



Empowering ERP Asset Management Solutions

Are your planning and scheduling processes using best practices?

Improve asset utilization and uptime

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Few people have as much influence on maintenance and reliability as the work planners and schedulers. They are responsible for establishing the priorities and ensuring that the maintenance work flow is controlled so that asset utilization and uptime can be optimized.

Fortunately, there are several steps that can be taken to enhance work planning and scheduling, improve maintenance and reliability, and enhance operational and financial performance.

This paper explores the relationship between maintenance and reliability, including the operational and financial impacts and opportunities. It outlines how to improve planning and scheduling in a manner that benefits the organization as a whole, using specific tools, strategies, and best practices. Additionally, it recommends key performance indicators (KPIs) for measuring and managing performance and justifying further planning and scheduling improvements.

Opportunities and Enablers

Planning and scheduling processes impact both maintenance and reliability, which can directly affect uptime. Although these terms are often used interchangeably, their definitions are distinct. Maintenance refers to the actions necessary to maintain or restore an item's operational condition, or to improve its condition, so that it can fulfill its intended functions. Reliability, on the other hand, is the probability that equipment, machinery, or systems will perform their required functions satisfactorily under specific conditions and within a certain time period.

Maintenance productivity is directly impacted by how work is planned and scheduled. Maintenance managers tend to overestimate the effective maintenance time of their craftspeople to be 45-55 percent of their day. In reality, analysis has shown that only 2.5 hours of an eight-hour day represents effective maintenance time, on average, and it's worse in locations that are reactive (Figure 1). The balance of the day is consumed by breaks, cleaning up, waiting for the next assignment, transit time or, for poorly planned jobs, searching for materials and tools needed to execute work. With better planning and scheduling, maintenance productivity, utilization, and effectiveness improves.

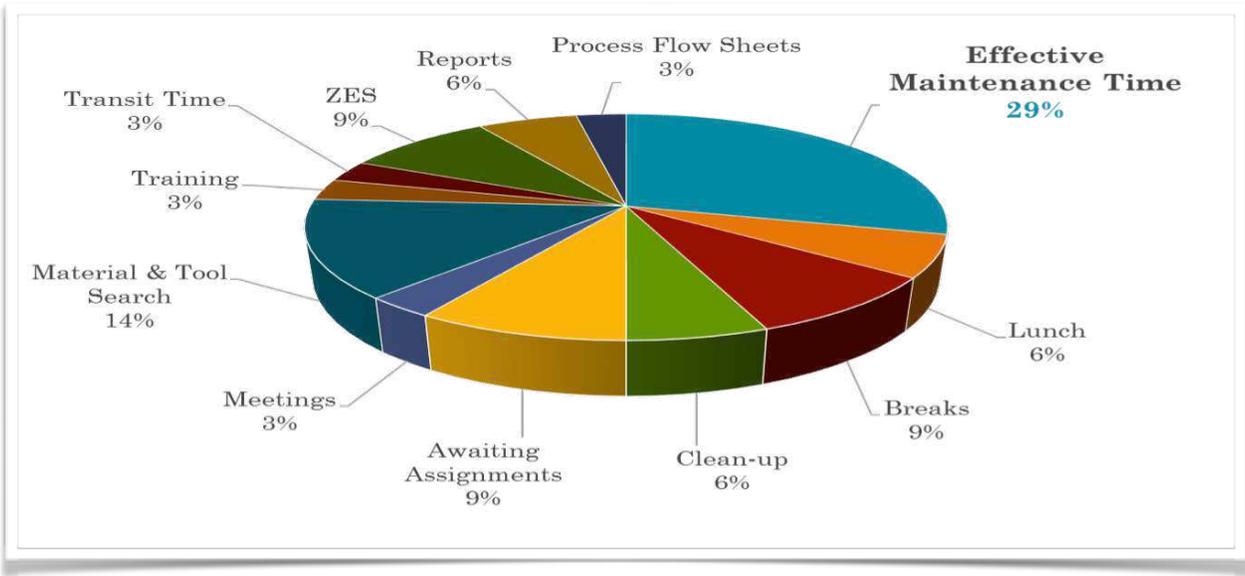


Figure 1 Maintenance Productivity (Source: Allied Reliability Group)

Such improvements also help to enhance the overall cost position of the facility itself. This is best illustrated by the Iceberg Analogy (Figure 2), which shows how maintenance costs are the “tip of the iceberg” in terms of overall operational profitability. Obvious maintenance costs such as labor, materials, and contractor costs are easy to identify and report, while the hidden costs of maintenance (below the water line) impact process reliability. Unexpected downtime, excessive energy or water consumption, accidents or quality deficiency costs, for example, typically won’t roll up to a maintenance budget, but they will impact the operating budget and financial results.

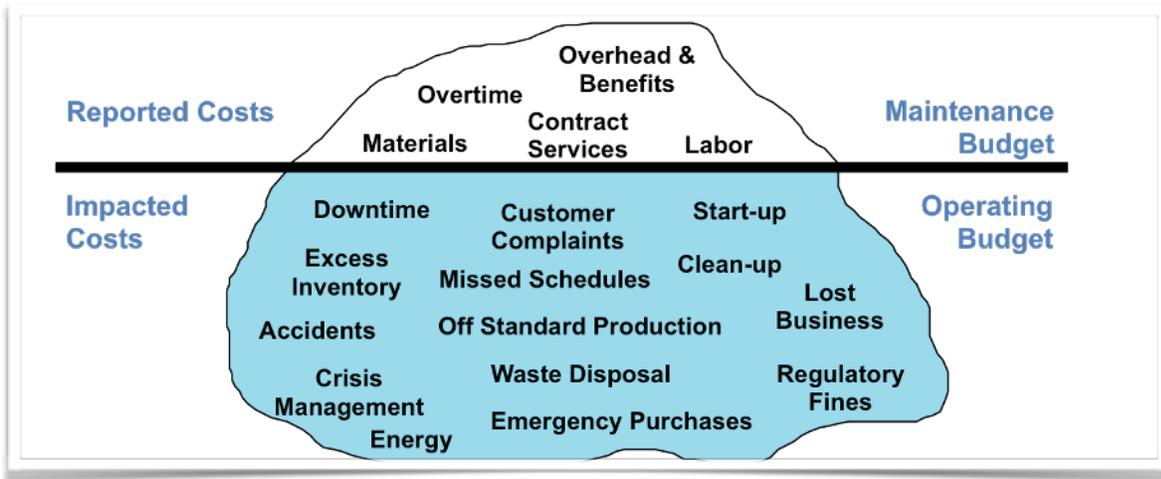


Figure 2 The Iceberg Analogy: Obvious vs. Hidden Reliability Costs (Source: Allied Reliability Group)

Achieving reliability at world-class costs is imperative to remain competitive, and maintenance efficiency is a key enabler. With the right maintenance management system (EAM/CMMS) and sound processes, continuous improvements to asset designs, repair practices, and maintenance initiatives can reduce preventable maintenance and improve overall profitability.

The foundation for all maintenance and reliability activities is the work management system (WMS). In the WMS, work is identified, planned, scheduled and executed, and the work history is recorded, audited and evaluated. It is a cyclical, continuous process seeking to improve efficiency and effectiveness through proactive problem solving and analysis.

Planning Best Practices

The advantage of proper planning is illustrated with a modified probability failure curve (Figure 3).

When failure conditions are detected early during the asset evaluation or work planning phase, it allows for adequate planning, scheduling, and execution of corrective actions well before failure can occur. Predictive maintenance (PdM) techniques such as vibration analysis support early detection, and since PdM is typically associated with the most critical pieces of equipment in the organization, planners must ensure that this work does not go dormant in the backlog.

When conditions are instead found near the end of the probability failure curve, scheduling must start in earnest to avoid failure. In reactive organizations, 35 percent or more of the work is emergency or urgent in nature, making it almost impossible to get ahead on the planning advantage curve. By definition, emergency work breaks into the current day's schedule, urgent work breaks in to the current week's schedule, and planned work is scheduled for the next week.

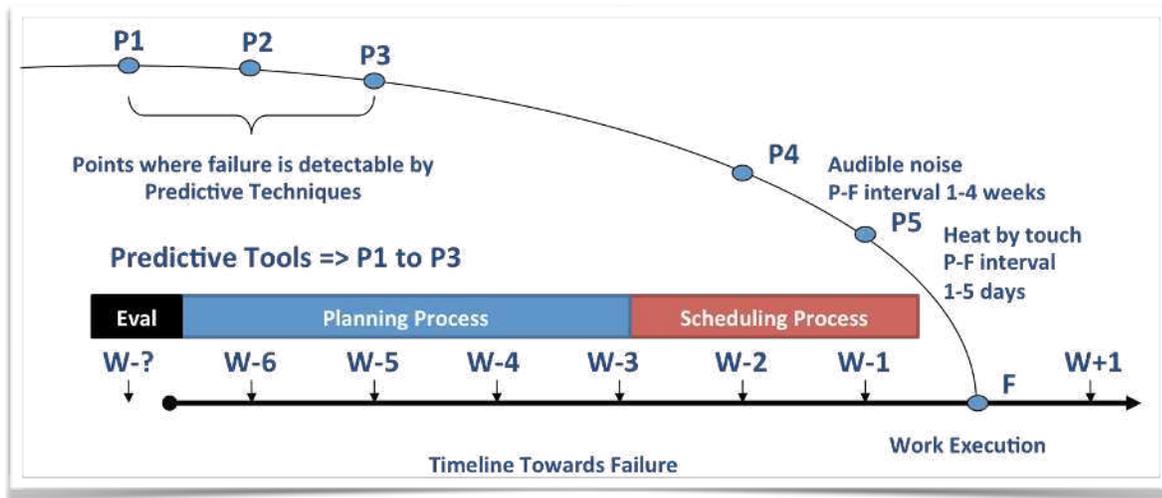


Figure 3 The Planning Advantage (Source: Allied Reliability Group)

Many tools and methods exist to optimize and continuously improve the maintenance planning process. They range from developing job planning steps, work plans, one-point lesson plans and standard maintenance procedures, to documenting the bill of materials and improving material and tool organization.

Job planning steps: In high-performing organizations, job planning steps are documented and followed. Many planners will scoff at this practice, particularly those who were skilled craftspeople at the plant long before becoming planners. However, no matter how good they are as planners, the process will suffer when someone has to fill in for them or replace them. For this reason alone, every maintenance manager should insist on establishing best practices job planning steps such as the following:

1. Analyze the work request, ensure there are no duplicates, and get clarity on the requirements.
2. Visit the job site, bringing a list of all of the equipment to be planned, all associated work requests, and a mobile device to take photos.
3. Validate the basic information, make edits or corrections if needed, and take photographs.
4. Plan the work.
5. Determine and ensure the availability of materials, particularly for the more critical equipment.
6. Complete the work plan.
7. Test for work plan readiness (materials, tools, special equipment, task lists with all operational steps identified and scheduled hours). The givens are lockout/tagout and zero energy state information.

Job plans: Work quality is directly affected by the quality of maintenance job plans (or work packages) provided to the craftspersons. Developing a job plan library drives consistency in how the work is performed, whether it's by internal personnel or service contractors.

Job plans are most useful for work that will be conducted with some degree of frequency on a particular piece of equipment. Effective job plans are written to the level of the workforce's skill and knowledge, and technical jargon should generally be avoided. They also provide quantifiable details about how to complete the tasks. For example, a subjective inspection task stating "check gearbox" is not nearly as helpful as the following quantitative inspection task:

Inspect conveyor gear drive:

- No loose or missing fasteners
- Oil level in the green band on the sight glass
- Oil temperature 160+/- 20F

When quantitative details like these are provided, the time to perform inspections is minimized, generalities are replaced by facts and data, and a foundation for continuous improvement is established.

Standard maintenance procedures: SMPs combine job plans and OPL plans into a planning checklist template with pictures. They are used by planners to ensure that they have done due diligence on each phase of the planning process. They are also used by maintenance supervisors to ensure that the packages are assigned to qualified personnel; by the operations team responsible for readying the asset for maintenance; and during work execution to validate that every step is completed. At minimum, the most critical pieces of equipment and the bad actors should have SMPs.

Bill of materials: The bill of materials (BOM) lists all stock and direct parts associated with a piece of equipment. Planners can attach BOM parts lists directly to the work order. An accurate BOM is a time-saving tool, allowing planners and maintenance workers to find the correct parts within minutes, so that the work can be efficiently planned and executed. They are not only useful for urgent and emergency work, but also for executing planned work. In plants where BOMs are not already in use, start with the most critical pieces of equipment.

5S: 5S is a system to eliminate waste and improve productivity by maintaining an orderly workplace. It simplifies planning and execution when tool shops, storerooms, and warehouses use this approach. For example, a tool shop using 5S will have all tools tagged and identified, with shadow boards to organize the tools. The maintenance supervisor will have a list of all tools so that replacements can be easily ordered. And, the space above and below all cabinets will be designed so that it can't be filled with clutter. Although 5S takes some time to set up, analysis has shown that once the system is in place, the areas generally remain orderly.

Parts kitting: Kitting of planned parts is another effective organizational strategy (Figure 5). All tools and parts needed for a job are packed in a kit, along with an inventory of the tools and parts contained, so that they are ready when needed. Work orders should reference the kit location, and a copy of the work order (or the work order number and equipment number) should be attached to the kit. Color coding can be used to indicate whether a kit is complete and/or to which crew or area it belongs. Unused and returned kits should be stored in separate areas.

Scheduling Best Practices

Schedulers organize, prioritize, and create the schedule for the execution of planned work orders. They leverage the WMS to determine which work is planned and ready for execution, and to optimize the available workforce. They consider production

requirements, work priorities and budgets when establishing work schedules, and they monitor crew performance metrics.

The scheduling team should always include the following:

- Planner: The individual who plans and schedules work orders, if the roles are combined
- Scheduler: The individual who schedules work orders, if separate from the planner
- Maintenance supervisor: The team leader for a group of workers
- Maintenance coordinator (someone from operations): The link between maintenance and production

Daily and weekly scheduling meetings are recommended. At the daily meetings, which should last no more than 10-15 minutes, the team will review the current day's schedule and what is breaking in that schedule. It will also track the weekly maintenance schedule.

On a weekly basis, the scheduling team will look at work that didn't get done, work that must be done in the next week, and what work to postpone. They will also validate the preliminary schedule created by the planner for the following week, and complete the production priority list.

When selecting work orders from the backlog, priority should be given to the following:

- Predictive maintenance work orders, e.g., those originating from vibration analysis
- Preventive maintenance work orders, e.g., inspections
- Work orders to reschedule, which were not completed in the last week
- Work orders prioritized by the scheduling team
- Work orders for critical, bad actor, or bottleneck equipment
- Other corrective work orders
- Equipment modification work orders

Once the schedule is complete, formally communicate and publish it to all affected resources; even those in the control room who need to purge and cleanse the equipment and bring it to a zero energy state prior to maintenance.

Finally, schedule coordination must be a formal process, otherwise work execution will suffer. When emergencies occur, the schedulers will adjust the schedule in real time, based on current priorities.

They should never make changes to the current weekly schedule; only to the daily schedule.

Essential KPI's

Maintenance and reliability performance is quantified and measured using KPIs. If it is not already being measured, begin with a few basic KPIs and add more when the maturity of the organization starts to improve. For instance, maintenance efficiency is measured by the mean time to repair (MTTR) and reliability effectiveness is measured by the mean time between failure (MTBF). These two KPIs, in addition to scheduling compliance, planning compliance and how much PM and PdM work is being executed, are good starting points.

How much of your budget is consumed by emergency or urgent work?

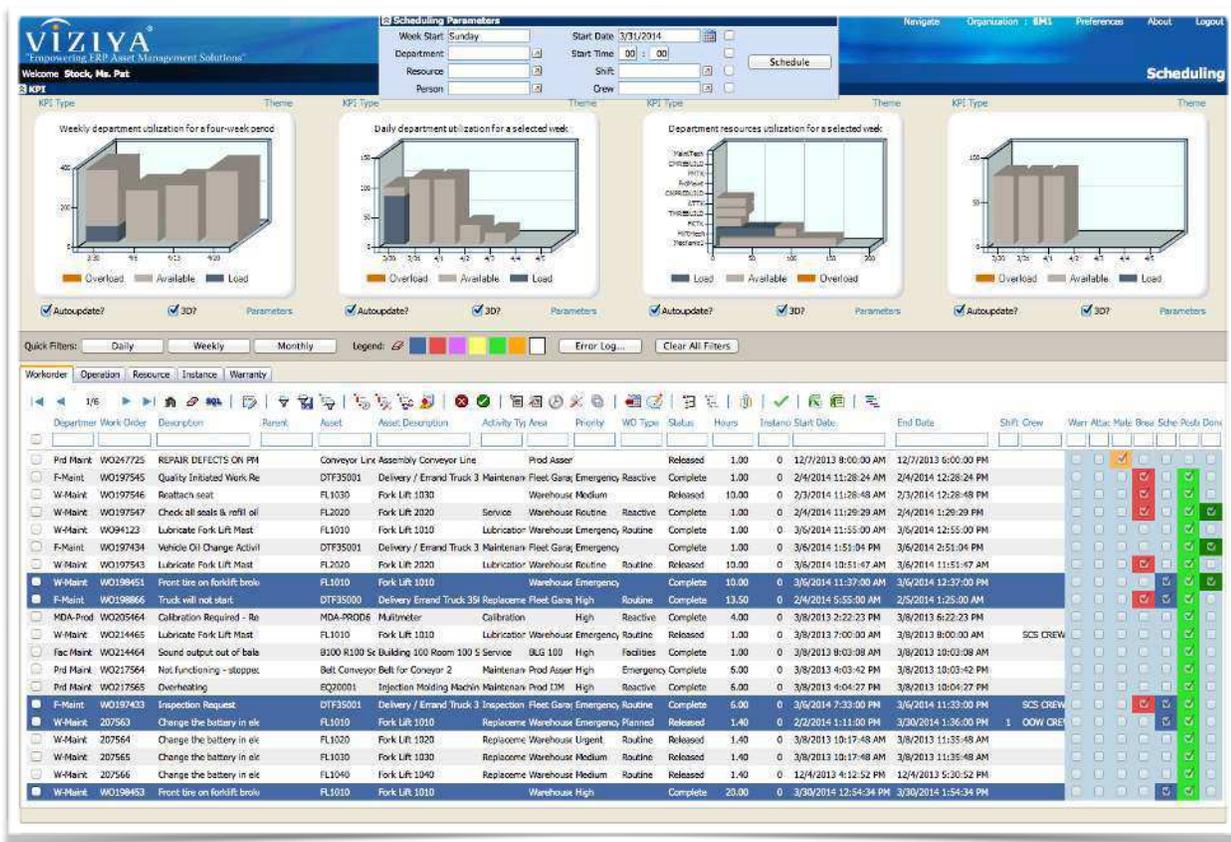


Figure 4 WorkAlign Scheduler: Sample screen

True improvements in planning and scheduling will trigger positive trends not only in maintenance and reliability, but in the operational and financial metrics as well. Reflecting on the Iceberg Analogy, when maintenance and reliability KPIs trend

positive, the operational and financial KPIs must similarly improve, otherwise it's time to rethink what is being planned and scheduled.

Conclusion

Stepping up your planning and scheduling processes is clearly a worthwhile investment. The upgrades recommended in this paper can be manageable if applied incrementally. Make sure you're looking at the WMS to identify work that is preventable, and place priority on those activities that will prevent failures. Focus your efforts on the most critical equipment first when developing job plans, SMPs, BOMs, and kits. Monitor your performance starting with the most important KPIs. These efforts will pay off not only for the maintenance organization, but for the company as a whole.



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Aleks Vujicic is the VP Product Management at VIZIYA. Aleks has over 20 years of experience in the maintenance and reliability industry. During his careers Aleks has gone from being a plant manager at a steel plant, to implementing best of breed CMMS solutions around the world, and best practise consulting.

About VIZIYA

Headquartered in Hamilton, ON, with offices in Barcelona, Perth, Atlanta and Dubai, VIZIYA is the industry leader providing bolt-on software products to enhance ERP-based asset maintenance systems. VIZIYA's proprietary WorkAlign™ Product Suite delivers seamless integration into existing ERP systems. With over 45,000 users at 740 sites across 6 continents, the world's best companies use VIZIYA products to help them better maintain their assets. Visit viziya.com for more information.