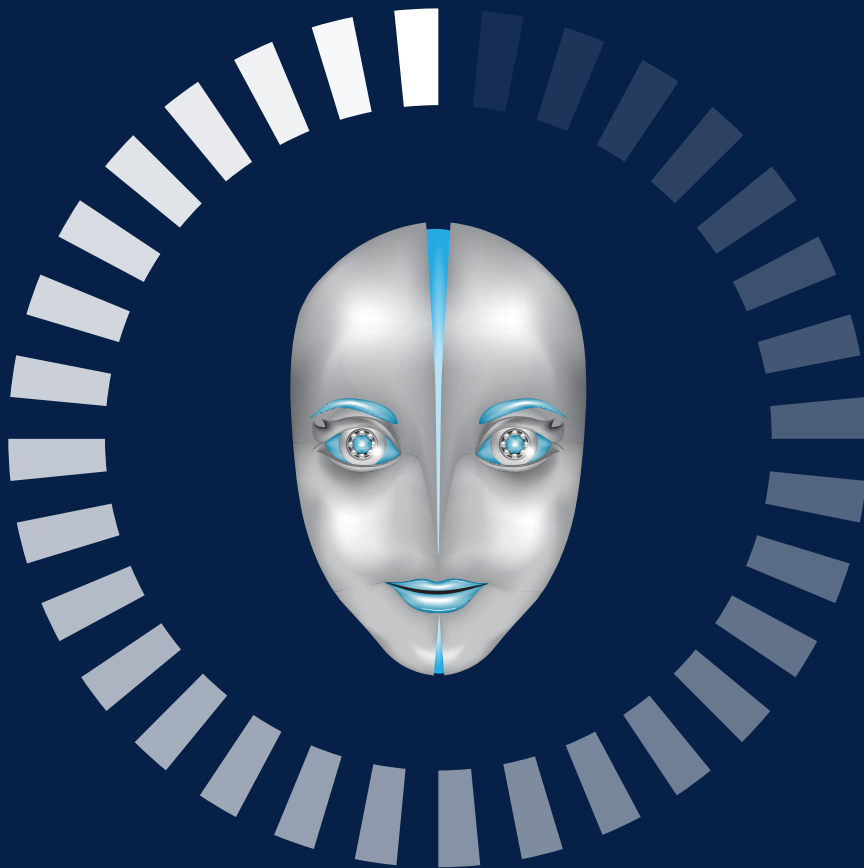


ADA™

The Automated Diagnostic Assistant



- **Fully Automated** — Compares multiple readings taken at a similar time on the asset to advise on potential faults present.
- **Built-in Vibration Analyst** — Advises on common vibration problems (similar level to a Category II vibration analyst)
- **Recommends Further Actions** — Identifies checks to be performed
- **Remote Diagnostic Centre** — Additional support for more complex analysis situations available from our expert analysts

ADA™ The Automated Diagnostic Assistant

ADA™ can predict stage 2, 3 and 4 bearing failure and detect a wide range of other common fault conditions, which would be discovered by a category II vibration analyst, by using advanced algorithms which are included as standard.

ADA™ has been developed by Machine Sentry® vibration experts who have used thousands of hours of vibration data coupled with over 40 years of field experience to create the algorithms behind ADA™.

ADA™ acts as an aide to the on-site maintenance teams by identifying 22 common fault conditions which could lead to potential causes of asset downtime.

Expert advice from ADA™ can be accessed through both the Machine Sentry® portal and app. Meaning any assets with Machine Sentry® sensors installed are monitored by ADA™ 24/7, 365 days a year.

Features

- **Fully Automated** - compares multiple readings taken at a similar time on the asset to advise on potential faults present
- **Built-in Vibration Analyst** - advises on common vibration problems (similar level to a Category II vibration analyst)
- **Advanced Algorithm** - identifies checks to be performed and recommends further actions
- **Remote Diagnostic Centre** - additional support for more complex analysis situations available from our expert analysts

“ADA™ the Automated Diagnostic Assistant can predict stages 2, 3* and 4* bearing failure and detect a wide range of other common fault conditions.”

* Bearing information required

What Are The 4 Stages of Bearing Failure?

The stages of bearing failure are used as a guide by condition monitoring engineers to define the level of criticality of the bearing condition and therefore indicate the urgency of remedial action.

Vibration analysis is a method of identifying bearing faults, at various stages in the progression to failure, by breaking up the vibrations into their component frequencies. Generally, the appearance of fault signatures progress from very high to lower frequencies as the bearings degrade.

The four stages defined below are based on accepted industry practice:



Stage 1

Stage 1 bearing failure can be detected only at ultrasonic frequencies.

It can be used to detect metal-to-metal contact and a lack of lubrication.

Stage 1 bearing failure is not visible to the human eye and urgent action is not required, however less than **20%** of the bearing life is remaining.



Stage 2

Stage 2 bearing failure is the second stage of bearing failure, it can be detected using standard accelerometers.

In this range bearing defect frequencies appear and if the bearings are examined, small pits will be starting to appear. Highly critical machines should be replaced/repared at the next available opportunity, which may be months ahead.

It is often a good idea to monitor these assets more frequently in case of some significant change.

Less than **10%** of the bearing life is remaining.



Stage 3

Stage 3 bearing failure is indicated by an increase in the harmonics on the frequency spectrum.

Typically, if the bearing is removed, the defects can be clearly seen in the raceways and / or the rolling elements.

Bearings on both critical and non-critical assets should be replaced at this stage as soon as possible.

Additional monitoring should be performed to establish the rate of deterioration if the maintenance action is delayed. Less than **5%** of the bearing life is remaining.



Stage 4

Stage four bearing failure appears towards the end of bearing life.

It is indicated by random high frequency vibration, which lifts the noise floor in the higher frequencies.

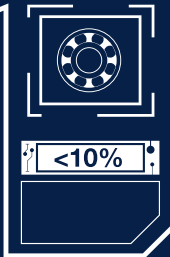
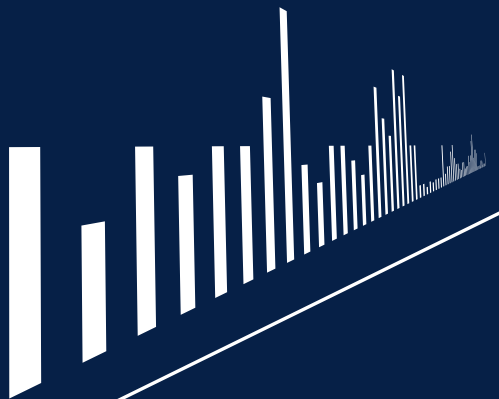
Bearings should not be allowed to reach this stage and failure is imminent as less than **1%** of the bearing life is remaining.

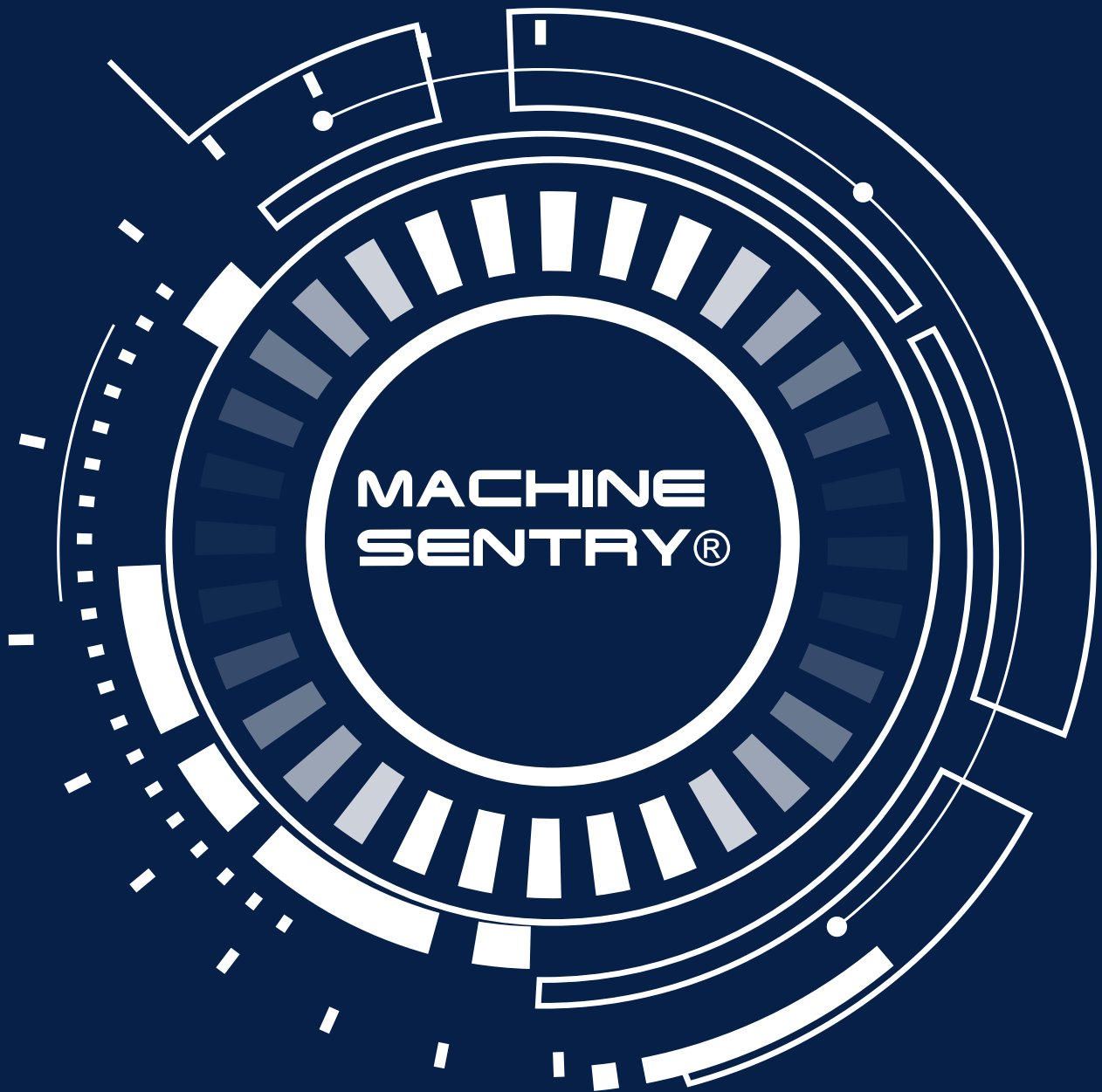
ADA™ — An Expert at Your Fingertips



Faults diagnosed include:

- Bearing Failure
- Imbalance (couple, static, dynamic and overhung)
- Bent Shaft
- Resonance
- Parallel, Angular, or Complex Misalignment
- Cocked Bearing
- Structural, or Rotating Looseness
- Blade or Vane Pass Issues
- Soft Foot
- Cavitation
- Lack of Lubrication
- Gear Misalignment
- Gear Backlash / Eccentricity
- Gear Broken Tooth
- Gear Tooth Wear





Not Measured



Invalid Reading



Normal



Warning



Alarm



No advisories/actions ever



All advisories complete



Outstanding Advisory



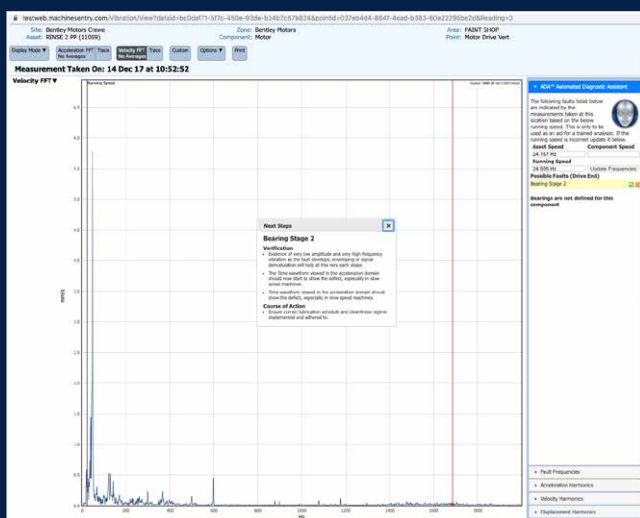
Outstanding Action

Your Own Diagnostic Assistant

Having highlighted an issue users can view more information of the potential fault using ADA™.

This tool examines multiple readings taken on the asset to assess the likelihood of faults being present. These readings are analyzed against our knowledge bank algorithms of failure symptoms.

As well as helping the user diagnose potential faults, the assistant also suggests further verification steps which should be carried out to confirm the diagnosis.



“ADA™ compares and evaluates multiple vibration measurements taken on an asset in a similar time window to better evaluate and differentiate between different failure modes.”

Next Steps



Bearing Stage 2

Verification

- Evidence of very low amplitude and very high frequency vibration as the fault develops, enveloping or signal demodulation will help at this very early stage.
- The Time waveform viewed in the acceleration domain should now start to show the defect, especially in slow speed machines.
- Time waveform viewed in the acceleration domain should show the defect, especially in slow speed machines.

Course of Action

- Ensure correct lubrication schedule and cleanliness regime implemented and adhered to.

Next Steps



Bearing Stage 3

Verification

- We should be able to see frequency peaks and harmonics which are 'non-synchronous' to the speed of the shaft carrying the defective bearing. (Correct shaft speed is paramount when looking for rolling element bearing defects).
- There should now be visible impacts in the waveform.
- Always ensure you have enough spectra resolution (the higher the better) when looking for bearing impacts.
- At this stage, the non-synchronous bearing defects can normally be seen in the velocity spectra as well as the waveform.
- At this stage, there will normally be non-synchronous harmonic content. NB at this stage, the fundamental defect may be very small, or even not evident, but there could be a high number of fundamental defect harmonics
- When the bearing is removed and inspected, there should be visible signs of the defect.

Course of Action

- Plan to replace the bearing at next available opportunity.

Next Steps



Bearing Stage 4

Verification

- At this stage, non-synchronous activity and harmonics start to disappear, the spectrum will become very noisy and 1X shaft speed harmonics may come into play as clearance within the bearing increases resulting in mechanical looseness.
- The time waveform will now become less useful due to increased noise and random events.

Course of Action

- The bearing has significant damage at this stage and should be replaced at the 1st available opportunity.

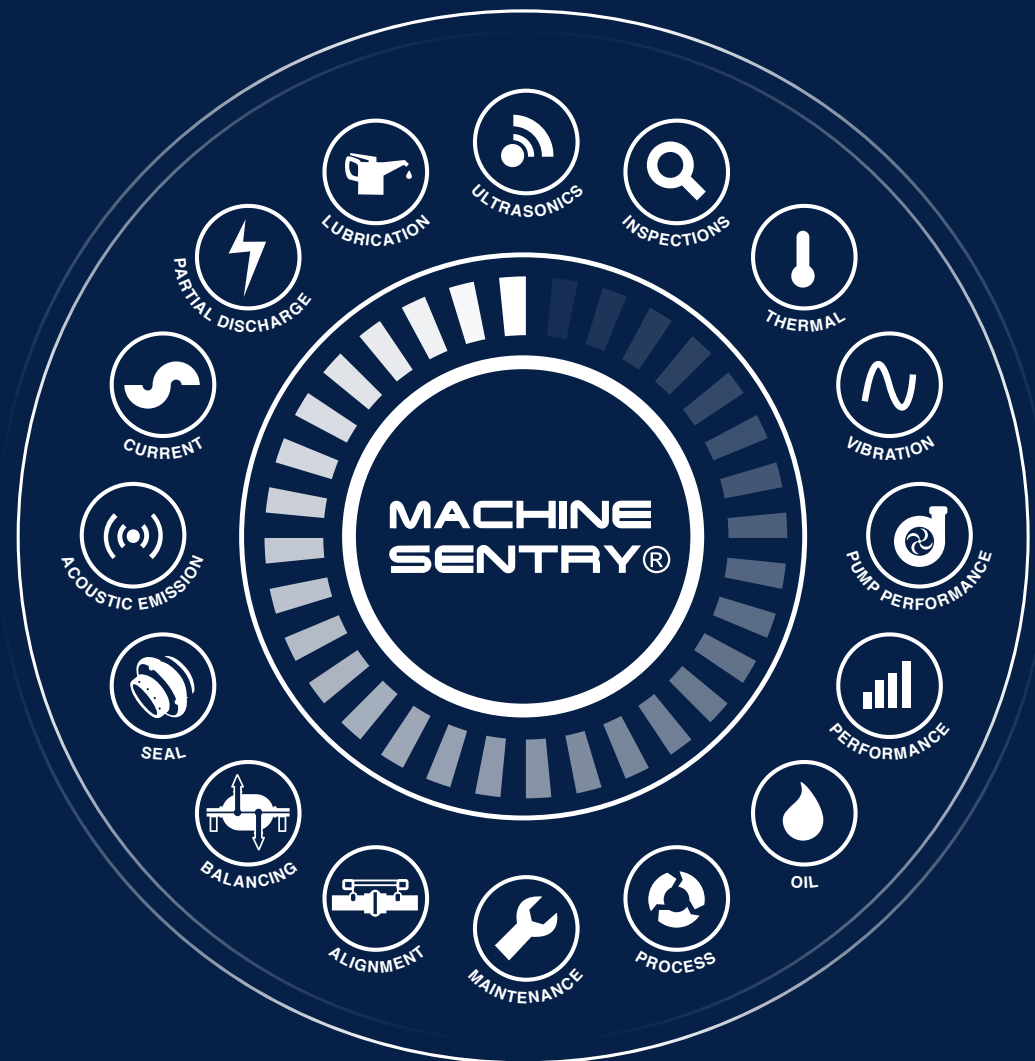
Need Extra Assistance?

For customers who do not employ experienced condition monitoring engineers, distribution partners of Machine Sentry® provides access to a large pool of condition monitoring experts.

These experts can review clients' data and deliver practical guidance that will improve plant reliability.



www.machinesentry.com

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