

# Insight



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# Executing Capital Projects More Effectively

SmartPlant Enterprise for Owner Operators Project Execution solution reduces CAPEX and project schedules

■ By **Adrian Park**

Owner operators today are faced with the challenge of implementing larger portfolios of capital projects than ever before, with limited resources and pressures to ensure projects are delivered on schedule, to specification and within budget. This is not easy to achieve.

Average CAPEX overruns of 20 to 30 percent and delays in production start of several months are common in many areas of the process, power and marine industries today. Examples of projects that have fared much worse are not difficult to find and gain considerable adverse publicity for the companies involved.

One trend that is clear is that there is a positive correlation between the size and complexity of projects and the relative magnitude of cost overruns and delays. It appears that as projects grow larger and more complex, the number of things that can potentially go wrong increases, as do

the consequences and complexities in project execution. This is worrying in an industry where what was once considered a mega-project at US\$1 billion is now becoming more the norm, and multi-billion dollar projects involving many different contractors working globally are being more frequently encountered.

Project Management Contractors (PMCs) face similar issues to owner operators in managing complex projects effectively, often against challenging fixed-price or incentive-based contracts. Many of the benefits described in this article can apply also to the PMC.

## **SPO Project Execution**

CAPEX projects require effective, user-friendly tools for project execution that can be rapidly deployed. To meet this demand, we are launching the SmartPlant Enterprise for Owner Operators (SPO) Project Execution solution.

This is the third SPO solution suite and is now available. The other two solutions, SPO Core and SPO Operating Plant, were released late last year.

As explained in the previous issue of *Insight* (Issue 22, pages 8-10), the work processes in the SPO Project Execution solution can make a major impact in greenfield and brownfield CAPEX projects, saving between two to six percent of CAPEX. This is achieved through implementation of improved project execution processes supported by our SPO Project Execution solution, resulting in a combination of reduced CAPEX overruns and risk of project delays, improved quality and bringing plants online more quickly.

SPO Project Execution provides preconfigured, out-of-the-box work processes for managing several critical project management procedures

for very rapid, low-risk implementation. The processes that are being initially prioritized are:

- Management of change
- Non-conformity management
- Technical queries/site queries
- Interface control.

The first three are included in the initial release and interface control is planned for inclusion in a follow-up release. These key business processes overlap and are integrated with the plant design basis managed in the SPO Core solution. A key success factor for these processes is the ability to easily cross-reference project changes, non-conformities, technical queries and more to the affected documentation, tags and plant breakdown structure elements (areas, systems, units, etc.). SPO Project Execution work processes can also be linked to each other, as shown by the green arrow in Figure 1. For example, a technical query arising from a site can result in a temporary or permanent non-conformity or project change. The ability to link these project execution work processes facilitates the complete auditable traceability of issues and their resolution.

SPO Project Execution will include the capability of bi-directional exchange of information with contractors and suppliers and the seamless hand-off of processes via Web services. This mechanism is available as an alternative to either bulk-loading through Microsoft Excel spreadsheets or manual data entry.

For example, an EPC contractor may raise a variation order request and send details and attached documentation to the owner operator via Web services. The request will then be placed into a predefined owner operator change workflow, and after review and approval or rejection, the response is made available to the EPC via Web services.

This process eliminates costly traditional correspondence and reduces the amount of manual intervention in transferring work processes between organizations. SPO Project Execution can dramatically speed the process of handling key project execution functions such as project change, non-conformity, technical queries, interfaces, etc.

In SPO, both the plant design basis and project execution data are managed in Intergraph's SmartPlant Foundation information management tool. This provides a high degree of flexibility and enables rapid adjustment of the out-of-the-box work business processes if required to meet any customer-specific requirements.

The SPO Project Execution solution can exchange information with cost control and contracts administration systems to provide essential input, such as the correct cost of changes to be incorporated into revised project baselines and budgets.

### Management of change

Change to the approved project design basis is the single greatest influence on project costs and schedule. It is therefore essential that changes are subject to an appropriate level of scrutiny before being approved or rejected.

On a major CAPEX project, there will be thousands of changes, and hundreds may be under consideration at any one time. Changes can arise from the owner operator project team, the owner operator corporate organization, contractors or suppliers.

The process of evaluating changes is complex, involving many technical and administrative stakeholders in the project. This complexity is compounded by overlapping scopes between changes.

The management of change process in many CAPEX projects is still largely based on simple hardcopy, electronic paper-type solutions or

spreadsheets and costly correspondence. For the owner operator or PMC, these do not provide adequate control of the change process through the project value chain, nor do they provide management the necessary visibility of the change process to effectively manage it proactively.

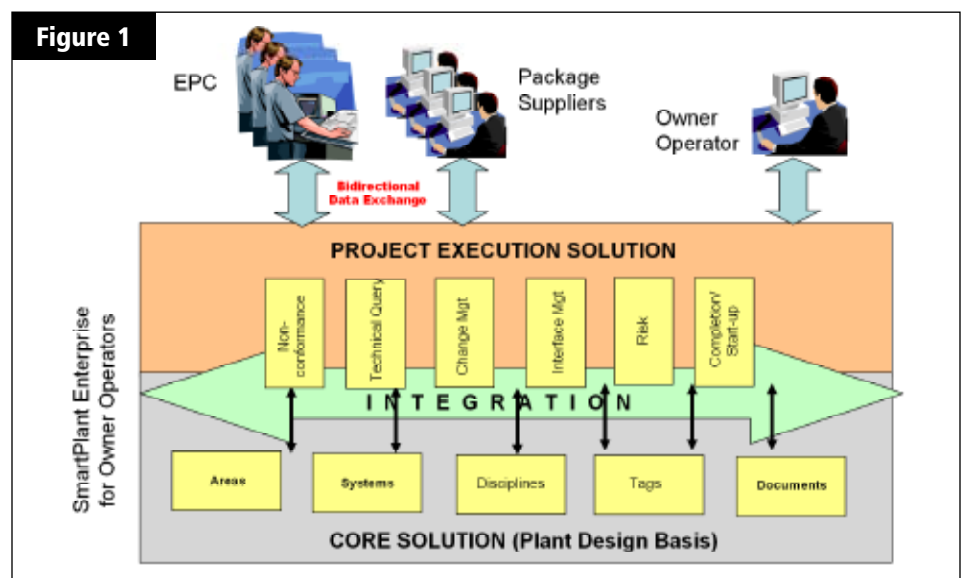
The lack of a good change management process results in a major drain on project executive resources. It can also jeopardize the achievement of project schedule, budget, quality and safety targets.

The SPO Management of Change process for projects provides:

- Increased visibility through management reporting
- A method for implementing increased discipline and rigor in the change process, including the critical distinction between change within existing scope (commercial and design development) and additions to existing scope (commercial and design change) as shown in the standard report from the SPO Management of Change process.

The SPO Management of Change process provides auditable traceability to demonstrate adherence with the owner operator project authorization matrices. Savings of one to three percent of CAPEX investment are possible from enabling a tighter change discipline and increased scrutiny of changes across the value chain.

In addition, administration costs and cycle times are reduced through:



**Figure 2**

**CHANGE SUMMARY REPORT**  
 Plant/Installation : Main West  
 Project : Explore  
 Date/Time : 02.05.08

Design/Commercial Development within scope/budget

	Total Number	Total Value (1000 \$)	Changes being handled						Changes completed							
			Status: Registered			Status: Ongoing			Status: Rejected		Status: approved		VOR		VO	
			No.	Value	VOR No	VOR Value	Number	Value	Number	Value	NO	Value	NO	Value		
Project Changes	299	1364000	65	273000	98	148000			117	587000						
Site Changes	417	1750000	89	245000	115	465000	274		172	666000	320	766000	766000			
Design/Commercial Changes outside existing scope/budget																
Project Changes	448	352200 (9%)	125	110000	180	114000			45	54200	96	74000				
Site Changes	533	586800 (14%)	172	144900	192	155000	302	155000	87	82500	102	206800	171	206800	206800	
<b>Total Change</b>	<b>1695</b>	<b>4655000</b>	<b>451</b>	<b>772500</b>	<b>565</b>	<b>902000</b>			<b>172</b>	<b>826700</b>	<b>487</b>	<b>1553800</b>				
Budget ref.		5200000														

Annotations: "Within existing project scope" points to the top section. "Additional project scope" points to the bottom section.

- Automated hand-off of the change process between the owner operator and EPCs
- Implementation of workflows to push the change through the pre-defined work process
- Reporting providing both overviews and identification of bottlenecks in the management of change process.

The close integration of the management of change process in SPO with the plant design basis facilitates the evaluation of change requests. Users can easily identify what other changes involve the same plant items and documentation and determine any potential conflicts or synergies.

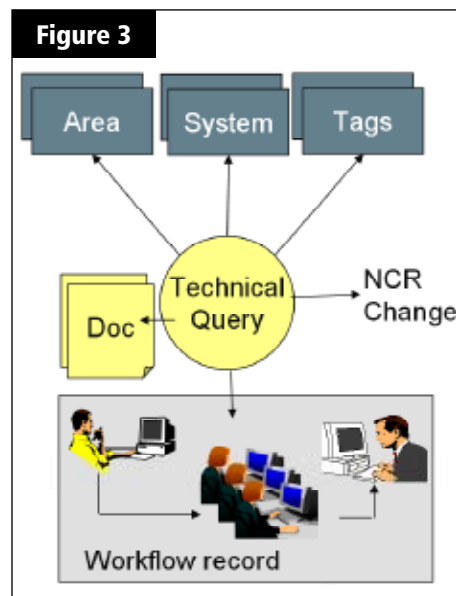
**Non-conformities**

Non-conformities and deviations to relevant laws, regulations, corporate governing documents and project specifications all need to be closely managed on projects. The process is tightly linked and integrated with the other project execution processes such as the management of change process and is required to demonstrate compliance with regulatory requirements. Non-conformity requests may need to involve the owner operator corporate organization experts in evaluation of potential technical, HES impacts, etc. and regulatory authorities.

The management of non-conformities and waivers in many organizations is performed by traditional paper-based or electronic archive systems. Such systems often suffer from non-conformities and the associated history of

review and approvals not being easily visible, especially during operations. When an incident does occur in a plant with such a system, it can take a long time to gather the necessary information together for the investigatory team and to receive permission from regulatory authorities to resume production.

The non-conformity process in SPO manages non-conformities from all parties (corporate, project/site team and contractors/suppliers) and the granting of temporary and permanent waivers. During project execution, the exchange of non-conformity-related information between the owner operator and contractors may be facilitated by Web services. This process is undertaken during project execution and the resulting non-conformity data are handed over seamlessly to operations (Figure 2).



The transfer of non-conformity information to operations, including the plant items and areas that are affected, helps to prevent the occurrence of incidents by making non-conformities highly visible for operations so that preventative steps can be taken, such as increased inspection. When incidents do occur, the process reduces the downtime impact of the plant and quicker restart of production by enabling all documentation and information related to the waiver process to be made available without delay. This includes complete, auditable traceability of the process leading to the waiver.

The benefits of this process are estimated at an average of three to five days per year in avoided production loss (OPEX) and reduced time and administrative effort needed to accumulate information from incidents. But these benefits pale in comparison to the potential avoidance of loss of reputation to an owner operator that can be achieved by increased visibility of non-conformities and proactively preventing an incident that causes environmental damage, an injury or loss of life.

**Technical queries**

Technical queries (also known as site queries) occur across the value chain on CAPEX projects. A technical query usually involves a request for an engineering or construction clarification. Generally, project procedures require a fast (typically 72-hour response) to a query. Not meeting this deadline can give rise to variation order claims from contractors and suppliers. On any large CAPEX project, thousands of these queries arise, and some of these result in non-conformities or change requests.

Technical queries are a fact of life, and projects today often suffer from a lack of overview of the technical query situation. This makes it difficult to identify bottlenecks and ensure proactive steps are taken to avoid late response to technical queries with the potential consequence of project delays and variation order claims increasing.

The SPO technical query process (Figure 3) provides for effective monitoring of query handling, plus it enables automated workflow and management reporting. This can reduce project schedules by one to three percent by

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empowering project management to take proactive action to resolve bottlenecks in processing technical queries and resulting project delays. It can also produce savings of \$6-16 million on a \$1 billion CAPEX plant from reduced project costs by being able to start production and generate revenue earlier. Plus, potential variation order claims and administrative effort for all parties will be reduced.

#### **Interface control**

Interface control is a key project execution area for the control of all formalized internal and external interfaces:

- Between the main contractors, suppliers and owner operator
- Within the owner operator project team and the corporate organization.

The interfaces include technical items that need to be agreed upon and delivered between two or more parties in the project organization. This includes both contractors and the owner operator. There are often interfaces within the owner operator itself that need to be managed. For example, on an offshore oil and gas development there could be interfaces between the reservoir engineering, subsea development, drilling and topsides development subprojects as well as the corporate organization. All of these interfaces are broken down into hundreds of interface items that need to be

executed according to formalized contracts or agreements between the interfacing parties.

In many projects, interface control is performed by each interface coordinator, individually documenting the interface through multiple spreadsheets. This makes consolidated reporting and gaining an overview impossible.

The SPO interface control process offers a uniform means of reporting the status and exceptions for all interfaces across a project and provides the necessary visibility for project executive management to proactively manage conflicts between contractors and avoid schedule impact or variation order claims arising. Typical benefits for the owner operator include reduced variation order claims and reduced administrative effort in compiling reports and administrative effort in handling interfaces, resulting in CAPEX savings of one to two percent.

#### **Future work processes**

The processes described so far are those that are being prioritized. There are several other work processes that are planned for future releases, such as:

- Risk-reducing measures – Plant risks and the measures to be taken to reduce these risks “as low as reasonably possible”

- Supervision, the identification of management reviews and follow-up of findings
- Risk and opportunity management will identify risks and opportunities related to project execution. Measures taken will reduce the probability of risks and increase the chances of gaining from opportunities
- Technical issues administration with interfaces to administrative systems
- Site surveillance findings for deviations discovered by the owner operator construction/field teams
- Plant handover to operations – Streamlining the handover of the plant to operations by commissioning sub-system/area.

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#### **More information**

More information about SPO, including a brochure and solution sheets, is available at [www.intergraph.com/ppm/speoo.aspx](http://www.intergraph.com/ppm/speoo.aspx). Register to download SPO white papers at [www.intergraph.com/spo](http://www.intergraph.com/spo).