

Predictive Monitoring and Machine Learning of HVAC Equipment



Industry: Building Services



Asset: HVAC Equipment



Goal: To develop a reconfigurable analysis platform for predicting maintenance of building services equipment.

Overview

This case study on air condition systems was in collaboration with Daikin Industries, Ltd., The Global Leader of HVAC systems Manufacturing based out of Osaka, Japan. The goal of this collaboration was to develop, test and validate Predictronics health monitoring capabilities for air conditioning units. Approximately 2-10 years of historical data from a number of air conditioning units were used in this project. The amount of historical data analyzed for this project varied depending on each individual unit. Some of these units experienced failure events that were documented in the maintenance records.

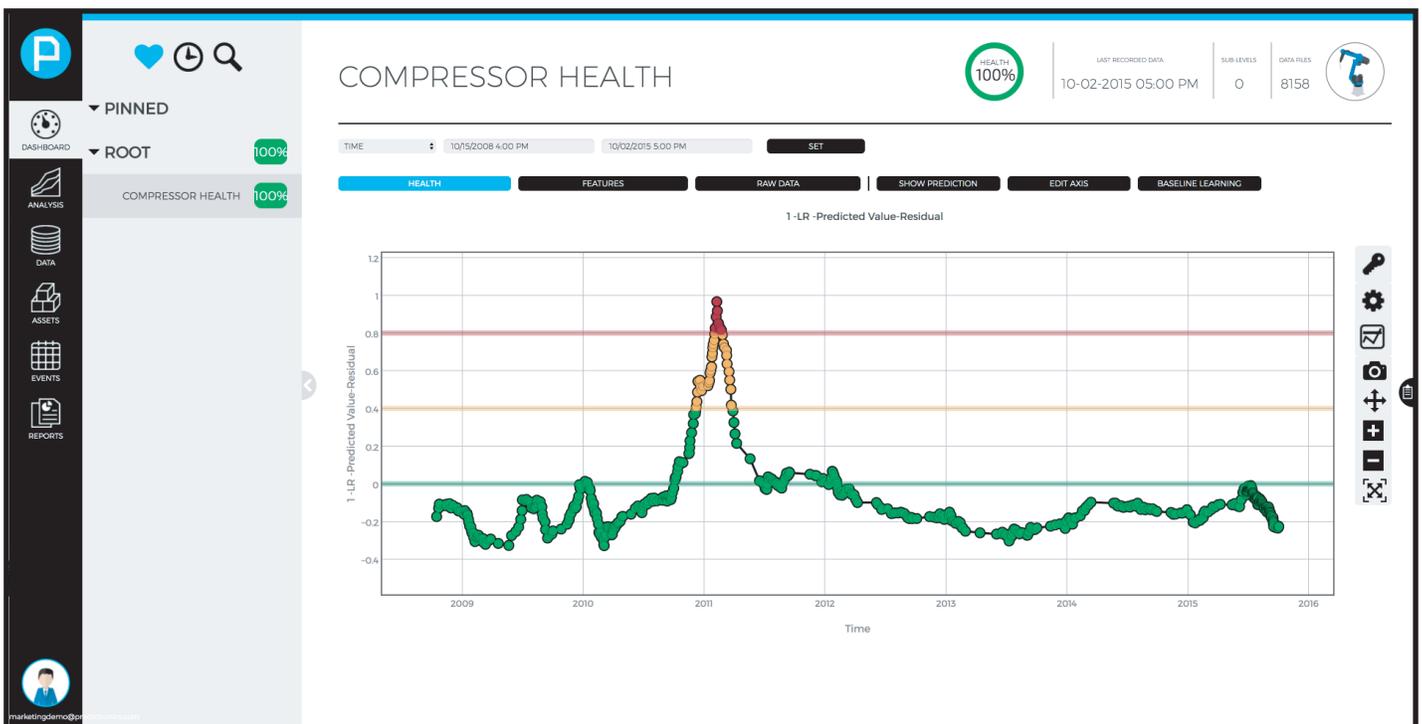
Value

The analysis model provided a clear early indication of a compressor problem before the actual failure and eventual repair occurred. The alert generated was several weeks prior to the actual failure. This type of predictive result was used to predict and prevent costly compressor, as well as other subsystem, failures for air conditioning systems. The analysis model also provided subsystem and variable contribution results, which indicate which aspect of the air conditioning system is having the early symptoms of failure.



Solution

These maintenance records, along with Daikin's engineering expertise, were used to correlate the health monitoring results with the failure events in order to validate the analysis models. A Predictronics-developed analysis approach established baseline behaviors and developed time series machine learning models. These patterns and trends defined the behavior of each critical component within the air conditioning system. These subsystems consist of the compressor, thermistor, expansion valve (EV) and refrigerant systems. Appropriate personnel are then provided accurate trends and can be alerted when a subsystem's performance deviates from the model via a moving window approach.



* View of the degradation of the compressor health in PDX Deploy