

# Increased performance for rolling bearings



Patrick Scherr

*For more than ten years now, X-life bearings has been the seal of quality for particularly high-performance products from the INA and FAG brands. Now Schaeffler has optimized its product range. But what are the benefits?*

**X**-life products are characterized by significantly higher dynamic load ratings than previous standard products. The catalog range is continuously being expanded through the addition of new and performance-optimized X-life bearings that allow customers' requirements to be fulfilled and the overall efficiency of machines and equipment to be increased. More and more catalog products are thus being replaced by their X-life versions.

## Optimized design

Under the same operating conditions, the operating life of X-life bearings is signifi-

cantly longer or, alternatively, higher loads can be applied while maintaining the same rating life values. These state-of-the-art manufacturing technologies enable a better and more uniform surface over the whole contact zone between the rolling elements and raceway. The internal construction is designed for optimum functionality using state-of-the-art analysis and evaluation methods which ensures optimized contact surface geometry and more even internal load distribution inside the bearing. As a result, there is a reduction in the stress conditions present on the rolling elements and mating track under identical load. This produces a higher dynamic load rating, longer

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nominal rating life, less friction, lower bearing temperatures as well as a reduction in the strain placed on the lubricant.

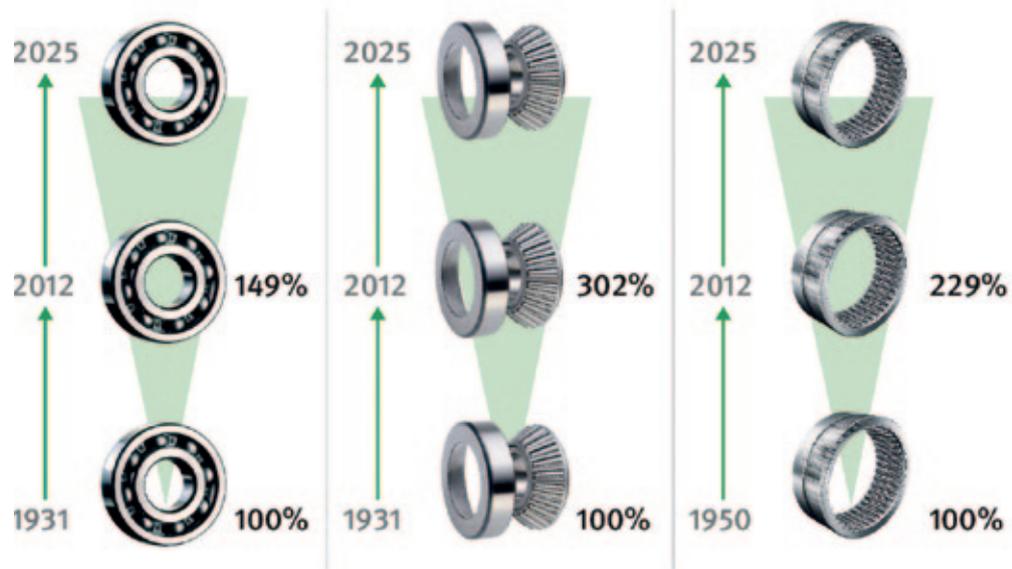
Tests have confirmed that optimizing bearing positions with X-life bearings allows the overall cost-effectiveness of the relevant application to be improved. The hydraulic system used in wheel loader travel drives with a power transfer unit, hydraulic pumps, motors, and innumerable rolling and plain bearing positions is one example: The overall efficiency of this application can be increased by up to two percent. For a wheel loader with 140 kW drive power, this means a total saving of around 9 kW. With 1,000 wheel loaders in service, operated for around eight hours a day, this gives an annual savings potential of approximately 26,000 MWh, in other words a financial saving of around five million Euros and a CO<sub>2</sub> saving of around 16,000 tons. In addition, optimization using X-life bearings ultimately means that the hydraulic pumps and motors that are used can be designed one size smaller.

### For a longer bearing life

Thanks to X-life quality, radial insert ball bearings and housing units for applications in agriculture, the food processing and packaging industry, and in textile machines also benefit from a 15% increase in bearing life, an expanded application temperature range of -40°C to 180°C, and a high level of anti-corrosion protection through the use of Corrotect N coating. An improved locking collar design also means higher clamping forces and thus secures better seating on the shaft, thanks to optimized geometry and improved material properties. Reliable seals keep the high-quality bearing grease inside the bearing and prevent the ingress of contamination and moisture. This increases the durability of the bearing and thus extends the operating life of the machine.

### For increased robustness

FAG axial and radial spherical roller bearings in X-life quality are characterized by increased robustness, load carrying capacity, lower friction levels, and greater efficiency in addition to a longer rating and operating life. They are used where very high loads have to be supported and shaft deflections or bearing seat misalignments have to be compensated.



**01** Over the last few decades, the ongoing technical development of rolling bearings has led to a significant increase in their dynamic load ratings

The design measures mean that on average, FAG radial spherical roller bearings have a 50% higher limiting speed and allow the dynamic load rating to be increased by 15% and the nominal rating life by 60%. Thanks to the design of the rollers which is characterized by an enlarged load-bearing contact surface. At the same time, however, the convex form of the roller end faces ensures a low-friction contact between the rollers and the lip.

Improved performance offered by FAG axial spherical roller bearings was made possible by changes to their geometry that increase the load rating, such as longer rollers and larger roller diameters. The rolling partners' improved surfaces ensure that a lubricant film with an even higher load carrying capacity is formed, while improved oscillation conditions and additional profiling optimize the rolling contact. This increases the dynamic load rating by 30%, reduces friction and more than doubles the rating life.

### For higher performance

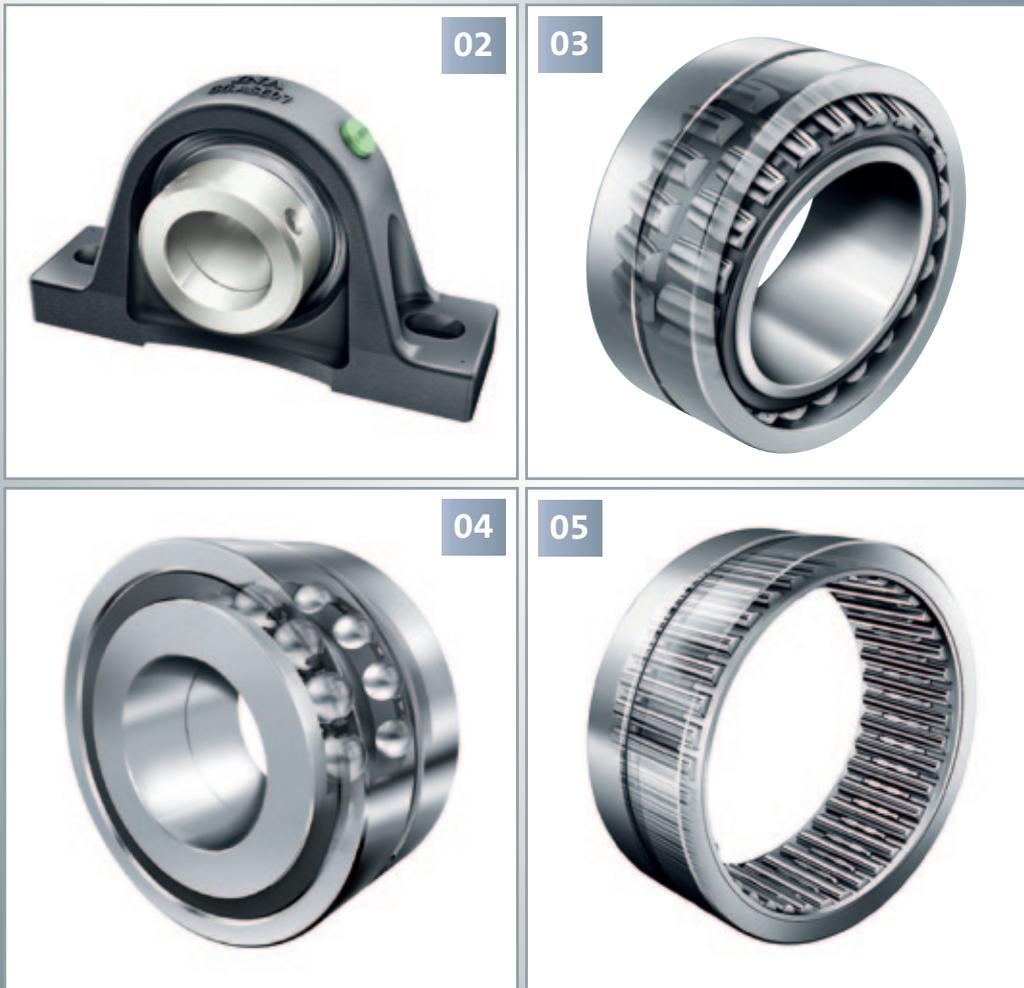
In addition to reducing energy consumption, the technical optimization using X-life increases the dynamic load rating which, at approximately 10%, is significantly higher than the values achieved by previous bearing designs. This in turn

increases the nominal operating life by up to 33%. As a result, the axial angular contact ball bearings have a longer operating life under the same operating conditions. Alternatively, the bearing support can be subjected to correspondingly higher loads while maintaining the same operating life. Design engineers thus have additional options for designing the bearing support.

In addition to the improvements made to the surfaces, the bearing ring material also undergoes a special heat treatment process. This makes the raceways of the inner and outer rings more resistant to solid particles and mixed friction. This in turn extends the operating life of the lubricating grease, as the strain placed on the lubricant is reduced. This heat treatment measure thus means that the operating life of bearings in X-life quality is significantly longer compared to that of standard bearings and competitors' bearings. The significant improvement in the performance of the bearing support increases its overall cost-effectiveness, which means the customer benefits from a better price-performance ratio.

### For efficiency with downsizing

INA's-D needle roller bearings in X-life quality feature a newly developed, profiled steel cage produced by optimized forming methods that allows a significantly higher



**02** INA radial insert ball bearings and housing units

**03** The performance increase offered by FAG radial spherical roller bearings in X-life quality is achieved through a new bearing design

**04** INA axial angular contact ball bearings in X-life quality for screw drives

**05** INA's -D machined needle roller bearings in X-life quality feature a newly developed, profiled steel cage produced by optimized forming methods

load carrying capacity to be achieved. The cage is designed that the number of needle rollers and the needle roller length can be increased while maintaining the same bearing dimensions. The larger number of rolling elements and the increase in their load-bearing length means that the load ratings of new -D needle roller bearings in X-life quality are up to 25% higher. The bearings installed in the same mounting space can be subjected to significantly higher loads. Viewed another way, the new -D needle roller bearings in X-life quality open up new design options for downsizing, i.e. a reduction

in the size of machines and units while maintaining the same performance. For example: The X-life needle roller bearing NK20/16-D with a bore diameter of 20 mm and a width of 16 mm corresponds to the existing X-life needle roller bearing NK26/16 with a bore diameter of 26 mm in terms of load carry capacity. If the new bearing is used for downsizing, the section height of the bearing is reduced by 15%, the weight by 20% and the friction by 30% while maintaining the same load carrying capacity.

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#### About

Company name: Schaeffler Technologies

Brands: INA, LuK and FAG

Headquarters: Herzogenaurach, Germany

Turnover: € 11,2 bn (2013)

Employees: over 79,000 worldwide

Products: Rolling bearing and plain bearing solutions, linear and direct drive technology, as well as high-precision products for the automotive industry