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Repairs and Maintenance

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Get your facility ready with a reliability-centered maintenance program

Although recent weather patterns have been strange lately, we can be certain that the summer season will wrought sweltering heat and suffocating humidity upon us. Your guest ways to beat the heat, and as facility managers, we want to be assured that our restaurants will be pleasantly climate controlled to provide a temporary respite. But can you rely on to perform under the increased demand and load?

Most restaurateurs rely on preventative, cyclical services to ensure that their systems are running efficiently. However, inevitably, our HVAC systems will experience equipment fail demand and load in the summer months. And although there are no crystal balls or psychic powers that can predict these failures, there are some predictive measures that can be these incidents of failure and keep the CFO's blood pressure regulated.

PM + PdM = RCM

We must first discuss the differences between preventative or timebased maintenance (PM) and predictive maintenance (PdM) and how it relates to reliability-centered maintenance

Preventative Maintenance

The primary goal of preventative maintenance is to avoid or mitigate the consequences of equipment failures. This typically means preventing the failure before it actually occurs. tasks outlined within the majority of preventative/time-based maintenance programs for HVAC systems that include, but are not limited to:

- Return air filter replacement
- Condenser and evaporator coil cleaning
- Condensate drain pan and drain line cleaning/treatment
- Controls inspection
- Belt adjustment/replacement

These tasks are classified as perfunctory because, when performed as needed and properly, they are very effective in maintaining energy/ operational efficiency and limiting fatigue failures. However, some time-based maintenance programs are labor intensive and make it difficult to find problems between periodic services, which may deem them cost ineffectiv

Usually lacking though are essential predictive measures that may reveal potential failure developments that could occur in the future. And not only may these tasks predict potentia help our facilities professionals predict the expenditures and capital outlays to keep their CFOs on an even keel and the restaurants more profitable.

Predictive Maintenance

The ultimate goal of predictive maintenance is to perform maintenance at a scheduled point in time when the maintenance activity is most cost effective and before the equipm within a threshold. This is in contrast to time-based maintenance, where a piece of equipment is maintained whether it needs it or not. Predictive maintenance will most certainly in maintenance tasks list illustrated previously, but a predictive maintenance program will also integrate measurements and analyses of certain components to mine data that is potential failures on the horizon. These analyses and measurements could include, but are not limited to:

- Compressor amp draw
- Condenser and evaporator fan motor amp draw
- Superheat and sub-cooling for the refrigeration system
- Voltage measurements (drop) across contractors and disconnects
- Motor temperatures

The data obtained from these analyses must be cataloged to establish a trend leaning toward potential failure. For instance, a trending increase in compressor amp draw measur an early sign of imminent failure. Other cited predictive measurements could be considered preventative in nature depending upon the specific program particulars.

What if we concur that preventative maintenance and predictive maintenance are useful practices? How would we attempt to implement the two programs to make them a cost-e that also integrates a time-based element? That's where reliability-centered maintenance steps in.

Reliability-Centered Maintenance

Reliability-centered maintenance emphasizes the use of predictive maintenance techniques in addition to traditional preventative maintenance measures. It is an analytical proci appropriate failure management strategies to ensure safe and cost-effective operations of a physical asset in a specific operating environment. When properly implement maintenance provides companies with a tool for achieving the lowest asset net present costs for a given level of performance and risk. Reliability-centered maintenance is de standard SAE JA1011: Evaluation Criteria for RCM Processes, which sets out the minimum criteria that any process should meet before it can be called reliability-centered maintenz

There are seven important questions outlined in standard SAE JA1011, which must be asked in the order given below:

1. What is the item supposed to do, and what are its associated performance standards? (Functions)
2. In what ways can it fail to provide the required functions? (Functional Failures)
3. What are the events that cause each failure? (Failure Modes)
4. What happens when each failure occurs? (Failure Effects)
5. In what way does each failure matter? (Failure Consequences)
6. What systematic task can be performed proactively to prevent, or to diminish to a satisfactory degree, the consequences of the failure? (Proactive Tasks and Intervals)
7. What must be done if a suitable preventative task cannot be found? (Default Actions)

Reliability-centered maintenance does not promote periodic equipment overhaul. Studies dated as far back as 1965 have shown that periodic overhauls are unnecessary and not does promote is a systematic analysis to determine which components of the equipment could be demonstrating a failure development or will fail in the future. With our restaurant F analyze the major components of the system, answer the seven questions and then determine the appropriate measures that should be implemented to create a true reliability-program.

A Sample Analysis

Let's analyze the heart of our HVAC system, the compressor, which also happens to be the most expensive component to replace. We'll attempt to answer these questions as they created a Failure Modes Effects and Criticality Analysis. Below is an example of a simplified spreadsheet that I quickly designed, illustrating a few failure modes compressors diagram below.)

Planning and Implementation of RCM

The core principles of reliability-centered maintenance as outlined by the asset management pioneer, F. Stanley Nowlan, are as follows: components fail, they have an operational solution must be designed and implemented. Nowlan wrote in the industry leading Nowlan-Heap Report for United Airlines in 1978, "The main objective of RCM is to realize the reliability of the equipment for which they are designed, and to do so at minimum cost. Each scheduled task in an RCM program is generated for an identifiable and explicit reason."

The late John Maubry expounded upon Nowlan's and Heap's work with his landmark book, "RCM II." The preface to the book begins, "Humanity continues to depend to an ever-increasing degree on the wealth generated by highly mechanized and automated businesses ... more than ever these depend in turn on the continued integrity of physical assets."

Planning and implementing a program that emphasizes the use of predictive maintenance measures in addition to traditional preventative maintenance measures may seem daunting. However, it would surely help in managing, predicting and budgeting for failure events. Traditional preventative maintenance measures can be performed as needed or based "on-time" being time-based, which will help alleviate additional costs for performing these measures on equipment that just doesn't need it.

Predictive maintenance and preventative maintenance measures will provide pointed data and analyses of possible failure events and allow for the repairs to be made when they are most effective, during a planned shutdown and not on a hot summer evening when the dining room is full of customers. With our ever-increasing dependence on the reliability of our restaurant equipment, a shift toward a reliability-centered maintenance approach has never been more warranted.

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