

TIMKEN



TIMKEN SOLUTIONS FOR UNDERGROUND MINING

INCREASED RELIABILITY FOR GREATER PRODUCTIVITY

CONTINUOUS MINER

Coal miners work far below the earth's surface and have little time and less space to deal with unscheduled breakdowns. With enormous rotational forces and constant impact loads on the cutter heads, equipment productivity is paramount, especially when downtime costs between \$10,000 and \$15,000 per hour for room and pillar mining.

Timken offers a wide range of tapered and spherical roller bearings used in cutter heads, propulsion track systems and conveying systems. Timken® spherical roller bearings and Timken® tapered roller bearings help manage radial and combined loads because they can be customized to meet specific application requirements. Timken® precision roller chain in the propulsion system helps keep continuous miners moving.



Photograph used with permission of Joy Global.



Tapered Roller Bearings

Spherical Roller Bearings

Precision Roller Chain

TIMKEN SOLUTION SUCCESS

Enhanced Surface Finishes Help Increase Bearing Life and Reliability

In continuous mining equipment, bearing loads are unpredictable due to a wide variety of different operating conditions. This leads to uneven loading and large overturning moments for the cutter drum bearings.

When Joy Global needed help to improve the performance of their cutter drums, they called Timken. The bearing damage was fine grain spalling due to the heavy loads and low-speed conditions that did not allow the lubrication to generate sufficient film strength to separate the

rolling element surfaces. The solution leveraged tribology technologies that improved surface finishes by reducing the surface roughness. Timken manufactures bearings with enhanced surface finishes that mitigate the effects of fine grain spalling. The improved surface finish is designed to allow for better separation of the steel rolling surfaces, preventing the asperity contact that leads to premature bearing damage.

As a result, Joy experienced increased bearing life and reliability of their

machines to meet life requirements between rebuild cycles. According to Mark Ziegler, Joy Global Principal Engineer, "We enjoy working with Timken on these projects. Their engineering team assists with inspection of field parts and then validates product improvements through their analysis tools. With global engineering support, we rely on Timken to support us whether we are in the United States, China or anywhere in between."

ROAD HEADER

Up, down, left, right – it's solid earth with every rotation. Throw in moisture, dust and an endless work schedule and that's the life of the road header. Exposure to constant contamination and crushing loads are what the bearings face every day.

With a complete line of tapered, cylindrical and spherical roller bearings, Timken offers customers a wide range of solutions for road header applications. Timken® bearings and chain are designed to meet the challenges posed by cutter heads, propulsion systems and conveyor drive systems. Timken application engineers utilize bearing modifications to optimize bearing performance, meeting various challenges in customer systems.



Tapered Roller Bearings

Cylindrical Roller Bearings

Spherical Roller Bearings

Precision Roller Chain

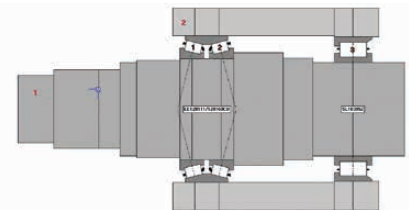
TIMKEN SOLUTION SUCCESS

SYBER Delivers Fast and Improved Solutions to Customers

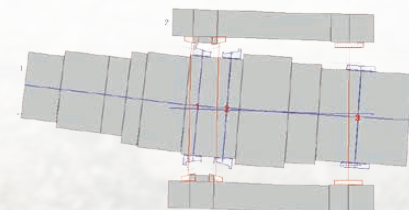
Deep industry knowledge – backed by SYBER, the Timken proprietary analysis tool – establishes the foundation for our problem-solving capabilities. SYBER performs complete system analysis, taking into account all typical mechanical and environmental factors before evaluating bearing performance. Timken engineers then assess the full range of factors to develop unique solutions that address customers' specific challenges, whether at the design phase or in the field.

SYBER helps ensure that Timken solutions can withstand real-world demands prior to product installation. The system allows for deep understanding of application-inherent torque requirements, stress points, deflections and lubrication issues.

By reducing the time between design and testing, SYBER delivers improved solutions to customers and faster time to market.



Model that depicts shaft and housing with no load.



Model simulating system deflection under one potential load condition.

LONGWALL SHEARER

The confines of underground mining mean that equipment must become more and more productive without increasing size. When downtime ranges between \$30,000 and \$50,000 an hour, increased uptime means more profit.

Longwall shearer cutters traverse back and forth, stripping layers of coal. Each pass is challenged by intense impact loads and extreme dirt and debris. Timken® tapered roller bearings and debris-resistant bearings are ideal for helping to maintain continuous operations in this tough application.

Longwall shearer idler gears and planets also benefit from the high radial load capacity of Timken® spherical and cylindrical roller bearings.



Spherical Roller Bearings

Debris-Resistant
Tapered Roller Bearings

Cylindrical Roller Bearings

TIMKEN SOLUTION SUCCESS

Bearings Help Improve OEM Equipment Reliability

Jixi Coal Mine Machinery Company, Ltd., part of Joy Global and one of China's largest manufacturers of underground mining machinery, engaged Timken because of problems they experienced with electric haulage shearers. Analyses done by Timken showed that a competitor's original-equipment spherical bearings were not ideal for high-thrust loading and caused excessive bi-directional axial movement due to large endplay. This

resulted in frequent bearing and seal failures and end-user complaints.

To provide a solution, Timken utilized its global technology resources and determined that Timken® tapered roller bearings were better suited for the shearers and would help reduce costly downtime. Timken worked with Jixi to improve the shearers' design for optimal performance with tapered

bearings and provided training on the use and maintenance of the bearings.

"Our goal is always to improve a customer's total performance by applying what we know about friction management," said the Timken sales manager on the project. "From products to engineering to training, we were able to assist Jixi and improve their customers' performance as well."

ARMORED FACE CONVEYORS

Minutes matter when the day's success depends on the number of tons of coal moved. The wide range of durable bearing designs offered by Timken helps keep armored face conveyor gear drives in operation. From cylindrical roller bearings with one-piece machined brass cages to spherical roller bearings with innovative steel cages, Timken applies its knowledge of materials and friction management to deliver value.

Input shafts benefit from the increased capacity and lubrication flow of Timken cage designs when it comes to variable high speeds and load conditions. Sprockets benefit from Timken double-row tapered roller bearings. Precision ground spacers control bearing settings and help optimize sealing for increased machine availability.



Photograph used with permission of Joy Global.



EMA Cylindrical Roller Bearings

EJ Spherical Roller Bearings

EM/EMB Spherical Roller Bearings

Two-Row Tapered Roller Bearings

TIMKEN SOLUTION SUCCESS

Cage Designs Add Strength and Durability

Timken offers cylindrical and spherical products with engineered cage options to help improve equipment performance.

EMA Style Cylindrical Roller Bearings

- One-piece brass cage with fully milled pockets optimizes lubrication flow, reduces heat generation and improves wear resistance
- Increased cage rigidity allows for more rollers than alternatives with competitive brass cage configurations

- Land-riding cage design reduces drag on the rollers, compared to traditional roller-riding cages, minimizing drag on the rolling elements to reduce heat generation and help improve bearing life

EJ Style Spherical Roller Bearings

- Stamped, nitride steel-slotted cage helps to better purge contaminants
- Surface-hardened steel provides increased strength and reduced wear

- Land-riding, window-type slotted design allows for more efficient lubrication flow, resulting in lower operating temperatures

EM/EMB Style Spherical Roller Bearings

- Machined brass cage available in land- and roller-riding designs
- Enhanced roller/cage contact geometry is designed to provide optimum roller guidance and reduced friction
- Robust cage bridge is designed to operate in extreme environments

CRUSHING EQUIPMENT

Shock loads and contamination make crushing equipment one of the toughest kinds of equipment for precision components, particularly bearings. Keeping machine availability high and total cost of ownership low in these harsh conditions requires specialized engineering and materials knowledge.

Timken® AP™ bearings handle the crushing loads from the breaker shafts in crushing equipment, while Timken® spherical roller bearing solid-block housed units and feeder breaker chain help ensure conveyor systems keep moving.

Timken engineers have the know-how to help customers' equipment handle heavy shock loads, along with contamination and lubrication challenges. From the metallurgic knowledge gained as a steel manufacturer to revolutionary debris- and wear-resistant coatings, Timken delivers stronger performance.



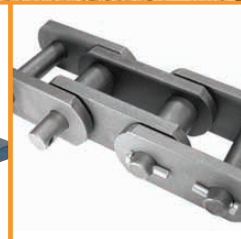
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AP Bearings



Spherical Roller Bearing
Solid-Block Housed Units



Feeder Breaker Chain

TIMKEN SOLUTION SUCCESS

In-Depth Analysis Crushes Unplanned Downtime

When a few of a customer's plants ran more power through their Lippmann-Milwaukee, Inc. crushers, something had to give. Users of the Lippmann-Milwaukee 4248 and 3862 models pushed their jaw crushers beyond specification limits, resulting in premature damage of the frame bearings. Working together, Timken and Lippmann-Milwaukee engineers conducted root cause analysis and discovered the increased

speeds created a low lubrication film that, when paired with the shock loads, damaged the bearings.

Timken application engineers took the data collected from their work with Lippmann-Milwaukee and recommended a solution to accommodate the current crusher designs and the real-world demands placed on the equipment.

They solved the problem by applying a Timken engineered surface to the rollers of Timken® tapered roller bearings. The deployed units immediately displayed a marked improvement in service hours. The results convinced Lippmann-Milwaukee to specify Timken® tapered roller bearings with engineered surfaces as standard for these equipment models.

HAULAGE EQUIPMENT

Put a few tons on your back, climb steep grades, make a few sharp turns and do it over and over again – that's what's expected from haulage equipment. Whether it's articulating trucks or shuttle cars, they move a lot of material without much space to do it.

When Timken® tapered roller bearings are installed in the wheel ends of haulage equipment, they provide the durability required to handle the extreme radial and thrust loads from hauling tons of payload. Timken® precision roller chain helps ensure haulage equipment rolls through some of the toughest environments underground. With the highest dynamic load ratings in the industry and a toolbox of bearing enhancements to combat debris, Timken® bearings are designed to deliver the performance customers demand.



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Tapered Roller Bearings

Precision Roller Chain

TIMKEN SOLUTION SUCCESS

Ratings Increase Leads to Greater Load-Carrying Capacity

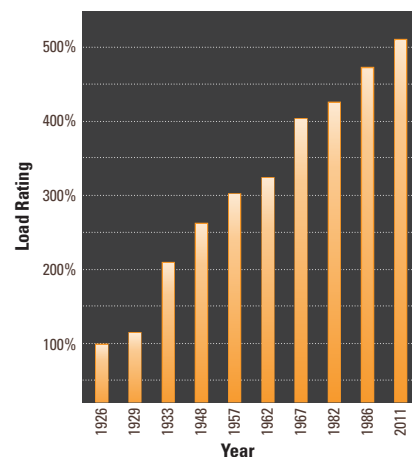
Timken has a long history of designing and manufacturing tapered roller bearings. Through material improvements, internal design enhancements and precision manufacturing, Timken continues to set the standard for industry-leading ratings. With advanced technology engineered into the bearings, performance assessments warrant increases in predicted life across 20 product types.

The higher performance ratings translate into greater value, with longer predicted useful bearing life and heavier load-

carrying capacity than previous ratings of Timken® tapered roller bearings.

Timken engineers work closely with many original equipment manufacturers to develop best-in-class tapered roller bearings for specific applications such as transmissions, gear boxes, pumps, compressors and other processing equipment. For customers, the higher ratings mean increased power density – more performance packed into smaller, lighter bearings that help boost the energy efficiency of the equipment they help keep in motion.

History of Timken Dynamic Load Ratings



MATERIAL HANDLING

Below-ground material handling equipment must withstand heavy loads and large amounts of dust, mud and grime. The full line of Timken housed units can quickly conquer these challenges.

With the full line of Timken® spherical roller bearing solid-block and split-block housed units, Type E tapered roller bearing housed units and the complete problem-solver series of Timken® ball bearing housed units, high performance and optimal uptime can become standard operations.



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SNT Plummer Block Housed Units



SAF Split-Block Housed Units



Spherical Roller Bearing Solid-Block Housed Units



Type E Tapered Roller Bearing Housed Units



Ball Bearing Housed Units

TIMKEN SOLUTION SUCCESS

Solid-Block Housed Unit Helps Multiply Uptime

When New Clydesdale Colliery in Mpumalanga, South Africa, an EXXARO location, experienced premature bearing damage on the tail pulleys of its conveyor system, operators challenged their bearing distributor to find a solution. The distributor asked Timken to help meet the challenge in an application where the competitor's bearing was failing.

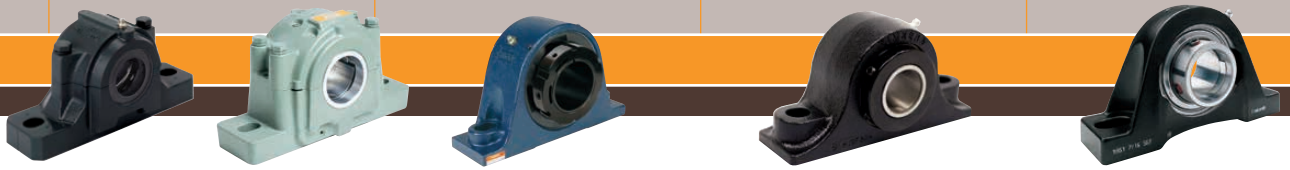
"We were getting eight weeks maximum bearing life with our previous solution. From fractured housings to seal failure and higher-than-normal maintenance cycles, the issues ran the gamut," said Frans Botha, mechanical foreman at New Clydesdale. "Timken presented the SRB solid-block housed unit as a potential solution and we gave it a try.

We experienced benefits right from the start. It took us approximately 30 minutes to install each unit, compared to an hour and a half normally required to reinstall the previous split-block units. Now, 10 months later, the original units are still running and our maintenance cycles have been reduced significantly."

BEARING AND HOUSING GUIDE

Choosing the right type of bearing and housing for material handling equipment can strengthen the performance of equipment and the bottom line. Timken offers a full line of housed unit solutions to suit application-specific needs.

	SNT Plummer Block/ SAF Split-Block Housed Units	Spherical Roller Bearing Solid-Block Housed Units	Type E Tapered Roller Bearing Housed Units	Ball Bearing Housed Units
Bearing Insert	High-performance spherical roller bearing with tapered bore or straight bore option	High-performance spherical roller bearing with six shaft locking options	Tapered roller bearing with enhanced internal geometries	Ball bearing with superfinished raceways and three-shaft locking options
Housing	<ul style="list-style-type: none"> Split, two-piece design Cast iron (cast steel and ductile iron available) 	<ul style="list-style-type: none"> Solid block, one-piece design Cast steel Machined feet for consistent housing location 	<ul style="list-style-type: none"> Solid block, one-piece design Cast iron 	<ul style="list-style-type: none"> Solid block, one-piece design Cast iron
Seal Options	<ul style="list-style-type: none"> SAF comes standard with labyrinth (LER) seals, options include Timken Guard (superior protection against contamination), dustac and taconite SNT options include double-lip, labyrinth, V-ring and taconite 	<ul style="list-style-type: none"> Six seal options Three triple-lip seal options (superior protection against contamination) Two double-lip seal options One labyrinth seal option (for high-speed applications) Auxiliary steel end covers available 	<ul style="list-style-type: none"> Double-lip seal (standard) designed for optimized lip contact 	<ul style="list-style-type: none"> Single-lip (standard) Triple-lip (superior protection against contamination) Labyrinth (for high-speed applications)
Additional Features	<ul style="list-style-type: none"> Push/pull-type adapter sleeves available Components interchangeable with industry standard designs May be ordered as an assembly or as individual components 	<ul style="list-style-type: none"> Multiple options to lock bearing to shaft Eccentric lock Set screw lock V-lock Tapered adapter lock Double adjustment nut for fixed to float conversions 	<ul style="list-style-type: none"> Available with set screw locking Electro-coat paint for additional corrosion protection Enhanced bearing geometries deliver highest dynamic load ratings in the industry 	<ul style="list-style-type: none"> Available with Shaft Guarding Technology™ Available with wide or narrow inner rings Variety of shaft locking options Set screw locking Eccentric locking Concentric locking
Benefits	<ul style="list-style-type: none"> Easy-to-remove cap for bearing inspection Housings may be re-used Easily converts from fixed to float in the field High-performance Timken® spherical roller bearing runs cooler for longer bearing life 	<ul style="list-style-type: none"> Quicker installation time than split housings Easily converts between fixed and float positions after installation High-performance Timken® spherical roller bearing runs cooler for longer bearing life 	<ul style="list-style-type: none"> Quicker installation time than split housings Increased useful bearing life and load capacities Double-lip provides industry-leading protection against contamination 	<ul style="list-style-type: none"> Unique Shaft Guarding Technology™ Eases removal and simplifies replacement Extends shaft life Multiple sealing options provide choices to meet application needs



TIMKEN SOLUTION SUCCESS

Housed Units Shine at Gold Mine

Minerales de Occidente, a gold mine in Honduras, was ready to give up on one of its biggest machines. Their mobile crusher shut down for about 90 minutes every 20 days because of bearing failure in the conveyor system.

Unable to find a solution using competitive products, the mine's bearing supplier approached Timken. Through application analysis, it was clear that heavy loads and contamination were too much for the current bearing. Flange block housings that were supposed to last 5,000 hours were lasting less than 500.

"The problem bearing was a ball housed unit, and Timken could provide a better alternative from our portfolio of spherical roller bearing solid-block housed units," said the Timken sales engineer on the project. "Our units are made of solid steel and rugged enough for punishing equipment like a mobile crusher."

Seven months later, the Timken flange block worked like new. The units utilize a triple-lip seal, which has proven superior to the competitive

bearing in keeping contaminants out. It holds more than two times the weight of the old bearing, with an expected design life of 100,000 hours.

Then, the mine added Timken flanged units to another reinstalled conveyor that was previously disabled due to ongoing maintenance issues. Timken housed units paid off for the mine. It avoided the cost of a major investment and \$580,000 a year in maintenance and bearing replacement costs.

UPTIME SOLUTIONS

Improved uptime for a healthier bottom line – that’s the name of the game for the mining industry. Every operation looks for ways to optimize machine availability, safety and profitability. In an industry where dust, debris and even the weather put equipment to the test, the answers to achieving better uptime can be elusive.

Proper maintenance schedules and predictive technologies help achieve operational goals. Timken answers the call with a suite of reliability solutions including portable instruments, continuous monitoring devices and wireless online systems.



StatusCheck®



Online Intelligence System



Bearing Tester

TIMKEN SOLUTION SUCCESS

StatusCheck® Rescues Coal Terminal from Lost Time and Money

A large coal terminal in the Midwestern United States receives and transloads more than 17 million tons (15.4 metric tons) of coal annually. The facility works 24/7, and it can be very damaging when their equipment fails unexpectedly. The Timken® StatusCheck® wireless condition monitoring system detects issues in critical bearing applications and alerts maintenance personnel before the problems cause a major breakdown. “The conveyors are the heart of our operation, where we sort the coal into

two different silos,” said the plant’s senior maintenance coordinator. “In the past, the bearings in the take-up pulley have failed and put our entire operation out of order for three days while everything was rebuilt.”

In addition to replacing the bearings, this type of failure also required repairs to the pulley system and steel structure, which added up to almost \$80,000 in parts costs and three 24-hour workdays in unscheduled downtime and lost production.

“Since the StatusCheck® system was installed, maintaining the coal conveyor has been much easier” he said.

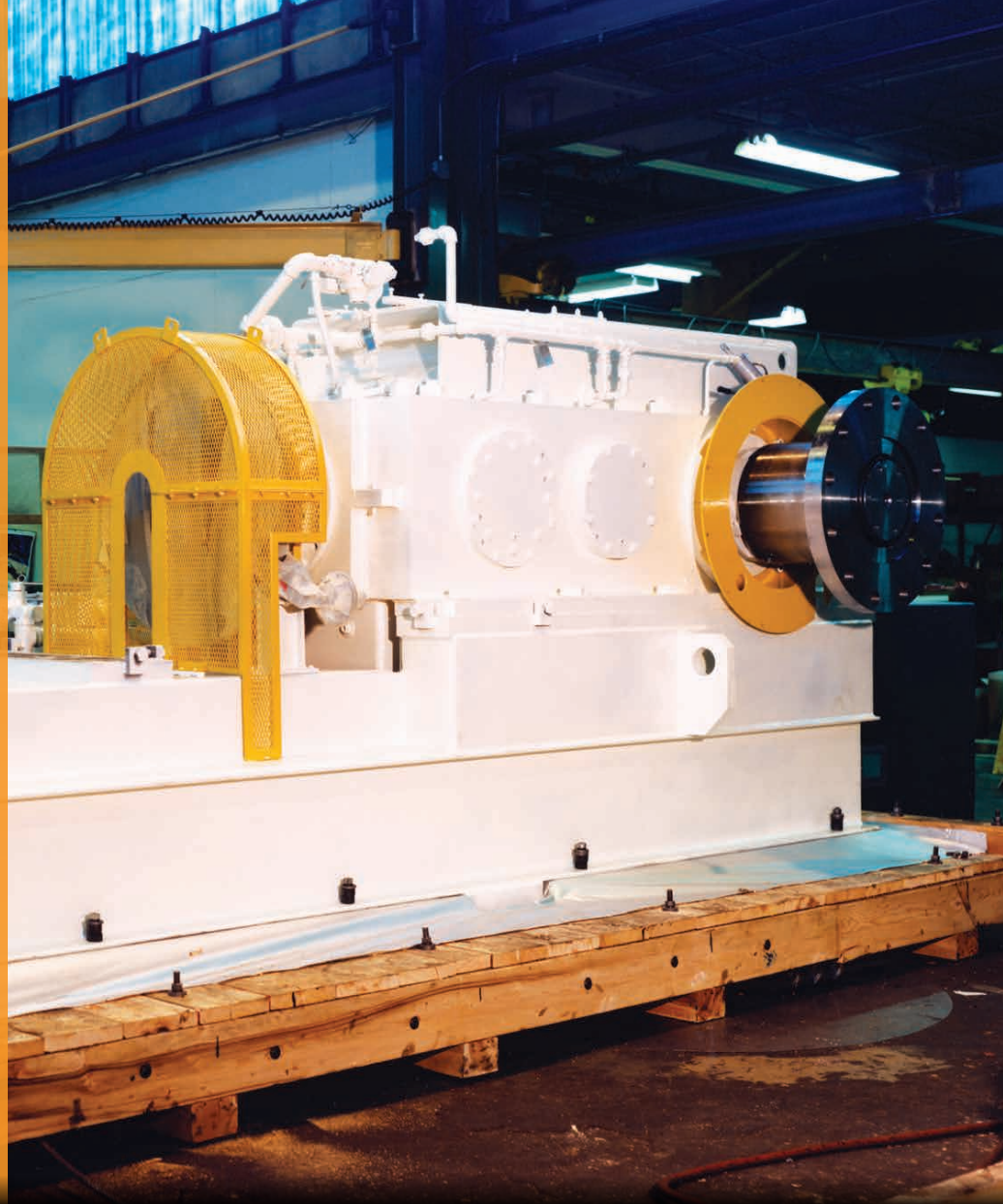
“The last time a bearing began to fail in that application, StatusCheck® helped us catch it just as it was starting to spall,” said the maintenance coordinator. “This took it down to an eight-hour repair that only cost us about \$3,000 to \$4,000 in parts.”

BEARING AND GEARBOX REPAIR

Highly engineered and relied-upon equipment components like bearings and gears are expensive to replace. Why not save on lead times and budget by repairing and reusing existing components?

Through the process of remanufacturing and repairing bearings, Timken can increase the useful service life of the original bearing up to three times and can save up to 60 percent of the cost of buying a new bearing. Timken performs repairs on any brand and type of bearing up to 2,134 mm (84 in.) outside diameter.

Timken engineers also provide gearbox solutions used in mines, quarries and refineries. They repair and rebuild gearboxes to help maximize customer uptime and increase profits.



TIMKEN SOLUTION SUCCESS

Repair Saves Time, and Time is Money

In steep-angle slope and overland conveyors, an instantaneous reverse of tension can be fatal to the belt. Constantly replacing those belts is frustrating, time-consuming and very expensive. The Timken technical team used their vast engineering expertise in designing Philadelphia Gear® products to help improve belt reliability on one of the highest-tension, steepest-angle slope belt conveyors manufactured today.

Flywheels are typically used to prevent belt failure in the event of a power or prime mover failure. By mounting the flywheel on the high-speed shaft behind the first-stage pinion, the Timken gear services team reduced the flywheel mass compared to those mounted to the intermediate or low-speed shaft. In addition to improving belt reliability, this reconfiguration reduced required

maintenance in two ways. First, it eliminated the need for another assembly mounted on its pillow block bearings. The change also enabled the removal of a coupling connection and a set of support bearings, dramatically reducing the complexity of equipment alignment.

TIMKEN BEARING SOLUTIONS FOR UNDERGROUND MINING



Tapered Roller Bearings

Timken sets 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: Cutter Heads, Gear Drives, Primary Crushing Equipment, AFC Sprockets

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 make these bearings economical in both large and small quantities

Applications: Cutter Heads, 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 current leading high-performance industry designs.

- Designs provide an 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: Screens, Primary Crushing Equipment, Shearers, Gear Drives, Road Headers



Spherical Roller Bearings

Timken® spherical roller bearings manage high radial loads even in the presence of misalignment, marginal lubrication, contamination, extreme speeds or critical application stresses.

- Higher load and speed ratings provide enhanced performance levels as the result of optimized internal geometry and improved surface finishes
- Slotted cage made of hardened steel improves lubrication flow for lower operating temperatures, leading to 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: Primary Crushing Equipment, Gear Drives, Shearers, Road Headers, Continuous Miners



Type E Tapered Roller Bearing 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 55 percent increased design 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; 1³/₁₆ in. to 5 in.

Applications: Conveying Equipment



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 feature 15 sealing and four locking collar options
- Bore size range: 35 mm to 180 mm; 1¹/₁₆ in. to 7 in.

Applications: Conveying and Crushing Equipment



SNT Plummer Block/SAF Split-Block Housed Units

Timken® SNT/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: 20 mm to 500 mm; 1¹/₁₆ in. to 19¹/₂ in. bore

Applications: Conveying Equipment and Crushing Equipment



Ball Bearing Housed Units

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

- Housings are wider along the 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 to 75 mm; 1/2 in. to 4¹⁵/₁₆ in.

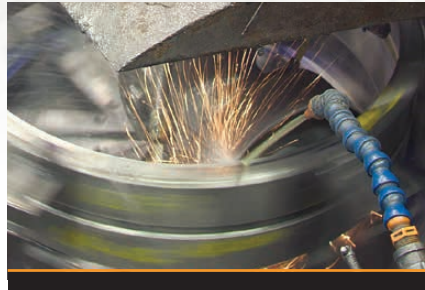
Applications: Conveying Equipment

TIMKEN UPTIME SOLUTIONS FOR UNDERGROUND MINING



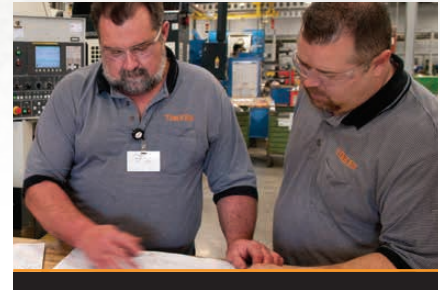
Condition Monitoring

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



Bearing Repair and Remanufacture

Timken remanufacture and repair experts can return most brands of bearings to like-new condition, increasing service 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 mining industry, Timken repairs tapered, cylindrical and spherical bearings, shafts and housings used in haul trucks, shovels and conveyors.



seven dedicated repair facilities. The gear services team continues to expand product services for large diameter gearing and replacement parts for mining customers around the world.

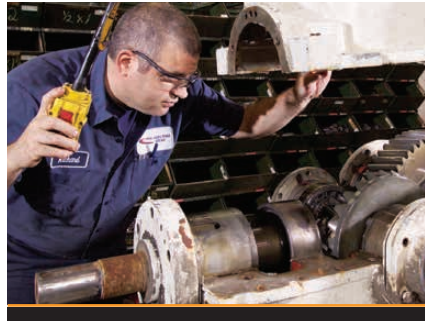
Service Engineering

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.



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.



Gears and Services

Timken products are known throughout the world for their reliability, quality and performance in harsh operating environments. With skills that cover a vast number of mission-critical applications, including crusher gear drives and variable speed conveyor drives, Timken Industrial Services has the experience necessary to assist with mechanical gear repairs whether on-site at the customer or at one of

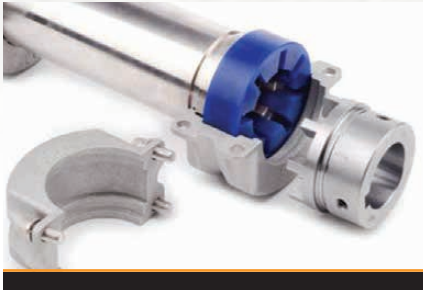
Training and Certification

Timken Service Engineering provides well-respected bearing maintenance training programs in the 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 students' needs precisely. Seminars range from two hours to three days.



TIMKEN PRODUCT SOLUTIONS FOR UNDERGROUND MINING



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
- Help 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

Applications: Motor and Gear Drive Connections



Chain

Timken manufactures chain that stand up to virtually any environment. Timken Drives® chain is built to precise specifications for strength and maximum wear life.

- Offering includes a complete line of precision roller chain, attachment chain and engineered conveyor chain available to handle extremely challenging environments
- Stacker-reclaimer chain is engineered for optimum wear life including induction hardening of the sidebar wear surfaces. Pitch chain is offered in 12 inch and 315 mm in either steel bushed or bar and pin style.

Applications: Feeder Breakers, Shuttle Cars, Conveyors, Continuous Miners, Road Headers



Seals

Our complete line of Timken seals is designed to keep 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

Timken offers a wide variety of single-point and centralized multi-point lubrication systems that consistently distribute grease into machine operations. These canisters can be filled with Timken lubricants or many other types of commercial lubricants and mounted in place with a full line of Timken accessories. Timken continues to expand its range of centralized lubrication solutions to improve mining equipment performance around the world.



Underground mining customers bring Timken their greatest challenges, and we deliver. The global Timken team leverages our engineering expertise and draws on our field experience to provide solutions that help you improve uptime.

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 mechanical components, including bearings, gears, chain and related mechanical power transmission products and services.

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