World-Class Companies Need World-Class Motor Management and Maintenance

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Ask a manufacturer how long a motor it makes is expected to live, and the response will be something like, "20-plus years in the right environment." Ask the same question in a facility that uses such a motor and the answer is more likely to be, "If we get five years out of it, we'll be happy!" Why does this discrepancy exist? Why do motors die of an infant mortality instead of living to the ripe old age for which they are designed and built? The answer has to do with the failure to optimize motor management and maintenance.

Fortunately, in recent years, there has been a shift in philosophy with regard to motor management and maintenance. Companies no longer regard it as a cost center or a necessary evil. Rather, optimizing the lifespan of motor assets is now considered an opportunity. Business owners have come to recognize motor reliability as a decisive variable in overall profitability and competitiveness. Previously, they purchased information systems and software programs to attack the challenge from different vantage points, but until now, technology has not provided a turnkey solution for optimizing the motor management and maintenance processes.

Four Levels of Software – A Puzzle With Pieces Missing

Now companies recognize that optimal motor management and maintenance brings greater reliability. Greater reliability, in turn, ensures the best return on asset values, as well as less downtime and therefore more cost-effective manufacturing. This recognition led to the birth of reliability centered maintenance (RCM), a coordinated approach to maintenance, communicated through a centralized base and directed toward the overall reliability of assets and machinery. There are four levels of technology that facilitate this coordinated approach. They are:

Level 1: Technology-level software. The software in this category has been limited to identifying health concerns with motors. It is designed around widely accepted standards for motor reliability and delivers alerts and alarms recommended by IEEE (Institute of Electrical and Electronic Engineers) or NEMA (National Electric Manufacturers Association). These serve as a first level of notice that something is wrong with the motor or with the system in which it is installed.

Level 2: Information management software. A handful of software tools are available that are designed to organize information about a specific asset so that a supervisor, planner or technician can rapidly identify trends or indications of problems related to that asset. Much of this information amounts to historical data on a motor allowing personnel to track which systems the motor has been installed in and what kinds of problems it has encountered in the past.

Level 3: CMMS, centralized maintenance management software. Best-of-breed CMMS packages provide centralized information management on a company's motor assets in a variety of technologies – electrical, mechanical, vibration, and others. It is the central location where work requests are initiated and work orders submitted and authorized. The software tracks each asset's work request and work order history so that personnel can look up the status and type of maintenance or repair work currently being performed on an asset.

Level 4: EAM, enterprise asset management. Top-level recognition of maintenance as a critical portion of business decisions is the driver behind popular business-level software programs such as those produced by SAP. CMMS software is often linked directly to a company's EAM platform so that reliability and return on investment (ROI) of assets can be monitored directly at the highest levels to ensure cost-effective and competitive manufacturing.

Some EAM programs include their own CMMS modules, which are, however, not usually best-of-breed software.

While each of these technology levels is critical to the overall picture, they only present partial pieces of the puzzle. What has been missing is a turnkey approach to tracking motor management and maintenance cradle-to-grave.

Cradle-to-Grave Approach

The ideal technology supports the entire motor management and maintenance effort from cradle-to-grave, without the need to purchase and integrate several software packages. The process of assuring motor reliability begins with specification. It continues on to quality control upon receipt of the asset, then to proper storage, to pre- and post-installation verification, to monitoring the asset while operational. The final stage of the process is having the right information to recognize when a motor has become afflicted with a terminal disease or is nearing the end of its life for other reasons. Then the process begins again with a replacement motor.

1. *Precision specification.* Cradle-to-grave management software includes a tool for precision specification, a growing trend in motor management. When forward-thinking companies buy a motor today, they begin with stringent specifications to make sure it is the highest quality motor available in the marketplace. They know that it is more cost-effective in the long run to purchase a superior, highly reliable motor than to pay a low price up front and then waste resources on frequent repairs. A cradle-to-grave approach to motor management includes technology that allows motors to be pre-qualified at purchase to "design out" potential problems from the start.
2. *Quality control.* Quality control is a paramount, but often overlooked component of reliability. Motors are sometimes defective upon arrival. As such, much testing,

troubleshooting and repair down the road could be avoided with solid quality control at the time of receipt. The old adage is, don't buy a car that was built on a Friday. In other words, don't buy a motor and count on its warranty, hoping for the best. Starting with a new motor that is 100 percent perfect will increase its long-term life expectancy and decrease reliability concerns with its installed application.

3. *Scheduling and tracking.* Scheduling and tracking are important to the efficient use of a motor in any industrial environment. For example, just like a human body, a motor needs regular check-ups and maintenance so that any trends pointing toward a health problem can be identified and corrected or reversed before they become terminal illnesses. Because problems directly or indirectly related to a motor can be very subtle, thorough tracking of a motor's history can identify negative trends. Such tracking must be automated because people are generally too busy with other tasks to keep notes on the history of motors. While everyone has good intentions about maintenance, it is generally eclipsed by other priorities. Further, the population of workers available to perform testing and analysis on motor assets is dwindling, making the need for automated scheduling and tracking that much more vital.

   Another important reason for tracking a motor's reliability and maintenance history is to be able to recognize the point of diminishing return. If a motor's problems and repairs are not tracked, investments may be made in maintaining and repairing it when it is no longer cost-effective to do so. For instance, if a motor has been rewound 13 times, another rewinding is inadvisable because the motor will be very inefficient despite this maintenance effort.

The fact is, if maintenance activities are not scheduled and tracked, they probably will not occur. Furthermore, in the absence of automated scheduling, analysis and trending of data to identify conditions leading to lower reliability, potential problems will be overlooked, and the plant's competitiveness will suffer.

4. *Predictive testing and trending.* Testing and trending needs to be predictive rather than just preventive or reactive. Let's clarify that important distinction with a medical analogy. Regular medical checkups are predictive in that the findings may predict illnesses. A preventive measure would be taking vitamins on a regular basis to minimize the risk of unhealthy conditions. However, since the body eliminates excess vitamins, it is not necessary to be predictive about taking vitamins, which would amount to taking a blood test every day. Being reactive about one's health would mean to stop eating junk food once diagnosed with a serious medical condition. Like medical checkups, software-enabled predictive maintenance is designed to identify conditions that are conducive to failure or lower reliability, so that they can be corrected to increase the life expectancy of an asset or motor.

   Cradle-to-grave reliability software tracks the history of repairs, or mean time between failures, to show faults so that their source can be identified and remedied. Without such historical information, repeated repairs or continual cleaning of a motor may waste a company's resources on correcting symptoms while missing the real disease.

5. *Tracking installation history.* Tracking the history of a motor itself is not enough. Turnkey reliability software also tracks the history of the systems in which the motor is installed. This is particularly important when a motor is used in a number of different systems, from fans to pumps to compressors. If a motor fails as part of a pump, is sent to

repair, installed in a fan, fails again, is repaired again, installed in a compressor, and fails yet again, it's important to be aware that the motor has failed every time and to know why it failed. Knowing whether it failed for the same or a completely different reason each time is critical to making a decision about its future. If analysis shows that none of the failings are related, the motor may still have 10 years of life and is therefore worth maintaining.

Here's an example. Let's say a motor's application history shows that its last failure was due to a ground fault when it was installed in a ventilation fan. A review of the fan's history reveals that all of the last three motors installed in it failed due to insulation to ground. A common fault mechanism has now been identified and can be further investigated. A technician is dispatched to the site and discovers that the motor above the fan is leaking grease into the fan's motor. If the history of the fan and its motors had not been tracked, several more motors might have failed, wasting resources on repeated repairs. Again, it is critical to automate the tracking of where a motor has been and what problems it has encountered so that personnel can focus on making the right decision rather than spending valuable time on analysis.

New turnkey software at the technology level now enables the comprehensive management and maintenance of motors through all these important stages of an asset's life, from precision specification to recognizing when the motor must be replaced – in short, from cradle-to-grave. The software also delivers that information to asset management platforms so that senior management can make decisions that will continue to increase the company's competitive edge.

A Solution to Last a Lifetime

As one of the most critical factors in reducing manufacturing costs, motor reliability has to be taken very seriously if a company wants to increase its return on investment in motor assets. Keeping around several spare motors is not a profitable solution to reliability issues. Rather, the answer is a cradle-to-grave approach to motor management and maintenance that begins with thorough specification and qualification and tracks assets and the systems in which they are installed throughout their lifetime. A company that wants to be world class has no choice but to be world class in its motor management and maintenance efforts. Thanks to new turnkey, best-of-breed software at the technology level, the motor reliability effort has just become a whole lot easier.

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