

Design of a Roller Bearing Grease Removal Device

Anupoju Sai Vamsi, Singavarapu Veerendra, Seela Chiranjeeva Rao



Abstract: In the present Scenario, The manual method for Removing grease from the Roller Bearing used in the railway department became a major problem. Chemicals will effect humans while cleaning the railway bearings in manual method. In order to reduce human effect and increase efficiency in cleaning, we are aimed to design a machine which will automatically clean the bearings and will decrease the time of cleaning. In the overhauling process, which will be done manually will be directly apply the kerosene and the compressed air. This suggested machine will clean the bearing automatically by providing kerosene and compressed air with high velocity. The compressed air with high velocity will be provided to rotate the bearing continuously and kerosene will be applied simultaneously, Thus the cleaning of the bearing. Will be done automatically. It works on principle that kerosene air mixture will reduce the density and remove the grease from the bearing completely and it is collected in a drain. After the overhauling process, the parts will be assembled in the railway coaches. So this machine can reduce the time in the working process and avoids the human problems in manual method.

Index Terms: Manual Degreasing, Infections to humans, Automatic cleaning process, Kerosene, Compressed air, Overhauling process

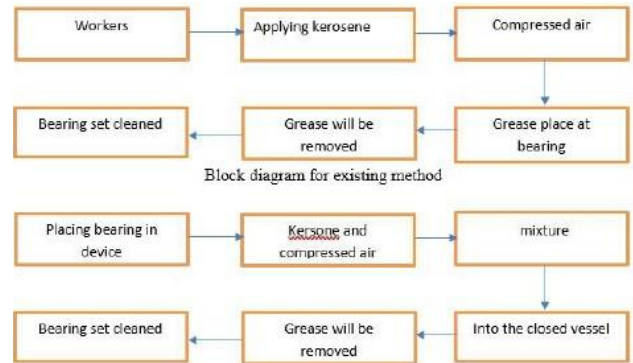
I. INTRODUCTION

One of the best of transporting goods and people is railway system. The Indian railway department is one of major income in goods sector. It is existed from the year 1832, the first railway built by Arthur cotton to till now. Indian railway system is running 20000 passenger trains and carries 11 million passengers every day. The railways earn about 22,341 crores through transport of goods and 9449 crores through transportation of passengers. The railways have the net revenue of about 3458 crores including all expenses. In Indian railways, Perambur is one of the oldest workshop for the carriage and wagon works built in 1856 to serve the southern railway company by British. The main purpose is to overhauling of locomotives and wagons. Some activities can be done at perambur are:

- Coaches will be overhauling periodically
- Wagons will be overhauling periodically
- Coaches will be repaired for being corrosion.
- Laminated Springs will be manufactured.
- Roller Bearings will be repaired.

II. PROPOSED METHODOLOGY

a) Block Diagram:

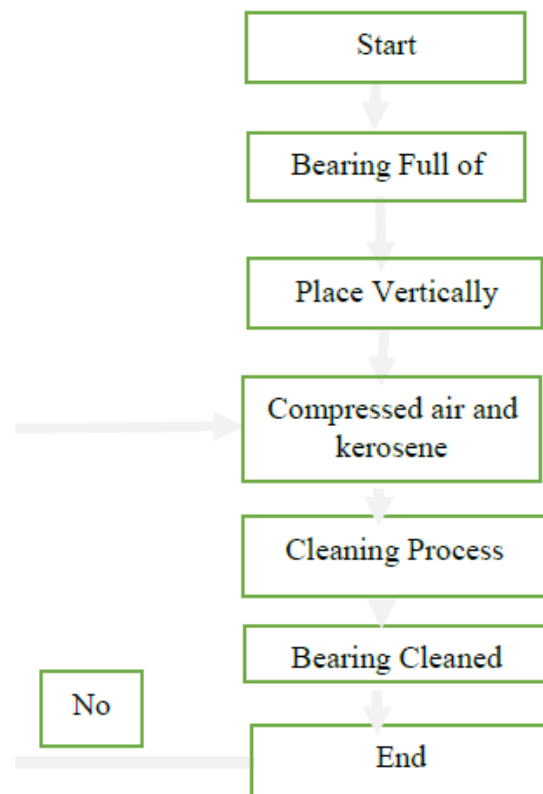


a) Algorithm:

• Start

- Select a bearing which consists of full grease
- Bring the bearing to the equipment
- Place the bearing vertically inside the equipment
- When the compressed air and kerosene will pass through bearing. The grease will be removed from the bearing
- Hence the bearing will be cleaned
- End

b) Flow Chart:



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III.DISCUSSION

a) Existing method :

The cylindrical roller bearings will be taken to the washing section. Initially, Kerosene is applied on the bearings. So that some grease will be removed from the bearings. The compressed air with the pressure of 8-10 kg-f/ will be applied then the bearing will be cleaning full. Servo gem 3 from Indian oil cooperation and Lithon 3 from Hindustan petroleum cooperation will be used as grease to clean the bearing. The main disadvantage with this method is the chemicals used to clean will effect the human health and there will be a more wastage of kerosene and compressed. Time consumption will be more as the cleaning process is going manually. This suggested machine will improve safety, reduce workload, time required, labour cost and wastage. The working of the suggested machine is explained very clearly in 4.a working section.

b) Description of parts:

i. Bearing:

A bearing is a device that is used to enable rotational or linear movement, while reducing friction and handling stress. Resembling wheels, bearings literally enable devices to roll, which reduces the friction between the surface of the bearing and the surface it's rolling over. Bearing can be used for power transmission. The commonly used bearing in railway is cylindrical roller bearing. A standard bearing size from the Maintenance handbook is adopted and drawn in Iron cad 3D. The Traction motor HS-15250A bearing is of 150mm Diameter. So we have taken the width of the bearing is 30mm. Fig.4.1 shows the roller bearing.

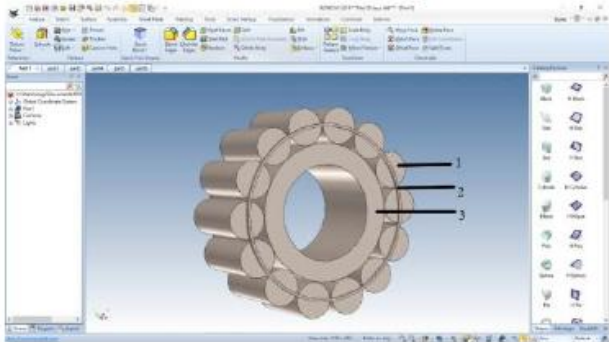


Fig.3.1 Roller Bearing 1- Cylindrical rollers

- 2- Cage
- 3- Inner ring

ii. Outer casing:

Outer casing will be provided to hold the bearing. A two pipes will be placed on the top of casing where in the one pipe kerosene will be passed and in the other pipe compressed will be passed. On both sides of outer casing, Pipes of compressed air in opposite direction will be placed to rotate the bearing. Most suggested material for outer casing is mild steel because of its high tensile strength, durability, light weight and more availability. Welding technique can be used for the mild steel is gas cutting since it is costly. Fig.4.2 shows the outer casing of the machine.

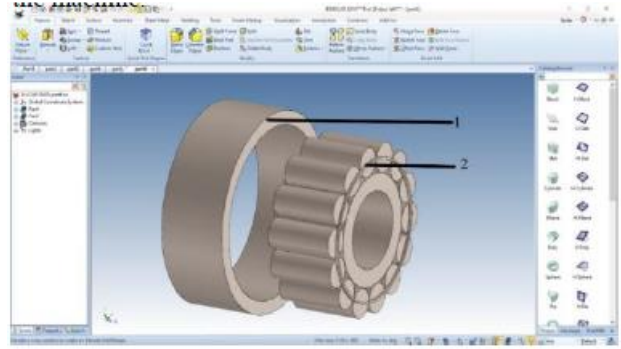


Fig.3.2 Outer Casing

- 1- Outer casing
- 2- Bearing

iii. Lock and Drain Area:

Lock will be provided to hold the bearing when the bearing is placed horizontally while the outer casing is in vertical direction. Drain area should be more so that the kerosene applied on the bearing will be washed out.

iv. Detailed Diagram:

The parts are disassembled in the fig.4.3 for clear understanding of every part.

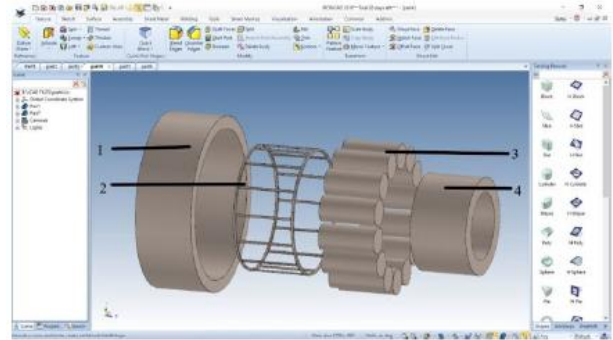


Fig.3.3 Detailed view of every part 1- Outer casing

- 2- Cage
- 3- Bearing rollers
- 4- Inner ring

v. Assembly:

Complete assembly of machine is made and shown in fig.5.1.

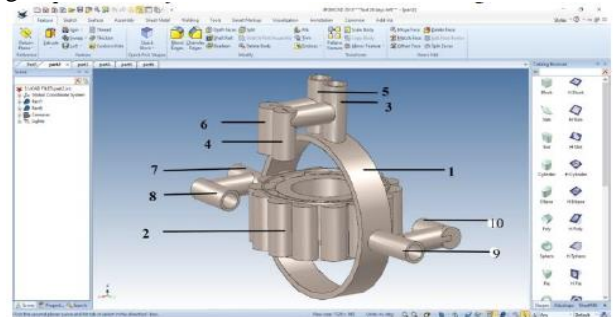


Fig.3.4 Assembly of the mechanical device

- 1- Outer casing: the details is given in
- 2- Bearing: the details is given in
- 3- Kerosene Inlet: the kerosene will come through this pipe .
- 4- Kerosene Outlet: From the kerosene inlet, kerosene will pass to the bearing
- 5- Compressed air Inlet: compressed air will come through this pipe.

- 6- Compressed air Outlet: compressed air will pass to the bearing.
- 7- & 9 -Compressed air inlet
- 8- & 10- Compressed air outlet: this compressed air will rotate the bearing with its pressure.

IV.RESULT ANALYSIS

a) Working:
This machine will work on main principle that kerosene air mixture will reduce the density and remove the grease from the bearing completely and it is collected in a drain. When the kerosene is applied from the pipe on the top casing and compressed air will also be applied from the another pipe on the top casing. A gauge pipes are required for flow of the kerosene and compressed air. A lock will be provided on the sides to hold the bearing perfectly and efficient cleaning. From the side pipes, compressed air will be applied to rotate the bearing. So that grease from the bearing will be removed and cleaned effectively within less time. The used kerosene will be collected from drain unit in the bottom. So that, After some filtration process, kerosene can be reused to serve the same purpose. The manual operation link of degreasing the bearing is provided for clear understanding.
Manual Degreasing Link:
<https://drive.google.com/file/d/1Wi6v5PWmLWn68N86U8nnCFv7Y2vMHXBL/view?usp=sharing>.

b) Design Suggestions:

vi. Outer casing:

As the standard diameter of cylindrical roller bearing is 150mm diameter and 30mm width. So the casing should be with 155mm with 5mm clearance and width can be 30mm because there is no need of providing any clearance on width of the bearing. The arrangement can be made as follows so that casing will hold the bearing while cleaning as shown in the fig.7.1.

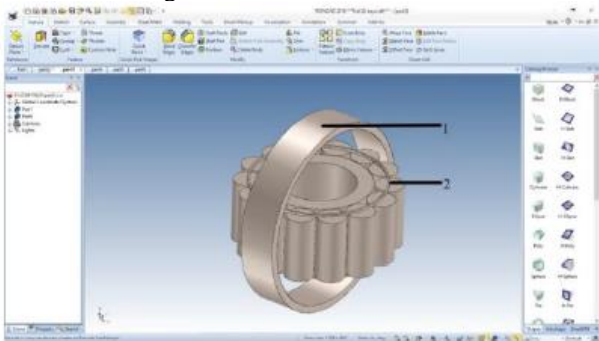


Fig.4.1 outer casing

- 1- Outer casing
- 2- Bearing

vii. Pipe diameter in top casing:

If there is less diameter to compressed air pipe then the velocity will automatically increase and moderate diameter size can be taken so that wastage of kerosene can be reduced.

viii. Drain area:

If there is more drain area to drain the kerosene then the cleaning will be done effectively but wastage will be there. So the drain area should be moderate so that wastage of kerosene will be less.

ix. Formulae:

These are the formulas required to calculate the details of this device:

- a) Drain Area= length * breadth
- b) Volume occupied = Area of the equipment* height of the equipment
- c) Weight of the equipment =volume occupied * density of material
- d) Material cost = weight * cost per unit weight

x. Advantages of Automatic Degreasing:

- 1. It may take less time compared to manual degreasing.
- 2. Work load for the workers will decrease.
- 3. The wastage of kerosene will be less compared to manual degreasing.
- 4. Safety is more and there will be no effect to human health.

xi. Future Scope:

- Sensors can be placed. So, the work can be done automatically.
- The compressed air and kerosene can be controlled by the computers by using sensors. So that machine can be controlled from the far distance.
- Weightless material can be used. So that it can be portable.

V.CONCLUSION

The design for automatic cleaning grease in the roller bearings is given. The detail 3D view is drawn in Iron Cad for the clear understanding. This device will decrease the wastage of kerosene and compressed air. It will reduce the effect of human health from the chemicals used in cleaning the roller bearing. The work load on the labour will decrease. The eight sight of workers while dealing with chemicals on cleaning can be avoided by using this suggested machine. The design for constructing this equipment is completely simple. The working of this machine is also very simple. So skilled person is not required. By filtration process the kerosene collected in the drain area can be reused so that cost for removal of grease from the roller bearing will be decreased. This suggested machine has better advantages than the manual degreasing method.

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