HECO
All systems go

Before you send out a critical electric motor to be repaired or maintained, you want to know that the repair shop has the tools and procedures in place for a fast turnaround and a quality repair. Maybe you've scanned through some of their webpages and saw them throwing around the term "motion amplification." It sounds impressive, but does it really help with electric motors and their power trains? And, maybe even a bit more important, will it help your bottom line?

A Definition of Motion Amplification

It is possible for something to be vibrating in such a way that you really can't see it -- the deflection involved with the vibration is too small for the naked eye to detect. However, just because the deflection is small doesn't mean that the vibration causing it isn't doing serious damage to your system. This kind of motion can be the source of major problems or could be indicative of a catastrophic system failure that is about to happen.

What motion amplification does is scale up the motion of an object or system visually so that we can better understand how it is behaving.

How Motion Amplification Works

There are three stages to this process:

1. An object or system is filmed in action using a digital video camera.
2. Using a combination of digital video and image processing technology, displacement, deflection, vibration and movement are measured pixel by pixel.
3. That data is processed and scaled.
4. The processed and scaled data is used to visualize the now amplified movement, usually in video form.

https://www.hecoinc.com/heco-system/motion-amplification

Why Motion Amplification is Useful

For many of us, it is easier to process information visually through charts, graphs, and animations than it is to find meaning in table after table of data. Even when numerical data is presented in a clear, concise way, that old adage holds: a picture is worth a thousand words. A video is even more helpful -- allowing us to not only visualize movements that are too small for our eyes to register but see how these movements interact with the system as a whole.

The Technology Behind Motion Amplification

One of the leaders in motion amplification technology is RDI Technologies and its Iris M system. The four-fold purpose of their design is to visualize, communicate, measure, and troubleshoot. Their system uses a combination of a digital video camera with proprietary software that tracks pixels in the camera images and processes that data into highly accurate raw motion data (e.g., spreadsheet, tables, etc.) and scaled motion data that is turned into a video. Of course, that software needs a home, which is usually a laptop computer. The video generated shows the object moving with the motion amplified for better visualization.

Motion Amplification and Its Role in Electric Motors

So, what can motion amplification do for electric motors? It is extremely useful in the area of predictive maintenance.

Predictive Maintenance

Predictive maintenance is a philosophy of maintenance, along with breakdown maintenance and preventative maintenance. What makes predictive maintenance different is how it aims to detect issues ahead of time, identify the source of the developing problem, and implement a solution. It also endeavors to minimize downtime, reduce spare parts usage, and keep maintenance costs to a minimum.

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Motion Amplification and Predictive Maintenance for Electric Motors

When used as part of a predictive maintenance program for your electric motors, it can help skilled technicians identify areas of your electric motor powertrain that are subject to vibration and deflection, see the effects of different frequencies on the motion of the system, and narrow down the source of the problem. Keep in mind, however, that this takes training and experience.

Motion Amplification and Electric Motors

Motion amplification works extremely well when analyzing not just electric motors but the power trains they interact with.

Example #1: Paper Machine Line Shaft Bearings

In this video, we see motion amplification used on a paper machine line shaft with a 15x amplification of the measured motion. On the left-hand side of the video, you can see the original digital camera footage, while on the right-hand side of the video you see the amplified version along with a plot of the frequencies involved. During the video, you can see footage gathered at each of the bearings along the line shaft.

https://youtu.be/PtLZe4Ots3w

Example #2: Blower Motor

The video below shows a motion study of a blower motor that was performed using motion amplification. Once again, the left-hand side is the original footage and the right-hand side is the amplified footage. Around the 20 second mark, you can see footage of a flange that illustrates motion that cannot be detected with the naked eye. Even with vibration detection equipment, it would be difficult to pinpoint the exact area where the most displacement is occurring; however, motion amplification makes it very clear and also shows that the greatest motion in the flange shares a common frequency.

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https://youtu.be/eNkSaCE8ydg

Conclusion

An electric motor repair shop that has motion amplification technology on hand and technicians that know how to use it provides some definite advantages to you:

- They can diagnose motor-related problems quickly

- They can detect potential problems before they start

- When used as part of a predictive maintenance program, they can save you money in downtime, repairs, and overall M&O costs

Here at HECO, we use RDI Technologies Iris M Motion Amplification system for predictive maintenance for both electric motors and powertrains as part of our Predictive Service Group, or PSG for short. HECO PSG is an on-site predictive maintenance and reliability service that encompasses a wide variety of diagnostic and analytical tools that will keep your equipment running at peak performance.