



ELGETI
ENGINEERING

EXPERTISE



QUALIFICATION



TEST RIGS



FAILURE ANALYSIS

- Fracture face investigation
- Scanned electron microscopy
- Numerical simulation
- Discussion of complete systems considering operation history
- Root cause identification

SUGGESTION OF COUNTERMEASURES

QUALIFICATION OF BEARING SUPPLIERS

- Discussion of requirements considering operation conditions and damage history
- Assessment of functional surfaces
- Material analysis
- Lifetime tests on bearing test rigs incl. statistical evaluation of test results
- Process and quality audit

BEARING TEST RIGS

- Test bearings up to 320 mm diameter
- EELPAX-130 for lubrication test referring to DIN 51819
- Hydraulic force application for maximum precision
- Splash, circulating or grease lubrication
- Design of special test rigs according to customer specification

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Damage control

*In just two years, **Elgeti Engineering** has carved a vibrant niche for itself in the field of damage diagnosis and component testing*

In an industry where reliability and quality are paramount, the mechanical damage and failure of components is an unwelcome inconvenience to rail operators. Key to preventing such incidences is a thorough understanding of the stresses and causes of this damage, and using this to feed into new component construction and system configuration.

Established in November 2009, Germany-based Elgeti Engineering has a dedicated business line in the investigation of damage cases, determining the associated root causes and subsequent valid counter measures. The company also offers qualification of bearing manufacturers as suppliers through the testing of bearing samples on its own in-house developed test rigs. This has since sparked the creation of a further division focused on building and selling these test rigs based on customer specifications.

"These three business fields have a number of synergies between them as we are able to use the experience we gather through damage and failure inspections in assessing samples of new bearings, and therefore provide our customers with a broad consultancy across all relevant issues," begins Hagen Elgeti, managing director of Elgeti Engineering.

He continues: "We are able to react very quickly to customer needs, so if a client is experiencing a problem we can act as a trouble-shooter and identify the cause of these issues. Since the company was established we haven't lost a single client, and much of this is down to the importance we place on high quality – not just in our processes but also our equipment."

Systematic approach

In fact, Elgeti Engineering has achieved notable success in its mere two year's of business, with clients spread right across Europe and even contacts out on the wider international market. The company deals with a very wide spectrum of industries, as anything working with steel parts falls into its remit, but approximately 80 per cent of its current business is situated in the railroad and wind energy industries.

Elgeti Engineering takes a systematic approach to damage assessment, which typically begins with a visual inspection of the failed part. This informs the next step, such as the use of scanned electron microscopy to determine the damage mechanism. Considering the operational conditions, maintenance activities, specification, or even



A cylindrical roller bearing with broken brass cage

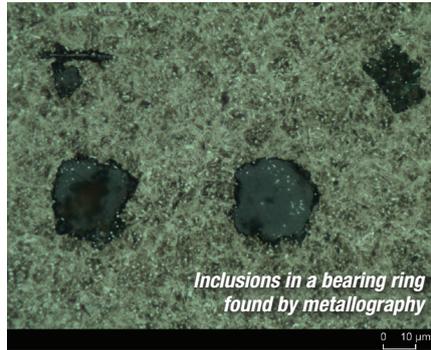
observations of the operators of the part, this data can be used to identify the likely cause of failure.

These theories can be further supported through numerical simulations of the component, which places it under potential contributory conditions. Comparison between these results and the observation data enables Elgeti Engineering to identify the root of the problem and therefore to suggest viable countermeasures to prevent further damage of the same type.

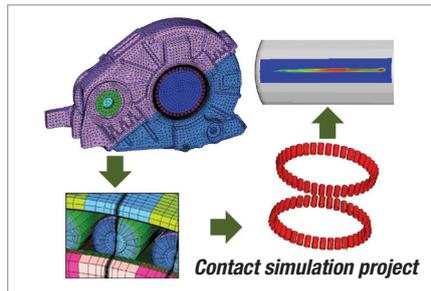
Research and analysis

As Hagen explains, the company's work in this field has often led it into more pioneering ground, as demonstrated in the case of brass cages: "Historically we have seen many issues related to brass cages and roller bearings, and as such our experience in identifying these has been close to basic research. Apart from that, we optimised crowning parameters of tapered roller bearings for a very challenging railway application. For this, we simulated contact pressure distribution considering the overall deflections of the gearbox, which is very challenging from a numerical point of view. This is particularly notable as currently a similar research study is being carried out at a technical university without completion in three years, yet we were able to accomplish this in just three months."

Such an achievement is certainly testament to Elgeti Engineering's technical understanding and specialist expertise. These merits are also



Inclusions in a bearing ring found by metallography

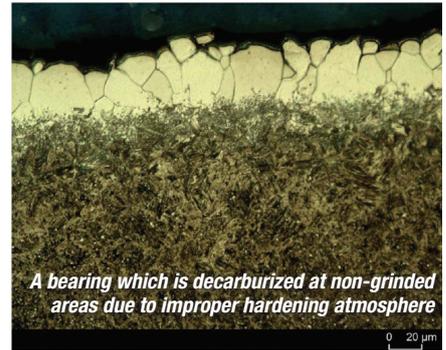


Contact simulation project

present in the company's other main business activity in qualifying and testing bearing suppliers. This is carried out in two parts – a sample assessment of the bearing itself, and an evaluation of the relevant processes such as product development and production.

Beginning with an analysis of the operating conditions and damage history, the sample assessment provides valuable information on the actual requirements placed on the part in application and the relevance of certain characteristics. Functional surfaces are also inspected and measured, and the part is subjected to a material analysis. In cases where high requirements are placed on product reliability, lifetime tests can also be carried out on Elgeti Engineering's broad range of test rigs.

With reliability underpinning the world's rail services, having reassurance of the quality of parts is a fundamental advantage. By carrying out qualification services, Elgeti Engineering is helping smaller manufacturers to enter the bearing supply chain, whilst ensuring quality meets that offered by larger competitors: "Most gearbox manufacturers rely on the two major bearing suppliers – FAG and SKF, and so it's very hard to get products from other suppliers to be considered. As a result there have been occasions when gearboxes have been delivered only just in time as manufacturers are waiting to secure these parts. Therefore we are helping them to find new ways of purchasing and improving the quality of their supply chain, which in turn



A bearing which is decarburized at non-grinded areas due to improper hardening atmosphere

makes these parts more readily available," explains Hagen.

As its latest business line, Elgeti Engineering has high hopes for the sale of its in-house designed test rigs. The company first moved into production of its own equipment after becoming dissatisfied with the state-of-the-art models on the market at the time. Design work on each test rig is carried out at Elgeti Engineering's own facility, before being passed on to a supplier for manufacture and assembly.

Complete damage experts

Having achieved great success in the use of these rigs in its day-to-day activities, Elgeti Engineering is now looking to sell its concepts to the wider market: "The most basic difference between our test rigs and our competitors is that we are working with hydraulic load introduction devices, as opposed to the common plate spring models. Our approach enables us to achieve much higher accuracy during testing and therefore better quality in results. We are permanently expanding our testing capabilities and can currently test bearings of up to 320 millimetres in a wide range of parameters," highlights Hagen.

Much of Elgeti Engineering's strategy for the future is based around its business content today, but the company is looking to achieve a much higher proportion of test rigs sales, which are built in line with customer specifications. Beyond that, there is also the potential of the company to expand the current purpose of its test rigs: "Currently we are just testing bearings and lubricants as these are most urgently needed by clients due to the expensive nature of the parts. However, as damage experts we look at complete systems and therefore we could easily move into the assessment of gears, sealings, and other key customer parts in the future if there was a demand for this," concludes Hagen. ■