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Deliver Your Next Project
**ON TIME,
WITHIN
BUDGET**

Through Technology and Services Innovation, Emerson Process Management Is Transforming How the Process Industry Executes Projects

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Partner Early to Optimize Automation Project Strategies

While time always seems short, an upfront investment in assessment and planning will more than pay for itself in the course of your next project

Just ask any group of process automation professionals or project managers about the most satisfying capital project of their careers. Each will cite a particular set of challenges overcome or business benefit achieved, but two common denominators of project execution success quickly emerge: starting up on schedule and finishing within budget.

But across today's global process industry and energy landscape, forces are arrayed to derail such project satisfaction. Indeed, even as the industry experiences a demographic dip in its

supply of qualified workers, projects across the globe continue to get larger and more complex. A recent survey of executives responsible for projects of \$1 billion or more by the Accenture Center for Energy & Utility Innovation found that only a third of respondents saw projects routinely delivered within 25% of approved budget, while even fewer saw them routinely delivered to the approved schedule. Such delays and overruns could amount to trillions of dollars in added expenses and lost revenue annually, the study concluded.



MAKE TIME TO SAVE TIME

Fortunately, an array of proven automation technologies, project services, and business practices is now available to reduce project costs, speed execution as well as mitigate the effects of late design changes. And the time to consider them is as early in the project cycle as is practical, before “the way we’ve always done things” is deemed, by default, the least risky path forward. Time invested in upfront planning is rarely if ever a poor investment, according to the Construction Industry Institute,

which in a recent report attributes as much as 20% cost savings and 39% schedule reduction for overall project design and construction to the practice.

While few industry professionals would argue the value of upfront project planning, sufficient resources and expertise often are lacking among the owner/operator and engineering, procurement and construction (EPC) community, especially when it comes to the evaluation and application of new automation technologies and related business processes. Enter Emerson Process Management and



its large and growing project services organization. As a leading innovator in the process automation space, Emerson is uniquely qualified to help users develop a strategic vision for their project investment, and to identify opportunities for automation technology to reduce schedule and cost risk during the project itself—as well as enable operations that are safer, more reliable, more efficient and more profitable long after start-up.

INTEGRATED TEAM TACKLES CANADIAN BITUMEN

It pays to establish a transparent, collaborative partnership among all parties involved, whether these services are engaged with on an a la carte basis or under the

scope of a larger main automation contractor (MAC) relationship, according to Rusty Barras, control systems engineer for Royal Dutch Shell, and MAC contract manager for the company's Carmon Creek project in northern Alberta, Canada. Initial construction and detailed design began last year on a series of well-pads and central processing facility that will produce 80,000 bpd of bitumen by steam injection.

Shell engaged with Emerson Process Management on the project in September 2012, six months before front-end engineering and design (FEED) began. As a result of this early collaboration, they've taken a number of steps to streamline and modularize project execution, such as leveraging Electronic Marshalling with



“The Emerson folks are an extension of my discipline; we have the ability to make decisions quickly, and to make our ideas reality.”

– Rusty Barras,
Royal Dutch Shell

FLEXIBLE CONTRACTING ENABLES INNOVATION

Of particular benefit to Barras and his team is a flexible contracting strategy that allows engineers from Shell, Emerson, and Emerson local business partner Spartan Controls to “work quickly, focus on quality, and not worry about the commercial side,” Barras says. “We established a good, integrated team early on in the define stage of the project, and hit the ground running with a sound and flexible execution plan,” Barras says.

The stakeholders also engage in quarterly business performance reviews in which each grades the others on how well they’re meeting expectations in terms of safety, schedule, innovation and responsiveness. Any shortfalls are discussed, as are potential solutions, Barras says. “These honest exchanges help promote the integrated team aspects of the project.”

The Carmon Creek automation team continues to pursue innovative ways to streamline project execution, and it’s seldom business as usual, according to Barras. “Much of what we’re doing, we’ve never done this way,” Barras says. “The Emerson folks are an extension of my discipline; we have the ability to make decisions quickly, and to make our ideas reality.” ■

CHARacterization Modules (CHARMs) technology and standardized remote I/O cabinets throughout its DeltaV integrated process control and safety system architecture.

Along with the ability to better accommodate late design changes, these efforts are allowing the team to shift a significant amount of planned project work to modules that can be completed offsite. “Everything we can put back in the mod yard is a big savings,” Barras says, noting the short summers and high wages at the production site. Virtualization and WiFi enabled Mobile Worker technology, which promise to further streamline project execution, are on the docket to evaluate further as more detailed planning continues, Barras says.

Leverage Technology for Fast, Flexible Designs

As project details take shape, look to collaborative platforms and decoupled hardware and software development paths to speed execution efforts

As early project visioning shifts into more detailed engineering, it's time to take a much closer look at how the latest automation technology and project execution methodologies can be brought to bear for project success. Key automation considerations at this stage include evaluating those technologies that will reduce project costs and schedule risk, as well as those that will enable improved plant performance once operations takes over. As it happens, some key technology decisions can advance the cause on both counts. And the global project services team from Emerson can guide you on the path—and help execute the details, too.

In particular, virtualization, simulation, Electronic Marshalling, and wireless networking are among the proven technologies that can have a dramatic positive impact on project cost and schedule, while contributing to more efficient and flexible ongoing operations as well.

COLLABORATION TECHNOLOGY PROVIDES ACCESS TO GLOBAL EXPERTS

In order to facilitate collaboration, Emerson developed its Remote Virtualization Office platform based on insights gained through the company's Project



Management Office. This platform enables remote engineering, connecting Emerson's global team of project engineers and subject matter experts, clients, and other stakeholders throughout the project execution process.

The Remote Virtual Office platform provides an integrated engineering environment where project members can collaborate on engineering systems and tools. Data management tools exchange plant data between the Emerson integrated project database and engineering design packages such as SmartPlant Instrumentation. From the integrated project database, the base layer for the control system application



is created automatically. Further, control system loop diagrams and other project documentation can be generated automatically, negating the time consuming and error prone manual exchange of data. Project engineers have access to libraries of proven application code that go beyond standard function blocks and provide optimal control for many devices, for example, variable speed drives. Emerson engineers maintain client-specific libraries for re-use on the client's projects around the globe. This further speeds design execution, minimizes potential errors, and makes for more consistent, supportable systems down the road.

During the recent construction of a state-of-the-art biopharma facility in southeast Asia, the depth of the global project services team that Emerson was able to bring to bear proved particularly critical. Due to an unanticipated project delay, the drugmaker had a limited, eight-month window to advance from the functional specification its own engineers had completed to a fully realized automation system design.

"We brought Emerson on early, and were able to leverage their process expertise and their understanding of their systems," said the automation specialist responsible for the plant design. "And when we needed to move quickly, Emerson ramped up people

“You can run through everything you normally would in a factory acceptance test, without any control or I/O hardware at all.”

– Peter Zornio, Emerson

in multiple locations around the world.” Indeed, as many as 65 people from 10 Emerson locations in Europe, Asia and the Americas were engaged on the project, which currently is being put through its final pre-start-up paces. “Who else but Emerson could do this?” he asks.

PROJECTS MOVE FASTER WITH HARDWARE, SOFTWARE DEVELOPMENT DECOUPLED

In addition to facilitating global collaboration among project team members, the Remote Virtual Office platform offers the ability to fully virtualize DeltaV control system servers, controllers and the Electronically Marshalled or traditional I/O; a detailed system design and configuration can be fully developed and tested on the fly, independent of its ultimate hardware implementation.

Clients also have access to the Remote Virtual Office, so when it comes time for the FAT, they can do a virtual FAT, or VFAT, from the comfort of their own office. “You can run through all the things you normally would in a FAT, without any control or I/O hardware at all,” explains Peter Zornio, chief strategic officer, Emerson Process Management.

Meanwhile, the latest controller, server and

operator station hardware, together with field enclosures or remote I/O cabinets with CHARMs technology, are shipped directly to the site. The junction boxes can be shipped to the plant before configuration is done, and ahead of the controllers, servers, and workstations. This is possible because with Electronic Marshalling, I/O hardware design specifics are no longer beholden to a final process design. An approximate total I/O count, irrespective of type, is all that’s needed. Each and every channel is fully characterized by its respective CHARM plug-in, which can be added or changed even up to the last minute without impacting the overall hardware design. “You can plug in the characterization modules (CHARMs), download the pre-tested configurations and you’re off and running,” Zornio adds.

Even after the project is complete, virtualization continues to deliver low-risk system maintenance benefits at the server and workstation level, effectively decoupling the technology upgrade cycles of one’s hardware and software.

WIRELESS MAKES ADDED INSIGHTS VIABLE

Wireless provides the ultimate in installed instrument cost savings, and in a growing number of greenfield projects users are opting to include a WirelessHART-based instrument network infrastructure from the very beginning. Further, a WiFi-based wireless plant network for enabling Mobile Worker applications can make for much faster instrument commissioning and loop-checking during a project’s final stages, effectively doubling the productivity of field technicians. Emerson project consultants can help identify the best solution for your needs and justify either or both types of wireless network investment, and, in the case of instrumentation, help determine which measurement points are clear candidates for wireless savings—and which are best left physically connected. Either way, early in the design cycle is the time to decide if wireless makes sense within the specifics of your particular project.

Of course, not all engineering and design decisions that need to be made hinge on the latest technology advances. Because of its depth of application experience and breadth of product portfolio, automation experts within Emerson’s project services group also can answer more prosaic questions that nevertheless impact project risk and ongoing operations, such as “Which flowmeter technology is best suited for this particular application?” ■



Simplify, Standardize to Streamline Onsite Tasks

Early attention to system flexibility and human-centered design increase the odds of efficient installation and commissioning—and a trouble-free start-up, too

The installation and commissioning phase of any automation project is where planning and design finally meet three-dimensional, application-specific reality. Valve meets pipe flange; screwdriver meets terminal strip. Just how efficiently the rollout proceeds is largely the result of all the planning and design work that's gone before. Thousands of earlier decisions—both large and small, for good or ill—will largely determine how smoothly this final project execution stage unfolds.

From a control and instrumentation point of view, installation and commissioning are all about efficiency and flexibility. Is the instrumentation and I/O infrastructure designed to be installed quickly, while minimizing the potential for errors? Have instrument technicians been given the tools they need to commission instruments and check loops as efficiently as possible? Is the automation system flexible enough to gracefully accommodate late engineering changes, or will incoming revisions throw the schedule (and budget) into a tailspin?



HUMAN CENTERED DESIGN ILLUMINATES NEW PATH FORWARD

The often unfavorable answers to these questions, among others, first prompted Emerson some 10 years ago to investigate and then apply human-centered design to its products and systems. Based on the three directives of eliminating unnecessary work, reducing the complexity of technology, and embedding knowledge into technology, human-centered design is now a cornerstone of the company's technology development process.

But the influence of human centered design is also apparent in the delivery of project services. For example, a virtual factory acceptance test (VFAT) that a user can perform from the comfort of his own desk is certainly a step toward eliminating unnecessary work and time (notably travel). But the implications of human centered design on project delivery are perhaps most apparent when hardware, instruments and software arrive on site, ready to join up with their real-world context.

If spearheaded by the Emerson project services organization, the various elements of a process automation project likely will arrive on site already optimized to minimize risk to schedule and

to budget. Pre-configured cabinets complete with electronically marshalled I/O, together with wireless instrument networks, will be leveraged where practical to dramatically trim the cost and effort needed to install the I/O infrastructure. Electronic Marshalling, for example, effectively reduces the number of screw terminations by up to 70% as well as eliminates the need for marshalling cabinets altogether. The need for fewer terminations also means less work and fewer opportunities for error. As one industry pundit observed, "It's hard to make a mistake on a task if you no longer have to do it."

MITIGATING THE EFFECT OF LATE I/O CHANGES

Another key appeal of Electronic Marshalling with CHARMs technology is that if a new measurement point comes late to the project, even after installation has begun, the new instrument wire need simply be landed on any available termination pair in one of the standard I/O enclosures. The signal is then characterized as one of a wide breadth of analog and digital input and output types supported with CHARMs technology, including AI 4-20mA, AO 4-20mA, AI 0-10V, thermocouple, RTD, DI dry or NAMUR, DO high

side, relay contact output, and isolated DI and DO for higher currents or higher VAC voltages. Other control system modifications needed to bring this new point into the automation architecture are limited to software; the hardware design itself need not be touched.

Wireless instruments, of course, effectively eliminate the need for traditional I/O altogether, connecting instead to a WirelessHART self-organizing mesh network. And with the latest access point from Emerson, jointly developed with Cisco, WiFi and WirelessHART connectivity comes in the very same box. This enables the deployment of Mobile Worker applications that run on tablets, smartphones or other portable devices. With Mobile Worker applications loaded on their mobile devices, instrument techs can see what the operator sees from wherever they are located. They can proceed to commission instruments and verify the integrity of control loops without relying on walkie-talkie communications with a second tech back in the control room, effectively doubling productivity.

These are but a few of the ways that Emerson technology is helping to reduce project risk and budget. “We’re addressing the entire project execution chain, starting with plant design and FEED, electronic data interchange, detailed engineering libraries, virtualization, and flexibility in the field,” says Peter Zornio, chief strategic officer, Emerson Process Management. “We can dramatically revolutionize the project execution process.”

SERVICE THAT TRANSCENDS TECHNOLOGY

But for some customers of the Emerson project services team, it’s not the technology they remember. It’s the professional and personal relationships, and the commitment to deliver. For example, at the liquified natural gas (LNG) terminals that line the coastline of Qatar, some 100 million standard cubic feet per day of jetty “boil off” gas was once flared each and every day, a by-product of the tanker loading process. But not any longer. Qatargas successfully started up in October, 2014, its Jetty Boil-off Gas (JBOG) Recovery Project in Ras Laffan Industrial City, a \$1 billion investment designed to eliminate flaring and reduce greenhouse gas emissions. Emerson, a longtime partner of Qatargas, was a key supplier of electronic controls and valves for the project, according to Michael Koo, project manager, Qatargas.

“We engaged with Emerson at the beginning of

“As a result of the close working relationship with Emerson we were able to overcome many issues relating to the existing systems.”

— Michael Koo, Qatargas

the project in 2010,” Koo says. “Several engineers from Emerson worked with our team in Houston along with Fluor while we were doing the detailed engineering drawing and developing the concept of the electronic controls system. As a result of the close working relationship with Emerson we were able to overcome many issues relating to the existing systems.” Further, due to the excellent long-term relationship with both Emerson and ConocoPhillips (a Qatargas shareholder), the JBOG project team also was able to test one of its valves at the Emerson Innovation Center flow lab in Marshalltown, Iowa.

One of the biggest challenges of the project was tying in the existing systems of the off-plot areas with the new JBOG Recovery systems, Koo says. Effectively, this means that the project team had to split its work into manageable pieces that could be performed at off hours in between tanker fills. “Emerson worked diligently with the project management team and the construction contractor’s field personnel as well as the Qatargas maintenance personnel to ensure that the installation and testing of the interface systems were completed without incident and within the shipping windows.”

“As in any project there were issues,” Koo admits. “However, Emerson and the project team worked together to resolve them.” ■

It's time to LOOK AT PROJECTS DIFFERENTLY

Looking for a way to avoid unforeseen and unrecoverable risks, budget overruns, schedule slippage, and unreliable partners? With Emerson's global project services team providing guidance, you will reduce cost and schedule risk throughout the project.

PROJECT SCHEDULE RISK

\$135
million
AT RISK

56%
INEFFECTIVE
communication

For every \$1 billion spend on a capital project, \$135 million is at risk. 56% of that (\$75 million) is at risk due to ineffective communication.

—2013 Pulse of the Profession, Project Management Institute

40 percent of projects in the oil and gas industry are subject to budget and schedule overruns.

—Capital Project Execution in the Oil and Gas Industry. M. McKenna, H. Wilczynski, D. VanderSchee. 2006 Booz Allen Hamilton survey from 2006 of 20 companies (super-majors, independents and EPC firms)

budget & schedule
OVERRUNS
40%

30%
anticipated value
DISAPPEARS

Up to 30 percent of anticipated value disappears during the turnover/ commissioning and ramp-up phases of new asset lifecycles.

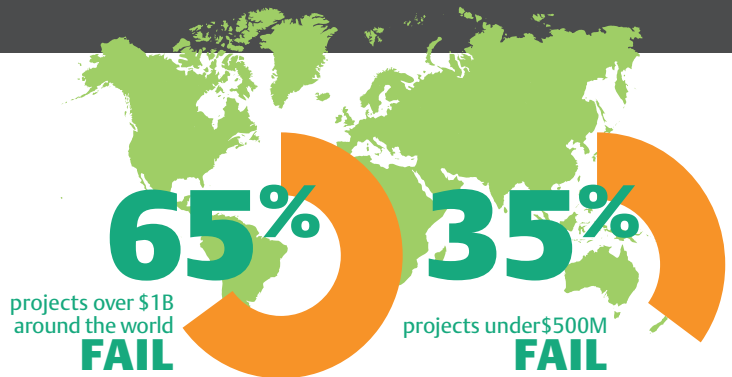
—Deloitte. Effective Operational Readiness of Large Mining Capital Projects - Avoiding value leakage in the transition from project execution into operations. Article, 2012.

20%
cost savings

Good front end planning leads to as much as 20% cost savings and 39% schedule reduction for total project design and construction.

—Construction Industry Institute: Adding Value Through Front End Planning. CII Special Publication 268-3

39%
schedule
REDUCTION



A project is considered to have failed if the schedule slips or the project overspends by more than 25%, the execution time is 50% longer, or there are severe and continuing operational problems into the second year of the project.

—Speed Kills, Klaver, Ali. 2012 Project Manager Magazine

PERSONNEL



50% expected to
RETIRE

50% of experienced and managerial personnel in national and international oil gas processing companies are expected to retire in the coming decade.

—Society of Petroleum Engineers, "The Great Crew Change: A Challenge for Oil Company Profitability", April 16, 2011.

6 TO
7
YEARS

It takes an average of six to seven years to develop new employees into autonomous petrotechnical professionals who can make non-standard, original technical decisions.

—2010 SBC Oil & Gas HR Benchmark, Schlumberger Business Consulting Energy Institute, March 2011

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