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Collaboration, confidence and control during plant turnaround projects

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"Engineers spend 40 to 60 percent of their time looking for information and validating it."

National Institute of Standards and Technology

Plant turnaround projects are costly, not just in terms of labor and materials used to execute the project, but also in terms of lost production while the facility is offline. These projects demand the most significant portion of a plant's annual maintenance budget, and can positively or negatively impact the company's profitability.

At the heart of a plant turnaround project are documents and data, and lots of it. Every activity on the project depends on some form of document or data and having access to all that information at your fingertips is critical. While having quick access to information is critical, trusting the information you are working with is compulsory.

One of the main challenges facing our industry today is that documents and data associated with the same asset are stored in multiple locations such as the Enterprise Content Management (ECM) system, Computerised Maintenance Management system (CMMS), Document Management system (DMS), or other business systems. This challenge is exacerbated by the fact that the documents could contain incorrect, incomplete or inconsistent data, such as asset tags. Often, we see sets of documents referring to the same equipment but using a mixture of different numbering conventions – such as a dash rather than an underscore, so it becomes very difficult to link all related content together for knowledge sharing and reuse.

"Well-executed shutdowns, turnarounds and outages will be profoundly influenced by the quality of asset information and engineering content available at all phases of the project"

An industry report[1] estimates that the cost of inadequate interoperability in the U.S. capital facilities industry is to be $15.8 billion per year. The report addresses the cost burden issue by presenting both quantitative and qualitative findings and identifying significant opportunities for improvement. One of the NIST report findings suggests that "engineers spend 40 to 60 percent of their time looking for information and validating it". Conclusions drawn from the report also suggest that "having high quality, interoperable systems that capture and maintain this data and information tends to improve effectiveness and efficiencies in managing facilities and ultimately reduces costs."

Turnarounds are inherently complex to manage and can present multiple opportunities for high risk consequences. Change management of plant documentation, and the information contained within, can significantly affect the success or failure of your next turnaround project.

[1] Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry, National Institute of Standards and Technology (NIST)

Risks, rewards and consequences

Turnarounds, shutdowns or outages – however you may refer to them depending on your industry or the nature of the event – can be described as structured chaos. It is a choreography of events, balancing priorities with resources to execute a predefined number of tasks within the shortest amount of time possible. Hundreds, even thousands of highly skilled craft and other support personnel descend on a single plant site, executing a host of multi-discipline projects. There are daunting numbers of interrelated work tasks, working around the clock to get the plant back online, on or before the scheduled deadline. Those that have been involved with plant turnarounds or outages in the past would agree that schedule delays can have significant cost implications for all parties involved. These implications are simply quantified as either risks or rewards, where consequences make the difference between success and failure. If the turnaround schedule is negatively impacted for any reason, a delay in the restart of the plant could cost hundreds of thousands or even millions of dollars each day in lost production. Considering all the potential implications, well-executed shutdowns, turnarounds and outages will be profoundly influenced by the quality of asset information and engineering content available to consumers at all phases of the project.

Critical decision-making begins with "trusted" documents and data

Strategic planning in the context of a turnaround is "the act of creating short term plans to implement specific upgrades or maintenance activities during a compressed time frame". The first phase of every plant turnaround involves the process of defining the owner's strategy in pursuit of its goal. The strategic planning process begins with the identification of the turnaround purpose and objectives. During this phase, market opportunities and threats are analysed against the objectives and desired outcomes. Mission and vision statements outline the required results and goals are assessed. Best practice implementation strategies are crafted into action plans and commissioned work tasks.

Metrics are established to measure and review turnaround performance. Initial cost estimates are prepared, work and cost control breakdown structures are defined. During the initial planning phases, multiple consumers will need to access and leverage all currently available information regardless of format, complexity, or geography in order to quickly assess the various options and predict real-world scenarios to discover the best turnaround practices. While the Engineering Content Management system provides the optimal knowledge base for these activities, all reusable content from the system must be controlled and safeguarded from unauthorised or unapproved change in order to be considered a trusted source.

Information reuse for the asset-centric enterprise

During the detailed planning phase, the Project Lead works with the various project team leaders to establish the detailed project plan. This is most often accomplished through a series of working group sessions including primary stakeholder representation from engineering, operations, maintenance and construction. These project planning sessions are working meetings where the project execution and control phases are planned to a moderate to high level of detail. Master execution schedules are completed, work packages are assembled, detailed cost estimates are prepared and procurement of materials begins. Input from the operations and maintenance teams is critical to ensure the design intent meets operational goals and physical layouts are reasonably maintainable. The deliverable for this phase is to establish the detailed plan for all aspects of the project, including the final scope, major milestones, task list, dependencies, risks and mitigation strategies, and communication mechanisms for the work to be performed. During the detailed planning phase all turnaround stakeholders will require secure access to trusted information from both inside and outside the owners firewall.

Information reuse at this phase provides substantial cost savings to both the owners and contractors, which helps to reduce overall turnaround budgets. Integration between the plant document management and plant asset information management systems provides the one-to-one and one-to-many asset relationships required for critical decision-making regarding detailed planning activities.

Increasing the value of your engineering content

Trusted information and the speed at which it can be retrieved is a vital element for confident decision-making during unplanned shutdowns and scheduled turnarounds. The quicker you can find and obtain information relevant to your objective, the better your chances will be for avoiding schedule delays and lost revenue.

Leveraging the value from the engineering content you already have can enable faster retrieval of critical documents and data. Creating tag to document relationships helps to maximise your search and retrieval efficiency, saving both time and money.

During the project lifecycle hundreds if not thousands of tag identifiers are created by EPCs, suppliers and vendors, many of which are in dissimilar formats. For cost and schedule sensitive plant turnaround projects, manually extracting tags from documents simply isn't a viable option. Manual tag extraction and creation of tag to document relationships is a time-intensive and error-prone activity consuming hundreds of hours, costing thousands of dollars. Missing or inaccurate data slows the handover process and Operations and Maintenance Engineers can spend significant amounts of time searching for content to perform routine tasks.

Automating the process of creating tag to document relationships is a fundamental step in any asset digitalisation journey. The challenge therefore is not exclusive to the task of tag extraction and quality checking, establishing a one to many relationship between the tags and their associated documents is essential to increasing searchability and accessibility of engineering content.

Having tag to document relationships provides flexible search capabilities for retrieval of documents which enhances worker collaboration and speeds up the decision-making process.

Confident decision-making

In a traditional environment, document control or engineering teams may be responsible for manually extracting and validating engineering tags from document content, in order to create trusted tag to document relationships. Often, significant time and cost is associated with this exercise and, as with any labor intensive, manual task, the risk of human error is high, resulting in inaccuracy and rework.

Concurrent engineering and secure access control

Execution of turnaround projects requires a constant flow of trusted information in the right context to the right people at the right time. The cornerstone behind any successful turnaround execution is that of data and document accessibility and quality. The best planned turnaround will be challenged if data and documents cannot be trusted. The information must be easily retrievable on demand and must also be safeguarded at all times. Traditional Windows-based file systems do not provide sufficient safeguards for the control of digital information, especially when hundreds of potential information authors and consumers are hired as temporary contractors who are not familiar with the process and procedures required for manually managing the flow of information. The scope of plant data and documentation required for all phases of a typical turnaround project includes both historical and current (as-built) information which, can number in the thousands or even millions of documents. Most importantly, the relationships between documents and data must be maintained in order to assess the potential impact of change across all the related information sources. Turnaround teams must also be able to identify the source editors of documents particularly when more than one editor is updating the same document in parallel. On demand retrieval of data and documents must be intuitive to the casual user in order to empower ad hoc collaboration across the various turnaround teams. It is imperative that the engineering content management system provide concurrent engineering and secure access control capabilities to support parallel engineering and change management activities.

"The best planned turnaround will be challenged if data and documents cannot be trusted"

Investing in the future

Close out of the turnaround involves de-mobilising of turnaround support facilities, dismantling and removal of scaffolding, finalising cost and progress reporting and conducting lessons learned sessions. This is also the time where health, safety, environmental and quality data, including all approved field changes, are compiled to support final document as-built and archive tasks. Updating the master document repository with as-built information from the turnaround is a key activity in the change management process to ensure accurate information is captured and made available for future reuse. Another practice that is often overlooked at close out is the opportunity to institute knowledge succession, which is to enable the capturing of insights and experiences for future planning. A sound knowledge management strategy is an investment in the future for those individuals who operate and maintain the facility, in addition to those outside the owner organisation who are called upon to assist with subsequent engineering activities and turnarounds.

Summary

Plant data and document quality are directly affected by change management and work process controls. The owner operator Enterprise Content Management system will play a vital role in providing the trusted source of up to date information required to help accelerate plant turnaround schedules by reducing re-work, contractual disputes and ensuring regulatory compliance. In many cases, once a turnaround is completed it will likely be time to begin the planning activities in preparation for the next turnaround.

If a management of change (MOC) process is not in place, the owner should take the steps to develop one. The MOC process will help to control changes to data, documents and workflow and as a result, will help to control turnaround costs. When considering such a critical system for an asset-centric enterprise, essential qualities should at a minimum provide management of change control for critical digital information, collaboration, knowledge capture and information reuse.

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About the Author

Kevin Hutto has over 20 years of engineering, procurement and construction experience, serving highly regulated industries with Bechtel Power Corporation and Halliburton Brown and Root. Kevin has also worked in engineering and plant design automation serving in consultative capacities with leading CAD and document management software providers.

Kevin is passionate about helping businesses and industry achieve incremental value from engineering automation technology. In his current role, Kevin is a Business Consultant at Idox. The Idox solution safeguards virtual plant assets, empowers collaboration and institutes knowledge succession across the EPC and Owner Operator enterprise.

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