



## On-Site Pinion Gear Repair

### THE CHALLENGE

By repairing the pinion gear of a mining crane in-situ with the SIFCO Process®, industrial gearing manufacturer Horsburgh & Scott Co. was able to return the crane to service with minimal downtime and extend the working life of the gear components. This in turn has improved the time between failure rate of the part and saved significant cost compared to alternative repair methods.

The pinion gear is an essential part in a gear train assembly. In this application, the pinion gear was part of the boom driveline of a dragline excavator crane used in the surface mining of coal. If not maintained regularly, lubricant in the pinion gear can leak out of the seal, ultimately causing the bearing to seize and gall to the shaft. When the seized bearing is removed it can also remove excess material from the journal resulting in a gouge to the surface.

The bearing journal in question had incurred a deep gouge measuring 0.030" in depth, 0.75" wide and 12" long making it 0.012" undersize.

Traditionally, this type of damage is rectified by replacement of the bearing journal or repaired by sleeving, welding, metal spraying or tank plating. However, replacement can have a four to six week lead-time as well as being costly, welding can weaken the strength of the substrate, and other processes require the part to be removed from the equipment and taken off-site to be repaired, causing inconvenience and incurring the cost and additional downtime of equipment disassembly and rebuilding. Repairs to the component could also require machining of the journal surface diameter to remove the defect, which would also have made the diameter 0.060" undersize.

### CUSTOMER

Horsburgh & Scott

### LOCATION

Cleveland, Ohio

### CHALLENGE

Repairing the pinion gear of a mining crane in-situ

### SOLUTION

Perform on-site repair of component

### RESULTS

Successful repair kept costly downtime to a minimum and offered protection to the component from further damage



HORSBURGH & SCOTT

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### THE SOLUTION

Defects are typically repaired with one or more layers of copper, and then covered with a wear resistant deposit that has good release or wetting characteristics. In this instance, a nickel in the 30 Rockwell hardness range was selected as the final coat to fulfil the required wear properties as well as being close to the hardness of the original material. Copper was chosen for the fill material as it is the most cost effective and is easy to reactivate and dress back down in between layers as it is softer, therefore easier to contour to the original shape when machined.

The groove was relatively shallow therefore could be quickly filled with copper using a 100% tool contact. The bearing journal was first plated with 0.001" thickness of copper and then masked for the defect repair. The anode that was then used to fill the defect covered the full length of the gouge. The gouge was filled with three layers of copper and hand finished in between. The final layer was then dressed flush by the SIFCO ASC technician and once the defect was repaired, the Outside Diameter was plated with 0.006" thickness of nickel using an ID plater.

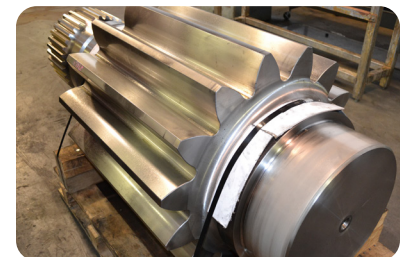
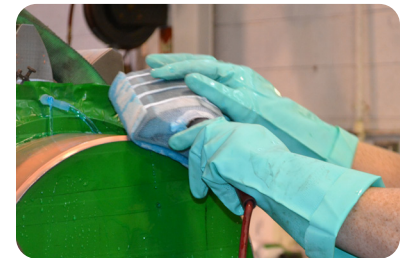
### THE RESULTS

Dave Niederheman, Chief Metallurgist, Horsburgh & Scott Co. said: "SIFCO ASC is a well-established partner of Horsburgh & Scott and their ability to work on-site is highly attractive. Over the years they have helped us to find the most efficient ways to repair and maintain our customers' equipment and this has added up to thousands of dollars, hours of downtime, and manpower time saved.

"In this application the SIFCO Process® has extended the working life of the gear and improved the failure rate due to the nature of the nickel coating on the journal. The cost of manufacturing and material to replace the gear would have been extortionate in comparison, as well as causing weeks of downtime."

Lee Shelton, Managing Director of SIFCO ASC concludes: "At SIFCO ASC, we understand the inconvenience caused when critical components fail and need urgent repair. The portability of the SIFCO Process® makes it a versatile solution used for numerous demanding repair and OEM applications. The localised plating process works well in an industrial environment. The plated deposits withstand considerable stress and strain, while maintaining excellent adhesion."

Horsburgh & Scott Co. has extensive experience in successfully repairing and rebuilding more than 90 varieties of gearing manufacturers' brands from around the world and, with heritage dating back to the 1870's, it is therefore well placed to identify the most cost-effective and robust methods of repair.



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