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Preventative Maintenance for Multi-Site Retailers

What program is right for your company?
Equipment failures are expensive: they impact consumer comfort, generally cost more than proactively maintaining equipment, and require reactive, crisis management to gain resolution. An effective preventive maintenance program puts companies in the driver seat to proactively identify and resolve issues, while lowering the consequences and costs of failure.

Equipment wears at a rate of 1.5 to 3% each year depending on the ASHRAE zone in which it resides and how hard it runs. And certainly, energy usage increases as the equipment ages. Too, providers cost increases. To accommodate, they will attempt to reduce the time required on-site for doing planned maintenance. Unfortunately, the net result to your company is that repair and maintenance costs increase as the number of site visits increase to accommodate service calls.

Siemens works with multi-site retailers nationwide who have varied programs in place to address. We have customers with robust processes in place. From them, we have identified best practices and recommended minimum statement of work requirements which we have included in this paper. Siemens also works with customers who have engaged in little to no preventive maintenance activities, and we try to address in this paper the value of not doing so as well.

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What is preventative maintenance?

According to Wikipedia, preventive maintenance (PM) has the following definitions:

1. The care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection and correction of incipient failures either before they occur or before they develop into major defects.
2. Maintenance, including tests, measurements, adjustments and parts replacement, performed specifically to prevent faults from occurring.

The primary goal of a PM program is to avoid or mitigate the consequences of equipment failure. PM plans are designed to preserve and restore equipment reliability by replacing worn Original Equipment Manufacturer (OEM) components before they actually fail. Preventive maintenance activities include partial or complete overhauls at specified periods (monthly, quarterly, semi-annually and annually). In addition, technicians can record equipment deterioration, which is the first step in planning for warn part repairs or replacement budgeting.

In the context of multi-site retailers, PM activities typically address HVAC equipment, including: filter changes, inspecting and tightening blower belts, oil changes, lubrication and minor adjustments. Certainly, other equipment such as refrigeration or lighting may be included as well.

Common Approaches

Siemens is aware that for a multitude of reasons, clients handle equipment maintenance in many different ways. Here are a few:

Run Until Failure – Some companies refuse to proactively maintain equipment. Often they even use this approach to establish relationships with repair vendors, and will rely on the Yellow Pages to find one when the equipment does fail. At some point, it will be too expensive to fix and they will simply replace it.

Periodicity-based PM – A proactive approach that may involve daily checks, monthly inspections, quarterly replacements, semi-annual inspections and annual overhauls.

Manufacture-based PM – Every asset has an OEM recommended set of checks at varying timeframes. Usually it is written to protect the equipment during the warranty period, which keeps the manufacture accountable for the performance of that equipment.

Run-time Method – Hour meters capture asset run-time, and a predetermined number of run-hours drives component replacement. This is similar in nature to the often quoted need to change the oil in one's vehicle ever 5,000 miles.

Predictive PM – Technology driven program determines when and where to perform inspections, repairs and replacements based on a predetermined set of parameters, such as vibration analysis and/or analytics from an energy management system (EMS).

What is the value of preventative maintenance?

There are two primary value drivers of preventative maintenance. The first is maximizing the useful life of the asset. Performance at the designed efficiency output, whether it is miles per gallon, tons per kilowatt hour, or say cubic feet per minute per kilowatt, is a desired objective in minimizing your energy consumption. Continuing with the vehicle analogy, the cost of rotating tires or performing tune-ups is minimal relative to the cost of replacing an engine.

A second driver is budgeting predictability or insight for repair and maintenance needs, as well as for asset purchases. Building an accurate view of the asset and repair needs and the associated timeline for each is a critical and effective budgeting exercise. Additionally, site visits at predetermined intervals, along with asset maintenance activities are the key to providing that insight.

Without preventative maintenance, energy managers are relegated solely to reacting to equipment failures, which by their very nature are not likely the best use of the company's limited resources.

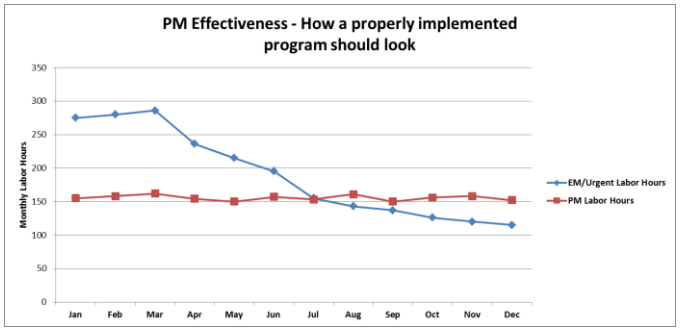
Consider this example. Pictured to the left is the blower belt on a rooftop unit (RTU) for a multi-site retailer. It is visibly cracked and should have been replaced during a regularly scheduled PM visit. As it was not replaced, this condition has a cascading effect on the RTU in a relatively short period of time. The lack of proper airflow across the evaporator will cause the unit to ice up, restricting all airflow to the zone as well as causing damage to the compressor itself.

Pictured on the following page is a different RTU that suffered the same net result – the compressor is iced up and damaged internally. It now requires replacement.

The value of the PM activity as it relates to this use case is the fact that replacement of a $30 part (the blower belt) could have prevented the $2,000 expense by the retailer on a new compressor; avoided discomfort to consumers in the store; and finally, averted $400 in excessive energy consumption per month due to the running of a failing compressor.

Another perspective to consider is the prevalence of emergency labor hours in an organization without a PM program. Emergency hours require substantially inflated hourly bill rates and at times too have an impact on staff's ability to cover obligations during the following days' regular business hours.

An effective PM program should cause a material decline in emergency labor costs. The graph below shows a decrease from roughly 240 hours per month to approximately 120.



Siemens finds that multi-site retailers without controls generally have at any one time 30% of their HVAC fleet in failure or operating ineffectively. These underperforming units often operate for 3-6 months at a time before being addressed. Also, consider that an inefficient HVAC unit, depending on run times, tonnage and age, will cost approximately $300-$500 per month in excessive energy consumption alone.

To dimensionalize the exposure here, let us examine a multi-site retailer that has 1,000 stores and an average of 5 HVAC units per site. Assuming 30% of the HVAC units are in extreme to moderate failure, this means roughly 1,500 HVAC units are in need of some level of repair. Also assume they operate inefficiently for 3 months at a cost of $300 per month. The result is that the retailer spends $1.5M per year on wasted energy consumption alone.

Managing an Effective Preventative Maintenance Process

Administration. Here are a few suggested steps for implementing and/or executing an effective program:

1. Know the assets you are maintaining and index them. Capture HVAC unit model & serial numbers, age, tonnage and unit conditions.
2. Use that information to identify equipment with an age of less than 10 years. Target this equipment for regularly scheduled PM activities.
3. Any equipment greater than 15 years in age should be placed on a time and materials service. It should also be prioritized for capital replacement.
4. During the third quarter of each year, your PM vendors should provide a list of units that will require replacement during the upcoming budget. Facility managers should strive to include this activity in the vendor statement of work (SOW). HVAC health reports from the EMS platform are a great source of intelligence for this prioritization effort.
5. Utilize an EMS platform to perform remote audits throughout the year on 10% of PM sites. Coordinate these 5-7 days following the execution of a coil cleaning or PM activity.
6. Hold quarterly conference calls with all of your HVAC providers. This facilitates a team spirit, creates opportunities for sharing lessons learned and implementing best practices.
7. Hold an annual business review meeting with each HVAC service provider individually. This should be the time/place to review performance and offer feedback received from operations on store visits and compliance.
8. Perform unannounced spot checks across your markets. Upon arrival, call your service provider and ask them to meet as you visit 10 sites in the area. This keeps complacency at bay.

These process steps outlined above have proven effective for companies with no program in place to those having complete visibility to maintenance budgets. For those entities starting anew, the process usually takes 6-9 months for demonstrable results if implemented properly.

This process can also be used as a framework for each major physical plant component for which the organization may be responsible. Items to contemplate include: electrical (signs and lighting), plumbing pipes and fixtures, handyman

painting, walls, floors, ceilings and doors, roofing, and point of sale and electronics.

Statement of Work (SOW). We recommend the following minimum PM activities for multi-site retailers:

1. Filter changes every 45 days. Providers should use a quality pleated 24x24x2" MERV-8 filter.
2. Evaporator and condenser coil cleanings once annually.
3. Detailed seasonal inspections for either pre-summer cooling or pre-winter heating. These should include:
    a. Check operation of all contactors, capacitors and relays.
    b. Measure and record amp readings for the compressor, blower motor, and condenser fans; and verify against data plate ratings.
    c. Inspect, lubricate and test the operation of mechanical outside/return air dampers.
    d. Inspect pulleys and tighten blower motor drive belts. Lubricate pedestal bearings and clean blower vanes.
    e. While unit is running, check FREON levels. Record high/low pressures and temperatures.
    f. Record zone, return and supply air temperatures and verify against EMS.
    g. Inspect overall integrity of the unit to ensure no leakage is found. Plug and seal if required.
    h. For pre-winter startup of heating system, test unit for proper operation. Inspect and test ignitor, high temperature limit switch and clean heating assembly. Turn on gas and check for leaks.

Cost. The annual cost for a typical 23,000 sq ft, six RTU site with 63-tons of air condition would cost roughly $5,413 per store. For benchmarking purposes, this is approximately $86 per ton.

	$/unit	Filters	Hrs/Unit	$/Hr	Total
Filter Changes		$10	0.33	$15	$720
Coil Cleanings	$350				$2,100
Seasonal Inspections			2.5	$85	$2,550
Setup/Sign in			0.08	$85	$43
Total					**$5,413**

Assumptions	
RTUs/Site	6
Filter changes/yr	8
Seasonal Inspections	2

Keys to Success. Consider these variables as you put your program in place:

1. PM budget pricing from a prospective HVAC provider should be generated through multiple site visits. Failing to create a picture of your buildings via multiple visits ignores the law of averages and belies inexperience.
2. Do not succumb to the temptation to simply, "do what we did last year." Incremental improvements or an entire program overhaul may be warranted. Consider options accordingly.
3. Re-evaluate HVAC provider contracts once every three years. This keeps complacency at bay and ensures the company is receiving the best service at the best value.
4. Start small, test the program that your company is trying to implement in a small market. As targets are met, move into a larger area, maybe one division. Put a plan in place to rollout nationwide over time.

Key Metrics

Managing HVAC providers is initially time consuming, but defining measurable, obtainable and reasonable goals creates clarity of focus and incentive for compliance.

To this end, Siemens has aggregated some of the key metrics customers use to incent desired performance. We share some of these below.

1. Number of first service calls within 45 days of PM visit. Effective PM plans should not result in a service call to a site within 45-60 days of a PM activity. Track these instances to ensure providers are executing the desired SOW.
2. Percentage completion and date of asset inventory. Regular visits to sites create opportunities to compile, verify or update asset information. Reporting on these two metrics will help ensure this database is evergreen.
3. Number of comfort complaints due to underperforming assets.
4. PM schedule accuracy percentage.
5. Percentage deviation up or down from budgetary pricing.
6. Publish results of audit as a percentage of compliance.

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