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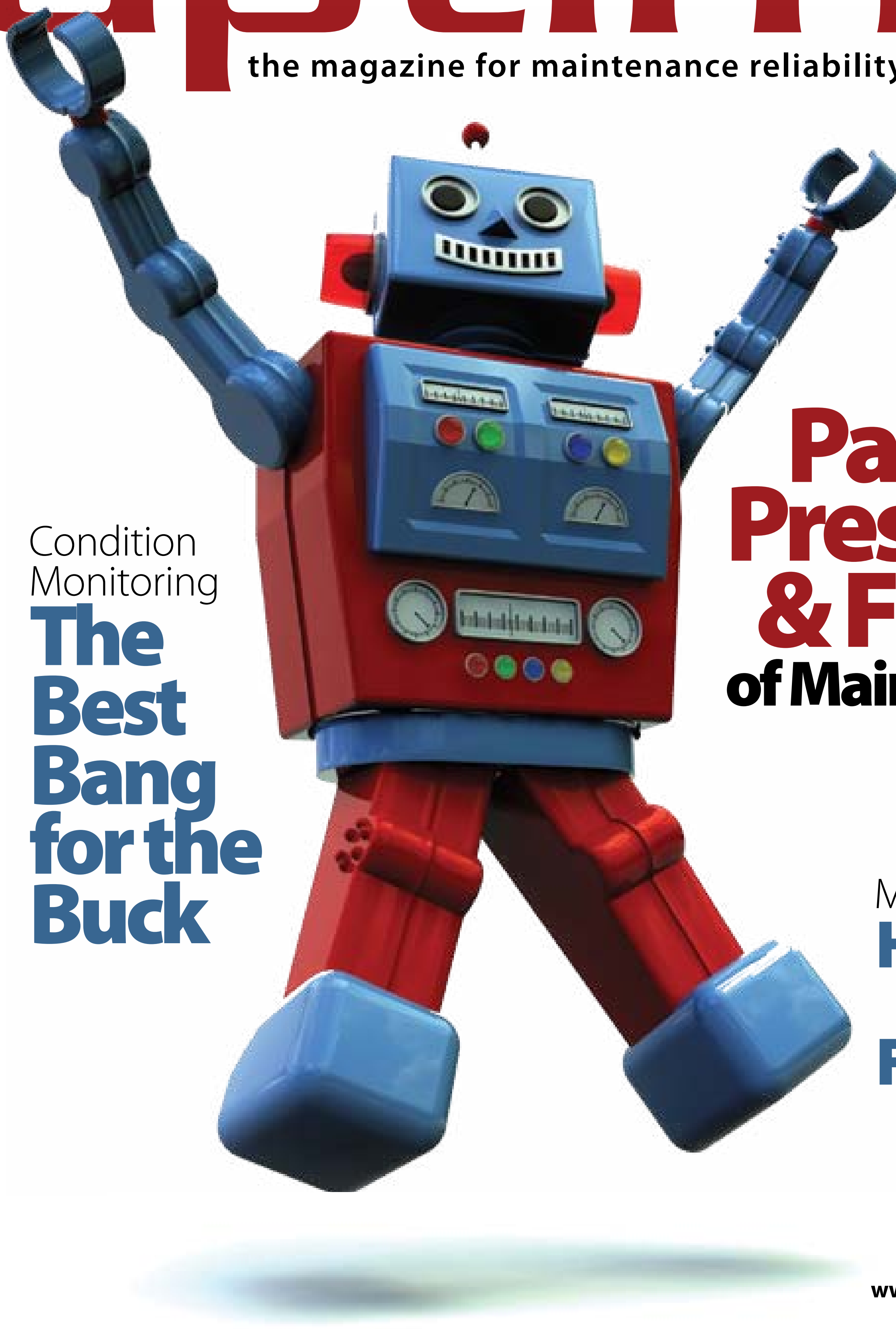

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Part 2

Establishing Ultrasound Testing as a CBM Pillar

"There's lots of talk about the benefits of implementing CBM and the positive impact that condition monitoring technologies like ultrasound testing can have. It seems we all have a good grasp of what it is and why we need it. The ultimate challenge is to move from inception to launch stage. Show me HOW TO DO IT."

Allan Rienstra and Thomas Murphy

Not everyone has the same perception of what Condition Based Maintenance (CBM) is; therefore not everyone has the same expectation of what an investment in CBM will return. In Part 1 of this paper, we asserted that careful planning must precede starting down the path of CBM. We suggested a useful goal of 90-95% of your maintenance tasks being condition directed. This means not allowing your current CMMS to plan and overrule tasks. Instead, let it work with your CBM to create condition-driven work orders. We maintained that the initial CBM investment must be oriented toward the education and thus the alignment of upper management's, middle management's, and frontline staff's expectations. Part 1 provided answers to the "What" and "Why" questions of CBM: what is it and why do we need it? Part 2 confronts what many perceive to be the ultimate hurdle: How Do We Do It?

The best way to tackle this large project is to go at it in small bites. There is so much to do, and you probably find yourself with limited resources. Early frustration may be exacerbated by the pressure for and anxiety about fast success. Resist the temptation to quell your anxiety by being overzealous with failure reporting. Yes, there is pressure to show results. No, the anxiety from that pressure doesn't go away through reporting false failures; it only feeds the naysayers, those who want to say, "I told you it doesn't work."

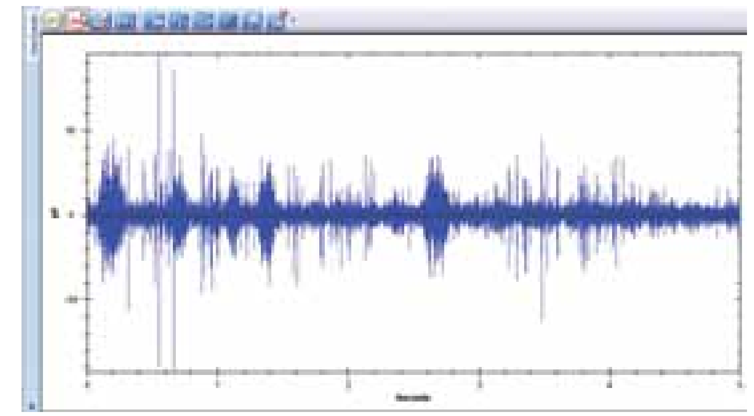
The perception that CBM can only be associated with rotating machinery is a false one. Does a compressed air leak speak to the condition of the compressed air system? Yes, of course, the same way a vacuum leak or steam leak speaks to the condition of those processes. A failed steam trap says that the condition of your steam recovery system is not being optimized. None of these defects rotate, nor are they trendable. They are only findable and fixable. They represent a huge drain on company resources in terms of energy waste and process efficiency. But do any of these defect conditions get addressed by your current Computerized Maintenance Management System (CMMS)? The answer is likely not. So take a run at the easy bits first. Start a compressed air leak management program, and while you are out there, incorporate procedures that look for vacuum and steam leaks, failed steam traps, and faulty valves. In conjunction with your infrared program quickly tie in ultrasound testing of low-, medium- and high-voltage electrical systems.

These represent aspects of your ultrasound CBM that require a lesser amount of preparation. Use of these quick hitters will achieve fast success for the program, which in turn will reduce frontline staff anxiety and satisfy middle/upper management expectations. Moreover, success early on buys the time needed for applications that require greater preparation. Those include machinery lubrication, bearing condition monitoring, and machine condition monitoring.

Not all defects are trendable. There are many defects that are purely and simply "good" or "not good." The first important task your CBM program needs to accomplish is to categorize those tasks that are non-trendable, those that require trending, and those best identified using dynamic signal analysis. Non-trendable defects include:

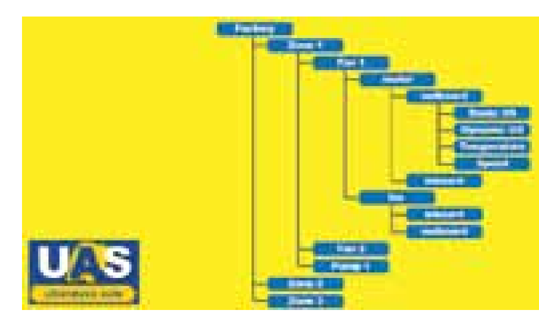
- **Compressed air leaks**
- **Steam leaks**
- **Vacuum leaks**
- **Heat exchanger inspections**
- **Tightness testing**
- **Corona, arcing, and tracking detection**
- **Steam trap testing**
- **Basic identification of some rotating defects**

The most well-known trendable defect is condition-based bearing lubrication. It is a very simple and accepted science to trend using decibels. One basic thing to consider is identification of which bearings are greasable (yes, it is quite plausible to find a sealed bearing with a grease nipple). Other basic issues to consider include: Do you have the buy-in from your CMMS to migrate time-based lubrication, or will the CMMS overrule your findings? Will you find and fix, or will your program require two passes through? Work in a routine way with a survey-driven program, and not only will this identify your lube problems, but at the same time also address larger issues.



Understanding trend changes in ultrasonic decibel data lets us decide which bearings need to be analyzed further, with either ultrasonic dynamic signal analysis or vibration analysis. Dynamic data analysis serves us in many ways. We can use it to understand and categorize electrical faults. It can be applied to steam trap testing to differentiate between a fault and flash steam. Dynamic data analysis helps us diagnose faults in slow-speed applications like bearings and gearboxes. Analysis of valves on reciprocating compressors gives us insight about the efficiency of these machines.

The key point to take away here is that CBM does not always have to be about bearings.

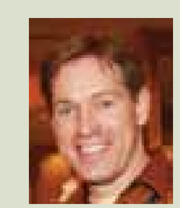


Since we identified the assets we will monitor, and categorized them as trendable and non-trendable, we can move toward the next step in our planning, which is to build a database. Don't just pick up the ultrasound instrument and head out into the plant. There are several things to consider: Where are the items to be monitored? What are they called? What does everyone else call them? Consistency when naming assets is important, both for the people handling the data and the software that uses case-sensitive search filters to mine data. Are some of the assets to be monitored affected by operational changes? Are some of them affected by process changes? If so, define those changes and train the inspectors to identify them. Use this knowledge when applying intervals to data collection.

Not all defects are trendable. There are many defects that are purely and simply "good" or "not good."

Once a database of items is built, a list of manageable surveys needs to be defined. Some considerations for building surveys include defining when to go out and collect data (intervals) and which alarm definitions will trigger intervention. Your database may include every asset in your plant, which may mean thousands of data collection points. Breaking this massive library down into manageable surveys takes planning and thought. Creating groups of data points that can be started and finished in a day, or even a half day, makes good sense. Make your survey too big and it won't get finished. Eventually, it won't even get started. Organizing the tour so that the work flow follows a logical path through the plant also makes good sense. Asking your ultrasound inspector to zigzag while moving through the plant will not win his or her cooperation.

To this point, we have covered the bases for establishing ultrasound testing as a pillar of your CBM strategy. Part 1 explained what it is all about, and here in Part 2 we laid the framework for how to get it started. That brings us to the final and most important phase of implementation: communicating the results. In Part 3 of this paper, to be published in a future issue of *Uptime Magazine*, we tie our implementation strategy together by addressing the key points of communication. We will cover the objectives of good communication, the format of a sound report structure, and some examples of how those reports will inform the people who need to know. Stay tuned . . . we're almost done.



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