Reliability Solutions for Industry with a Human Touch

The SAMI Times

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The President's Corner

Your Hidden Plant— Claiming the Prize!

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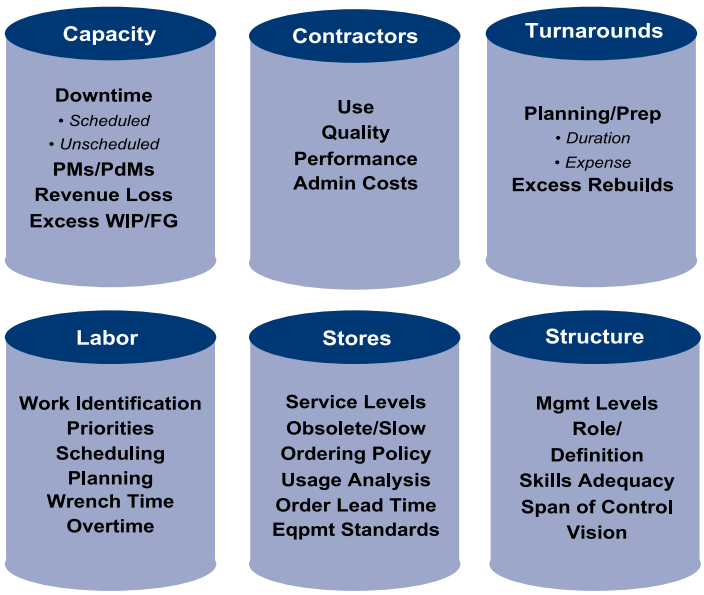
SAMI President

Calculating the Benefit

Most of us like technical stuff by our nature. That's how we got where we are. We are good at what we do, know how the equipment should operate, how to run the maintenance crew, what to do to keep equipment available.

There are some other tasks, though, that may not come naturally to us. Like how to convince the management team that something needs their attention. Like how to get money allocated, when we seem to forever be in a cost cutting mode. Like how to turn around the downward spiral we see every day.



The "six buckets of maintenance value" are a good place to start. Let's look at a typical scenario:

Your maintenance force has been cut in half in the last 10 years. Preventive maintenance compliance is decreasing, because there just isn't enough manpower to get the high priority jobs done. The backlog becomes less meaningful all the time, as the work that gets done is P1's and P2's, and outages. If there is time during the outage, we can take care of some of the chronic offenders, otherwise there is little hope. Out costs are actually creeping up in spite of our best efforts, including overtime, contractors used to supplement our work force, and more work loaded to outages. Materials costs are up too, as some big ticket items are failing in a big way. Current expense is running $14 million per year.

Could this be your situation? How do you justify making change in this environment? People are likely to say you have to deal with the resource levels you have, and they can't be increased.

To start, we know there is hidden capacity in our maintenance staff. With all the emergency work, we know we aren't working smart, but hard and long hours with lots of barriers. So we must start by creating **work capacity.** We're not going anywhere until we get more work done.

In our Day-in-the-Life-of Studies (DILOS), we find that most plants without a disciplined work management process have wrench time of about 25%. That can be doubled! So our first opportunity is increasing work capacity. If we have 50 people in maintenance, conservatively we can expect to get an additional 15 FTE's worth of work done through better utilization.

Benefits Calculation 1: Work Capacity yields 15 people @ 2000 hrs/year at $30/hr=$900,000

Right....sounds like a consultant. We can't let anyone go, so where are the benefits? Our next review for REAL SAVINGS is overtime and contractors. If our 50 people averaged 20% OT last year, that's worth 20,000 hours @ 1.5 times $30/hr. Guess what? $900,000 per year! Okay, we know we can't completely

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We are a consulting group for industrial organizations working to improve profitability, efficiency and equipment reliability. Our Mission is to improve our clients' production equipment health, by tapping the desire, creativity and dedication of all plant staff, and our vision is to be the firm consistently chosen by companies serious about making change; because our values of integrity, content knowledge, advanced practices and compassion for the workforce match the values of our clients.

The Operational Reliability Maturity Continuum:
Part 9 Work Execution

By Dave Army

Up until now, we've been discussing Stage 1 activities that lead to work execution. I guess I've always been a little uncomfortable with that term. When I talk with clients and tell them that we're going to talk about the execution phase of the Work Management process, they usually look around the room as if to say, "What did I do now?" What I mean by execution is the actual laying of hands on the equipment. This is the point of a Stage 1 Work Management process where all of the planning and scheduling efforts come together. On the other hand, this is the point where they can fall apart.

All previous Work Management activities are of a strategic, forward-looking nature. Primarily these activities are performed as planning and scheduling responsibilities. Of course, this depends on who's responsible for planning and scheduling and varies from organization to organization. The execution phase is tactical. Whether a supervisor is working to a weekly work list or daily schedule, it is important that he or she be involved in the creation of those schedules. This is not to mean that the supervisor is responsible for the development, only concurrence. As we expect with operations, the "buy in" element is critical.

If any organization is going to reap the benefits of a well-conceived Work Management process, then it is during work execution. However, crisp work execution requires organizational discipline, another of my favorite terms. No, put away the whips and chains. Discipline means sticking to the plan.

Once a work schedule changes hands, the schedule should become the property of the maintenance supervisor. This transfer should take place far enough ahead to allow for preparation of daily activities. Furthermore, if the work is accompanied by detailed work plans, then those plans should also receive an appropriate level of review and approval prior to the schedule date. This allows time for the correction of work plan deficiencies and a review of parts status. Where possible, parts can be staged prior to work commencement. Perhaps, more importantly, the supervisor can share plans with craftpersons, prior to the day of the activity.

Now, an argument can be made for scheduling either by the week, via a list of desired activities (weekly schedule) or by the day, where expectations for each day are laid out in advance. The weekly approach allows the supervisor to decide what will take place each day while the daily schedule is more formal, removes some of the flexibility and can become labor intensive, depending on the CMMS in use. While I personally prefer the weekly work list approach, both approaches can work well. However, in both cases, each day must be scheduled the day prior to execution. This is to allow craftpersons to know what they'll be working on, therefore removing some of their anxiety, and providing them with some semblance of control. Furthermore, this will also allow the supervisor to communicate with operations counterparts and ensure that equipment will be ready for the next day.

When schedules are published and distributed to the workforce, in advance, I have seen some amazing things happen. I remember seeing an electrical and mechanical supervisor discussing a job that was scheduled for the next day. This was after the shift ended and most people were gone. Both electrical and mechanical groups were involved and they were planning how they could integrate their activities. This wasn't a "forced" conversation. They were just planning their day. At another facility, I began to notice that boxes of parts were stacked by work locations and staging and rigging were mysteriously appearing around equipment that was scheduled for repair that week. Again, this was done by workers, on their own initiative.

It is my firm belief that everyone wants to do a good job. Why keep the workers out of the loop? Giving them information and better still, letting them know when the work will occur, provides them with a mechanism to provide valuable input and some control of their workday.

Back to discipline. If a schedule is published, then all attempts should be made to stick to it. We can start by not scheduling more work than is reasonably achievable. If you have an average reactive workload of 20%, then you shouldn't schedule more than 80% of your available time. Why? Well, if you can expect a work group to be spending at least 20% of their time on "break-in" (emergent high-priority) work, how could you expect them to complete all of their scheduled work? They start the week knowing they can't meet all of their schedule goals, so why try. Now, I'm assuming that resource estimates are fairly accurate, or a lot of slop will occur, blowing my argument out of the water. What I recommend, when starting out, is that you set schedule loading for a shop at 5% less than the rate of break-in work. Provide the supervisor with a list of other work that can be interrupted. Then set the expectation that at least 90% of the work that is on the schedule for the first workday of the week, be completed by the last workday of the week. This sets realistic expectations. As the rate of break-in work decreases, estimating gets better, and work capacity increases -- gradually increasing your expectations, but never back away from expecting scheduled work not to be performed.

It will be difficult at first. All maintenance workers, me included, have been trained from the very beginning to be reactive. Some organizations actually measure have quickly work requests are dealt with. Maintenance supervisors are famous for dropping what they're working on to deal with a perceived emergency. My advice is to let the scheduling process work. Encourage workers to stick to the schedule, and discourage them from dropping what they're doing. Plan for the emergencies by holding resources in reserve, assigning them to interruptible jobs. Try it; you might be pleasantly surprised with the results

Strategic Planning Workshop

SAMI will be hosting a workshop titled **"Creating & Implementing A Strategic Plan for Asset Management"** in conjunction with EUCI on October 8-9 in Salt Lake City. Please visit www.samicorp.com or www.euci.com for more details.

What's Your Work Capacity Index?

By Ralph Hedding, PE

A few issues back, we talked about the analogy of the maintenance workforce as the drivetrain of a vehicle. The output of an automobile is fairly easy to measure with the proper gear, in terms of horsepower, torque, etc. Going back to the analogy though, how do we measure the output of a maintenance group? Up until now there have been the classic measures but none that takes a comprehensive view incorporating most of the factors of success.

Our colleague Robert Hansen last year published a book titled "OEE" referring to probably the best measure of an operating entity. OEE refers to "Operating Efficiency and Effectiveness" and uses the factors of equipment availability, rate of operation and rate of quality output to determine the overall effectiveness of an operating line or an entire plant operation. We can use similar logic in developing a measure of our maintenance operation. We have named this measure the "Proactive Work Capacity Index." There are three factors used in calculating the PWCI: maintenance wrench time, scheduling loading factor, and schedule compliance. The product of these three factors expressed as decimals is the resultant index.

For example, an organization with an overall wrench time of 40%, a schedule loading factor of 60% and a schedule compliance rate of 65% would have a PWCI = 0.40 x 0.60 x 0.65 = ~ 0.16

Let's look at each of the factors in the equation.

Wrench Time is the amount of time a craftsman is engaged directly in *working* on the scheduled job. Wrench time is the net result of the effectiveness of the work management process in place and indicates the degree of barriers presented to craftsmen in attempting to do their jobs. Poor wrench time can be caused by a myriad of issues such as improper planning, a preponderance of high priority work causing craftsmen to be pulled off scheduled work to attend to failed machinery, or poor supply logistics leading to searching for materials, to name a few. Using wrench time as our first factor brings into play many of the elements of Stage 1 of the SAMI triangle.

Schedule Loading Factor Working on scheduled jobs is the name of the game for maintenance operations to be successful. The more hours that can be scheduled, the less reactive the organization, the more stable the environment, the more reliable the equipment, and so forth. An organization that is not spending a great deal of time reacting to breakdowns will be more confident in committing to work in an advanced scheduling mode. The amount of schedule load or percent of the available maintenance hours scheduled is a good barometer of the success of current maintenance initiatives.

Schedule Compliance While I just said that schedule loading tells a story, it is an incomplete picture. We have assessed clients that truly believe that building schedules at 120% loading factor makes sense while reacting to 45% emergent work. Who's kidding who? Schedule compliance refers to determining the amount of work completed for the weekly period that was scheduled in advance of that week. Adding jobs during the week, in this case, is considered a schedule breaker and does not count in the compliance calculation whether completed or not. A well run maintenance group should be able to schedule in advance with some certainty of achieving what they have committed to. This last factor is the balancing factor; good schedule loading with good compliance to schedule points toward a facility in control of its maintenance work management. As our articles over the past year have discussed the elements of the Triangle, this measurement can be considered the dashboard gauge of Stage 1.

World Class Numbers So then what can you use to compare your operation against? Realize that the calculation results in a percent of a percent of a percent, so that low factor numbers result in very low results. From our perspective, we have seen a few organizations that approach world class results. These groups have a low level of emergent work, usually less then 10%. This is probably the key factor in getting the PWCI up where it should be. Think about it...if emergent work is low, the equipment base is running in stable condition, jobs are able to be planned well, in advance of the scheduled date assuring that all the necessary resources are there for the craftsman to perform the job. Wrench time is good in this case approaching 60%.

With emergent work low, the maintenance scheduler and their operations counterpart can be confident that they can schedule a high percentage of the next week's available manpower since there has been less then 10% emergent work to break schedules. So the second factor approaches 90%.

With low emergent work levels, well planned jobs, materials supply processes given adequate lead time to respond to planning, jobs scheduled in advance are getting completed at a rate that approaches 90 – 95%. A percentage of the workforce is not scheduled but reserved to handle the emergent work. Additionally, the requesters of work will have confidence in the work management process with a reasonable assurance that they do not have to inflate work order priorities to get work done. This in turn continues to help keep the emergent, high priority work at bay. This then becomes a mirror image of a "catch 22", the right kind of self feeding cycle that most organizations would like to be trapped within.

So looking at the world class level of PWCI through this discussion, the numbers provide a resultant **PWCI = 0.60 x 0.90 x 0.95 = ~ 0.50**

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eliminate OT, so how about going after half? Say $500,000 per year in round numbers (there's probably more, but it's hard to believe at this point).

Okay, we have 30,000 hours greater capacity through disciplined work management. We are investing 11,100 hours in OT reduction. How about eliminating five contractors? That would be 10,000 hours per year, let's say at $40 per hour (sometimes they cost more, sometimes less than your own labor). Now we aren't talking about specialty contractors. Just the ones you don't want to know about that come in every day, just like they're part of the family. They are hard to eliminate, but worth $400,000.

So now we have $900,000 ($400,00 + $500,000) in real savings, based on a relatively small increase in our work capacity. We even have 9,000 hours to reinvest in our backlog! Where do we put it? PREVENTION! When we get caught up with our immediate work, and get our PM compliance back, we now have time to work on reliability projects.

What's it worth to prevent failures? We have an exercise we call Preventable Maintenance. With your staff we examine 50-100 corrective work orders. And we ask if that work was preventable due to operator error, maintenance error, known engineering problems (but uncorrected), should have been caught with preventive or predictive maintenance, or management fails to take a requested action. Typically 75% of these work orders are identified as *preventable.* And up to half of these are found to be preventable due to failed PPM efforts.

Benefits Calculation 2: Your plant does 5000 work orders per year, average cost of $2000 per order. Estimate that 20% of work orders can be eliminated due to prevention. **Prevention yields 20% x 5000 work orders x $2000 per order = $2 million**

In this case, once again we have freed labor capacity. What are the real savings? If materials are 40% of the cost of a work order, that's $800,000. But maybe there are offsetting costs for PM materials and PdM devices. Let's say a net of $400,000.

So before we ever get to the question of whether your plant is sold out (and therefore there is value in increased reliability), we have a very significant business case. So what are the **real dollars** we can offer up:

1.	Overtime Reduction	$500,000 annually
2.	Contractor Reduction	$400,000 annually
3.	Materials Reduction	$400,000 annually
		$1,300,000 annually

A reasonable amount, less than 10% of the expense budget, conservatively developed but significant. Not many will argue this is possible. The question now is "HOW?"

That's SAMI's job to show you. We do it in plants like yours time and time again. But to get started there has to be a financial justification. These simple calculations, once the data is collected and validated, can help your make your case.