

WHITEPAPER

Centralizing Your Shutdown,
Turnaround, or Outage:
Creating Alignment Between
Your STO Plan, Process,
and Team



PROMETHEUS GROUP



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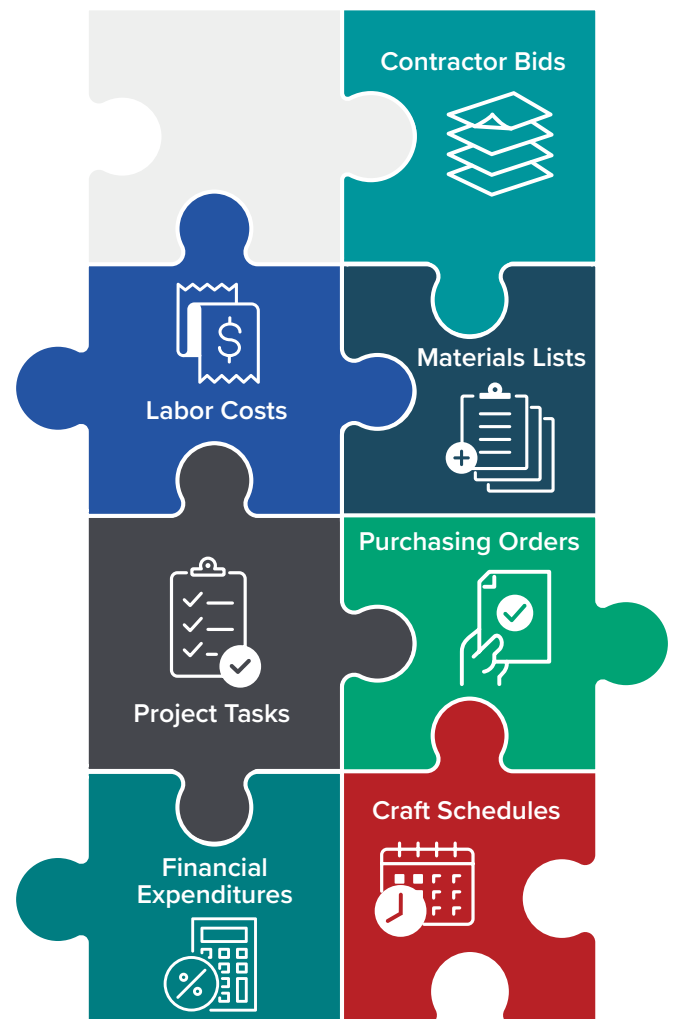


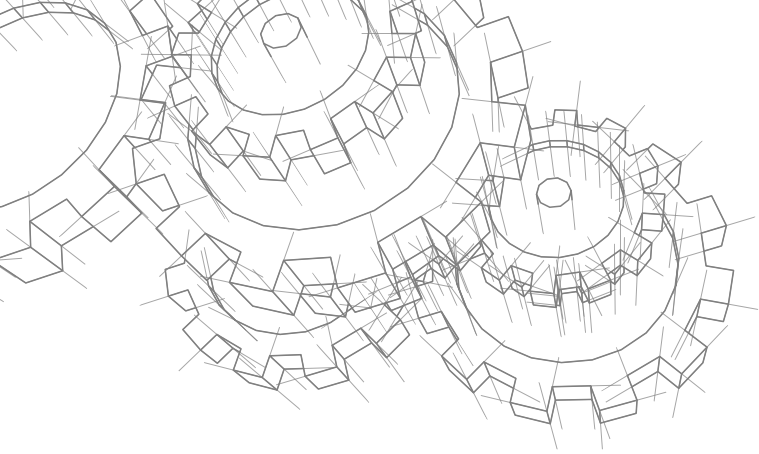
Building the case around why a successful STO planning, scheduling, and execution process requires a centralized, digital system.

Any organization that has undergone a shutdown, turnaround, or outage (STO) knows the staggering complexity involved in the planning, coordination, management, and execution of an STO event. Usually planned at least a year in advance, STOs require a significant amount of capital, labor, and resources. All of these must be managed with precision. With only a short window to execute repairs, inspections, and initiate capital improvements, every stakeholder involved in the event must coordinate project tasks efficiently to ensure a site is back online within a specific period of time. A small refinery, for example, can average around 1 million dollars per day in revenue; each day a site remains offline beyond its scheduled run date becomes lost production time. The consequence of mismanaging schedules, budgets, resources, or tasks can cause significant loss of revenue, an increase in operating and labor costs, and even impact the supply chain.

Having the proper monitoring controls in place between company and contractor to ensure a timely and efficient shutdown, turnaround, or outage can drastically improve visibility during the STO process.

Currently, many organizations rely on outdated methods or software to capture data and information like:





Often, the methods used to input data are not automated or integrated, creating information silos across technical, operations, and management teams. Relying on programs that are unable to communicate with a company's ERP, EAM, or CMMS can impact the progress of planning a shutdown, turnaround, or outage in many ways. It affects the company and contractor's ability to access and act upon to-date information, creating challenges in communication, progress tracking, quality assurance, quality control, and organizing STO plans and schedules.

To overcome these challenges, organizations need a centralized, integrated platform. Having a digital, centralized location for both the company and the contractor to organize and manage their tasks before and during a shutdown, turnaround, or outage eliminates the risk of going off schedule or over budget. Using a digitized system increases the likelihood of successfully completing the event on time.

Develop a Detailed Plan for Your Shutdown, Turnaround, or Outage Before the Event

Nearly 90 percent of an STO event happens in the planning phase. This is the point where an organization needs to pay the most attention to the details of their plan. How will teams communicate with each other? What restrictions will be put in place to limit or eliminate the addition of tasks post-scope freeze? What metrics will each team track as they move through the STO event? What kind of software is needed to easily sync documents? Most of the challenges that an organization faces during the scheduling and execution phase can be traced to poor planning or communication at the beginning of the event.

According to an article in Digital Refining, **"approximately half of all shutdown projects are delayed by more than 20 percent and 80 percent go over budget by more than 10 percent."**¹ By breaking down the planning process into phases — either months or years before the STO start date — an organization can reduce the chances of an event going over budget or off schedule. To accomplish this successfully, a team needs to determine how it'll properly manage and update team communication, planning and scheduling progress, scope preparation, KPIs, and risk mitigation during execution.

Create Strong Channels of Communication Throughout a Shutdown, Turnaround, or Outage

A shutdown, turnaround, or outage is an immensely challenging task can become more difficult without efficient lines of communication across your STO team. Breakdowns in communication between managers, maintenance crews, operations, and safety teams can impact your event if easily identifiable communication channels aren't defined early in the pre-planning/ planning phase. Communication issues may delay the re-start date of a plant or facility and also create unsafe, or even hazardous, working conditions. Establishing communication channels between maintenance, project group, management, and operation teams prior to the planning phase is important for two reasons:



1. It serves as an opportunity to observe and adjust how frequently teams are communicating with each other. When it's time for the STO execution, the process is already baked in and reduces or eliminates communication silos.



2. It allows teams to communicate challenges or issues that may arise during any routine maintenance work prior to a shutdown, turnaround, or outage. This can help boost scope management and reduce issues related to scope creep.

A common issue with many teams is in the forms of communication used prior to an STO event. They might not be accurate enough to accommodate the bandwidth of 1,000+ workers, all of whom might be using different channels to communicate.

¹ https://www.digitalrefining.com/article/1001320,Achieving_turnaround_success.html#Xh93LMhKg2x

Remember, all communications related to the STO event needs to be recorded in a system to track what's happening throughout the actual execution and to ensure everyone is on the same page.

Get Everyone on the Same Page EARLY!

In the “pre-planning” phase, management needs to consider implementing a robust software tool that can manage and track communications over progress reports, schematics, project/task notes, and more. Having a streamlined and centralized location for entire teams to stay up-to-date with each other minimizes the chance of chaos and confusion. Establish early on how each team is going to share data or information, what software contractors will use to manage their individual teams, and how collected data will be added into your EAM, CMMS, or ERP.

Building a simple yet iron-clad communication channel between all stakeholders before the planning and execution phase ensures that time-critical items are completed on schedule and aids your STO planners, schedulers, supervisors, etc., in assessing high to low-priority tasks during the actual event. Due to the time-constraints and large budget of events of this scale, teams have no room for error or miscommunication. At the earliest stages of the planning process, contractors need to establish a communication process to determine how information and data will be shared across teams. Each team will develop their own method to share information if this foundation isn't put in place before the start of the event. This can quickly lead to confusion and slow down the process.

Leave Room in Your STO Planning and Scheduling for Potential Surprises

Scope growth during STO planning can drive up capital budget costs and labor hours. Organizations stumble in this area but it's an issue that can be remedied if an STO team is actively on the lookout for potential, unplanned issues in the time leading up to an STO event. A team has the power to reduce driving up capital budget costs and labor hours from unexpected repairs that appear during an STO.

A STO team may discover additional critical repairs during the planning phase. Management needs to communicate to the planning team — prior to drawing up the STO plan — to leave room for potential unexpected surprises. If the organization stays consistent with tracking critical repairs throughout the years, they'll be able to estimate budget labor costs and hours from unexpected issues, compare it to costs from prior STOs, and fold it into the capital budget. Therefore, it's important to have a full-service, integrated solution that not only tracks routine maintenance jobs and repairs in an ERP, EAM, or CMMS, but can also make the data easily accessible to your STO teams. Dave Bullard, an STO expert, mentions in POWER Magazine “for a plan to truly be solid and comprehensive, it must enable nimble planning scenarios and fixes for emergent work and anticipate and account for delays beyond control [...]. Failure to account for these realistic events will set the event back and create frustration for all involved.”² Planning in advance not only minimizes scope creep, but keeps the STO team in control of the event, increasing the organization's chances of staying under budget and on time.



² <https://www.powermag.com/how-to-make-shutdown-turnaround-and-outage-events-successful/?printmode=1>

Scope preparation, or the lack of it, can also become another stumbling block for teams regardless of whether it's their first shutdown, turnaround, or outage or their fourth. Frequently, the work scope for organizations increases unexpectedly by up to 50 percent during most STO events³ and can strain resources. This inadvertently places delays on critical repairs that may get pushed out to the next STO due to a lack of time. Creating a project scope relies on coordinated communication with key stakeholders before the planning stages to develop a stringent review process. Prior to the planning process, activities identified outside of core STO tasks need to be vetted against past estimated deadlines, budgets, duration of repairs, and labor hours. Expectations need to be set with management about the scope inclusion process. Once the objectives are understood by all the key players, an organization can move into building out the details of the scope in the planning phase.

Even when the scoping process is communicated with key stakeholders, unnecessary activities may still wind up on the scope. To prevent this from occurring, STO management teams will need to implement a set of controls that limit or prevent unapproved tasks from being added. Setting up your STO team for success means not only limiting or eliminating scope creep, but also creating strategic goals and milestones that assist your planning, scheduling, and execution teams in following the STO plan successfully. Determining what key performance indicators (KPIs) to measure success by prior to determining budgets, costs, labor hours, task completion rates, etc., in the planning and scheduling phase will help your organization stay on track during execution. They also provide a standard to measure against subsequent shutdowns, turnarounds, or outages.

Know Your KPIs

During the planning and scheduling phase of your STO event, your planners and schedulers will be responsible, at a minimum, for coordinating:

- Activities
- Materials
- Contractors
- Workers
- Work packages
- Estimating labor hours
- Purchasing orders (PO)

For each piece of the puzzle a planner or scheduler is responsible for, there is a corresponding benchmark that needs to be met. Before your STO planners and schedulers undergo a series of meetings and negotiations with management over what to include in the plan or schedule, management needs to assess what KPIs the STO team needs to achieve and the best way to capture, analyze, and share that information. If possible, your organization should review industry measurements of success and compare them to your past shutdown, turnaround, or outage and see what additional benchmarks to include in your progress reports prior to the event. A few key performance indicators management can consider bringing to the STO process are:

- Prior vs. estimated (labor costs, labor hours, material costs)
- Daily vs. weekly (task completions, projected labor hours spent, QA/QC approvals)
- Scheduling progress
- Number of activities added to scope
- Hours elapsed vs. amount of work that's been completed: For example: if spending several hours on work that's not on the calendar or task list, burned hours will be lower than earned hours. If there's a list of 10 items to complete on schedule but only one item is completed, burned hours are used up but nothing else on schedule was completed.
- Percentage of work packages completed
- Percentage of materials on site and accounted for

The more pre-planning you can do around developing KPIs ahead of your STO event, the better a position your schedulers and planners will be in to schedule and plan accordingly. Your team will then be able to follow through on staying on time and on task during execution.

³ https://www.digitalrefining.com/article/1001320,Achieving_turnaround_success.html#.Xh93LMhKg2x

⁴ <http://www.palmerplanning.com/wp-content/uploads/2011/11/Maintenance%20Planning%20for%20Shutdowns.pdf>

Plan Your Work and Schedule, and Then Follow It

There's a lot that goes into organizing and managing a shutdown, turnaround, or outage.

Consider this:







Value of 1 planner = 17 tradespersons.⁴

Your STO planners and schedulers are the vital lifeline to a successful STO and it's in the planning stages that determines most of what happens during the execution phase. It's also where most of the time is spent prior to an STO event, so it's a pivotal process. During this phase, key stakeholders are working with planners to assess contractor bids and labor rates, budgets, materials lists and orders, work permits, labor needed and availability, and more. This process requires an incredibly high level of exchanging of notes and spreadsheets, all of which needs to be reviewed by management, planners, schedulers, and contractors, so they can take them into account when building the STO schedule. If Primavera, owned by Oracle, is used as the primary scheduling tool, the information must be exported into SAP or a CMMS since Primavera does not directly integrate with either. This can become an incredibly labor-intensive process without the right tools to integrate Primavera into SAP or a CMMS.

Having a flexible tool that can connect to multiple platforms during the STO planning process makes it easier to communicate important schedule or plan information to teams. A software that can house STO-pertinent documents and information in a digital, centralized location cuts down on delays resulting from miscommunication and inaccurate data.

A centralized, digital location can help planners and schedulers:

-  • Access historical records on previous asset repairs and STO events.
-  • Improve communications with key stakeholders during the “scheduling draft meeting” phase of the planning process.
-  • Share schedule adjustments or status updates with other teams.
-  • Efficiently and quickly provide transparency and visibility into scheduling details during STO execution.

In addition to having universal access to the most up-to-date information and data, a centralized, digital location can assist STO planners and schedulers in sharing important information such as estimated task completion times and purchase order status with the other contractors.

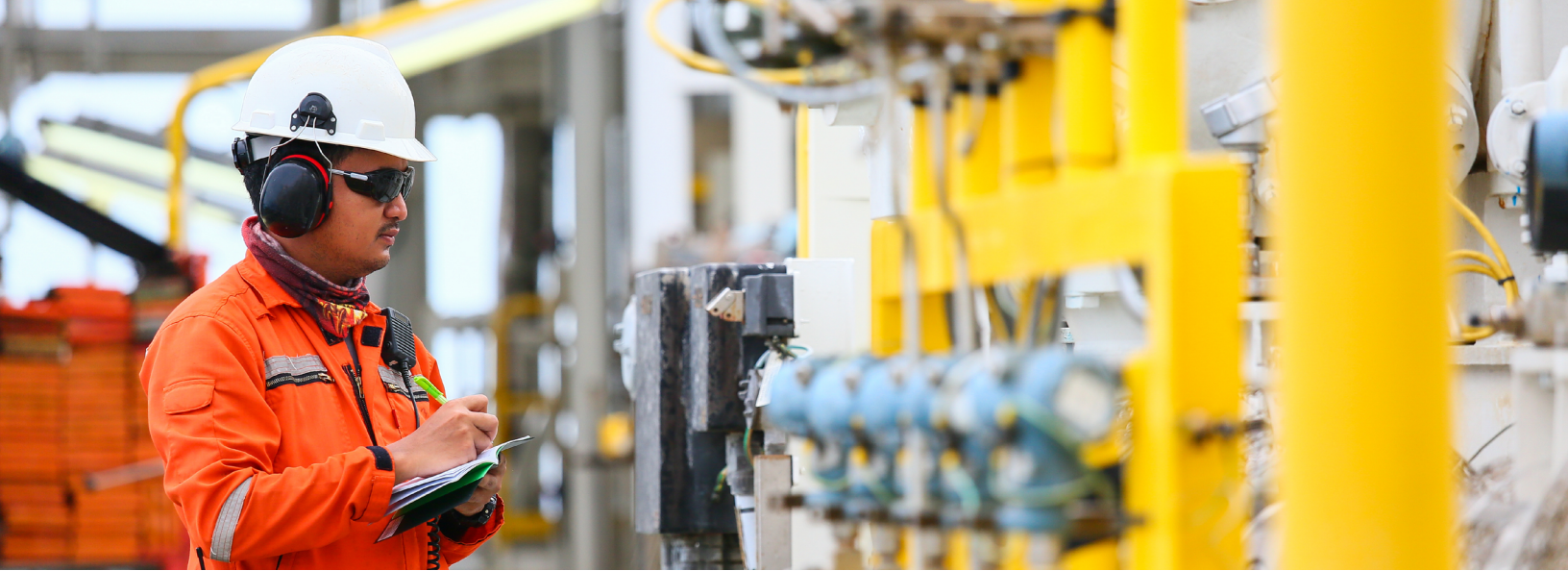
The pinnacle of an excellent planner and scheduler is their ability to assess and avoid risky situations, such as scheduling instrumentation loop checks prior to startup. Just as great sport teams rarely win games by making up their tactics on the fly, an STO team has to work with their planners and schedulers early on to assess and mitigate risky situations during planning to avoid their STO plan going off track.

Managing Scope Creep

Scope creep is a frustrating challenge that many organizations face during a shutdown, turnaround, or outage. While there's no way to avoid potential critical repairs popping up on a team's radar post-scope freeze, management can put controls in place that prevent anyone on their team from creating new scope. This process can be effectively controlled using a single or multi-user approval/sign-off process to ensure additional work requests do not make it to the final scope without the proper workflow process.

⁴ <http://www.palmerplanning.com/wp-content/uploads/2011/11/Maintenance%20Planning%20for%20Shutdowns.pdf>

⁵ <https://www.mckinsey.com/business-functions/operations/our-insights/the-upside-of-downtime>



Setting the expectations early on with key stakeholders over what should be included in the scope can help curb late additions to the list but won't prevent unapproved activities from being added. The best way to manage scope creep is to put an approval process in place that prevents activities from being added to the scope without the proper sign-off. The difficulty lies in having the bandwidth to manage multiple managers with multiple tasks requiring multiple approvals. You can automate this process by implementing software that acts like a "gatekeeper" against unapproved tasks. This helps to get the right people to approve or deny tasks which keeps the scope from impacting scheduling, costs, and resources.

Being able to view scope documents, schematics, budgeting spreadsheets, and progress reports can help increase transparency and overall awareness of STO progress across teams. However, managing the volume of documents shared during the execution phase can be overwhelming. This is especially true for smaller organizations with a limited number of resources. Having a centralized, digital location to share and store vital documents will help with juggling multiple systems and working with multiple people.

Document Management Can Help Maintain a Safe Working Environment

During the execution of an STO, everything from daily budget and hours worked to work permits are reviewed daily. Planners, schedulers, contractors, and management are constantly in communication with each other to ensure that workers have the documents, materials, and tools needed to complete a task.

Benefits of implementing a software system that uses a digital, centralized location for managing, storing, and sharing documents between people and systems are that it 1.) streamlines the process of sharing and storing documents and 2.) gives key stakeholders access to up-to-date information which is especially important when dealing with work permits and confined work.

Review QA/QC

Quality assurance and quality control requires a detailed checklist review to make sure the STO process was followed with replacing/repairing equipment or parts.

- **Quality assurance:** Contractor responsible. Make sure everything on the checklist has been completed.
- **Quality control:** Company responsible. Verifies expectations were met.

During event execution, as trades move through each activity, it's their responsibility to make sure they've fixed each piece of equipment assigned to them. It is the organization's responsibility to ensure benchmarks have been met. Skipping this step or not thoroughly following the list can lead to serious, or potentially dangerous, situations like operating poorly repaired equipment. If vital steps were missed during QA/QC, it can cost an organization thousands of dollars (outside of the capital budget used for the STO) to repair the damage and lead to lost productivity hours. Create a set of QA/QC best practices that can assist your team in guiding them through completing a QA/QC checklist.



Manage Your STO Process During Execution — By Sticking to the Plan

Although the execution phase of a shutdown, turnaround, or outage takes the least amount of time to complete in comparison to the rest of the other phases, it can be the costliest and the most hazardous if planning and scheduling are poorly executed.

By the start of execution, the entire STO team should know their schedule, goals, and who to communicate with throughout the entire process. During execution, it's important to empower your team to succeed with the right tools to assist them on the path toward a timely re-opening of the plant or facility. Do you have tools that can alert the team when there are changes in critical path or potential safety hazards? Are there watch windows or direct access to view schedules or work progress?

Finding the right software to not only gather performance data but also manage an expensive project is important. Being able to work off the most up-to-date information, in real-time, with accurate data is just as important.

Mobilizing Your Shutdown, Turnaround, and Outage Team and Tracking Progress From the Field

The main challenge STO teams run into during execution is the inability to synchronize spreadsheets or other systems with an ERP, EAM, or CMMS in real time. Having access to data in real-time ensures everyone from maintenance, operations, and management are using the most up-to-date data from the field.

For example:

During a shutdown, turnaround, or outage, two crews each typically work in 12-hour shifts. At the end of each shift, each craftsman enters the amount of time worked and tasks completed which is then passed on to a timekeeper to input into their ERP, EAM, or CMMS. The problem, however, is the information is 12-hours old which means that any issues that may have occurred DURING the activity can't be retroactively fixed and any time lost during that period can negatively impact the entire project. Conversely, if a crew in the field completes their tasks ahead of schedule but is unable to notify the project scheduler, the scheduler is unable to strategically adjust the schedule in real-time and direct the crew towards another activity that leverages the time gained from completing their tasks early.

Tracking metrics to measure how well your team is executing your event's schedule and plan is crucial. Teams can track the following performance data during event execution:

- Earned value schedule vs. costs
- Planned vs. actual costs and labor
- Earned vs. burn rate

Even if the scheduler can adjust the schedule, without a mobile device, teams can't see those changes in real time and changes aren't seen until a few hours later or at the end of the day. For this reason, most teams are working off 12-hour old information during their execution. Decision-making based on live and up-to-date information can make the difference on whether a facility starts up on time or not. This is where leveraging mobile devices can truly help shutdown, turnaround, or outage managers communicate with schedulers while in the field.

Currently, most STO teams track the progress of a shutdown, turnaround, or outage through a spreadsheet. This can lead to human error when transferring data from the spreadsheet to the client's ERP, EAM, or CMMS. A robust STO solution provides a mobility option that allows workers in the field to see recent project

updates and changes in schedule, task progress and completions, and the ability to close jobs. A turnaround manager can also track overall project progress (e.g. project progress completion actual vs. goal) and coordinate with the scheduler to make updates if needed.

Since shutdowns, turnarounds, and outages are costly, working off accurate data can help improve your next STO event and save your team from over-spending and over-extending their resources.

Complete a Post-Event Assessment on Your STO Event and Adjust for the Next One

An STO event doesn't just end with the plant and facility going back online. This can be another major issue for organizations that feel like they are not seeing any improvement in its success rate with each completed shutdown, turnaround, or outage. Analyze your data/ KPIs from your STO event and compare it with past events. It's a great way to assess what changes occurred during the event and the overall success of the shutdown, turnaround, or outage.

Review/track your STO process and note any inefficiencies

After your STO event is over and the plant and facility is back online and producing, many organizations assume the event has ended, not to be critically reviewed again until the next event in a few years. STOs are usually cyclical which means the process is ongoing. In order to understand what instrumental changes need to be made for the next shutdown, turnaround, or outage,

management must review what worked, what failed, and whether they met the KPI benchmarks they set up at the start of the event.

One reason why it's critical for teams to track and gather insights during and after their STO event is due to workforce turnover.

As an aging workforce is exiting the industry, younger workers who aren't familiar with STO management might not have a strong understanding of all that goes into a shutdown, turnaround, or outage. Gathering and reviewing data from each STO provides newer workers with a starting point in knowing how to move through an STO and cuts down on the time needed training them on how to successfully complete an STO event. Aside from workforce turnover, consistently tracking issues and wins post-STO allows the team to continuously learn and improve their STO process. Whether that means finding ways to cut costs, work more efficiently, or improve scope management, tracking plant or facility progress once back online can offer valuable insight into how to make the next STO event even more successful.

According to "The Upside of Downtime" by McKinsey and Company, "many companies avoid the challenge of improving STO. But for those willing to take a closer look, the opportunity can be substantial, with schedule and cost improvements of 10 to 30 percent not uncommon."⁶ The key takeaway is: always be monitoring, tracking, and sharing any occurrences post-STO event.



⁶ <https://www.mckinsey.com/business-functions/operations/our-insights/the-upside-of-downtime>

Conclusion

The best STO solutions allow an organization to manage their shutdown, turnaround, or outage in one system from beginning to end, providing the tools needed to simplify and automate the process. Managing activities in areas such as scope/risk management, costs and materials monitoring, scheduling coordination, and people and data management is important. It is critical to do this in a way that easily disseminates information across teams, in real time, so the information can inform intelligent decision-making.

A centralized digital system reinforces communication, organizes and manages processes, acts as a repository for important documents, and can easily integrate with other software tools to help manage your shutdown, turnaround, or outage. When a team, plan, and process are in alignment, an organization increases the chances of completing a successful shutdown, turnaround, or outage on schedule and on budget. If your organization



is looking for a robust and intuitive STO solution that can help better manage your STO plan, process, and team, STO Planner is a full-service tool that offers seamless integration with your ERP, EAM, or CMMS. It manages the planning, scheduling, execution, and reporting phase of your shutdown, turnaround, or outage, and can help improve your organization's chances of completing a successful STO.

To learn more about features and functionality, visit our website and review our Shutdown, Turnaround, & Outage section.

STO PLANNER

About Prometheus Group

Prometheus Group is a leading global provider of comprehensive and intuitive enterprise asset management software solutions that work within ERP systems and span the full work management life cycle for both maintenance and operations. Developed jointly with end users, Prometheus software enhances the customer experience for planning, scheduling, and executing work for both routine maintenance and shutdowns and turnarounds, all while protecting the workforce with safety solutions and electronic permit to work. Our straight-forward functionality, graphical visualization, and simple processes enable customers to increase productivity, reduce costs, and improve reporting. For more information, please visit www.prometheusgroup.com.