

Bearings

Advanced bearing engineering

In the general machinery industry, incorporating fluid technology is a basic requirement for increasing performance and higher efficiency. That pressure also demands upgrading and improving existing designs in order to enhance performance and – of equal importance – to cut down on maintenance costs and service efforts.

One of the key parts in each pump are the bearings. In larger pumps, rolling element bearing performance is – along with the seals – one of the dominating factors for maintenance and service costs.

On the other hand, stable and reliable bearing performance is of paramount importance. As rolling element bearings fulfil key functions in rotating machines, a sudden or premature bearing breakdown will significantly affect the performance of a pump or associated equipment, occasionally with catastrophic consequences.

In general, there are several possibilities available to the design engineer and the maintenance personnel for improving design and benefiting from extended service life and prolonged maintenance intervals, respectively.

In any case, a design review or modification requires a careful examination of the existing design and of the actual operating conditions.

Successful bearing applications

Each bearing application can be seen as a complex system of several interacting factors (Figure 1). Some of the most important factors are:

- correct selection of type and size of bearing
- correct choice of specific bearing characteristics including tolerances according to given operation conditions
- correct mounting and ease of adjustment
- realistic design of bearing location

- adequate dimensional and geometric accuracy of adjacent parts
- adequate sealing of bearing arrangement
- efficient and effective lubrication including a suitable heat dissipation.

Tips for new pump designs

In many cases experience and a certain kind of 'engineering tradition' in a company with already existing pump designs and bearing arrangements is available and is a useful guide.

However, for newly designed pumps, there are several more possibilities for improving in bearing performance:

The international bearing industry has developed a new generation of bearings that feature higher load capacities but

**ONLINE
BUYERS'
GUIDE**

Coming soon.....

to

www.worldpumps.com

The pump professional's partner worldwide

NEW

take up the same amount of space. An example is shown in Figure 2, which illustrates the development step in single row angular contact ball bearings from the historic design to the modern 'E' version, which features extra capacity.

As there is a non-linear but exponential connection between load rating and the nominal bearing life, doubling the load rating would allow for gaining up to – theoretically – eight times the life of the original product.

Downsizing bearing arrangements

The same achievement also brings a second possibility, downsizing a bearing arrangement, ie 'shrink' the bearing sizes by taking advantage of their increased load ratings.

This yields reduced size and thus less mass, which enables building smaller, lighter and more compact structures and pumps.

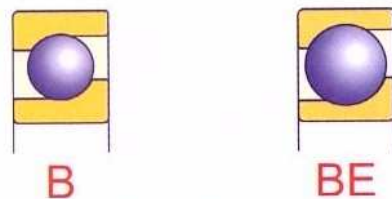


Figure 2. The 'E' version angular contact ball bearing (right) can take up extra capacity.

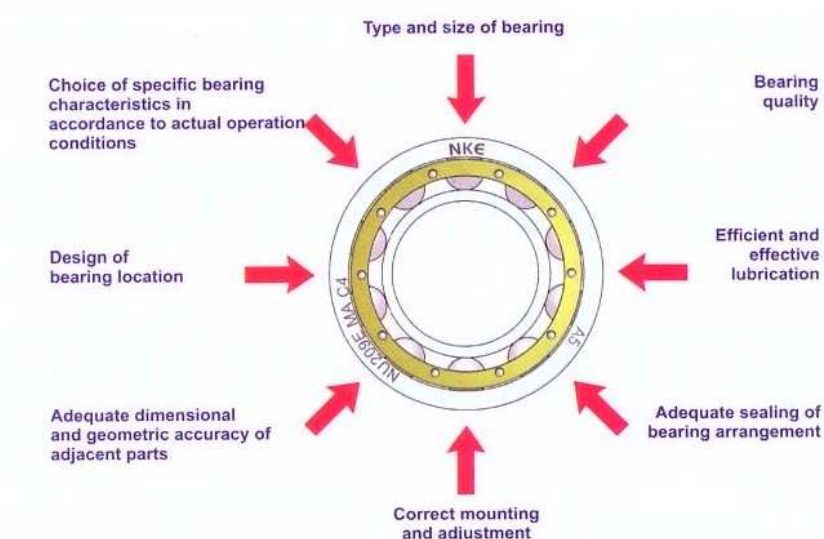


Figure 1. Factors influencing bearing performance.

Re-evaluating existing solutions

There are new bearing designs available on the market, including bearing sets designed specifically for the demands of the international pump industry.

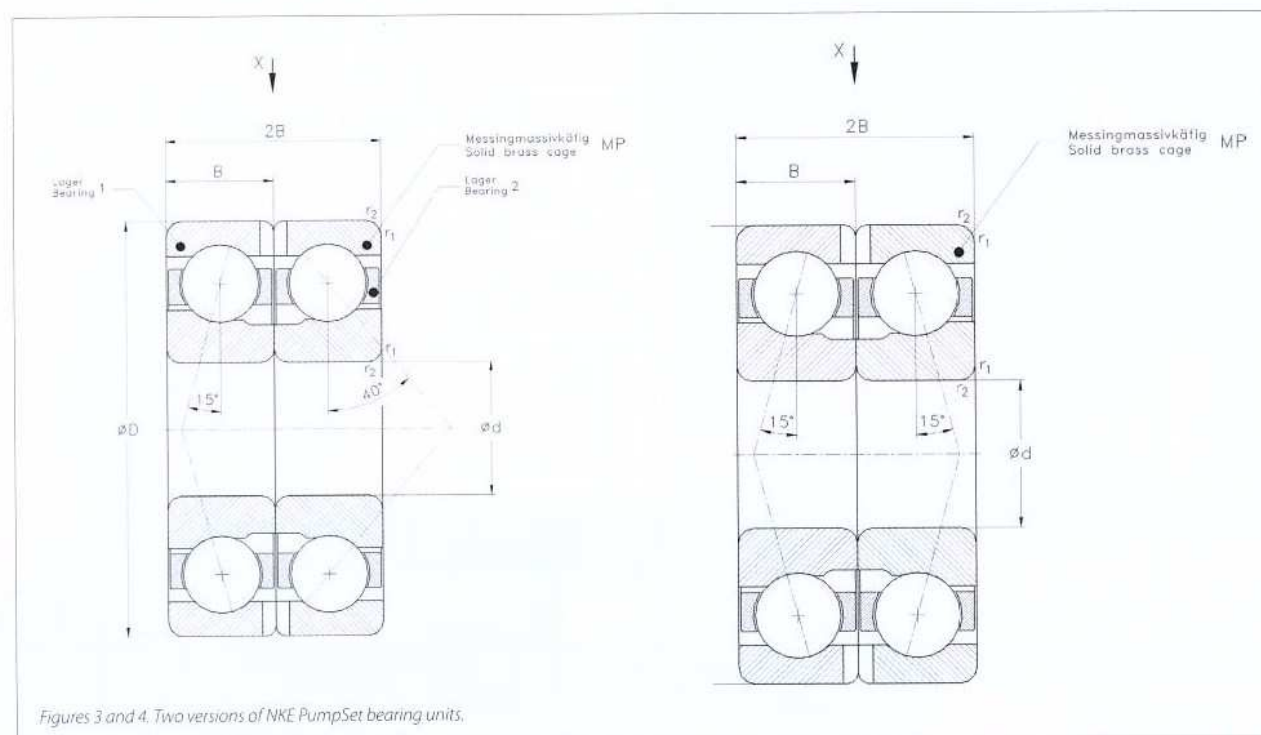
One of the typical challenges is the increased speed requirements in pumps that require new solutions for the bearing arrangements, too.

Amongst various modifications of standard bearings, such as high speed angular contact ball bearing using ceramic balls ('hybrid' bearings) or bearings with high temperature resistant plastic (PEEK) cages, there are also

specifically matched pairs of angular contact ball bearings available for high speed application. The NKE PumpSet series is one such setup (Figures 3 and 4).

NKE Austria's PumpSet bearing arrangements are pairs of specifically modified single row angular contact ball bearings.

Figure 3 shows an asymmetrically arranged thrust ball bearing unit consisting of one 40° angular contact ball bearing and one 15° angular contact ball bearing arranged back-to-back in matched pairs. This enables the bearings to cope with thrust forces that are predominately acting in one direction.



Figures 3 and 4. Two versions of NKE PumpSet bearing units.

Figure 4 shows a symmetrically arranged radial ball bearing unit consisting of a matched pair of 15° angular contact ball bearings arranged back-to-back. This unit is accepting the radial loads.

Lubrication technology

Every bearing application resembles a tribological system consisting of the bearing and the lubricant. The lubricant is an element of equal importance in this consideration. A lubrication failure will always terminate the bearing service life and cause serious problems to the pump.

There are new generation lubricants available that considerably outperform older or standard lubricants.

Applying new lubrication solutions or lubricants may thus enhance specific technical features, such as the high speed ability of bearing arrangements. New lubricants may also extend the grease service life or simply add to a higher reliability in case of grease lubricated bearings.

Surveillance technology

Countless pumps are used in remote locations. A fair portion of them are just used as stand-by or back-up systems; other pumps are being used non-stop over long periods of time.

In all cases, the pumps fulfil essential tasks; a failure will have significant effects on products and processes.

In many cases, these bearing are subjected to preventive maintenance. All wear parts, including bearings, are replaced irrespective of their actual condition. This is important for field maintenance engineers in order to make sure that there is no bearing breakdown.

Moreover, using modern condition monitoring equipment enables centralized condition monitoring, which allows for a planned maintenance schedule. The condition monitoring system can clearly indicate when a bearing is likely to develop damage or fail. An initial investment is required, but the system will eventually reduce maintenance costs.

For existing pumps, the possibilities are somewhat limited as there are hardly any design changes which can be performed.

In addition to the condition monitoring program described above, another possibility would be the use of modern lubricants, which yields longer grease service life and fewer re-lubricating intervals.

Besides design, maintenance also plays an essential role in maximising service life. Although premium quality bearings are extremely reliable, every care should be taken to ensure their optimal service life. ■

Contact

Roland Gruber, Technical Manager
 NKE AUSTRIA GmbH
 Ennsner Strasse 41a, A4407 Steyr-Gleink
 Austria
 Tel: +43 86667-0
 Fax: +43 86667-59
 E-mail: rgruber@nke.at
 www.nke.at



Information and solutions for water management at your fingertips

The first issue of **Working with Water** was published in May 2008, focussing on water management for large scale projects, and pushing the boundaries of water engineering from an international perspective.

Distributed to 40,000 readers worldwide, **Working with Water** includes news on product launches and technological developments, events, case studies, feature articles and more...

Features from the launch issue included:

- Water treatment in Scotland
- Managing land use with water needs
- Maximising water recovery from mines

Also circulated at 10 major water events worldwide from May 2008

Please contact Bart Crabbé on +44 (0)207 424 4362 for advertising opportunities available. Alternatively, contact Sally Pye on +44 (0)1865 843081 or Peter Morgan on +44 (0)1865 843646

Brought to you by the publisher of

Filtration+
 Separation
 Leading the world of filtration

WORLD PUMPS

