



Technology



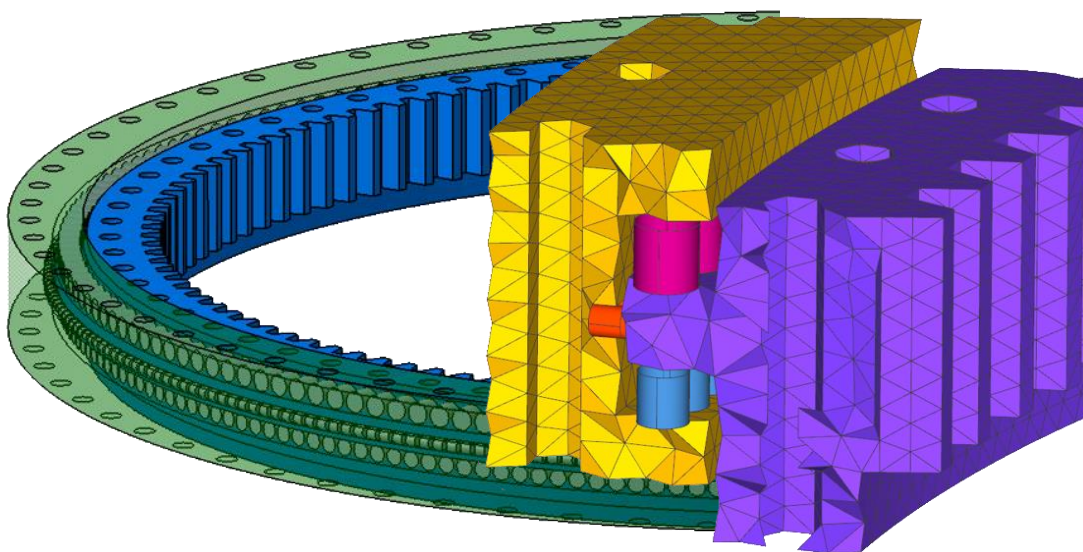
Speed



Savings

# GUIDE

## HOW TO REGENERATE SLEWING BEARINGS



## REGENERATION SLEWING BEARING



Regenerate your slewing bearing

## REGENERATE YOUR SLEWING BEARING

Regenerating medium or large-size slewing bearings allows saving money and time.  
Giovanni Sala for EUROROTHER s.r.l.

### Introduction

EUROROTHER s.r.l. has recently updated its production of slewing bearings with targeted investments, now operational at the new Fontaneto D'Agogna plant. Laser measuring equipment and new control systems are used here. The engineering capability for "special" products has also been strengthened.

Besides enhancing production aspects, these investments made by EUROROTHER aimed at upgrading the regeneration technology in such a way as to provide a full range of services for bearings and slewing bearings.

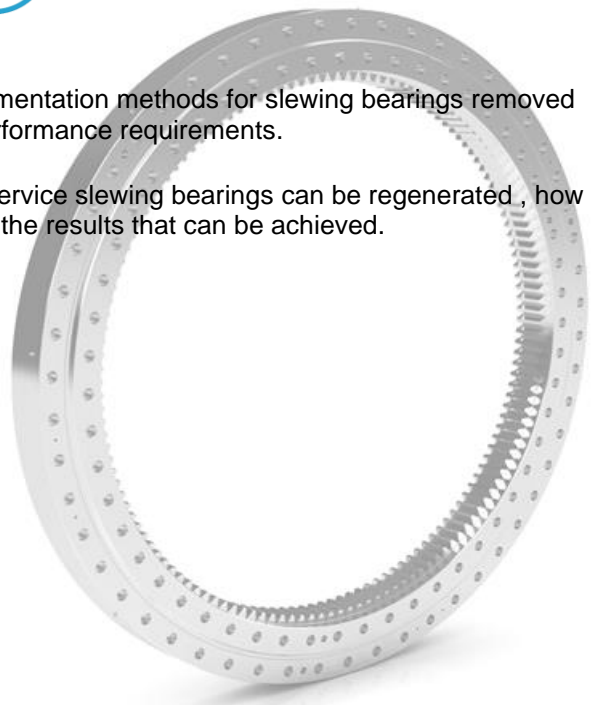
Slewing bearing regeneration is a possibility worth assessing by the user. Depending on the degree of regeneration, savings can range between 40% and 70% compared to the cost of a new component; delivery times are also reduced by 80%

Regeneration can save thousands of Euro and months of inactivity, contributing at the same time to the protection of the environment as a result of less CO2 emissions and less energy used compared to the production of a new slewing bearing



This article focuses on regeneration assessment and implementation methods for slewing bearings removed from applications because they no longer meet the initial performance requirements.

We will discuss the criteria used to determine which out-of-service slewing bearings can be regenerated, how are the regeneration implementation processes defined and the results that can be achieved.



## Technology

Large slewing bearings are usually very expensive and imply long delivery times. A good solution for the user is to remove the component from the application before it becomes seriously deteriorated. A slewing bearing removed before it has suffered severe degradation is the ideal candidate for regeneration processing.

Regeneration-repair-reconditioning are words related to a variety of processes aimed at restoring the initial characteristics of the slewing bearing.

Upon receipt, EUROROTHER assessed the condition of the slewing bearing and completes a detailed inspection report. Based on this report, it informs the customer about the regeneration program to be carried out.

## Regeneration programs

- **LEVEL 1** The slewing bearings are completely disassembled and inspected, checking for any damage due to incorrect storage. They are then machined to remove any oxidation layers; after checking their size and clearance, the slewing bearings are lubricated and finally packed.
  
- **LEVEL 2** Slewing bearings that have not been used in heavy-duty applications and were removed at about half of their theoretical life are cleaned, examined and inspected. The races and rolling elements are lightly lapped and, where necessary, the spacers or cages and the sealing gaskets are replaced. The components are assembled, the clearance is checked and then the slewing bearings are lubricated and packed.
  
- **LEVEL 3** Slewing bearings that reached the end of their theoretical life or those that present abnormal clearances are cleaned, examined and inspected. Depending on the level of wear and damage found, the slewing bearing may be subjected to various machining processes such as full race grinding, replacement of rolling elements, spacers or cages, and sealing gaskets. Where there is a high degree of wear, the machining of the races may involve a new induction hardening process. The slewing bearings are reassembled, their clearance and torque are measured, a test report is completed and the bearings are then lubricated or greased according to the intended specifications and application and possibly painted, if so requested by the customer.
  
- **LEVEL 4** For slewing bearings used in heavy-duty applications, seriously damaged and that require the replacement of an important component such as the inner or outer ring. After reconstructing the inner or outer ring, which may damage the teeth of the slewing bearing (for slewing bearings made with teeth), we will proceed with the level 3 program.

### EUROTHE Assessment and processing method

Many times we receive slewing bearings in rather critical conditions, as shown in figure 1.



Figure 1 - Crossed-roller slewing bearing with external gear teeth: Rings, rollers and spacers received for repair.

The outside of the slewing bearing is washed and inspected and, if possible, we will attempt to rotate it and measure its clearance. The slewing bearing is then disassembled to examine its rings, rolling elements, spacers and sealing gaskets. In examining the rings, we pay particular attention to the condition of the gear teeth and races, focusing on hardening depth, surface hardness and any signs of breakage.

We use an ultrasound spectrometer to determine the hardening depth of the race. Figure 2 shows how this instrument and the obtained data are used to prepare the inspection report.

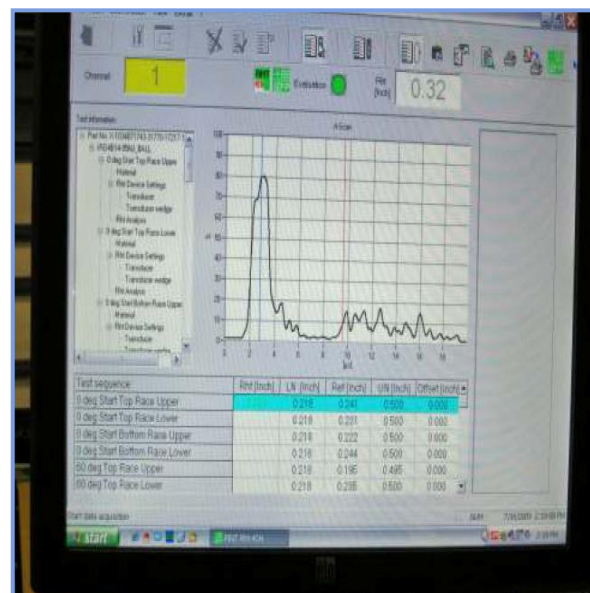


Figure 2 - Hardening depth data measurement with ultrasound spectrometers.

### **EUROTHE Assessment and processing method**

When implementing level 3 and 4 regeneration programs, which involve grinding the races, we will ensure that the remaining hardening depth is enough to support the service loads. If we know exactly the level of load applied to the slewing bearing, we will be able to determine accurately the minimum required depth necessary to support the load properly. For most of the slewing bearings sent to us for regeneration, the applied loads are not known; therefore, based on analytical data collected from numerous designed studies, we determined that the minimum useful depth is 11% of the diameter of the rolling element with a minimum hardness of 50 HRC.



Figure 3 – Race hardness measurement

The hardness of the races is measured with a portable hardness meter according to the rebound principle (fig. 3) and it must meet the minimum limit of 50 HRC (evenly distributed throughout the surface)

It is also important to determine whether the races are affected by fatigue cracks. We use liquid penetrant testing methods to inspect the surface of the races and check for cracks or micro cracks. Figure 4 below

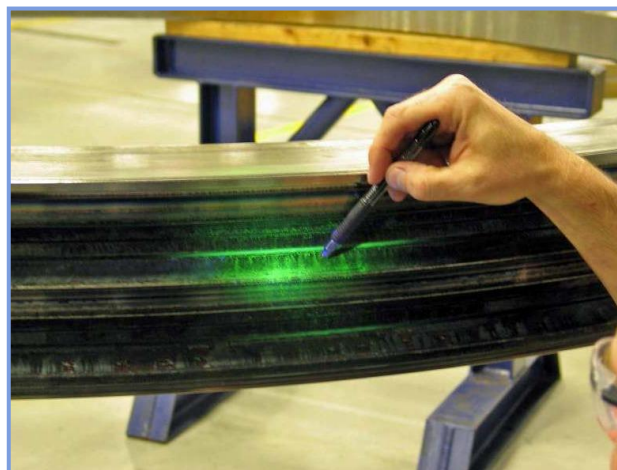


Figure 4 - Groove magnetic particle inspection.

### EUROROTHE Assessment and processing method

The assessment and regeneration processes are conducted using innovative measuring equipment. The race diameter and height are measured using properly equipped laser equipment. Figure 5



Figure 5 – Measuring the edge of the machine with a laser beacon.

For level 3 or 4 regeneration programs, if the damage assessment and analysis reveals that the deterioration of the slewing bearing is due to the fact that design of the bearing is not suitable for the loads applied, our technical department will formulate corrective solutions to be applied during processing-regeneration. The EUROROTHE Group technical team is qualified to formulate appropriate answers regarding the key characteristics of the slewing bearing such as: radial clearance, axial clearance, preload, rotational precision, rotation torque levels surface treatments, teeth, lubrication. These technical notions are supported by our experience and by appropriate engineering analysis software tools, such as, solid modelling, FEA analysis and internal calculation programs used to determine the life of the slewing bearing based on the application factors.

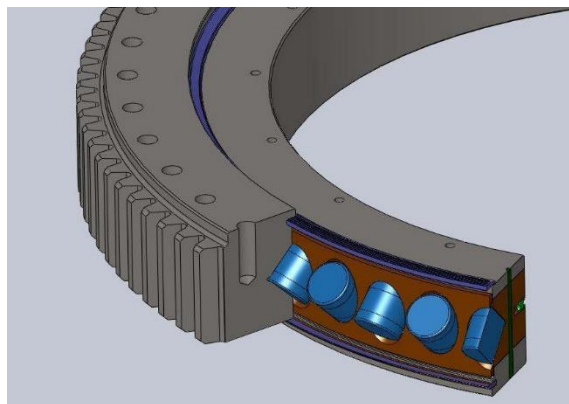


Figure 7 shows an example of a 3D cad model created with SolidWorks.

## EUROTHE Assessment and processing method

### Results obtained according to the regeneration program carried out

After a level 1 or level 2 program, the characteristics and life of the slewing bearing will be similar to that of a new slewing bearing. It basically is a cleaning operation that does not affect the induction hardening depth; all components are checked and, if necessary replaced, and the clearance is also verified.

After a level 3 program, the slewing bearing will have characteristics similar to the initial ones, with a service life similar or very close to that of a new product. In case of mild wear, the grinding of the race will decrease the hardening depth but, thanks to the correct assessment of the minimum required depth, the overall impact on the life of the slewing bearing will be very reduced. In case of severe wear, before grinding the races, we will carry out a hardening treatment to restore the hardening depth to its initial value.

A level 4 program involves the replacement of an important component; the races and, in some cases, the teeth also will be subjected to a new induction hardening treatment; this will allow restoring the life of the slewing bearing to a value very close to that provided by a new product.

## EUROTHE Conclusion





This short guide is intended to demonstrate that with the right processes, technical capabilities and equipment, it is possible to repair- regenerate and recondition slewing bearings of medium and large sizes restoring their performance and life almost to the initial values. This is an important saving option that reduces both system or machinery maintenance costs and time.

**EUROTHE** has the technical know-how, experience, equipment and ability to provide regeneration services for single-row ball slewing bearings, double-row ball slewing bearings, crossed-roller slewing bearings and triple-row roller slewing bearings with any kind of teeth starting from diameters of 500mm to 5000 mm.

### EUROROTHER Regeneration applications

Some examples follow:

<b>Excavators</b>	Mini excavators Hydraulic excavators Self-propelled excavators Bucket rotation	
<b>Cranes</b>	Truck cranes Deck cranes Bridge cranes Harbour cranes Overhead cranes Construction cranes	
<b>Platforms</b>	Mobile platforms - Service and assembly platforms - Aerial ladders	
<b>Other</b>	Carousels for amusement parks — Bottlers - Wastewater treatment plants - Concrete pump rotation - Forklift fork rotation - Rotary tables	

Regenerated slewing bearings are used in the field of lifting and handling equipment, general mechanics and various technology fields.



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