Detecting lack of lubrication

with the

Airius wireless vibration sensor

by

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1 Introduction

Lack of lubrication is a major cause of bearing damage and bearing failure. Therefore, it is critical for vibration sensors to be able to detect the higher-frequency vibration resulting from lack of lubrication, which is generally far above 1 kHz. We tested the 5kHz Airius wireless vibration sensor from SPM Instrument. The following data are from our dry bearing test, simulating a dry bearing fault developing followed by re-lubrication.

2 Conclusion and summary

The results confirm that the wireless sensor technology used in the test is indeed capable of detecting lubrication issues. The results also clearly demonstrate the importance of selecting a high enough Fmax to capture the high-frequency vibration signals typically associated with lack of lubrication in bearings.

3 Test procedure

3.1 Implementation details

Test parameters, results, and graphics are reported below.

1. Bearing: SKF 6205
2. RPM: 2100
3. Motor: HP 1.5
4. Machine type: Test stand with belt-driven, overhung rotor
5. Airius 5 kHz wireless vibration sensor
6. Condmaster Ruby 2020 analysis and diagnostics software.

Data was taken over a period of 2.5 hours. The bearing was a new pillow block mounted, the seals of which were removed to accommodate removal of the grease during the test.

The test was carried out in steps as follows:

1. Test rotor ran for 30 minutes with normal grease amount.
2. After 30 minutes, the grease was gradually removed while running.
3. After a nominal amount of grease was removed, the rotor ran until the residual lubrication was depleted.
4. Complete depletion of the lubricant was achieved and resulting plots are shown.
5. In this step, grease was reintroduced into the bearing.

4 Test results

The following Condmaster Ruby screenshots clearly show the trending amplitudes from the depletion of the lubricant. This is followed by a sudden increase in vibration once the bearing is totally void of any trace of lubrication.

This event is followed by the re-introduction of grease to the bearing. The vibration levels instantly reduced; however, vibration levels are elevated from the baseline by .192 g's. The vibration spectrum and color spectrum plots easily show the event cycle and the increased vibration from lack of lubrication. Looking at the spectrum plots, the bottom spectrum shows the 1 kHz cut-off point. It can be concluded that if the sensor used had an Fmax of 1 kHz, the lack-of-lubrication event and resulting damage would not be detected, as the primary frequencies are around 3.3 kHz.

Image 1 Condmaster Ruby Colored Spectrum Overview plot.

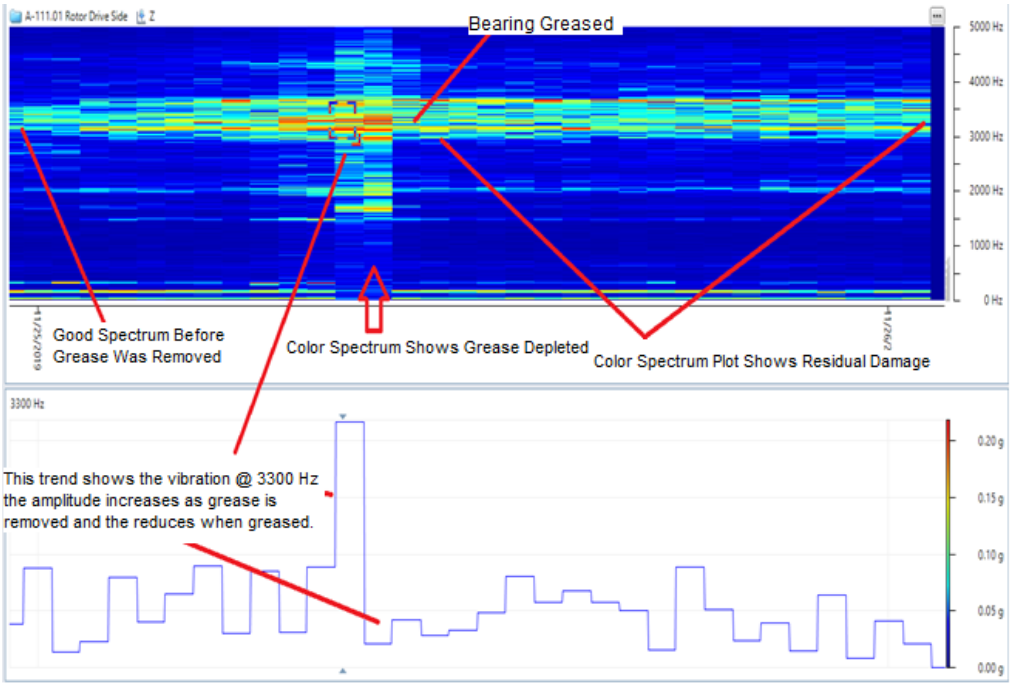


Image 2 Rms overall trend graph in g's.

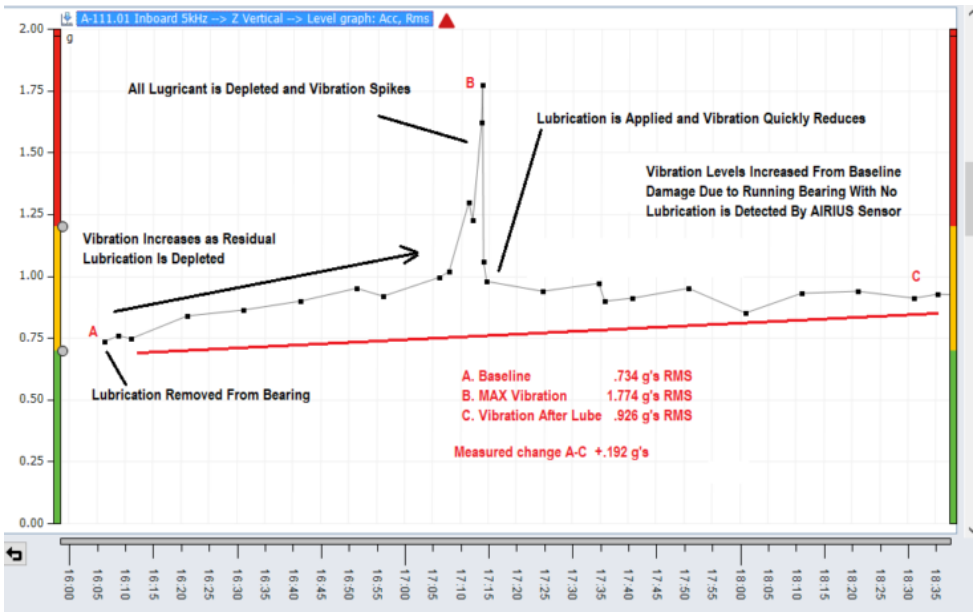
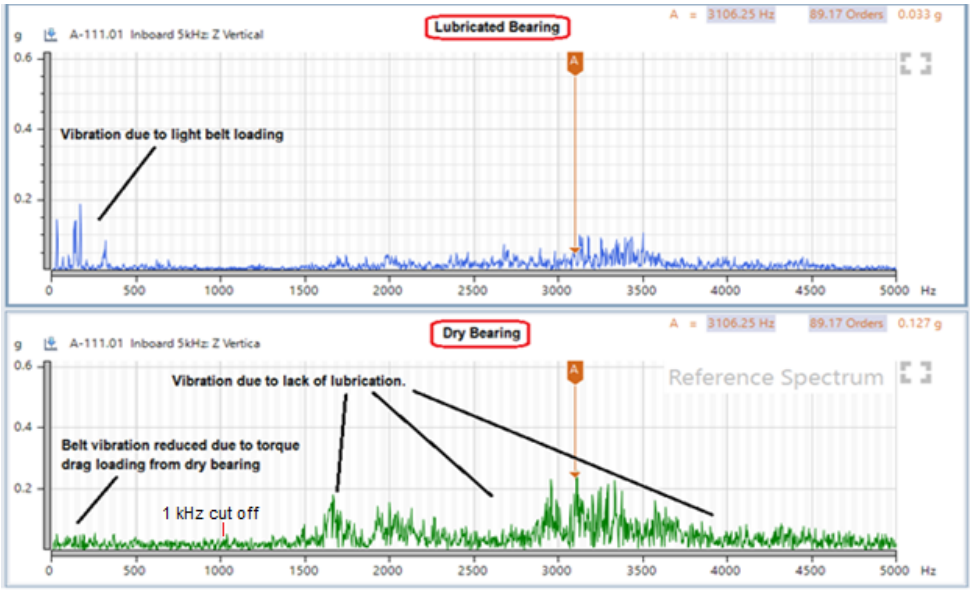


Image 3 Condmaster Ruby spectrum plot.



5 References

5.1 About the author

Mike Olszewski is president of Reliability Concepts and inventor of the B.A.T. Belt Alignment Tool®. In his over thirty years of reliability experience, he has implemented reliability and condition monitoring programs for many users in a variety of industries. He also provides vibration analysis and vibration analyst certification training. Some of his experiences and certifications include CDI Degree in Computer Technology, University of Michigan Degree in Business Management, Vibration Institute Vibration Analyst CAT III, industrial reliability engineer, industrial electrician, and maintenance manager.

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