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System 1* Evolution - Part 2

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System 1* Evolution – Iteratively Designing a World-Class Condition Monitoring Solution

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Impactful Capabilities added as a Result of User Engagement

Numerous capabilities have been integrated into System 1 Evo as a direct result of the FastWorks development process and our continuous user engagement. Six key diagnostic capabilities resulting from this process are highlighted below.

Find Part 1 of this series on System 1* Evolution (Evo), which covers the FastWorks design process, [here](#).

Ability to Select n Number of Historical Samples and Overlay them on Applicable Plots

This fantastic capability enables quick comparison of waveform or spectral samples over time, which can be especially useful for identifying and presenting changing machinery conditions. Users simply open up the list of samples (1) in the plot header to overlay additional samples as depicted in Figure 3. The example shown depicts damage to a pinion gear through the use of an acceleration waveform and the acceleration waveform peak-peak trend.

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Figure 3: Historical Sample Overlay

Linking the Cursor Position in Trend Plots with Spectral and Waveform Samples

This longstanding request provides users with the capability to identify a change in behavior with a trend plot and quickly update the associated spectral and/or waveform samples based on the trend plot cursor position. In the example shown, there is a clear increase in the demodulated energy as exhibited in the trend plot. The user can move the cursor position from point (1) in Figure 4 to point (2) in Figure 5 to investigate the cause of the increase by referring to the demodulated spectrum in Figure 5, an outer race bearing defect.

Figure 4: Linking Trend Cursor to Spectral and Waveform Samples

Spectral Band Bar Graphs

Fans of Ascent software will recognize this popular feature that provides a visual representation of each spectral band that has been configured for a given spectrum, complete with the energy value and current alarm condition. The example shown in Figure 5 depicts an increase in the BPFO spectral band, indicating possible damage to the bearing.

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Figure 5: Spectral Band Bar Graphs

Spectral Peak Interpolation “Locate Peak”

This capability really comes in handy for samples collected without an actual speed measurement, which happens to be the majority use case for portable data collection on general purpose equipment. An induction motor’s nameplate will typically provide a rated rpm, let’s say 1750 rpm for a 4-pole motor; however, actual running speed will vary slightly as a result of the loading condition. The actual running speed will lie somewhere between 1750 and 1800 rpm, resulting in the true spectral 1X peak occurring between spectral buckets.

Utilizing the “Locate Peak” tool allows the user to estimate the true spectral peak amplitude and frequency which can be used to improve the running speed accuracy as shown in position (1) in Figure 6. The algorithm has estimated that the running speed was at 1782 rpm instead of the 1750 rpm for the example shown. The user can now set the sample speed to this new estimate (2) and cascade its value across all samples for the machine train (3), this action accounts for power transmission ratios.

Performing this task helps to align harmonic peaks and results in better fault frequency overlay placement.

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Figure 6: Spectral Peak Interpolation

Quick Machine to Machine Comparison Facilitated through Drag & Drop

Comparing identical machines can help the user to diagnose fault conditions and judge relative severity. System 1* Evo facilitates this by providing drag and drop capability from the asset and measurement hierarchies. In the example shown, the user is comparing a gearbox with suspected tooth damage to one with relatively low vibration. This was accomplished by dragging and dropping from the hierarchy and selecting the desired measurement (1), as depicted in Figure 7.

This comparison effectively shows the difference between the two gearboxes, where one exhibits excessive 1X sidebands surrounding the stage two gear mesh when compared to the sample with low overall vibration and expected spectral content.

Figure 7: Machine to Machine Comparison

Simple Diagnostic Report Generated by System 1 Evo

The ability to diagnose equipment problems and quickly generate a report with findings and recommendations is important to many users. System 1 Evo provides a customizable report to facilitate this process as depicted in Figure 8. The user can create this report by selecting the button shown in position (2) in Figure 7, and choosing the content that they wish to include in the report.

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Figure 8: System 1 Evo Diagnostic Report