FAG Industrial Services

Reconditioning and Repair of Rolling Bearings

Technical Product Information

SCHAEFFLER GROUP INDUSTRIAL

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Reconditioning of rolling bearings

Introduction

Introduction

The characteristics and condition of rolling bearings have a significant influence on the production process. In order to reduce the costs involved in this process, it is often highly advisable to recondition rolling bearings than to replace them by new bearings.

Preventive and condition-based maintenance measures are intended to maintain a consistently high level of plant availability. As part of these measures, rolling bearings are often replaced for reasons of safety that could be restored to an acceptable and functionally reliable condition through appropriate cleaning and reconditioning.

In some cases, the costs of such reconditioning are significantly lower than the costs of a new bearing, with shorter delivery times in most cases. In individual cases, customers may also receive the same warranty on the reconditioned bearing as on a new bearing.

The reconditioning of rolling bearings and rolling bearing units is one of the core competences of FAG Industrial Services (F'IS), which we offer at several certified locations worldwide (see page 11). Our services for rolling bearings of all types apply irrespective of manufacturer and are not restricted to Schaeffler Group products.

F'IS is able to recondition or modify rolling bearings with an outside diameter of up to 4250 mm. It is thus an expert partner for customers from a very wide range of industrial sectors such as general and special machine building, steelmaking, pulp and paper production, wind energy, shipbuilding, private and public railways, mining etc.

1: Mounting of a reconditioned tunnel boring machine bearing

2: Mounting of a reconditioned tunnel boring machine bearing

Reconditioning of rolling bearings

Overview of reconditioning levels

Overview of the individual levels in rolling bearing reconditioning

Assessment - Inspection

Dismounting

Washing

Examination

Definition of repair operations

Preparation of proposal

Level I - Requalifying

Measurement

Mounting

Preservation, greasing if appropriate

Packaging, long term packaging if appropriate

Despatch

Level II - Refurbishment

Polishing of raceways

Removal of fretting corrosion

Mounting

Preservation, greasing if appropriate

Packaging, long term packaging if appropriate

Despatch

Level III - Remanufacturing

E.g.

Regrinding of raceways

Manufacture of new rolling elements

Replacement of cage if appropriate

Removal of fretting corrosion

Mounting

Preservation, greasing if appropriate

Packaging, long term packaging if appropriate

Despatch

Level IV - Remanufacturing Plus

E.g.

Regrinding of raceways

Manufacture of inner ring with new bore diameter

Redimensioning of internal clearance

Manufacture of new rolling elements

Replacement of cage if appropriate

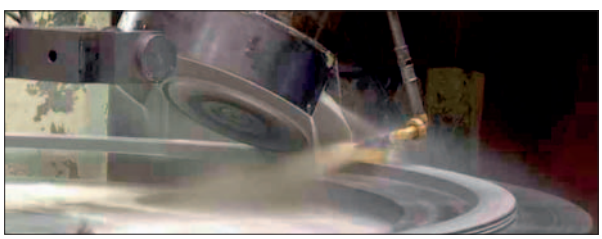
Removal of fretting corrosion

Mounting

Preservation, greasing if appropriate

Packaging, long term packaging if appropriate

Despatch



Detailed description of levels see following pages

Reconditioning of rolling bearings

Definition of rolling bearing reconditioning · Assessment

What is the meaning of rolling bearing reconditioning?

Reconditioning is a defined process for maintaining and extending the performance capability and life of rolling bearings that are already in use. The costs and delivery time involved in reconditioning are less than those for a comparable new bearing. We distinguish between four reconditioning levels and subdivide bearings and bearing units into three groups on the basis of their outside diameter D:

- D up to 425 mm
- D larger than 425 mm and up to 1 250 mm and
- D larger than 1 250 mm and up to 4 250 mm.

Assessment – Inspection

Before actual reconditioning is carried out, some preparatory steps are necessary. These are designated as assessment.

First, the rolling bearing is thoroughly cleaned. For this purpose, we have washing plants that has been developed in-house and configured specially according to the product.

For example, F'IS has different washing equipment for railway bearing units (TAROL), levellers or large individual bearings. Using special cleaning agents, all the adhering contaminants are rinsed out, separated and disposed of by environmentally responsible methods.

After cleaning, our specialists carry out conscientious examination of all components. Thanks to their many years' experience, they are extremely well versed in the damage characteristics of all bearing damage. Their work is supported by modern measurement and inspection equipment. All defects found are logged and archived in an inspection record so that a curriculum vitae can be prepared for each rolling bearing.

Based on this inspection record, the further processing steps required to return the bearing to as-new condition are defined. The assessment thus determines the extent of the damage and the reconditioning level of a rolling bearing.

Once the work described is completed, a proposal is sent to the customer showing the scope of the required repair work and the resulting prices and delivery times.

If the damage characteristics are such that mechanical processing is required, the assessment costs are taken into account in the scope of the repair if we receive the maintenance order.

If no significant damage is found, the only costs taken into account are those for assessment, which depend on the size of the rolling bearing.

3: Measurement of levellers

4: Measurement of TAROL components

5: Greasing of TAROL units

Reconditioning of rolling bearings

Level I · Level II

The procedure differs in the case of TAROL units and levellers for cold and hot strip mills. On the basis of the design drawing, we submit a reconditioning proposal to the customer. After reconditioning, charging is calculated piece by piece according to the units assessed and reconditioned. In this way, we ensure that our customers do not pay one cent too much.

Level I – Requalifying

In the ideal case, the bearing is in such a good condition that mechanical processing is not required. At Level I, we simply measure the components and then reassemble the bearing. After preservation and regreasing, the bearing is carefully packed and returned to the customer.

In this case, only the assessment is invoiced.

Level II – Refurbishment

Level II is applied in order to eliminate light scratches and minimal corrosion marks on large rolling bearings. The main element in this phase is therefore fine surface processing of the inner and outer rings. This method is also effective in removing discolourations such as those arising from lubricant additives.

In addition to mechanical processing, chemical methods are also used to bring the metal cages back to health while using resources in a sparing and environmentally responsible way, Figure 7.

When all the rolling bearing components have been treated appropriately, the bearing is reassembled and returned, carefully packaged, to the customer.

For TAROL units, which are used mainly in the railway sector, Level II involves not only the careful checking of all components but also and primarily the adjustment of the axial clearance. For this purpose, F'IS has the most modern inspection equipment.

Correct axial clearance is decisive for achieving maximum bearing life and quietness of running in travel. After this operation, the units are reassembled. In addition, the required quantity of fresh Arcanol grease (FAG rolling bearing grease with a registered trademark) is injected precisely and accurately into the bearing, Figure 5.

Upon request, we log each TAROL unit in our database to give a seamless curriculum vitae.

6: Before: Rollers with corrosion marks and foreign body indentations
After: New rollers with matched oversize

7: Before: Cage segments with lubricant residues and contaminants
After: Etched cage segments

8: Before: Raceway with heavy scar formation in the area of the slippage point
After: Reground raceway

Reconditioning of rolling bearings

Level III · Level IV

Level III – Remanufacturing

If foreign bodies have left behind “permanent indentations” in raceways or rolling elements, our specialists take drastic action. In this case, a full set of measures is required: Raceways are reground and new rolling element sets are produced in order to save the valuable capital item that is a large rolling bearing.
In Level III, careful analysis of the wear condition is followed by grinding off a few tenths of a millimetre of the raceway material. This is only as much, however, as allowed by the hardened zone. In case of doubt, therefore, we always call on the advice of our experts from the Schaeffler inspection laboratory in order to eliminate any risks and effects on the functionality and service life right from the beginning.

In regrinding, it is essential to achieve the precise profiling, which is known only to rolling bearing manufacturers. This is the only way to guarantee the performance capability of the bearing.
The new rolling elements are produced with an oversize that is specifically matched to the regrind. This ensures that the rolling bearing retains its original internal clearance and can resume its service in the machine without restriction.

In the TAROL units, roller and cage assemblies are replaced and new sealing covers fitted if necessary. The other steps are identical to those of Level II.

The same applies to the levellers. In addition to regrinding the functional surfaces, we replace the seals, retaining rings and grease. We also ensure that the bearing sets are within the narrowest tolerances.

Level IV – Remanufacturing Plus

If extreme bearing damage occurs, such as material spalling or cracks due to material fatigue on the raceways, reconditioning according to the principles in the levels described above can no longer be carried out. The material is then already so severely weakened that it is no longer possible to give a reliable service life forecast. The risk in such types of bearing damage is their exponential growth; the bearing service life decreases rapidly. For this reason, the rolling bearing rings, rolling elements and/or cages must be completely replaced by new parts.

General statements about delivery times and costs are not possible but must be agreed in each individual case with the customer.

For economic reasons, we do not offer Level IV for TAROL units.

9: Grinding of a leveller unit

10: Components of a leveller for a strip mill

11: Regrinding and inspection measurement of a large rolling bearing ring

Reconditioning of rolling bearings

Customised solutions · Customer benefits

Customised solutions

F'IS offers individually tailored special solutions for rolling bearings: from the provision of threaded holes for fixing of vibration pickups, through adjustment of bearing clearance, to modification of the bore diameter. Through close collaboration with Schaeffler application engineers, we bring together all the resources required in order to ensure the full functionality and service life of bearings. In this way, it is possible to prepare a rolling bearing from the spare parts stock of a customer for a new intended application. This saves on valuable time and resources that would be involved in the mounting of a new bearing. Nevertheless, the customer receives a rolling bearing of equal value and quality.

Customer benefits

Reconditioning of rolling bearings is often worthwhile for rolling bearings or bearing units with an outside diameter of 180 millimetres or more. The reconditioning costs are between 45 and 85 % of the price of a new bearing. In addition, the delivery times are in general significantly shorter than the delivery times for an equivalent new bearing.

For the customer, this means: He carries out his maintenance measures as usual. It is at the replacement stage that, instead of a new bearing, the rolling bearing reconditioned by F'IS according to the last machine level is fitted. As a result, customers receive a dual advantage: They both reduce their maintenance expenditure and minimise their stockholding costs.

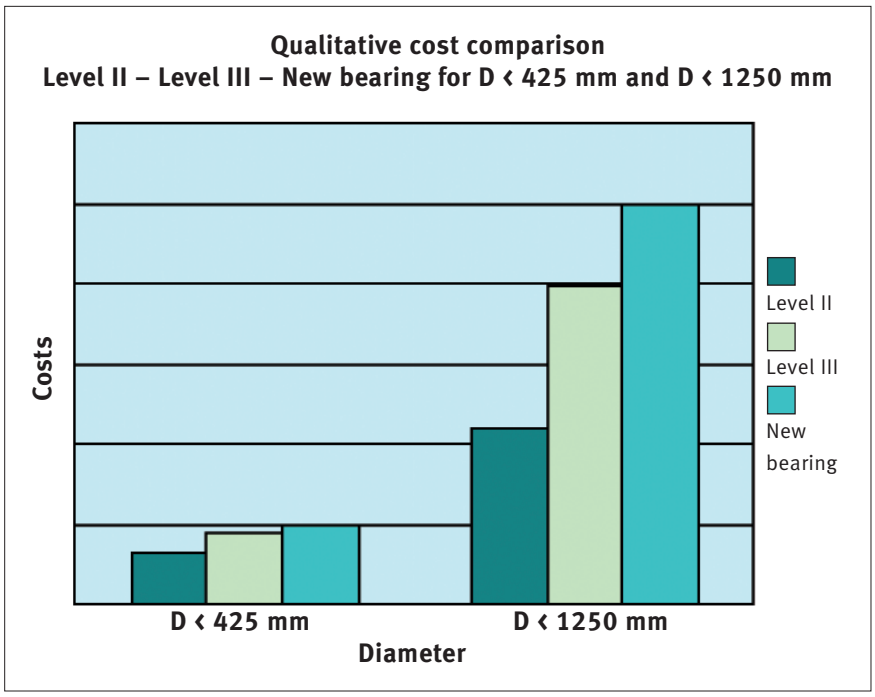


Diagram 1: Cost comparison for D ‹ 425 mm and D ‹ 1250 mm

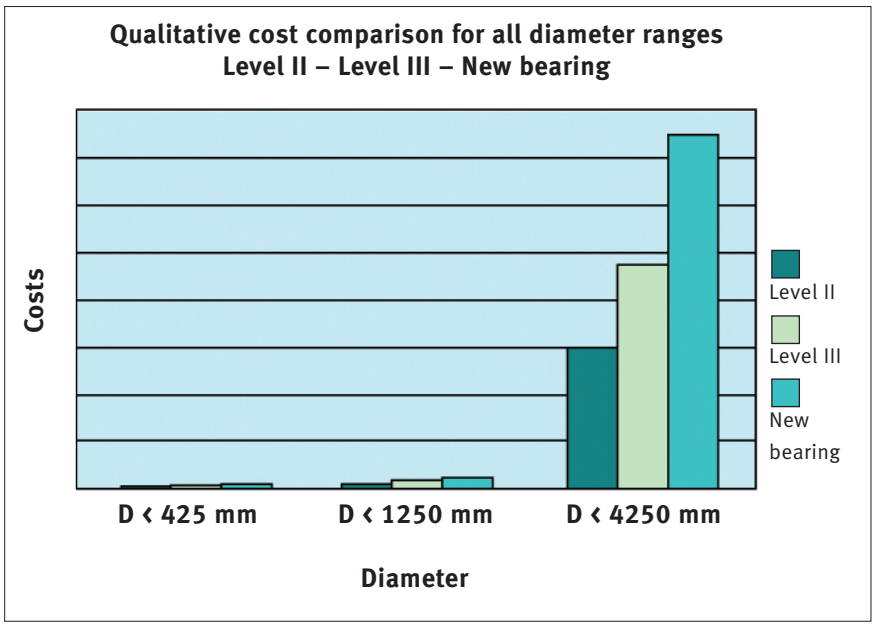


Diagram 2: Cost comparison for all diameter ranges

Reconditioning of rolling bearings

Customer benefits · Sparing use of resources · Suitable packaging

Some customers decide to hold one of our reconditioned bearings in stock for emergencies. This is because any unplanned machine downtime is generally associated with increased personnel and material use and the corresponding costs. If the urgently required spare parts are not present because they are not held in stock, extended production stoppage and the corresponding losses are unavoidable.

Customers can combat this situation by having their bearings reconditioned by our specialists, thereby ensuring their plant availability.

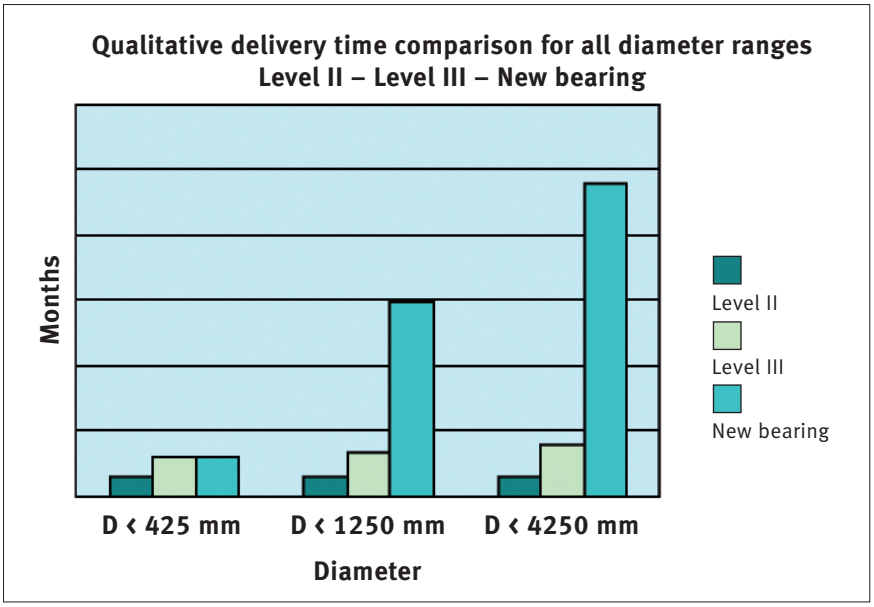


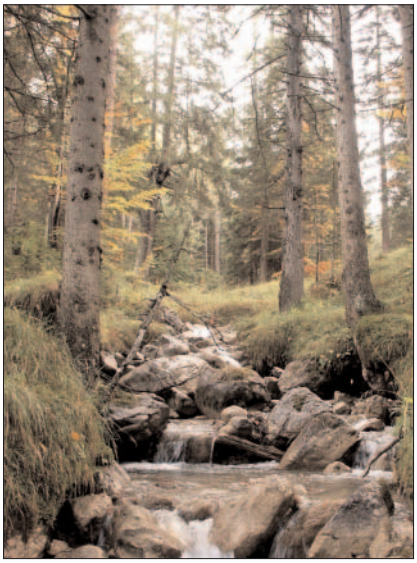
Diagram 3: Delivery time comparison for all diameter ranges

Contribution to the sparing use of resources

One of the most important shared assets is a well protected environment and industry has a decisive responsibility for its maintenance. The decision in favour of reconditioning of rolling bearings allows manufacturing companies to make a considerable and ongoing contribution to the sparing use of resources and the protection of the environment.

It is only at Level III - Remanufacturing and above that new steel is required for the manufacture of rolling elements. This means a significantly reduced material requirement when compared with the procurement of a new bearing.

There is also an impact on energy demand due to the savings on steel production, the forging process for the bearing rings and in the production of brass and plastics for the bearing cages. Furthermore, we ensure that bearing components to be scrapped are sorted and separated according to their material grades. This separation is also applied to the cleaning agents used and the resulting residues that occur in the washing equipment.



Packaging is important

Not every rolling bearing is put into use immediately it is delivered. In certain circumstances, it must be stored before use under challenging conditions for which standard packaging is not sufficient. This may be, for example, a dusty building site or a store in a tropical region.

In order to protect rolling bearings against these types of extreme environmental influences, we have developed special types of long term packaging. Special preservatives and dessicants are used that are matched to the specific climate zone in which the bearing is to be stored. The air in the packaging is sucked out in order to prevent the formation of condensation.

Reconditioning of rolling bearings

Suitable packaging · Correct preventive

Finally, the rolling bearing is placed in a special type of wooden crate. As a result, it is also protected against mechanical influences. There is a flap in the crate for quality control purposes. The condition of the dessicant can thus be checked by means of an indicator and evidence of the integrity of the packaging can be obtained.

F'IS supports the customer in selecting the correct packaging, in order that the customer's bearing will retain the same high quality standard of reconditioning even if stored for several years.

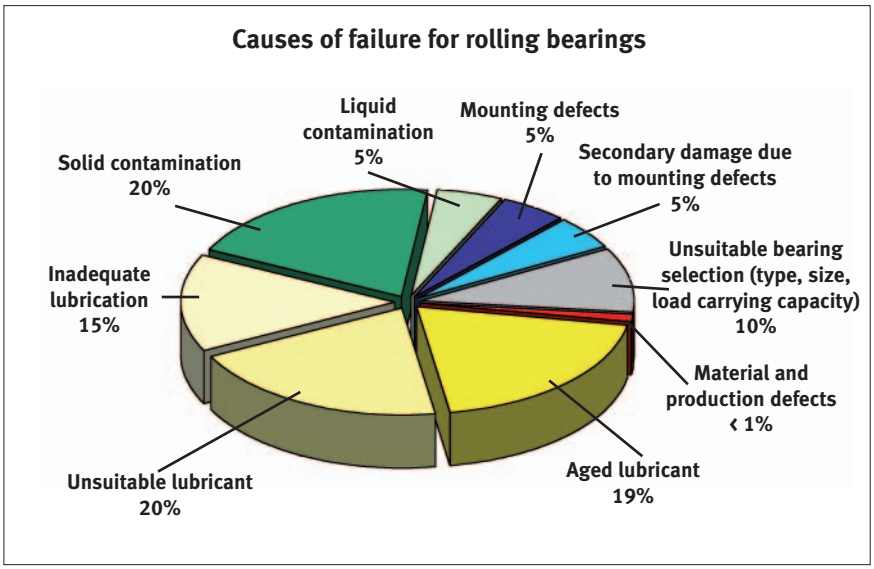


Diagram 4: Causes of failure

The correct preventive

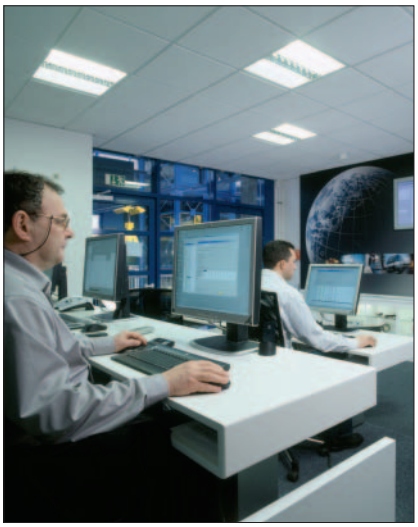
Investigations have shown that less than 1% of bearing damage occurs as a result of errors in production. Factors such as incorrect lubrication and mounting are much more decisive in the early wear of rolling bearings.

In order to prevent major bearing damage occuring in the first place, F'IS offers suitable products and services covering all aspects of rolling bearings. Our product portfolio encompasses not only mounting of rolling bearings by our specialists but also the complete spectrum of tools for mounting, dismounting and alignment in the machine.

For ongoing operation, we offer a wide selection of high performance greases (Arcanol) including appropriate lubricators.

The "heartbeat" of a rolling bearing can be monitored using our online and offline systems and analysed by our Condition Monitoring specialists using remote diagnosis.
With the aid of this monitoring equipment, it is possible to detect incipient plant damage at an early stage and thus prevent unplanned downtime.
Furthermore, we offer a highly developed training programme on the subjects mentioned which can be structured on a modular basis such that each customer can select the training appropriate to his needs from the complete programme. Upon request, F'IS also carries out individually tailored training.

12: Mounting of a TAROL unit



13: Remote diagnosis in the F'IS Teleservice Center

Reconditioning of rolling bearings

Reconditioning locations worldwide

Reconditioning locations worldwide

FAG Industrial Services GmbH (F'IS), with headquarters in Herzogenrath, near Aachen (Germany), is an independent company that takes responsibility for the worldwide service business of Schaeffler Group Industrial covering the brands INA and FAG.

In order to provide the skilled and rapid supply of F'IS products, services and training to customers worldwide, F'IS has specialist centres around the world.

We offer reconditioning and repair of rolling bearings worldwide from the following locations:

Reconditioning of rolling bearings

Reconditioning locations worldwide

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98/08/07 Printed in Germany by Druckhaus WEPPERT GmbH

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