White Paper:

Improving the Work Cycle Through Planning

by

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What Is Planning?

Planning is the most important part of any integrated maintenance policy involving limited resources in time-critical activities. If time and effort are to be saved on the job, then time and effort must be put into the planning process.

Some people use the word plan synonymously with the word intend. They say, "I plan to do that." However, identifying work that is to be done and intending to do it is not the definition of planning in the context of maintenance.

Planning, with respect to industrial maintenance, can be defined as determining the proper methods, manpower, material, and other resources for efficient and effective job execution. It is the effort that is put into a work order before it is assigned to a craftsperson.

Why Planning Is Important

Everywhere, maintenance departments are being asked to reduce costs while improving maintenance efficiency and quality of services. The cost of maintenance continues to rise. With increased global competition in many industries, maintenance costs are receiving more attention. To remain profitable, many companies are asking their maintenance organizations to keep machinery running longer with fewer people, reduce failures, implement new programs, continuously improve, and do so at reduced cost. This can only be accomplished if the maintenance organization is efficient and effective.

Professional application of planning and scheduling concepts is a critical maintenance business practice for achieving and maintaining a "world-class" status for any maintenance organization. Planners provide significant benefits to a maintenance organization, but they cannot do it on their own. People all throughout the organization—operations, maintenance workers, contractors, supervisors, spare parts—impact the planning and scheduling function.

The planning and scheduling function is primarily focused on improving productivity and reducing maintenance wastes and losses.

Productivity Improvements Through Planning

Maintenance productivity (wrench time) is typically in the 25% to 35% range. At the high end, 35%, in a 10-hour workday, only 3.5 hours are spent directly on value-added maintenance work. Planners battle and eliminate the losses and delays that workers typically experience. Doing so increases the workflow rate.

Productivity represents the series of activities required to accomplish a job. Direct activity, commonly called "wrench time," is the percentage of time spent on the direct execution of a maintenance task. Indirect activity is the time spent in job preparation, travel, gathering of materials, personal time, and time waiting on instructions or equipment. Indirect activities are part of overall productivity. Productivity does not mean absolute wrench time. It means the minimum number of events (activities) to complete a quality job in the shortest period of time.

Maintenance must strive to eliminate as many indirect activities as possible in the planning, scheduling, and execution of work.

Best practice wrench times are variously described as being from 50% to 55%. Doc Palmer, author of McGraw-Hill's *Maintenance Planning and Scheduling*,[1] and one of the premier planning and scheduling practitioners in the U.S., states that, with effective planning and scheduling, 30 maintenance technicians could yield the effect of 47.

> 3 techs x 35% = 105%
>
> 2 techs x 55% + 1 x 0% = 110%
>
> 55/35 = 57% improvement
>
> 30 techs x 57% = 47

For example, an unenlightened, old-school maintenance supervisor remarked, "I can't lose somebody to go be the planner. I need everybody I got." He did not realize the value of planning and scheduling. Suppose he only had five workers.

- 5 workers for 1 hour each = 5 man-hours
- 5 man-hours x 30% direct activity per worker = 1.5 man-hours of productive work
- In an 8-hour shift, this equates to: 8 x 1.5 = 12 man-hours of productive work for the crew

Assume that the supervisor makes one worker the new planner, and that maintenance efficiency improves to 50%. The crew of four workers and one planner would perform as follows:

- 4 workers for 1 hour each = 4 man-hours
- 4 man-hours x 50% direct activity per worker = 2.0 man-hours of productive work
- In an 8-hour shift, this equates to: 8 x 2.0 = 16 man-hours of productive work for the crew

The dividend is four additional hours of direct work activity from the crew each day, with one less worker in the crew—the other worker being the planner.

[1] Palmer, Doc. 1999. *Maintenance planning and scheduling handbook.* New York: McGraw-Hill.

Improvements in Equipment Run Time

Plant management today is asking maintenance departments to find cost-saving ways to extend production equipment reliability between scheduled overhauls. Along with increased reliability, production equipment is expected to maintain product quality and operate safely. Improved equipment run time is expected with good repair/overhaul job planning because:

- Skills have been matched with difficult tasks.
- Proper materials/parts are available before job execution.
- Equipment history is documented in the CMMS.
- Ongoing analyses of historical data are being performed to anticipate requirements.
- Engineering and vendor data have been reviewed to ensure that operation of equipment is as designed and installed.

Improvement in Material/Parts Availability

With the implementation of computerized store catalogs, automated materials ordering capabilities, and improved (often automated) coordination between work orders and store/procurement systems, locating, ordering, and kitting the correct parts for work is being streamlined. Good job planning and communication between maintenance and inventory management will greatly improve material/parts support.

The more that work is planned and that parts and materials usage is work-order specific, tied to the proper location on the equipment tree, the easier it will be for the organization to ensure proper minimum/maximum and reorder points.

Improvement in Safety

Planned jobs are inherently safer. This implies that the job scope and location have been evaluated for potential hazards; that these potential hazards have been identified, eliminated, mitigated, or managed; and that necessary information is embedded in the work order or attached, such as with safe job procedures that are part of the work package.

Even more than looking for productivity improvements, planners should start evaluating each planned job with an eye toward safety: What has happened in the past on jobs like this? What could potentially happen? What safety precautions are required? What procedures should be identified and referenced?

The Work Cycle

The goal of any maintenance program is to maximize and sustain the reliability of the facility and its ability to produce high-quality products at the lowest possible price.

In order to achieve this goal, the maintenance program must contain elements that ensure work is performed in the most efficient manner. This is a key part of the maintenance program, and it provides an important set of procedures and guidelines that enable the maintenance organization to accomplish its goal. It provides a systematic approach to collect, analyze, and identify problems and concerns, and a means to feed back the information so that these problems or concerns can be rectified and prevented from recurring. It also provides management with the information necessary to make sound decisions regarding the operation of the maintenance organization. A generalized view of a maintenance management and control system as a major element of the maintenance program is presented below.

The elements or phases of this system include:

- **Work Request** – When a need is identified, a request for maintenance is initiated. This may be a formal "work request" or "notification," or may be verbal. The request should be a clear and concise description of the problem, identifying the equipment or asset, the name of the requester, dates, and a priority.
- **Work Planning** – Planning is the process of deciding what is required to accomplish the work. This phase includes estimating time, materials, and cost necessary to complete the work.
- **Work Scheduling** – This is the synchronization, or coordination, of all resources at a particular time and place for work execution.
- **Work Execution** – This is the phase where actual (direct) work is accomplished.
- **Performance and Management Reporting** – These are measurements used to determine planned versus actual work performed, budget or cost variances, and other indicators that describe how the work was performed.
- **Work Analysis** – The analysis evaluates the work performed from the request through work execution.
- **Critique and Revision** – The critique is the (timely) analysis of data and reports, which uses feedback to revise and improve performance of future work. This is often termed the "performance improvement" phase
- **History** – Collection and documentation of all key data in the performance of work is necessary. Maintenance personnel must file this data for future reference in a form easily retrievable.

There are five main reasons to plan work:

- **Eliminate or reduce uncertainty**: New machinery or processes require routine work and activities that may be unknown or unfamiliar to a maintenance staff. A predefined plan can prepare individuals for the tasks at hand rather than subject them to an unknown and unfamiliar environment. A predefined, long-range plan eliminates the uncertainty associated with trying to predict when maintenance is needed; indications and parameters can be well established and specified.
- **Improve efficiency, effectiveness, and safety**: Preplanning any effort improves the efficiency of the individuals performing the tasks as well as the ability to plan for similar work in the future. Preplanning helps to minimize delay time and improve outage work efforts.
- **Obtain a better understanding of the scope, risks,** and potential delays: Without planning in advance, craftspersons go out to start jobs; discover additional requirements such as scaffolding, electrical work, or parts requirements; and encounter several delays in the job. Without planning, workers start jobs and then discover many additional problems once the equipment is down, requiring additional parts or materials that were not anticipated. However, with proper planning, the scope, risks, and potential delays can be better known and contingency plans put in place in advance.
- **Enable improvements through learning**: Planners cannot plan the perfect job. Often not enough time is allotted to them to develop perfect job plans. Some jobs require a minimal amount of planning, as the planner respects the ability of the crafts to do repetitive and well-known jobs. Other jobs, perhaps those that are more complex, involve higher risks or are done infrequently, require more rigorous planning. In both cases, getting the work orders returned with information from the craftspersons is vital to improving the quality of job plans.
- **Enable scheduling in advance**: Without effort in the planning process, schedules would be unworkable entirely. Without planning, jobs would have no estimated time frames, making a schedule impossible to create in the first place. Secondly, without planning, craftspersons encounter so many delays that schedules inevitably go awry and provide no value.

In planning a maintenance activity, *efficiency* and *effectiveness* depend on:

- Defining the scope of work
- Determining the skills required for the job
- Identifying special tools, equipment, and parts needed to do the job
- Identifying safety hazards, permits, and protection requirements
- Estimating the job duration and crew size
- Communicating needs to all parties associated with the job to be done

A work package is composed of a number of items, one of which is a work order. The work order provides the scope, responsibilities, strategy, costs, schedule, and location of the maintenance activity.

An insufficient amount of effort spent in the planning phase of a work package can result in incomplete work, undue risk, inability to respond to change, and increased time spent on the job once it is initiated. This translates into increased costs and dissatisfied customers.

About the Author

Ken Arthur began his career with GP Strategies in 1991. He is the author of numerous client-specific Planning and Scheduling textbooks and is the creator of GP Strategies' hands-on Planning & Scheduling simulation games. Ken has helped many clients design and implement planning and scheduling improvement strategies, standard processes, and customized training. He is currently the Manager of GP Strategies' Maintenance and Reliability Consulting Practice. ■

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Ref. Code: WP - ImproveWorkCyclePlan KArthur 10.7.16.indd