Manufacturing Business Technology

Evolution Of Maintenance: Today's Walk Is Tomorrow's Crawl

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by Kay Jenkins

The 20th century produced incredible advances in technology, beginning with the moving assembly line installed by Henry Ford in 1913, reducing the time it took to build a car from 12 hours to under three. One hundred years later, car manufacturers can produce over 500 cars in one hour. As companies strive to be more productive, and more profitable, it is increasingly important that the assets driving the process operate at peak efficiency.

Fundamentally, maintenance has been around as long as humans have existed. From the routine sharpening of man's earliest spears and tools to the repair work needed for modern technologies, our tools and machines have needed upkeep and repair. "If it isn't broken, don't fix it" is an adage that has been repeated for decades. But is that a viable approach in today's plants? While there are exceptions, for the most part the answer is no, especially when it comes to asset-intensive industries and smart factories.

To illustrate that point, let's consider different maintenance strategies for one of the most basic (yet revolutionary) pieces of equipment: the wheel.

Replacing the Wheel When it Falls Off

Centuries ago, when the wheel fell off the delivery cart, the driver had to stop in the middle of his route to deal with the crisis. Reactive maintenance is the oldest strategy known to man: repairing or replacing a part after it has stopped functioning. According to industry research, the average uptime for a plant operating solely on this strategy is 83 percent. But that 17 percent downtime can occur at any time. What if a conveyor belt malfunctions in the middle of peak production? Can your company absorb not only the costs of emergency repairs, but also the lost revenue? What if a generator shuts down in the middle of the night? Did you budget for overtime expenses as well as the spare parts?

Reactive maintenance is an effective component of a maintenance strategy when applied to the right circumstances leveraging the right technology. Consider this approach when equipment can be replaced quickly and costs the same in failure as it does in controlled replacement. For example, it's easier to replace light bulbs when they burn out than to replace them on a set schedule.

Checking the Wheel Every Three Months or 3,000 Miles

Eventually the driver begins checking the wheels before setting off on his route and notices that the spokes are beginning to wear or that the axle is bending. Those observations allow him to make repairs or replace a wheel before it fails. He then decides to check the wheels on a weekly basis and plans his repairs accordingly. As equipment has become more complex, manufacturers often recommend time or usage-based inspections to maintain standards. The goal is to extend the life of the asset at a lower cost. The warranties offered for equipment may also depend on whether or not maintenance requirements have been met. Heavily regulated industries are often required to keep records to ensure that they are in compliance.

Preventive maintenance activities can increase uptime about 5 percent; however, the company also runs the risk of over maintaining. For example, a mechanic may schedule an engine oil change every three months. What if the oil change itself creates issues with the equipment? Many of us have either experienced, or know someone who has experienced, the preventive maintenance oil change on our car which ended up causing expensive engine damage because the mechanic forgot to properly reinstall the oil plug. What if the company decides to switch from a conventional oil to a synthetic, which would allow for better performance and more time between oil changes, but the mechanic doesn't update his maintenance plan? The benefits the company expected to receive are never realized.

Paying More Attention to the Squeaking Wheel

After a few years of deliveries, the driver begins to notice patterns. The wheel squeaks more under certain conditions and the spokes usually snap after a certain length of time. Instead of checking the wheels once a week, he determines that repairs can wait until the squeak becomes more persistent or until the cart begins to shake when he applies the brake. Observations such as these are the beginning of a more proactive approach to maintenance. In addition to longer life and lower costs, proactive approaches often align with organizational initiatives such as health and safety concerns, sustainability and better regulatory compliance.

With Great Data Comes Great Opportunity

By monitoring conditions over time and tracking the equipment's history, maintenance becomes more effective. The focus shifts from repairing to improving. In addition, the company can begin to pinpoint why equipment failed, which provides an opportunity to intervene before failure in the future. When this aspect is incorporated into the overall strategy, industry research presumes 98 percent uptime.

The eventual goal for every organization should be to optimize its assets. Machines are getting smarter, finding patterns in data and extrapolating generalizations from those

patterns. Advanced strategies such as predictive forecasting and reliability-centered maintenance require a constant stream of data to improve equipment availability and production capacity. The completeness, accuracy and integrity of the data becomes critical.

Asset-intensive industries, which depend on the safe and reliable operation of their physical assets for the production and delivery of products and services to market, put a high premium on being able to predict when a piece of mission-critical equipment will fail. Industry research indicates that those organizations may see more value in the Internet of Things (IoT), as the nature of their business is tied to the performance of equipment. Predicting equipment failure sometimes requires drawing inferences from seemingly extraneous information, such as production data, ambient temperature and data from peripheral equipment, and can mean using new forms of advanced analytics. In addition to structure data gleaned from IoT, those advanced strategies also benefit from unstructured data in the form of observations and interactions.

Are You Just Keeping Up?

Maintenance is a cycle of continuous improvement; the objective should be to provide reliability and capacity capitalize on the plant's investments in its assets. Maintenance is being recognized as an area in which to be invested, rather than a cost to be reduced. All of these practices and supporting technologies are designed to improve decisions on how to operate, when to maintain and what types of activities to perform on equipment. With more information and better analysis of that information, better business decisions will be made.

As more companies consider the impacts of Industry 4.0 and the move toward smart factories, asset management becomes even more critical. Equipment is much more sophisticated, with more complicated parts and service needs. It is necessary to determine the right strategy, or combination of strategies, for each piece of equipment and identify the data needed to implement that strategy.

To fully exploit the oceans of data generated by assets, ancillary sensors and IoT, it is necessary to invest in an Enterprise Asset Management System (EAM). Integrating this system with your Enterprise Resource Planning (ERP) system and Manufacturing Execution System (MES) should be a top priority to achieve the potential offered by Industry 4.0. Take care to properly set internal expectations to prepare your stakeholders for the iterative nature of this initiative. Learning and CPI (Continuous Process Improvement), which will occur over a long period, should be factored into those expectations. None of this should dissuade you from moving forward; instead, it should encourage you to begin now. Or to use another often repeated adage, if you don't start, you'll never finish.

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