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Achieving turnaround success: 5 case studies from the field

Managing a turnaround is a complex challenge. The many individual activities and their respective resources need to be coordinated in such a way that the overall duration of the plant downtime is minimized as much as possible so that revenue losses don't mount when the refinery is not running. As a result, most plants are prepared to properly invest significant financial resources if start up can be achieved sooner.

However, the sheer volume of work required during a turnaround means that all refineries face difficulties when organizing, managing and executing turnarounds and shutdowns to completion. A large turnaround (TA) can include up to 150,000 individual activities. With this level of complexity, approximately half of all shutdown projects are delayed by more than 20% and 80% go over budget by more than 10%. Frequently, the work scope increases unexpectedly by up to 50%.

With the help of a series of case study examples, this article will explore TA challenges within the petroleum refining industry. Each case study highlights individual problems a site may face in addition to the typical difficulties of planning, scheduling, communication and scope management. Although it requires experience and expertise to recognize potential pitfalls, every obstacle has a solution and in these examples, the ways in which sites were eventually able to carry out a successful turnaround is highlighted.

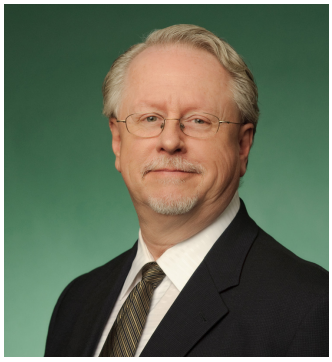
Case Study 1: Cross-site consistency

In the first example, a North American multi-site client wanted to implement standardized turnaround cross-site consistency for 20 turnaround events they were planning over a five year period. Although the company had implemented a variety of best-practice improvement processes, the scope and resulting schedule continued to exceed the desired objectives.

By implementing new work processes, the CapEx process was better integrated and management procedures were aligned with industry best practice. To support sustainability, managers identified and analyzed the span of control and addressed the issue of resource bottlenecks. To promote proactive management behaviors in the field, compliance to the new procedures and sustainable solutions, all managers participated in behavioral based training and on-the-job coaching.

Massive turnaround projects must excel in many different areas in order to have a favorable outcome. In this case, the the 10-box model for turnaround excellence (Figure 1) was used to analyze the various aspects of a TA. Tools such as this are helpful to assess the effectiveness of integration of the key components of large projects.

Through a rigorous review process with a focus on each individual aspect of the turnaround, the company was



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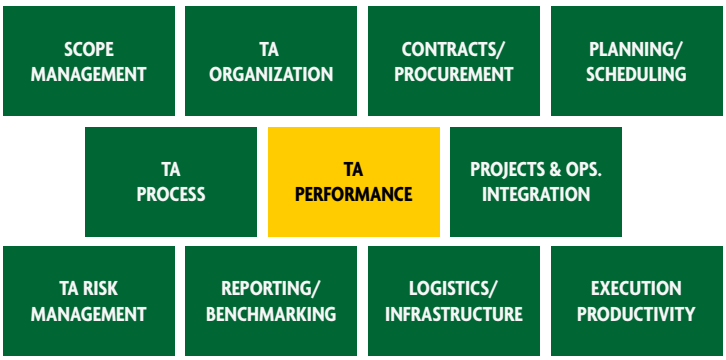

Figure 1: The TA 10-Box Model

able to achieve consistency in its TA execution. In the end, they were able to generate a 15-25% budget reduction savings over a five year period.

Case Study 2: TAR Planning Procedures

In the second case study, a Canadian refining facility was preparing for their upcoming turnaround. Unfortunately, as the TA was quickly approaching, it became clear that it was not going to meet the initial forecasts. A one-week assessment was carried out to identify gaps in the preparation and subsequent execution process improvements. The evaluation used data analysis and interviews with key personnel to establish exactly what was delaying planning activities and how those factors could be improved.

The assessment shed light on two key issues in the process. First, only 55 percent of the planners' time was actually spent on planning. Second, skilled TA planners within the facility were in short supply, which led to reduced planner motivation due to overwork and made supervisors reluctant to carry out active management for fear of losing key planners at a time when no replacements could be easily found.

To address the problem of poor planner utilization and bring it back on track, the team developed a new focus on their planning management processes. Supervisors worked to establish exactly what goals should be achieved and when. Then, these milestones were used to create daily and weekly expectation schedules, which supervisors could use to track planners' productivity, communicate responsibilities, graph progress accurately and improve the ability to forecast completion. Managing the details of the TA preparation planning gave stakeholders the ability to stick to deadlines and provided more preparation transparency.

Skilled work force availability is a problem many firms face, especially in Canada, due to the remote locations many companies operate in. The company's managers and supervisors identified the level of skills the planners possessed, including their expert knowledge, the software available to them and their ability to use it. This emphasized the exact gaps in planners' abilities and helped managers address manpower/skill deficiencies for TA planning long-term. Specialized training topics were developed to close the identified gaps and increase the overall level of competency. By coaching supervisors in active management techniques, the company enabled their supervisors to better manage planner productivity. As a result, by addressing the productivity issue, the firm was able to recover to schedule without spending an additional $1 million CAD.

Case Study 3: Communication and Scope

The next case study explored in this article highlights a large European refinery that suffered from ineffective communication and transparency during TA preparation, which in turn led to difficulties in identifying actual scope. An analysis and external audit was conducted to identify specific deficiencies.

The analysis showed inconsistent compliance to the defined scope preparation process. The organization had poorly defined roles and responsibilities resulting in certain roles, functions and responsibilities not being filled with skilled workers who could competently perform the job. Good meeting practices were disregarded with several key players choosing to not attend meetings or arriving late and unprepared. Management did not have a reliable plan based on accurate work estimates or work list execution to properly define and freeze actual work scope. Additionally, contractor management was weak, and key performance indicators (KPIs) and benchmarks were poorly defined.

A formal, structured scope definition and management methodology was developed and introduced which helped increase scope accuracy. The budgeting process was revised to increase accuracy and frequency of information being available to improve timeliness of decisions. By redesigning meeting cadence, supporting meeting terms of reference, and introducing new KPIs, the refinery better utilized relevant management operating systems, improving TA governance, interface management and contractor coordination.

To improve data accuracy and timeliness, management increased reviewing their KPI reports and dashboard to a weekly basis to consistently validate facts and figures for real time decision making. The resulting TA Execution Strategy Paper was more complete and reflected ownership of all key stakeholders. The TA preparation team and key stakeholders within the company better understood and complied with their roles and responsibilities. Regular preparation, execution and review meetings became more effective and provided better defined TA objectives and scope.

Case Study 4: On schedule and within budget

In this next case study, a refinery had a history of poor TA preparation and execution practices across the board. For over eight years, all turnarounds and shutdowns had failed to meet schedule or budget. For the past five years, the company's planned TA expenditure had exceeded $1 billion and cost-reductions were needed. An objective assessment of the existing tools, techniques, processes and methodologies was under-

taken to identify and quantify opportunities to reduce costs and improve performance.

Over the course of five weeks, an analysis was conducted on the current TA preparation and execution practices. After thorough data collection, it became apparent that there were various opportunities for cost reduction and process improvement. In fact, referring back to the Figure 1 10-Box model, the company had multiple deficiencies. The organizational design, and planning and scheduling practices needed updating. The contractor strategy, work logisitics and productivity were poor. The analysis identified significant TA cost reduction potential in a variety of ways. The refinery could minimize material, equipment and contractor labor costs by developing more favorable commercial contract terms and focusing on increasing productivity.

New and improved short-term and long-term plans were then created to reduce TA costs. A short impact program (SIP) focused on contractor productivity: by making logistical improvements, such as improved tent positions, site bussing and parking, significant lost time was recovered resulting in higher productivity. The analysis also found potential for reducing contractor work estimates by 15%. As part of the long-term optimization program, the site implemented an 18-month partnership with a TA specialist consultancy which helped implement better practice behavior and develop continuous improvement projects site-wide. In the long-term, the TA organization was completely restructured. By better clarifying roles and responsibilities during the preparation and execution phases and encouraging support from other functional groups during turnarounds, resource utilization was optimized.

For this refinery, scope optimization offered the greatest cost-saving potential. In order to properly optimize the project scope, TA and operations personnel implemented standardized tools and established more effective and consistent evaluation methods for scope definition and management. All work which did not meet an established level of cost-benefit ratio was classified as unfavorable and either eliminated or scheduled to be done outside of the TA. This alone reduced scope by 17% to 35%.

To optimize contractor usage and efficiency, more formal, competitive bidding was adopted. Existing and future contracts were reevaluated based on risk. A new contractor strategy included a variety of tools to help effectively track, document, evaluate and manage contractor performance, resulting in an average cost saving of 15%. Logistics and productivity were given new importance, which resulted in a work output increase by one hour per day for over 2000 contractors and a saving of over $2 million in labor costs.

Formal Management Control and Reporting Systems (MCRS) were used to combat a lack of useful Key Performance Indicators. Once KPIs were clarified and better understood within the site's leadership team, performance management was greatly improved, decision making became timelier and benchmarking more accurate. These reporting systems improved TA execution in a variety of ways, including planning productivity, scheduling accuracy, milestone compliance and utilizing short interval control to manage critical due dates.

Working closely with the in-house leadership, new processes and procedures were implemented resulting in sustainable improvements being achieved and for the first time in eight years, the site was able to stay true to the original TA schedule and budget.

Case Study 5: Performance

In next case study, a large refinery had an historically below average TA performance and safety record. The site attempted to improve their turnaround results by reviewing working procedures and allotting more time for staff and contractors to identify and manage risk. While this led to some TA performance improvement, it proved to be an expensive undertaking and the contractor's earned value continued to not meet expectations. Refinery leadership decided that to work toward significant improvement within a five-year timeframe, they would need to update their TA work processes and competences. Additionally, the site had planned a three-asset, $70 million turnaround just a few months away.

An analysis helped detail specific improvement plans for the short, medium and long-term. Although a company-wide TA process was in place, there was not company-wide understanding or compliance. Work lists and contracts tended to be poorly managed. Even though the TA budget was a significant portion of the company's overall budget, the turnaround process was regarded by many departments as low-priority and other work was frequently considered more important.

The analysis discovered that inter-departmental risk management was not established. There were not clearly defined expectations, roles or responsibilities among many groups of staff and contractors. Despite the site's tendency to use external personnel in most maintenance and TA projects, contractor management was subpar and estimates and schedules were regularly inflated by more than 25%. Execution resources were hovering at about 40% productivity. The company aimed for all three individual TAs to be executed on-

time, for a 50-day mechanical cycle and to save 12-15% off the original estimate.

Evaluators identified short and long-term optimization opportunities worth around 20-30% of the original TA budget. Even though the project was only six weeks from execution, there were many steps to take that could potentially make an impact on the final TA. As a result, the site began to work on a variety of improved behavior techniques. Management reorganized shift crew logistics, improved worker transportation and better communicated the working hour expectations to staff. Planners worked to optimize scheduling, have more accurate contingency assumptions and correct scope discrepancies. With a more accurate plan with stronger ownership, decision-makers were better able to create a more structured risk management plan. To further improve productivity, all necessary permits were prepared beforehand.

Once the site staff agreed on process and behavioral improvements, observational information was gathered by the consultants during two weeks of the execution phase by observing supervisors and contractor crews to gather information. The consultants focused on recording and analyzing timesheet data, establishing accurate progress updates and deciding the best way to improve and control labor utilization. A four week coaching session prior to execution starting, helped challenge the workforce to adopt proactive management behaviors to drive field productivity. The engaging style included technical, managerial and pragmatic support with a cultural awareness. For the first time in five years, all three TAs were completed on time, within budget and with an above average safety record despite weather delays and unpredicted scope growth.

There was a huge improvement in the understanding and standardization of the management of planning, scheduling, scope management, proactive work practices and contractors productivity. The company was able to establish sustainable, effective management processes and accurate, timely KPIs.As a result, all future TAs will be able to follow an established standardized scope. Particularly noteworthy was an immediate TA budget decrease of 10%, a cost reduction of 8-12%. Within five years, the refinery expects to reduce their TA costs by 30%.

Conclusion

As seen in these examples, massive turnaround projects present a myriad of challenges. Being able to conduct TAs effectively and efficiently is a key challenge for the petroleum refining industry. From conceptualization to execution and review, most turnaround practices have the potential for improvement. Tools such as data analysis and improved management control and reporting systems (MCRS) can be employed to help managers support their teams and achieve ideal execution productivity. Continually auditing current performance and noting possible developments is absolutely necessary for a producer to remain competitive in this industry.

Although every turnaround will be different, many face similar problems and most can be corrected with comparable best practice techniques. If a refinery finds itself not performing a TA to the best of their abilities, engaging external consultants for an objective, unbiased view can provide meaningful insights. With an in-depth analysis and a tailored plan to address identified gaps in compliance and performance, every turnaround project can be a success.