THE VALUE OF PREVENTATIVE MAINTENANCE

PRESERVING THE USEFUL LIFE OF OLDER SYSTEMS
Overview

And yet, preventative maintenance has long been the gold standard across industries such as aviation, government and print and mail.

The goal of a successful preventative maintenance program is establishing consistent practices designed to improve equipment performance and safety. But there is also a great debate on whether a preventative maintenance program is worth having in place.

The term, "if it’s not broken, don’t fix it,” still applies to many organizations.

Do the man hours and money invested in a program outweigh the cost of emergency repairs? And what are other benefits of a successful preventative maintenance program?

This report assesses the true value of preventative maintenance, key industry findings and the best practices for running a successful program.
That's preventative maintenance in its simplest form. By employing the concepts listed above, one effectively mitigates or avoids the ramifications of equipment failure. In other words, preventing damaging outcomes.

On the other hand, corrective maintenance is generating a work order in response to an existing failure, then performing the work necessary to make it operational again.

With preventative maintenance, a trained staff is able to better detect potentially consequential issues and correct them before they become crippling. The maintenance is scheduled based on a time or usage trigger.

A typical example of an asset with a time-based preventative maintenance schedule is an air-conditioner that is serviced every year, before the summer months. A typical example of an asset with a usage-based preventative maintenance schedule is a motor vehicle that is scheduled for service every 5,000 miles.

Assets suitable for preventative maintenance include those that:

- have a critical operation function
- have failure modes that can be prevented (and not increased) with regular maintenance
- have a likelihood of failure that increases with time or use
The definition of service is constantly evolving, according to a recent study\(^1\) conducted by the Aberdeen Group, where the internet of things (IoT) gives service organizations the ability to sell service contracts which can execute on the future of the service, which is preventative. It does so by allowing the service to move beyond continuous monitoring which has limited value, to rely on automated triggers that send technicians out to a customer site the moment an asset begins to degrade.

The study concluded that 53 percent of equipment for best-in-class companies “is connected” for the purpose of maintenance and service. Additionally, the IoT helps service organizations gain valuable insights into monitoring product performance for maintenance purposes and helps them improve the efficiency and productivity of the customer’s operation – something that is paramount in mission critical environments such as oil and gas and medical devices fields.

Aly Pinder, Jr., a senior research analyst at Aberdeen, said that the real value of IoT comes from what the technology can enable and empower organizations to do.

“Ultimately, your customers don’t really care how many devices you connect to,” he said. “They want to know that you will be able to deliver better value and provide better service each and every day.”

He added that currently only about 50 percent of companies he surveyed have their equipment connected.

“It’s still early, but hopefully, more companies can make the leap and connect in order to maintain and operate more efficiently,” he said. “There is still a need for reactive maintenance, but it is important for companies to use preventative measures.”

Cisco CEO Chuck Robbins, who spoke at the Code Conference in June 2016\(^2\), said that his company had zeroed in on one significant use for the IoT: fixing things before they break. In 2015, Cisco teamed up with FANUC, a Japanese company building industrial robots, to keep track of how often robots in factories need maintenance.

Cisco is tracking 28 million devices on its IoT network and adding a million more each month.

Robbins added that preventative maintenance on robots saves money by eliminating costly and unexpected downtime. And that the savings from preventative maintenance is enough to justify the investment.

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2. Hesseldahl, Arik (2016). Cisco is tracking 28 million devices on its IoT network and most of them are cars. Recode.
Preventative maintenance brings reliability and predictability to a fleet, and Delta Airlines is a prime example of how its diligence has helped it position itself above the average.

In 2014, the airline devised a strategy of investing in older aircraft instead of buying only new ones and aggressively managed and controlled maintenance, material and repair costs via preventative maintenance. The result?

Delta's 740-aircraft mainline fleet logged about 120 days, two to three times a week, without a single maintenance-related cancellation. In fact, it went the entire month of October 2013 without a single domestic cancellation. All of this came while flying a fleet that averages 17 years of age, at least three years older than any notable carrier.

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But the airline’s performance is about more than just reliable aircraft. Delta was aggressive about swapping spare planes for faltering ones to keep from canceling flights. This strategy paid off and the airline’s 2013 net profit of $2.7 billion topped all U.S. carriers.

That same year, United Airlines, deferred maintenance on its fleet in favor of easing cash flow. However, the airline quickly learned that doing so created bigger hurdles down the road. Some of the airline’s legacy widebodies, including its 23 graying Boeing 747-400s, were having reliability issues that traced back to maintenance deferrals during the carrier’s mid-2000s bankruptcy.

Determined to catch up, United altered its 2013 aircraft routings and based the 747s in San Francisco, where it has a full-service maintenance, repair and overhaul shop. While that positioned the aircraft for much-needed preventative work, it also pulled them from higher-revenue routes, such as Chicago to Tokyo, costing the airline money.

Over the last three decades, the United States Congress has enacted several laws to assist agencies and the federal government in managing IT investments that, among other things, requires Operations and Maintenance to develop standardized performance metrics, including cost savings, and to submit quarterly reports to Congress on cost savings.

And according to a new Government Accountability Office report, federal agencies are spending an increasing amount of their IT budget on maintenance. In fact, the 2017 budget request was more than $89 billion, with much of this amount reportedly for maintaining existing equipment—a testament to the value of an ongoing preventative maintenance program.

Funds from 5,233 of the U.S. government’s 7000 IT investments are being spent on maintenance programs.

Examples of legacy investments and systems include:

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<td>Currently maintaining with plans to update.</td>
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<td>Benefits Delivery Network</td>
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Powner, David A. (2016). Information Technology: federal agencies need to address aging legacy systems. Testimony before the committee on oversight and government reform, House of Representatives.
Many print and mail production operations are employing preventative maintenance programs in order to avoid larger, costly fixes down the line, according to Jim Feely, Senior Vice President of Global Services for Bell and Howell. These include:

1. **Cost savings:**
   Unplanned downtime can result in idle employees, halting the production line, missed deadlines and long-term damage to a brand.

2. **Increased efficiency:**
   Measuring performance and creating standards for preventative maintenance is key to a successful operation.

3. **Decreased equipment downtime:**
   A preventative maintenance program helps plan for scheduled downtime, improving an equipment’s ability to keep running at peak performance levels.

4. **Improved reliability:**
   Preventative maintenance can also help a company be a more reliable business partner. Customers can count on a company to deliver products or a service on time without unnecessary delays.

5. **Conservation of assets:**
   Most printing and mail equipment is not inexpensive. But the better the company cares for its equipment, the longer it will last. Preventative maintenance prolongs the life of a system resulting in reduced costs and increased profits.

### Five Things to Know About Preventative Maintenance

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<td>Increases efficiency</td>
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<td>Improves reliability</td>
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<td>Conserves assets</td>
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Preventative maintenance is more complex to coordinate than run-to-failure maintenance because the maintenance schedule must be planned in advance.

A common example of run-to-failure maintenance is a plan for a simple light bulb (where it runs until it fails). Then a new bulb is obtained to replace the older one (fixing the asset).

However, preventative maintenance is far less complex to coordinate than predictive maintenance, which requires planned monitoring strategies and interpretation of results.

Key Advantages

Planning is the biggest advantage of preventative maintenance. Unplanned, reactive maintenance has many overhead costs that can be avoided during the planning process. The cost of unplanned maintenance includes lost production, higher costs for parts and shipping, as well as time lost to responding emergencies and diagnosing faults while equipment is not working.

Unplanned maintenance can cost as much as three to nine times more than planned maintenance.

With preventative maintenance, equipment can be shut down to coincide with breaks in the production schedule. Also, prior to shutting down, any required parts, supplies and personnel can be gathered to minimize the time taken for a repair.

Preventative maintenance does not require condition-based monitoring.
Designing a Successful Preventative Maintenance Program

It’s one thing to understand how preventative maintenance works and another to actually implement a successful program. Additionally, it is important to know the difference between preventative maintenance and predictive maintenance, the latter being a series of dynamic inspections of machine components while the machines are operating in their normal production modes.

Great preventative programs should follow these four key steps:

1. Laying down the groundwork and having the right systems in place:
   Designing and implementing a preventative maintenance program requires a different mindset than operating and managing a normal maintenance department. Companies must:
   - understand facility goals
   - set equipment performance standards
   - document preventative maintenance procedures and schedules
   - upload information to a computerized maintenance management system

2. Ensuring other things don’t get in the way:
   Companies often delay or stall their preventative maintenance program for a variety of reasons. But the primary reason is because a profit motive was not included. Companies should:
   - incorporate a way to benchmark and track the savings their program generates

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Designing a Successful Preventative Maintenance Program

3. Correctly rolling out the program:
   Companies that fail quickest simply hand over preventative maintenance implementation to their maintenance staff without the proper training and oversight. They should:
   - focus their objectives
   - create preventative maintenance tasks correctly the first time around
   - train their team
   - oversee all the implementations
   - ensure a management system is in place to sustain the program’s success

4. Understanding why breakdowns occur and weighing preventative maintenance activities correctly
   Preventative maintenance tasks must be documented to address the root causes of breakdowns in order to positively impact productivity. Companies should:
   - have a good work order system in place
   - use a computerized maintenance management system to measure the program effectiveness

If a company’s in-house experts can initiate and manage a successful program, then great. But if not, it is imperative to find a qualified organization to get and keep the ball rolling.
Looking Ahead: Predictive Maintenance

Even with preventative maintenance being the gold standard across most industries, some are now looking into predictive maintenance and its capabilities.

For starters, predictive maintenance is not designed around experience and time, but rather documented impact of production on the equipment. It’s also being touted as a data-driven method for managing routine equipment maintenance to maximize production and efficiency while ensuring ideal operation and reliability of equipment.

This new approach has the potential to be a game-changer when it comes to optimizing maintenance, production and cost-efficiency. Additionally, it has the potential to provide a more reliable method to detect and prevent potential failures.

For example in 2016, Delta Airlines became the launch customer for an Airbus-developed digital maintenance prognostics solution. The web-based application, developed in partnership with IBM, will be applied to the airline’s Airbus A330 fleet, allowing the carrier to maximize aircraft turnarounds and turn unscheduled maintenance events into anticipated and scheduled ones. Additionally, prognostic alerting will allow Delta’s engineers and maintenance teams to detect in advance failures on components and systems to mitigate possible operational interruptions.

Similarly, predictive maintenance solutions are also being developed for other industries – using sensor data to predict the failure of an ATM cash withdrawal transaction, predicting the failures of circuit boards at early stages in the manufacturing process and predicting credit defaults.

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