

# Bearing Cup Grease Metering for EOHS Fulfilment – An Obligatory in Propeller Shaft Assembly

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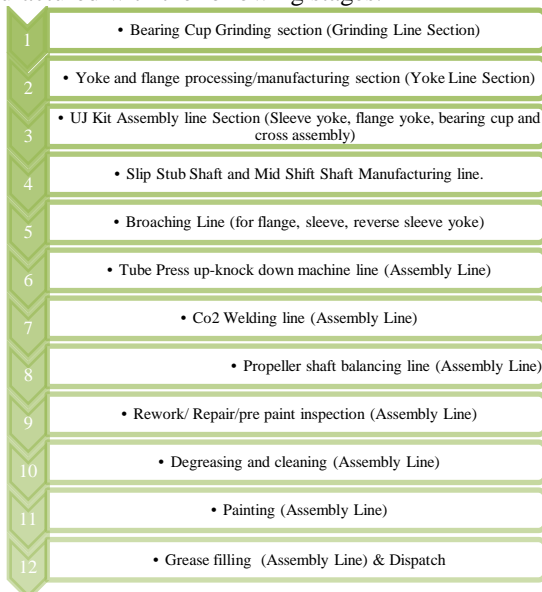
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**Abstract:** - Nowadays technology is rapidly changing with innovation. In this 21<sup>st</sup> century organizations are focusing on lesser inputs with higher productivity and quality with minimum human resources. To enhance OEE [4], [5] is a primary task in the growth of the organizations. Considering present scenario of most of the Indian industries it has been observed that there is still lack of technology due to too many certain reasons. Apart from focusing on such types of issues and by visited the certain different types of leading automobile manufactures to know their production related barriers by providing them with better solution to resolve their production related issues at our extent. Environmental occupational health and Safety is very much essential part in Industries.

**Key words:** Bearing Cup, Propeller Shaft Assembly, EOHS, Grease Metering

## INTRODUCTION:

The lean and agile [2],[3] manufacturing technologies are very much essential for improving the quality and quantity of the organization. For the propeller shaft assembly, the universal joint kit must be assembled with the four bearing cups, one cross and four Circlips. The special dedicated machines are provided to do the sub assembly of these above mentioned parts. The propeller shaft is manufactured with the following stages.



The propeller shaft is manufactured through the above stages [1]. These are the most commonly employed steps followed by most of the original equipment

manufacturers. There are separate manufacturing sections for each stage in propeller shaft manufacturing line.

The eighth stage is the propeller shaft balancing stage, where the propeller shaft is balanced with the designed standards in gm/cm. The balancing is required to reduce the unwanted vibrations produced due to rotational movement of the propeller shaft. The vibrations may damage the bearings and rest of the moving parts, also due to vibrations there might be fatigue failure of the propeller shaft components.

## Grease Spillage during Propeller Shaft Balancing

During the propeller shaft balancing; the propeller shaft is rotated with unloaded condition at approximate 1500rpm. During rotation, the excessive grease which is popped during the sub assembly operation will be thrown away due to centrifugal action.

After completion of the bearing press up fitment operation; there will be an assembly carried out over the conveyor of the front propeller shaft and the rear end of the propeller shaft with the proper orientation. This will be carried out with a specific skill and experience. After having the assembly; the propeller shaft is fastened on the dynamic balancing machine; to reduce the unwanted vibrations during when the propeller shaft is at a higher speed.

But when the propeller shaft is clamped over the balancing machine; it is rotating with designed rpm. Each end is having 04 Nos. of the bearing cups; that means that, if the propeller shaft is of two pieces, then it is having 12 Nos. of the bearing cups fully filled with the grease. And all these bearing cups; will rotate with approx. 1500 RPM and there will be spillage of the grease because during the sub assembly, rest of excessive grease will gets out of the bearing cups and it will be the major concern of the EOHS audit point and it will also hampers the morale of the associates; those are working on the same machine.

## Trouble description:

“Excessive Grease is spilling out from the propeller shaft; during balancing operation”

Considering the severity of the problem, it was decided to go for the why-why analysis.

- Why- to use this tool? - Its EOHS Audit Open point.
- Why- it's EOHS Audit Open point? - Grease is spilling out during operation
- Why - Grease is spilling out during operation? - Bearing Cup filled with excessive grease quantity.
- Why - Bearing Cup filled with Excessive grease quantity? - Improper past experience of filling the grease in the bearing cup.
- Why - Improper past experience of filling the grease in the bearing cup. - No trials executed for metering the grease quantity.

From the why-why analysis, it is apparent that, the trials for the grease metering must be executed. The data is collected for the random bearing cups of special 1310 series.

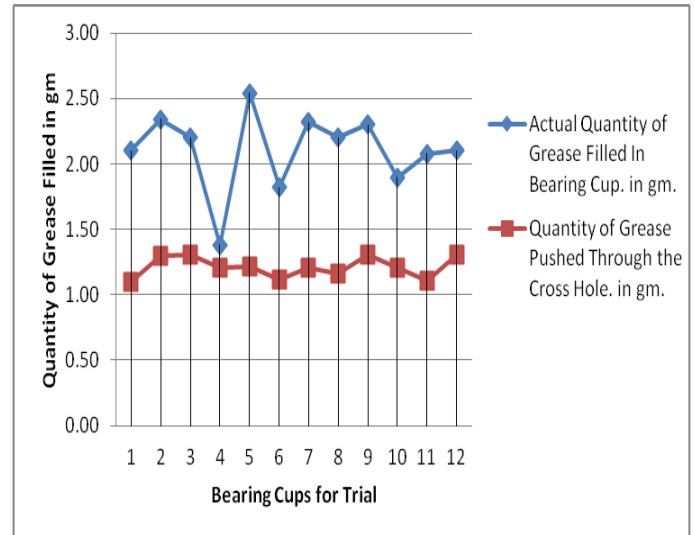
**Trial Details:**

- Number of Bearing Cups considered for the trial = 12 Nos.
- Number of the series used for the trial = 1310 series
- Weighing Scale used = Standard room weighing scale with least count of 0.01gm.

The bearing cup considered for the trial are randomly picked up and its empty weight taken with the empty volume of the cross cavity and the actual quantity of grease filled in each bearing cup is metered in gms. The rest of the data concerning to the quantity of Grease Pushed through the Cross Hole. in gm. is also noted in the following table.

SN	Bearing cup Weight in gm.	Volume of Cross Cavity (Tube) in mm <sup>3</sup>	Actual Quantity of Grease Filled In Bearing Cup. in gm.	Quantity Of Grease Pushed Through the Cross Hole. in gm.
1	70.43	706.85	2.10	1.10
2	71.07	706.85	2.34	1.30
3	70.03	706.85	2.20	1.31
4	71.90	706.85	1.38	1.21
5	70.30	706.85	2.54	1.22
6	71.20	706.85	1.82	1.12
7	69.32	706.85	2.32	1.21
8	70.10	706.85	2.20	1.16
9	71.70	706.85	2.30	1.31
10	70.20	706.85	1.90	1.21
11	71.31	706.85	2.08	1.11
12	72.33	706.85	2.10	1.31

Table: Bearing Cup Grease metering values



Graph :Bearing Cup Trial

**Inferences from the graph:**

- The quantity of the grease in the each bearing cup is not in order.
- Quantity of grease pushed through the cross hole is having a systematic pattern.

**Proposed Remedy:**

- The bearing cup vendor will be notified with the problem about metering the exact quantity of the grease presetted in the control plan i.e. 2gm.
- Auto needle filling and exact quantity grease dispense special purpose machine to be manufactured for individual bearing cup.

**CONCLUSION:**

This first suggested remedy was implemented in the propeller shaft assembly; and the results were most encouraging. The spillage of the grease is now in control and henceforth; there will be enhancement in the morale of the associates, as in the earlier case; the associate working on the balancing machine was working on the most greasy area resulting in the slippery shop floor surface. The said point was earlier issue of the Environmental Occupational Health & Safety audit. Now the issue is resolved.

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