Truck Fleet Monitoring

METALS & MINING

Data Sources

- Process Data Historian: OSIsoft PI
- Asset Structure: OSIsoft PI AF

Data Cleansing

- Enables removal of invalid data points from communication dropouts or sensor calibration

Calculations & Conditions

- Calculate travel time from the base to top of the mine.
- Create a condition for excessive travel times
- Create reference profiles for gear selected by operator, engine load, payload, throttle position, and ground speed
- Create composite conditions for deviations from the reference profiles and long travel times
- Scale across hundreds of trucks in Treemap

Reporting & Collaboration

- Seeq Organizer Topic set to a Live Document to read maintenance flags in near real time to notify the Operations Center

Challenge

In the mining industry, it is critical to monitor and maintain the health of the large, rugged trucks that bring material from the bottom of a mine to the surface. With an average value of more than $3 million per truck, these assets are essential to the mining operation. Working under extreme conditions, it is common for the trucks to develop engine trouble. The cost of unplanned truck downtime is high.

But managing truck maintenance is complicated and time-consuming. Maintenance parameters vary from truck to truck, making it difficult to scale across a large fleet. Calendar-based maintenance is costly and can be unnecessary.

Traditionally, mining companies have not done condition-based monitoring of the health of their truck fleets, performing maintenance tasks on an arbitrarily chosen schedule. But this led to both truck breakdowns, as well as time and money wasted on unnecessary maintenance.

A modern approach is to use condition-based monitoring to flag when an engine is due for repairs. Telemetry on the trucks often has enough information to proactively signal an engine problem, making it straightforward to monitor a single truck asset. However, the availability, sample frequency, and magnitude of signal readings can vary widely from truck to truck, making it difficult to scale this approach across an entire fleet. Due to this complexity, a mining operation will often revert to the more costly calendar-based approach.

Data analysis is a better way to identify trucks needing maintenance by combining excessive travel time identification with profile monitoring of truck telemetry signals that assess truck health. This approach can also incorporate logic to identify and exclude excessive travel times due to non-engine issues (such as mandatory operator breaks).

A global mining company wanted to more accurately assess the condition of its fleet of trucks in order to increase asset availability and decrease the payback period for each truck.

Solution

Using Seeq, the mining company's engineers were able to identify trucks needing maintenance based on long travel times to the top of the mine. The team analyzed correlated signals such as gear, engine load, and throttle to determine truck health. The analysis was easily scaled to hundreds of trucks in the mining company's fleet.

Using Seeq, the mining engineers created an analysis to identify all the trucks exceeding a minimum time to traverse to the top of the mine. Seeq created capsules during these times and then further tuned the analysis by identifying deviations in the following signals: gear selected by operator, engine load, payload, throttle position, and ground speed. Finally, a Treemap was built to visualize the trucks that had significant deviations during their travel. This provided the engineer with a fleet-level view of the trucks, highlighting those that required immediate maintenance.

Results

The visualization in Seeq now shows all the trucks in the fleet that are experiencing a maintenance condition before a failure occurs. Preventing a single truck failure saves the mining company approximately $100,000 in parts, labor, and lost opportunity–with significant fleet-wide savings.

Using Seeq's analysis and a Treemap visual, the mining operation dramatically reduced the time required to analyze trucks for preventive maintenance. The maintenance team has eliminated the need to periodically schedule truck maintenance. Now, the maintenance team concentrates its efforts on vehicles that truly need the service, a major savings of engineer and mechanic time and effort.

Treemap for a truck fleet highlighting those due for maintenance (in red).