



# Asset Performance Networks

## MAXIMISING PLANT PRODUCTIVITY

*Combined project management, risk assessment and asset management tools and methodologies can achieve the optimum systems integration capable of addressing every aspect of a project.*

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Increased project complexity and pressure to improve plant up time has driven many improvements in the process industry over the past decade. At leading companies, some of this improvement is due to the identification and repeated implementation of best practices gathered through benchmarking and incorporated into standardized project management systems. Many organizations have subsequently tried to adopt such practices and some have succeeded, though others have had more difficulty. While project management technology has improved considerably in the past 10 years, there is a large knowledge gap developing in the industry as seasoned professionals continue to retire, taking decades of expertise with them and leaving a significant void in their wake.

The challenges to effective project management are numerous, but the following are a few of the most common:

- Inability to identify risks
- Independent scheduling by department
- Limited resource forecasting
- Rapidly retiring workforce
- Missed turnaround objectives and blown budgets.

### **Reducing Turnaround Time**

Identifying risks early enough to act on them has direct and massive economic implications on turnaround budgets. One of the primary causes of cost overruns is the appearance of unforeseen issues or risks. Risks are often identified so late in the process that delays become unavoidable, and every day of delay carries a huge price tag. Conversely, the benefits of shortening turnaround time by a single day are staggering. Many organizations put the economic figure in the vicinity of \$500,000 to \$2.5m per day, depending on the type of product, size of unit, turnaround timing in relation to market cycle, sales contracts, shipping logistics, and other factors.

Turnarounds are costly and risky events financed by production margins, which directly affect company profitability. While a plant is shut down, productivity is at a standstill, ships are waiting offshore, and the stockholders are watching the clock. Extended delays also put contractual obligations in jeopardy and increase the risk of losing customers.

While oil refining companies have a very good idea of the costs of extended turnaround times, they often don't have visibility into all of the factors that can cause the extension – they are unable to plan for various 'what if' scenarios that can end in disastrous financial overruns. They have established daily profitability figures for each processing unit and can calculate the major loss simply by multiplying these by the number of days of downtime. The cost of the resources

required to complete the project can be added to forecast the total economic loss of the turnaround. But, if acts of nature of unforeseen resource or safety issues arise, the forecast is a worthless figure.

Using AP Networks' proprietary risk assessment software to create 'what if' analyses in the schedule, Valero Energy recently discovered in advance that, even though the budget factors looked favorable, an upcoming turnaround was on track to be completed five days late. With the combined data, they were able to pinpoint the factors that would cause the delays. These were addressed with detailed contingencies, which allowed them to prevent massive revenue losses, complete the known scope on time and be well prepared to manage the anticipated unknowns.

The existence of multiple, independent schedules and priorities relative to projects contributes greatly to the problem of 'siloes' departments. A fundamental fact of projects in the oil and gas industry is that they require all functions of the organization to work together for successful project completion. In other words, projects have no regard for silos. If turnarounds were the sole responsibility of the turnaround group, they would be greatly limited in their ability to achieve predictable and competitive results. For the most efficient project, all company functions must participate as a collaborative part of the project.

Organizations, however, have traditionally been designed by functional knowledge and experience. For example, maintenance specialists work with others who complete the same types of projects. The same goes for design and engineering, accounting and so on. Over time, these functions grow into semi-autonomous units, with different business objectives, internal processes, and input, output and production cycles. Each has its own demands and time frames, and these are generally not in synch with each other. Unless the various functional groups are fully engaged in the project and define early on who is going to do what by when, they will operate out of synch. The alignment issue is perhaps the single most critical element affecting maintenance and turnaround project outcomes.

Specific challenges presented by the silo phenomenon and discussed in further detail include territorialism, communication barriers and accountability disconnects.

While the need in a project turnaround is to form a cohesive, cross-functional team to advance the project; instead a collection of leaders is assembled, each representing their own departmental interest. The leaders often have trouble relinquishing authority or arriving at sound cross-departmental decisions. Their loyalties and priorities are with their department's objectives rather than with the project. For example, a member might say in response to a cross-departmental request: "To solve your problem, there are certain stakeholders that need to be

notified, reports produced and processes followed, all of which will take too long to meet your deadline.” Essentially, the need and cycles that govern each department do not always take into consideration the best interest of the project, which often involves a collective team.

The communication problems caused by departmental silos are numerous, including delays in communication due to slow inter-departmental responsiveness; resistance to the demands of preparing for cross-department meetings and workshops; longer decision-making processes; and high levels of protectiveness where openness to other people’s ideas and comments would be more constructive. For instance, the planning of a major project may be delayed because some team members from different departments are slow to respond to requests for essential information, or don’t have time to communicate their input to the planning process. Worse, they may not have direct access to the information they need, and must rely on others to pull and distribute reports from disparate technologies.

While one might say the functional silos do provide a high degree of technical accountability, the same cannot be said for schedule and budget accountability. In a project environment, these three accountabilities cannot be separated without great risk of project failure. During turnarounds, it is common for the manager to feel confident that the operation was five days ahead of schedule, but the project still ended up \$5m over budget because no visibility existed into other departments’ version of the resource schedule. Three different versions of a resource plan were created and maintained separately, each with a different view of the cost structure of the job.

### **Cross-departmental planning and project management**

The question, then, naturally arises: since projects cross over many departmental silos, how do organizations effectively plan for and manage these projects while still allowing for functional groups to manage to their respective major business objectives (MBOs)?

Many organizations would do well to consider approaching this problem in the same manner as Kuwait National Petroleum Company (KNPC). For most of their big projects, they form a matrix organization to handle all activities through all project phases. The resulting team has well defined and agreed on objectives and terms of reference. The matrix approach allows the team members to give appropriate attention to project and scope management, without compromising the achievement of departmental MBOs.

Increasingly, the most effective processes are formed through use of enterprise project management systems, which help to lower the silos by

providing project transparency across the entire organization. These systems bridge the wide spaces in the organizational chart to improve communications, knowledge sharing and collaboration. Further, an enterprise system promotes the capture of input from a much wider group of contributors and stakeholders that would otherwise be possible.

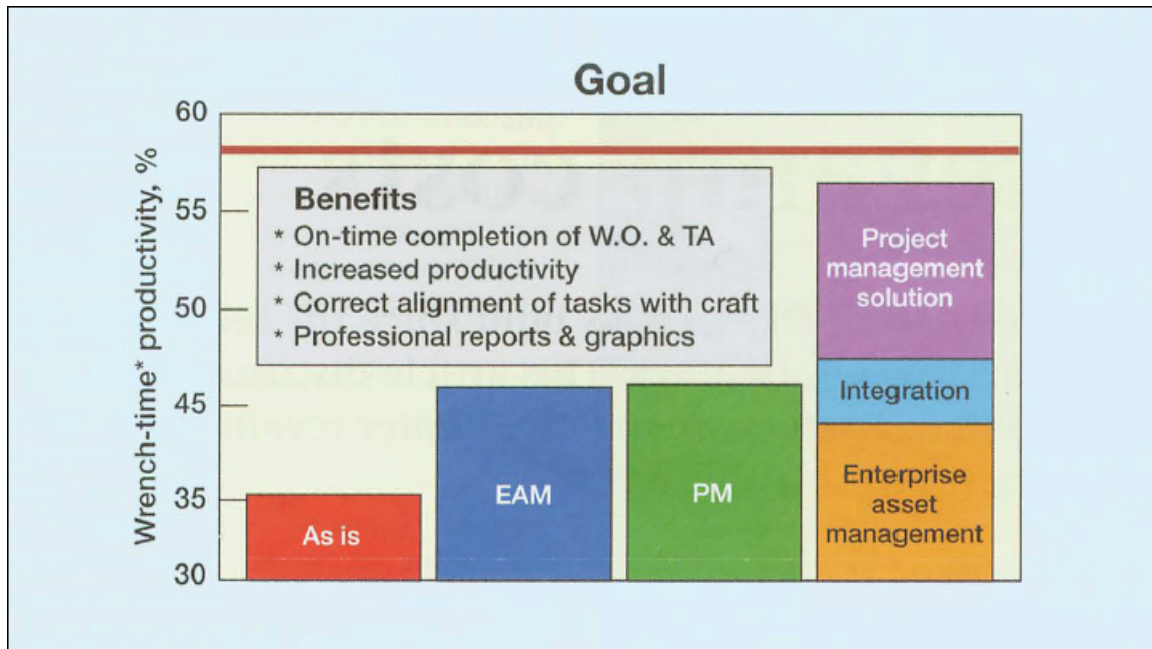
Most project management solutions help to streamline the processes required by cross-functional teams, with clearly identified interfaces approved by senior management and other major project stakeholders. Implementation of these systems results in unambiguous, assignable accountability for project success and provides a clear basis for project performance assessment. In short, technology can go a long way towards removing many of the sources of conflict frequently found on cross-functional teams.

### **Enabling Systems**

The value of project management systems, of course, extends beyond breaking down silos and facilitating team collaboration. The scarcity of accurate resource forecasting is a primary concern in the oil and gas industry. Today's software systems support virtually all the complex processes involved in oil and gas projects, including the forecasting of total cost, schedule and resources to completion.

At KNPC, all required work, which will eventually comprise the scope of the project, is fed into the work order management system from each division – inspection, operations, maintenance, planning, engineering – triggering the automated assignment of materials, resources, equipment, services, and so forth, for the entire project. The optimum management and integration of all these factors directly impacts on company profitability, and the development of better project management systems has played an important role in the competitiveness within the oil and gas industry. In the past ten years it was not uncommon for an FCC turnaround to last 50-70 days. Now, using project management software to manage all of the factors that contribute to the project, the process has been reduced to 29 days at organizations like Valero Energy.

Progress in systems development has also led to the ability to integrate project management tools with enterprise asset management systems, resulting in important synergies. Valero Energy integrates SAP with Primavera to create a single dashboard of schedule, cost and resource information that's available daily. This enables accurate forecasting and reduces a plant's risk of cost or schedule overruns. Valero Energy is working to reduce manpower needed for data integrity by using a shared software system where data is entered only once. They have found great efficiency by creating an integrated, complete solution that is flexible in documentation, planning and scheduling and in asset management (Figure 1).



**Figure 1**  
*(Integrated asset management software system)*

At KNPC, an interface was built between Maximo’s work order application and Primavera. After planning the resources on the work-orders, the system migrates the pool of work orders to the project schedule with related information such as work order numbers, priority, resources required, material cost, and other data. A true CPM schedule can then be generated, including resource levels and activity relationships based on the new requirements. KNPC knows that identifying true resource requirements is paramount when an average of 500 additional contracted resources is added to the plant staff for the turnarounds. In the case of a general refinery turnaround, additional contracted resources can grow upwards of 1,000 people at Kuwait National Petroleum Company. These additional resources need coverage at their usual location, and need to be scheduled into the new location’s turnaround plan. Furthermore, some of these staff members are moved from plant to plant according to planned and unplanned resource needs. Once the plan is approved within the schedule, the stat is transferred back into Maximo, including start and finish dates, durations of summary tasks and percent complete. The company has found that the integration of these two systems has fully automated the scheduling process, eliminating human errors and shortening the time needed to schedule large-scale projects. It has allowed planners to update both systems at the same time, making reporting easier, faster, and more comprehensive, and it has enabled scheduling on a global basis, resulting in better utilization of resources.



Many companies do use various project management technologies because they are readily available and commonplace across the industry. Unfortunately, however, too many are using them more as a historical record after the fact, rather than as a way to drive and shape the decision-making process. The top-performing organizations have actually implemented these tools in an effective way that helps them execute according to plan, and make decisions in real time. They stay out in front of the events surrounding them. But it takes a commitment from senior management and a longer-term view to do this.

One contributing factor is the rapidly graying workforce. Leading organizations are putting technology systems in place to help stop this brain drain. For example, companies are implementing project management systems and standard methodologies that capture and share project data across sites around the globe, preserving valuable collective knowledge and expertise and making this information available to the new recruits. These systems are enabling the new hires to become competent and productive more quickly, to replace the retiring teams, who would otherwise have simply taken 30-plus years at organizational know-how out the door.

Technology, coupled with advanced management methods, is also helping top organizations win the fight against project scope creep, which so often prevents turnarounds from meeting their objectives. If objectives are missed, the schedule is compromised and cost overruns become inevitable. Companies employing best practices demand extensive planning, reflected in meticulous resource and costing activities. When it comes to implementing the plan, they collect detailed work performance information on actual schedule, resource, and cost progress, documenting problems encountered and lessons learned and sharing project data. They also reapply lessons learned on previous projects to prevent reoccurrences on future projects.

Best-in-class companies are also systematic in the processes used to close out their projects, preparing post-project performance evaluation analysis, and using the data to update their best practice templates. Organizations that document actual performance data are generally better at forecasting cost, schedule, and resource completion, thereby avoiding scope creep and successfully meeting project objectives.

KNPC uses resource-leveling to more quickly identify additional resources required. They have found that feeding the schedule with the required data is leading to more effective resource control and that the quality of its reports and layouts, and its Web-enabled reporting, all support more timely and solid decisions.

## Conclusion

The demands to anticipate risks, forecast resource requirements, and minimize plant downtime are the substance of a turnaround manager's daily life and work. The existence of functional silos, their conflicting cultures and independent schedules and priorities is as fixed as the fact that major plant projects absolutely require planning, collaboration, and communication between the team members whose loyalties reside in these silos. The problem of diminishing human resources in this industry plagues any manager who is trying to put together a turnaround schedule and needs to feel confident the manpower will be there when needed. And, the spectre of scope creep haunts the budget of every major project.

What has been found is that these challenges do not need to be quite as daunting as they seem. Through the integration of project management, risk assessment and asset management tools and methodologies (and the determination to work with these tools to achieve optimum systems integration that address every aspect of a project), they have experienced improvements that save their companies millions every year. They have made headway against the industry brain drain by capturing and managing global industry knowledge to support expedited training and orientation processes for new workers. And, they have gained some control over slippage in project scope, to more consistently meet major business objectives.