

Predictive condition monitoring (PCM)



Pumps are just one type of rotating equipment that can be continuously monitored by a predictive condition monitoring system that aims to maximize MTBF.

By Jane Alexander, with Jeff Benson,
Maintenance Coordinator, CASCO Inc.

The Hot Trend in Maximizing Assets

Isn't it about time for your operations to catch up with the future?

There's no doubt about it. Today, industry faces challenges that were unheard of only a short time ago. Global competition, spiraling energy costs and increasingly expensive downtime all contribute to corporate cultures that push each and every employee to find ways to do things better, cheaper and faster. The key to successfully competing today is being able to get the most out of your people, your manufacturing processes and your plant equipment. This is what optimizing your plant assets is about. To stay competitive, a company must be able to plan better for the future and be proactive in its maintenance and repair operations.

Until recently, industry relied mainly on the knowledge and expertise of veteran Operations personnel. Just as you become used to the sounds and feel of the automobile you drive 365 days a year, operators know their equipment. As they do their walk-arounds, they can distinguish minute changes in motor pitch or an unusual rattle in a pump casing. By checking a bearing housing and sensing the heat, they can tell you that a bearing is wearing and may fail. They alert Maintenance, which turns off the affected pump (and process), then inspects and repairs the unit. At least that's the scenario in a perfect world.

Unfortunately, important warning signals are sometimes missed, resulting in catastrophic failures. Instead of planned maintenance, a more extensive repair (or even replacement) might be required. Moreover, the cause for all these problems might have been nothing more than a bad bearing. In retrospect, personnel walk-arounds are relatively "hit and miss." They can waste valuable man hours, cause system downtime and lost production, and result in increased maintenance costs. With attrition eating away at valuable manpower assets, there has to be a better way.

Maintenance Meets the 21st Century

Most equipment failures give some warning that they are about to occur. Therefore, what industry really needs is a way to head off a catastrophic failure before it has a chance to happen. The answer lies in a technology called predictive condition monitoring (PCM). With a PCM system, a bearing problem could be picked up by vibration and temperature sensors weeks earlier, thus avoiding a system shutdown. Repairs could be scheduled at a convenient time, minimizing the economic impact of downtime and lost production. Using a predictive condition monitoring approach, a plant's assets are maximized by the ability to:

- Avoid failure and extend equipment service life and reliability.
- Immediately alarm the proper personnel regardless of the time or distance. (This reduces the chance of failure occurring before Maintenance can get to the problem. It also minimizes any downtime through the integrated planning and scheduling of the repairs indicated by predictive monitoring.)
- Issue alert reports that are easy to translate and provide an early warning of any impending failure.
- Maximize component life by avoiding the conditions that reduce equipment life (for example, by ensuring ongoing precision alignment, minimal lubricant contamination etc.)
- Use condition monitoring techniques to maximize equipment performance and throughput.



Past maintenance procedures required operations personnel to visit each piece of equipment to manually monitor its status. These "walk arounds" are costly and ineffective in avoiding failures.

Cutting-Edge PCM Today

It's probably safe to say that most companies with a significant investment in plant equipment are utilizing various forms of monitoring technology to predict some equipment failures. But, it's also safe to say that these companies aren't necessarily achieving optimum results. If PCM is becoming essential to improving a company's bottom line, why isn't it being used universally on all rotating equipment? Until now, the barriers have been the cost and difficulty of using the technology.

Casco Inc. has a substantial investment in pumps and rotating equipment. Since this company's founding almost 150 years ago, it has worked consistently to improve the effectiveness of plant operations by effectively controlling maintenance costs. From very modest beginnings, Casco has grown to become the largest corn processor in Canada, and now serves a global customer base. Its primary product is high-fructose corn syrup used as a sweetener in a variety of consumer food products, including dairy, carbonated beverages, breads, cakes and low-calorie items. Other Casco syrups are used in brewing beer and providing functionality to candy and ice cream. The company also produces dextrose products used by the pharmaceutical industry, as well as starches for use in industrial

applications such as adhesives, papermaking, plastics, water filtration and oil and gas drilling. Casco's three manufacturing plants run 24/7/365—they can't afford downtime.

Casco had considered PCM systems in the past, but, like many other companies, had been turned off by both the cost of the technology and its limitations. That was then. Today, it's a different story.

The Future is Now

New technology that significantly enhances the economic return and capabilities of predictive condition monitoring systems is continually being developed. In the space of a few short years, tremendous advancements have taken place. Today, what was impossible just a little while ago is very much a reality (and very available), including:

- Increased intelligence, such as vibration and temperature monitoring.
- Wireless operation, such as data/alarm transmission.
- Self-powered capabilities, to save on wiring costs.
- Simpler reporting, that reduces reliance on experts to interpret the results.
- Ability to do more with less, which is vitally important in operations where consolidation and down-sizing have created more multi-site responsibilities.

End users like Casco are finding that predictive condition monitoring is now available at a cost that can provide near-term return on investment. Operations personnel are able to use PCM techniques to highlight potential



PROsmart sends alerts to management via computer or cell phone when problems are detected. Easy-to-understand reports are issued that can be compared on a period-to-period basis.

equipment problems and the Maintenance staff can use these techniques to check the quality of their own repairs (for example, shaft alignments, impeller balancing etc.). Soon, there will be reduced focus on using PCM to predict equipment failure, and an increased focus on using these techniques to extend equipment service life.

The concept of remote monitoring is simple enough, and the capacity to carry it out exists. Today's state-of-the-art PCM systems can detect an alarm condition and automatically contact—via pager, phone, and e-mail—all the people who need to know about it. This allows plant personnel to monitor critical equipment in the most unwelcome environments, so that they never have unwelcome surprises. Whether you are a maintenance manager with multiple site responsibility or a contractor, today's PCM systems can keep you tuned into your plant equipment. As for the interrupted vacation, don't worry. These systems will head off many a "vacation emergency."

Breakthrough Technology

When Casco revisited the possibility of utilizing predictive condition monitoring as part of its plant asset improvement program, it found significant value in a major advancement that ITT Industries has introduced to the marketplace.

Encompassing state-of-the-art, patented technology, ITT's PROsmart™ provides a cost-effective solution to maintaining uptime on all types of rotating equipment. It continuously monitors, analyzes (to pre-stated parameters) and annunciates an alarm when critical criteria are not met. By identifying and diagnosing equipment problems before they have a chance to manifest into unexpected downtime or catastrophic failure, operational costs are dramatically reduced.

PROsmart is powered by locally available power that works 24/7 with alarm and alert capabilities. (It's also offered as a self-powered option.) Individual computer formulas

(algorithms) have been created based on testing. These are used as the basis for evaluation and are stored on the PROsmart central computer. The unit continually monitors for changes in bearing vibration, temperature, speed, cavitation, etc. The monitored information is then fed via wireless transmitter through a protected Wide Area Network to PROsmart's central computing server where the data is analyzed and compared to the diagnostic rules-based program for that particular piece of equipment. Failures can be predicted based on the analyzed information.

Alerts are sent when problems are detected. Problems might include abnormal flow—*high, low or shut-off*. With flow shut-off, the resulting dry running can cause extensive damage to the pump. Bearing distress is detected by the rates of change in vibration and temperature levels. Early bearing fault technology is patented. Another patented technology is early cavitation detection.

Alarms are sent when preset parameters are exceeded. These conditions can include High Vibration, High Temperature, High/Low Oil Level, Seal Leakage or Seal Flush Stoppage.

Finally, easy-to-understand reports are issued on all equipment that can be compared on a period-to-period (hourly, daily, weekly, etc.) basis.

Casco is presently using PROsmart on six pumps in three different areas at one of its plants. Results to-date have been excellent. The fact that personnel can go online at any time to check readings is a real plus. So is the peace of mind it's bringing to both Maintenance and Operations sides of the house.

Catching Up with the Future

The current way of checking equipment is both obsolete and costly. What's more, it is often time consuming, unreliable and reactive rather than proactive. Acceptance and installation of predictive monitoring technology now rather than later can help you improve your plant efficiency while saving substantial dollars in operational costs. Good

management practices, just like good maintenance practices, are proactive, not reactive. There are many operational benefits to adding predictive condition monitoring to a facility's uptime strategy. With the competitive environment that exists in today's global economy—an *environment that promises to grow even more competitive well into the future*—PCM is fast becoming a real business requirement. **P&S**

PROsmart Features

- Continuous 24/7 monitoring—catches potential problems before they become catastrophic.
- Wireless communications—minimizes system costs
- Self-generated power supply—no wiring costs, an especially attractive solution for remotely located equipment.
- Built-in vibration, temperature, oil level, cavitation, seal leak detection capability—all in one device.
- Immediate alarms at the equipment location and alerts management—via cell-phone message, computer and/or DCS.
- Condition monitoring and analysis program—automatically generates alarm and trend reports.
- Reports accessible at all times—from any location via a password protected homepage
- Reduces costs—for software, hardware, training and maintenance.

For more information, call 1-800-734-PUMP, or log on to www.ittprosmart.com

