TIMKEN

Where You Turn

Turn to Timken for High-Performance Bearings

High-Performance Bearing Solutions

Tough environments and demanding applications require special attention and unique solutions. Challenges such as heavy loads, shock loads, high speed, high temperature, debris contamination and corrosion can adversely affect the performance of standard bearings.

Value-Added Performance in Demanding Applications

Fortunately, Timken offers a complete line of high-performance bearings. These bearing solutions apply proprietary technology in materials, surface finishing, profiled contact geometry and coatings. They are designed to provide our customers with high value and the competitive advantage to reduce the total costs of equipment design and operation. Targeting the most demanding environments, our high-performance bearings can provide:

- Increased bearing performance and longer life.
- Increased power density – with more power throughput capacity in the same bearing envelope size.
- Reduced bearing replacement costs.
- Reduced equipment maintenance and servicing costs.
- Increased equipment uptime and productivity.
- Highest value – with increased bearing performance-to-price ratio.

Solution-Focused Applications

High-performance bearings may be implemented at any stage – from prototype to end use – without requiring a system redesign. Through sophisticated application-focused computer tools, our engineers can suggest which product is ideal for your operating environment.

High-Performance Bearing Solutions:
Mitigating damage modes to improve performance

	DuraSpexx & P900	DuraSpexx "Power Rating Series"	Debris Resistant Bearings	Engineered Surfaces *(ES coatings)*	Corrosion Resistant Bearings
Common Brg types	TRB	TRB	TRB SRB CRB	TRB SRB CRB	TRB, SRB, CRB, BB
Typical size range (O.D.)	all	3"-24"	>8"	>8"	up to 40"
Life factors:	up to 4x	2x	up to 2x	(see below)	up to 5x
Primary Damage Mode Environment:					
Heavy load/fatigue	x	x			
Misalignment/GSC	x				
Thin film/high temp.			*x	**up to 1.5x	x
Debris/wear			x	up to 3x	
Roller end scoring	x			6x	
False brinell				2x	
Corrosion					up to 5x
Housing/shaft fretting				x	x

** when using ES brg solution ** improvement over DuraSpexx*

fig. 1 Comparison matrix of Timken high-performance bearing solutions and typical benefits.

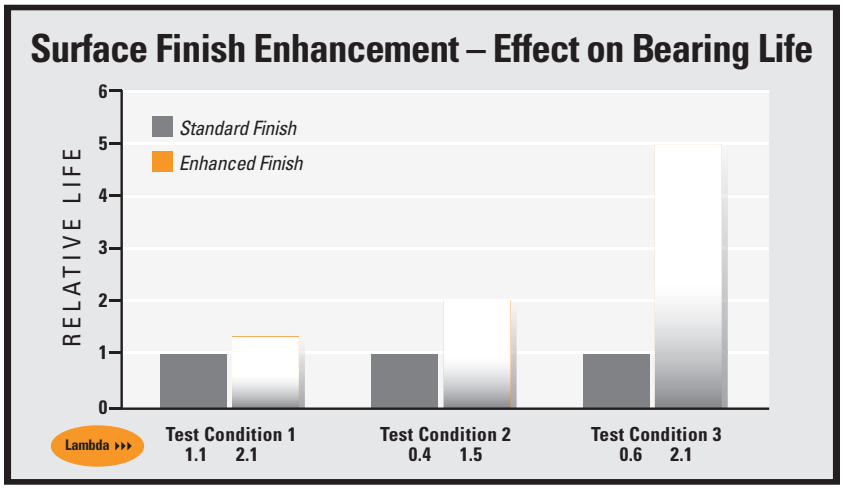


fig. 2 Timken enhanced finishing technology can result in up to four times improvement in bearing life by smoothing and reducing the height of surface contact asperities.

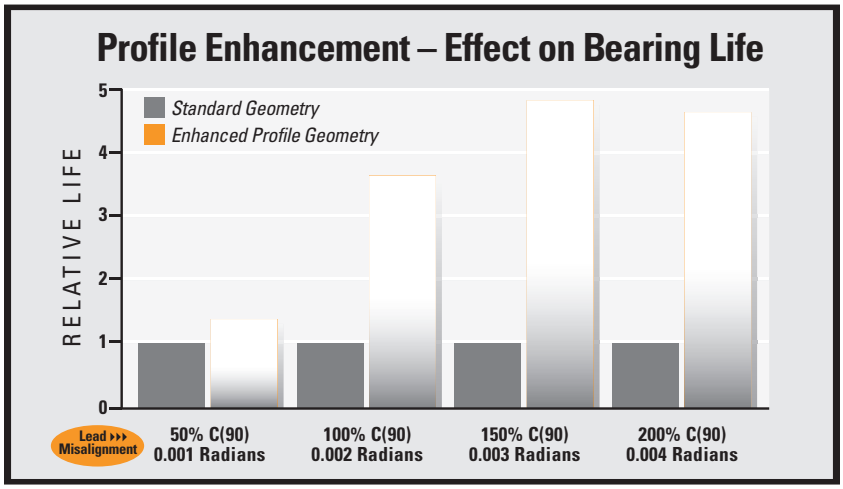


fig. 3 Timken enhanced profile technology can result in up to four times improvement in bearing life by providing added, incremental support to edge-of-contact loading for more evenly distributed stress.

Improved Bearing Service Life

The objective of our high-performance bearing technology is to improve bearing service life by minimizing the four primary modes of fatigue damage:

- **Inclusion fatigue** – subsurface damage that begins with a fatigue crack forming near a non-metallic inclusion (micro-impurity) in the material. The crack then rises to the surface (spall damage) after a number of load cycles.
- **Geometric Stress Concentration** (GSC) – premature damage that begins at a localized area of high stress, typically at the edge of raceway contact and caused by very high loads and/or shaft deflections and misalignment.
- **Point Surface Origin** (PSO) – premature surface damage that begins on the raceway surface, typically caused by high stress at micro-asperity contact points, by boundary lubrication/thin film operating conditions or debris contamination.
- **Corrosion** – premature surface damage due to oxidation and degradation at the raceway surface from prolonged exposure to water contamination within the lubrication.

A Complete Line of High-Performance Bearings for Demanding Applications

Timken offers a unique portfolio of high-performance bearing solutions. These include P900™, DuraSpexx™, debris-resistant, engineered surfaces and corrosion-resistant bearings (see fig. 1). Each bearing is designed to mitigate fatigue damage for a specific set of primary damage modes. In various environments, typical service life improvements from one and one-half times to six times have been demonstrated.*

* Performance will vary depending on applications and operating environment.

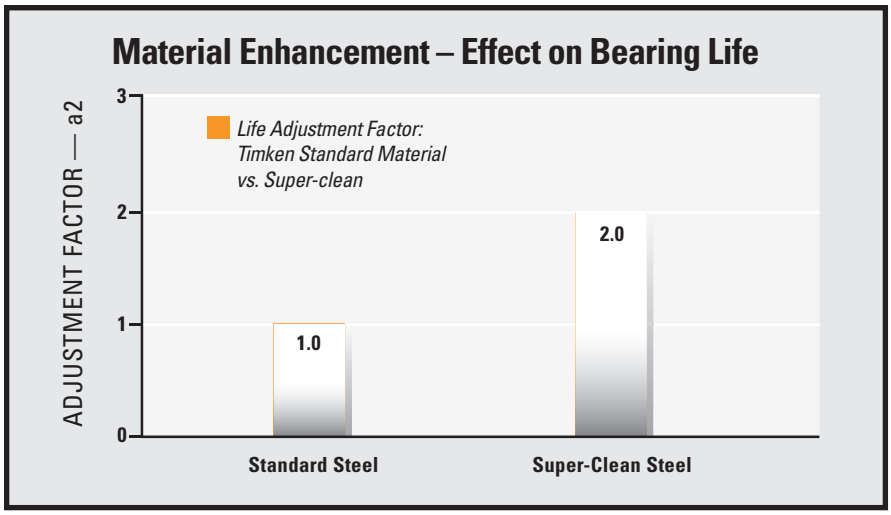


fig. 4 Timken super-clean steel can result in up to two times improvement in bearing life by minimizing the micro-impurity content of the material and by mitigating inclusions.

P900™ and DuraSpexx™ Bearings

Timken P900 and DuraSpexx™ bearings are recognized in the industry as benchmarks for increased power throughput, efficiency and durability. Coupled with clean steel, these bearings feature special finishes on the rollers, cones and cups to reduce surface-related modes of damage (see fig. 2), and advanced geometry profiles to virtually eliminate edge stress concentrations caused by high loads or misalignment (see fig. 3). Depending on the environment, these bearings can provide a relative life that is typically four times higher than standard Timken bearings.

DuraSpexx™ Power Rating Series

Ideal for mining, gear drive, rolling mill and oilfield applications, the DuraSpexx Power Rating Series leverages our technology to provide a 23 percent bearing rating increase over traditional Timken bearings, extending predicted life by up to two times. A package of enhanced features is applied, including our superclean steel (see fig. 4) to minimize inclusion-related damage, coupled with improved finishes and profile geometries to support the higher rating.

Debris-resistant Bearings

Standard Timken case carburized bearings are designed and proven to resist the detrimental effects of moderate debris contamination, even outperforming competitors' special debris resistant products in laboratory and field testing. Timken debris-resistant bearings can further extend bearing life in more severe debris and thin film environments and have been tested to increase life by up to three times over standard Timken bearings. As a complementing service, we also offer Debris Signature Analysis℠, a sophisticated computer tool that allows engineers to model the severity of operating system debris by analyzing the debris damage "signature," as witnessed directly on the bearing's raceway surface. This tool quantifies the effect on bearing life of this damage signature and can aid in selecting the most appropriate bearing solution.

Timken Engineered Surfaces (ES) Bearings

Timken engineered surfaces (ES) bearings offer customers our highest performance technology. They are commonly used where maximum bearing performance and uptime are critical such as mining, oilfield, metals, wind, aerospace and power generation markets.

Our ES bearings feature enhanced bearing designs that are coupled with a Timken ES coating. Our ES coatings feature a thin film, nano-composite, metal-carbide matrix design that provides extremely hard and ultra low-friction near surface properties. The ceramic-like properties of our ES coatings inhibit micro-welding and adhesive wear at the roller and race interfaces, significantly minimizing metal-to-metal contact.

ES bearings can be applied to provide debris resistance, reduced friction and torque, reduced component scuffing and smearing damage, increased life in thin film lubrication, decreased false-brinelling wear and oil-out protection.

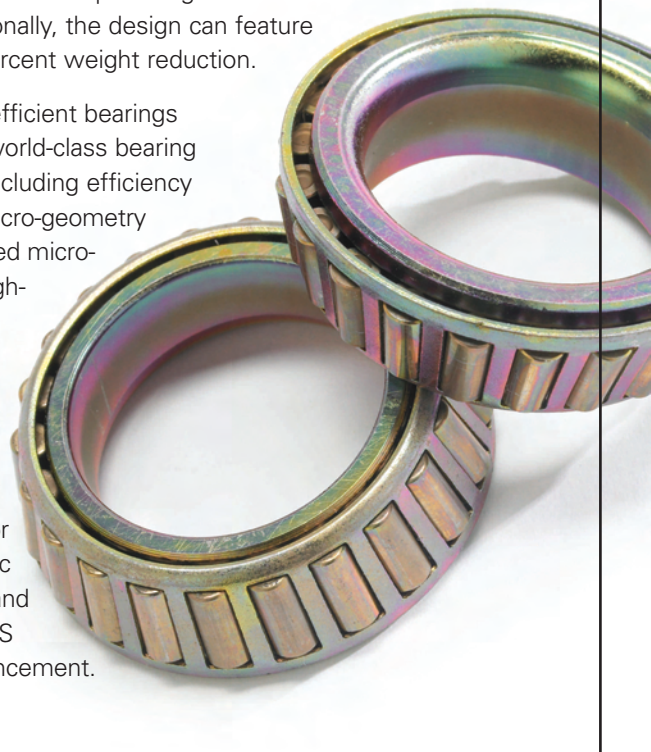
Our technology experts have tested and optimized our coating formulas for maximum performance. Bearing life improvements up to six times over standard have been validated. Our ES coating process is also rigorously controlled within our world-class production facilities and with our tight design and quality specifications.

Fuel-efficient Bearings

Fuel efficiency and reduced power loss are a top priority in both the automotive and wind energy markets. In 2003, Timken developed and supplied its fuel-efficient (FE) bearing design to the automotive industry to improve fuel economy, reduce weight and temperature and minimize noise. Today, it is provided as standard production on many passenger car models.

Our FE bearings come in various designs and are available to support both automotive and industrial applications. Our typical FE bearing consumes 30 percent less power and operates at 30˚C (86˚F) lower temperature than standard bearings. The low-torque design also reduces vibration and noise. Additionally, the design can feature a 10 to 15 percent weight reduction.

Timken fuel-efficient bearings incorporate world-class bearing technology including efficiency optimized macro-geometry design, profiled micro-geometry, high-performance steel and enhanced finishes. Design optimization is available for use in specific applications and can include ES coating enhancement.



Timken offers a variety of corrosion-resistant bearing products.

AquaSpexx™ Bearings

AquaSpexx™ bearings feature a proprietary, patented, zinc-alloy coating to combat damage from water-based corrosion commonly found in rolling mills, process equipment and maritime applications. The coating design is typically applied on bearings experiencing lighter loads and non-acidic solutions. AquaSpexx™ bearings have a very high resistance to corrosion and have been application tested to provide a relative bearing life improvement up to five times that of traditional bearings.

Thin Dense Chrome™ Bearings

Thin Dense Chrome™ (TDC) bearings feature a thin, hard chrome-based, barrier coating that is designed to protect bearings from rust and etching corrosion. Commonly applied in wet-end paper mills, food and beverage processing and maritime applications, these bearings have been proven to resist corrosion by three to nine times beyond that of traditional bearings.

For more information, visit www.timken.com or contact your Timken representative.

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Bearings • Steel •
Precision Components • Lubrication •
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