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management Ps planning and scheduling

Using Metrics

to Influence Planning and Scheduling Behaviors

Jeff Shiver

While many organizations have maintenance planning and scheduling individuals or groups, few measure the effectiveness of the function. Why is it that we want to measure anyway?

Improvement is one reason. For improvement, we need to know where we have been and hopefully, where we want to go. Another is that people like to get a score or feedback on how the organization sees their work. That said, while metrics reflect individual performance, the focus of metrics should be to identify issues with the business processes associated with the work and not the individual themselves. From the metrics, we can identify trends and patterns. Adding to that, consider: "What gets measured gets done. What gets celebrated, gets done well."

Recognize that there are two types of metrics, leading and lagging. Both are useful. To better understand the difference, ask yourself if you are operating within the organization as doctors or coroners? Are you taking a pulse of the organization or performing a postmortem on last month's performance? In most organizations, the reality is that everyone is focused on the postmortems. Often, the reason for the postmortem focus is those numbers are the

Time in Status or Phases		
Metric	**Target**	**Objective**
% of work requests remaining in "request" or "new" status for more than five days, over a specified time period (e.g., last 30 days)	80% or more of incoming work requests should be reviewed and validated within a maximum of five days. (See the following metric and target)	Eliminating partnership issues regarding "responsiveness" of maintenance and the entry of additional requests with inappropriate priorities to get a response
Activity times of other statuses could be measured, such as: "Awaiting approval" "Awaiting planning" "In planning" "Awaiting materials"	80% of all work orders should be processed in five days or less; Attention must be paid to "late finish" or "required by date"	Provides an understanding of on average processing times to identify opportunities for improvement Are there obstacles preventing timely processing?

Planner Thoroughness		
Metric	**Target**	**Objective**
Planning Work Order Completion – % of work orders with all planning fields completed (e.g., task duration, required by date) over a specified time period	95% or more of all planned jobs	Measure of planner accuracy and thoroughness

For Organizations New to the Planning Function - measure the level of job plan preparation		
Metric	**Target**	**Objective**
# of detailed job plans written per week	Varies by site, but if new with no or few job plans, target a minimum of two to three detailed job plans to be developed per week	Not every job requires a detailed job plan, but when applicable, job plans help transfer knowledge, and drive precision maintenance activities and wrench time

most readily available from current reports. They are easy to identify and it is the quickest way to satisfy the demand for metrics. Lagging metrics are like looking in the car's rearview mirror; they only tell you where you have been and not where you are headed.

Ideally as a rule of thumb, you should have two leading metrics for every lagging metric. Leading metrics are performance drivers. Utilizing them allows you the opportunity to make preemptive actions to improve your chances of meeting the desired outcomes or lagging metrics. Leading metrics often measure activities or even processes.

Understand that the selected metrics (much like processes, too) the organization chooses to employ will drive employee behavior as well. As an example, one organization chose to measure the number of work orders requiring re-approval if the labor or materials cost exceeded 10% of the original estimate. This measure is a lagging metric because it was after the work had been completed. The re-approval process was designed as a heads-up information sharing activity to show more dollars spent than anticipated. What behaviors did it drive? Planners would significantly overestimate labor hours and contractor/materials costs to avoid the re-approval process. Look at how the domino effect takes hold from there. Those labor hour estimates were used to create the following week's schedule. Now we aren't assigning enough work to the technicians as the hours were padded. Wrench time suffered. As the CMMS was also used as a time clock for payroll purposes, work orders on completed work that were left open became easy targets for technicians or contractors to charge time to when working on other jobs or idle. Materials for other jobs were charged to those work orders as well.

How can we use metrics to drive behaviors? Introducing or revising the organizational metrics requires training for all stakeholders, not just maintenance personnel. Don't assume that the standard metrics that you might take for granted, such as "schedule compliance," are understood by all. Using this metric alone, questions like, "What counts toward the metric?," "When is the cutoff point that items can be added to the schedule and count?" and "What is a scheduled job?" should be addressed from an educational perspective.

Before reviewing specific metrics, it should be noted that variations to the following metrics could be defined or utilized based on your requirements. The listing is not intended to be comprehensive, but to provide insight on specific behaviors related to maintenance planning and scheduling. Let's begin with those metrics directly influenced by the maintenance planning and scheduling function. (See Tables shown on these two pages.)

For New and/or Mature Planning Organizations

Metric	Target	Objective
% of planned work for the week with job plans supplied	Varies by work requirements and site as not all jobs require detailed job plans; Think precision maintenance, standardized work	To have consistency in your work execution from a standardized work approach; Upwards of 70% of equipment failure is self-induced, with ~40% of that due to human error

More Planner Metrics

Metric	Target	Objective
Job Planning Accuracy – % of work orders with man-hour estimates within 10% of actual over the specified time period	Accuracy of greater than 90%	Man-hour estimates are utilized to determine schedule loading and assignment of enough work to the technicians
% work orders with materials and parts used identical to planned over the last 30 days	Accuracy of greater than 90%	Missing materials and parts can create significant delays and missed schedules
If the planner creates job kits – % of planned work orders with the materials staged and kitted over a specified time period	Varies by organization, planning maturity and procurement/storeroom partnerships (could also be a storeroom metric)	Elimination of an avoidable delay to wrench time; Ideally, someone other than the planner should do this to allow the planner to focus on future work
Replan – % of work orders assigned "replan" status due to a need for additional planning over 30 days	Should not exceed 2%	Missing materials and parts can create significant delays and missed schedules
# of job plans updated over a specified period (e.g., 30 days)	Varies – looking for updates to parts or materials, job duration, special tools, etc.	Continuous improvement loop following the execution of work to improve the job plan based on technician feedback

General Scheduling Metrics

Metric	Target	Objective
Schedule Compliance – # of scheduled jobs completed divided by # of jobs scheduled as a % once the schedule is "locked" for that period	Accuracy of greater than 85% to 90% Can be measured by week, by day, or by hour	Man-hour estimates are utilized to determine schedule loading and assignment of enough work to the technicians
PM Compliance – % of PM work orders completed as scheduled using the 10% rule	Greater than 95%	Timely execution of PM and CBM activities drives equipment reliability and helps to break the reactive cycle
% of work orders over the specified time period that have a scheduled date earlier or equal to the "late finish" or "required by date"	Greater than 95%	With appropriate "required by dates," is maintenance providing the appropriate partner response from a timing perspective?
Delay or Reschedule – % of work orders assigned "delay" or "reschedule" status due to the unavailability of labor, equipment, or parts over the specified time period	Less than 3%	Highlights opportunities with respect to partnerships or the scheduling process
Schedule Effectiveness – % of scheduled available man-hours to total available man-hours over the specified time period	Ideally 100%, but often not achievable due to the reactive nature of the organization; Some organizations opt for 80%, while others target 120%	Are we scheduling enough proactive work for the maintenance crews?

General Maintenance Metrics		
Metric	**Target**	**Objective**
Schedule Compliance – # of scheduled jobs completed divided by # of jobs scheduled as a % once the schedule is "locked" for that period	Accuracy of greater than 85% to 90% Can be measured by week, by day, or by hour	Man-hour estimates are utilized to determine schedule loading and assignment of enough work to the technicians
Productive work time or wrench time	Greater than 55% to 65% of the available crew hours Typically determined by work sampling studies	Elimination of the avoidable delays, such as waiting on parts, information, or the equipment to be available; these three items are primary reasons for planning and scheduling activities
% Uninterrupted Work	Varies	Interruptions create delays and possibly inhibit the completion of scheduled work
Rework – # of jobs requiring rework within the specified time period of original work completion	Less than 1%	Rework is corrective work done on previously maintained equipment that has prematurely failed due to problems in maintenance or operation
Work order closure rates trended on 30/60/90 day intervals	Review and closure within three days or less	Timely closure to ensure items like budgets accurately reflect maintenance cost, for example
Backlog – Trend "ready to schedule" and total # estimated work order hours for each category divided by # of available labor hours in the week (man-week) Also consider Backlog Aging - 30/60/90 day	For a typical manufacturer: Total: four to six man-weeks Schedule Ready: two to four man-weeks, however it can vary based on the organization and business objectives. Some organizations, such as Tier 4 data center, may choose to overstaff and have no backlog as a business decision.	The metrics is a tool to evaluate staffing levels and response times. Backlog is simply the amount of unfulfilled demands at a given point of time within the CMMS. Backlog can also be used to measure function compared to monetary (capital) commitments.

The metrics shown on this page are more general in nature to the maintenance organization. However, the planning or scheduling role can and often does influence these metrics. Consider the simple metric of "schedule compliance" as an example. If the planner has not correctly identified the materials and parts, or incorrectly estimated the hours required for the job, it may be very difficult to complete the number of jobs that are scheduled. If the scheduler has not coordinated the various crafts and the work cannot be completed in the scheduled window, schedule compliance may be impacted.

Are your metrics headed down south or stagnating, not improving? Wondering how to identify the problems or root causes? Do you know the behaviors the metrics are driving? There is a saying from the Six Sigma training world that the "product always follows the process." W. Edwards Deming said, "If your system is not working, don't blame the people, blame the system." To that end, where is your audit program to evaluate if the processes are working? Ideally, you should be pulling three completed work orders off the pile randomly every 30 days as a minimum. Gather the planner scheduler, supervisor, technician(s), storeroom person, and maybe even the plant manager, as examples and walk the jobs. When you get to where the work occurred, you should be stepping through metric type items to determine the process effectiveness. Did the planner scheduler estimate the job duration correctly? Did he or she have the right parts? Were the parts staged and kitted? What about multi-craft coordination? Did operations have the equipment ready based on the schedule? Did the job get completed before the due date? Was any follow-up work required? Was the work order completed and closed in a timely fashion? The primary goal is to determine if the business processes worked, but inherently, you can also determine performance issues or the need for training, as examples.

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At this point, you may be reflecting on all that you have read and are considering adding to your suite of metrics to bring better focus to your planning and scheduling activities. When selecting metrics, focus on the behaviors you are trying to drive. Keep the number manageable so you are not looped into a state of paralysis by analysis. Strike a balance, as the decision-making process should be driven by leading measures, ideally two to one over lagging metrics. Remember, leading metrics are the ones you can manage, while the lagging metrics tell you the result of how well you managed.

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