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Friday, 01 June 2007 00:00

Designing a best-in-class vibration analysis program starts at the beginning.

It's no secret that when machinery operates effectively and efficiently, it will run longer, more safely and without unscheduled downtime. That surely can improve the bottom line.

A field technician captures vibration data on a motor using state-of-the-art equipment. This can be performed without interrupting operations.

Vibration analysis can be a very effective part of a good predictive maintenance (PdM) program and an integral part of an overall condition-based maintenance (CbM) approach. The theory itself is pretty straightforward. An increase in vibration almost always accompanies deterioration in running conditions. Therefore, monitoring vibration levels can indicate the general condition of a machine.

Unfortunately, not all vibration analysis programs are as clear-cut. Many programs today aren't as effective as they could be, due largely to lack of resources, time and formal program processes.

Is your CbM vibration program living up to its full potential? There are several things to consider when evaluating it. Do you struggle with:

- **allocating time and/or resources to run the program effectively?**
- **turning raw data into actionable information?**
- **implementing a "close loop" program process that ensures recommended actions are handled quickly while correctly fixing the diagnosed problem?**
- **guaranteeing consistency and quality of data?**
- **sharing equipment problems/diagnostics effectively throughout your facility or corporation?**
- **assigning annual cost benefit dollars to the effectiveness of your program?**
- **achieving (or even tracking) the stated goals set when approval was given for the program's inception?**

If you are struggling with any (or most) of these issues, you're not alone. Many programs today simply survive by keeping their basic lifelines functioning, collecting mountains of data and performing basic single-pass analyses, resulting in quick and dirty maintenance recommendations. Little, if any, time is left to perform needed program functions such as tracking predictive work actions to establish repair effectiveness, establishing new baselines, reviewing alarm effectiveness and fine-tuning alarm parameters, database management, failure analysis, bad actors review, analysis technique review and sharing valuable information across sites, business units and corporations. The problem worsens significantly when an attempt is made to truly integrate all predictive technologies into a comprehensive program.

The most effective vibration analysis efforts ensure that the program doesn't just stop after the monthly vibration rounds are complete, points in alarm have been identified and machines with high levels are passed to Maintenance Planning for action. Communication of the diagnosed problems through clear, concise, easy-to-navigate reporting tools and the ability to track the repair actions through completion are crucial to a program's success. Evaluating the benefit of those actions also is critical. This ensures that a program truly turns the raw vibration data that is meaningless to most Operations and Maintenance personnel into useable, actionable recommendations.

The right design decisions

For many organizations, these problems are real—*and seemingly insurmountable*. The problem often begins with the initial program design. Critical design decisions might be overlooked or minimized. More time is typically spent trying to choose the best hardware and software platform and not on ensuring that the program design is appropriate to

achieve the stated goals. Whether the goal is to lessen unplanned failures and downtime, minimize emergency or overtime work load, increase or improve availability or just reduce maintenance costs, the program needs to be effectively designed from the beginning in order to achieve stated goals and provide a return on investment. There are several critical decisions to make during the program design phase (before moving forward in purchasing equipment and toward implementation):

Program goals or expectations…
What should the program achieve to be deemed successful? What is the payback required? What is the timeframe? Are the metrics required to fully evaluate the cost benefits of the program available? Programs that are developed without a good foundation for tracking benefits or ROI usually become less effective over time and harder to justify from the standpoint of resources, costs and ongoing training requirements.

Critical equipment assessment…
You probably cannot—*or do not want to*—cover all assets. Determine what equipment is critical to achieving your goals and to maintaining continued operations. Use an 80/20 rule approach to make sure that you spend your time wisely and realize the maximum return on your investment.

Technology assessment…
Which predictive technologies (vibration, infrared, oil analysis, ultrasound, MCE, etc.) should be applied to the critical equipment list to ensure effective detection of impending problems or problem types?

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Required frequency for collection…
How often does trend data need to be collected and stored for proper analysis and predicting typical machine failure modes? Machine types with typically short failure

modes will require data collection intervals to be equally short or even continuous. Failure modes that usually develop in a longer period of time can be handled with manual collection and at longer intervals, and they still will be effective.

Required program equipment…
Information will need to be gathered on the necessary program equipment to achieve the desired data at the desired frequency. This process will probably require working with multiple vendors for hardware and software to support their technologies. Program quality and effectiveness… Most programs are designed to focus solely at a site level. Consistent program traits and quality are very difficult to manage without the proper tools. There is tremendous benefit in establishing program templates for data collection, data analysis, reporting and deriving cost benefits. Additional benefits come from the ability to analyze equipment type trends over similar operations across multiple sites. These trends can prove OEM quality or flaws that can cause significant problems throughout your operations.

In-house vs. contract services…
Possibly the single most important decision is whether to run the program with existing resources or to outsource it to certified experts who can manage the program for you. This decision needs to take into account the availability of resources, the training requirements of those resources, the initial program investments (including all hardware and software), the ongoing training and program costs and the other inevitable distractions that will come when using in-house employees with many other job duties to run your program.

Depending on your situation, contracting with experts whose core expertise is designing integrated programs to achieve program goals and provide services such as vibration analysis, infrared and oil analysis as primary offerings might make the most sense in that such arrangements can allow your operations to focus on its core maintenance, operational and production goals.

The right partner(s) should be able to assist with all of the previously discussed design decisions. They should be focused on providing integrated program services, as well as tools to track the program at the data level and analyze that data with true sortable, Web-based integrated reporting, repair tracking and real-time, customizable cost-benefit tracking. In short, the right partner(s) will have the right approach and the right technology for running a successful, corporate-wide integrated PdM program.

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