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*chapter seven*

# *Reporting and KPI development*

With the processes, procedures, and main areas of your CMMS requirement now completed, your attention needs to turn to how you measure this, and what form of reporting is needed for you to use the system. There have been several books written on the subject of KPIs (key performance indicators) or metrics. While they are all very good, they assume that the information that you require to measure exists in the system.

Based on the methods and approaches outlined in the previous chapters, you can be very sure that the information does exist. You can proceed to the definition of the KPIs and reports that you will need. There are three main areas of reporting and metrics that you need to consider:

1. *KPIs and measures:* Reports focused on the measurement of key performance indicators to identify problem areas that need your attention
2. *Functional reports:* Reports that you require on a daily basis in order to carry out the work in accordance with the processes you have defined
3. *Exception reports:* Reports that you require in order to measure compliance with the business rules that you have set (discussed in previous chapters)

Although most CMMSs are delivered with a set of standard reports, there is a need to create your own reports quickly if the system reports do not accommodate your requirements within their standard scope.

## *KPI development*

KPI development is of key importance to the final outcomes that you get from a CMMS, although more often than not, there will be a widely used KPI structure in place. It is of vital importance that you revise this to better

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define your CMMS requirements, as well as redefine your corporate focus in this process.

The focus should be threefold: (1) on the definition of the KPIs that you will be using to better measure equipment performance, (2) on the KPIs that you will be using to define financial performance, and (3) on the performance of maintenance processes generally. There are various sub-headings of each of these which will also be of use.

The overall business requirements first need to be defined. In the case of a mine site, you can state that the production plan for the year is based on a given availability, or, in the case of a process plant, that throughput for the year also will be based on predetermined availability statistics. As with everything in the model that you are developing, there is a need to determine the business requirements first.

Following are a series of maintenance indicators that are of use in any situation. However, along with the indicators themselves, there needs to be a guide for how they are to be used and applied. The principal reason for the use of KPIs is not to produce pretty graphs or to tell you when you are doing well. Rather, it is to indicate when you are not doing well, and provide a point of reference that you can use in finding the fault in your processes or strategies in order to correct it.

## *Equipment performance*

Some of these will be recognized as standard measures, while others will be new to you. However, most are proven measures in today's industrial environments.

### *Availability*

First, there is a need to define the overall downtime or availability hierarchy as it exists in your operations, i.e., what each of these measures is focused on, and how you classify different periods of time, depending on what they are used for in your organization.

Figure 7.1 gives a high-level representation of this and attempts to describe the process by which you can classify these periods. The table represents three levels of downtime analysis only; however, it can be used to apply to many more levels of operations time. This will depend on the level of detail that the organization wants and also on the level of explanation that is required. As always, there is a common rule that applies. From this there is the ability to define various KPIs and graphics of how the organization is performing. I will limit further examples on this theme to a fleet of haul trucks or transport trucks in order to provide clear explanations. Reference will be made to other areas; however, the main focus will be on this example.

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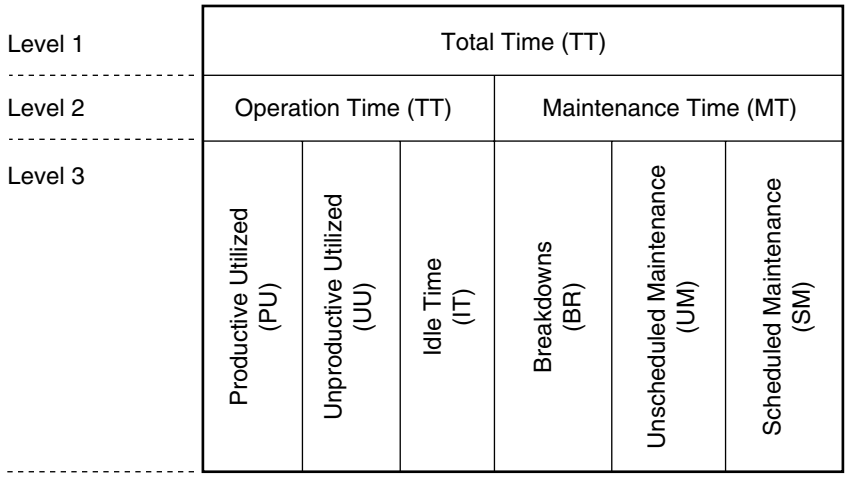


***Figure 7.1*** High level availability.

If this hierarchy or one similar to it is to be used by your maintenance and operational measures, then there is a need to define this requirement in some manner when compiling the CMMS template. This will become clearer when you actually discuss the template itself. In addition, you will need to decide if you need various availability hierarchies to be determined, e.g., different hierarchies for different pieces of equipment or, through some creative coding, using only one system.

## *Total time (TT)*

Total time is the sum of all time required by the operational departments for use of the machinery. In the case of a 24-hour operation, there is a need to focus this on the total calendar time available. In the case of an operation that works only 8 or 16 hours per day, there is a need to focus this on that period only.

## *Operations time (OT)*

This is all of the time used by operations within their various functions. For example, time for operations may be divided into three main areas:

1. Productive utilization
2. Unproductive utilization
3. Idle time

Depending on the focus of your operations, there may be a need to determine a fourth area, operations-caused downtime. Returning to the example of a

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hauling fleet at a mine site, there may be a need to attribute all tire failures to operations. The major factor affecting a downtime period such as this is that of the road condition, a factor over which maintenance may not have control. A second criteria may be that of operational errors, items where the operation of equipment is the primary factor in its failure. Although this can be very useful, it can also be very contentious, and must be applied in situations where the corporation is willing to use the findings to improve operations procedures. It should not be defined or used in an organization where it would be used as a trigger to dismiss an employee or place the blame somewhere. Such practices lead to inaccurate recording of results and can also lead to lower employee morale.

In addition, if the creation of such indicators will cause problems and conflict between the two departments, it would be wise to focus instead on creating a synergistic and focused environment within the organization prior to implementing an operational error code.

### *Productive utilization (PU)*

Productive utilization codes cover the main areas of operation where the equipment is used to fulfill its principal functions. Here, you need to clarify that it does not matter if the equipment is used to its capacity, only that it is being used to fulfill its primary function. In the case of a hauling truck, its functions including waiting for a load, loading, hauling, and dumping. As a matter of fact, the four functions described here would be ideal as subclasses of productive utilization.

As can be seen, the construction of an availability hierarchy is a useful tool for all aspects of an operation, not only measurement of maintenance performance. For example, a report on the percentages of productive utilization time may show that there is a disproportionate amount of time waiting to be loaded by the hauling units in the fleet. This may lead to the adoption of different loading procedures and possibly more loading units.

You may see the possibility of taking this to yet another level of development. For example, under travel time (TR), you can calculate travel to the loading unit and travel to the dump site, vital factors which you need to consider when planning this hierarchy.

### *Unproductive utilization (UU)*

Unproductive utilization refers to time where you are not using the equipment for its primary functions. For example, it can be time where the operator is taking a break or attending a toolbox meeting, or when the equipment is undergoing a pre-shift inspection. Although there is no doubt that these periods are productive and useful from a corporate point of view, they are not productive uses of the equipment, and this distinction needs to be made and communicated.

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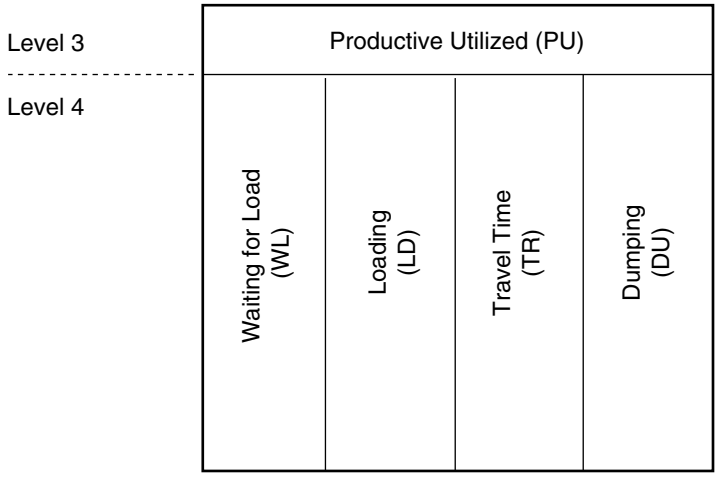


***Figure 7.2*** Productive utilized breakdown.

## *Idle time*

This measurement is critical to the optimization of your operations in the future. Idle time describes all of the time that the equipment was available and not used. There can be a myriad of reasons, however it is vitally important that you measure and record this because it can affect future planning and efficiency targets. Referring again to the model of the hauling truck fleet, idle time can apply to

- Time unused due to production requirements
- Time unused due to meetings or other organizational factors

## *Maintenance time (MT)*

This is all of the time that a piece of equipment is not available for reasons associated with the maintenance function of a the company or fleet. This may be time for scheduled or unscheduled maintenance or time for breakdowns, as defined by your corporate guidelines.

## *Breakdown (BR)*

BR is the total time the equipment cannot be used due to it having a fault of some kind. There is a need to define here that a breakdown is a corrective maintenance action. However, it is one that has stopped you from operating and needs to be fixed prior to going forward. Therefore, when you have a breakdown that is serious and it takes the equipment away from operations for periods of several days or weeks, there is no time, from the point of view

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of availability recording, when this will become anything other than a breakdown. If you plan the work, this will factor heavily on your work order management KPIs, but it will not matter to your availability calculations. A breakdown is a breakdown and in order to realize great improvements, you need to raise the bar.

Depending on what equipment you are operating, you may be able to define a substructure under the area of breakdown. A warning here: please do not try to define every possible area where you can have an equipment breakdown. Within most of the major systems on the market today, there is an ability to link the recording of codes to a work order that was raised to do the work. As such, the bulk of the definition and detail will be in the work order, while the classification will be in the coding.

### *Scheduled maintenance*

Again, you need to define definite "horizons" or limits within which you consider it important to comply with the scheduled maintenance definition. I suggest that if the task existed on the weekly plan prior to your agreement and to starting work on it, then the maintenance is scheduled to be done. There is no doubt that you can schedule work within a one- or two-day horizon. However, your goal should initially be to achieve a scheduling horizon of one week, and you need to mark against that. As you get better at it, your indicators will reflect that and you then need to contemplate pushing your horizon to two or more weeks. Scheduled maintenance includes all of the maintenance work that you have included on your weekly schedule and falls under the planning and scheduling category of planned/scheduled.

It does not matter if the work is corrective, preventative, predictive, modifications or workshop repairs. If it was scheduled at the beginning of the period, whatever that may be, then its outcome is to be recorded as scheduled maintenance.

Again, you find yourself in need of further levels to the original hierarchy table. You are in need of a definition principally of whether it is electrical or mechanical. These are the two main discipline areas which can be further broken up as shown in Figure 7.3.

As with all items in this book, this is very definitely an example. There are many ways to define downtime codes and many ways to apply them. This is merely the better of the procedures that I have come across in the areas that I have consulted.

### *Unscheduled maintenance*

This is a means of measuring the time dedicated to opportune maintenance or maintenance that you are scheduling within your one-week horizon. Opportune maintenance and maintenance that you are scheduling can also be two sub-headings of the next levels of the hierarchy. Whatever structure

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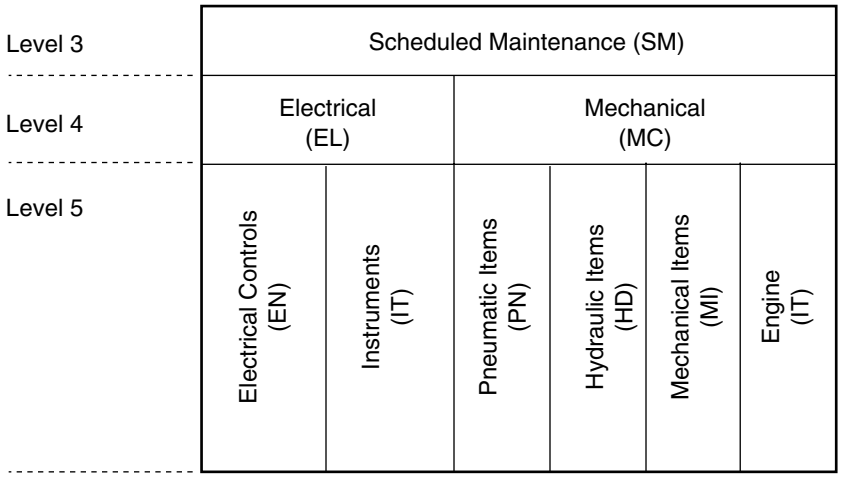


***Figure 7.3*** Scheduled maintenance breakdown.

you use, it needs to be seen that opportune maintenance is not detrimental to overall operations.

There are a multitude of reasons that opportune periods are often created in various processes. Perhaps you do not have access to product to mine, or you do not have the primary materials to continue with the manufacturing process, or you do not have demand for the product. Opportune maintenance can even be caused by the breakdown of one piece of equipment, leaving an associated equipment available for maintenance. In any case, the result is a window of opportunity in which you have access to the machinery or an opportune period for maintenance purposes.

The other form of unscheduled maintenance that you can perform under this heading is that of unscheduled corrective actions. You may recall that you are operating under a weekly time horizon, and, as stated earlier, anything that is scheduled within that week, although technically a scheduled task, needs to be recorded as unscheduled maintenance. Urgent items arising from a routine inspection or other such things would fall into this category.

There is a need to define the electrical and mechanical sections of this part of the hierarchy and their relevant sub-headings or categories, depending on where in the system you place them.

## *The formula*

Now that you have defined a maintenance downtime hierarchy, you need to consider the types of availability formulas that are available.

### *Standard availability*

Total time (TT) – maintenance time (MT)/total time (TT)

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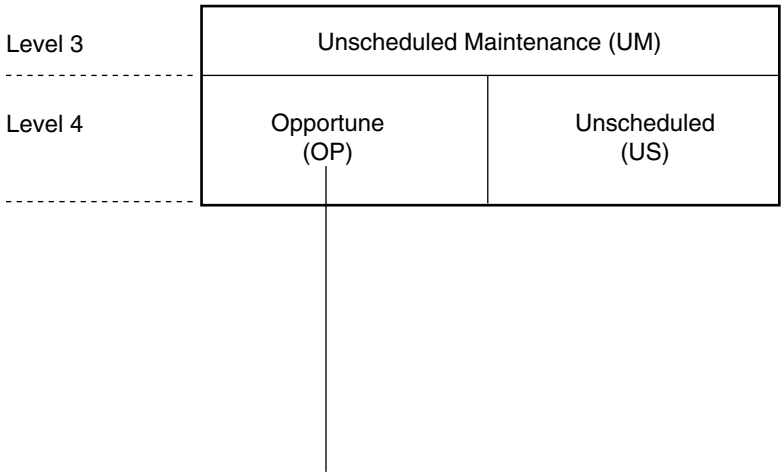


***Figure 7.4*** Unscheduled maintenance breakdown.

The goal of this formula is to determine the availability of the equipment to operations during a given period. Depending on how far your organization wants to go into the creation of a downtime or availability hierarchy, there may be cause to further define the formula:

Total time (TT) – (SM + BR + US)/total time (TT)

However your organization decides to define this, it is important to do so with the following in mind. It is only the time when the machinery was not available due to maintenance work, whether predetermined or otherwise. It is not a measure that should include the time when the equipment is given to maintenance, such as opportune periods.

*Mechanical availability*

Total time (TT) – total mechanical maintenance downtime/total time (TT)

The goal here is to identify the amount of time that the equipment was available from a purely mechanical point of view. Another way of describing this is the performance in a mechanical sense of the equipment.

*Electrical availability*

Total time (TT) – total electrical maintenance downtime/total time (TT)

*Utilization*

Productive utilization + unproductive utilization/
total time (TT) – maintenance time (MT)

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The goal of the utilization measure is to determine what percentage of the time available you actually took advantage of. Again, using further levels in your hierarchy, you can further define what each piece of equipment was doing, but the focus here is only on the utilization measure.

*Effective utilization*

Productive utilization/total time (TT) – maintenance time (MT)

The goal of the effective utilization measure is to determine what percentage of the time available you took effective advantage of. This measure, more than that of utilization alone, can show what sorts of problems you are having on a regular basis so that you can encourage your operations departments to better utilize their equipment. As always, you need to bear in mind the following: the equipment belongs to operations, but the reliability of it belongs to maintenance.

As such, again referring to the haul truck example, it is easy to see that if you raise availability and effective utilization, you are in a position where you may be able to lower committed resources (in this case, haul truck units). The savings here are massive and well worth the time taken to measure and analyze the numbers. For example, you can realize saving in the areas of:

- Operational costs
- Maintenance costs
- Inventory costs

## *Other measures*

There are other more graphic means of producing these measures than merely in the forms stated previously. Figure 7.5 is a visual representation of the time used in the various parts of operation that you can use as a base for decisions that you need to make in the future.

In terms of your CMMS selection, you may need to know if this form of graphic is available, or if it can be easily produced. There are substantial advantages from being able to drill down on such a graphic. For example, a double click on the breakdowns part may bring up a list of work orders for that day, for that fleet, or you may choose to have this type of graphic on an equipment basis rather than a fleet basis.

*Equipment reliability*

Another measure that you will be able to apply from the amount of information that you now have in the system is mean time between failures (MTBF). At the equipment or fleet levels, this is not a deeply analytic measure, merely a guide to how the machine, fleet, or group of equipment is performing in a given period. The MTBF measure is calculated as follows:

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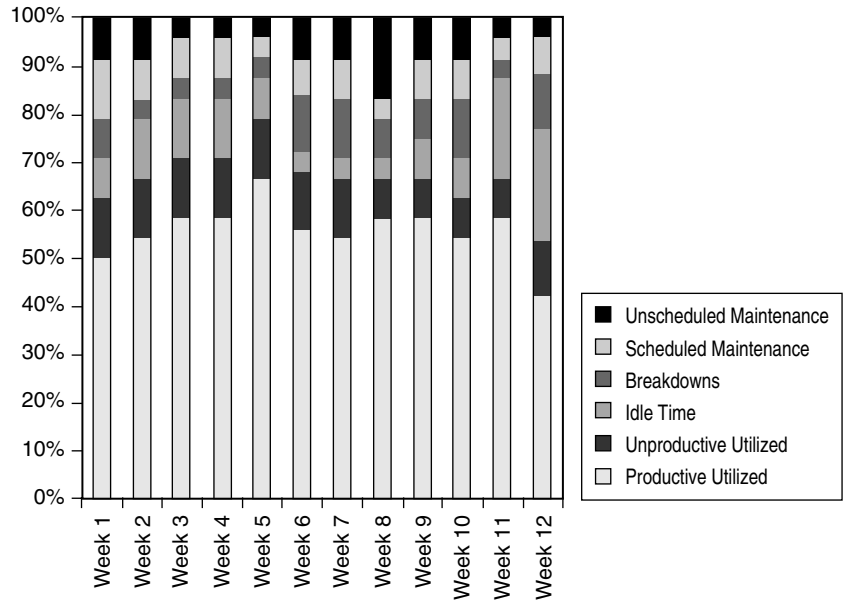


***Figure 7.5*** Utilization over time.

Productive utilized/number of occurrences of downtime

Here you see the average amount of time you can rely on the equipment prior to having a failure on that equipment. You will notice that the unproductive utilized and idle time codes are not included. This is because, in order to make this measure a fair one and one that you can use as a guide, you need to discount time that you were not using this machine for its productive purposes. Of course, much will depend on how you have defined unproductive utilized as it applies to your operations.

This is a very important measure to determine the real performance of your equipment as seen through the eyes of your primary customers (operations). In addition, it is important to recall that it is easy to have a high availability while having a very low MTBF. Through frequent, short-duration failures, you maintain your equipment at high availability levels while not meeting the expectations or requirements of your operations department.

*Equipment maintainability*

Total downtime/number of occurrences of downtime

The goal is to gauge the average time for you to recover from a downtime period, at equipment or fleet levels. This also is an important measure because it tells you several things:

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- How easy it is to do maintenance to these machines
- How responsive maintenance is to the failure
- Whether you are improving in this function over time

This measure is known as MTTR (mean time to repair) — a very important part of the overall maintenance focus. This measure, however, can be very deceptive to the untrained eye. When a maintenance operation is operating in reactive mode, this number can often be low, indicating that you are very efficient at repairing faults. What it is really telling you in this instance, however, is that you are accustomed to repairing faults; you are good at it because you do it all of the time. As such, this needs to be reviewed in conjunction with the availability and reliability measures mentioned previously.

### *Overall equipment effectiveness (OEE)*

Overall equipment effectiveness is a very harsh but extremely useful measure for evaluating the performance of your equipment. The formula is the following:

$$\text{Availability} \times \text{utilization} \times \text{quality}$$

Built into each one of the sub-components of the formula are the requirements of your plant. For example, availability is one measurement out of a hundred. If you are not at 100%, it will show in the OEE calculation. There are some issues regarding the application of OEE and this should be done at the equipment level as much as possible.

We have not previously spoken of the need for you to evaluate the quality requirements of your plant or equipment. If you are truly interested in evaluating it at the OEE level, then you will need to include this in your requirements statement of the template.

As an example of how harsh OEE can be, consider the following scenario. Imagine your plant with 90% availability. Not a great achievement but perhaps acceptable for your requirements. Imagine you also have a utilization of 90% and an achievement of your quality goals of 90%. Multiplying availability by utilization by quality ($90\% \times 90\% \times 90\%$) gives you an OEE of just 72.9%, or 27.1% *less* than achieving the maximum performance of that piece of equipment. The OEE formula is a very good tool for gauging the overall performance of your equipment, but it is not likely to give the results that you want to see at first.

In addition to these reports or metrics, it is good to revise the following information:

- Equipment downtime costs in terms of lost production
- Equipment downtime costs in terms of maintenance costs

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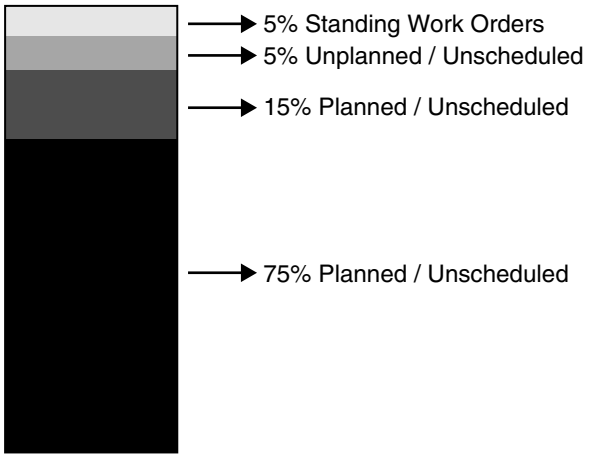


***Figure 7.6*** World class modes of execution.

With all of these reports, you will have a strong base for the detection of equipment-related failures and enable you to take early corrective actions in this regard.

These are only a few examples of the types of reports available from the CMMS that you need to consider. Using the template approach will guarantee that you have the processes and procedures in place in order for you to deliver these results, and not have to redefine your business processes at a later date in order to accommodate a metric that someone read about in a magazine or on a website. As always, the approach is about being ready and therefore in control of the change, not being driven by it, as is so often the case.

## *Maintenance process measures*

The goal here is to measure how you are doing in the various areas where you operate as a maintenance department. As with all areas of maintenance these measures should be classified into various sub-groups to enable you to locate important issues with greater ease.

### *Overall measures*

Here you need to refer back to the standards of planned/scheduled ratios and maintenance content that were introduced in Chapter Four.

While keeping in mind these two targets for maintenance planning and scheduling contents, the graphics can appear as detailed in Figures 7.6 and 7.7, showing the number of man-hours dedicated either to maintenance content or to the planned/scheduled ratios over time. This allows you to monitor improvements and the effects of any improvement initiatives.

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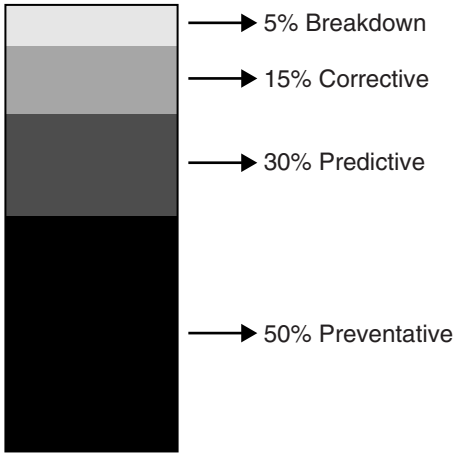


***Figure 7.7*** World class maintenance program content.

These reports should also be available in a drill-down fashion so as to view the compliance or progress of the maintenance effort by craft as well as the workforce as a whole.

### *Schedule compliance*

You need to be aware of the schedule compliance as well as any reasons for noncompliance at your company. At this point, you can make decisions to either reduce the amount of hours that are scheduled or any other appropriate action.

## *Other planning indicators*

### *Backlog percentage planned*

As stated previously, it is wise to have at least 2 to 3 weeks of planned backlog available in order to have a high level of maintenance preparedness. As such, the formula becomes (depending on the shift arrangements at your plant.):

Total available resource hours × 3 weeks of hours/total resource hours in the planned backlog

### *Percentage of work orders delayed due to poor planning/scheduling*

Here you are trying to understand what the failings of your work order planning system can be. As discussed in Chapter Four, you need to develop a series of work order codes that explain any failings of the work order

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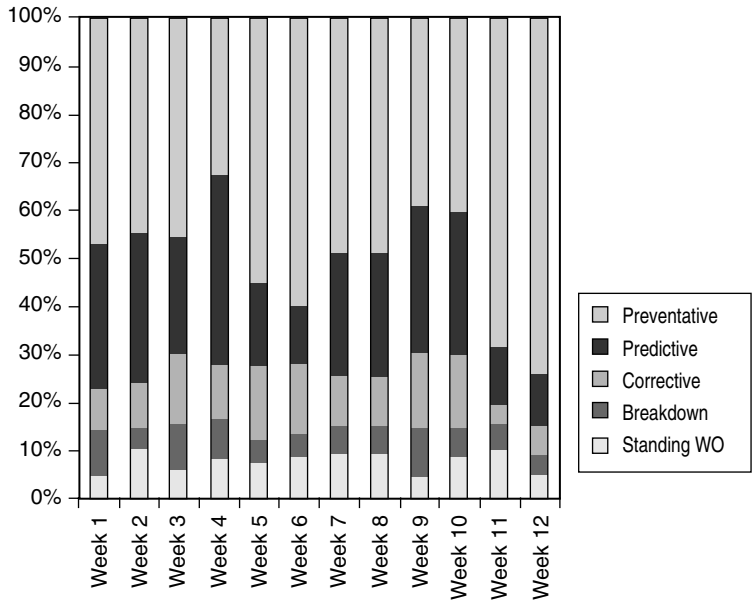


***Figure 7.8*** Maintenance program content over time.

planning system. For example, excessive delays due to lack of parts may point you to the fact that you are not allowing enough lead time for work order materials.

Similarly, you may be experiencing great delays due to equipment not being available for the work. This would then point you to possible failures in the weekly scheduling process and the follow-up daily scheduling processes.

## *Work order life by priority*

As explained in Chapter Five, you need to set a methodology by which you prioritize work orders, and subsequently plan, schedule, and execute these work orders.

A report showing the number of work orders by age in each respective priority will enable you to give a quick health check to the priorities system. Work orders that are of greater age than they should be for a specific priority need to be actioned quickly while you go about finding out why it is that they were not attended to in the first place.

A result of reports such as these may point to the fact that you are in need of some short-term contract labor in order to get past a critical stage in development, for example.

Although there is a tendency to find high-priority work orders that have outlived their life expectancies, there is also a tendency to find work orders that are of low priority and are not being attended to. The goal is to attend

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to all of the reasonable and agreed requirements of the operations departments. You need also to take action when faced with this scenario.

### *Estimations index*

As a measure of the accuracy of your task planning, you need to be constantly comparing your results with the real results. Allowance needs to be made here for the fact that you will often experience delays due to one factor or another. However, the total tool time of any work order needs to be close to the estimates that you plan into the work orders. This also needs to apply to materials estimates.

## *Preventative maintenance (PM)*

### *Percentage of work orders arising from preventative maintenance inspections or services*

As a maintenance department, your mission is to gain absolute control over your processes. With measures such as these, you will be able to find out why you are failing in various areas and what can be done about it. The maintenance regime that you use in your plant or facility will determine the performance of many of your assets or pieces of equipment. For example, low ratio of work orders from preventative maintenance routines as opposed to other avenues of corrective maintenance work order raising indicates that your PM regime is not detailed enough.

### *PM compliance*

PM compliance is one of the greater measures that you will be able to apply in this area. As the basis of your reliability growth plans, the PM compliance of maintenance schedules needs to be of a very high level. If it is not, the problem will need to be highlighted and corrected immediately. Poor PM compliance leads to poor machine performance which leads to poor financial custodianship of the company's assets.

### *Percentage of overtime*

As a general guide, you should be able to easily maintain your overtime ratios to less than 5%. Failure to do so may point to a larger workforce or smarter work practices.

### *Costs charged to standing work orders*

As stated several times throughout this book, there are very few occasions that truly call for a standing work order for maintenance work. As such, any costs and materials that are booked to these work orders need to be rigorously

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monitored to maintain a high level of analytical potential of the work order information.

### *Reasons for noncompliance*

Noncompliance to maintenance schedules can be divided principally into:

- Higher priority work
- Nonavailability of equipment to be worked on
- Nonavailability of resources, both human and material, to do the work

A report showing these three groupings with their sub-classes possibly as a drill down will enable you to easily highlight those areas where you do not have control over your processes, thus wasting maintenance resources.

### *Failure reporting*

Failure reporting must be focused on locating the few critical items that are major stopping points or levers for increasing availabilities and reducing failure frequency rates, e.g., the frequency of a failure code against a critical piece of equipment and the frequency of the same work used to correct a failure. As a part of this, you need to constantly review the number of proactive work orders in the system that are focused on eliminating failures as a part of your continuous improvement focus.

## *Administrative functions*

### *Percentage of total work covered by a work order*

This is imperative to your continued evolution along the path to the predictive state of maintenance. The only acceptable level here is 100%.

### *Labor and materials as a percentage of total maintenance costs*

You will need to see what the content of your maintenance spending is on these items. The goal is that this will ultimately equal 100% of the total maintenance costs.

### *Contractor usage as a percentage of total maintenance costs*

You will need to determine your reliance on contractors and their cost effectiveness. Work orders for contractor labor can and should be contrasted against work orders for the same work using in-house labor in order to detail the differences in costs, time, and material usage.

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### *Cost reports*

You should be able to quantify with ease the following maintenance cost statistics.

- *Maintenance unit costs.* Per machine, per fleet, or per process
- *Maintenance budget compliance.* While coming in under budget is good and should be one of your goals on an annual basis, you are nevertheless wasting capital by setting a budget greater than you can adequately use.

## *Inventory management*

### *Percentage of compliance of items with preset service levels*

As stated in Chapter Six, there is a need to set the service levels of specific items depending on their particular characteristics. There is an often-stated view that this should be a flat 95% for all stores items. This is incorrect and is a recipe for bloated warehouses and over stocking on items that may not be needed. However, once the maintenance store policy has been set, according to the requirements for each item, then you must continually review its compliance with those service levels and take action for noncompliance.

### *Vendor compliance with lead times*

You need to review vendor performance, by item if required, on issues such as:

- Late/early arrival of new items
- Late/early return of repaired items
- Compliance with quoted costs

An idea of how your vendors are treating you can give you the ability to either change vendors or reward good vendors with additional work.

### *Number of urgent requisitions*

This should also be reflected in the measures on breakdown maintenance. However, there is often the case where specific departments or people will book out an item to a cost code as opposed to a work order. To account for this, you must review this indicator. Although it is a measure of the stores function, it is very much a measure of the reactive nature of maintenance.

### *Low usage items reports*

For the setting of future stock levels and determining obsolescence in your stores system, a means of reviewing this function is vital. However, you also

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need to be working with your inventory management policy and revising it in order to determine obsolescence. A part may still retain high criticality even though it is a slow-moving item. The focus of this report is a one year time frame.

### *Potentially obsolete items*

The chance of obsolescence within this range (items with no movement over two to three years) is much greater and as such this report should be included in any inventory analysis regime.

### *Surplus stock reports*

In the hustle and bustle of daily industrial life, there are various reasons why there may be more than maximum limits of a certain store item. However, it is of importance that you focus on these and take action where deemed appropriate.

### *New items added*

The last of your critical inventory reports is the new items added for a period report. Complete with a description and the relevant ABC analysis of the new item, this report can act as a final filter for items that may have slipped through the system. As stated in Chapter Six, the maintenance inventory is one of the greater maintenance expenditures, and, as such, it is fitting that you maintain tight control over it.

## *Maintenance functional reporting*

These are reports that you will need on a daily basis to carry out the functions of maintenance management easily. The majority of them will focus on the backlog system and on being able to pull out variously filtered reports depending on your requirements at that point in time.

As previously stated, maintenance falls in one of three areas: operational maintenance, shutdown maintenance, and technical change management. Therefore, you will need to filter first to determine whether a work order is in one or many of these three categories. I say one or many because a work order may be a technical change that is scheduled to be completed in a shutdown, or it may be an operational work order that has been scheduled for some reason to a shutdown, or any other of the possibilities.

Once you have defined the areas, you then need to apply your requirements of maintenance planning, i.e., you need to determine where an item is in the planning process. For example, you will need to pull up a work order report that contains:

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- All items for a specific shutdown that are of a priority 1 classification and are awaiting materials
- All items that are priority 3 classification and require a procedure
- All items for a specific project that are of a safety nature and are planned

The ability to filter and reorganize your maintenance backlog can be either to further the planning effort for a specific area or, once planned, to determine which of the items needs to go into the weekly schedules. It is also a means of revising the backlog content for specific work order classifications and maintenance types.

So, as a general rule, you will need to filter and report on the maintenance backlog in a combination of any of the following criteria as a baseline:

- By area of maintenance (operational, shutdown, technical change, or a combination)
- By equipment
- By originator
- By requestor (if applicable according to the business rules)
- By specific shutdown or merely by shutdown type
- By work order class
  - Safety
  - Maintenance
  - Capital or technical change
  - Environmental
- By maintenance type
  - Preventative
  - Predictive
  - Corrective
  - Workshop repair
  - Breakdown
- By priority: priority-based reporting will determine how you deal with items to schedule and how you deal with planned/unscheduled work.
- By date scheduled: this style of report is very useful for weekly scheduling meetings where you can determine and agree upon the requirements for the next week's work.
- By date raised: this particular report is very useful for the daily, 24-hour work review reports and can be used to determine the priorities for the day and how the daily plan needs to be changed.

In carrying out daily functions as maintenance practitioners, these backlog-style reports will be of invaluable assistance and will aid you in the

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continuous improvement path that you are on. For example, from the previous listing, you extract a report on the scheduled work, for a specific day, for a specific machine, that has the highest priority. This is one of many useful tools that a planner has for conveying information and for reviewing the work loading for a period or a group of workers.

### *Parts arrived reports*

By being able to see the parts that have arrived for a particular work scheduling period, you make last-minute scheduling calls to determine the validity of your schedule and the need to omit tasks.

### *Time to go reports*

One of the more critical of the equipment monitoring reports that pertain to maintenance planning functions is the time to go report. This report is a list of the major items on a piece of equipment with a calculated value for their change-out date as well as the remaining life in days. From this report, you advise and forewarn suppliers of your major equipment items that this is the anticipated envelope.

In systems and operations that are using condition-based maintenance philosophies and programs, this report may take on a dual function: (1) to indicate the change-out date and the remaining life according to the equipment life statistics normally provided by the manufacturer, and (2) the life expectation figures according to your condition-monitoring readings. You must create this report using the available data on operating hours, the maintenance routines for changeouts of components, and the calculation between the current date, average hours per day, and the remaining life of the component. This is most useful for large equipment items that have long lead times on major components.

## *Exception reporting*

Exception reporting is often overlooked in the scoping of a CMMS as well as in the running of a maintenance department. Exception reporting is exactly that, reporting on all of the exceptions to your business rules and guidelines that you have set for your organization. Following are examples of the sorts of exceptions reports that may be produced, depending on the business processes you have developed and applied.

To maintain high-quality levels of the work in the backlog, you need to filter the work orders created to easily find and react to problems that have been arisen in them. This will assist you greatly in your overall backlog management aims.

Reports need to be set to find work orders with the following noncompliant characteristics.

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### *No priorities*

As discussed previously, the priority function is one of the central functions in any system.

### *Insufficient lines of data*

A work order report based on finding work orders with, for example, less than two lines of information. Each must be checked in order to ensure that is sufficient in coverage of the work required.

### *Noncompliant work order codes*

The combinations of work order classes and maintenance types are not a pattern where all maintenance types can be used for all work order classes. As such, you must filter them to find those that do not comply. An example is the class of capital with the maintenance type of breakdown. As capital work is essentially new work, modifications, or purchases, there is no room for this maintenance type.

### *Priority by age*

Although mentioned earlier, this is also an exception style of reporting mainly because it shows up exceptions to your business rules. A work order with a priority 2 rating must be completed within 48 hours. If it has not been done by that time, it is an exception to the rule.

### *Planned status*

Some work orders have been planned, but do not qualify for planned status rating. If you have determined that your definition of planned is that a work order must have resources, materials, procedures, and safety instructions, an exception report focused on the planning status must pick up any of the work orders that do not have these.

### *Scheduled/unplanned work orders*

You cannot allow any scheduled/unplanned work orders to slip through the net at all. You must set a high standard from the beginning. With your horizon of one week in this case, there is no plausible reason that you should have scheduled work that you have not had time to plan. By scheduling unplanned work, you are setting yourself up for inefficient execution of work. You have thrown out the window your drive to eliminate logistical waste and you are beginning to let the rot in.

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### *Corrective work orders closed with no failure codes recorded*

This must be highlighted quickly so that you can act on it while the information is still fresh in the minds of those who did the work.

### *Work orders with minimal or no completion comments*

These are vital for your later analysis and other parts of your continuous improvement programs. You also need to capture and act on these quickly so as not to lose the ability to capture the information.