FEATURED ARTICLE

BEST PRACTICES OF MAINTENANCE PLANNING & SCHEDULING

MATT MIDAS, GenesisSolutions, An ABS Group Company
INTRODUCTION
As an engineer, I have always prided myself on being able to fix things and "keep the plant running." In my earlier days, I thought it was fantastic to get the recognition I did for fixing things. I never considered it to be reactive. Heck, I did not even know what that meant. With the advancements in today's technology and improvements to Enterprise Asset Management (EAM) systems and Computerized Maintenance Management Systems (CMMS), if we deploy them properly and in line with best practices, it is possible to reach previously unreachable levels of efficiency, data quality, and meaningful reports. If your organization is in a reactive state of maintenance (see the Maintenance Maturity Continuum below), all the things that need to be done to fix and repair assets need to be documented in the form of a job plan so that it can be used the next time that work needs to be done. Accurate and complete job plans enable planners to be more efficient at what they do. If your organization is in a predictive or reliability-based state of maintenance, congratulate yourselves and read on, as you may discover new areas of opportunity.

Unfortunately, many organizations still do not have fully developed and implemented planning and scheduling programs. Work still gets done, but at what cost to the organization? Without a properly developed and defined planning and scheduling function, maintenance inherently operates in a more reactive mode. Why? Without proper planning and scheduling, work quality, equipment/asset uptime, and maintenance productivity will not be at their maximum levels. This is due to excessive non-value time added during the job and between jobs. Additionally, planners are not able to effectively plan for the number of technicians that are assigned to them. Overall maintenance costs also increase due to the acquisition and storage of unnecessary spare parts, and up to 10% of the energy being consumed is wasted by poorly maintained equipment.

BENEFITS OF PLANNING & SCHEDULING
Instead of talking about what proper planning and scheduling is, I would like to set the stage for why you want proper planning and scheduling as a key initiative within your organization. Let's consider several areas where waste occurs and what this waste could mean for an organization. Without planning and scheduling, the wrench-on time for a company is on average only 35%. That means that for every technician working an 8-hour day, only 2.8 hours of actual work on assets is done. Of the remaining 65% of the time, the breakdown is as follows:

• 5% goes towards receiving instructions
• 12% goes towards obtaining tools and materials
• 15% goes towards travel time to and from the job

With the addition of proper maintenance planning and scheduling, a company is able to increase the wrench-on time from 35% to 65%. At this level of efficiency, a technician working an 8-hour day will complete 5.2 hours of actual work. With 65% of the engineer’s time being used efficiently, only 35% of their time is wasted.

At this point, you might be asking yourself: “So what? Why should I invest time and effort in establishing a proper planning and scheduling function?” The simplest answer would be because it will allow your facility to move away from a reactive state of maintenance and improve overall work force efficiency. From a financial perspective, what would it mean to your organization if you could:

• Increase a technician's wrench-on time from 2.8 hours to 5.2 hours?
• Eliminate 10% of the spare parts associated with maintenance?
• Reduce backlog work orders with your current staff?
• Repair an asset more efficiently, getting the plant back on line in less time?
• Have time to analyze failures and implement activities to prevent them, moving towards a reliability state of maintenance?

I challenge you to do some homework and answer the questions above. It may surprise you.

PLANNING & SCHEDULING DEFINED
Let’s look at the components of planning and scheduling so we can level the playing field. If we can understand the impact of the following items, we can get to a better place with planning and scheduling.

Work Planning:
This is the process in which maintenance work is documented, resources are assigned, work and safety procedures are identified, labor and materials are identified, and they are all interfaced with the scheduling element.

Work Scheduling:
This is the process in which all resources which are required for
work are scheduled for execution within a specified time frame. Executing this component requires an understanding of equipment/asset availability as well as technician, material, and specialty tool availability.

Coordination:
This involves the logistical efforts of assembling necessary resources so the job is ready to be scheduled. Requires coordination of both scheduling and planning activities.

Maintenance Excellence:
Having an effective maintenance strategy that eliminates non-value added activities, maximizes condition based maintenance, and focuses resources on the most critical assets is of vital importance. Doing the right jobs, with the right parts, at the right time is what maintenance excellence is all about.

MAINTENANCE PLANNING PRINCIPLES
There are a lot of great books out there on planning and scheduling. I have read several of them over the years as I have tried to improve the planning and scheduling functions at a few of the companies where I have worked. If you are working to implement planning and scheduling, I recommend a book titled “Maintenance Planning & Scheduling Handbook,” by Doc Palmer. In this book directions are given on how to properly set up an effective planning and scheduling function. There are 6 Maintenance Planning Principles and 6 Maintenance Scheduling Principles that I have summarized below.

6 Maintenance Planning Principles
The 6 Maintenance Planning Principles include having a separate department for planners, focusing on future work, maintaining component level files, estimating based on planners expertise and historical data, recognizing the skill of the crafts, and measuring performance with work samplings. When all six of these principles are used and combined correctly, maintenance planning can reach new levels. What this means is that, important asset related data and information can be shared across the plant, and even across multiple plants. Imagine identifying an issue with a pump that recently failed and you have 50 of these pumps across multiple plants. You can notify the other plants of the issue and address it before another failure occurs.

1. Separate Department:
   • Planners are organized into a separate department from the craft maintenance crews to facilitate specialization in planning and scheduling techniques as well as focusing on future work.
   • Planners are not members of the craft crew for which they plan.
2. Focus on Future Work:

- The planner concentrates on future work—work not started—and provides maintenance for at least one week (3-4 is better) of backlog that is planned, approved, and ready to execute.
- The one-week backlog allows crews to work primarily on planned work.
- Crew supervisors handle the current day’s work and problems. The craft technicians or supervisors resolve any problems that arise after any job begins.

Two “Rules of Repetitive Maintenance”

- The 50% Rule—if a piece of equipment needs work, there is a 50% chance it will need the similar, if not the same, work within 1 year.
- The 80% Rule—there is any 80% chance the equipment will be worked on again within a 5 year period.

- Conclusion: feedback on jobs completed is the path to increased productivity.
  - After the completion of every job, feedback is given to the planner.
  - Planners use the feedback to improve future work.
  - Benchmark: 6 months of feedback make job estimates and costs more accurate.

3. Component Level Files:

- Planners maintain a simple, secure file system based on equipment/asset numbers—Best Practice: individual component level—not by manufacturer or vendor.
- Information allows the planners to utilize equipment data and information learned on previous work to prepare and improve work plans—especially on repetitive tasks.
- Historical information consists of both work order history and equipment databases.
- Cost history assists in making repair or replace decisions.
- Supervisors and engineers are trained to use these files to gather information they require with minimal planner assistance.

4. Estimate Job Based on Planner Expertise:

- Planners use personal experience and file information to develop work plans that will avoid anticipated work delays, quality or safety problems.
- Planners are typically experienced senior level technicians, who are trained in the appropriate planning disciplines and techniques.
- Planner training includes specialized techniques including: industrial engineering, statistical analysis, etc. on-the-job training and feedback are most effective.

Best Practices:

- Choose from the best crafts persons to be planners.
- Expect to see a department productivity loss for a few months when an experienced person transitions to planner.
- Payoffs—Good execution on an excellent scope job or excellent execution of the wrong scope job.

5. Recognize the Skills of the Craft:

- Best Practice: all work is planned with a minimal level of detail in the job plans—use some standard plans.
  - Choice: highly detailed job plans for minimally skilled crafts or less detailed job plans for highly trained crafts?
  - Control the workforce or empower skilled, knowledgeable people?
- The planner determines the scope of the work request.
  - This includes clarification of the originator’s intent where necessary.
  - Engineering requirements are gathered before planning.
- The planner determines the strategy of the work (repair or replace)
  - Planners should attach helpful procedures from their experience, such as files or reference documents, for the technician’s use.
  - Craft technicians can use their expertise to determine how to make a specific repair or replacement.

6. Measure Performance with Work Sampling:

- Measure how much time technicians actually spend on the job versus other activities such as obtaining parts, waiting for instructions, etc.
- Wrench time—the proportion of hands-on time a technician spends working per hour—Best Practice: 60%.
- Gives everyone a measure of how much planning helps “put everyone on their tools in front of a job” instead of doing something else.
- Work that is planned before assignment reduces unnecessary delays during jobs and work that is scheduled reduces delays between jobs.
- Management question: Is time spent obtaining parts or tools part of the job or is it a delay to be avoided?
1. Plan for the Lowest Required Skill Level:
   • Job plans need to identify the skills required to perform the work.
     - Are there special crafts that are required that will need to be informed of the work?
     - Are there special tools needed?
   • Should include the number of technicians, work hours per skill level, and total duration of the job.
   • Why do we call for the lowest skill level?
     - If we list two mechanics, one being a helper, we don't want to send our two best mechanics when it is not necessary.
     - It impacts our ability to get other jobs accomplished.
     - It limits the impact on wrench time.
   • Avoid two common traps:
     - Always assign two workers.
     - Estimates should not be based on half or whole increments of a shift.

2. Schedules and Job Priorities are Important:
   • Weekly and daily schedules need to be followed.
   • Priorities should be used appropriately for new work.
     - Consider how to handle break in or emergency work.
     - Do you have a process defined? Asset Criticality?
   • Any disruption to the schedule impacts the overall process
     - We are setting goals for maximum utilization of available craft hours
     - When a schedule is interrupted, consider postponing a job not started rather than interrupting a job in progress—the job site needs to be secure before moving to the emergency repair.
     - Restarting the interrupted job may require additional review.
     - Document how you will handle in-progress, urgent, and non-urgent work.

3. Schedule from Forecast of Highest Skills Available:
   • Develop a one-week schedule for each crew based on forecasted hours available for the highest skill level.
   • Consider the following for the schedule:
     - Job priority and job plan information.
     - Multiple jobs on the same piece of equipment or system.
     - Proactive work.
   • Supervisor for crew provides forecasted hours available.
   • Schedule should be based on how much work the crew can finish.
   • The goal of scheduling is to accomplish more work by reducing delays.

4. Schedule for Every Work Hour Available:
   • Assign work for every available hour.
   • Include easily interruptible jobs for emergencies and high priority reactive jobs.
   • Complete higher priority work by under utilizing available skills.
   • Consider the following:
     - 100%—all available hours are scheduled which improves accuracy of reporting KPI's on work accomplished vs. scheduled based on total available hours.
     - 80%—building inefficiency into the schedule by leaving a 20% buffer. If we hit the 80%, we need an additional 20%.
     - 120%—Having additional work in the schedule ensures poor performance on schedule compliance.
   • What defines emergency work? Consider a week without an emergency.

5. Crew Leader Handles Current Day's Work:
   • Supervisor develops the daily schedule one day in advance based on:
     - Current job progress.
     - The one-week schedule.
     - New high priority, reactive work.
   • The supervisor matches the personnel skills and the tasks.
   • Supervisor handles current day's work and addresses emergency work.

6. Measure Performance with Schedule Compliance:
   • Wrench time is the primary measure of work force efficiency and of planning and scheduling effectiveness.
   • Best measure of scheduling performance.
   • Schedule Compliance- jobs scheduled vs. jobs started.
• Work that is planned prior to assignment reduces unnecessary delays during job by eliminating non-value added time.
• Work that is scheduled reduces delays between jobs.
• Schedule compliance is the measure of following the one-week schedule and its effectiveness.

NECESSARY ELEMENTS FOR PLANNING & SCHEDULING
We have discussed why we should implement proper planning and scheduling, the principles of planning and scheduling, and now we need to discuss some of the necessary elements that are needed to support proper planning and scheduling. This is not an overnight process, so don’t give up if you think it might take too long. The benefits are well worth it.

First things first, do you have any of your processes documented? Have you documented the definition of a planned job for your organization? Does it include the following?
• The person planning the job verifying the job scope?
• Crafts, Materials, Tools?
• Special resources needed and identified?
• Required skills identified?
• A documented description of job steps (job plan)?
• All lock-out, tag-out, and other safety issues identified?
• Necessary technical documentation?
• Craftspeople involved in the planning process?
• Labor hours by skill identified?
• Availability of required permits?
• A list of physical and environmental constraints?
• Approvals?
• Operations/customer impact?
• A formal documented checklist?

Not all organizations will have the same elements as part of their definition; however, these are the common items that should be considered. There are many applications that can be used for planning and scheduling, and some are better than others. Almost all of the EAM/CMMS packages that are available today have fields to support the required data elements, and can be used for planning and scheduling. Most do not have visual capabilities and what if scenarios. Some have bolt on modules while others have interfaces to pure planning and scheduling applications. There and also add on applications that have been specifically designed for certain EAM/CMMS’s. All are designed to improve the planning and scheduling function through a more visual and user friendly approach. Take your time when determining what applications to use. Remember, one size does not fit all, but the general principals do apply. Figure out what fits your organization and plan on a continuous improvement cycle.

CONTRIBUTING AUTHORS

MATT MIDAS
Matt Midas is a Senior Account Executive at GenesisSolutions, the Asset Performance Optimization service line for The ABS Group of Companies. A graduate of the US Merchant Marine Academy, Matt has served aboard US flag merchant vessels and as an engineering officer on board the USS Jesse L Brown, FF1087, where he was responsible for maintenance, operations, engineering and safety programs. Matt is qualified as a nuclear engineer in the maintenance, repair and overhaul of S5W and S6G nuclear propulsion plants. Over the last 20 years Matt has helped his customers implement effective EAM & Reliability Programs. Matt earned his MBA from Loyola College in Maryland.