Schneider Electric's FLEX Project Execution Approach Designed to Help Take Automation off the Critical Path

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Keywords

Project Execution, Engineering, FLEX, Costs, Risk, Lean, Automation

Summary

A common theme that has emerged from recent ARC Industry Forums is that capital projects today frequently take much too long to execute, cost too much, and involve too much risk. This costs industrial organizations millions of dollars in capex and lost production, even for the shortest delays, impacting their profitability and overall business performance. According to many owner-operators and EPCs, automation is often on the "critical path" in these project delays, introducing front end engineering design (FEED) issues that can linger throughout both the project and the operating phases of the plant lifecycle.

> Schneider Electric introduced its FLEX Project Execution Methodology to help its customers reduce the time, cost, and risk in executing projects and help assure maximum efficiency and effectiveness of manufacturing operations.

A good part of the problem is that owner-operators and their EPCs alike have an increasingly limited pool of skilled workers, particularly those with in-depth knowledge of the industrial processes and associated automation technologies. This makes it challenging to protect margins and meet continually changing customer demands and market conditions. Faced with dwindling human and capital resources, everyone is being asked to "do more with less."

In response, a handful of leading automation suppliers – including Schneider Electric's Process Automation business – have beefed up their own resources and marshalled their technologies and know-how to help take automation off the critical path for both capital projects and ongoing operations. As ARC Advisory Group learned in a series of recent briefings with company executives, Schneider Electric calls it's aptly named program for accomplishing this, "FLEX." FLEX, which stands for "Flexible Lean Execution," applies to

the company's solutions based on Foxboro Evo Process Automation System and Triconex Process Safety system.

We learned that Schneider Electric designed FLEX to"…mitigate the human influence on project execution and secure automation off the critical path." The company also believes that its method for automatically tracking and validating data entered early in the project ("early data") puts it in a unique position in this respect and can provide significant value throughout the project execution phase and across the entire plant lifecycle. This is consistent with ARC's own research, which indicates that approximately 80 percent of plant capital costs are fixed in the early stages of a design, positioning front end engineering design (FEED) as a key function to reduce these costs and provide significant business benefit across the project lifecycle.

Components of Schneider Electric's FLEX Project Execution Services

As we also learned, FLEX combines what the company refers to as "Intelligent Engineering" components with its "Intelligent Marshalling" technology.

Intelligent Engineering encompasses:
- Device templates and rules (capture best practices)
- Engineering workbench (provides a rules-based workflow engine)
- Cloud engineering (supports virtualization and collaboration)
- Integration with Intergraph SmartPlant design tools (minimizes data entry requirements)

Intelligent Marshalling encompasses:
- Schneider Electric's Universal I/O (enhances flexibility)
- Pre-engineered cabinets (reduces costs and time-to-power up)

Project Execution Directly Affects the Bottom Line

With investment capital tight for many companies, any new project must face stringent ROI analysis to gain management approval. Once approved, completing projects on time and within budget is critical to the bottom line of producers and investors. Here, front end engineering design (FEED) represents a critical component of project activities. For owner-operators to

execute projects and lower costs and design risk and maintaining quality expectations, they must have a solution that can accept later changes and apply knowledge rules to templates. They should be given an opportunity to reduce the project schedule by adapting to the maturity of the EPC design information, using incomplete "early/preliminary" design project data and removing project constraints, such as the traditional full hardware factory acceptance testing (FAT). They must be able to reduce time-to-value by using cutting edge emulation technologies to ensure that process design, control schemes, and start-up procedures are dynamically tested in advance; and engineers, operators and field technicians are fully trained in start-up and plant operations.
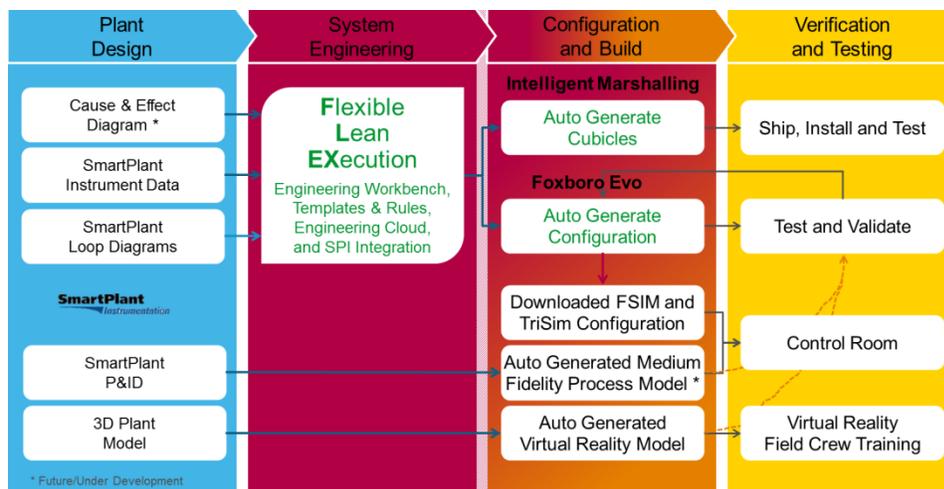
FLEX Integrates Automation with Plant and Process Design

Schneider Electric, which has been developing and deploying project execution methodologies for over 10 years, designed FLEX to leverage its technologies to make the automation component seamless and minimize opportunities for human error. This can help owner-operators maximize their information and knowledge investments. According to Schneider Electric, FLEX helps ensure consistent engineering data using an object-oriented infrastructure to provide "a single version of the truth."

Deploying Engineering Services

Traditionally, owner-operators delegated FEED, detailed engineering design, systems procurement, and final construction to their EPC (engineering, procurement, and construction) contractors. An EPC firm generally procured the process control solutions from automation vendors.

However, with the complexity and rapid technology changes of today's automation systems, it can often be advantageous for owner-operators to allow the automation suppliers (who know their systems best), to provide the related project engineering services along with the EPCs. In this capacity, Schneider Electric can assume responsibility for coordinating the project engineering activities. Using the FLEX approach can reduce costs and the number of change orders, provide a better-integrated solution, and provide the owner-operator with better control over the final solution.

> Schneider Electric's believes that when considering this approach, it's important for owner-operators to understand the value of a single, global delivery organization – around-the-clock engineering, access to the most appropriate subject matter experts from around the world, and the most extensive breadth and depth of industry specific experience available for the platform – all often unmatched by delivery teams that are more local or regionally focused.

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FLEX Benefits

With the Intelligent Engineering component of the company's FLEX approach, engineers can work concurrently on a project in the "engineering cloud." Systems designed "virtually" in the cloud can subsequently be loaded into the physical system infrastructure right before deployment. The cloud allows engineering and testing activities to be executed from multiple locations, which can also reduce travel requirements for testing purposes. Automating this workflow allows engineering to be taken off the critical path with early information to help reduce errors during deployment. This, in turn, helps to reduce schedule uncertainty and downstream risks.

With Intelligent Marshalling, universal I/O is programmable, so it can be configured via software as analog input, analog output, digital input, or digital output; enabling the physical I/O to be added to the project at a later time. Pre-engineered cabinets eliminate the need for custom cabinets. This can all help save significant time off the automation projects. The universal I/O-enabled FLEX methodology separates physical from functional design,

allowing parallel workflows using standardized designs and enabling engineering to be done from anywhere in the world. This helps compress project schedules and lower the risk of startup delays.

Intelligent Engineering with Cloud and SmartPlant Integration

Information management and interoperability of models and data are critical to successfully managing large projects. Owner-operators have made it clear that they need better data management platforms with a more collaborative engineering design environment for their geographically dispersed engineering teams. They see the need to move to a central data repository for all design models, build data, and equipment and asset data. Moreover, beyond engineering organizations, they need a highly collaborative platform to support the wide range of users throughout the global operations typical of today's companies. FLEX's Intelligent Engineering cloud was designed to address these needs.

Benefit Area		Benefits
Delivery	JIT Hardware Build	• Reduce time on the staging floor therefore reduce staging area required
	Global team working	• Reduction in travel and accommodation Reduction in integration errors Reduced rework cycle time costs • Increase Subject Matter Experts' involvement for testing
	Supported common engineering environment	• Maximum utilisation of computing resources which are shared across all users (virtual systems only use resources when running) • Individual offices do not require their own simulation and development systems • Engineering environment stored on centrally supported backed up servers disaster recovery (future)
	Pre requisite for reduction in staging areas	• Global program for consolidation of staging facilities.
Clients	JIT Hardware Build	• Early shipment and installation of system HW • Reduced risk of delivered HW obsolescence and failure • More flexibility in project schedule reduced risk
	Global team working	• Reduction in travel and accommodation. Ability to test the system functionality from their own desk.

Schneider Electric's FLEX Engineering Cloud Benefits

The Schneider Electric-owned and supported FLEX Engineering cloud allows engineers to share, build, and test systems from any location, supporting remote client access in a secured corporate IT infrastructure. This cloud platform is an important component to FLEX, since it provides a common, globally accessible (yet secure) repository for all plant/facility drawings, layouts, equipment, and infrastructure information. Not only is this engineering information essential during the project execution stage of a facility, it must be managed and organized properly so that it can be readily accessed and available to the operations personnel during plant life.

Key features of the FLEX Engineering Workbench include design data validation reporting, design database change reporting, control and safety device logic generation, HMI symbol generation, and hardware automation. FLEX's Engineering Workbench Efficiency Model is a software model for project engineering hours based on validated feedback from project teams.

According to the company, models based on developing full rules on each project can provide about 10 percent savings using software engineering, with an additional 6 percent savings if the rules and templates are re-used.
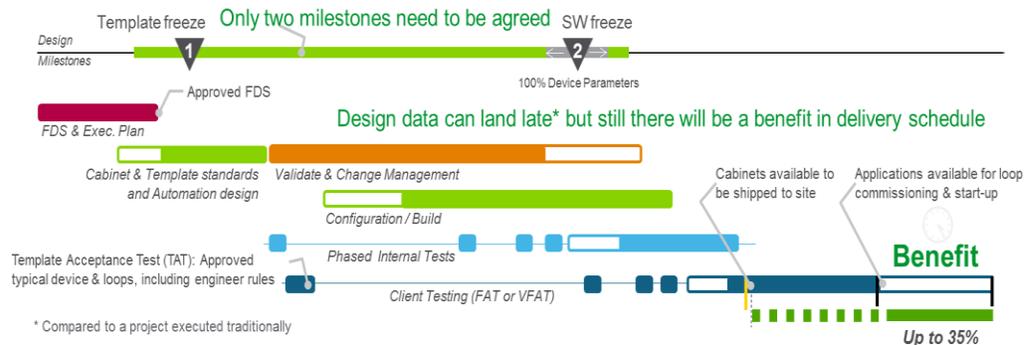
How a FLEX Schedule Improves Project Execution

Adding a hardware efficiency model results in about an additional 10 percent savings.

FLEX includes a large library of project templates that encapsulate best practices. These are designed to help reduce project schedule, costs, and risks. The templates work in association with best practice rules for use with the Engineering Workbench and a large library of industry application and graphics symbols for control, safety, and electrical assets.
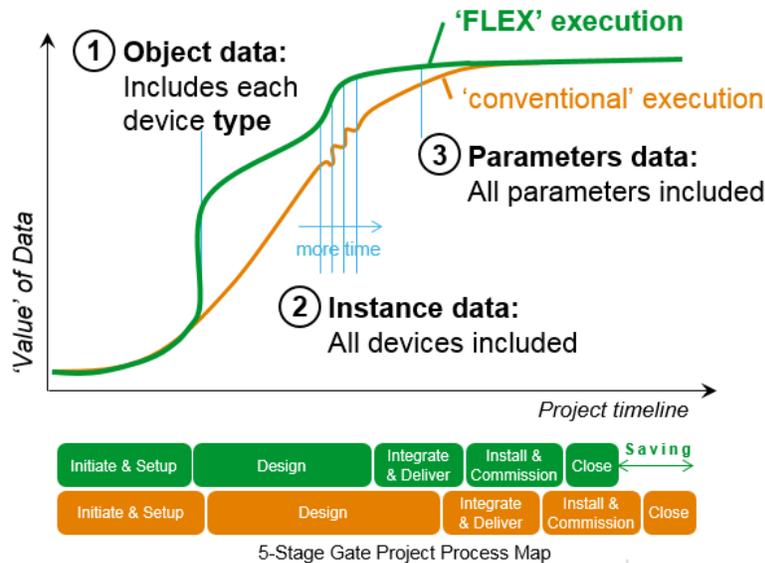
FLEX collaborates with Intergraph's SmartPlant Enterprise engineering solutions to enable automated project execution and improve data transfer to owner-operators. Intergraph's SmartPlant Enterprise is an integrated suite of solutions to design, construct, operate and maintain a plant throughout its entire life cycle. The interfaced FLEX and Intergraph solutions will enable all parties to work with a common engineering solution to better manage plant information to enhance plant safety and efficiency from design through decommissioning. The solutions are suited for ongoing maintenance activities, as plants and assets are continually changing and being revised even after the project engineering is completed.

The FLEX SmartPlant Integration (SPI) return can backfill the project's database using the as-built data available within the Engineering Workbench. In just one example, at the recent expansion of the largest refinery complex in India, 5,000 instrument loop drawings were generated without a single error by eliminating the need to enter data manually, which is typically a tedious, time-consuming, and mistake-prone activity.

Intelligent Marshalling

Intelligent Marshalling is a per-channel-configurable I/O module concept designed to eliminate the need for physical marshalling cabinets. Intelligent Marshalling reduces equipment and footprint costs, while providing significant documentation, inventory, and field labor savings.

FLEX's Intelligent Marshalling solution is entirely software configurable. All changes can be done via a remote workstation, with no extra hardware required. This not only saves engineering time, but also reduces the costs associated with physically sending maintenance and field service technicians out into the field to make a change.

FLEX Improves Project Timelines

FLEX Intelligent Marshalling Universal Fieldbus Modules can be configured securely on a per-point basis from anywhere in the world. The new Universal Fieldbus Module accommodates a variety of signal types, including both analog and discrete. The company estimates that project savings can approach 20 percent by eliminating traditional marshalling cabinets; minimizing spare parts; and reducing commissioning labor, documentation, and lifecycle maintenance costs.

Conclusion

Companies across nearly every vertical industry must invest to build new assets or revamp existing assets to meet market and/or regulatory demands. In today's capital-constrained environment, this typically requires justification metrics that can be challenging to obtain. No owner-operator or EPC can risk having a project run late or go over budget. Reliable and transparent management of the FEED is needed to avoid this.

Important solutions such as Schneider Electric's FLEX project execution program should go a long way toward helping improve engineering efficiencies,
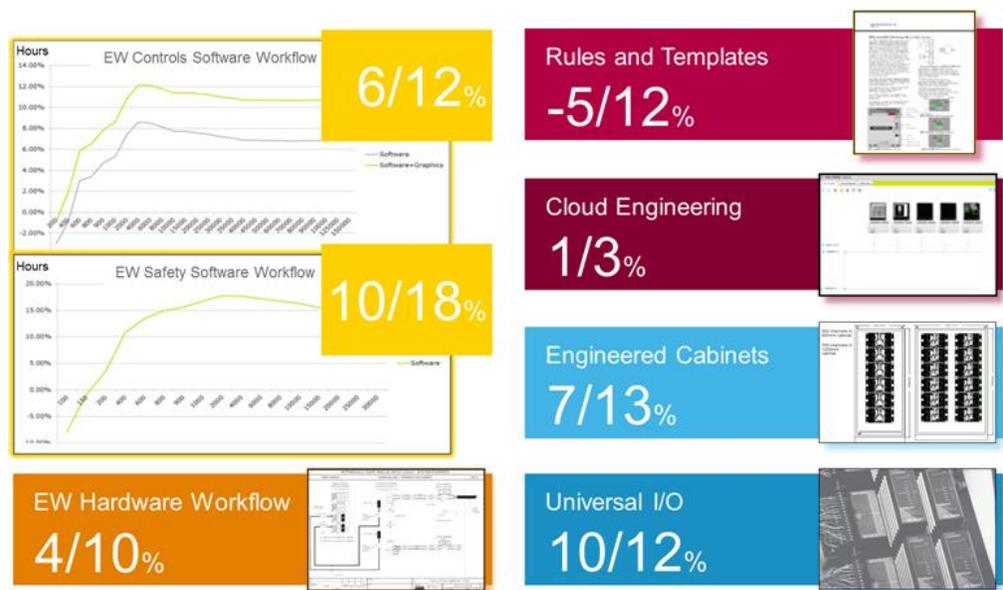
Projected Savings from FLEX Intelligent Execution

reduce costs, increase safety, assure regulatory compliance, quality require-ment and shorten project schedules. FLEX provides more time to accept late changes in design requirements, increasing schedule flexibility, removing a substantial amount of work from the critical path, and reducing time to op-erations/time-to-value.

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