CASE STUDY

# Low speed drum hoist bearing monitoring system

## Online monitoring with short operating cycle

## Application

At a large potash mine in Esterhazy, Saskatchewan, Canada, a 19.5 ft. diameter drum hoist, rotating at 60 RPM, is used to bring freshly mined material to the surface by raising and lowering two loading sleds. This is the only drum hoist at this mine location and its performance is absolutely vital to the mine's operation. To ensure the highest level of monitoring of the drum hoist's condition, SymphonyAI Industrial applied an online condition monitoring system using its SpriteMAX™ platform to continuously capture and diagnose potential faults from the machine's vibration spectral data.

Following each contiguous sample, the data is run through the SpriteMAX's integral automated diagnostic system for analysis. Deviations from the expected vibration spectral signature are identified and passed through a number of fault models specific to this machine type and application. The system then flags any identified fault and alerts the hoist control room via a mimic display and sends an email to the hoist engineer.

## Challenge

The total cycle time for one sled to be raised from the bottom and the other sled to be lowered from the top is roughly 90 seconds. The sleds are loaded and unloaded simultaneously over the next 12 seconds and then they each begin the return cycle. That 90 second cycle is broken into three sections. The first 25 seconds is the initial acceleration from rest to full speed. The sleds are at full speed for the next 40 seconds, and then slow to a stop over the final 25 seconds. To ensure we are comparing the current spectra to the established average spectra (the expected pattern of frequencies and amplitudes), we need to maintain the same speed and load conditions for each test. Based on the 90 second cycle described above, the only period of time that meets that repeatable condition is the 40 second stretch when the sleds are at full speed.

## Solution

In order for the SpriteMAX to determine when the sleds were at steady speed, a tachometer signal is read multiple times and compared to the previous reading. The system was set to determine if the hoist was operating in the clockwise or counterclockwise direction. Once steady speed and the rotation direction have been verified, the data acquisition begins. Due to the slow rotation rate of 60 RPM, a long time waveform is first captured (7 seconds at 40,960 Hz). This waveform is also passed through the Fast Fourier Transform to generate spectral data of 0–500Hz and 0–12,000Hz frequency spans. In addition to the time waveform and spectral graphs, a demodulated graph with a frequency range of 5,000 — 10,000 Hz is acquired. This demodulated test is ideal for detecting the impacting signal of rolling element bearings during the very early stages of wear and fatigue.

## Benefits

Prior to commissioning the SpriteMAX system, the hoist engineers would perform a battery of specialized tests using their hand held instruments on a monthly basis. With SpriteMAX as the early warning system tracking the health of the hoist bearings, the hoist engineers can focus their attention on their myriad of other tasks. When the SpriteMAX system alerts them to a change in the bearings health, the engineers will observe the SpriteMAX data and/or perform other specialized tests to determine the rate of degradation. With the help of SpriteMAX online monitoring, they are able to apply timely and planned corrective action, such as additional lubrication or schedule repairs to coincide with planned hoist/cable maintenance.