer network linking all four global regions. We have specialists in field and application support available for every industry where NSK bearings are used.
- **NSK Authorized Distributors:** Only reputable distributors are chosen to sell our products. They hold comprehensive stock, as well as have access to our centralized stock, distribution centers, and service engineers.



AGGREGATE, MINING, & CONSTRUCTION

CONSTRUCTIVE SOLUTIONS

Cement plants produce unbelievable dust. NSK was called when one cement plant, using a competitor's bearings, experienced failure in a pump application. NSK found that dust in the bearings prematurely wore down the raceways and caused increased clearance. Solution? NSK Tough Steel™ Bearings, which more than doubled the bearing life and increased performance.



NSK believes that downtime is not an option.

No industry knows that better than the Aggregate, Mining, & Construction Industry, where the competitive nature of business is often fought in the world's harshest environments. To help maintain uptime and provide the efficiency needed to improve the bottom line, NSK offers a complete line of products, services, and solutions.

Over the years, NSK has completed extensive research to gain a better understanding of the needs of the Aggregate, Mining, & Construction Industry.



As a result, we are able to provide reliable solutions to problems that are inherent in vibratory equipment, contaminated environments, and applications with shock load. For this industry, we provide some of the toughest and most dependable products on the planet, as well as a team of field and application engineers to assist in protecting vital capital equipment.

IN THE SHOWCASE

NSK's vibrating equipment bearings are engineered specifically to withstand the high speed, shock loading, misalignment, and marginal lubrication conditions typical of the vibratory equipment in the Aggregates, Mining, & Construction Industry. Innovative spherical roller bearings like our CAM-U15-VS type bearings offer:

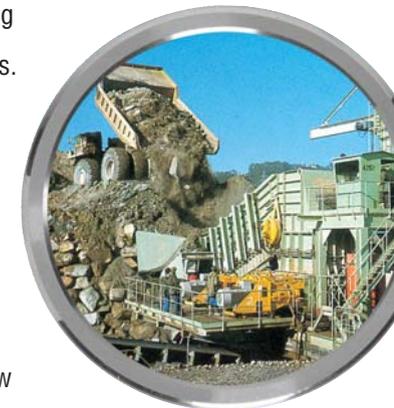
- High capacity with tightly controlled radial clearance
- Super-finished raceways
- Superior shock load capabilities



NSK ON THE JOB

Working hard above or below the ground, as well as in processing plants, are NSK's:

- SAF Housings are ideal for handling heavy radial loads. They are dimensionally equivalent to competitors' offerings and come with a host of optional accessories including seals, end covers, fixing rings, and multiple grease fittings.
- EM and EW Series Cylindrical Roller Bearings offer high load capabilities and utilize either a patented, high-strength brass or pressed steel cage respectively. Both series offer low noise and heat generation characteristics. These bearings are easily interchangeable across the globe.
- Tapered Roller Bearings are available in two and four row versions to support high radial and axial loads. They feature an optimized cage design and come in a range of special materials for arduous conditions.



GEARBOXES

Knowledge is power. NSK remains a driving force behind the Gearbox Industry through its research and close working relationships. We recognize that standard solutions are just as important as innovation. Our standardized solutions mean that if a replacement is inevitable, customers will get the product they need – fast. With our worldwide sales and distribution network

available around the clock, we're able to help diminish downtime to virtually no time at all.

NSK gearbox bearing solutions minimize downtime and improve operational efficiency, but of course,

no level of innovation is complete without technical support. Our gearbox specialists provide world-class assistance on everything from making bearing recommendations, to validating new gearbox designs, and even defusing crises on shop floors.



Compact, power dense, and highly efficient gear drives push the power transmission industry today. At the forefront is NSK's HPS™ Spherical Roller Bearings, which use the most progressive designs, sophisticated materials, and advanced manufacturing techniques available. HPS redefines bearing innovation with:

- An average 12% higher load carrying capacity
- Higher limiting speed
- An average 50% increase in bearing life
- Reduced maintenance and improved productivity



IN THE SHOWCASE

THE GEAR FACTS

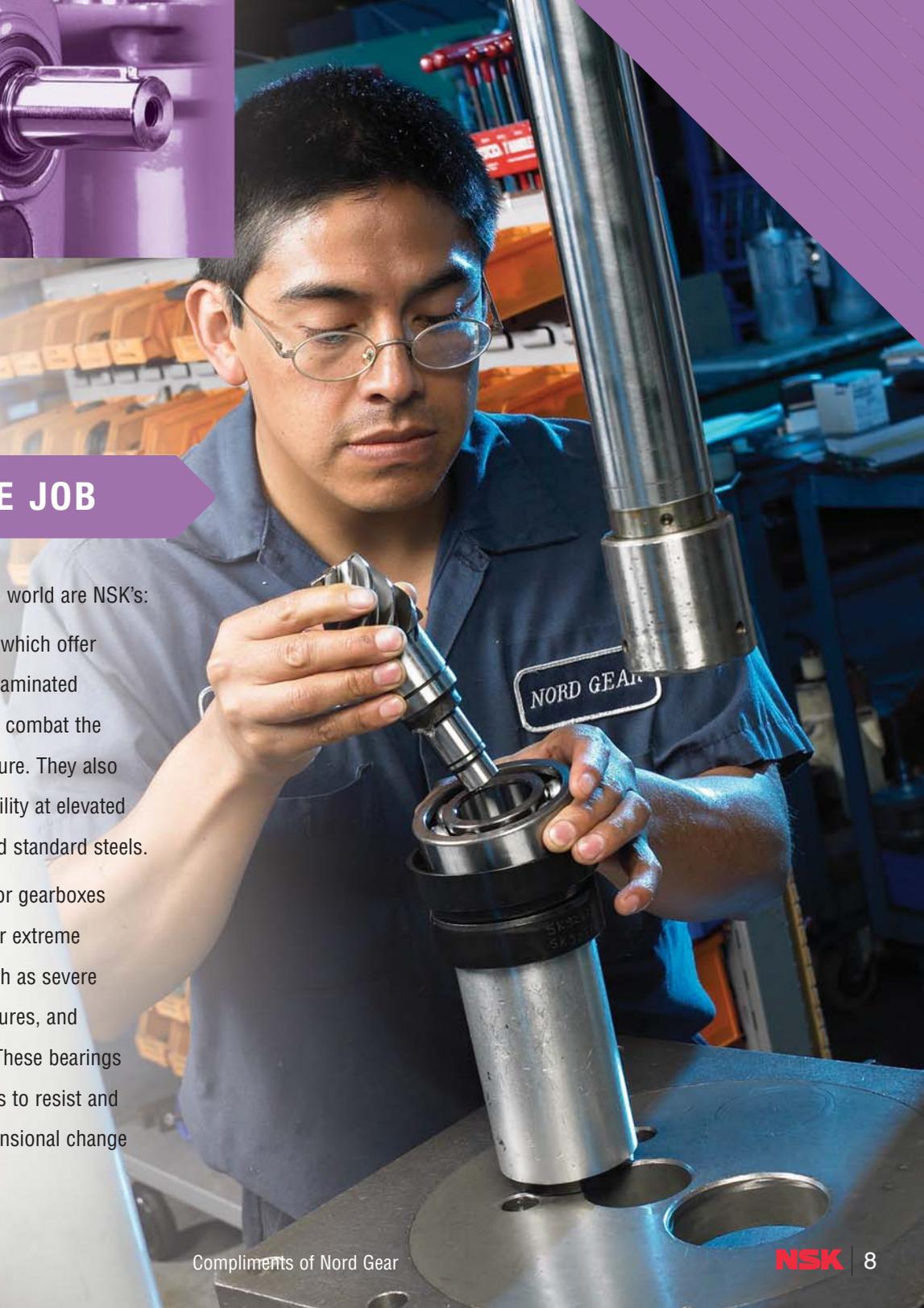
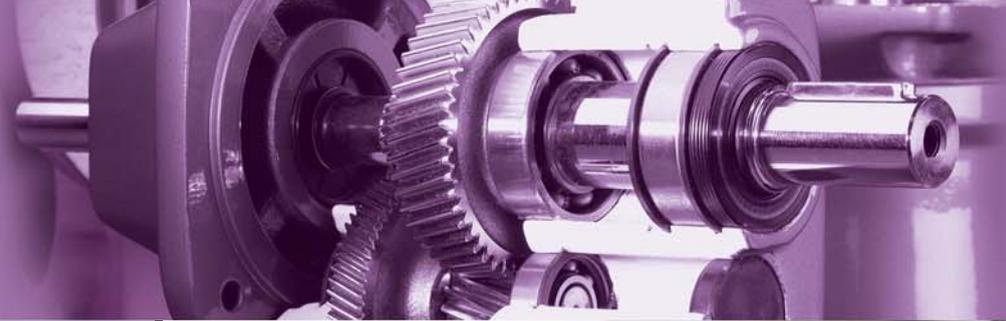
A gearbox manufacturer for industrial and wind turbines was attempting to optimize bearing performance in a planetary gear application. After analyzing, NSK recommended matched spherical roller bearings with CAM-design. A one-piece cage, loose guiding ring, and matching bearings improved load distribution, which eliminated the failures. Now, NSK is a trusted supplier for this manufacturer's other critical applications.



NSK ON THE JOB

Powering up gearboxes around the world are NSK's:

- Family of Tough Steel Bearings, which offer extended bearing life under contaminated conditions. All of these bearings combat the effects of flaking, wear, and seizure. They also provide higher dimensional stability at elevated temperatures than heat stabilized standard steels.
- Tapered Roller Bearings for gearboxes help transmit power under extreme operating conditions such as severe vibration, high temperatures, and high rotational speeds. These bearings have special specifications to resist and combat cage breakage, dimensional change of the inner ring, and seizure.

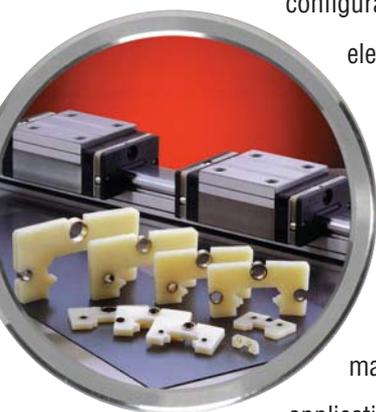


METAL MACHINING & FORMING

NSK ON THE JOB

Advancements in the Machine Tool industry include NSK solutions like these:

- Super-precision Bearings, which come in a wide range of configurations, including different types of rolling elements, ball and cage materials, contact angles, ISO precision grades, pre-loads, seal arrangements, and greases.
- ROBUST Series™, our high-performance, super-precision bearings are designed for ultra high-precision machining and other high-speed applications. This series' wide variety of materials and configurations combine to provide low heat generation, high seizure resistance, and better stability under changing temperatures at high-speed operation.
- Linear Guides, ball screws, and ball screw support bearings complete the anti-friction requirements for machining centers. Linear guides and ball screws are available with patented K1 technology for lubrication and maintenance-free operation.



NSK is the brand of choice among Machine Tool operators because we provide more superior products and groundbreaking innovations for this industry than any other manufacturer.

As machining centers operate at higher speeds and demand greater levels of precision, NSK continues its pursuit of advanced technologies and materials to meet

IN THE SHOWCASE

For the Machine Tool Industry, NSK's Sealed Angular Contact Ball Bearings improve overall spindle performance, plus reduce downtime and maintenance because they are:

- Pre-greased
- Protected against contaminants
- Stable in temperatures (no grease migration)



the vigorous demands of the Metal Machining & Forming Industry. For all machine tool applications, our bearings perform with higher rotational accuracy, smooth operation, and controlled rigidity.

We carry a full line of precision bearings, including open and sealed single and double row angular contact, thrust, single and double-row cylindrical, and deep groove ball. In addition, we also offer specific cylindrical and tapered roller bearings for heading, stamping, bending, roll forming, and turning of heavy radial and axial loads.



AN OPTIMUM PERFORMANCE

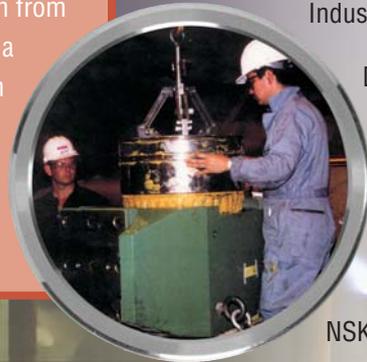
A supplier to the Automotive Industry changed their end forming process from hydraulics to servo driven using NSK ball screws and a quad set of NSK precision bearings. After three years of service, the company is still amazed at the quiet running, more efficient machine that doesn't leak on equipment or the floor.



PRIMARY METALS

DID YOU KNOW?

A steel mill averaged 500K tons of production from a competitor's bearings. When they changed a segment to NSK SWR™ Bearings, production rose to 2.8 million tons. In disbelief, the mill examined the bearings and noted an amazing lack of wear. Quickly, all competitor bearings were replaced with NSK.



NSK has been intimately involved in the Primary Metals Industry since our inception as a company in 1916.

During that time, we've learned a great deal about the needs of our customers, enabling us to produce products requiring less maintenance with improved reliability.

NSK bearings such as the SWR and the Super-TF™ series keep steel mills in production longer with less downtime. That's because our products for Primary

Metal Mills overcome contamination and debris, operate in poorly lubricated environments, and keep performing even with heavy loads at ultra-low speeds. Whether you're suffering from contamination and over consumption of grease in your roll neck applications, excessive loads and heat in your continuous castor, or just looking for a fresh approach to achieving maximum uptime, NSK has the answer.

IN THE SHOWCASE

The new SWR (Super Wear Resistance) Bearing is designed for improved wear resistance and bearing life in continuous casting machines. Over conventional steel bearings, the SWR's performance results in:

- Five times greater fracture toughness
- Three times greater wear resistance
- Two times longer life



NSK ON THE JOB

We improve a steel mill's bottom line by offering NSK solutions like these:



- Protection Plus is a complete maintenance package for slewing ring bearings to guard a mill's most critical resources. This is our guarantee that spare bearings are ready when needed most.
- Family of Super-TF Bearings incorporate advanced materials through special heat treatment techniques. Our Super-TF steel has the right balance of retained austenite and hardness to combat surface originated flaking; the major source of failure in contaminated and poorly lubricated environments.
- WTF™ (Water Tough) Bearings are used for roll neck applications where water contamination is present. These bearings offer advanced levels of sealing to minimize grease leakage and increase resistance to the entry of water and other foreign substances.



PUMPS & COMPRESSORS

TRUE SOLUTIONS

Piston seal failures, caused by bearing grease purge, created warranty issues and headaches for an air compressor manufacturer. NSK recommended low-torque, purge-resistant contact seals with stiffer synthetic grease. This solution eradicated the purge, plus extended grease life. Now with zero failure due to grease purge, the warranty claims have ceased.



Take a good, hard look at virtually any industry and you'll find pumps and compressors in the mix.

From oil and gas to chemical processing, water and waste treatment, medical, manufacturing, power generation, paper, and mining – there are pumps and compressors working behind the scenes and around the clock. For each of these industries, the requirement for greater Mean Time Between Failure (MTBF) places increasingly severe demands on the bearings being used.

To meet the challenges of pump and compressor applications, NSK has developed a variety of unique ball and cylindrical roller bearings. These bearings are engineered to withstand heavy radial loads, perform longer and more efficiently, operate smoother with less noise and vibration, and last longer for maximum productivity and minimal downtime.

IN THE SHOWCASE

Angular Contact and Cylindrical Screw Compressor Bearings are often exposed to the damaging effects of compressor oils, refrigerants, and ammonia gas. To operate under these difficult conditions and resist oil and heat, NSK screw compressor bearings feature Linear Polyphenylene Sulfide (L-PPS) cages, which offer:

- Long, trouble-free performance
- Superior heat, chemical, and wear resistance
- Increased load capacity
- Improved lubrication performance



NSK ON THE JOB

Pumps and compressors perform consistently with NSK solutions like these:

- The BMPC Series of Angular Contact Ball Bearings are ideal for centrifugal pumps. These bearings incorporate a high-strength machined brass cage, which provides superior reliability in the harshest of API-610 pump applications.
- Four-point Contact Bearings are unique with their split inner ring. The ball bearings have a contact angle of 35° and can accommodate high axial loads supported in either direction. In some cases, a four-point contact bearing can replace a pair of angular contact bearings mounted face-to-face or back-to-back.



PULP & PAPER

NSK SUCCESS STORY

The spherical roller bearings on a mill's suction roll were lasting only three months and their life span was getting shorter. NSK's technical team found the tolerance was insufficient for the hollow shaft bore. A customized NSK solution provided the extra give the shaft needed. With failures past, the mill now saves \$1 million annually.



Around the globe, NSK bearings are found in every section of a paper mill's manufacturing machinery. And because we're one of the largest global suppliers to original equipment manufacturers, you'll also find NSK bearings in a mill's electric motors, pumps, gearboxes, fans, blowers, and compressors.

The number one concern for any mill in the Pulp and Paper Industry is maintaining uptime. To stay ahead of their competition, more mills turn to NSK for solutions. We've worked extensively with paper machine manufacturers to design products that overcome everyday challenges and improve performance. We help paper mills remain as competitive as possible with quality products that offer reliability, increased speeds, and longer operational life. Plus, NSK offers a dedicated team of pulp and paper specialists to help customers maintain the edge they need.

IN THE SHOWCASE

TL (Tough and Long-life) Spherical Roller Bearings withstand extremely high temperatures found in dryer and calendar sections of paper machines. Special steel and heat surface hardening treatments give TL Bearings:

- A stronger inner ring resistant to fractures
- Superior dimensional stability
- Increased raceway hardness for wear and durability



NSK ON THE JOB

Pulp and paper mills achieve longer uptime with NSK products like these:

- A Family of Maintenance Tools, which extends and verifies our position as an authority in maintenance reliability. Our sine bar gauges, bearing heaters, pullers, pushers, hydraulic nuts, and spanner wrenches help customers do the job quickly and easily.
- Sealed-Clean Roller Bearings are designed particularly for felt roll applications in the wet-end of paper machines. These sealed spherical bearings protect against water, humidity, condensation, and dirt. NSK ingenuity has increased reliability against failure due to contaminants and poor lubrication, as well as produced a seven times increase in L_{10} life. These bearings are direct drop-in replacements for standard-sized sphericals.
- Reconditioning Services that provide a full bearing inspection and a complete report beforehand at no cost or obligation to you.



FOOD & BEVERAGE

UPTIME IN NO TIME

Every two weeks, a chicken plant was losing \$20,000 and two full shifts because it had to replace all bearings in a transfer table due to contamination and high water temperatures. By switching to NSK Stainless Steel Molded-oil Bearings, downtime became uptime, as the same NSK bearings were still going strong after six months.



One of the most challenging industries NSK serves is the Food and Beverage Industry. Here, bearings must perform with the highest degree of reliability and do so in clean environments while battling food particles. In this industry, hygiene and safety are just as important as efficiency and production quotas. That's why we've developed a variety of food-grade products that conform to sanitation laws as well as withstand the rigors of frequent wash downs, detergents, chemical exposures, and a wide array of temperature changes from -20°C to 150°C.

SPACEA™ is a vast series of specialty bearings designed to excel in a variety of challenging environments, including the Food & Beverage Industry. Several series are designed to combat water and humidity exposure, high and low temperatures, and alkali and acid environments. SPACEA offers:

- Stainless Steel Bearings for corrosion resistance in wash-down environments
- Nickel Alloy-coated Bearings for protection in alkali and weak acid environments
- Molded-oil Bearings with polyolefin resin impregnated with oil provide maintenance-free lubrication and protection from water and dust
- Fluoride Low-temperature Chrome-coated Bearings protect against high-temperature and water-splash environments



IN THE SHOWCASE

NSK ON THE JOB

Quality food and beverages come from plants using these NSK solutions:

- Silver-Lube® Mounted Units are specifically designed for use where thorough wash downs are necessary, optimum hygiene is imperative, and resistance to detergents and chemicals is required. They offer corrosion resistance, paint and coating-free surfaces, stainless steel bearing inserts, and efficient sealing arrangements with high-temperature food-grade grease.
- Linear Guides with Patented K1 Technology use a porous synthetic resin and built-in lubricating seals for continuous lubrication. K1 is especially effective under conditions that must prevent oil from entering into a hygienic environment.



AUTOMOTIVE



ANSWERING THE CALL

Failure of a competitor's linear guide, plus unanswered calls for help, put NSK through the door at a North American automotive plant. Our engineer and distributor were onsite within two hours. Result? Potential downtime was eliminated and now when a competitor's product is out of service, it'll be replaced by NSK.



NSK bearing technology drives the Automotive Industry to places it has never been. A vehicle can contain anywhere from 80 to 120 bearings. NSK not only makes them all, but we are in fact, the largest bearing supplier to the Automotive Industry in the world. We've risen to such prominence as the premier bearing supplier to both the OEM and aftermarket sectors of the industry through our diverse

range of custom engineered products and unparalleled commitment to quality. Our dedication and extensive experience in meeting the needs of tooling integrators, tier 1 and 2 suppliers, OEMs, and aftermarket distributors mean that in the end, we're trusted to provide the highest degree of reliability, safety, compactness, and fuel efficiency that consumers desire.

IN THE SHOWCASE

NSK's Integral Shaft Bearings for water pumps are highly durable. A wide variety is available including ball/ball and ball/roller configurations up to 1" in shaft diameter. All varieties offer:

- Buna-N rubber heat-resistant seals reinforced with metal
- Water-resistant seals that last five times longer
- Special grease resistant to heat, load, and water
- Highly clean steel carburized for three times service life



NSK ON THE JOB

NSK automotive products are found in more vehicles than any other manufacturer, here's why:

- Interchangeable series of linear guides offer compact low profile type, wide type, a shock resistant design, with high load capacity and long life. The optional K1 maintenance-free lubrication system greatly enhances the performance by providing a compact and efficient oil-impregnated lubrication unit as well as acting as a seal.
- Automotive Components including electric power steering systems, steering columns, joints, automatic transmission parts, and half-toroidal CVT units. Our extensive experience in bearing technology has made NSK a market leader in the designing and manufacturing of automotive components.



ELECTRIC MOTOR



WHAT CUSTOMERS NEED

“We want bearings that last with longer time between maintenance intervals!” That was the problem presented by an electric motors and generators manufacturer. After discovering that mineral oil grease being used actually limited bearing lifespan, NSK recommended a synthetic oil grease, which increased bearing life by three times. Problem solved.

Several NSK technological breakthroughs for the Electric Motor Industry have put our name in more homes and businesses than any other bearing manufacturer. From washing machines to photocopiers, vacuum cleaners, and computers, NSK has set the benchmark for bearing performance, making us the preferred brand among leading electric motor manufacturers. NSK advancements such as the industry’s tightest tolerances in ball sphericity,



raceway waviness, and bearing vibration velocity, exceed the standard “Electric Motor Sound Class” and make our bearings some of the quietest around. Other developments, such as NSK special heat treatments for dent resistance offer protection against axial brinells and damage during assembly. These innovations, along with NSK quality manufacturing assure our bearings last longer, produce minimal noise, and operate trouble-free for years.

IN THE SHOWCASE

NSK’s electrically insulated Ceramic Coated Ball and Roller Bearings, Ceramic Hybrid Single Row Deep Groove, and Ceramic Hybrid Angular Contact Ball Bearings are 100% effective in eliminating electrical arcing.

They offer:

- A thicker ceramic coating
- A robust design
- Improved material



NSK ON THE JOB

Homes and businesses alike have electric motors running because of NSK bearing advancements like these:

- Extra Pure Steel (EP™) Series extends bearing life by as much as five times under normal operating conditions. The EP material allows electric motor design engineers the flexibility to choose a smaller bearing and still meet the required life of the motor.
- GR™ Series of bearings is eco-friendly. Their optimized internal design offers quieter operation. They also have 40-50% less dynamic torque for better energy savings, as well as three to four times the lifespan even at their highest operation speed.
- CM Electric Motor Grade Internal Clearance on bearings provide smooth and quiet operation. NSK is the only bearing manufacturer in the world to offer this special clearance.



Compliments of Baldor