

## Statistics of Bearing Failure and How it looks like For Failure Due to Electrical erosion

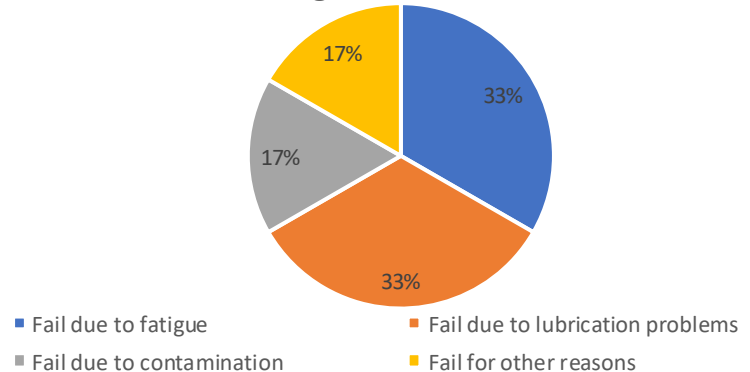
Every year an estimated 10 billion bearings are manufactured around the world. Only a small fraction of all bearings in use actually fail (Fig 1). Most of them (some 90%) outlive the equipment in which they are installed. A number of bearings (9.5%) are replaced prior to failure for security (preventive) reasons. Approximately 0,5% of bearings are replaced because they are damaged or fail. This means that some 50000000 bearings are replaced every year due to damage and failure. There are several reasons why bearings can be damaged or fail. Generally speaking fig 2:

- 1/3 fail due to fatigue
- 1/3 fail due to lubrication problems (wrong lubricant, wrong quantity, wrong lubrication interval)
- 1/6 fail due to contamination (ineffective seals)
- 1/6 fail for other reasons (improper handling and mounting, heavier or different loading than anticipated, wrong or inadequate fits)

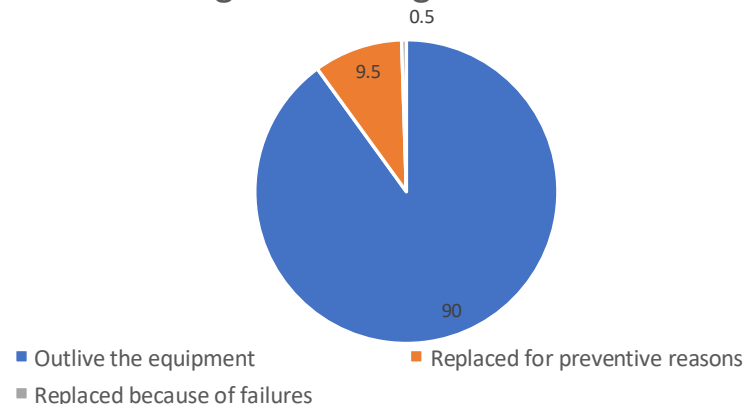
Possible cause of bearing failure is listed below

- Lubrication problem
- Sealing conditions
- Insufficient clearance in operation
- Improper bearing loading
- Metal-to-metal contact
- Contamination
- Too loose fits
- Surface damage e.g.- False brinelling
- Electrical Erosion

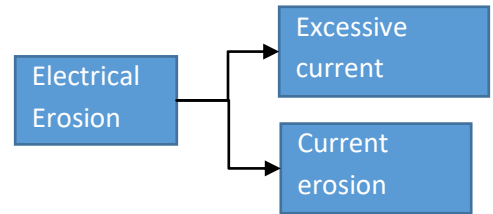
Several reasons why bearings can be damaged or fail



Percentage of Bearing life and failure



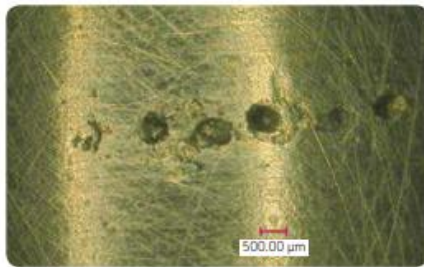
As stated in earlier writeup with increase in use of VVF, bearing damage due to Electrical Erosion has increased over time and we have understood the cause of bearing current in this writeup we would focus on how the bearing failure due to electrical current looks like so, that we can identify the cause of bearing failure.



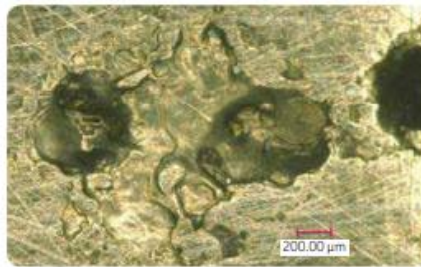
The Electrical Erosion is classified in to two as shown in the fig.

- 1) Excessive current
- 2) Current erosion

- 1) Excessive current



Craters of 0,5 mm in size



Magnification



Fig shows damage caused by excessive electrical current in a deep groove ball bearing, both on the outer ring raceway and ball. Notice the zigzag burns. Excessive current erosion on the roller of a spherical roller bearing.

- 2) Current erosion

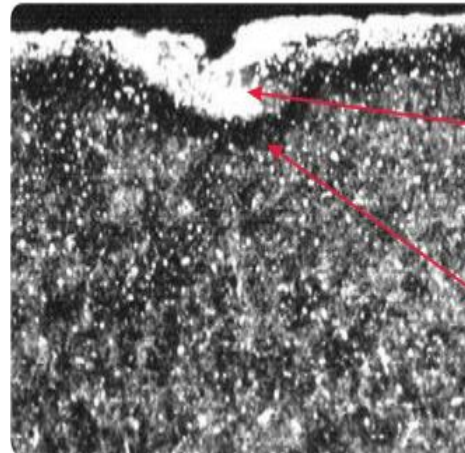
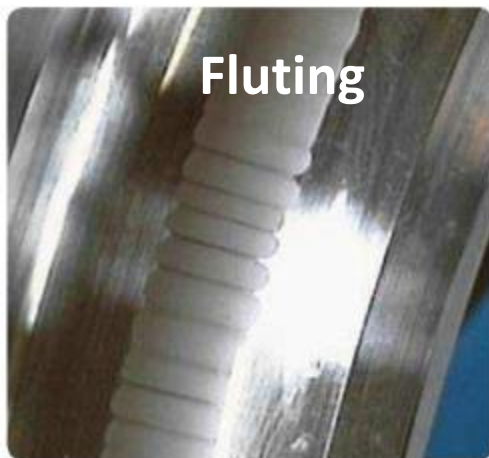
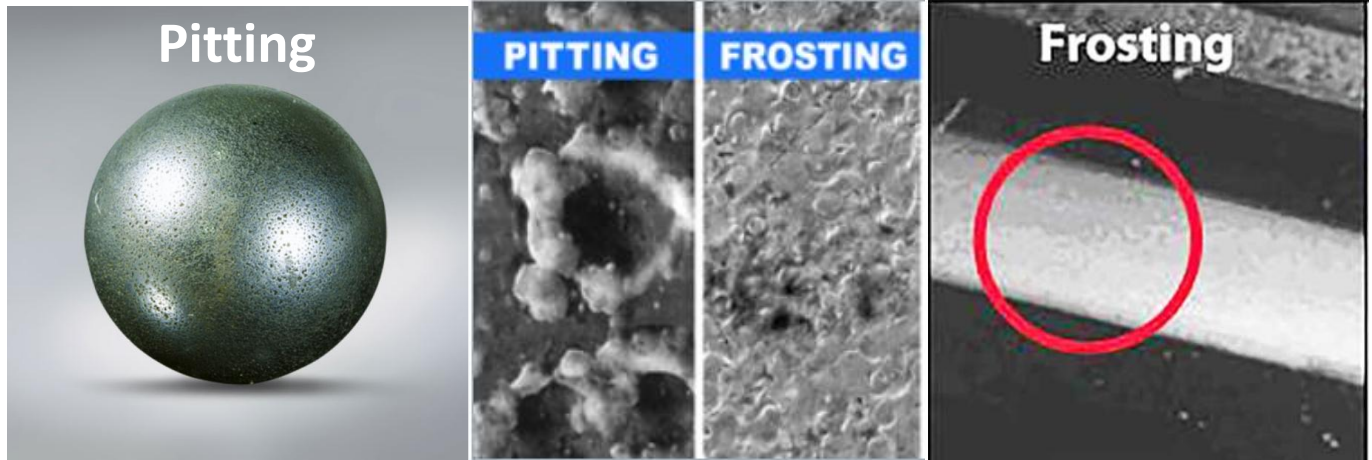


Fig. shows damage to a cylindrical roller bearing due to current leakage called as fluting mark. Washboarding is developing on the raceways and rollers. Notice the grease on the cage pockets. At the start of this failure mode, the grease is gradually carbonized and loses its ability to form a lubricant film. This eventually leads to surface-initiated fatigue, spalling and even sudden seizure.



The fig shows two more type of damage called as pitting and frosting caused due to current erosion.

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