



## **Technical Bulletin / Safety Alert**

**Unique ID No:** GEN2009-TBSA-02

**Rev:** 0

(This document supersedes SMV Technical Bulletin INV1122533)

**Subject:** Mine Loader Driveshaft Centre Bearing Failure

**Date:** 27/05/2009

**Applicable to:** All JUG-A-0 UL/UV Machines

**Note: Minimum PPE required to carry out any inspections contained in this TBSA shall be protective clothing & footwear, safety glasses, hearing protection & any site specific requirements. A JSA or equivalent should be carried out prior to performing these tasks.**

### **Occurance:**

At the request of the Mine Mechanical Engineer a centre bearing from a driveshaft on an underground mine loader was submitted for metallurgical investigation and examination to determine the cause of failure.

According to maintenance reports, the bearing grease line had been purged and the bearing greased the shift before failure. During operation, the centre bearing was reportedly on fire. No other information regarding history is available at this time.

### **Investigation & Cause:**

A general view of the bearing in the as received condition is shown in figures 1 & 2. The bearing had the following markings on the end of the inner raceway.

UC212 39 (see figure 3)

There was still some grease present in the bearing, although it had become very dry and contaminated from the fire. The grease had a very gritty texture and was very hard as well.

The outer raceway was removed to allow inspection of the cage, rollers, inner raceway and the interior of the outer raceway, see figures 4 & 5. Approximately ½ of the cage that holds the rollers in place was missing. The remainder of the cage was severely damaged and distorted, see figure 6.

The cage has been almost completely destroyed during operation. There is no evidence of any fatigue on the remaining part of the cage, although there is still significant damage and deposits, which could be obscuring any evidence or the evidence, could be on the piece of the cage that is missing.

From the cage, there should have been 15-16 rollers within the bearing. On examination, only ten (10) were still present. Four (4) rollers were located within the remains of the cage, three (3) rollers were stuck to the outer raceway and the remaining three (3) were loose when the outer raceway was removed. All of the rollers show signs of damage and wear, with several rollers being badly misshapen, see figure 7. The ball rollers that were recovered from the bearing show signs of plastic deformation and colouring caused by excessive heat see figure 8.

The outer raceway interior is heavily coated in a hardened/carburized layer of grease (from excessive heat). Underneath this layer, the raceway surface exhibits signs of light spalling/peeling, see figure 9. The exterior surface of the outer raceway shows signs of excessive heat, with one area blued, indicating a temperature in excess of 400 °C.

The inner raceway has a similar thick coating of hardened/carburized grease as the outer raceway. After some of the hardened layer was removed, light spalling/peeling was evident on the inner raceway. The interior surface of the raceway that would have been in contact with the driveshaft shows signs of exposure to extreme heat, see figure 10. This heat has caused the material of the raceway to soften resulting in the marks shown in figure 11.



Figure 1 Ball roller bearing in the as received condition (before cleaning)



Figure 2 Ball roller bearing in the as received condition (before cleaning)



Figure 3 Identity number on inner raceway



Figure 4 Bearing after removal of the outer raceway



Figure 5 Close up of the bearing without the outer raceway



Figure 6 Close up view of the remainder of the cage



Figure 7 View of the ball rollers; note the severe deformation present in some of the balls



Figure 8 Close up view of a discoloured and deformed roller ball





Figure 9 Close up view of the outer raceway spalling



Figure 10 Close up view of the inner raceway heat affected zone



Figure 11 View of the damage caused by the driveshaft

**Recommendations:**

From this investigation, there are several recommendations that can be made.

Check the type of lubricant used and ensure it is correct to the manufacturer's specifications.

Ensure that the correct amount of lubrication is used.

**Supporting Documentation:**

None.

**Conclusion:**

The excessive heat that has been generated in this bearing suggests an inadequate lubrication problem. The bearing has seen temperatures probably in excess of 400 °C, which has softened the material causing failure.

Please ensure this document is circulated to all relevant personnel within your organisation.

Should you have any further queries please contact your VLI Diesel Representative.

Tomago Operation  
28 Old Punt Road  
Tomago NSW 2322  
P: +61 2 4913 7500  
F: +61 2 4964 8919

Rutherford Operation  
20 Shipley Drive  
Rutherford NSW 2320  
P: +61 2 4015 3200  
F: +61 2 4932 1722

Mackay Operation  
6 Fursden Street  
Glenella QLD 4740  
P: +61 7 4942 7495  
F: +61 7 4942 4944

Emerald Operation  
25 Hawkins Place  
Emerald QLD 4720  
P: +61 7 4987 5011  
F: +61 7 4987 4711