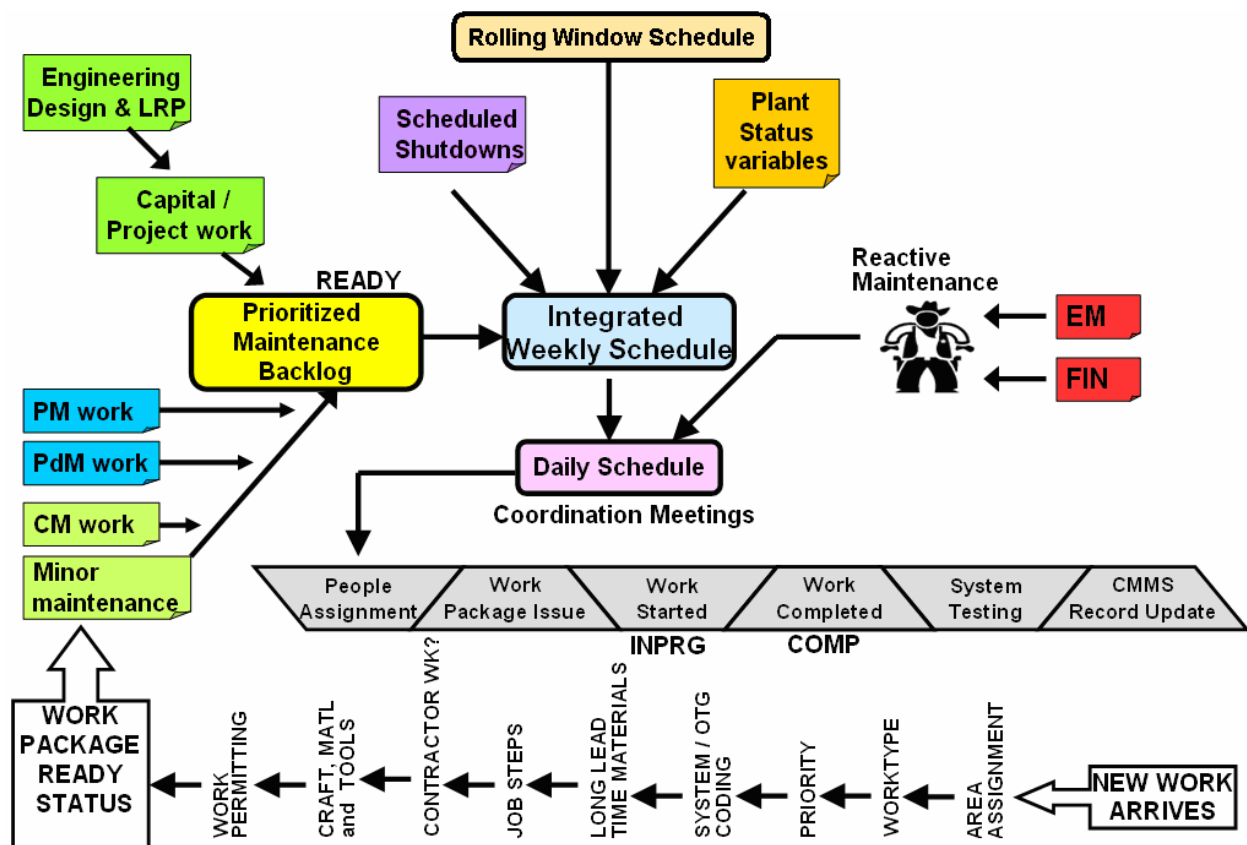


# The Elusive Weekly Maintenance Schedule

By John Reeve

Scheduling has several variations: long range planning (LRP), shutdown/turnaround/outage scheduling, rolling schedules, Weekly Schedules and daily plans. All of these are important, but, the Weekly Schedule process is by far the most significant yet underutilized tool for work force efficiency. Most clients assume that their “scheduling tool add-on” would make weekly scheduling easy. They soon discover that what they bought is simply an interface tool to a scheduling product. A further complication is that the interface does not transfer all the needed information across at the right level of detail. Upon discovering these problems too many users say “this is too hard to use” and give up on one of the most important benefits of a Computerized Maintenance Management System (CMMS) - increased labor productivity.

## A Weekly Schedule is the Logical Center of the Maintenance Process



### **Where is the problem?**

It could be the software, or a lack of perceived benefit for such a process, or a training issue. In most cases it is simply a software design issue – or lack of design. CMMS vendors have historically relied on a third-party interface to facilitate the scheduling function. They also seem to treat all scheduling requirements the same. This generic approach has given the users a clumsy interface which at best “sort of works”. The result is that very few clients take the time to create a Weekly Schedule and even fewer understand how important it can be to their success.

A resource-leveled Weekly Schedule adds even more value. This advanced technique requires that several processes already be in place. For example, if the backlog isn’t planned it will be very difficult to create a schedule. Too many vendors and implementation consultants gloss over this critical process and stumble when it comes to actual implementation. Typical CMMS software and training regimen has a work order screen for entering schedule dates, work priority fields, plus an ability to print a report which lists work for the week, but they lack both resource leveling and compliance analysis. **In other words, they ignore the process of deciding what is the most critical work for the best use of limited resources.**

### **Points to consider when determining if your company should develop Weekly Schedules**

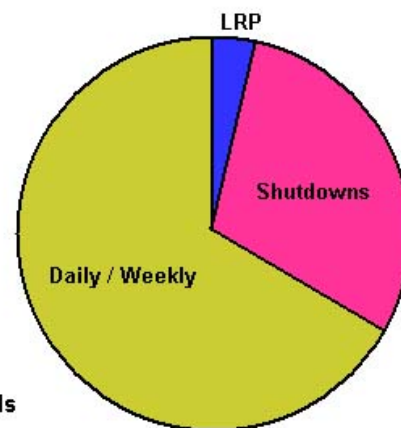
1. You should not have to hire more staff to generate and operate a Weekly Schedule.
2. You should not have to migrate this data outside of the CMMS when the majority of the information needed for processing is already in the CMMS.
3. Resource leveling is an algorithm which can reside in the CMMS product.
4. There are little to no logic ties (work dependencies) requiring critical path analysis.

### **Where is the greatest need?**

For any given site, there are more man-hours (across a one year time span) spent developing and maintaining Daily/Weekly schedules than committed to Shutdown/Turnaround scheduling. The everyday Planner/Scheduler not only represents the larger need but uses the CMMS more than any other employee.

Daily/Weekly Schedules	Issued weekly
Shutdowns/Turnarounds	Twice a year - on average
Long Range Plans	Monthly

**Total Number of Planner/Scheduler Manhours Over a Year**  
( by percentage )



**Assumptions:**

- 1) The site being measured employs Job Planners
- 2) The site being measured builds a weekly schedule
- 3) The site being measured has periodic Shutdowns/Turnarounds

## **Weekly Scheduling – What is it and why is it important?**

A Weekly Schedule is an excellent management tool since every employee can easily relate to “what needs to get done this week”. More importantly, this design promotes proactive maintenance which is more cost efficient than traditional reactive maintenance practices. One week is also an ideal amount of time for forecasting a set of work which all departments can support. Warehouse and operations employees can be more easily convinced that the specific jobs on the schedule will actually be completed. Management’s goal should be to present a believable schedule that maximizes the use of craft labor without incurring overtime - and that effectively reduces backlog. Working with a schedule that accurately forecasts work activities enhances worker productivity, builds teamwork and keeps the staff focused on a common goal.

## **Resource Leveling**

A resource-leveled Weekly Schedule provides a logical way to balance required work versus available man-hours. Once a week, the resource pool is assessed. This information is then compared to the backlog of work. This may be a manual process or it may utilize a resource leveling program. A preliminary schedule is then taken to the Weekly Schedule meeting. The attendees then refine the schedule. Without resource leveling, the process becomes subjective and open to error – which unfortunately is common practice for many sites.

## **Weekly Schedule Meeting**

If the management team waits until the meeting to select the work, then it is already too late to gain maximum value from the meeting. The Weekly Schedule meeting is the time to refine the schedule – not build it. That said, the Weekly Schedule meeting should be flexible. This is the time to confirm whether the scheduled work is actually the work which should be done. Work can be added or deducted based on parameters not known to the CMMS. All affected departments should be present to provide input and gain consensus. Good communication between maintenance and operations will improve schedule accuracy.

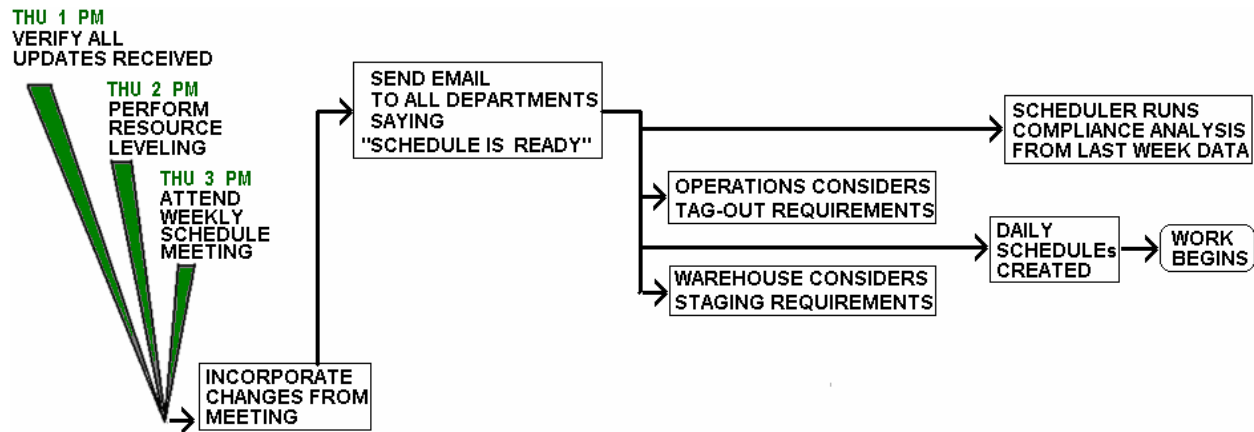
An example of an appropriate change at the Weekly Schedule meeting might be selecting related work based on the craft traveling to a remote location. This “force selection” is called opportunistic scheduling and is an acceptable practice. Resource leveling would be performed a second time to incorporate these changes, followed by re-issuance of the schedule. Since the resource pool is fixed, some work may drop off.

When a user site initiates resource-leveled scheduling, it’s typical that they will discover inaccuracies in the maintenance backlog. This is because the automated selection of work depends on accurate data.

## **Weekly Scheduling is a Process**

Simply implementing a fundamental planning and scheduling system should help improve productivity. Before each work day, the maintenance supervisor will create his Daily Schedule – from the Weekly Schedule. The work is linked to the worker in the Daily Schedule. Each day, progress is provided on work performed and the CMMS is updated. Examples of progress could be: work was started, completed, or placed on hold.

## An Example Process Time Line



### Daily Schedule

The Daily Schedule should be created from the Weekly Schedule. However, the typical Daily Schedule includes reactive maintenance not shown on the Weekly Schedule. Please note: if the maintenance organization is only issuing a Daily Schedule, this does not eliminate the need for a Weekly Schedule. Relying only on daily scheduling leads to increased reactive maintenance.

### Schedule Compliance: the last step of the process

Once a schedule is issued, every attempt should be made to make sure these activities occur. Sometimes unforeseen events prevent the start of work. Some possible “reason codes” might be:

1. Operations would not let maintenance take the equipment down
2. Parts not available (even though the job was planned)
3. Management said “not to perform”
4. Ran out of time or craft availability
5. Unexpected repair situation discovered causing job delay

This information should be recorded in the database under a compliance tracking table – recorded by the week number and work order record. The goal is to make a schedule which is >80% accurate each week.

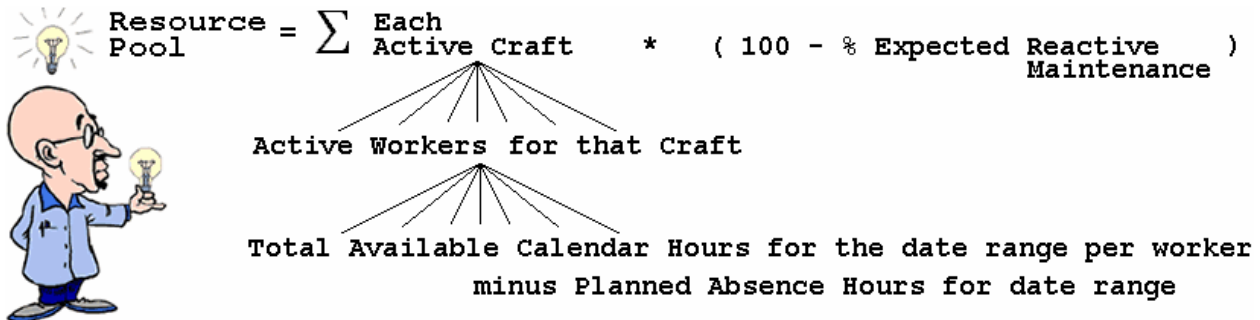
### Resource Pool

Every CMMS should provide easy entry screens for:

1. Worker labor information including the labor identifier, craft code and the assigned calendar/shift code.
2. Yes/No worker availability. Is this craft person an available worker? A worker, such as a Leading Hand may be in a craft but not normally assigned to work activities. (A Leading Hand may be the most senior person in the craft for larger maintenance organizations.)
3. Yes/No craft availability. An entire craft code may be marked as “no resource leveling necessary”.
4. Calendar/shift definition – able to match any possible rotating shift combination and company holiday schedule.
5. Planned worker absences for next week. This data is stored as non-available time per worker.

- Efficiency factor by craft – which relates to the “percentage of time expected to be available to work on the schedule each week”. This factor allows for an expected amount of reactive maintenance and is critical in creating an accurate resource pool.

Given the above tools, it is easy to maintain a resource pool. The working level normally stays on the same shift, although rotating, for years at a time. The only variable is when they say something like “I have jury duty next Wednesday and Thursday”. In the end, resource pool management is not an exact science. We are just trying to get close. Typically you can find a staff member in the maintenance group who already maintains this information. The challenge is to get this data into the CMMS.



### **Resource Demand – the maintenance backlog**

The accuracy of the maintenance backlog is a critical part of the process. If it is not accurate, then one might wonder how any analytical decisions should be made from the CMMS – including KPI measurements. The minimum amount of information needed within the maintenance backlog for this process to work is:

- A valid work order record assigned to a supervisor or an area with a clearly defined scope.
- The work order is in “ready” status, meaning it has been planned and is ready to work with no material or operational constraints, i.e. “requires major system shutdown”.
- Estimated man-hours by craft and the (minimum) number of men required to perform this job are entered.
- Any long-lead material items required for this work are on-site, and linked to this work order.
- The work order has a valid work type such as repair activity, preventive maintenance, major maintenance or design work.
- The work order has an assigned priority; ideally a calculated priority based on asset criticality.

There are many more steps to properly planning a work order. But from a resource leveling view point, these form the minimum criteria.

### **Resource Leveling – manual versus automatic**

Resource leveling balances the resource demand (backlog) with the resource pool (worker availability). This leveling can be done with paper and pencil (as described by Doc Palmer). It can also be done using software – meaning automatically. Either approach involves a comparison of required work hours to available hours. However, if done automatically, a substantial period of time is saved. This factor is even more significant when the schedule has to be regenerated during the course of a scheduling meeting.

## **Subjective Selection Isn't Effective**

Without resource leveling, the staff is basically guessing how many jobs can be completed each week. The maintenance supervisor will routinely guess at a "safe" number they want to work on, or they will select priority work which came up in the last two days - because this is what they (and management) remember as being important. This subjective selection technique often leads to a less than desired backlog reduction rate since there is no way the human mind can evaluate an entire backlog of work taking into consideration multi-craft work orders, craft estimates, work priorities and worker/craft availability.

## **Additional Concepts and Definitions**

- A. A Weekly Schedule does not assign worker names to work orders. That is done with the Daily Schedule. The Weekly Schedule primarily states "this is the set of work which maintenance needs to work on this coming week".
- B. Weekly schedule compliance is a best practice – and should also be a KPI (>80%)
  - There needs to be a separate table, other than the work order table, in which to store these records by scheduled week.
  - This table also allows for "reason codes" as to why the work was not started.
- C. PM work
  - The CMMS product automatically generates these records as PM work orders.
  - They have a work type of 'PM', a status of "ready" and a target start date. If this target date falls within the upcoming Weekly Schedule range then it will be scheduled.
  - Some sites may have a dedicated PM crew.
  - The processing order ("order of fire") for the resource leveling program involving PM work would be selected by the client.
- D. "Order of Fire"
  - This is a unique concept which defines the order of backlog processing. A primitive answer would be to simply "take the highest priority". The "Order of Fire" concept directs the Planner/Scheduler to develop statements which then control the exact order of evaluation.
  - Examples:
    - i. EM or FIN work-types
    - ii. "Carry-over work"
    - iii. PM work with dates in range
    - iv. Scheduled modifications which require internal maintenance resources
    - v. All other maintenance work, ranked by calculated priority in descending order and by report date
- E. Opportunistic Scheduling as a Best Practice
  - When reviewing a job on the Weekly Schedule it is proper to also consider including related work, especially if the work is at a remote location.
  - The Weekly Schedule meeting should allow for this process to work quickly and efficiently. An effective technique is for the planner/scheduler to project the computer-generated report on a screen. While reviewing a work order record the planner should then hyperlink to that work location (or asset field) and bring up other related work. The attendees would then say, for example, "select the first and third records and add them to the schedule". By working as a team the group can very quickly make decisions which will be honored by everyone involved in making them.

- F. Major maintenance; Modifications; Capital work; Project work
  - Work can come from the Long Term Plan (LTP). Typically an external group meets periodically to review the entire LTP. They make decisions on budgets, priority, system availability, shutdown requirements, contractor support and long-lead material items.
  - Complications can also come from:
    - Jobs that cannot be done until a particular season
    - Long-lead time material requirements
    - Contractors may not be readily available.
    - Planned operational downtime
    - Multi-craft coordination
  - The major maintenance team might say, “the following work is now ready for the Weekly Schedule”. This should lead to the development of a work order in the CMMS product with the proper work type (i.e. CP) and giving it a scheduled start date. If this start date falls within the upcoming Weekly Schedule range, it will be processed.
  - Major maintenance may or may not consume on-site labor resources but it is still beneficial to include this work in the Weekly Schedule. Adding this information gives improved visibility to all departments, and reduces work coordination errors such as tearing up the parking lot twice in the same month.
- G. In-progress work (sometimes called carry-over work) deserves special consideration
  - Once a job is started it makes sense to allow that work to be continued even if it crosses over onto multiple weeks.
  - Any work left unfinished at end of the week must be changed to “In Progress” in the CMMS with these notations:
    - Remaining man-hours by craft
    - Is the status changed to “hold” or is the unfinished work “available” for the following week
- H. The importance of Planners – and job planning
  - Creating a Weekly Schedule is quite difficult without a planned backlog.
  - Maintenance work should be pre-planned to the extent necessary to minimize delays in work performance. Pre-planning also minimizes downtime, plus optimizes labor efficiency and job safety.
  - Planners provide:
    - Consistency of input in regards to craft estimates, priority assignment, work-type assignment, and proper asset identification.
    - Interpretation of each work request by using clear and obvious wording and a sufficient amount of detail.
    - Links to work associated with future system shutdowns
    - A proactive view of future work not just short-term reactive maintenance.
    - An important service by identifying recurring repair problems and informing engineering.
- I. Shutdown/turnaround scheduling typically requires a robust scheduling product since it involves the use of logic ties, critical path and resource analysis. Conversely, weekly scheduling is mostly a collection of work activities with no inter-dependencies.

### What if you have no Job Planners?

Not all CMMS sites are the same. Some user communities are in manufacturing, heavy industry and utilities have detailed job plans and work packages. On the other hand, some facility maintenance organizations may not have job planners to do this work. With or without a Planner, it's usually possible to find someone to create a rough estimate and enter it into the CMMS. Here are the questions to be asked and answered in this situation:

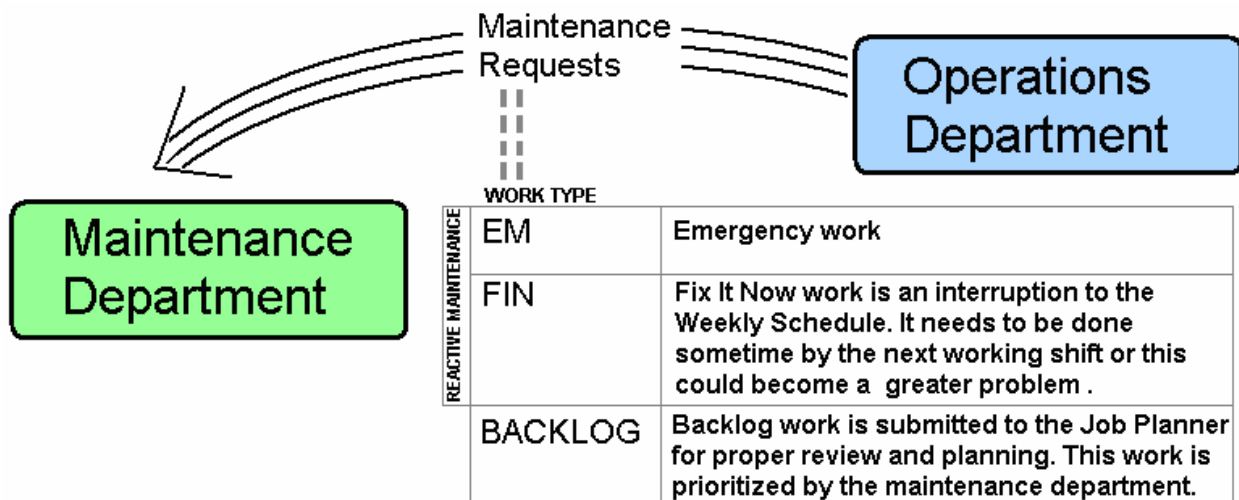
1. What is the repair problem? Enter the problem description and work type.
2. What should be the priority of this work?
3. What is the craft required to perform this work? Can this be done with just one craft, or does it require two? Number of men? Estimated man-hours?
4. Are there any long-lead type material requirements? (Yes/No)

Typical facility maintenance takes only five to ten minutes to enter the above information. Once entered, the status can be changed to "ready". This type of interaction will help the maintenance department quickly develop an accurate and useable "planned backlog".

Depending on the situation It may take several "more than forty-hour weeks" to catch up on backlog planning. The maintenance staff should not be afraid of job planning. **The worst situation is to not have any planned estimates entered on the work order and leave it up to the worker to define all requirements up front - as well as do the work.**

### Communication between Operations and Maintenance

This subject often raises strong opinions and the CMMS vendors have added to the confusion. Vendors simply say, "enter a job priority for all new work and apply schedule dates". A better doctrine would make use of multiple fields: work priority, asset priority, work type, schedule start dates, target start dates and job status. As shown in the illustration below, by making clever use of the work types, you can properly communicate importance between departments. But for the routine backlog work, the maintenance staff can internally prioritize the backlog. They have the best familiarity with the overall contents. Note: this backlog should be periodically reviewed and priorities re-assessed.



Maintenance needs and wants to support Operations, but they should also support a Weekly Schedule format. Proper use of work types promotes segregation of reactive maintenance for future analysis and communicates importance. FIN work type will be placed on the Daily Schedule regardless of what the Weekly Schedule dictates.

### **The Hidden Failure – Your Maintenance Backlog**

Often the biggest gap is the belief, or lack of belief, that a computer program can be good enough to create a Weekly Schedule. The problem is usually the poor quality of the data - not the quality of the software. If a site has confidence in their maintenance backlog and is comfortable with the assigned priorities, then they should know in advance what the leveling process will generate. Therein the real problem is the accuracy of data - the “hidden failure”. This reminds me of a client comment: “You mean the (CMMS) backlog must be accurate?”

### **How can you learn if your system of Prioritization is not working?**

Here are some clues:

- You are making use of “deadline” priorities. This means you are linking the “allowed time to repair” to a priority value. This approach does not take into account the available resources for any given day or week. There will be violations because you only have so many resources to get the work done.
- You review your backlog of work and find “high priority” work that is many months old.
- You review your backlog of work and find that the majority of all work has the same priority.

### **What would be a good system of Prioritization?**

- Backlog work priorities are periodically reviewed and adjusted as needed.
- The work order priority is combined with the asset/location priority. This technique provides a normalized result and is ideal for ranking the work.
- The higher the number, the higher the priority. With this approach there are no limits on processing new work - which is now more important than the existing work in the backlog.

### **How much time should it take to develop a Weekly Schedule?**

The answer depends on the amount of typing and screen manipulations a person must perform to set-up the Weekly Schedule each week. They may be creating a list of work and downloading this information to other software programs for further editing and/or data sorting. They may also be pushing the data to a P3 or Microsoft Project (MSP) tool. Those who track the process of pushing this data from and back to the scheduling tool usually find that a substantial amount of effort is involved.

Typically the data moved outside the CMMS is quickly out of sync with reality due to constant updates of the CMMS data from the insertion of new work and changing priorities based on short-term emergencies. What if work priorities or calendar data is entered on the schedule side – and not updated on the CMMS? Is it necessary to maintain work level calendars in two systems? What if the resource leveling algorithm in the scheduling tool doesn’t use the “order of fire” concept? Where do you run Weekly Schedule compliance?

## **How does your company compare to the general CMMS user community?**

Based on my field experiences, talking with other consultants, reading the industry magazines, and observing the various user group internet sites there are very few sites generating a resource-leveled Weekly Schedule.

### **CMMS Users Generating an Automated Resource Leveled Weekly Report**

<b>10,000</b>	<b>Estimated total CMMS client sites world-wide</b>
<b>x 35%</b>	<b>35% currently desire to have a Weekly Schedule</b>
<b>3,500</b>	
<b>x 30%</b>	<b>But only 30% can say they currently have a planned backlog (&gt;90% planned) which is accurate</b>
<b>1,050</b>	
<b>x 5%</b>	<b>Only 5% would willingly choose to perform automated resource leveling – as opposed to subjective selection</b>
<b>53</b>	<b>Of the estimated 10,000 user sites only 53 sites potentially generate an automated, resource leveled, Weekly Schedule</b>

The reasons for this low adoption rate are simple. Software vendors don't believe there is a market for resource leveling software. Likewise, because a useable tool has been unavailable users have not learned the value of this process. My goal in this article has been to break this "Catch 22" situation by giving the readers of this article the information they need to understand what they are missing.

### **So what now?**

My clients have learned that with a readily-available CMMS "add in" and adjustments in a few crucial processes they are able to gain significant economic efficiencies. A surprising, but significant, added bonus is that their companies soon become a far better place to work. Shared goals built on inter-departmental cooperation have quickly lowered conflict and increased job satisfaction.

If your company is one of the estimated fifty-three companies world-wide who regularly generate a resource-leveled weekly report, then be proud. If not, it's probably time to evaluate how you can join this elite group. Start by comparing your current practices with those discussed in this article. If you believe you have opportunities for improvement then take action. Change what you can with your current skills and tools; then ask your CMMS vendor and/or consultant to help you make it all the way.

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About the author: John Reeve has spent the past eighteen years helping clients solve real-world CMMS problems. As a Senior Consultant for Synterprise Global Consulting he deals with "once in a lifetime" issues several times each year. He can be reached at [JReeve@synterprise.com](mailto:JReeve@synterprise.com).