

# Slew Bearing Back Lash Checking Importance for Stackers/ Reclaimers and Mobile Harbour Cranes for the Availability of the Equipment-Ports Service Quality

G. Vara Prasad Babu<sup>1</sup>, M. Pramila Devi<sup>2</sup>

<sup>1</sup>Deputy Manager, Engineering Services Department, Gangavaram Port Limited, Visakhapatnam, Andhra Pradesh, India.

<sup>2</sup>Professor, Department of Mechanical Engineering, Andhra University, Visakhapatnam, Andhra Pradesh, India.

## Article Info

Volume 83

Page Number: 8916 - 8920

Publication Issue:

March - April 2020

## Article History

Article Received: 24 July 2019

Revised: 12 September 2019

Accepted: 15 February 2020

Publication: 09 April 2020

## Abstract

The purpose of this study is to assess the importance of slew bearing maintenance periodically; the backlash checking increases life of the component conforming to design standards. Port and yard equipment's being considered for backlash checking for optimal availability of the equipment's. the brake down which is leading to shut down won't happen in the overnight the sub-assemblies of individual components of equipment's should be examined thoroughly with proper check list preparedness by which the fatigue sub part can be identified before further worn out conditions and can be brought back to operational effectiveness with in the minimum down time. The ports service quality factor being taken care of by the importance of parts and sub-parts critical evaluation so that the risk priority number of sub parts of equipment would yield the reliable performance, by which the customer satisfaction level will be optimistic.

**Keywords;** *Slew bearing, Availability, Port Service Quality, Backlash*

## I. INTRODUCTION

### 1.1 Slew Bearing

Slewing bearings comprise an inner ring and an outer ring, one of which usually incorporates a gear. Together with attachment holes in both rings, they enable an optimized power transmission with a simple and quick connection between adjacent machine components. The bearing raceways, in conjunction with the rolling elements and cages or spacers, are designed to accommodate loads acting singly or in combination, and in any direction.



**Fig. 1: slew bearing**

Ports play a critical role in the economy of many countries and regions. Failure or unreliability of port services can significantly influence port customers shipping lines and cargo owners and result in their dissatisfaction.

Not only the slew bearing importance in port and

8916

yard equipment's it's also vital in Construction machinery, Energy, Transport and materials handling technology, and special technologies as well.

## Ports service quality

Ports service quality plays a vital role in any organizations for optimal availability of services which they provide un-interruptedly. There by special focus should be given to equipment's parts and subparts for reliability.

### 1.2 Backlash

Periodically checking of backlash improves the life of the component conforming to design standards.

### 1.3 Lubrication

Lubrication the outer and inner race with scheduled maintenance will prolong the life of slew bearing.

### 1.4 Slewing drive:

Elastic deformation in the area of the drive bearings changes the tooth meshing.

As a result of these risks we require the use of pinions with a tip flank relief and tip edge rounding of  $0.1 - 0.15 \times m$  rounding radius (R) for such applications.

In this case, the radius R must blend into the addendum flank without forming an edge. This change towards an involute-like shape ensures a smooth transition from the modified tip flank profile to the normal flank profile.

Advantage reduced tendency to meshing problems with highly stressed gearing.

## II. MATERIAL AND METHODS

A slew bearing is a heart of the equipment which should be taken optimal maintenance care due to procurement is a time taking and costly factor and replacement takes several safety procedures and step wise replacement process should be taken accordance with original equipment manufacturer so

that other components of equipment's shouldn't be worn out and the centre of gravity should not be disturbed. The availability aspect will be less in accordance to organizational requirements.

### 2.1 Backlash

#### -Reduced wear

Correct tooth backlash is a prerequisite for trouble-free operation. It significantly influences the wear. Therefore, during assembly of the drive pinion, adequate backlash must be assured. Advantage Correct backlash ensures Low-wear operation and also extends the service life. The tooth backlash must be set on the three teeth marked in green with  $(0.03 - 0.04 \times \text{module})$ . After final assembly and tightening of all the fastening bolts, the backlash must be checked.

Backlash is required for most geared slewing ring bearing applications. This is to accommodate manufacturing tolerances of the gears, mounting structures, lubrication, thermal expansion, and deflection of the components under dynamic loading. Gear Assembly Backlash Figure 2

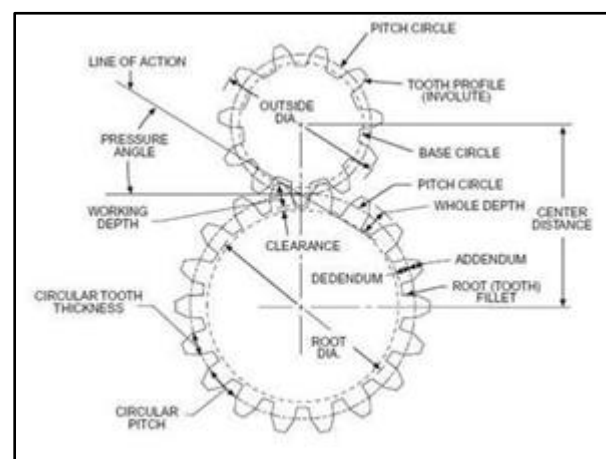


Fig .2: Back Lash

### 2.2 On-Site Inspection Carried In Gangavaram Port

#### Limited in The Yard Equipments:

Procedure followed in finding the Backlash of Slew Rack and Drive Pinions in Gangavaram Port

Limited.

-The Backlash can be checked using a Feeler gauge or a Lead wire.

Procedures followed:

Finding the Backlash Using a Lead Wire:

-The Lead wire is placed at the meshing area on the pinion, to press the lay which in turn gives the Backlash.

-The pinion is made to slew around the rack in order to get the lay.

-The lead wire is removed and the lay thickness is measured with the Vernier calliper. Thus the Backlash is determined.

-The Backlash is determined at four different positions or two positions as per possibility.

Finding the Backlash Using a Feeler Gauge:

-The slew pinion is positioned at required angle.

-The slew brakes are manually lifted and the brake drums are manually rotated to position the pinion as per requisition.

-The pinion is positioned in such a way that the teeth of pinion are meshed completely with the rack, so that the other side clearance between the teeth can be measured by feeler gauge.

The following equipment's are checked for Backlash:

-Ore Reclaimer

-Ore Stacker

-Stacker cum Reclaimer (SCR)

-Coal Stacker

-Coal Reclaimer

**Table 1: Ore Reclaimer**

Equipment Name	Method Used	Drive Pinion 1	Drive Pinion 2
Ore Reclaimer	Lead wire method	0.2	0.2

**Positions Considered**

For drive pinion 1 reading is taken when boom is slewed.

For drive pinion 2 reading is taken when boom is slewed.

**Table 2: Ore Stacker**

Equipment Name	Method Used	Drive Pinion 1	Drive Pinion 2
Ore Stacker	Lead wire Method	>1	0.2mm

**Positions Considered**

For drive pinion 1 reading is taken when boom is slewed.

For drive pinion 2 reading is taken when boom is slewed

**Table 3 :Stacker cum Reclaimer (SCR)**

Equipment Name	Method Used	Drive Pinion 1	Drive Pinion 2
Stacker Cum Reclaimer	Feeler Gauge Method	0.1 0.1	0.1 0.1

**Positions Considered**

For drive pinion 1 reading is taken at initial position

For drive pinion 2 reading is taken at initial position

Boom positioned in 90° position towards yard 3 and readings are taken from both the drive pinions

**Table 4: Coal Stacker**

Equipment Name	Method Used	Drive Pinion1		Drive Pinion 2	
Coal Stacker	Lead Wire Method	0.25	0.28	>1	>1

**Positions Considered**

For drive pinion 1 reading from the initial position the boom is slewed.

For drive pinion 2 reading from the initial position the boom is slewed.

Boom positioned at 90° and the boom is slewed towards initial position in order to get the reading at drive pinion 1.

Boom positioned at 90° and the boom is slewed towards initial position in order to get the reading of drive pinion 2.

**Table 5: Coal Reclaimer**

Equipment Name	Method Used	Drive Pinion 1		Drive Pinion 2	
Coal Reclaimer	Feeler Gauge Method	0.2	0.2	0.28	0.28

**Positions Considered**

Readings of drive pinion 1 & drive pinion 2 are taken at initial position.

Boom is positioned at 90° and the readings are taken at both the drive pinions.

The Lead wire that has been used in the procedure is of 20 gauges (1mm).

From the table no's 2 and 4 The ore stacker and coal stacker been observed in the non-acceptable

range by the back lash procedure's, by which the preventive measures been taken to prevent further wear out of the slew bearing due to uneven load fluctuations on slew bearing. Hence periodic check list should be given more criteria regarding slew bearing checks.

**III. RESULTS AND DISCUSSIONS**

The critical component of the equipment needs a critical periodic maintenance and checks by which the parts of the component and subparts durability and reliability can be increased.

The risk priority number is very high regarding the slew bearing component that's why the timely lubrication and inspection of the component and sub parts should take in to high priority.

The periodic checking of backlash will prolong the life of component and the percentage of availability of the equipment increases.

**IV. CONCLUSION**

Customer satisfaction increases with availability of the services without interruption, which leads to economic development of the organization. Slew bearing replacement with new slew bearing is a very costly procurement process and time factor of shut down of the equipment rate is very high, hence the slew bearing maintenance factor should be more emphasised

**REFERENCES**

[1]. Carman, J. M. (1990). Consumer perceptions of service quality: an assessment of T. Journal of retailing, 66(1), 33.  
 [2]. Cho, C. H., Kim, B. I., & Hyun, J. H. (2010). A comparative analysis of the ports of Incheon and Shanghai: The cognitive service quality of ports, customer satisfaction, and post-behaviour. Total Quality Management, 21(9), 919-930.  
 [3]. Dehghan, A., Zenouzi, B., & Albadvi, A. (2012). An investigation on the relationship between service quality and customer

satisfaction: In the case of CCG CO.  
International Business Research, 5(1), 3.

- [4]. Ladhari, R. (2008). Alternative measures of service quality: a review. *Managing Service Quality: An International Journal*. 18(1), 65.
- [5]. Van Doorn, J., &Verhoef, P. C. (2008). Critical incidents and the impact of satisfaction on customer share. *Journal of Marketing*, 72(4), 123-142.
- [6]. Kaydonbearings.com
- [7]. Slew bearing Wikipedia
- [8]. RotheErde® Slewing Bearings.com<sup>[1]</sup>