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THE ROI OF PREVENTATIVE MAINTENANCE

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There are very few terms that are as embedded in the restaurant facilities industry vernacular as “preventative maintenance.” Whether we’re speaking of HVACR equipment or parking lots, we all have resigned ourselves to the “fact” that preventative maintenance is needed, even though the evidence to support the need is seemingly anecdotal. This is not to say that our resignation is unfounded; up until a few years ago, however, it was scarcely documented.

When you think about the phrase “preventative maintenance” do you ever ask yourself, what exactly am I preventing? Am I truly preventing or reducing the chance of a catastrophic failure? Am I actually extending the useful life of my equipment or asset? Or am I just paying money for someone to tell me that I have to spend more money? Would I be better off just letting the darn thing run and not letting anybody touch it?

Does Preventative Maintenance Work?

I wrote an article for Facilitator a few years ago titled "When Does a PM Program Make Sense?" In that article, I attempted to tackle the age-old question of how much a PM program actually mitigates failures of electro-mechanical components and equipment. The results were not astounding, but many would consider the percentage of failures mitigated by a properly executed maintenance program to be, at the least, substantial enough to entertain the idea.

We found that at least 14 percent of component failure patterns could be mitigated by a properly executed maintenance program. To recap that article briefly, there are six component failure patterns that contribute to the demise of electro-mechanical component failures.

We found that there are three failure patterns that can be directly addressed by implementing an age-related maintenance program:

• Age-related — 2 percent: A maintenance program can help facilitate the identification of aging parts and allow us to have them replaced prior to total failure.

• Fatigue-related — 5 percent: Components and equipment can demonstrate premature failures due to fatigue. An example would be a compressor for an HVAC or refrigeration system operating for abnormally longer periods due to an impacted condenser coil. Because heat rejection is impaired, the system is required to run longer and harder, which could contribute to the early demise of the compressor and its internal components.

• Condition-related — 7 percent: The operational conditions and environment in which a structure, system or component is operating could affect a percentage of failures within that system. Inclement weather patterns, neighboring manufacturing activities and coastal regions are examples of factors we may consider to be condition-related attributes that could promote premature failure.

We must also realize that most components demonstrate what's called a failure development period, or FDP. For instance, motor bearings will usually make some sort of audible warning, such as squeaking, screeching or grinding, prior to their total failure. The motor may be operational; however, it is demonstrating a failure development. This is something a regularly scheduled maintenance program would be able to identify prior to total failure at the worst possible time.

When PM Makes Sense

So, when does a PM program make sense? Two conditions must be met:

• The component/equipment in question has an increasing failure rate. In other words, the failure rate of the component increases with time, thus implying the component is subject to the failure patterns outlined previously.

• The overall cost of a preventative maintenance action is usually less than the overall cost of a corrective action. (Note: In the overall cost of a corrective action, one should include ancillary tangible and/or intangible costs such as downtime costs, loss of production costs, lawsuits over the failure of safety-critical items and loss of goodwill.)

Can We Quantify the Value of PM?

Preventative maintenance seems to be much more popular in the restaurant industry than other commercial industries. Restaurant facility professionals around the country adhere to the idea, and rightly so in my opinion, that keeping equipment well maintained to extend its expected life and avoid or at least predict future repair costs is a good idea. Plus, they more than likely have proof to back it up to an extent. Less clear is an understanding of the actual relationship between the cost of preventative maintenance and the returns such activities can be expected to deliver.

Contractors and manufacturers trying to persuade owners and managers to invest in preventative maintenance do offer a range of seemingly solid arguments: "The equipment will perform better." "Equipment life will be extended." "Repair costs will fall." "Downtime will be reduced." "Tenant satisfaction will increase." "The manufacturer says we need to do it."

Although most owners acknowledge these issues, the changing economic climate has caused C suite personnel to be more concerned with saving money and obtaining optimum value from their investments. Given that perspective, a more convincing argument for preventative maintenance is needed to demonstrate that PM generates a solid rate of return. As mentioned previously, anecdotal evidence does suggest that preventative maintenance is valuable; however, its economic value is difficult to determine. No specific statistical methods exist to my knowledge. I am not aware of many empirical studies that have been performed. Can one quantify the extended life of a boiler if it is properly maintained? How can one know how much longer a compressor will last if it receives proper preventative maintenance than it would if the unit received no maintenance at all? Is anyone willing to neglect these expensive assets to find out? I highly doubt it.

I ran across one study that did deal with this scenario; however, it was more hypothetical and based on literature and industry insight rather than actual neglect or termination of PM altogether. Although the study in question is from a telecommunications firm, it can be easily related to the fixed assets we find in restaurants by equipment type, e.g. air conditioning, boilers, ventilation equipment, parking lots and some other assets that may require periodic maintenance.

The Study

The corporate real estate managers of a large telecommunications firm believed that their preventative maintenance program had been significantly underfunded and ignored for years. They sought additional funds but needed financial data to support their request. These managers had to show a significant return on any proposed investment. So, they decided to conduct an analysis.

The team surveyed approximately 12 percent of the company's entire portfolio. For these mixed property types, they ascertained:

• Type of equipment in each building (e.g., chillers)

• Amount of equipment (e.g., number of chillers)

• Size of equipment (e.g., tons)

• Age of equipment

• Annual preventative maintenance expenditures for equipment

They operated under the assumption that the 12 percent of the company's portfolio would be representative of the entire portfolio for study purposes. They also limited the types of equipment that would be reviewed under the study to help establish a baseline, I presume. Using this information, the team proceeded to build a financial model. The most difficult information to obtain was the effect of maintenance on the expected useful life of equipment. The team studied textbooks, spoke with industry experts and manufacturers, and reviewed articles on preventative maintenance to identify this data. One consistent message was that preventative maintenance would extend the life of equipment, but few sources provided estimates of the amount of life added by PM. The study employed the most conservative estimates sourced from equipment manufacturers, reference books and sales material.

Three Scenarios

The team then considered three different preventative maintenance programs or scenarios.

Scenario 1 - No PM: Obviously, the cost of preventative maintenance is zero in this scenario. The cost of repairs, cost of energy and frequency of equipment replacement will increase, however, because the equipment will not be properly maintained. The amount of energy degradation and expected life degradation is based on the research previously mentioned. It is also assumed that the frequency of repairs will increase in an amount similar to the expected-life degradation.

Scenario 2 - Current PM: This scenario was based on the company's current PM levels. Here, the cost of preventative maintenance represents the actual amount spent by the company.

Scenario 3 - Industry benchmarks: In this scenario, the model assumes that the company spends the industry benchmark amount on preventative maintenance activities.

For each scenario, the team calculated the yearly cost of operating a piece of equipment and built a timeline of expenditures. The cost consisted solely of energy, repair maintenance, preventative maintenance and equipment replacement. To calculate the cost of energy, the model assumes an average figure for annual operating hours and an average efficiency. In scenarios 1 and 2, efficiency was degraded based on the amount of preventative maintenance performed or lack thereof.

The Financial Model

To determine the value, they had to first establish the net present value (NPV) of preventative maintenance and then the return on investment (ROI) of preventative maintenance. To do this they had to identify the following:

• Annual cost of PM

• Average cost of repairs or corrective actions annually

• Cost of replacing equipment

• Estimated useful life (EUL)

• Effects of PM on EUL

• Effects of PM on energy consumption

• Frequency of repairs if equipment is not maintained

To determine the NPV of PM, one must compare repairs, energy and replacement costs for the three scenarios and bring these costs to a present value using an assumed discount rate. The PM scenario value is subtracted from the non-PM value. If the result is positive, performing PM makes economic sense. If the value is negative, performing PM is not justified economically.

The Results

The NPV and ROI of Scenario 1 were compared to those for Scenario 3. Scenario 2 was also compared to Scenario 3 to determine the effect of increasing spending on preventative maintenance.

The results showed that compared to no preventative maintenance, an investment in preventative maintenance produces a return over time. Due to the size and expense of this firm's assets, they showed a substantially higher ROI percentage than we'd expect in our industry, but nevertheless, a return was realized.

The bulk of the ROI (about 50 percent over 25 years) came from extending the useful life of the equipment and delaying large capital outlays for replacement. Obviously, the longer we can delay the replacement of a large asset the better the rate of return. Repairs/ corrections were also found to be delayed or less frequent when a PM was in place, which would lead us to our component failure pattern analysis we discussed earlier in the article. And lastly, a fairly substantial rate of return came from energy savings, around 7 percent.

Can We Use This Model in the Restaurant Industry?

Although time consuming and based on certain assumptions, I believe a similar financial model could help us determine which assets we should be allocating our PM dollars toward. This would be a group effort, in my opinion, comprised of manufacturers, contractors and, of course, restaurateurs working together to establish an empirical study to truly quantify the value of PM.

Once we apply the methods outlined to the restaurant and hospitality industry, we then would have to consider the two conditions of when a PM program makes sense. When establishing a NPV in the restaurant industry, we must include the ancillary, tangible and intangible effects of a repair scenario as outlined in condition two. How will this affect customers and operations staff? What safety hazards will appear due to no PM? What affect will a failure have on adjacent equipment, structures or components? We also know that many of our fixed assets and their components are subject to the six failure patterns discussed in condition one. Answering these questions will help us to define our scope, depth and frequency of our PM tasks, which then will help us know how much to allocate toward PM.

I feel the reason why there's no true empirical evidence to correlate with anecdotal evidence on preventative maintenance ROI becomes clearer. It's a lot of work, it's based on numerous assumptions and I would bet that very few organizations would want to run the risk of not providing some sort of periodic maintenance to their valuable fixed assets. So, if we don't have the time or resources to build this model and perform these analytics, what options do we have?

Exploring the Options

The HVACR industry has ultimately heeded the call for a preventative maintenance standard outlining minimum requirements for various types of equipment. ANSI/ASHRAE/ACCA Standard 180 was created in a collaborative effort between the American Society of Refrigeration & Air Conditioning Engineers and the Air Conditioning Contractors of America. Its intent is to provide consistent practices for inspecting and maintaining HVAC systems in commercial, institutional and other buildings. Standard 180 describes the minimum acceptable level of maintenance for commercial building HVAC systems. This standard can be readily found with a simple Internet search.

Each manufacturer of various types of equipment has a baseline of maintenance tasks that they consider to be perfunctory to maintain design operational efficiency and also realize the expected useful life of their equipment. Most manufacturers also require that the equipment be maintained or they will not honor certain warranties on the equipment.

I would argue that this should be the starting point when we are examining the options for designing a preventative maintenance program. Below is a list of considerations when designing a PM program and what options you may have to either reduce or increase the service to help meet certain operational standards:

1. Established budget for R&M services

2. Manufacturer's recommendations for baseline maintenance service per equipment type

3. The equipment's operational environment/climate

4. Unique circumstances that affect equipment/facility

5. Your organization's business objectives

6. Local or national contractor/vendor input and feedback

7. Clear and concise objectives the organization seeks to achieve from the program

When devising your task list and program, also remember the 14 percent of failure patterns discussed previously that a PM program has been proven to mitigate, and make sure the tasks that address these failures are included in your scope.

Why We're Lucky

We are fortunate to be part of a national organization that allows for the sharing of knowledge and experiences within the restaurant facilities management industry. Not only does the organization provide the forum for that feedback and information sharing, but the Restaurant Facility Management Association (RFMA) offers educational opportunities and an abundant amount of resources specifically catered to the needs of restaurant facility professionals. RFMA is comprised of the very best talent in restaurant facilities management, and we are able to derive information from not only restaurateurs but also equipment manufacturers and national and regional contractors and vendors. Utilizing these resources is a vital component to developing a PM program for your organization.

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