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Technical note

IoT-Enabled Vibration Analysis

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1. Overview

Wireless triaxial accelerometers are installed at suitable locations to capture vibration data from rotating machines. Raw vibration data is converted into useful features, which are then fed to analytics engines at IoT platform to identify remaining useful life and probable failure causes. The RUL (remaining useful life) estimates and identified causes help in reducing downtime. Further, early indication of impending failure provides sufficient time to plan maintenance work without affecting other operations.

## 2. Data processing and transmission

Acceleration time waveforms are measured by accelerometers that are attached firmly at the selected measurement points (mostly bearings' housing). Raw vibration data are then filtered, transformed to frequency domain, and transmitted to the IoT gateway for further processing. Wireless sensors can directly communicate to gateway when there is a clear line of sight and machine is located withing the range. In case of absence of line of sight or if machine is located outside the wireless range, range extenders are used for data transmission.

Measurement can be performed either at a pre-defined interval (for continuous running machines) or trigger based. Real-time continuous data are then sent to the cloud platform for analytics. User can see the data on Vadict IIoT dashboards. On-premises arrangement can also be made based on the requirement.
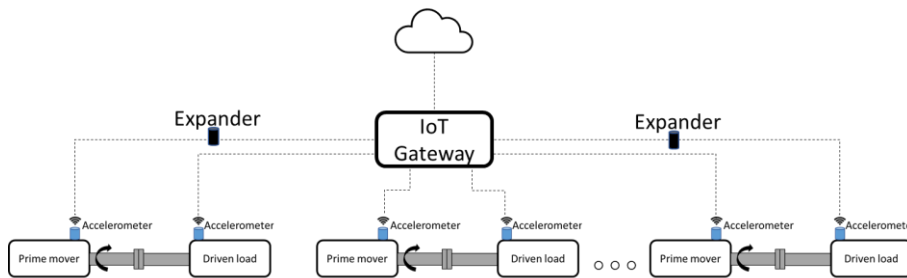
3. Data presentation on dashboard

Vadict IIoT platform has different dashboards with multiple features. Key parameters with historical trends can be seen on the dashboards. User can also customize the dashboard. Threshold are set for various parameters for alert and alarm indications based on current measurement. Following is a snapshot from Vadict IIoT dashboard showing trends of vibration data.
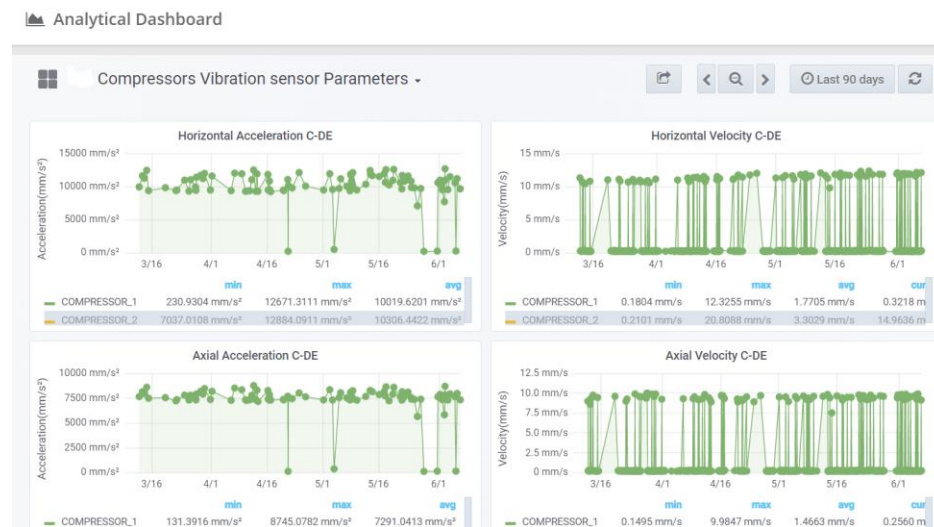
4. Predictive analytics

Features derived from the vibration data are used for RUL and fault type identification using predictive models. Predictive models are built from a good number of datasets recorded from similar machines. Based on the efficacy and performance, these models are regularly updated.

Predictive analytics dashboard contains RUL, confidence level, and probable failure causes. Confidence is calculated based on the various factors such as maintenance history, diagnosis, prognosis process, etc., as recommended by ISO standard. A view of the predictive analytics dashboard is shown below