



Crane Slewing Gear Maintenance and Rocking Tests

Loss Prevention Bulletin

Incidents continue due to pedestal crane slewing gear's failure because of bearing wear, often leading to damage to equipment, cargo, significant repair delays and in events of catastrophic bearing failures, severe injury and fatalities. In many cases, the bearings fail with hook loads well below the crane's safe working load.

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The slewing ring attached to the rotating crane body will be subject to the most wear at the rear of the crane body opposite the jib and under the jib itself, the former being subject to tension and the latter to compression caused by the weight of the jib and loads suspended from the hook.

The principal causes leading to failure of a crane slewing ring bearings are lack of lubrication of the bearings and inadequate monitoring of the bearing wear down. Crane slewing ring bearing failure seems to affect single ball race type bearing arrangements principally; however, double ball race and roller bearings are also susceptible.



Greasing

A lack of lubrication accelerates bearing wear and corrosion; therefore, the inclusion of regular greasing within a vessel's planned maintenance system is essential. The greasing interval will depend on the crane's usage and the crane's exposure to wet or dusty conditions, high humidity or extremes of temperature; for example, cranes located forward subject to increased exposure to sea spray will require more frequent greasing.

The crane manufacturer's recommendations should be consulted when determining the greasing interval for a particular vessel. Grease should be injected into each grease nipple in turn whilst rotating the crane until a bead of fresh grease is sighted extruding from the grease seals' lip. Any damaged or blocked grease nipples noted must be replaced. Manufacturers will generally specify the minimum quantity of grease to be applied, depending on the bearing's size, over a specific length of time to ensure periodic renewal of all the grease. Additionally, greasing of the slewing rings after long periods of inactivity should be completed.

In line with manufacturers' recommendations, the correct grease must be used; for example, grease containing Molybdenum Polysulphide (MS2) can cause the bearings to slide rather than roll in some slewing ring types, increasing the wear rate. Excessive old grease emanating from sealing rings must be removed and disposed of in line with regulatory requirements to prevent it from falling onto the main deck or external crane ladders, creating a slip hazard. In conjunction with the planned periodic greasing of the slewing ring bearing, the inner slewing ring open gearing and slewing pinion should also be dressed with the crane manufacturer's recommended grease product, applied either by brush or careful spraying. Excess used and old grease should be removed and disposed of properly.

Monitoring of Bearing Wear

Grease Analysis

Some manufacturers recommend that a representative sample of grease be extracted from four equidistant points on the slewing ring at periodic intervals and sent for analysis to assess the bearings' condition.

Some slew rings have sampling ports fittings; this involves removing a bolt and drawing a grease sample from close to the bearing surface using a suitable syringe. If there are no sampling ports fitted, clean the outer seal next to the grease nipples closest to the four sampling locations; grease should be pumped into each grease nipple in turn without rotating the crane and the old grease expelled from the seal taken for analysis.



Rocking Test

To ensure that slewing ring bearings are not becoming worn, the vessel's planned maintenance system should include a rocking test, and each crane tested every six months. A record of these tests must be entered into the Registry of Lifting Appliances. The rocking test comprises the measurement of the deflection between the crane pedestal and the rotating crane housing in the way of the slewing ring using a dial test indicator to determine the bearing clearances. Measurements are taken at the two locations on the slewing ring susceptible to the most significant bearing wear, under the jib's centre and diametrically opposite. A set of eight readings are taken with the crane pointing dead ahead, dead astern, to port and then to starboard, initially with the jib luffed to its minimum radius with no weight on the hook and then with the jib luffed to its maximum radius with the difference between the two readings giving the bearing clearance.



The readings are compared against the manufacturer's maximum permissible clearance, which will depend on the type and size of the slewing ring and bearing size. The original bearing clearances should be available to determine the degree of wear. Consider shortening the testing intervals when the noted wear has increased appreciably between consecutive rocking tests.

Some manufacturers have produced integrated devices to measure unacceptable wear of the bearing in their slewing rings to provide early warning of excessive bearing wear.

During the five-year proof load testing and thorough annual examinations of lifting gear, a vessel's Classification Society may require evidence showing that tests to determine bearing wear have been conducted together with results that show these are within the manufacturers' limits. Neglecting these tests may result in the Classification Society not certifying the crane for further use.

Additional Concerns

It is also often found that the bolts' torque settings holding the slewing bearing parts to the crane pedestal and crane body are not periodically checked in line with manufacturers' recommendations. Therefore, in addition to routine maintenance and inspection of the slewing ring bearing, the bolts securing the slew ring's inner and outer race should be examined, and their tightening torque periodically checked in line with manufacturers' recommendations. The interval between successive checks will vary from manufacturer to manufacturer and usually is every twelve months; however, it may be as frequent as every three months.

Another potential oversight that can occur when it comes to the slew ring bearing bolts is the availability of certified testing facilities that can perform non-destructive testing on the bolts removed before the crane's five-year proof testing. The quantity of slew ring bearing bolts required for removal to undergo the nondestructive testing will be based on the crane's age, and this determines what percentage of bolts to remove from the slew ring bearing arrangement. When choosing which bolts are to be taken for examination, these must be from the slew ring bearing's most highly loaded area.



During washing down operations, crewmembers must be cautioned about using high-pressure water jets against slewing rings. Pressurised water can penetrate the sealing ring and cannot be removed, even with the introduction of large amounts of grease, leading to accelerated corrosion of the bearing parts.

Members requiring any further guidance are advised to contact the Loss Prevention department.



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