List of Maintenance Measures

By Joel Levitt

Customer service measures

Breakdown report
The core service that maintenance provides its customers is freedom from breakdowns and quick effective service when a breakdown occurs. Breakdown reports can take many forms from a list of breakdowns with causes and response times to MTBF (mean time between failures) with MTTR (mean time to repair) information added. In all cases a breakdown should be treated as an educational opportunity to see where (if at all) the system failed.

Number of service calls
This can tell maintenance and user departments how effective maintenance is at foreseeing problems and correcting them before they occur. This benchmark would be factored by significant changes in size, equipment or mission of the organization being served.

Mean time to respond (MTR, by priority)
How long does it take to respond to a service call from the time it is phoned in to the time a service person shows up. In some organizations this is a major way the maintenance department is rated.

Mean time to repair (MTTR)
Once a response has been made how long does it take for the customer to be satisfied. When this is added to MTR you can get an idea how long your customers are unsatisfied.

Callbacks % Callback
The bane of maintenance is rework or callbacks. A callback is defined as a return of a service person to a unit for work on the same system or related system as their original work. Callbacks are a problem in the mechanic, part, procedure, or the design of the asset. In any case the reason has to be uncovered and fixed. This ratio trended over time indicates if the problem is being addressed. This is a David Peterson measure. He states that world class organizations average 3% with the target being 0%.

Maintenance satisfaction survey
Ongoing or annual survey of attitudes toward maintenance. This measures the effectiveness of your communication about maintenance.

Maintenance benchmarks are divided into measures for costs, parts, work and customer service.

Costs

Maintenance cost index

The most common measure of traditional maintenance departments. It plots the total maintenance cost for the last few years, perhaps by quarter. It is still useful to show what is being spent. You combined that information with what else you know and it becomes another data point. In times of lower change and known inflation the maintenance index trend would be very useful. Today there are so many variables that the trend is almost meaningless. It is still kept by many companies.

Maintenance cost to budget (by line)

The most common benchmark is how are we doing in relation to how we said we would do. Variance reports show where problems might be developing.

Maintenance costs per square foot

In an office, shopping center or apartment building the maintenance cost varies with size rather then other measures. It is tough to relate maintenance costs to dollars sold in a department store or dollars of stock sold at a stock brokers office. In these cases the maintenance costs per size is the best item to track.

Maintenance cost per unit output (tons of steel, yards of garbage, patient-days, ton-miles)

Assets that are used to make a product or provide a service require maintenance to be kept in a preserved state. This usage creates a need for an investment for every unit of usage. Your unit of usage could be making bricks, processing policies or delivering blood. That activity can be related to the use of the asset (such as a building, truck, kiln) needed to provide that product or service.

In many industries the maintenance cost per car assembled, hundred packages delivered, or thousand barrels of beer brewed in well known and understood. This is a David Peterson measure, he calls it maintenance contribution to cost per unit of production. He also has a related metric called maintenance cost effectiveness which compares actual cost per unit output to calculated cost per unit.

Ratio of maintenance costs to asset value

Ratio of maintenance people to asset value

Consult the chapter on estimating maintenance budgets for details. This ratio can give a gross analysis if adequate maintenance is being invested. It is a very useful ratio if your organization is buying buildings and other assets and you want to keep ahead of problems. Another way of looking at this is to see how many people it takes to maintain $100 million of this kind of asset. This is a David Peterson measure.

Contractor ratio

What is the ratio of contractor hours or dollars to in-house work. The design of your budget should predict the amount of contractor work in a given year. The ratio is only important as it relates to your prediction. If you predicted 10% and the last few months have been coming in at 50% there had better be a bunch of construction or projects going on that were approved after your budget.

Parts

Maintenance labor to parts

Useful ratio when added to other knowledge because it provides input into formulas to estimate budgets for new buildings, fleet expansions or plants.

Inventory Turns

While maintenance inventory is different then a retail inventory the analysis of turns is useful when insurance policy stock is removed from consideration. After that removal the turns should be approximately reflective of an industrial distributer

Purchase to issue ratio

The purchase to issue ratio is an advanced indicator of inventory accumulation or depletion. If you are trying to reduce your inventory then you must run this ratio below 1.

Work ratios

There are many measures that deal with the ratios of various types of work. How do you spend your time benchmarks (this is defined more precisely in the chapter on work orders in the section Reason for repair) are essential to see how the mix of work is showing improvement.

Planned maintenance hours % Planned hours

Planned hours from all sources should exceed 80% of the worked hours. Detailed breakdown in next measure.

Emergency hours % Emergency hours unscheduled
DIN (Do it now) hours % DIN unscheduled
Short repair hours % Short repairs scheduled
CM (Corrective maintenance) hours % CM scheduled
Preventive maintenance hours (PM) % PM scheduled

The first important breakdown is planned (PM+CM+Short repair+Project) to unplanned (DIN+EM). This ratio shows how much your facility is ahead of the breakdown curve or how much you are dominated by unscheduled events. The trends of these numbers gives you a feel for whether there is improvement.

Personal service work % PS
Project/Capitalization work % Project/Capitalization

A second measure to look at is how much non-maintenance work is done (this would include PS and Capital). There might be money saving opportunities in reviewing the details if the ratios look too large.

Total backlog by craft (in hours, weeks per person)
Many experts believe that managing the backlog (work immediately available to be done including pending) might be one of the most important jobs of maintenance leadership. The amount of backlog should not fall too low (1 week per person) or too high (3+ weeks). How to Manage Maintenance says that low or no backlog indicates over manning and more then 10 days backlog indicates overtime is needed.
If people see the backlog running out they tend to slow down to avoid layoff. If the backlog is too large then user's routine work doesn't get done quickly or reliably. Increased backlog is one reason to authorize contracting or overtime.
One calculation issue is whether to use true time available or 8 hours. Calculations show an eight hour day is reduced by 1 hour and 20 minutes from meals and actual breaks and additional 30 minutes from meetings and other information exchange. A real workday might be closer to 6.0-6.5 hours. When a 10 person crew has a 490 hr backlog we would calculate they have about 8 days (using 6 hr/day) not 6 days (using 8 hr).

Overtime % Overtime

Unscheduled overtime (or scheduled overtime) % Unscheduled overtime
Overtime is an interesting indicator because in most maintenance situations some natural overtime (3-9%) indicates that you are properly crewed. Natural means that people are not slowing down to create overtime. If there is no overtime the temptation is to think that there are too many maintenance people for the workload. Of course, this does not include organizations that artificially restrict overtime. Unscheduled overtime for emergencies is a problem because it not only shows a lack of planning but also a lack of control over deterioration. Don Nyman (see appendix) recommends 6% overtime.

Hourly to support people ratio
Hourly to planner
Hourly to supervisor (span of control)

Excess support staff sometimes gets in the way of productivity. One area of savings may come from moving the support staff back to the floor if possible. Other measures H. to planner and span of control can help you sharpen up your support ratios and optimize the amount of back-up your mechanical staff has.

Jobs waiting (by reason)

One of the problems of maintenance work is the number of hand-offs of maintenance jobs in large facilities. The job goes to planning who determines that it needs engineering who passes it back to planning who passes it to purchasing, etc. The waiting time is frequently what kills speed. The customer waits and no one can easily give them an idea of where the job is. Jobs waiting reporting helps highlight the problem areas and can indicate opportunities for reengineering.

Open work order hours

An open work order is related to an area assignment. A machine might have an open work order for any work done each month. Usually the goal is to minimize open work orders in most situations because of the loss of control. The exception might be in routine work of a known content and duration (such as line start-up, or policing the parking lot for glass).

Accounted for hours (Payroll hours/Work Order hours)

Use of Work Orders % labor hours
The first measure after you install a work order system is the ratio of work order hours to payroll hours. It should rapidly increase to the 90-95% range (some say to 100%). That way you know all of the hours are somewhere in the system (at least). Be sure people are not pencil whipping the work orders (at the end of the day just whipping through putting 2 hours on each of the 4 work orders to get 8 hours).

Effectiveness (work order hours/standard hours)
Where there are good standards on most jobs the effectiveness ratio can be useful. It shows how much work is really done. You get 3 hours credit for 3 standard hours even if the job took 16 hours. In this way slow downs, problems are subtracted from you output calculation.

Joel Levitt, Director International Projects JLEVITT@LCE.COM
Life Cycle Engineering | 4360 Corporate Road Office | Charleston, SC 29405
843.744.7110
Mobile +1-267-254-0061
www.LCE.com