Case Study

How to implement a successful Plant Turnaround as part of your operations excellence strategy

DuPont Sustainable Solutions

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DuPont Sustainable Solutions (DSS) spoke to Anthony Becerra, a Principal at DSS based in the Middle East, on what to consider when implementing a successful plant Turnaround strategy.

A Turnaround, also known as TAR, is a core part of an Operations Excellence Program, typically falling under the pillar of Risk Management, Asset Integrity and Reliability. A Turnaround occurs when part of, or all of, a plant's operations have to shut down for equipment to be inspected and, if necessary, cleaned, serviced, repaired, and/or replaced.

Turnarounds are extremely challenging activities which, if not executed and planned for efficiently, can become highly expensive, potentially costing an organization millions of dollars per day.

However, when executed effectively and with the right strategic partners, expertise, know-how and relevant experience, Turnarounds can have many benefits such as minimizing the unexpected events that lead to unnecessary costs or losses, reducing the potential for risks related to safety, and, ensuring the sustainability of operations.

The golden rule for implementing a successful Turnaround is to conduct a robust assessment of the Turnaround strategy and planning process prior to the actual execution of the Turnaround itself. The purpose of the assessment is to identify the improvement levers and value release opportunities for follow-on work. DSS gains an understanding of potential opportunities and the pain points with an accuracy of about 80%, this can be considered as a top performance benchmark from an industry standards perspective. At DSS there are highly skilled engineers who can critically assess the effectiveness of Turnarounds with a view of helping clients reduce the time

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and cost of Turnarounds as well as positively impact the 'mean time between Turnarounds' ensuring improved equipment reliability.

Alignment with management is presented using an improvement roadmap which focuses on the areas where value can be released. Following this, an engagement phase takes place as per the roadmap defined. During the assessment, a number of activities are conducted such as widespread onsite reviews, a focus on mixed interviews, performance data reviews and in-field studies. To execute this process, DSS typically interviews key company representatives, does extensive site walks, during both the day and night shifts, takes part in daily meetings and conducts extensive surveys. This also enables DSS to establish a Predictive Turnaround, which is inclusive of the scope, schedules and budget.

Another core part of an assessment is data analysis whereby the DSS team (occasionally with the support of Data Scientists) leverages existing CMMS and plant performance data to extract meaningful information. The aim of the data analysis is to test hypotheses and draw conclusions on areas of impact and potential actions as part of the TAR.

DSS: What are the common reasons for why a Turnaround won't be successful?

AB: There are typically three pain points which illustrate the need for an organization to improve their Turnaround.

1. In-effective strategy

The inability to meet the company's Turnaround and business goals followed by a lack of alignment with asset conditions can lead to high levels of unplanned downtime. Other elements include Turnaround targets which are not challenged against global benchmarks and the lack of strategic partnerships with regional and local service providers. A lack of qualified resources to roll-out and execute a Turnaround also plays a role.

2. Inefficient planning

When the right amount of planning isn't implemented, Turnarounds result in cost overruns, low schedule compliance, a high number of incidents and unreliable production. Also, higher levels of complexity results in inefficient execution, especially when there is a shortage of experienced workers and skills. Often Turnaround timings can change due to external forces and if

the correct planning hasn't been implemented, a successful rollout won't be possible. A lack of scheduling and reliable reporting systems also significantly impacts TAR effectiveness.

3. Poor delivery

Poor delivery is a direct result of a lack of qualified resources for preparation and execution. Often, during a Turnaround execution, additional scope enters that can also aid poor execution quality which can lead to leakages, additional work, delays or ultimately shutdowns. A TAR needs to consider an effective stakeholder management process, especially when CAPEX activities need to be integrated into TAR activities. Another barrier for efficiency is the Permit to Work system resulting in excessive delays in completing on-site execution related activities.

DSS: What key challenges occur during a Turnaround which Clients should be aware of?

AB: While each plant Turnaround can present their own unique challenges, there are three main areas, which must be considered upfront. These include:

1. Lack of Turnaround experience:

Turnarounds are not a common occurrence within a plant, as they can typically take place every four to five years, depending on the operation. As a result, permanent employees will not necessarily have the right level of experience or expertise to implement a Turnaround as it is not part of their day-to-day-activities. This often requires a high contractor population to join the existing workforce to supplement the Turnaround implementation but often they themselves are not familiar with the environment resulting in poor outputs.

It is also important to consider that a contracting workforce can potentially create disengagement among employees. Even though contractors are a critical part of any Turnaround implementation, it is important to ensure that they work efficiently and as a team with the company employees.

In our observations with Clients, contractors can spend a large proportion of time on non-valuable activities. However, this can be reduced considerably through proper communication, training and by implementing systems and processes aimed specifically at eliminating this type of waste. It is also worth mentioning the importance of ownership over roles and responsibilities during a Turnaround and how contractors need to be brought in as early as possible during the Turnaround program to better prepare themselves for the work that needs to be completed.

By not introducing the right levels of a Turnaround experience throughout the program, this can influence another two specific challenges we have identified:

2. Time, scope and budget creep

Due to the nature of Turnarounds and their impact on operations, there is often enormous pressure to get them completed as quickly as possible. This is not surprising given not only the high cost of maintenance work related to the Turnaround itself, but also the fact that a plant that's offline isn't actively contributing to the business revenue. This can inevitably lead to scope creep, which often occurs because it is almost impossible to know the extent of maintenance required, which might only become apparent once the work actually begins. According to the World Class Turnaround Management Lessons and Benchmarking report from the National Petrochemical and Refiners Association, 80% of Turnarounds exceed costs by 10%. And considering Turnarounds can cost tens of millions of dollars, 10% is a significant amount of money.

Robust planning and preparation needs to be done prior to any Turnaround project to ensure both time and scope targets are met as the lack thereof can result in scope creep and a plan overrunning along with negative cost implications.

3. Safety incidents

A focus on safety is a critical part of any Turnaround, as there are a number of risks, which present themselves during this time. This includes non-compliance to safety and environmental regulations, a lack of pro-active focus on safety precautions, not learning from previous incidents and a lack of communication and information sharing. It is essential to consider safety related aspects during the Front End Loading phase of a TAR, this ensures that the level of preparation from a safety perspective matches the level of preparation from a technical execution standpoint.

It is expected that most operations would have a strong Process Safety Management (PSM) system in place and the extent of this should be seamlessly incorporated into the Turnaround process. Just some of the best practices which illustrate a rigorous PSM include leaders who are visible in the field, Life Saving Rules, daily field audits conducted by both the contractors and employees and emergency rescue plans. Without an effective PSM in place, organizations not only run the risk of injuries and fatalities but can also impact the Turnaround project overall.

Case study 1: Safety improvements during Turnaround

The rollout of an effective PSM to execute a safe Turnaround

DSS partnered with a petrochemical client in the Middle East over a three year period to assist them with designing and implementing a structured and robust Process Safety Management (PSM) program to deliver excellence in process safety and sustain the current production levels at the plant. At the end of the program, DSS also supported the client to implement the new and updated PSM procedures during their 2019 Turnaround. It was paramount for the client to have a resilient and fully integrated PSM program in place to ensure a successful Turnaround.

This was executed through daily field walks to identify high and medium risk activities, report findings during daily feedback meetings, and coached contractors and employees to implement the PSM procedures.

Results:

- Assisted workgroups to understand the expectation for PSM systems.
- Completed Turnaround Pre Startup Safety Review (PSSR) for all plant sections prior to start up.
- Implemented Client standard for flange tightening and torqueing.
- Implemented new leak testing procedure.
- Improved Job Hazards Analysis (JHA) for high risk activities by including process hazards and job safety hazards.
- Overall compliance with new high standards for the environment and PSM.
- Zero injuries recorded during the Turnaround execution.

DSS: You mentioned earlier the important role of assessments before a Turnaround begins. Can you share some more detail on the different types of assessments?

AB: According to DSS methodology, an efficient Turnaround execution starts with high-quality preparation and planning processes through vigorous assessments.

There are typically five elements in the DSS assessment process:

- **Maturity Assessment:**
  The maturity level assessment is a structured and efficient way to measure the maturity of a Turnaround in an organization. This process helps assess work methods in place and can be supported with visual technique to better prepare the execution of the work itself.
- **Readiness Assessment:**
  This assessment compares the actual Turnaround preparation status against global best practice for Refineries and Petrochemicals. Furthermore it takes into account the complexity of the upcoming Turnaround.
- **Effectiveness Assessment:**
  Assessing Turnaround effectiveness through specific Key Performance Indicators (KPIs) and establishing the ratio between the value adding and non-value adding work.
- **Post Turnaround Review:**
  Gathering lessons learned from completed Turnarounds provides the basis for identifying areas of improvement for future Turnarounds providing opportunities for continuous improvement.
- **Process Improvement/Quick Wins:**
  Identify the key levers to impact the effectiveness of a Turnaround and finding ways to improve the value which a Turnaround inevitably brings to the organization.

Assessment provides the strategic framework for the Turnaround, from setting the objectives, to implementing and measuring the results. Evaluation is such an important process to the Turnaround as it will help inform and direct the process for when the next Turnaround is due.

Case study 2

Increasing production by reducing unplanned downtime during Turnaround

A large Petrochemical company approached DSS to conduct a Turnaround assessment on one of its processing facilities. DSS identified the potential improvement opportunities with the aim to establish value release opportunities. During the assessment, a view on the Maintenance Strategy highlighted significant potential opportunity to shift unplanned downtime to planned downtime through a change in the facilities Turnaround strategy and sequencing of Turnarounds.

Subsequently, DSS developed a high level view on the Turnaround strategy over the next five years in order to move into a more predictable state of operation and subsequently improve process reliability and an increase in production volumes. In addition to the opportunity to improve operational reliability, it was also evident that significant value could be released with a detailed focus on the Turnaround management aspect alone. This would primarily be achieved through:

- More effective front end loading.
- More aggressive scope challenge sessions.
- A more robust approach to Turnaround Risk Management.
- It was identified that the opportunity exists to reduce TAR costs by up to 14% by increasing front loading effort, external scope challenge and effective risk management.

DSS: Sometimes even the best laid plans don't work out. Why do things go wrong and how can one go about reducing the potential value losses as a result of a shut down?

AB: Time Between Major Shutdowns (TBMS) can be increased to decrease the potential value losses due to a shut down. Furthermore, prep-work, assessments and planning will certainly go a long way towards assisting with the smooth running of a Turnaround, by providing systems, processes, checklists and schedules. What can be overlooked sometimes and become the thorn in the side of any Turnaround program, is the people and thus cultural transformation needs to be considered by the organization both during the Turnaround, as well as during the TBMS.

During a Turnaround, there are essentially two groups of people who are both looking to achieve the goal of executing an effective and safe Turnaround – the TAR steering committee and the contractor management team. While this is the common goal, they might have two very different approaches. The processes and systems are there to keep people on track and help follow the correct procedure, but if culturally, there is misalignment, a Turnaround can lose efficiency. Lack of communication is a common example we see between the organization and the contractors. Gaps or lags in communication can create interference in the proper and timely flow of information, resulting in situational concerns. A disparity and lack of clarity among exact roles and responsibilities between personnel will also put the success of a Turnaround at risk.

Cultural transformation needs to continue after the Turnaround has been completed, in order to extend the TBMS, without compromising the safety and environmental goals of the plant. The entire organization should be involved in the process for TBMS, in other words, the process and the data are equally important if positive results are to be achieved and sustained, the organization must collectively support and demonstrate an ongoing commitment to extending TBMS in a reliable and sustainable manner.

However, it also starts with leadership and organization alignment. The business leadership of the organization must offer assurance that sound business decision-making processes will be used and that the evaluation will be completed. Even if the TBMS cannot be reasonably extended such assurance will reduce the potential for false starts and programs not carried to completion, avoiding possible damage to the organization's morale and a waste of precious time and resources.

DSS: What are the benefits for the Clients implementing an adequate Turnaround?

AB: Typical benefits include increased revenue due to minimized downtime and higher production and schedule attainment. Reduction in cost overruns and an increase in an organization's return on Operational Excellence and Capital Efficiency redeployment. Contractor claims and spend are also minimized while productivity is increased. Risk mitigation is aided with an increase in cost and scheduled predictability as well as an increase in discipline and responsiveness. Efficiency is raised due to understanding the scope of collaborations, lowering inefficiency of workers and increasing contractor productivity and the speeding up of the decision-making process.

Case study 3

Reducing costs during Turnaround

During the execution of a major Turnaround at a large petrochemical company in the Middle East, DSS was approached to conduct a high level Turnaround assessment as they were not managing their Turnaround scope effectively, and struggled to deliver this within time and according to the budget calculated. There were also challenges in the availability of required spare parts and materials, and availability of experienced high quality contractors. DSS assessed the current execution and governance of the Turnaround while reviewing the complete preparation, planning and scheduling process.

Some of the findings from the assessment showed:

- High Complexity Turnarounds require 32 to 36 months of preparation according to best practice but due to reliability issues and other challenges, this client had only planned for seven months. During the preceding 32 to 36 month period clear milestones should be established and progress tracked to ensure effective front end loading.
- A combination of a culture of reporting only good news and not having the right systems and governance practices in place resulted in current reporting using estimates with late reporting of delays.
- By implementing better processes and resource planning for Turnarounds, and utilizing planning and scheduling tools to track and manage expected finishing dates for activities, issues can be presented earlier and managed.
- High level estimates of the potential benefit to this client would unlock $50 million through Turnaround optimization.

DSS: When a Turnaround is complete, how do you assess whether or not it was successful?

AB: The key metrics for assessing a Turnaround are of course whether the project was delivered on time, within the budget and without scope creep. However, we also consider other important operational metrics that will ensure the sustainability of the Turnaround efforts. These include:

- Safety Improvements of up to 25-35% in TRIR (Total Recordable Injury Rate) and environmental incidents,
- Quality Improvements (15-25% improvement in operable leaks and unit trips after a Turnaround),
- Cost Reduction of 20-30% (labor, material, and equipment),
- Downtown Reduction of 10-30% and a reduction in unplanned downtime.

DSS: In summary, what are the key fundamentals to execute a Turnaround strategy?

AB: The short answer – high quality preparation and planning coupled with the right processes, tools and techniques. In the diagram below we summarize some of these elements and the activities we would plan to execute. The entire process is subject to the scope and requirements for the Turnaround, of course.

EFFICIENT TAR EXECUTION
According to DSS methodology, efficient TAR execution is possible only with high-quality preparation and planning processes and tools

DSS: Why should Clients partner with DSS when planning a Turnaround?

DSS follows a strict Turnaround cycle that includes services pre, during and post, to support our Clients throughout the process.

1. **Pre-event:**
Before a Turnaround implementation, this includes the strategy review, diagnostics of assessments, design and methodology implementation, and conducting studies to describe the future of the Turnaround.

2. **During implementation:**
During a Turnaround, DSS provides the necessary technical support and training to standardize Turnaround skills needed. At DSS, we have designed a series of tools that will help Clients assess the effectiveness of their Turnaround strategies and plans in a very short timeframe.

3. **Post Turnaround:**
Post a Turnaround, we do a post mortem to assessment which evaluates the outcomes and feedback for our Clients.

4. **Our expertise:**
We have strong experience working in continuous production environments with many of our Clients operating in the Oil & Gas, Petrochemicals, Chemicals and Mining sectors. DSS is cognizant of the cultural differences and diverse backgrounds of employees working in large scale operations and pride ourselves on the sensitivities towards people related challenges.

5. **Our heritage:**
DSS has a rich heritage of Turnaround experience, through our legacy with DuPont, which has in excess of 200 production sites globally, and having assisted our Clients deliver effective Turnaround projects at a global level.

In closing, most companies want sustainable changes and improvements namely tools, disciplines and trained employees in order to continue delivering value once we have concluded the Turnaround. At DSS, we value our Clients and want to leave them with the right capabilities to ensure the sustainability of their operations.

DSS is a leading provider of operations management consulting services that enable organizations to protect their employees and assets, realize operational efficiencies, innovate more rapidly and build workforce capability.

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