

The Fundamentals: How To Begin Measuring Maintenance Effectiveness Part III

Written by Raymond L. Atkins CPMM, CMRP Contributing Editor
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You have a battery of KPIs to use in revealing your maintenance reality, including some that can show how well your team is performing.

As discussed in [Parts I](#) and [II](#) of this series, the real key in beginning to manage by metrics is the collection of meaningful and pertinent data. Such data can then be converted into the type of Key Performance Indicator — *or KPI* — that can be evaluated and tracked over time. It's important, however, not to put all your eggs in one basket. The most successful organizations track several KPIs.

This month, we'll focus on a set of metrics that address performance levels in the maintenance organization: Planned and Scheduled Work Completion Rate, Maintenance Overtime, Preventive Maintenance Hours as a Percentage of Total Work and Emergency Repairs as a Percentage of Scheduled Hours.

But, first things first. Before we begin our discussion of maintenance-related metrics, we should give some thought to the topics of scheduled time and work order completion. As is the case with any metric, the final result can only be as good as the quality of the input. Assuming that you intend to run your business based on the story that the metrics tell, a concerted effort must be made to ensure that you are receiving a true picture from the field. Along those lines,

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here are a few suggestions that will improve the quality of the feedback you receive. Please be sure that your technicians are aware that these procedures are not being required because you don't trust them, or that you are trying to catch them not doing their work. Still, it is a truism — *because it is true* —

that maintenance technicians, as a group, are notoriously poor at paperwork, and you need good data with which to run your business.

- Work orders can be handed out by the day, but should be retrieved by the job. The reason is that management needs complete and timely information in order to run its business, so the work order needs to be completed while the job is fresh in the technician's mind. Furthermore, if the quality of the work order's execution suggests that additional effort is required, the supervisor receiving the document can point out the information shortfall to the technician on a timely basis.

- If your organization uses a printed work order system, beware of work orders that are not greasy, crumpled or scribbled upon. A work order is designed to be used in the field by people who work with their hands. The paperwork should reflect this. Work orders that are returned in pristine condition may have been completed in the locker room or at the break table.

- If you use printed work orders, you should have a time-stamp system. Otherwise, the tendency is to get the paperwork back with times charged to them that are suspiciously similar to the scheduled times. You already know how much time you think a job should take. What you need is a good feel for the actual time that the assigned work really required to complete, so that the next time this task is performed, the schedule may be adjusted accordingly.

- Blanket work orders written for the purpose of covering unattributed time will not improve your maintenance effort, although they may enhance your metrics. If anything, these documents can have the effect of hampering your improvement initiatives by making your current maintenance reality seem rosier than it actually is.



Emergency Repairs as a Percentage of Scheduled Hours. This extremely important metric — *also called Emergency Work* — is a measure of how much unplanned emergency work your maintenance department does. As such, it is actually a very good measure of how far out of control your particular process has drifted. Like other maintenance metrics, this measure should be made in man-hours.

Suppose you have 10 technicians in your organization, each of whom works a 40-hour week with 100% of their time scheduled. In other words, you have 400 man-hours scheduled. Now, suppose that out of your 400 available man-hours, 89 of them were spent on emergency breakdowns. The computation for the metric is as follows: $\text{Emergency Hours (89)} / \text{Scheduled Hours (400)} \times 100 = 22\% \text{ Emergency Work}$.

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As a basis for comparison with your own process, 10% is a good number for this metric, and a 5% ranking signifies a world-class maintenance effort. This metric varies from process to process, and as bad as 22% Emergency Work may seem — *and it is not a good number when compared with many world-class operations* — the fact is that a large percentage of maintenance organizations actually do far worse, for a variety of reasons. Your percentage, whatever it is, should be considered a starting point for better days to come. This metric should trend downward over time.

Incidentally, the reason that this metric should be defined in terms of man-hours rather than jobs has to do with the indefinable nature of the concept "job." Take the preceding example. If the weekly maintenance schedule had 100 separate work orders (planned jobs) on it, but there were three breakdowns (emergency jobs) that took 89 man-hours to repair, the metric would become $3 \text{ emergency jobs} / 100 \text{ planned jobs} \times 100 = 3\%$. An Emergency Work percentage of only 3% would imply that your maintenance department ranked among the best in the world, but three breakdowns that consumed 89 man-hours to repair indicates a different reality altogether. Also, please note that if you are not scheduling your workforce at 100% of their time, this metric can become skewed.



Planned and Scheduled Work Completion Rate. Also known as Planned and Scheduled Work, this metric is, by definition, the opposite of the metric we just discussed. It can be viewed as a measure of what is going right in your maintenance organization. As was the case with Emergency Work, this measure should also be made in terms of man-hours. In order to illustrate this metric, let us assume once again that we have 10 technicians scheduled at 100% of their 40-hour weeks. Thus, we have 400 scheduled man-hours. Once again, we will assume that emergency breakdowns consumed 89 man-hours out of the work schedule. The computation of the metric is $\text{Scheduled Man-hours Completed} (400-89) / \text{Scheduled Man-hours} (400) \times 100 = 78\%$ Planned and Scheduled Work.

Another (and easier) way to compute the same metric is by subtracting the Emergency Work percentage from 100. In the foregoing example, this would be $100\% - 22\% = 78\%$. A 78% adherence to the scheduled and planned maintenance week is actually respectable when compared with the maintenance realities of most organizations — *but it clearly reflects great room for improvement*. (I don't know about you, but many long years ago when I was in school, a 78 was a C, and a C wasn't an acceptable grade in the Atkins home.)



Scheduled Preventive Maintenance Hours Completed on Time as a Percentage of Scheduled Preventive Maintenance Hours.

This metric, also known as PMs Completed on Time, is no less than the meat and potatoes of your maintenance effort. There is no substitute for thorough, consistent and correctly performed preventive maintenance activities completed on a timely basis. A world-class maintenance organization will spend 70% of its man-hours on preventive maintenance activities, and the successful execution of the PM program is the difference between success and failure. One of the keys to effective preventive maintenance activities, however, is that they be performed at the proper interval — *with too early being as bad as too late*

. In fact, sometimes "too early" is worse. When it comes to PMs, "on time" is all that counts.

PMs Completed on Time is a simple metric to calculate. Suppose there are 300 man-hours of PMs in the weekly schedule, and that 230 hours of these are done on time. The computation for this metric would be On Time PM hours (230) / Total PM Hours (300) \times 100 = 77%. Since 77% of the PMs were done on time, that means that 23% of your PM schedule is out of compliance. Another way to state this sobering statistic is to say that 23% of your bearings are running hot due to too little grease because the PM was late, or that they are running hot due to too much grease because the PM was performed early. It also means that 23% of your visual inspections were not performed in a timely manner, so perhaps one out of your last four breakdowns could have been prevented if these inspections had been performed on time.



Maintenance Overtime as a Percentage of Maintenance Time.

Also known as Maintenance Overtime, this simple metric is a fair measure of the health of your maintenance organization. If Maintenance Overtime is trending up, it may be a sign that part of your process is slipping out of control. If it is trending down, it could be an indication that the measures you have put into place are having a positive effect. Maintenance Overtime is calculated as follows: Maintenance Overtime / Total Maintenance Hours Paid. In our previously referenced 10-person maintenance organization, suppose the maintenance payroll hours came in at 478 hours. Maintenance overtime would be figured as Overtime Hours (78) / Total Hours (478) \times 100 = 16%. It should be noted that for many maintenance organizations a 16% overtime rate would be considered real progress. Still, it should be stressed that this metric —

as is the case with all of the metrics we have discussed

— should always be viewed as a component of the overall maintenance picture. More about this metric can be found

[here](#)

What you're shooting for

In a perfect maintenance world, you might expect Preventive Maintenance man-hours to fall somewhere between 50% and 70% of your maintenance man-hours, and 85% of this critical work would be completed on time. Planned and scheduled corrective work would consume between 20% and 30% of your technicians' time, and 85% to 90% of this work would be finished according to schedule. Depending on how or if you account for Predictive Maintenance (PdM) hours — *many maintenance organizations expense their predictive activities outside of the maintenance budget* — these activities should amount to 10% of your maintenance man-hours. The remaining 5% to 10% will be spent on emergency work. These are your goals, the numbers you are shooting for. They are your benchmarks, the numbers against which you compare your performance.

Coming up

In the next installment of this series, we will discuss benchmarks in depth and look at what many consider to be the Gold Standard of metrics — *Total Effective Equipment Productivity (TEEP)* . **LMT**

Contributing editor Ray Atkins, CPMM, CMRP, is based in Rome, GA. E-mail raymondlatkins@aol.com; Website: www.raymondlatkins.com