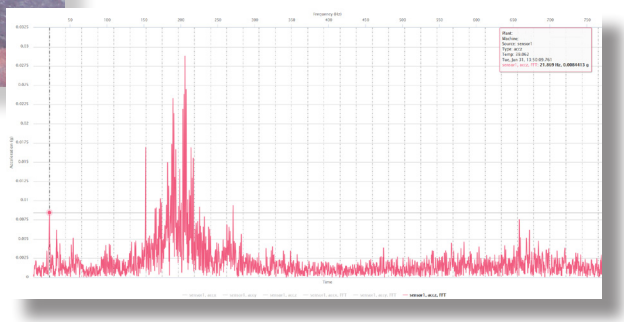
DYNAPAR™

Case Study

Online Condition Monitoring Enables Paper Plant to Detect and Monitor Bearing Issue, Avoid Unscheduled Downtime

Affordable online monitoring system enables paper manufacturer to safely delay bearing replacement until scheduled monthly maintenance while mitigating risk of unexpected downtime to maintain production schedule.



Case Study

Online Condition Monitoring Enables Paper Plant to Detect and Monitor Bearing Issue, Avoid Unscheduled Downtime

Affordable online monitoring system enables paper manufacturer to safely delay bearing replacement until scheduled monthly maintenance while mitigating risk of unexpected downtime to maintain production schedule.

Paper manufacturing is a complex, tightly synchronized process. Wood pulp enters the line from the head box as a process slurry and exits at the uptake role as finished paper. In between, it passes through banks of high-speed rollers that squeeze out water, adjust thickness, and dry the paper, maintaining precise web tension all the while (see figure 1). Equipment failure in this type of system does more than just stop production. It disrupts the process, requiring time-consuming cleanup and restart. This downtime can cost as much as $10,000 per hour and stretch into days.

When a major manufacturer of paper goods for the food and beverage industry identified a bearing problem on a roller in its main manufacturing line, the reliability manager sought to maintain production while preventing failure. By using the Dynapar OnSite™ Condition Monitoring System, they were able to operate their equipment with confidence.

Figure 1: in a paper processing line, slurry passes from the head box onto screened conveyors where rollers quickly compress it into a wet web. In the wet press section, felt rollers squeeze out the liquid, consolidating the fibers and reducing the thickness. In the dryer section, heated rollers remove additional moisture.

Continuous Monitoring

The manufacturer's third party vibration expert discovered the troubled asset during routine route-based testing. The vibration spectrum of the suction-roll bearing displayed the characteristic frequencies of an inner-race defect with sidebands of RPM (figure 2). The time waveform showed excessive beating with high peak-to-peak vibration (figure 3). The condition of the bearing was poor.

See Appendix A for additional FFT and Time Waveform Plots.

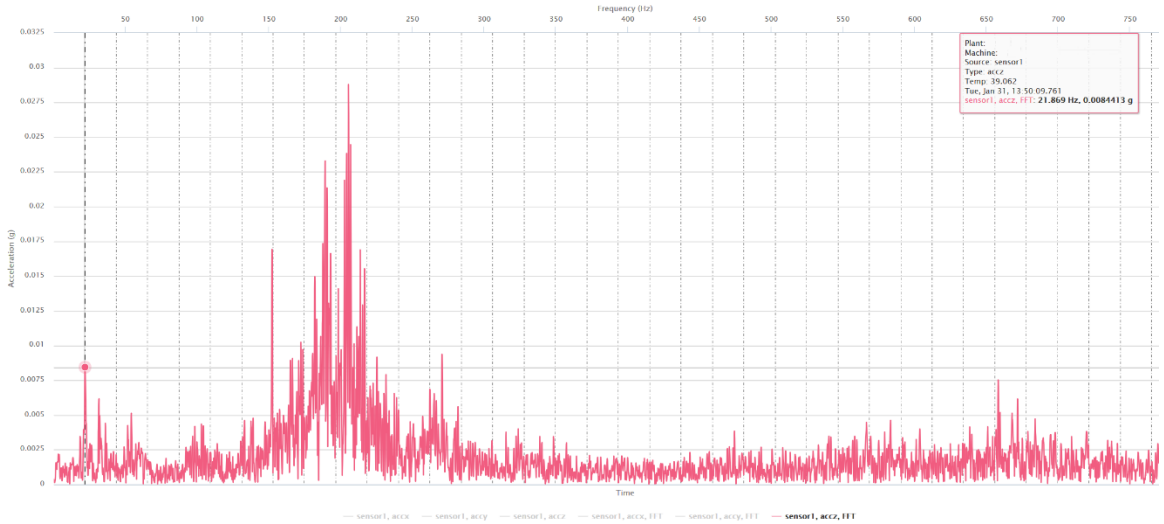


Figure 2: Magnified plot of acceleration as a function of frequency exhibits sidebands around 150 Hz to 200 Hz, characteristic of bearing damage.

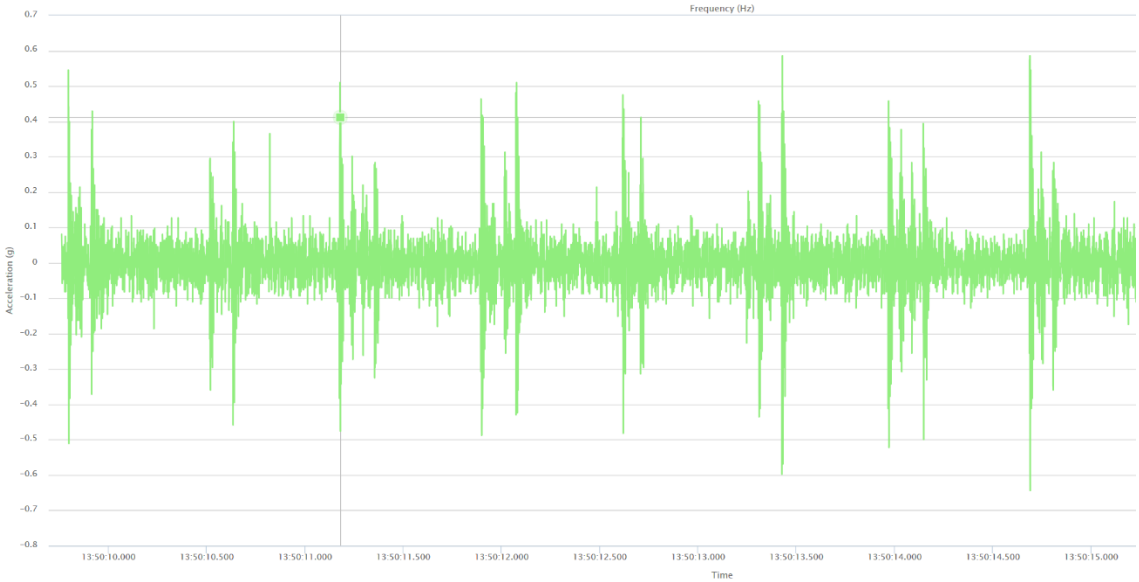


Figure 3: Frequency spectra captured over time shows the high peak-to-peak vibration.

Ideally, they needed to change the bearing before it failed and stopped the line, which fed paper stock to multiple converting lines. Unfortunately, the line normally operated 24/7, aside from monthly shutdowns for scheduled maintenance. Unscheduled downtime carried an unacceptably high cost, but so did stopping the line off schedule. Management needed to make the repair in the most cost-efficient fashion possible. They

decided to continue running the line but to monitor the bearing closely to take action if it appeared close to failure

The location of the suction roller made it difficult for personnel to access it more than once a week. Although route-based monitoring identified the problem, continuing operations with the bearing in place required more frequent data capture than was possible with route-based readings. The paper manufacturer found a solution with the OnSite System. They mounted the unit on the suction-roll bearing in minutes and began transmitting hourly readings over a wireless link.

Data Analysis

The frequency of data capture generated highly-granular frequency spectra that provided a clear understanding of the behavior and health of the bearing. The results showed increased amplitude in the overall vibration spectrum with the addition of new frequency peaks and overall noise floor was raised that indicated increasing instability (see figure 3). After analyzing the data, the team concluded that the bearing was troubled but functional enough to maintain operations. They could make that decision with confidence, knowing that the near-constant readings would reveal any sudden changes in condition that might point to impending catastrophic failure. In the meantime, they got a longer lifetime out of the existing asset and avoided the cost of unscheduled maintenance.

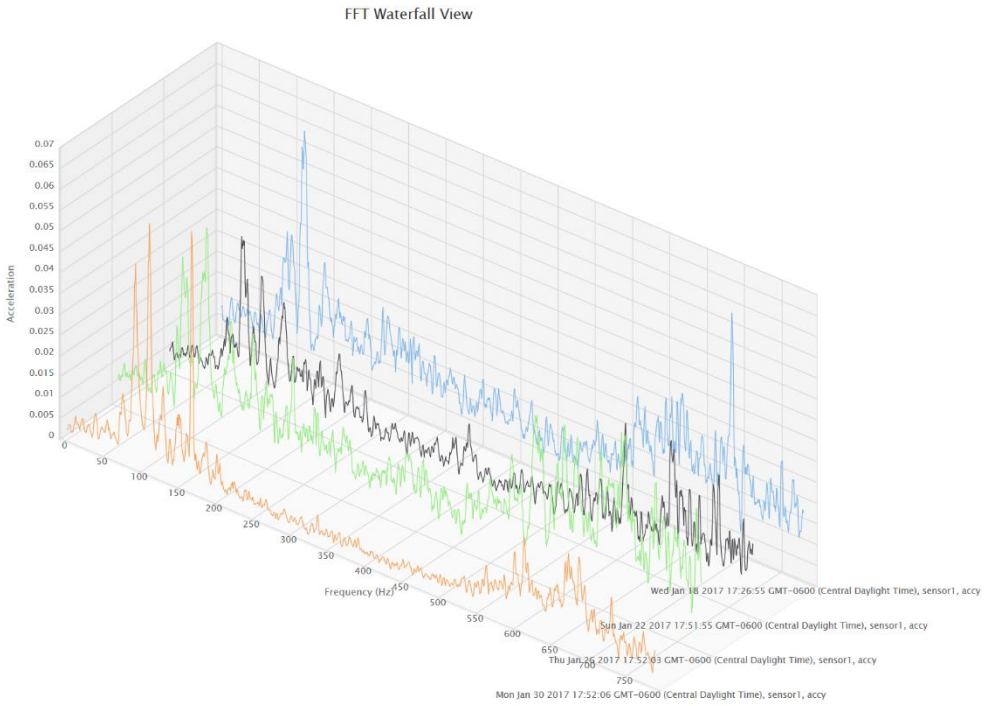


Figure 3: Waterfall plot generated by the OnSite System enables a comparison of vibration spectra of the troubled bearing over the course of several days.

Three weeks after monitoring began, the maintenance team replaced the bearing in the suction roll. (see figure 4).

Figure 4: Picture of the suction roll bearing housing and the mounted sensor.

Conclusion

Continuous condition monitoring makes it possible for asset owners to conduct manufacturing operations on their own terms. The steady stream of information enables them to better use their human assets and physical assets for higher productivity and lowered costs through predictive maintenance. Until now, the biggest barrier to entry for this type of monitoring was the price point. The feature-rich performance and affordability of the OnSite System make it suitable for broad deployment, delivering insights and savings from across the plant.

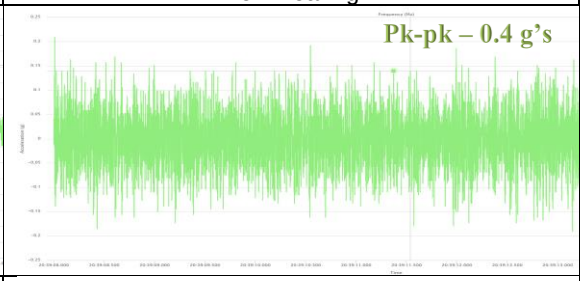
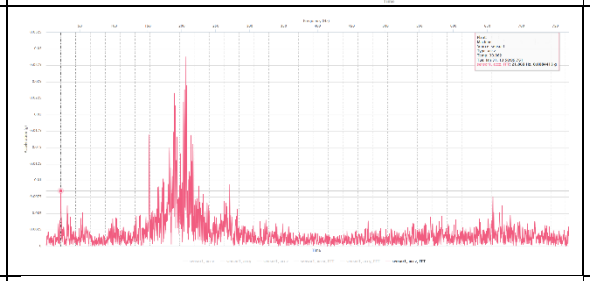
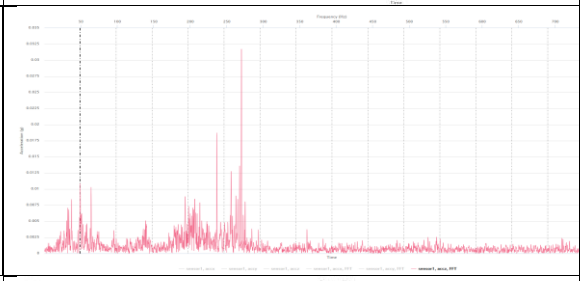
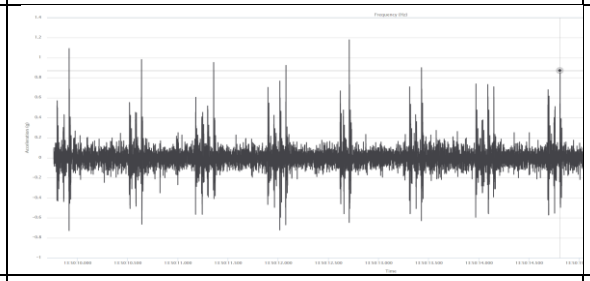
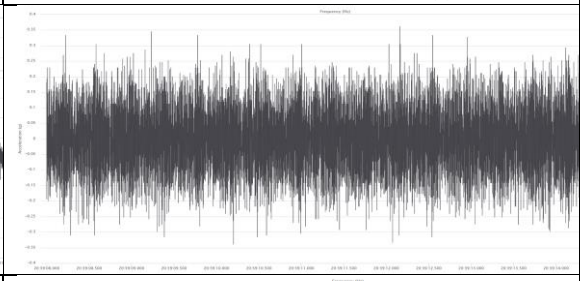
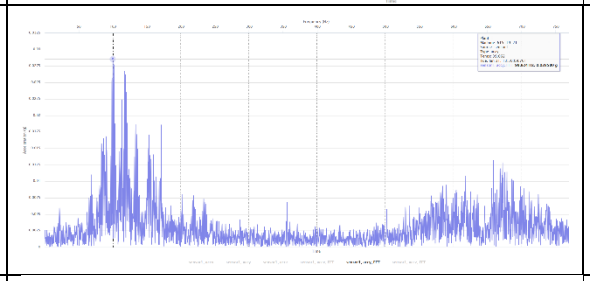
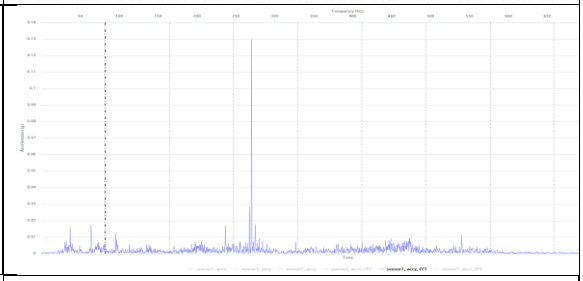
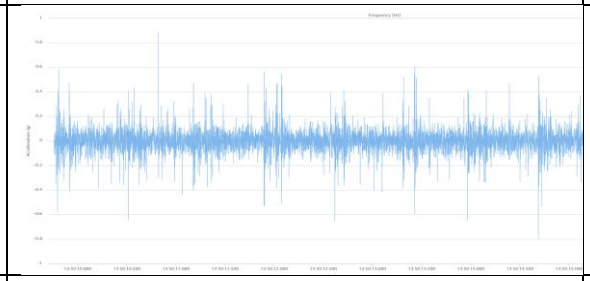
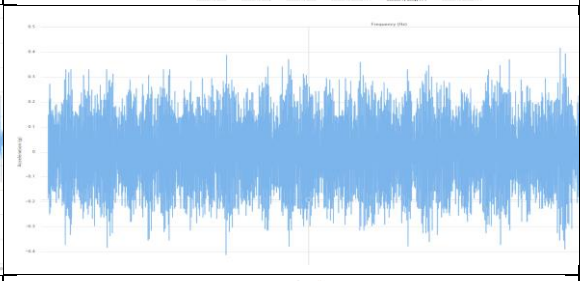
Additional Resources:

- Learn more about vibration analysis best practices and continuous vibration monitoring here
- Learn how to develop a predicate maintenance program by starting small and scaling here
- See how remote monitoring prevented downtime by catching the failure of an auto-lubrication system here

About Dynapar

Dynapar is an industry leading supplier of encoders, resolvers and condition monitoring solutions. From small kit encoders to large mill-duty tachometers, Dynapar has a strong market presence in a wide range of industries including steel, paper, elevator, oil and gas, aerospace & defense, medical, material handling and industrial servo manufacturing. Dynapar offers a broad array of encoders and resolvers through our well established Dynapar™, Hengstler™, NorthStar™ and Harowe™ brands. Dynapar also provides 24/7 remote condition monitoring systems with built-in cloud-based analytics. Dynapar supports global customers with local sales and production locations in Germany, Japan, China, and Brazil.

Appendix A

Asset Point	Old Bearing	New Bearing
TWF (Hor)		
FFT (Hor)		
TWF (VER)		
FFT (VER)		
TWF (AXIAL)		
FFT (AXIAL)