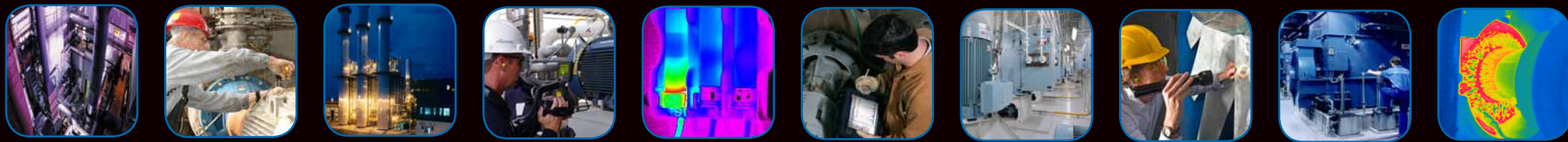


10 Critical Elements for Successful PdM

Common pitfalls of predictive maintenance programs and how to avoid them



The principles and benefits of predictive maintenance (PdM) are widely known and generally accepted, but many plants still fail to implement and exploit a successful program. “Many facilities and enterprises have failed to achieve the 10, 20 or even 30:1 ROI promised by the adaptation of a PdM program,” says Alan Friedman, Senior Technical Advisor, Azima DLI (www.AzimaDLI.com). “Investments have been made in monitoring equipment and training but, in many instances, data collectors are collecting dust on a shelf in some storeroom waiting for someone to rediscover them and wonder what these artifacts may have been used for. On the factory floor, it is back to business as usual with unplanned outages as the norm and everyone too busy fighting fires to get a handle on the situation. At least it’s an exciting place to work!”

Like any complex task involving many people of differing disciplines, it requires a comprehensive, coordinated effort to implement PdM and sustain it over time. Through research, experience, and interactions with PdM experts and consultants, plant management, and maintenance personnel, we have identified what we see as the 10 most prevalent pitfalls:

1. Vision: What will we achieve?
2. Commitment: Management expectations, plant-floor buy-in
3. Technologies: Identifying the appropriate predictive technologies for the job
4. Training: Initial and ongoing
5. Tools: The right hardware and software
6. Procedures: Established, communicated, followed
7. Methodology: Consistency among people

and locations, over time

8. Personnel: Enough qualified personnel with enough time available
9. Justification: Tracking results, making them public, proving effectiveness
10. Partnering: When needed for all of the above

Vision and Commitment

Any major change starts with a vision and relies on commitment. The supporting document, [“Why Do Predictive Maintenance Programs Fail?”](#) describes the role of vision and how to obtain commitment. Done correctly, a predictive maintenance program should change the culture, philosophy and work flow of the maintenance department. It is not just the addition of a new technology or tool, but a different approach or strategy towards maintaining one’s assets.

This approach is being undertaken in order to gain specific benefits that can and should be measured. These benefits include: increased uptime, reduced failures, shorter planned outages, fewer preventive maintenance actions and ultimately a greater efficiency of the facility. Failure to adapt the culture to this new philosophy and benchmark the gains will eventually lead to the program’s dissolution. Adopting new technologies without changing maintenance strategies will not result in the desired benefits.

Technologies, Training, and Tools

Successful PdM programs almost always rely on using condition monitoring technologies (such as vibration analysis, fluid analysis, ultrasound readings, temperature measurements, current signature analysis, etc.) in combination to fully characterize the condition of critical components and support accurate diagnoses of impending problems. The appropriate combination of methods must be combined and coordinated to obtain reliable results. But many facilities simply purchase a new technology, such as a vibration data collector or alignment tool, spend time and money learning how to use the tool, and never fully understand why it is being used. For details about technologies, see the supporting document [“Misuse of Technology”](#).

“One facility had the capacity and ability to detect incipient bearing wear in a pump using



Technology requirements must be understood so tools can be selected according to the needs of the facility and staff, not according to a vendor's sales pitch.

a vibration analysis system,” Friedman says. “Although the pump showed no signs of wear, the facility went ahead and changed out the bearings according to their preventive maintenance schedule. At another plant, a vibration analyst was adept at detecting mechanical faults in his plant’s machinery but he was afraid to tell his supervisor about all of the problems he found because his supervisor might get angry at having to repair all of these machines! Both of these cases demonstrate the use of the technology as an end in

itself with no greater vision of why the technology is being employed.”

Azima DLI’s recent inaugural “State of the Condition Monitoring Industry” report, based on a survey conducted among engineers and plant managers, found that 65% have a machine condition monitoring/predictive maintenance program in place. Of those, more than half indicated that it’s difficult to know exactly what solutions and tools are needed to maintain a successful program. This, along with insufficient staff, limited in-house expertise, and poor training, were the top factors respondents perceived as negatively impacting the results of their programs.

Training is a never-ending concern, starting with PdM principles, extending through implementation and following up as technologies evolve, equipment is updated, the facility progresses to more sophisticated applications, and personnel change. Training must take place on multiple fronts, as described in the supporting documents [“Why Do Predictive Maintenance Programs Fail?”](#) and [“Choose Your Partners Wisely”](#).

Technology requirements must be understood so tools can be selected according to the needs of the facility and staff, rather than a vendor’s sales pitch. Matching the right tools to the job can

minimize effort and efficiently deliver the right information in actionable form.

Procedures and Methodology

A successful PdM program is the result of following a standard set of procedures and remaining consistent year after year, “Not in being an expert at looking at graphs,” Friedman says, “and yet in the industry we often see people taking certification courses that teach a lot about looking at graphs and little or nothing about managing a PdM program.”

Each asset must be baselined and tested in the same way, at consistent intervals, to accurately track its condition. Only then can you set meaningful alarm limits and know when a change is significant.

Personnel

Though number eight on our list of 10 pitfalls, personnel issues are the number one problem for PdM programs. “How many times have we had to pretend that we had no program and now we are starting from scratch all over again - maybe with new equipment this time around - because the guy who used to run the program retired or left for greener pastures and took everything





When queried about barriers to success, difficulty demonstrating ROI was one of the top factors.

with him except for a squarish-looking electronic device with some cables and a sensor hanging off of it?” Friedman asks. “Retention of highly trained personnel is a big problem.”

It’s especially devastating when individuals do not formalize their work into processes and procedures that other people can be trained to follow when they leave. Unfortunately, many workers like to be “experts” and protect their position by shrouding their work in mystery and holding onto the secrets of their expertise to ensure that the company remains dependent on them. Others may be less devious or insecure but simply don’t think ahead and plan things to keep the program running in their eventual absence. “In either case,” Friedman adds, “We can say for certain that the loss of the resident expert is often enough to doom a PdM program and banish its high tech equipment to the unreachable parts of the highest shelves.”

If a qualified replacement is not available, it may take a year or more to train a new resident expert, or experts, to the point where they have a handle on the technology and can effectively manage a PdM program.

In the meantime, many facilities view PdM responsibilities as something extra that has

to be done after the real work. As the plant operates without an effective PdM program, unplanned failures increase, and knowledge about the condition of the plants’ assets declines. “Maintenance people start operating in ‘hysterical’ mode to fix the next emerging problem,” Friedman says. “In this situation, it is difficult to step back and put together a strategy to move up the maintenance evolutionary ladder to the rung of PdM.” The new PdM expert-in-training must be given the time, space, and support to make the transition happen.

The same situation can occur when commitment is lost due to an abrupt change in strategic direction. “I have seen successful programs uprooted by managers who appear on the scene with no knowledge of PdM and either fire the staff or don’t give them the time or permission to continue working on their programs,” Friedman says. “This problem is more common where the people responsible for the PdM program have not adequately documented its efficacy. They do not have the evidence handy to justify why the plant should keep these programs in place.”

Justification

The majority of respondents in the Azima DLI survey agree that predictive maintenance programs directly impact the bottom line, but when queried about barriers to success, difficulty demonstrating ROI was one of the top factors. Plants must adopt the right technology and partner services to enable managers to better capture and report the benefits of condition monitoring programs, focusing on metrics such as decreased downtime, improved productivity, and cost savings related to improved equipment health and reliability.





The right partner may make the difference between a consistent and effective program, and an endless series of false starts.

A facility can change their philosophy to a predictive mode, correctly employ technology to reduce preventive maintenance actions, and minimize catastrophic failures, but fail to adequately document the efficiencies and savings associated with these actions. “In those facilities where the technology is being used correctly and in the right context, I have often seen a program fail because its successes were not adequately documented,” Friedman says. “Employees within



the maintenance department acknowledged that their work was useful, but they had no data to prove this to those outside of their group and saw their program get cut when managers had to tighten their budgets.”

Partnering

Consequences of the pitfalls outlined above can be reduced or eliminated by outsourcing PdM activities to a partner. More than half of the respondents to the Azima DLI survey who have PdM programs use a combination of in-house and outsourced solutions. While only 8% currently outsource data collection and analysis, of those handling programs in-house, 53% responded that they believe there are benefits to outsourcing the program.

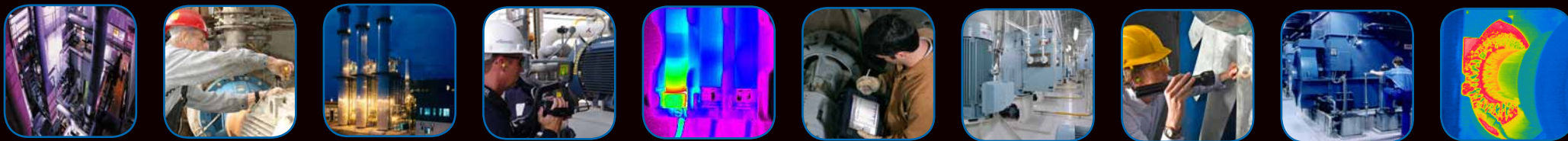
In considering a partner for third-party support, the following factors were ranked, in order of importance, as most influential in making that decision:

- Analytical software and services
- Ability to speak with a customer service representative 24/7
- Advanced reporting capabilities
- Web-based or on-demand access to data analysis

“While the benefits of an effective condition monitoring and predictive maintenance program are clear to plant personnel and management, many programs have been left on auto-pilot during tight economic times,” says Burt Hurlock, CEO, Azima DLI. “We believe one of the keys to long-term success is greater visibility among the C-suite regarding the quantifiable impact these programs can have on productivity and plants’ ability to comply with important industry standards for reliability. For example, by investing in cost-effective data collection and analysis capabilities, plants can make informed maintenance decisions and generate results in terms of cost-avoidance related to unscheduled downtime and unnecessary repairs.”

Ramifications of PdM partnerships are explored more thoroughly in the supporting document, [“Choose Your Partners Wisely”](#).

“Choosing the right partner may make the difference between a consistent and effective program that runs smoothly over the next 10 or 20 years and an endless series of false starts and investments in misused equipment,” Friedman concludes. “One thing is for sure, successful programs more often than not require good partners.” ■



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