International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019

Mechanical Characterisation of the Coated Roller Bearing

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***Abstract:** Due to increase demand of rotating elements in various fields of mechanical, electronics and fluid industry there is a need for moving elements like rolling bearings. Since the supporting member is rolling bearings hence in this work we are trying to improve the performance by studying the structure of the material present in the bearing, type of optimised coating i.e by polytetra fluroethylene coating.coating an optimum layer of 0.05mm thickness and checking the performance at different speeds and various load conditions is examined .the surface topography after coating is checked using sem technique and the discussions are made. Comparison of different types of bio grease for the coated bearing material. Capturing these vibrations of the bearing using vibrometers and accelerometers and improving the remaining useful life of the bearing by changing the type of coating material.*

***Keywords:** Roller Bearing; Bearing Coating; Vibrometers; Condition Monitoring*

I. INTRODUCTION

In order to increase the life of roller bearing we are finding out the possible methods of enhancing the performance of its operation by studying the root cause of defect. The root cause of defects are the scoring , pitting and wear. To enhance this life of the bearing we are coating with a particular type of biocoating and surface topography is examined using SEM. Further by using different vibration signal capturing techniques the raw data is captured using Fast fourier transform. These data once captured can be studied by using different MAT LAB solvers to predict and improve the characteristics life of bearing.

DrNiranjan Hiremath et.al has observed that wear rate accelerated when direct metal to metal contact took place due to some misalignments after 4000 hours of run. Due to increase in wear, lubricant film is not capable to form a hydrodynamic film between rollers and outer race of pits, wear tracks and plough marks at the contact surface due to surface contact fatigue . Gropper et.al reported that surface texturing has been shown to be capable of enhancing the tribological contact performance for a wide range of applications. For a divergent film geometries of journal bearings for which optimal parameters have been shown significantly depends on the convergence ratio or the eccentricity , the choosen texture design will always be a compromise for the range of operating conditions encountered material characterisation , coating characterisation and recording the images using SEM and TEM images.

The Scope of present work is to

- Increase the life of the bearing by varying the coating thickness using poly fluroethylene as a coating technique
- Coating with different process parameters and different techniques
- Studying the characterisation by using SEM images after coating the rolling element by a suitable process

II. EXPERIMENTAL SET UP

Fig1: Experimental Set up for testing coated bearing

The above figure shows the mounting of a coated bearing on a suitable test rig with load varying from 400N to 1000N in incremental value of 100N . The overall dimensions of the equipment is 500mmX600mmX400mm .The motor capacity used is 1HP motor at a maximum speed of 1500rpm.In this set up a voltage of 200V 50 Hz supply is given to motor to start the set up .

There are supporting legs of c shaped mounted on the bottom of the frame for arresting vibrations. These supporting legs will also act as vibration absorber to arrest the vibrations of the system

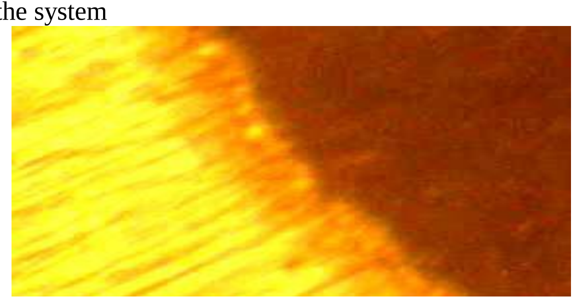

Fig2: Coating image of 0.3mm SnN and FeCrN coating by PolytetraFluroEthylene Method

Manuscript published on November 30, 2019.
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Fig2 shows coating of the bearingdone by using polytetrafluroethylene as coating material.The coating material used is SnN and FeCrN on the out side of the bearing .The process is carried out at 400 to 600º C.The evaporation of the particle of the coating material was great. The parts of the bearing is revolved at uniform speed to get uniform coating of materials

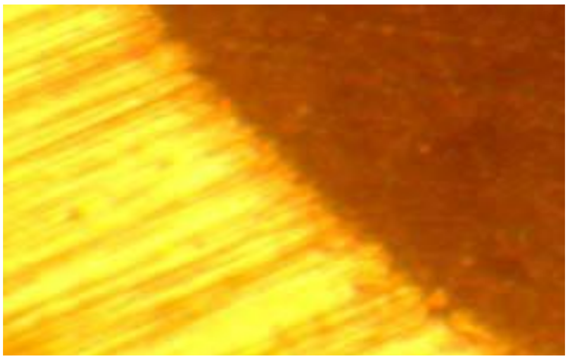

Fig3: Coating image of 0.6mm SnN and FeCrN coating by PolytetraFluroEthylene Method

Fig3shows the image of coating SnN andFeCrN on roller bearing with a speed of 150m/s. The required coating thickness obtained is 0.5mm. This coating is obtained between the rollers and insidediameter of roller bearing.We obtained a uniform distribution of the coating material

III. RESULTS AND DISCUSSIONS:

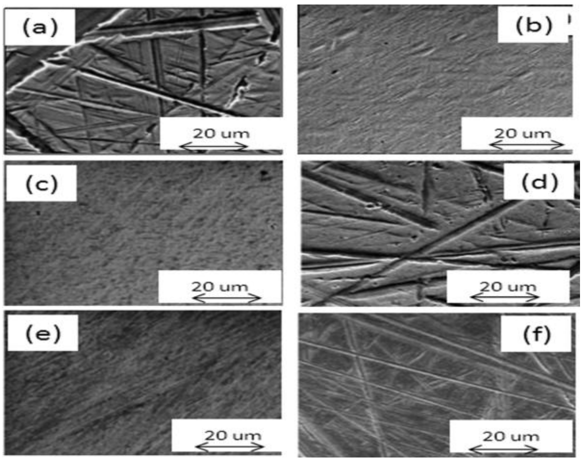

Fig4: Image of wear rate observed in SEM

The above figureshows the wear rate of the bearing observed at different speeds.Distribution of coating for same coating thickness and variation in speed of spraying the coating from 10m/s to 60m/s in increments of 10m/s .At 20m/s ,30m/s,50m/s we observed that the distribution of PTFE coating was uniform where as for 10m/s,40m/s and 60m/s we observed that the distribution of powder was not uniform but gave rise to waviness on the ball of the roller bearing which might give rise to unpleasant sound and noise causing failure of the bearing uncoated bearing under regular coating of 0.12mm

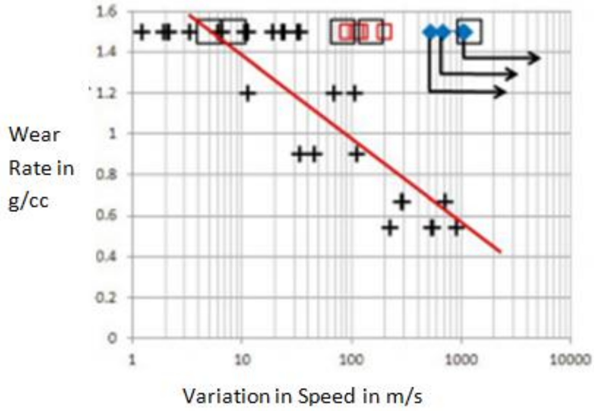

Fig5: Variation of wear rate v/s variation of speed in m/s

- The bearing after coating with polytetra fluro ethylene with varying speeds ranging from 10m/sto 100m/s in increments of 10m/s observed a decrease in wear rate for increase in speed . We observed that wear rate was decreasing from 1.6g/cc to 0.4g/cc

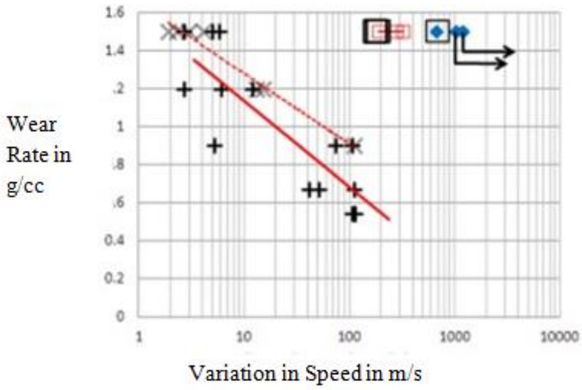

Fig 6:Variation of wear rate v/s variation of speed in m/s

When a coating thickness was increased to 0.14mm we observed that well below 1000m/s speed the wear rate was almost stagnant without gradual decrease in the wear rate of the specimen under consideration

IV. CONCLUSIONS

We found that at 0.14mm thick and at 1400m/s the wear rate was reduced. But as the coating increased to 0.16mm thick before the speed reached 1000m/s the wear rate was almost zero.Thus on repeated trials the optimised coating obtained was about 0.15mm thick .

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International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019

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