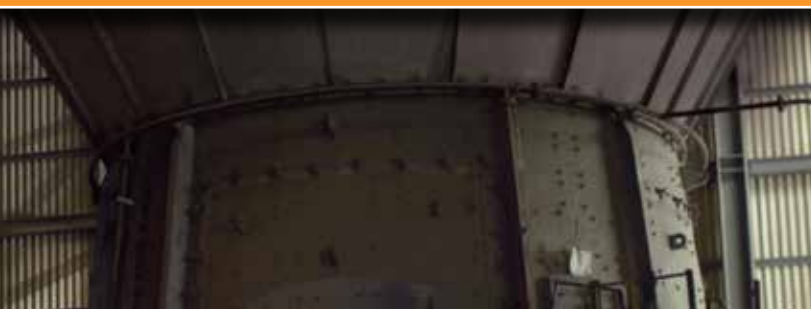


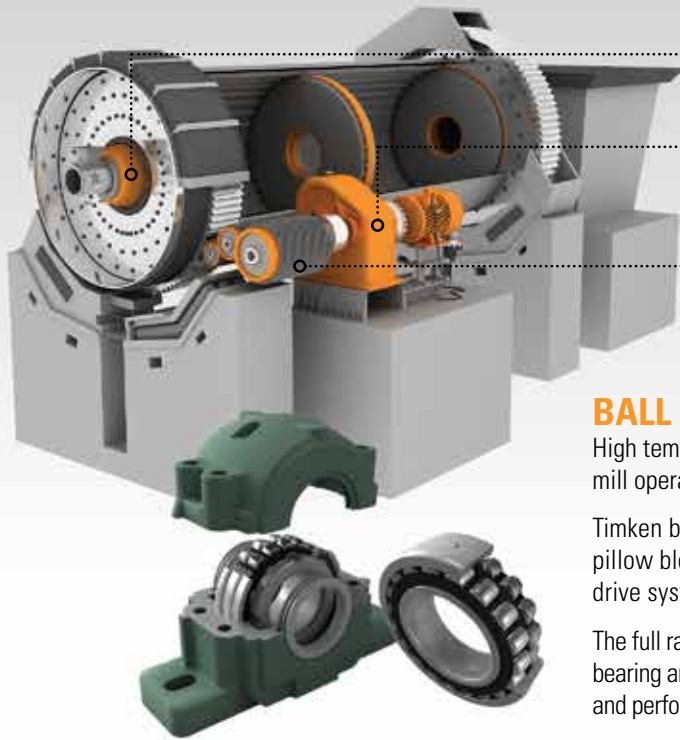


TIMKEN

TIMKEN SOLUTIONS FOR CEMENT APPLICATIONS

THE RIGHT MIX FOR THE CEMENT INDUSTRY





Trunnion Support:
Spherical Roller Bearing Housed Unit

Gear Drive:
Spherical Roller Bearing, Cylindrical Roller Bearing, Tapered Roller Bearing

Pinion Support:
Spherical Roller Bearing

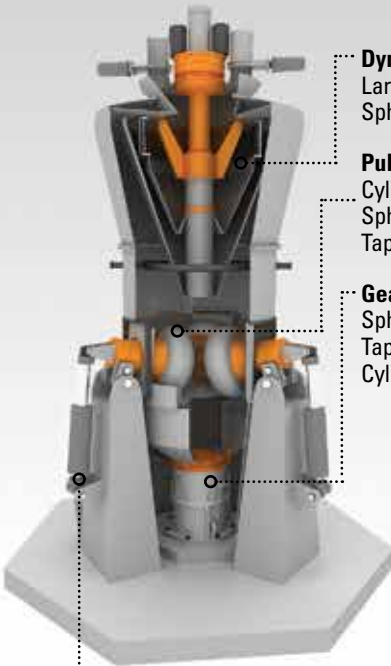
BALL MILL

High temperatures, debris and heavy loads make efficient ball mill operation a major challenge.

Timken ball mill solutions include spherical roller bearings in pillow block housings used to support the pinion shafts and drive systems.

The full range of Timken® tapered roller bearing, cylindrical roller bearing and spherical roller bearing products provides the quality and performance operators need to keep cement equipment running.

TIMKEN BEARING SOLUTIONS FOR THE CEMENT INDUSTRY



Dynamic Classifier/Separator:
Large Diameter Ball Bearings,
Spherical Roller Bearings

Pulverizer Roll Wheel:
Cylindrical Roller Bearings,
Spherical Roller Bearings,
Tapered Roller Bearings

Gear Drive:
Spherical Roller Bearings,
Tapered Roller Bearings,
Cylindrical Roller Bearing

Hydraulic Cylinder Rod End:
Small Bore Spherical Roller Bearings,
Spherical Plain Bearings

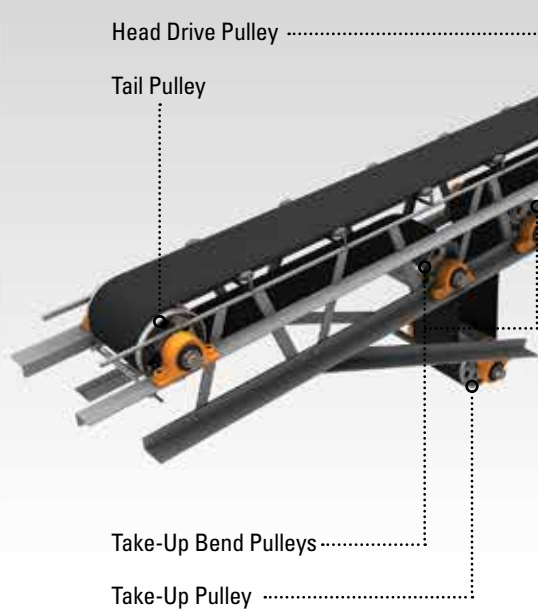


VERTICAL ROLLER MILL

Vertical roller mills and gear drives are subject to high temperatures, slow rotational speeds, extreme debris and high moment loads. These tough conditions can add costs and reduce bearing life. Timken helps by incorporating product and service solutions throughout the vertical roller mill and its gear drive.

True rolling motion in Timken tapered roller bearings and optimized internal geometry across the range of Timken bearing products help supply greater operational efficiency.

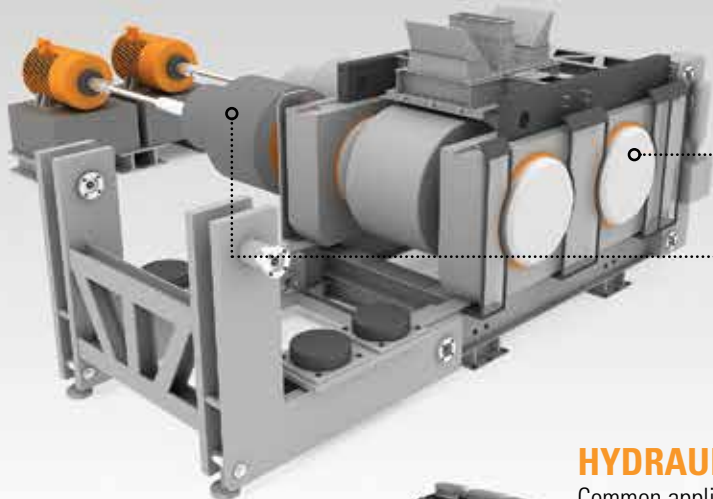
The longer life of Timken bearings can yield additional cost savings through reduced overall bearing maintenance and replacement costs.



MATERIAL HANDLING

At the heart of material handling are conveyors, which must operate safely and reliably while withstanding harsh indoor and outdoor operating conditions. Heavy loads, extreme debris, temperature fluctuations and weather conditions create an operating environment that requires a proven bearing solution.

Timken offers a full range of housed units that are specifically designed for material handling applications. Timken® Type E tapered roller bearing housed units, SAF pillow blocks and spherical roller bearing solid-block housed units with steel housings meet the challenge and provide performance and uptime.



Roller End (Support):
Spherical Roller Bearings, Cylindrical Roller Bearings, Thrust Bearings

Gear Reducer (Planetary Arrangement):
Tapered Roller Bearings, Cylindrical Roller Bearings, Spherical Roller Bearings

HYDRAULIC ROLLER PRESS

Common application challenges for a roller press include high roller contact stress and extreme debris. In addition, presses are subject to high temperatures and heavy loads. The complete offering of Timken tapered, cylindrical and spherical roller bearings supports the cement industry's multiple bearing needs.



TIMKEN SERVICE SOLUTIONS FOR THE CEMENT INDUSTRY

TIMKEN SOLUTION SUCCESS:

Increased Consistency Adds to Effectiveness for U.S. Cement Manufacturer

A U.S. cement maker initially approached Timken to help bring consistency, efficiency and effectiveness to its corporate predictive maintenance program.

Previously, the predictive maintenance programs varied at the company's multiple plants, with a combination of maintenance personnel and outside contractors performing various levels of vibration analysis, infrared thermography and oil analysis.

Timken experts traveled to the plants to review the existing programs and make improvement recommendations. They were accompanied by the company's vice president - manufacturing services and corporate reliability engineer. The Timken services team collected data and performed an analysis on all machines with greater than 1,000 horsepower.

According to the company's executive, "Timken's consulting and other services are improving our company's operations. Right from the start, Timken demonstrated a level of technical know-how to help us to achieve best-in-class predictive maintenance practices."

In this case, best-in-class also means big savings. In the first 10 months, Timken discovered 10 occasions when equipment was starting to fail. Early detection of these issues saved the cement maker costly downtime. Plant managers and company executives acknowledged the Timken solution paid for itself many times over in the first year.

CASE STUDY:
U.S. CEMENT MAKER

U.S. Cement Maker
Estimated Annual
Customer Savings
\$30,000 Maintenance
+ \$100,000 Labor
\$130,000



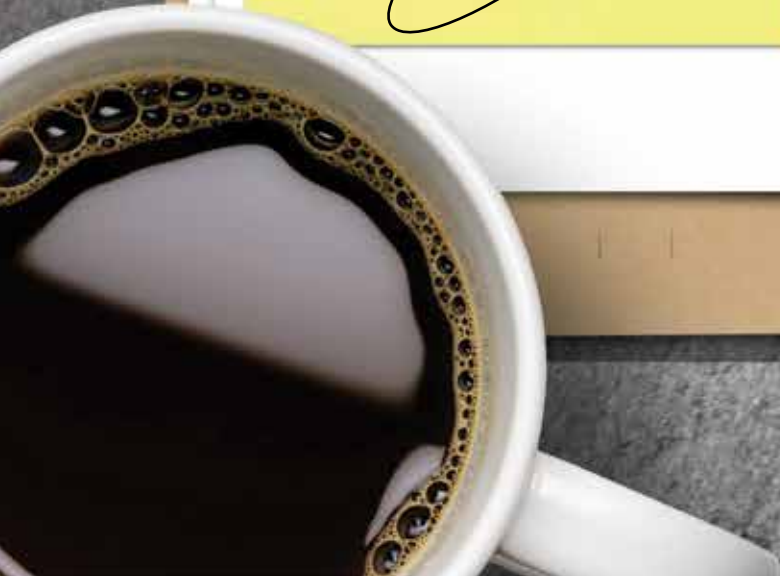
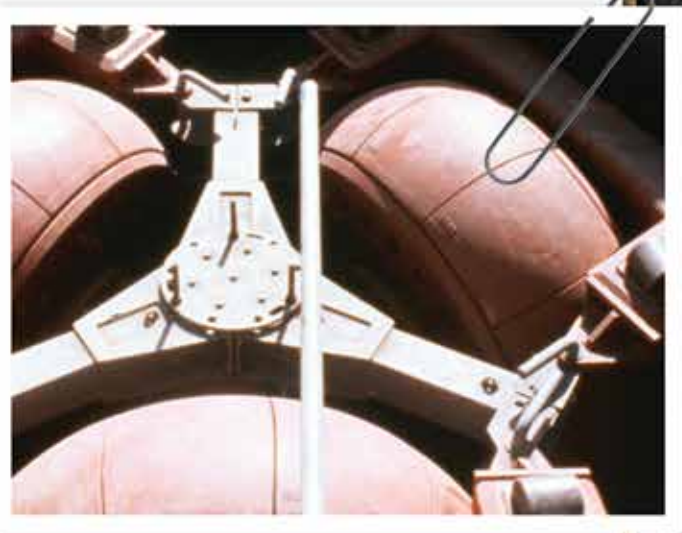
TIMKEN SOLUTION SUCCESS:

Reconditioning Gets Cement Producer Back Up and Running

Roanoke Cement lost 30 percent of its production when a roll press went down unexpectedly. A Timken team identified the problem – a damaged double-row spherical roller bearing and housing. The components were removed from the roll press and repaired at a Timken reconditioning facility. Timken service engineers were back onsite to assist with the installation of the repaired components, and Roanoke's roll press was operational in a fraction of the time it would have taken to get new components.

"Timken has the most reliable field services any mill could ask for," said Moe Petty, maintenance supervisor at Roanoke Cement. "From the sales representative to the engineers, they supported our mill through the situation to restore the unit to full operation. I know Timken service is excellent because there was a true partnership to provide the customer solution for our mill."

Roanoke Cement
Reduced Downtime
Est. Customer Savings
90 days of downtime
x \$10,000/day lost production
\$900,000



TIMKEN BEARING SOLUTIONS FOR THE CEMENT INDUSTRY

CASE STUDY:
HEIDELBERG CARPATCEMENT FIENI

TIMKEN SOLUTION SUCCESS:

Timken Utilizes Proprietary Technology to Develop Solution

The crusher operation at the Heidelberg Carpatcement Fieni cement plant in Fieni, Romania, removes huge rocks from its quarry operations and reduces them to pebbles.

“The problem was that about every three months the competitor’s bearings on the motor belt pulley that drives the hammers inside the rock crusher unit failed,” said a Timken senior service engineer in Ploiesti, Romania. “Heidelberg wanted to know if Timken could help. We did, and we now have the basis for a long relationship with this important new customer.”

Timken application engineers studied the entire system, using Timken analytical tools. They searched for the most suitable bearing solution and conducted lubrication analysis to find the right type and amount of grease, and the proper re-lubrication intervals. They also offered design modifications to the unit, so it could accommodate the new Timken® spherical roller bearing that replaced the previous cylindrical and ball bearings.

As a first installment, Timken provided eight bearings, as well as Timken premium all-purpose industrial grease and motorized single-point lubricators. Since Timken service engineers installed the new bearings, the crusher has run for more than 18 months without a bearing breakdown.

“Our old solution often led to high operating temperatures, and bearings burned up every three months,” said Gheorghe Gurgu, maintenance manager at Heidelberg Fieni. “The new Timken solution not only made all these problems vanish, but also allowed us to move from costly unexpected breakdowns to annual scheduled maintenance. Particularly pleasant to us was the fact that the Timken solution fit into the existing housing with little changes, thus allowing a quick implementation.”

Timken’s success with Heidelberg shows how the company can enhance customer performance by aligning its capabilities and delivering in an innovative and determined fashion. Getting the most out of bearings requires a special set of capabilities and tools, which is where Timken excels and differentiates itself from competitors.

*Heidelberg
Carpatcement Fieni*

Estimated Value

+ \$40,000 Reduced downtime

+ \$50,000 Elimination of rework

+ \$30,000 Timken service support

\$120,000



TIMKEN SOLUTION SUCCESS:

Customized Spherical Roller Bearing Enhances Roll Press Performance

One of Southeast Asia's largest cement manufacturers recently installed case-carburized Timken spherical roller bearings in its hydraulic roller press.

The company was dissatisfied with its current competitive through-hardened bearings, so the distributor offered Timken as an alternative. Timken provided a case-carburized bearing that could better withstand the shocks that the hydraulic roller press in the finishing mill constantly undergoes.

During initial use, the Timken bearings have lasted an additional 18 to 24 months – a huge cost savings. The case-carburizing process produces a hard outer shell and a soft inner core to each of the components, allowing it to better withstand shock. To serve this customer, Timken specially designed and manufactured a new product for this application.

The solution utilized innovative engineering and manufacturing capabilities to provide a case-carburized spherical roller bearing product.

The success of Timken with this large cement manufacturer illustrates how Timken understands customers' needs and provides superior value. The seamless coordination among application engineering, sales and the channel partner provided the type of solution customers can expect from Timken around the world.



Large Southeast
Asian Cement Maker
Estimated Annual
Customer Savings
\$25,000 Longer bearing life
+ \$75,000 Reduced downtime
\$100,000

TIMKEN BEARING SOLUTIONS FOR THE CEMENT INDUSTRY



Tapered Roller Bearings

Timken is the industry standard for tapered roller bearing quality and performance. Benefits include:

- Reduced energy consumption through enhanced surface finishes and optimized internal geometry
- Longer bearing life and greater reliability due to positive roller alignment
- Optimized bearing performance through application-specific endplay and preload conditions
- The industry's broadest range of sizes and configurations

Applications: Vertical Rolling Mills, Gear Drives, Ball Mills, Kilns, Primary Crushing Equipment

Debris-Resistant Bearings

- Timken debris-resistant bearings extend bearing life up to 3.5 times and are designed for tough, dirty conditions
- Proprietary alloy heat-treatment modifications and diamond-like coating technology interrupt adhesive wear and can self-repair microcracking
- Advanced manufacturing processes allow Timken to offer these bearings economically in both large and small quantities

Applications: Primary Crushing Equipment



Cylindrical Roller Bearings

The full range of Timken® cylindrical roller bearings includes single- and double-row configurations. The EMA series offers greater performance than the leading high-performance industry designs.

- Designs provide option to manage axial loads in either one or both directions, or permit axial float in two directions
- Surface finishes on the EMA series nearly double the operating lambda ratio, resulting in 1.5 times increase in predicted bearing life
- Timken EMA series cylindrical roller bearings feature a one-piece brass cage that minimizes drag on the rolling elements, reducing heat and improving bearing life
- Improved lube flow results from the open pocket cage design, as well as lubrication holes and grooves
- The complete line of Timken caged and full complement CRBs includes single- and double-row designs
- Size range: 60 mm ID to 1,800 mm OD (2.4 in ID to 70.9 in. OD)

Applications: Vertical Rolling Mills, Hydraulic Roller Press, Ball Mills, Kilns, Screens, Primary Crushing Equipment



Spherical Roller Bearings

Timken® spherical roller bearings manage high radial loads even when dealing with misalignment, marginal lubrication, contamination, extreme speeds or critical application stresses.

- Higher load and speed ratings allow enhanced performance levels due to optimized internal geometry and improved surface finishes
- Slotted cage made of hardened steel improves lubrication flow for lower temperatures and increased bearing life
- Timken spherical roller bearings offer a 17 percent increase in average thermal speed ratings over previous designs
- Available with rugged steel (EJ series) and machined brass retainers (EM or EMB series)
- Size range: 25 mm ID to 1,800 mm OD (1.0 in. ID to 70.9 in. OD)

Applications: Vertical Rolling Mills, Hydraulic Roller Presses, Vibrating Screens, Ball Mills, Kilns, Primary Crushing Equipment, Material Handling Equipment



Timken® Type E Tapered Roller Bearings Solid-Block Roller Housed Units

Timken® Type E tapered roller housed units are built for rugged applications.

- Enhanced surface textures and profiles on the Type E bearing insert provide more than 113 percent increased life over standard Timken bearings
- Significantly reduced contamination ingress and improved grease retention are the result of double lip seals featured on the Type E
- Better corrosion resistance helps protect the collar and housing with electro-deposition paint coating
- Available in a full range of housed units, including pillow blocks, flanges and take-ups.
- Bore size range: 35 mm to 125 mm (1-7/16 in. to 5 in.)

Applications: Fans, Material Handling Equipment



Timken® Spherical Roller Bearing Solid-Block Housed Units

Timken® spherical roller bearing housed units combine cast steel

housings with high-performance spherical roller bearings for outstanding reliability and durability in rugged conditions.

- Multiple layers of primary and secondary sealing options, as well as steel covers in sizes to fit all units, help protect bearings
- Timken spherical roller bearing housed units run efficiently on misaligned shafts up to +/-1.5 degrees without a reduction in life expectancy
- Spherical roller bearing housed units have 15 sealing and four locking collar options
- Bore size range: 35 mm to 180 mm (1-7/16 in. to 7 in.)

Applications: Fans, Material Handling Equipment



SAF Split-Block Housed Units

Timken® SAF split-block units include a wide range of tough housing designs, seals and accessories for outstanding performance in a compact package.

- Units contain Timken spherical roller bearings with a unique design allowing them to run cooler and more efficiently
- Wide range of options provides effective sealing and lubrication for different operating conditions and speeds
- Available in tapered bore or straight bore designs. Readily converts

from fixed to float by removing the stabilizing ring.

- Bore size range: 35 mm to 495 mm (1-7/16 in. to 19-1/2 in.) bore

Applications: Fans, Material Handling Equipment



Ball Housed Units

Timken® ball bearing housed units feature robust housings, bearings and seals designed to offer a rugged, reliable product.

- Housings are wider along shaft axis and 30 percent heavier than previous designs to offer better bearing seat strength
- Corrosion-resistant housings coated with black powder epoxy offer excellent performance
- Timken problem-solver series offers solutions for the most challenging environments
- Available in many configurations, including wide and narrow inner rings and stainless steel housings. A variety of locking systems includes eccentric locking collars, concentric locking collars and set screws
- Bore size range: 17 mm - 75 mm (1/2 in. to 3 in.)

Applications: Fans, Material Handling Equipment

TIMKEN PRODUCT & SERVICE SOLUTIONS FOR THE CEMENT INDUSTRY



Condition Monitoring

Identify potential system issues before failure occurs with Timken condition monitoring solutions, which evaluate bearing condition, lubrication quality and machine vibration. Customized programs reduce maintenance and capital expenses, while increasing productivity, uptime and safety. Products include a variety of handheld devices and online systems for periodic or continuous monitoring.



Reliability Services

Highly trained Timken technicians can evaluate your machine and component conditions, then recommend ways to maximize equipment uptime. To ensure uninterrupted operation, most diagnostic testing is performed without taking equipment offline. When combined with Timken condition monitoring solutions, reliability services offer cement operators a total-system check for the entire operation.



Bearing Repair and Remanufacture

Timken remanufacture and repair experts can return most brands of bearings to like-new condition, increasing life by up to three times and saving customers up to 60 percent of the cost of buying new. Repairs are possible on a variety of bearing types and sizes up to 2,134 mm (84 in.) outside diameter. For the cement industry, Timken repairs tapered, cylindrical and spherical bearings, shafts and housings.



Gearbox Repair

Philadelphia Gear®, a Timken brand, has long been known for its dedication to quality and its commitment to providing longer lasting gearboxes. With expansive knowledge that covers a vast area of the industrial gearbox realm, including crusher drives and variable speed drives, the team has the experience necessary to assist with mechanical gears and industrial gearbox repairs.



Service Engineering

Timken service engineers apply their expertise to help ensure equipment is installed properly and operates efficiently. They also deliver customized training for customers' maintenance teams.

Training and Certification

Timken Service Engineering provides well-respected bearing maintenance training programs in the cement industry. Timken maintenance training covers all bearing types, is 100-percent technical in scope and includes both pre-tests and post-tests to assure students understand the concepts presented. Timken training is modular, so it can be customized to fit the students' needs precisely. Seminars range from two hours to three days.



To validate that students retain the knowledge and skills covered in the seminar, Timken recommends a follow-up Timken Bearing Certified Shop Audit.



Couplings

Timken Quick-Flex® elastomeric couplings operate in harsh environments providing durability, while requiring minimum maintenance.

- Timken Quick-Flex couplings are easy to install, can handle up to 2 degrees of misalignment and require no lubrication
- Reduce downtime and replacement costs by replacing inserts without moving or disassembling the driving or driven equipment
- Elastomeric couplings are interchangeable with most other comparably sized couplings, regardless of type
- Elastomeric couplings have four insert choices for varying torque needs and temperature ranges
- Timken also offers cast steel rigid couplings, an excellent choice for joining shafts of the same size



Chain

Timken manufactures chains that will stand up to virtually any environment. Timken chains are built to precise specifications for strength and maximum wear life.

- Offering includes a complete line of roller chains, attachment chains and engineered conveyor chain available in a variety of designs to handle extremely tough challenges
- Feeder breaker chain is engineered for optimum wear life while handling highly abrasive conditions and heavy shock loads



Seals

Our complete line of Timken seals keeps contaminants out and lubrication in. Suitable options are available for a range of applications and include grease seals, oil seals and advanced bearing isolators in inch and metric sizes.



Lubricants

Timken developed its line of application- and environment-specific lubricants by leveraging deep knowledge of tribology and anti-friction bearings and how these two elements affect overall system performance. Timken lubricants help bearings and related components operate effectively in demanding industrial operations. High-temperature, anti-wear and water-resistant additives offer superior protection in challenging environments.

Lubrication Systems

The eight primary lines of Timken lubricants compliment the G-Power and M-Power single-point lubricators, C-Power centralized multi-point lubricators and global offering of lubrication products. G-Power, M-Power and C-Power units consistently distribute grease into machine operations. These canisters can be filled with Timken lubricants or many other types of commercial lubricants and mounted into place with a full line of Timken accessories.

Maintenance Tools

Timken maintenance tools make bearing installation, removal and service safer and easier. Choose from a variety of induction heaters, impact fitting tools, and hydraulic and mechanical pullers. Timken field specialists are available for training on proper tool usage and maintenance procedures.



TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance steel as well as mechanical components, including bearings, belts, chain, gears and related mechanical power transmission products and

Stronger. **Commitment.** Stronger. **Value.** Stronger. **Worldwide.** Stronger. **Together.** | Stronger. **By Design.**