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INDUSTRY TRACKER

The Cost Effectiveness of Preventative Maintenance

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For corporate real estate (CRE) professionals who are continually faced with reducing expenses for their organizations, having to justify maintenance contracts to the C-suite and Board are just part of a day's work. In this article, Scott Offerman, Critical Operations Manager for Cushman & Wakefield, builds a business case for investment in preventative maintenance programs. Click here to read more.

In today's business environment, real estate executives are frequently challenged with shrinking budgets, doing more with less and prioritizing maintenance activities. Corporate real estate professionals face the dilemma of whether equipment should be maintained or if it should be repaired when it breaks. This question is compounded by the ever-shifting real estate needs. The question of preventative maintenance versus run-to-failure appears to be a question easily answered. However, there are complexities that create confusion when maintaining the assets. Real estate professionals are challenged with determining the best way to maintain and operate the equipment.

Maintenance activity is defined by either a break-fix or a preventative maintenance methodology. The break-fix method is a reactionary response in which equipment is fixed when a failure is identified. Preventative maintenance addresses the potential failure in a proactive manner, replacing parts and components prior to a failure. The idea of any preventative maintenance program is to reduce the unplanned equipment failure and schedule repair time to reduce labor costs, reduce cost by planning the acquisition of parts, and extend the useful life and decrease power consumption by gaining optimal operation efficiency.

So the question remains: Is it better to maintain the equipment before it breaks down or to fix it after it fails? In order to demonstrate preventative versus run-to-failure maintenance models, let's look at the maintenance of an automobile.

Since each of us has been faced with managing the maintenance of our own vehicle, this provides a reference that is easily understood. The cost implications of a preventative maintenance program for an automobile are well documented and fairly consistent. Below is a chart of basic recommended preventative maintenance tasks, recommended intervals that the task should be done, the number of times this service is done in 150,000 miles, the one-time cost of the service and the total cost of more than 150,000 miles driven.

Service	Recommended Service Interval	# Of Times In 150,000 Miles	Estimated Cost Per Service	Total Cost Of Service Over 150,000 Miles
Oil Change	3,000	50.00	$24	$1,200
Tire Rotation	6,000	25.00	$12	$300
Tire Replacement	50,000	3.00	$1,000	$3,000
Brake Pads	60,000	2.50	$210	$525
Brake Fluid Flush	70,000	2.14	$80	$171
Transmission Fluid Flush	60,000	2.50	$220	$550
Power Steering Fluid Flush	70,000	2.14	$100	$214
Timing Belt & Water Pump	110,000	1.36	$1,200	$1,636
			Total	**$7,597**

If we compare the same maintenance items using a break-fix approach, an analysis the cost of a run-to-failure approach can be done. For this example we have estimated that the failures will occur at approximately 120 percent of the recommended preventative maintenance schedule.

Service	Recommended Interval	Estimated Failure Interval	# of Failures in 150,000 Miles	Estimated Cost	Total cost over 150,000 Miles
Oil Change	3,000				
Tire Rotation	6,000				
Tire Replacement	50,000	40,000	3.75	$1,000.00	$3,750.00
Brakes	60,000	72,000	2.08	$500.00	$1,041.67
Brake Fluid	70,000	84,000	1.79	$1,800.00	$3,214.29
Transmission Fluid	60,000	72,000	2.08	$2,500.00	$5,208.33
Power Steering Fluid	70,000	84,000	1.79	$450.00	$803.57
Timing Belt & Water Pump	110,000	132,000	1.14	$6,000.00	$6,818.18
				Total	**$20,836**

The cost of preventative maintenance is approximately $7,600 compared to a run-to-failure cost of approximately $20,800. The additional cost is due to collateral damage caused by the failure. There is no calculation for lack of oil change as this is unpredictable. We do know that if you do not change the oil, the engine will seize and fail, requiring a replacement at approximately $6,800. Depending on the conditions, this can occur at any time. What is not calculated is the inconvenient timing of the failure and the cost of not having a vehicle during an unplanned repair. Additional consideration is any lost revenue or productivity resulting from the failure and the extra work required to manage the break-fix repair. This includes contacting a towing company, extra time getting the repair done and the inconvenience of breaking down.

Another case study examines a 10-ton roof top air-conditioning unit. A preventative maintenance of the unit takes approximately one hour to complete. This includes changing filters and the drive belt. The cost is approximately $120 for one hour of labor and $25 for the consumable parts. Therefore, the cost of the maintenance is $145 and is scheduled at a convenient time with little impact to the operation. If a break-fix approach to this air-conditioning unit is taken, the following occurs.

Statistics tell us that on average, each service call takes 2.08 hours. When the unit fails, a need exists for one service call to examine and diagnose the failure, costing $249. The technician will need to return after obtaining the parts and repair the unit, again costing $249. If we assume that no collateral damage has occurred and the consumable parts are equivalent, it will cost $523 for the same repair.

The above demonstrates that preventative maintenance is more cost effective and increases the useful life. But in today's world, maintenance is not a simple linear costing exercise. While preventative maintenance can reduce the life cycle cost and increase the equipment's useful life, it is not always in the best interest of the organization to maintain equipment.

Based on the direction of the company and the real estate strategy, an analysis of the maintenance approach is required. A robust maintenance programs takes into account not only a preventative maintenance approach, but also opportunities for run-to-failure and extended maintenance periods. When determining a maintenance strategy, the strategy of the specific building, area and equipment need to be considered. Deferring maintenance of a building that is scheduled for remodel or sale can significantly reduce the maintenance budget. A maintenance program can be implemented and administered differently for each piece of equipment using diverse information. The decision as to how the program is to be implemented should be made based upon:

- Consequences of failure
- Probability of failure
- Historical data
- Risk tolerance

The most advantageous approach to preventative maintenance is a Reliability-Centered program. Reliability-Centered Maintenance (RCM) integrates Preventive Maintenance, Predictive Testing and Inspection, Repair, and Proactive Maintenance to increase the probability that a machine or component will function in the required manner over its intended life, with a minimum amount of maintenance and downtime.

These principal maintenance strategies, rather than being applied independently, are optimally integrated to take advantage of their respective strengths, and maximize facility and equipment reliability while minimizing life-cycle costs. The goal of this approach is to reduce the life-cycle cost of a facility to a minimum while continuing to allow the facility to function as intended with required availability. There are four recognized maintenance categories by an RCM approach. This ensures consistency in determining how to perform maintenance on all types of facility equipment. Each piece of equipment is assigned to one of four categories:

- Run-to-Failure
- Calendar-Based Maintenance
- Condition Monitoring
- Proactive Maintenance

In a case study conducted by Islam H. Afefy, an analysis of a process-steam plant was conducted comparing a break-fix maintenance program compared to a reliability-centered program (engineering, 2010, 2, 863-873) http://www.scirp.org/journal/PaperInformation.aspx?PaperID=3165. The summary of the results are:

- Mean time between failures increase
- Labor costs decrease approximately 25 percent
- PM planning creates a reduction of approximately 80 percent of the total downtime
- Savings of approximately 22 percent of the cost of annual spare parts

Transitioning from a run-to-failure to a preventative maintenance model will result in an initial short-term cost increase. This is a result of bringing the equipment back to operational standards. The age and condition of the

equipment also have implications on the cost associated with adopting a preventative maintenance strategy. In some cases, due to age and condition, not every piece of equipment will benefit from a preventative maintenance strategy. It is therefore necessary to analyze and validate the specific approach for each piece of equipment.

There is no one correct way to approach maintenance. Preventative maintenance demonstrates a measurable decrease in the life-cycle cost of equipment. However, every organization will have the opportunity to operate using an approach mixed with run-to-failure and preventative maintenance activities. Careful consideration on how a maintenance strategy is applied can create opportunity for reduced cost and increased asset life in either approach. It is necessary to clearly define the real estate strategy as well as a high-level maintenance strategy. This will create the foundation to identify the most effective strategy for your organization.