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Mega-Project Management: Reducing Risk & Complexity Across the Value Chain

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Executive Overview

Mega-projects have become commonplace in the oil and gas industry. Offshore oil and gas development increasingly tilts toward the mega-project scale because of the burgeoning exploratory success the industry is enjoying in ultra-deep waters, where development project costs routinely run into the billions and schedules can span half a decade or more.

In the downstream side of the industry, some of the new grassroots capacity additions qualify as mega-projects because of the long timeframes and the billions in capital costs that are incurred. Such projects entail enormous challenges in logistics planning, scheduling, communications, data management, and risk analysis. With mega-projects comes a great need to better collaborate and share information across the value chain that ultimately will drive down costs and increase the accuracy of delivery dates. Owner-operators, contractors, and suppliers working in the petroleum industry all must find innovative solutions to minimize complexity and risk in these massive undertakings, as it becomes a top priority to have all players on a project team work more closely together.

Refiners and petrochemical producers over the decades have often grappled with low margins for their products amid the turbulent ebb and flow of commodity prices and supply/demand shifts. Concerns over emissions and safety have long been trouble spots. However, now we see those concerns not only heightened but expanded to include carbon emissions—and the consequent demand for alternative fuels that threaten refiners' markets and petrochemical feedstock costs. Overriding all of these concerns, however, is that of market balance: With all the daunting macroeconomic challenges of supply and demand, how can we ensure an acceptable payoff from a downstream mega-project? Can refinery and petrochemical plant operators optimize capital and operating costs while addressing safety and environmental concerns in a perpetually low-margin environment? How can processing plant operators streamline turnaround schedules to minimize costs and downtime over the long term?

An increasingly complex and volatile business environment requires sound solutions for downstream oil and gas companies seeking to mitigate risk, enhance efficiencies, and rein in costs while planning, building, and commissioning mega-projects. Enterprise

Project Portfolio Management (EPPM) solutions, like those from Oracle, provide collaborative tools to help meet those goals. In addition, EPPM solutions can maximize collaboration and integration, provide real-time and uniform program visibility and predictability in a way that goes beyond traditional solutions to optimize the value of a capital asset throughout its lifecycle.

Introduction

Mega-projects loom large, appropriately enough, in our collective consciousness. The Panama Canal. Hoover Dam. The Channel Tunnel. These massive projects that incur billions in costs and that can sometimes stretch over many years capture the imagination and inspire awe at their scope and scale. At the same time, some mega-projects can inspire a different kind of awe: disastrous results from bad planning, unexpected negative consequences of epic proportions, and mind-boggling budget busts.

Recent research suggests that as many as 9 out of 10 projects experience cost overruns that typically can range from 50% to 100%. And, according to a study by the Rand Corp. for the U.S. Department of Energy, the absolute value of cost overruns and schedule slippage increases with the size of projects.

With that kind of track record, why pursue mega-projects? Simply put, the economies of scale that mega-projects provide make them a necessity, especially in the modern world. There is a very good reason why hopelessly inefficient “teakettle refineries” have disappeared from the American landscape. They could not survive with the often thin margins refiners experience in today’s largely deregulated markets. At the same time, however, enormous market and regulatory hurdles still loom for refiners today. That’s why there hasn’t been a new grassroots refinery built in the U.S. since 1976.

Nevertheless, many downstream mega-projects have been executed since then, and new ones continue to be green-lighted worldwide. And yet more than ever, mega-project management—and the inherent risk associated with these projects—relies heavily upon collaborating and sharing information transparently and breaking down the barriers that exist not only within enterprises but between them. This requirement is especially critical for the challenges posed by long-range planning for a downstream mega-project. Given the lifecycle of assets in the industry, it’s imperative to be able to plan out 30, 40, even 50 years. Likewise, other issues are top of mind, such as ROI and the ability to conduct a

comprehensive assessment of a multitude of factors that determine the viability of investments.

This calls for a robust technology solution that can serve as a foundation for developing new processes to create a truly collaborative project team culture. Such a solution would enable the downstream petroleum value chain project owner-operator, contractors, suppliers, and partners to:

- Correctly align strategy, execution, and results to underpin stakeholder value;
- Improve decision-making and accountability through enterprise-wide visibility, workflows, and collaboration to reduce costs and deliver on goals and objectives;
- Reduce financial and performance risk; and
- Respond quickly and appropriately to changes in strategy, customer needs, market threats, and overall business uncertainty.

Ideally, such a solution would also be specifically tailored to the downstream industry; offer a complete, integrated enterprise project and portfolio management solution; and be extendable to other core process industry technologies, such as enterprise asset management and enterprise resource planning.

This paper will detail how EPPM solutions can meet these downstream mega-project requirements and will provide a case study to illustrate their benefits.

Refining Market Overview

Overall, the global refining sector is grappling with tough market realities. Right now, the pace of global capacity additions is outstripping the rate of demand growth. And what little demand growth refiners have seen is geographically uneven. There is a large and growing disconnect between the petroleum products markets of the developed and developing nations.

Additionally, the recession has hit refiners hard. After a period of robust margins in 2006–2007 that spurred a round of capacity additions, refiners have seen margins in negative territory about as often as they've been (very modestly) positive during 2008–2010. Overall, 2009 margins were the worst in over a decade.

The upshot is an outlook for increased downward pressure on margins, capital constraints, and a growing need to wring more efficiency from the existing asset base. All of this comes at a time of increasing environmental demands, including restrictions on carbon emissions.

In addition to these macroeconomic challenges, refiners must operate in a highly competitive environment that features significant huge sunk costs, substantial operating costs, and implicit margin ceilings owing to substitute fuels and the usual supply-demand forces.

Given such a dizzyingly complex value chain, taking on a mega-project in the refining business can pose mind-boggling challenges. For example, one major oil company's program to integrated planning and scheduling for routine maintenance, capital projects (including a nearly $4 billion refinery revamp), and turnarounds at four of its North American refineries entailed the support of over 2.2 million activities over a 5-year period.

Motiva Refinery Project

The reversal of fortune for refiners in recent years underscores the urgency of keeping an eye on cost containment, adherence to schedules, and risk management on capital projects today—all the more so on a mega-project such as the epic expansion that Motiva Enterprises LLC is undertaking at its big Port Arthur, Texas, refinery.

Motiva is a joint venture of the Royal Dutch Shell Group and Saudi Aramco that operates three U.S. refineries with a combined capacity of 740,000 barrels per day and about 7,700 Shell-branded gasoline stations.

Motiva is expanding its Port Arthur crude capacity from 275,000 barrels per day to 600,000 barrels per day, making it the largest refinery in the U.S. and one of the top 10 in the world. Construction began in fall 2007 and is slated to be complete in 2012 on the $7 billion project. A joint venture of Bechtel Corp. and Jacobs Engineering Group is overseeing design and construction.

The following details give a sense of the magnitude of this massive mega-project:

- 61,175 piles for a total of 4,500,000 linear feet, or roughly 850 miles;
- 285,000 cubic yards of concrete—enough to create a concrete tower the area of a football field 170 feet tall;
- 3,100,000 linear feet of pipe, or 600 miles;
- 5,600,000 linear feet of cable—enough to extend from the Port Arthur site to Chicago;
- Almost 2,000 pieces of equipment—everything from a 2 million pound, 284-by-30 foot crude distillation column to 3-by-2 foot vessels; and
- 78,000 tons of structural steel.

Making this mega-project especially tricky is that it must be accomplished amidst ongoing operations: The Port Arthur refinery will continue to operate at current capacity during the expansion project.

Oracle Primavera EPPM at Motiva

EPPM solutions have already proven their value to Performance Contractors Inc., a Baton Rouge, La.-based industrial contractor working as a general contractor on the Motiva refinery expansion. Performance Contractors was awarded construction of the mega-project's H-Block, which consists of the hydrocracker, naphtha processing, cat feed hydrotreater, and power station units. Work got under way on Performance Contractors' portion of the Motiva mega-project in February 2010 and is slated for completion in November 2011.

Oracle's Primavera P6 Enterprise Project Portfolio Management and Oracle's Primavera Contract Management solutions are the ―tools of choice‖ for the owner-operator, managing contractor, general contractor and subcontractors on the Motiva mega-project, asserted Kirk Blanchard, project controls specialist for Performance Contractors.

"Typically, at Performance Contractors, what we do is maintain a construction database, and we feed that data back to the managing contractor," he noted.

The managing contractor then takes all the project data and rolls it up into a master file that reflects accurately the project status, which is then measured against the project baseline, Blanchard added.

"From a day-to-day perspective, there are actually two project levels: the managing contractor is the top level, and then all of us contractors and subcontractors, which might get down to a Level 4 or Level 5 detail that might feed that roll-up master."

In Performance Contractors' case, that entailed four sub-projects within the overall H-Block and thus managing four separate schedules with a number of subcontractors.

"With the [Primavera P6] EPS (Enterprise Project Structure) system, I can manage multiple contractors with several EPS nodes," Blanchard said, with all the contractors reporting in the same pattern vs. the typical approach of the past, i.e., all of the contractors reporting data in their own individual ways, making it infinitely more complicated to roll up all the project data into the master file.

"Now the real benefit of having Primavera P6 is that everyone can communicate across the whole spectrum, all using the same set of matrixes to get to the same data," he added.

In addition, a sound resource allocation solution helps Blanchard minimize the hire/layoff cycles that can add risk and costs to project execution.

He cites as an example an X-ray contractor coming out to the project to X-ray welds for quality control: "You have to keep track of the windows of opportunity for that work. Those opportunity windows are in the morning, before crew change; at lunch, which is a half hour; and at 5:00, which is the next crew change. So [a solution] allowing you to schedule those different calendar flows for different subcontractors that work at different schedules—I just don't know if there are any other solutions [besides P6] that allow you that kind of flexibility."

Those kinds of benefits encourage Blanchard to strongly recommend the employment of EPPM solutions in managing large construction projects—something he has been doing for most of his 27-year career.

Conclusions

Mega-projects carry their own unique potential for project risk because of their large scale and long timeframes.

In the downstream oil and gas industry, there is more pressure than ever before to manage and reduce project risk because of volatile commodity markets and growing regulatory uncertainty.

Across the value chain, collaborating and sharing information and data in a systematic, integrated approach thus takes on even greater importance in the case of a refinery mega-project.

Sophisticated EPPM solutions such as those by Oracle Primavera have been proven to reduce risk and complexity across the value chain for refiners today, especially for multi-billion dollar mega-projects.

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