Background

The Fishing Vessel Northwestern is a famous commercial crab fishing vessel which has been featured on television for more than 15 years as working in one of the most dangerous fisheries in the world. The crew of Northwestern battle against deadly Alaskan seas, freezing weather, and dangerously brutal storm conditions on a regular basis in order to catch their quota. Survival In these conditions is dependent on the reliable operation of ship machinery and systems therefore, maintenance becomes an integral part of their regime.

During the off seasons, The Northwestern typically engages in salmon chartering activities. While not exposed to harsh environmental conditions, it presents a shift in the criticality of assets and adds additional challenges to the operations. Certain conditions need to be met in order to ensure safety and smooth operations.

Atlas Reliability, LLC, a Distribution Partner for Nanoprecise, has been a supplier for the Fishing Vessel Northwestern for more than 3 years. Atlas has partnered with the crew of the Northwestern to provide innovative solutions for the challenging environment for which the ship operates in. Being able to plan the maintenance and prevent catastrophic failures has been key to the success in the relationship with Northwestern.

The Challenge

Major maintenance, while at sea, is impossible to accomplish as sea conditions and logistics prohibit safe and effective execution of such activities. Additionally, the dependence of critical systems functioning to support safe navigation and operations prohibit taking equipment offline during times while the ship is operating.

Generally, maintenance work is completed while the vessel is dock side. Even dockside, access to materials and trained personnel are still challenging when the ship is docked in Dutch Harbour, Alaska. Long transit times and expensive expedited fees make planning maintenance an even more critical task.

www.nanoprecise.io
solutions@nanoprecise.io

www.atlasreliability.com
info@atlasreliability.com

With longer time spent at sea, the chances of equipment failure propagation leading to a catastrophic failure becomes increasingly likely. Vessels of this type do not have room for excessive redundant systems. So, the crew of the Northwestern vessel decided to incorporate a predictive approach towards their maintenance activities so as to avoid any operational failures and ensure smoother sailing.

The productivity of service vessels depends on good working condition of the propulsion system—consisting of main engine, reduction gearbox, propulsion shaft, bearings and propeller. The reduction Gearbox is used to convert the output shaft revolutions from the main engine to those required to rotate the propeller. Failure of the reduction gearbox can lead to loss of power to the vessel's engine, leading to detrimental losses – both financial and that of human lives.

The Solution

Atlas Reliability and Nanoprecise proposed the Machine-Doctor™ wireless sensors with the Automated AI-based end-to-end predictive maintenance software RotationLF™. The Machine-Doctor™ wireless sensors were installed on critical assets as well as the Reduction Gearbox. Once installed, strong battery-powered wireless sensors started sensing and sending 6 streams of data – Acoustic, Acceleration, Magnetic Flux, RPM, Temperature and Vibration, to our SaaS-based analytics platform through an encrypted & secured network using Edge and Cloud computing. As data was received, the RotationLF™ analysis platform provided automated data analysis using highly sophisticated algorithms to ensure that the Northwestern crew can focus on their operations.

What Was Detected

On the first transit following installation, RotationLF™ indicated a rise in the amplitude of the acoustic emissions of a bearing, which was then notified to the crew of the Northwestern shipping vessel. Working with the crew, we remotely coordinated troubleshooting and identified that lack of grease was the potential culprit. This allowed the crew to grease the bearing, resulting in the lowering of the acoustic signal to the baseline level.

On August 29 & 30, 2021, the Northwestern team received a NanoAI alarm from the Nanoprecise Dashboard, indicating an unbalance on the drive end of the Reduction Gearbox. An increase in the vibration RMS for the Z-Axis (vertical) was flagged as the value exceeded the NanoAI alarm threshold. There was no marked increase in the X or Y Axis (Axial or Horizontal). The amplitude increase of 1X RPM (the 1st harmonic of RPM) was noted. The amplitude of 1X @ 1378RPM reached 0.3in/sec on Aug 29 & 30, 2021. There was no major change in the ultrasonic or temperature signature for these times.
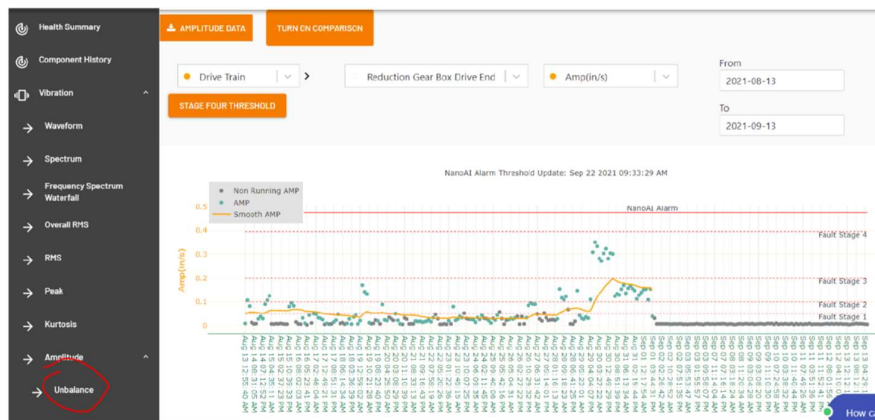
Frequency Spectrum Waterfall
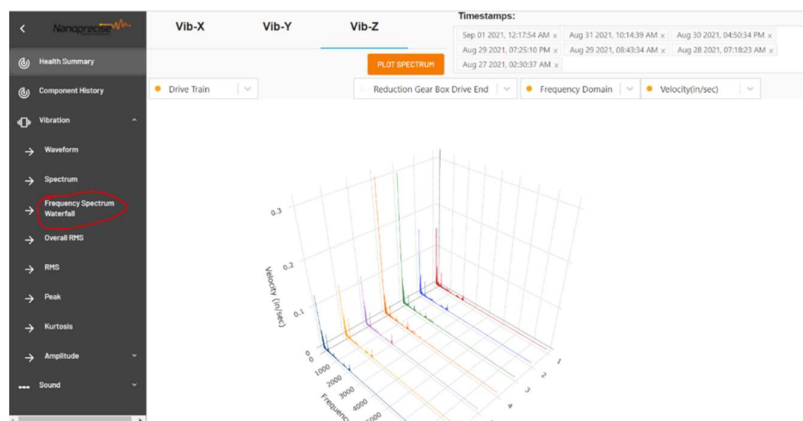
Vibration RMS Plots

Fault Amplitudes: Unbalance

The same increasing trend was observed in the amplitude plot of the fault mode Unbalance.

The Outcome:

The Nanoprecise system provided the notification to key people about this abnormal trend and the crew of the Northwestern vessel reduced the RPM from 1378 to 1002. This resulted in a decrease of the amplitude velocity from 0.3in/sec to .14 in/sec in the axial direction. The frequency of the Alarm was at 1X RPM which was indicative of an unbalance (displayed in the NanoAI Alarm Threshold Amplitude).

Upon a detailed discussion with the technical team, the Northwestern Vessel personnel planned for an inspection on the coupling between diesel engine and the gearbox once they arrived at Dutch Harbour in Alaska.

The automated AI-based predictive maintenance solution consisting of Machine-Doctor™ sensors and RotationLF™ platform sensed & detected anomalies from the output parameters of the machines, and alerted staff of the fishing vessel regarding these unusual trends automatically. As a result of the accurate diagnostics, the team was able to take immediate action in order to increase the reliability of the vessel, thereby preventing a potential catastrophic failure.

www.nanoprecise.io   www.atlasreliability.com
solutions@nanoprecise.io   info@atlasreliability.com

About Nanoprecise

Nanoprecise specializes in the implementation of Artificial Intelligence and IoT technology for predictive asset maintenance and condition monitoring. Our timely and accurate diagnosis of machine faults provides our clients with insights that allow them to make decisions that will help save considerable time and resources. Nanoprecise is headquartered in Edmonton, Canada with branches in Bangalore, India; San Diego, USA, and Newcastle, UK. We have managed to establish ourselves as a trusted solution provider in the asset management industry.

Talk to our experts   **solutions@nanoprecise.io**   **North America I Asia I USA I UK**

About Atlas Reliability

Atlas Reliability, LLC is a turn-key maintenance and reliability provider located in Houston, Texas.

Atlas has over 50 combined years of experience designing and implementing maintenance and reliability programs. Atlas' industry partners are world class product manufacturers on the cutting edge of the technology. Our condition monitoring solutions are all designed to meet the stringent requirements of the maintenance and reliability professionals.

Our focus is making our clients self-sufficient in maintenance and reliability. The solutions we provide are tailored to each plants' unique needs. We ensure our customers have the tools and training required to achieve their reliability goals.

Contact Atlas Reliability, LLC   **www.atlasreliability.com**   **info@atlasreliability.com**