



How Many Types of Maintenance are There?

In past *Focus on Facilities* columns we have discussed preventive maintenance (see Footnotes below). It is always good to remember why preventive maintenance (PM) work is performed and this is why:

- Keeps equipment in good operating condition so as to avoid larger problems later
- PM work contributes to extending the useful service life of the equipment
- PM work includes visual inspection that can identify small problems before they become big ones
- It is an opportunity for maintenance technician to remain familiar with the equipment they service
- Contributes to efficiently managing of the parts inventory
- Contributes to proactively reducing unscheduled equipment/system downtime

Most individuals familiar with and/or working in the facility management industry may be surprised as to the number of maintenance categories. Typically maintenance work is categorized into 3-types of maintenance: preventive maintenance, predictive maintenance, and unscheduled maintenance. The description of each are as follows:

1. Preventive Maintenance (PM); which we prefer to call, “Planned Maintenance” because one can never prevent equipment from failure but you can plan-to-maintain. One must remember, “Nothing lasts for every” but proactive, regularly scheduled PM work will maximize the useful service life of the equipment.

Our August 2019 column titled, [“What a Preventive Maintenance Work Order Include”](#) we highlighted the tasks and the frequency of completing a PM on a piece of equipment. This method is the most common approach to maintenance.

2. Predictive Maintenance (PdM); is a more proactive approach to equipment maintenance and this can be achieved through digital devices, such as a vibration switch mounted on a fan shaft to monitor the shaft’s vibration. There will be a set operating range that this device will monitor and should a shaft begin to experience excessive wear and/or get out of alignment then vibration can become excessive. The vibration



switch will send an alarm signal to the facility management’s building automation system computer (BAS) predicting that this shaft will fail in time if a PdM work order isn’t issued and corrective action taken.

3. Unscheduled Maintenance; which is maintenance repair that was not anticipated by the maintenance staff and, as a result, a piece of equipment has failed due to an integral part of the equipment. This unexpected failure can come at the most inopportune requiring immediate attention, as well as disrupting other scheduled work activities.

Recently we came across an article posted on the web site www.roadtoreliability.com written by Mr. Erik Hupjé founder of the Road to Reliability™ where Mr. Hupjé better defines PM work separating this topic into [9-types of maintenance](#):

The categories under preventive maintenance are categorized as, “Before a Failure has Occurred”. Corrective maintenance categories are identified as, “After a Failure has Occurred”. The goal of all facility management organizations is to strive for “Before a Failure has Occurred” so we will focus on these 5-categories starting with:

Time Based: Is simply that, PM work scheduled at specific intervals such as weekly, monthly, quarterly, semi-annually, or annually regardless of the equipment's condition. Analogous to one having the oil changed in their automobile after xxxx miles or x months, building equipment need the same attention to protect and preserve the equipment.

Failure Finding: Is the requirement to schedule PM initiative to test the "failure" device. An example of this is an air-handling unit freeze-stat, when its set point is reached e.g., 36F and this device is designed to shut down the air-handling unit to protect its water coil (hot water or chilled water) before freezing cold air passes over its fins as this temperature continues to drop to "below freezing." Another example is to routinely test a pressure relief valve to make sure this valve will operate as designed when needed.

Risk-Based: Is the task of prioritizing PM work based on what the facility budget can bear and recognizing the risk if the most important equipment does not receive PM work resulting in the highest consequence, e.g., a boiler failure has a significantly higher consequence than the terminal heating units failing because, without the boiler the entire heating system terminal units will be ineffective. An example of prioritizing risk-based PM work is as follows:

- Protect the occupants e.g., fire alarm system, security system, etc.
- Protect the primary equipment e.g., emergency generator, and boiler, chiller, etc.
- Protect the central distribution systems e.g., central air-handling unit, hot water heater, electric panels, etc.
- Protect the terminal equipment e.g., fan coil units, light fixtures, etc.

This risk-based approach should result in providing the PM work in the most economic way. A side note to this economic approach is that facility managers have also recognized that a sub-section to risk-based is "cost-based" where arbitrarily scheduling PM work each year to certain terminal equipment e.g., an \$800 cabinet unit heat with an estimated 16-years useful service life may cost the facility management budget \$1,400.00 during that period of time.

Condition-Based: Mr. Hupjé noted in his presentation, "9-Types of Preventive Maintenance that most failure modes are not age related. However, most failure modes do give some sort of warning that they are in the process of occurring or are about to occur. If evidence can be found that something is in the early stages of failure, it may be possible to take action to prevent it from failing completely and/or to avoid the consequences of failure.

Condition-based maintenance, as a strategy, looks for physical

evidence that a failure is occurring or is about to occur. Here is where the importance of the maintenance technician completing "walk through tours" on a regular basis to visually inspect the equipment, as well as listen for unusual sounds from this equipment that could eventually lead to equipment failure. This condition-based maintenance will not prevent the failure from occurring but it can raise facility awareness to a potential problem becoming a failure.

Predictive: Is basically just that, forewarning of a potential failure. While most predictive maintenance tools may be along the lines of the fan shaft vibration switch mentioned above, there are other forms of predictive tools. A magnehelic pressure differential gage* that senses upstream air pressure of an air filter and a downstream air pressure combines its two input signals to show on this magnehelic gage the current air filter pressure drop. This differential signal output can be digitally transmitter back to the BAS computer and its program will have an alarm setpoint to notify the O&M group that the recommended high point had been reached and to change the dirty filter. At the same time this "predictive" gage can be observed showing the filter unit slowly building up dust by simply noting the actual gage reading when a maintenance technician is completing his or her "walk through tours".

Mr. Hupjé's 9-Types of Preventive Maintenance versus 3-types of preventive maintenance better defines and offers a fresh perspective on the proactive facility management initiatives to maximize equipment useful service life. Having a comprehensive preventive maintenance plan in place is crucial, and perhaps one of these categories might just be a better approach to optimizing your own maintenance needs.

Footnote: Also refer back to Focus on Facilities columns to read more:

"Facility Management" — [Annual Building Maintenance Checklist](#)

"Asset Management" — [Creating A Deferred Maintenance Plan, Seasonal Maintenance—Why it is Done, Four Types of Maintenance](#)

For more information:
facilities@dioceseofcleveland.org

