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MULTIVIZ VIBRATION

PREVENT FAILURES WITH MODE IDENTIFICATION

Operational modes can reflect different usages in a production process, a typical state, or a developing failure.
By performing automatic segmentation of vibration data into operational modes, it is possible to build an image of the machine's behavior and discover early stage failures.

Automatic Mode Identification (AMI)
In a machine, different operational modes can reflect different usages, a production process, an on-off state, or a developing failure. Often, these operational modes are reflected in the vibration data, showing up as time periods in which the data exhibits a similar structure.

Specifically in the context of vibration condition monitoring, raw vibration measurements can be converted into the frequency domain by means of a Fast Fourier transformation (FFT). Therefore, the operational mode of a machine can be characterized by an FFT pattern or the distribution of energy across frequency bands.

When this energy distribution or the FFT pattern changes, an alteration in the operational state can be reliably detected or predicted.

This is what MultiViz Vibration, powered by its AMI proprietary unsupervised algorithm, detects. It performs multidimensional time-frequency series data segmentation and clustering. The clusters are optimized to reduce quick fluctuations or abrupt changes in the operating modes.

A mode change is registered only when the FFT changes from one consistent pattern across multiple vibration measurements to another. The number of modes identified is also informative,

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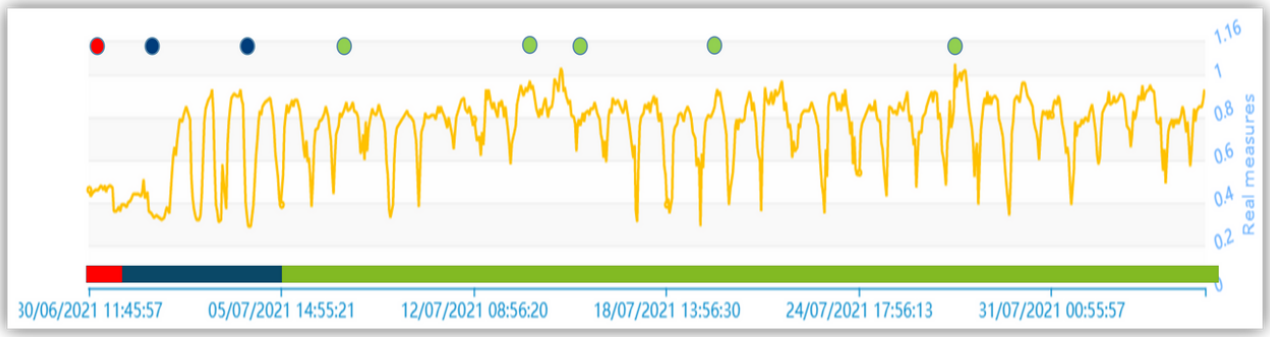
as the emergence of a new mode could indicate either the asset being used in a different way or a developing failure.

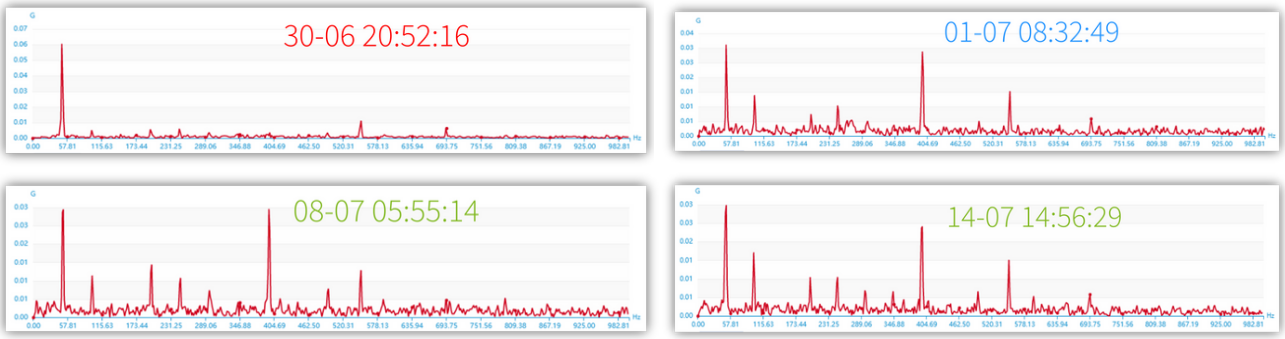
AI-enhanced experts

An operational mode can contain hundreds of time stamps and analyzing them manually becomes a time-consuming task. MultiViz Vibration makes this process simpler by automatically selecting the most relevant time stamps in each mode and generating FFT and timewave plots for each of them.

This way, vibration and maintenance experts know exactly which part of the data they should look at and make their analysis from there, reducing the work to a fraction of the time. Viking Analytics believes that rather than replacing experts, AI is better used in enabling them to do their best work efficiently.



Vibration data collected from sensors and analyzed by MultiViz Vibration. The operational modes are represented by the colored bar.



FFT Plots automatically generated by MultiViz Vibration indicating the most relevant timestamps in each operational mode

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Expert-enhanced AI

Even though AMI is an unsupervised algorithm and initially requires no ground truth, it actually improves when expert feedback is provided. This feedback to the algorithm is provided through labels that can be applied to each event by the maintenance experts.

Through this process, the algorithm "learns" that a re-occurrence of the same vibration pattern should be automatically identified according to the label assigned by the expert. The more this process is done, the better the algorithm becomes at detecting relevant events.

DIAGNOSTIC ANALYSIS VS. MULTIVIZ VIBRATION

Vibration diagnostic analysis

- Requires detailed knowledge of the asset under investigation
- Demands significant contribution from the domain expert
- Difficult to scale because of differences in assets' specifications

MultiViz human-augmented AI

- Does not require kinematics or deep knowledge of asset data.
- Data-driven unsupervised analysis without domain expert input
- Automatic data segmentation in operating modes
- Improves when domain expert feedback (human augmentation) is also provided

MULTIVIZ VIBRATION enables OEMs and maintenance companies to to add value to their offer through analytics features powered by Machine Learning algorithms. It allows large-scale unsupervised analysis of the history of an asset or a population of assets and the discovery and prevention of machine failures.

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