

# Ultrasound and Vibration analysis: two key elements of predictive maintenance

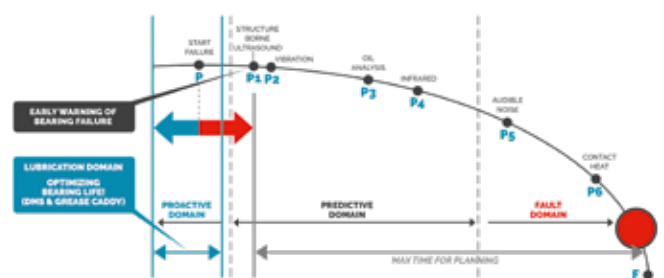
Vibration analysis has been for many years the technology of choice for maintenance professionals to monitor the condition of rotating assets. However, in the last years ultrasound has also emerged as a very popular technology for condition monitoring. The question that many are now asking themselves is: which one is best? Ultrasound or vibration? In this article we will focus on the role of ultrasound as a condition monitoring tool, and why using vibration and ultrasound together is the best way to reach excellence in your maintenance practices.

## Why vibration analysis?

Vibration analysis is an incredible tool: it detects and measures small vibrations and what is causing them, thus allowing maintenance professionals to detect early failures on rotating equipment. Furthermore, vibration analysis gives us a very deep diagnostic and allows us to identify the failure's root cause, and thus correct it to avoid further issues in the future. Plus, there are a great number of vibration sensors and solutions on the market to choose for, so maintenance teams can find a solution that is suitable for their needs.

## Why Ultrasound?

Ultrasound is considered by many the first line of defence when it comes to bearing failures, since it can give a very early warning of a potential problem, even with lubrication issues. The way ultrasound does that is by monitoring the friction levels on rotating equipment. The concept is simple: as a bearing starts to fail, or if it has not been lubricated properly (under or over lubricated), the friction levels rise. Friction creates ultrasound emissions that can be picked up by an ultrasonic handheld device or sensor and translated to low frequency sounds that the inspector can hear. Ultrasound equipment will also provide a decibel level – and the higher the decibel, the higher the friction.



## Ultrasound or vibration?

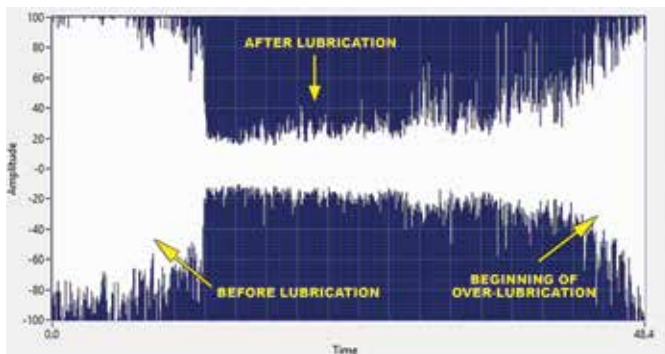
There is no easy answer to this question, but one thing is for sure: if a maintenance team wants to reach excellence, both technologies should be used. Ultrasound will provide the earliest warning of failure and is also very easy to use, since it relies on simply trending decibel levels. Vibration analysis is extremely complete and will give maintenance professionals a deep overview of the issue and the root cause of such issue. Almost as if ultrasound is the doctor who detects the problem, and vibration is the health specialist that will diagnose it properly. We will now talk about a few situations where, in general, ultrasound can be used instead of vibration analysis.

## Slow speed bearings

Slow speed bearings are difficult to monitor. Since they rotate very slowly, it is difficult for vibration sensors to pick up significant changes in vibration. Even with an ultrasound instrument it may be difficult to pick up failures if we rely only on decibel levels, since in extreme slow speed bearing applications (usually less than 25rpm), the bearing will produce little to no ultrasonic noise. However, high-end ultrasonic devices will allow for sound recording: by recording the sound of the bearing and checking it in a spectrum analysis software, we can easily find peaks in the sound spectrum amplitude which indicate a fault in the bearing.

## First line of defence, easy to use

For a maintenance professional to properly work with vibration analysis, significant training and experience are needed. On the other side, ultrasound has a much quicker learning curve. And this is because of how the technology works: since it is monitoring friction levels and translating them to dB values, we can easily check for potential problems with our rotating equipment. Once we setup a dB baseline for a bearing, we just need to trend the dB value overtime. So, if the baseline for a



bearing is 20dB, but the ultrasonic instrument reads 32db, we already know there is a problem simply by comparing values.

## Lubrication

Again, because ultrasound is based on the friction levels, it is perfectly adequate for bearing lubrication. Is the bearing lacking lubrication? Then the friction levels will increase, and we can hear that through the ultrasonic instrument and see it in the dB levels. If we start lubricating the bearing, most likely we will see a decrease in the sound intensity and the dB levels. Did the bearing receive too much lubricant? Then again, friction levels will increase, and we will know that using the ultrasonic instrument. Thus, ultrasound is perfect to avoid under- and over-lubrication issues.

## Versatility

While vibration analysis is an extremely powerful tool, its uses are limited to mechanical equipment. On the other hand, ultrasound has a wide range of applications which makes it a very versatile technology. One of the most popular applications of ultrasound, besides condition monitoring, is energy savings. Since turbulence also creates ultrasound emissions, the ultrasonic instruments can easily be used for leak detection (compressed air and other gases), steam traps inspection and even for electrical inspections, to detect issues such as corona, tracking and arcing.

## Conclusion

We believe, as many other maintenance professionals nowadays, that using multiple technologies that complement each other is the way to go. Therefore, the question is not ultrasound vs vibration, but instead ultrasound AND vibration and when we should be using one or the other. Both are very powerful condition monitoring technologies and, when used properly together, can really take any maintenance and reliability program to the excellence level. ■

