20 HP Motor Ultrasound Analysis CASE STUDY

UE SYSTEMS INC
The ultrasound approach

WHAT IS ELECTRICAL FLUTING?

Fluting is damage that is caused to a bearing due to an electrical current induced on the shaft of a variable frequency drive (VFD). Fluting is common in VFDs because if the motor in question is not VFD rated, then the current induced upon the shaft travels through the bearing, which can cause bearing failure at an exponential rate. To make sure your VFD machines are running efficiently, it is critical that you know how to properly diagnose and repair fluting. Running your machines at optimal efficienctly will significantly extend the life of your bearings.

A surefire way to physically see if a bearing is experiencing fluting is to simply check the inner ring for damaging ridges caused by an electrical current. However, there is an even easier way to detect fluting before it needs to be replaced– using modern bearing inspection tools and software.

CASE STUDY – ULTRASOUND ANALYSIS

Thankfully, there are many tools and software that you can use to diagnose electrical failure, such as fluting, in its early stages before. Using tools such as UE System's Ultraprobe 15,000, Ultraprobe 10,000, or 4Cast combined with Ultratrend DMS and Spectralyzer, you can record and analyze sound files by listening to sound trends and looking at visual data displayed in graphs.

In this case study, one of our customers suspected that fluting was occurring on a couple of their bearings. Here's what they were working with:

- 20 hp motor driving a fan mounted directly on the shaft
- 3540 RPM on a VFD running at 29.8 Hz; actual speed 1750 RPM
- Non-Fan End Bearing is 6309
- Fan End Bearing 6208

WHAT DID THEY FIND?

The sound file and graph data from January 2018 is showing multiple harmonics at 5,639 cycles per minute (cpm). The bearing opposite the fan end (6,309) is an 8-ball bearing. Based on that information and the normal operating speed of 1,750 rpms, this would indicate that there is an early outer race bearing defect (5,600cpm for 8 ball bearings) on the non-fan end bearing. While listening to the sound file, there are indications that electrical fluting may have been occurring, which would have then caused the defect.

In the January 2019 data, the overall noise floor has continued to rise, surpassing the 2018 reading in overall energy level. This is characteristic of a late stage bearing failure, which would warrant an immediate prioritization for repair.

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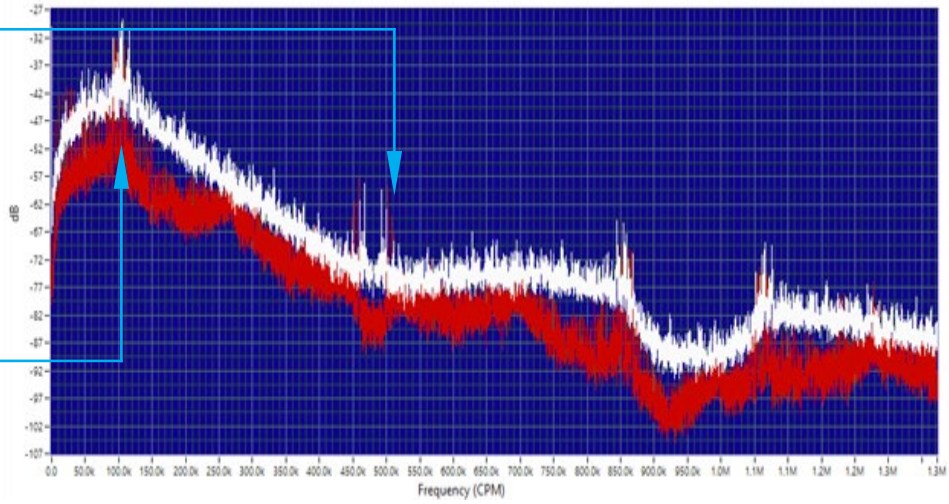
2019 data shows an increase in the raised noise floor indicating a late stage bearing.

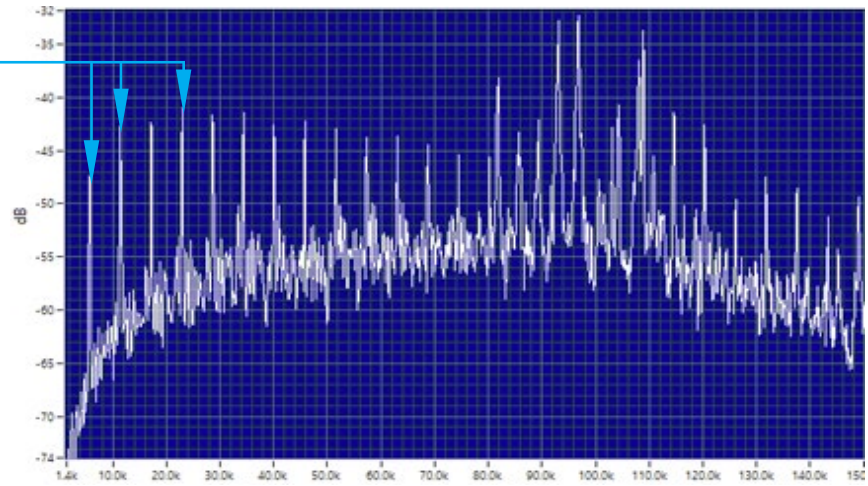
2018 data showing an early bearing defect with potential signs of electrical fluting found in the sound file.



January 2019 data.

Listen to the sound file here >

Bearing Outer Race Fault Frequencies from the January 2018 data. Harmonics of 5635 cpm can be seen; a generic 8- ball bearing frequency is normally 5600 cpm showing that the Non-Fan End Bearing is most likely the cause.



January 2018 data.

Listen to the sound file here >

CONCLUSION

By using bearing inspection tools and software, this customer was easily able to diagnose fluting present in their bearings, which then allowed them to replace the bearings before they caused even more critical damage to their assets.

"That's exactly what I wanted to hear," said the customer. "After listening yesterday, I thought fluting was the issue. I am ordering grounding brushes for this motor and adding them to the new motor."

After reviewing the findings, the customer took action and immediately solved the issue. Moving forward, they are confident that they will be able to diagnose and resolve any fluting issue they may face. Installing a consistent bearing monitoring and inspection process will help their machines continuously run at optimal efficiency, which will then allow them to extend the life of their bearings, ultimately saving them from preventable significant costs such as unexpected downtime and critical repair down the road.

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