



Issue 17: Is Fretting Corrosion a Function of Water or Chemical Attack?

When the word corrosion is used the first thought to most is “rust.” Rust is a coating or film of oxides, carbonates or hydroxides developing on a metal surface due to a chemical reaction. Rust can be caused by the contamination of water or other corrosive matter. Fretting Corrosion is better defined as fretting wear and is not a function of water or chemical attack. I, along with many bearing engineers, have been guilty of incorrectly using the term “Rust” for the sake of ease. In this article I will try to explain the phenomena of fretting corrosion (wear!)

Fretting Corrosion Process:

The issue of fretting corrosion occurs between the contacting surfaces of either the journal and bearing bore or the housing and the bearing outside diameter. In general, for bearings, the fitting is based on the rotating ring and how the load is applied. The objective to this fitting guideline is to avoid rapid spinning while allowing a slow creep between the two surfaces. While under load, the motion results in small wear particles that oxidize. The oxidization forms a layer of reddish black corrosion over the interference surface.



Pic 1: Fretting Corrosion on Outside Diameter

Different types of material react differently to this fretting corrosion situation. Most fretting occurs between corrodible steel and case iron fits. Stainless steel and nonferrous metal do fret but do not display the layer of oxidation (reddish black discoloration.)



Pic. 2: Fretting Corrosion on Bore.

How do I prevent Fretting Corrosion?

In most cases, fretting corrosion is not the cause of a catastrophic failure. Studying and paying attention to fretting corrosion patterns can help determine the root cause of a more critical bearing issue. The fretting corrosion pattern can help identify issue such as excessive/loose bearing fits, shaft or housing distortions (tapered shaft or housings, unsupported surfaces) or misalignment. As for preventing, a proper shaft and housing fit will reduce the amount of fretting corrosion to an acceptable level.

Conclusion:

Fretting corrosion is very common in the bearing world because one of the basic functions of a bearing is to transmit load across contacting surfaces. Although it is not normally considered a catastrophic failure mode, it is important to determine if the bearing is functioning properly. I would not spend too much time trying to eliminate fretting corrosion; but more on identification of fretting corrosion vs chemical corrosion.

