Advanced Fault Detection and Diagnosis

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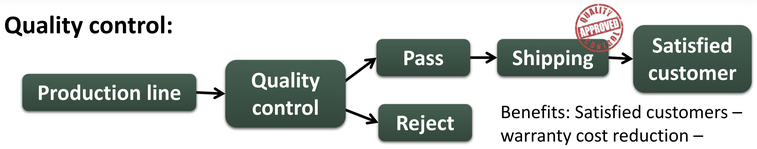
EECOMOBILITY (ORF) & HEVPD&D CREATE

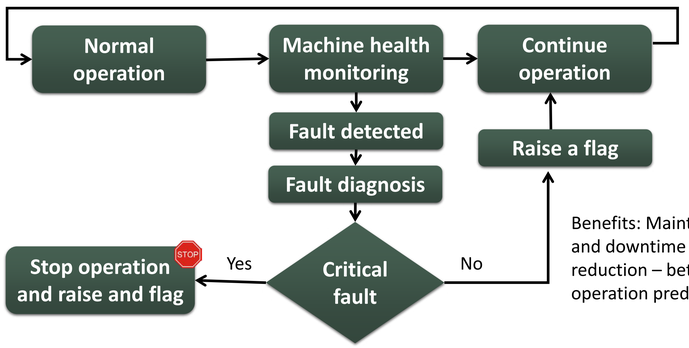
WHY FAULT DETECTION & DIAGNOSIS?

Quality control:



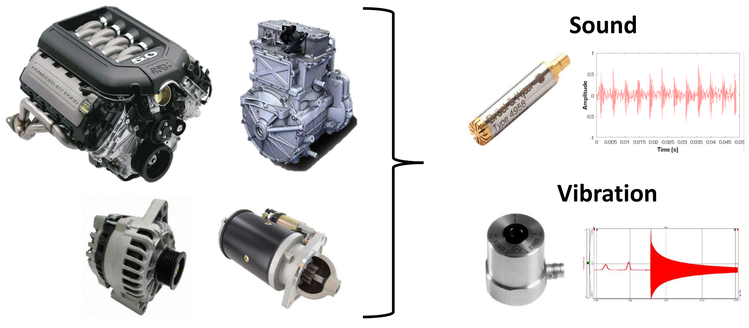
Benefits: Satisfied customers – warranty cost reduction – downtime cost reduction

Proactive Maintenance:



Benefits: Maintenance and downtime cost reduction – better operation predictability

SOUND & VIBRATION



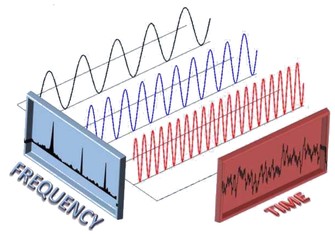
- The sound and vibration signals produced by rotary equipment is a result of their design, materials, and operating conditions. When a rotary equipment is faulty, it produces different sound and vibration signatures compared to a healthy baseline.
- Being able to detect the difference in sound and vibration enables fault detection and diagnosis.

WHY SOUND & VIBRATION IS COMPLEX

Amplitude

Many systems reject products that produce noise levels above a certain threshold but that is not enough as many faults and production problems such as excessive lubricant (grease) can result in quieter noise levels

Spectrum



Spectrum analysis can be very useful as it shows another dimension of sound and vibration measurements in the frequency domains. However it is very hard to relate the changes in frequency domain to the machine condition which makes its usage limited.

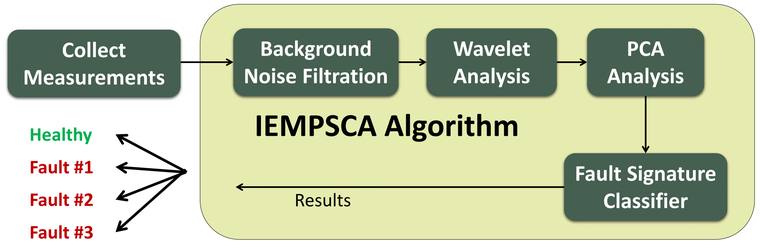
Complexity: to successfully use sound and vibration measurements to detect and diagnose faults, the analysis algorithm should take into consideration the changes in both time and frequency domains. Whether the changes are an increase or a decrease in sound and vibration levels.

IEMSPCA

Background noise filtration is an important step to eliminate any confusion in the results.

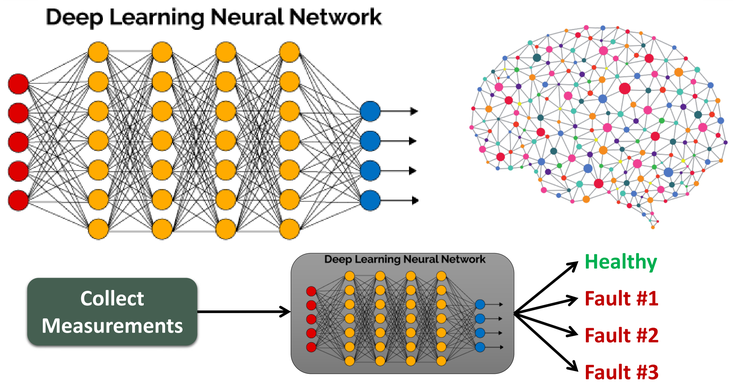
Wavelet analysis is able to analyze the measurements both in time and frequency domains.

PCA is able to detect any changes in the time and frequency domains produced by wavelet analysis



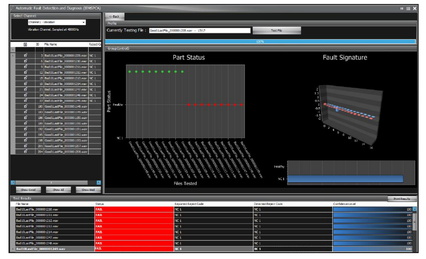
IEMSPCA algorithm uses the difference in time and frequency domains to detect any deviation from baseline measurements. If there is any deviation baseline, further analysis is done on the fault signature to diagnose the fault type. IEMPSCA was tested and achieved 100% fault detection rates and 96.8% from fault diagnosis.

DEEP-LEARNING AI



Deep Learning is the leading Artificial Intelligence algorithm in many industries such as speech and image recognition. The Centre for Mechatronics and Hybrid Technology (CMHT) applied Deep Learning on fault detection and diagnosis applications. 100% fault detection success rates and 97.6% accuracy for fault diagnosis were achieved.

COMMERCIAL IMPLEMENTATION D&V



Both technologies, IEMSPCA and Deep Learning are implemented for commercial use in D&V Electronics SV-PRO software. which is designed to provide different tools for sound and vibration analysis including traditional and advanced analysis types.

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