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Get more from your management system: best practices in data analysis

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In order to make informed and financially sound decisions regarding their assets, most maintenance managers will use some form of Computerized Maintenance Management System (CMMS) to drive their maintenance functions. It is vital that such systems are properly configured and structured and that data has been accurately entered, because it is precisely that repair data that will allow for future data harvesting and analysis. This article outlines a number of the key best practices in CMMS data analysis that will enable managers to drive improvements in asset reliability.

Set clear parameters

Once sufficient historical data has been accumulated in the CMMS, decide on a time period to be examined, such as one year. Then, identify "bad actors" that have created the most difficulty regarding downtime, labor/material costs, number of repair incidents and so on in relation to the assets that will be analyzed, following the concept of quick wins. Obtain input from operations and the maintenance performers who have the most interaction with the unit(s) being examined as this will allow you to identify which equipment most needs the budget you have to hand.

Proper planning: an example

Whatever assets are chosen for analysis, determine the maintenance indices as in the table below by comparing the hours reported as dedicated to PM work, planned repair hours, and unplanned repair hours. This can be done for the entire facility, a group of machines such as a production line, or a single asset.

These percentages will vary depending on the type of industry involved. High speed production will vary from assembly line work such as an automotive plant. Each plant's goals should be established with realistic and attainable figures, which should be reviewed and updated on a regular basis as the facility progresses in its reliability improvements.

The data contained in the table below was taken from a high-speed production facility, and examines 52 weeks of data, as reported by a staff of 6 maintenance performers during one year of CMMS operations. In this instance 1,680 hours were netted out of the gross hours available to reflect holidays, sick time and vacation for the staff, rendering 10,800 available man-hours for the year.

Initially, the PM percentage goal should be in the 70-75% range, planned repair work 15-20%, and unplanned work 5-10%. World-class maintenance strives for a 19:1 planned to unplanned hours ratio, but high speed production may have a more realistic ratio of 9:1 due simply to the speed of the equipment. In the table above the

Table 1

PM/PdM Hours Reported	3,149		
Planned Repair Hours Reported	1,054		
Unplanned Repair Hours Reported	751		
Total Reported Hours	4,954		
	Actual	Goal	Variance
PM/PdM Work Load = PM/PdM hours reported ÷ Total hours reported	63.6%	70%	-6.4%
Planned Repair Work Load = Planned hours reported ÷ Total hours reported	21.3%	20%	1.3%
Unplanned Repair Work Load = Unplanned hours reported ÷ Total hours reported	15.2%	10%	5.2%

planned (PM & planned repair) to unplanned/reactive hours ratio is 5.6:1, (3,149 + 1,054 ÷ 751), meaning for every 5.6 hours of planned work, the plant reported 1 hour of unplanned work.

Ensure reporting is accurate

If the combined planned and unplanned repair indices are greater than the time dedicated to PM, the figures are skewed and the reasons for this lopsidedness requires an investigation, as this indicates more reactive than proactive work is taking place. Inaccurate reporting will impact the pool of hours being analyzed. Accurate reporting must be emphasized to the maintenance performers, as incorrect reporting will distort future analysis of a number of functions, including staffing requirements. Planning and scheduling can also be negatively impacted when updates are performed to the estimated times based on reported hours.

Avoid duplication

One repair incident may consume multiple individuals across more than one shift. Each performer or shift documenting their participation on an individual basis will skew the repair data and give the appearance of more issues than are actually occurring, distort the MTBR figure and artificially inflate labor and material costs. One repair should be documented against the unit which contains all labor hours, material costs and downtime. One incident equals one repair, period. When you have your car serviced, you don't receive one invoice from each person that performed different functions. Don't accept one repair event reported separately by more than two individuals.

The PM compliance for the unit being researched should also be examined. A unit whose reported PM compliance is high yet continues to experience a high rate of repairs requires additional evaluation to identify the gap. It could be the result of PMs with non-value added content, inspections that are not aligned with the maintenance strategy of the unit, or potential false reporting. Determine why a unit with a 98% PM compliance would generate multiple repairs.

The reported factors for PM, planned and unplanned repair hours can also define the man-weeks consumed for those categories and provide information on labor expenses, which can be the greatest amount of a unit's overall costs.

Use keywords to assess the situation

Once the units to be examined have been determined, generate a search in the CMMS for the unit(s) being analyzed and identify the recurring/repetitive repair incidents by keyword. These can then be entered into a Pareto chart, and a cumulative percentage can also be incorporated. This will supply the information on which machine, component or area to concentrate the effort for analysis using the 80-20 rule.

Using the example of the Chain, the MTBF for this component calculates as 1.54 weeks, and the assigned PM tasking needs to be examined to ensure it reflects the operating demands placed on the component and that the inspections are correctly aligned as to strategy, frequencies, work times, skills, verbiage, and so forth.

Cross-referencing back to the established inspections for the component, determine what checks and inspections are present for the Chains. How do the frequencies compare to the MTBR/MTBF? Are there issues identified in the repair descriptions that have no inspections established? Either adjust the existing data to reflect what is "real in the field" or add as appropriate.

Regardless of the type of analysis planned; fish-bone, wiebull, probability distribution, Pareto, Failure Effects Mode Analysis, or Root Cause Analysis – it all begins with accurate data, extracted from a CMMS.

Summary

This article only briefly touches on some of the more practical and apparent means of capturing historical data to drive analysis. There are many that have been briefly mentioned and others not at all: this is meant to be a quick guide to getting the most out of the information you already have.

Essentially, it's your data and it is up to you to decide what to do with it. Whether it is utilized for value-added analysis, or allowed to reside in history with no practical use is up to the user, and how effectively they wish to drive improvements in the life and reliability of their assets.