



SKF energy efficient bearings

Because friction loss is energy lost



Introducing

new bearings for a new generation

SKF energy efficient bearings – engineered to work with less energy

As the world's supply of non-renewable energy dwindles, and demand for that energy grows exponentially, technology that enables even a small reduction in fuel consumption is big news.

No surprise, then, that people everywhere are taking great interest in the new SKF energy efficient bearings.

Drawing on 100 years of engineering knowledge and unmatched expertise in the field of tribology and related sciences, SKF has improved what were already the world's best tapered roller bearings and deep groove ball bearings.

As a result of optimized geometries, lubrication, cages, and manufacturing techniques, these bearings exhibit significantly less friction torque, or friction loss, than conventional bearings – 30% reduction or more, depending on bearing size and application conditions.

Friction loss, of course, is energy lost. Energy that could have been used to run machinery. Energy that will not be available to future generations. So reducing friction loss by at least 30% is an achievement with far-reaching implications.

In fact, the potential for energy savings on a global scale is huge, especially since SKF plans to apply this technology to a line of tapered roller bearings and deep groove ball bearings and, potentially, across all bearing types, including spherical roller bearings, CARB toroidal roller bearings, cylindrical roller bearings and angular contact ball bearings.

By their very nature, bearings are eco-friendly components, in that they reduce the amount of energy that machinery requires. New SKF energy efficient bearings represent a significant leap forward not just for our company, but also for our world.



The Power of Knowledge Engineering



Reducing energy consumption with a low friction, high-capacity tapered roller bearing

Continuing innovation

In the 1990's, SKF set out to increase bearing performance beyond conventional bearing standards. This resulted in SKF Explorer performance class rolling bearings, which substantially improved key operational parameters relevant to the bearing type and its typical applications. These parameters included dynamic load carrying ability, noise, vibration, service life, dimensional stability, and heat generation (frictional moment) depending on the bearing type.

Our next challenge was to develop new bearing designs with performance characteristics that maximize energy efficiency while maintaining ISO standard operating criteria. The result is the new SKF energy efficient bearings introduced here.

These SKF innovations represent the blending of SKF's applications knowledge with our expertise in tribology, materials development, design optimization and manufacturing. Our knowledge engineering capabilities are the reason we lead the world in innovations to reduce friction and save energy.

Working with designers of a new type of wind turbine gearbox, SKF engineers improved several aspects of an already superior tapered roller bearing to create a low friction tapered roller bearing that reduces performance loss. In initial rig testing, this unique bearing has a minimum of 30% lower friction torque than a conventional bearing design.

How was this achieved?

These improvements were achieved by tightening bearing specifications and optimizing the bearing internal geometry, then meeting the refined specifications with improved manufacturing techniques. Specifically, SKF was able to optimize the number of rollers and modify the raceway, reducing weight of rotating parts by 10% – without affecting performance.



Less power loss means less energy loss.

By decreasing power loss over time, this bearing reduces energy loss significantly. For example, if all five pairs of bearings in the wind turbine gearbox are of this new design, energy saved per turbine will be approximately 20 MWh/year, a 0,5% increase in turbine efficiency.

Developed in accordance with dimensions to ISO Standards, this new improved SKF energy efficient tapered roller bearing is interchangeable with other tapered roller bearings in almost any application. This means huge potential for energy savings in every industrial sector, from pulp and paper, metals, and mining to hydrocarbon processing, food, textiles, and wastewater.

SKF energy efficient tapered roller bearings

Applications

- Heavy industrial transmissions
- Ship transmissions
- Railway transmissions
- Wind energy transmissions
- Open pit conveyor transmissions
- Layshaft bearings in industrial transmissions
- Extruder transmissions

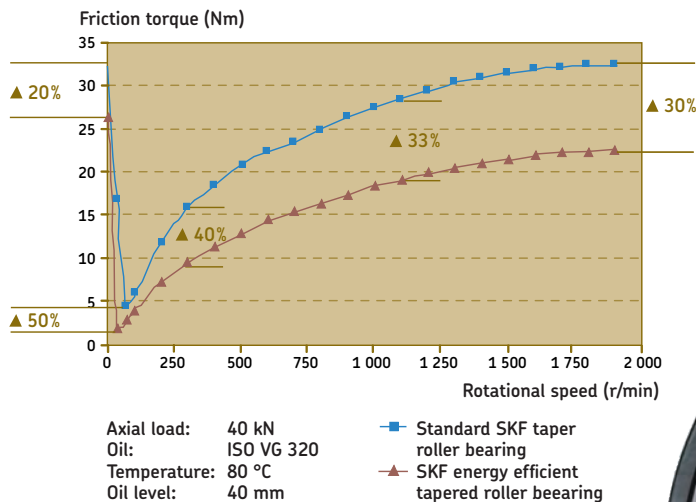
Benefits

- Lower energy consumption (industrial)
- Increased energy generation (wind)
- Reduced operating temperatures
- Improved lubrication conditions (viscosity)
- Extended lubrication intervals
- Reduced weight, lower inertia

Design

- Special polymer cage
- Special roller topography
- Special raceway and guiding flange topography
- Modified raceway profiles
- Increased raceway length and minimized undercuts
- Optimized number of rollers

Initial size range – 220 to 600 mm outside diameter



Frictional torque measurements showing energy savings of SKF energy efficient tapered roller bearings compared to standard SKF bearings.



Reducing power loss in motor driven systems equipped with deep groove ball bearings

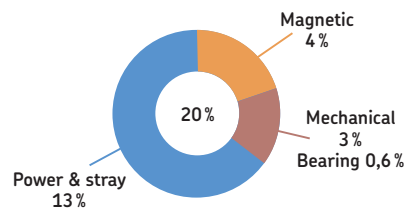


Potential energy savings

If these SKF energy efficient deep groove ball bearings were used on every industrial motor in the US and EU, and assuming a minimum of 30% energy loss reduction, potential energy savings would equal 2,46 billion kWh/year. This is equivalent to 420 000 barrels of oil – and this estimate does not take into account millions of other motors in use elsewhere throughout the world.

Motor-driven equipment such as pumps, compressors and fans accounts for roughly 16 % of all the energy consumed in industrial applications in the United States.* In the US and EU alone, total energy consumption in industrial motor driven systems amounts to roughly 1,36 trillion kWh per year. As energy costs continue to rise, industrial plants need effective ways to reduce the amount of energy consumed by their motor-driven systems.

Example: Motor efficiency: 80%



One obvious way is to increase electric motor efficiency. It is estimated that these systems lose about 15 % or 204 billion kWh due to motor inefficiency. About 20% of this loss, or 41 billion kWh/year, is due to mechanical losses, and of this, roughly 20% or 8,2 billion kWh/year, can be attributed to bearings. (See graphic at left.)

Small loss, big opportunity

While less than 1% of energy consumption (0,6%) is related to the bearing, SKF recognized in this reality a huge opportunity for energy savings. Our solution was to improve every aspect of the conventional deep groove ball bearing to reduce power loss and, consequently, energy use.

Drawing on SKF core competency areas including bearings, seals, and lubrication systems, and using advanced SKF modelling tools to reduce all sources of friction, SKF engineers created a new generation of deep groove ball bearings. Through optimized internal geometry, a unique polymer cage, and low-friction grease, friction loss is reduced by at least 30%.

SKF energy efficient deep groove ball bearings

Applications

- Electric motors
- Pumps
- Compressors
- Fans
- Conveyors
- Other applications of medium or light loads are possible

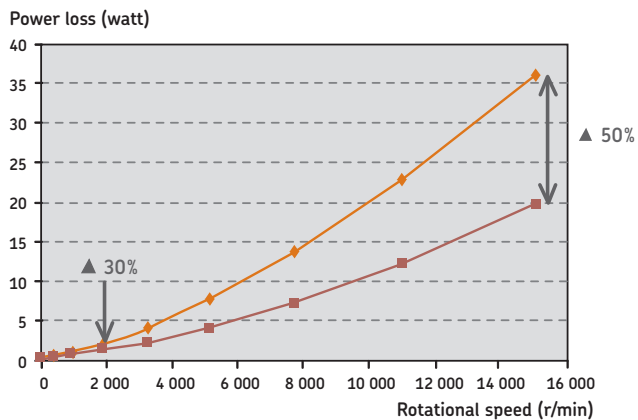
Benefits

- Lower energy consumption for end customers
- Enables easier building of higher efficiency machinery
- Reduced operating temperature results in increased viscosity that can extend bearing life
- Lower total cost of ownership

Design

- Optimized internal geometry
- Low noise, low torque, long-lasting grease
- Unique polymer cage design

Initial size range – 6205 to 6206 and 6309 to 6316 sizes. Open and shielded (2Z) variants

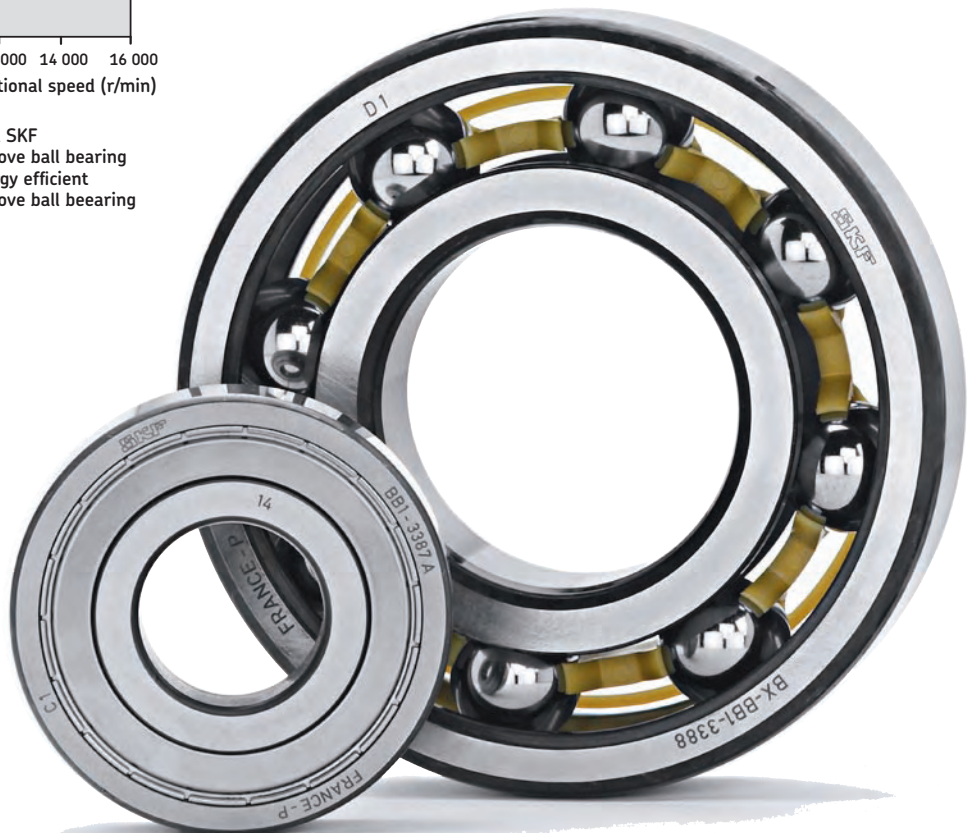


6306 size shielded bearing
Radial load: 0,75 kN
Temperature: 80 °C

- Standard SKF deep groove ball bearing
- SKF energy efficient deep groove ball bearing

Power loss simulation results showing energy savings of SKF energy efficient deep groove ball bearings compared to standard SKF bearings.

Verification tests have been performed on bearings on dedicated friction torque test rigs. Additional measurement tests on final application (3kW e-motor) are being carried out. Absolute watt savings will vary depending on bearing size.





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