IPA

Independent Project Analysis Newsletter

Independent Project Analysis, Inc. is the preeminent organization for quantitative analysis of capital project effectiveness worldwide. At IPA, we provide practices you can use to ensure your success.

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Organizational Effectiveness of Turnarounds and Team Staffing

Patrick Voogd, Senior Project Analyst

The quality of Turnaround Front-End Loading (TFEL) achieved at 6 weeks prior to the start of the turnaround (that is, the point in time when the plant is taken out of service) is a key leading indicator of turnaround outcomes—safety, total turnaround schedule, turnaround execution schedule, and the maintenance cost of the turnaround. Although process industry owners acknowledge the importance of TFEL, they face challenges in appropriately staffing their turnarounds, both in terms of planning and execution, as well as in governing turnarounds. Owners want to learn about industry Best Practices for staffing turnarounds for the scope development, detailed planning, and execution phases. IPA will begin research on the organizational effectiveness of turnarounds and turnaround team staffing. This article briefly addresses organizational effectiveness practices in turnaround team development and governance that are associated with achieving excellent levels of TFEL and excellent turnaround results.

A turnaround is any scheduled shutdown of a facility or the units within a facility to perform maintenance and/or capital work. Although most process industry owners understand what is meant by the term turnaround, other terms—overhaul, T&I (test & inspection), stop, and (somewhat confusing) shutdown—are also used to denote the same event. Turnaround work can include maintenance such as like-for-like replacements, repairs, inspections, cleaning, and/or catalyst change-outs, and capital work such as upgrades, add-ons, and/or tie-ins of capital projects. Emergency or unplanned shutdowns are not turnarounds.

The primary driver of turnaround effectiveness is turnaround definition, or Turnaround Front-End Loading (TFEL). Turnaround effectiveness is measured by turnaround safety performance, turnaround schedule performance and deviation, turnaround cost performance and deviation, and the plant's availability after turnaround completion. These measures are compared with Industry and the Best-in-Class performers. The TFEL Index is IPA's measure of TFEL completeness. The building blocks of TFEL are Scope Definition, Execution Strategy, and Planning. There is a strong relationship between the TFEL Index and all measures of turnaround effectiveness.

Most companies have developed a process for planning the maintenance and capital work to be performed during a scheduled shutdown of a facility or facility sites. However, despite having a process in place, only one in four turnarounds reach *Best Practical* TFEL status at 6 weeks out. A key factor preventing companies from improving TFEL is business' failure to develop clear objectives and realistic constraints for a turnaround, which results in the frequent revisiting of goals and constraints throughout the planning process. Without a solid foundation, teams cannot achieve alignment on the scope and complete definition.

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Organizational effectiveness is essential for companies seeking to improve turnaround performance. Companies are looking for industry Best Practices to establish effective (corporate) organizations that support turnaround team development and effective turnaround work processes. Issues like team staffing are emerging as an enabler for doing TFEL properly. When turnaround teams do reach alignment with their businesses on the objectives, IPA evaluations frequently show that turnaround teams still fail to duly complete turnaround planning because they are unable to fill turnaround team positions—if these positions were defined at all. ***Figure 1*** shows that organizational effectiveness is driven by three factors:

Organizational Structure

What is the degree of centralization of maintenance? What are the reporting levels between maintenance and senior management? What is the level of authority of the turnaround manager? Which career opportunities are offered to key turnaround team personnel by the employing company? Are personnel trained to effectively fill the function?

People

How many full-time equivalents (FTEs) are available for turnaround planning and execution at the site as well as company-wide? What is their level of experience? What is the selection process? When contractors are brought in for turnaround planning, which functions are filled by contractors?

Work Process

Is there a common turnaround work process? Are turnarounds planned in compliance with that work process? Is the work process a stage-gated turnaround implementation process? Who has the role of gatekeeper? What is the turnaround recycle rate?

With regard to the "Organizational Structure" element of Organizational Effectiveness, centralization of maintenance allows a common work process to be deployed to all sites, enabling more consistent performance site to site. Centralized maintenance organizations are able to train turnaround personnel across all sites more easily and better able to provide career opportunities to turnaround professionals.

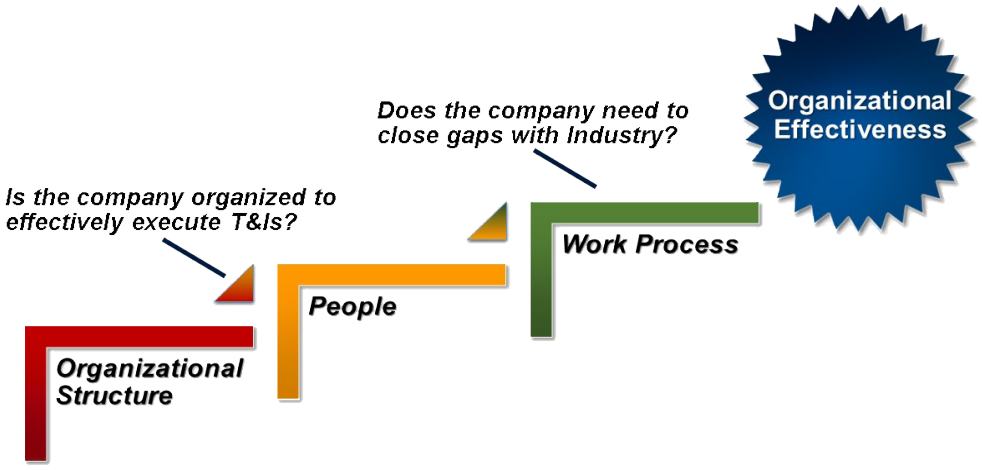

Figure 1. Elements of Organizational Effectiveness

However, centralization of maintenance is far less common than the centralization of projects in the capital project world, simply because maintenance is tied so tightly with the sites. The company-wide implementation of a common work process for turnarounds, as well as its governance, can only be achieved through a corporate maintenance organization. If this implementation is not achieved, the value of any work process used by the turnaround team is limited.

Team staffing one of several factors that drive the "People" element in ***Figure 1***, and team staffing is one of many components of team functionality. Team functionality incorporates the factors of team leadership, team behavior, and several turnaround development elements. Turnaround team staffing research is specifically focused on the factors of team functionality.

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In conclusion, strong organizational effectiveness drives a company's ability to develop integrated turnaround teams. Process industry owners seeking excellence in turnaround performance are understandably focused on achieving excellent levels of TFEL at 6 weeks prior to the start of the turnaround. From the inception of turnaround planning, businesses play a key role in developing clear objectives for the turnaround, as well as governing the turnaround planning, execution, and post-turnaround phases. The inability to build integrated turnaround teams is a constraint to achieving *Best Practical* TFEL. With turnaround organizational effectiveness research, we shift the focus from the turnaround level to the organizational level to better understand what other organizational factors are affecting turnaround performance. The future research aims to identify those organizational attributes that are related to consistent, excellent turnaround performance. The research will start in the third quarter of 2014. Clients that participate in the study by providing data will have access to IPA's research findings about Best Practices for establishing the turnaround organization.

Professional Profile:

Patrick Voogd, Senior Project Analyst, IPA EMEA

Patrick is currently a Senior Project Analyst at IPA EMEA. He is based in The Netherlands. Since 1993, he has conducted more than 350 evaluations of projects and turnarounds executed around the world in the chemical, refining, utility & power, renewables, pipeline, pharmaceutical, and upstream industries. These evaluations include major project system benchmarkings, site benchmarkings, special studies, workshops, and IPA Institute courses. Patrick's areas of expertise include plant turnaround and new technology projects.

Before joining IPA, Patrick worked as a chemical engineer in the area of process optimization for a Swiss chemicals and biotechnology company. Patrick received a B.E. Degree in Chemical Engineering and a Ph.D. from Delft University of Technology, Delft, The Netherlands. He has published numerous articles in international scientific journals and is a member of the Dutch Royal Chemical Society. He is fluent in English, Dutch, and German.

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- **Turnaround Front-End Loading Components**
- **Effective Turnaround Teams**
- **Integration of Turnarounds and Capital Projects**
- **Contracting Strategies**
- **Construction Safety Practices**

This seminar is intended for capital project professionals who manage turnarounds and for those who participate in the planning of the turnaround activities. Managers of projects executed during turnarounds and those who participate in plant site capital project programs can also benefit from the learnings presented in this program.

** Discount savings of 10% is available until 13 October 2014.*

Continuous Business Involvement in Project Development Theme at 24th Annual IBC

Business engagement throughout the entire capital project development process is vital as high project costs and unstable markets make project success more challenging. That was a key message sounded by analysts and industry representatives who attended the ***24th annual Independent Project Analysis (IPA), Inc., Industry Benchmark Consortium (IBC)*** conference, from March 31 to April 3, 2014, in Leesburg, Virginia, to share ideas on how to deliver successful projects.

IPA President and CEO Edward Merrow said the goal of the annual IBC gathering *"is to support continuous improvement"* by measuring project performance, conducting research, and finding and sharing practices that *"drive excellence in capital projects."* A requirement for each of the IBC member companies in attendance is the shared understanding that *"we are here in order to make our projects better."*

As is customary during the 4-day conference, members were briefed on their downstream and plant-based project performance as benchmarked by IPA over the past year. Presentations were delivered announcing top performers and addressing emerging industry issues and trends. Forum attendees also participated in facilitated discussions to share insights and Best Practices, offer topics for future research, and network with other forum and IBC participants.

Unique to the 2014 IBC conference was the attendance of a select group of non-IBC member mining firms who were invited to attend a separate **Miners Forum** to discuss industry challenges and trends such as falling commodity prices and fast rising engineering and equipment costs.

Much discussion centered on the difficulties companies face and the practices they use during the first phase of the project development process, Front-End Loading (FEL) 1. In his keynote address, Jim Fitterling, Executive Vice President of the Dow Chemical Company, said that Dow's successful capital projects have benefited from a *"business-centric mindset"* that forces business to work with project teams on challenging issues in which there is conflict. Given the ongoing economic uncertainties, he said, *"speed of execution is critical."* Following Fitterling's remarks, IPA President Ed Merrow led a panel of business executives who elaborated on the successes and pitfalls their business and project teams have found early in project development.

Among the several new IPA studies presented at the conference was the complex processes that go into setting the foundation for selecting the right projects by the end of FEL 1. The study examined the drivers of FEL 1 decision quality, including opportunity framing, analysis of alternatives, and initial cost benefit analysis findings that factor into whether business decides if further work on a project is justified. The study also examined the governance and gatekeeping practices followed by some IBC companies in attendance.

The study determined that while most companies have "moderate" decision-making quality in FEL 1, decision quality can be improved. The study's lead, IPA COO Paul Barshop, said a key to improvement is having everyone involved in FEL 1, including business, corporate management, engineering, and operations. For instance, limiting the involvement of the cost estimating function and using unreliable initial cost estimates increases the risk of unanticipated cost growth later in project definition. *"No one knows its basis, but everyone remembers the number,"* Barshop said of the initial cost estimate. *"It undermines the relationship between the business and project teams."* Ultimately, a strong work process and strong gatekeeping are characteristic of high FEL 1 gate decision quality.

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Several other selected research studies were presented to the IBC:

- ***Managing Projects With Limited Resources:***
  With economic pressures and competition for talent causing project resource limitations, the study examined the flow of information through project teams and the benefits of owner-led or owner support teams versus contractor-led and under-resourced teams. The study found that *"the flow of information is at the core of developing and executing capital projects"* and, therefore, *"teams must be staffed and organized to facilitate the production and movement of information."* The negative effects of resource limitations should not be underestimated, the study concluded.

- ***Taking Classes of Facility Quality (CFQ) Sessions to the Next Level:***
  A CFQ session is a meeting among business, engineering, and project area experts to discuss and define a project's boundary conditions and trade-offs to focus FEL 2 activities and reduce the potential for wasteful spending. In 2012, IPA elevated CFQ from a Value Improving Practice (VIP) to a core practice for aligning business requirements. However, CFQ session benefits have not been quantified to understand how they can be improved to drive better project outcomes.

  The study found that CFQs drive better definition at FEL 2 and FEL 3 when performed from mid-FEL 1 to mid- to late FEL 2. Qualities of a successful CFQ include: a structured and repeatable process, with a facilitated workshop process being most effective; required attendance of business, engineering, site manufacturing, operations, and other key project experts; and a system of documentation *"to ensure all topics are discussed and conflicts are resolved prior to scope closure."*

- ***Site-Based Engineering Contracting Best Practices:***
  Based on interviews with IBC member construction managers, the study identified main practices that have a measured effect on productivity in the field, such as involving construction managers in FEL and using detailed portfolio-level resource plans to ensure the availability of resources for construction plans.

- ***Site-Based Portfolio Management Practices:***
  The study set out to gain a better understanding of site-based project portfolio management practices that are correlated with improved project outcomes. A strong foundation for effective site-based project portfolio management involves focusing on all of the following practices in conjunction with one another: assembling the right information for project framing documents, including specific cross-functional teams in project development; establishing opportunity ranking methods; and ensuring regular reviews.—*Geoff Emeigh, IPA Staff Writer*

For additional information about IBC 2014, please contact ***Andras Marton***, Business Area Manager, Hydrocarbon Processing and Transportation (HPT), at ***amarton@ipaglobal.com***.

The goal of the *IPA Newsleter* is to provide you with research-based articles on current capital project issues, announce upcoming IPA events and IPA Institute course offerings, and introduce new and future IPA products that can improve your project management systems.

To subscribe to the IPA Newsletter and to view an archive of all past issues, please visit our website at *www.ipaglobal.com/Newsletter*.

To be kept informed regarding upcoming IPA Institute programs and courses being developed for capital project improvement, please join our mailing list at *www.IPAInstitute.com*.

Completed Study Provides Cost, Schedule Guidance for GoM Decommissioning Activities

Decommissioning costs in the Gulf of Mexico (GoM) exceed $1.5 billion annually, but oil and gas companies operating in the region often struggle to develop realistic cost and schedule estimates for decommissioning activities.

A recently completed multi-client study by Independent Project Analysis (IPA), Inc., has concluded that estimating errors make it difficult to develop realistic budgets for decommissioning activities in the Gulf of Mexico. Analysis of study participants' decommissioning data found that platform removal activities averaged 37 percent cost growth and 43 percent schedule slip. Well abandonment activities experienced 32 percent cost growth and 47 percent schedule slip. What's more, there is a large variation around these cost and schedule figures ***(Figure 1)***.

The study identified key technical characteristics of platforms that drove decommissioning costs and schedules. For example, platform characteristics—such as the facility type, weight, and location—significantly influence cost and schedule performance. The study also isolated operator decisions that affect the money and time it takes to complete temporary, permanent, or temporary to permanent abandonment activities. These decisions include the hydraulic rig, timing, and severing method. Taken together, the asset characteristics and decisions form guidelines for building predictable decommissioning estimates. Companies normally do not have guidelines for developing the cost and duration of decommissioning activities,

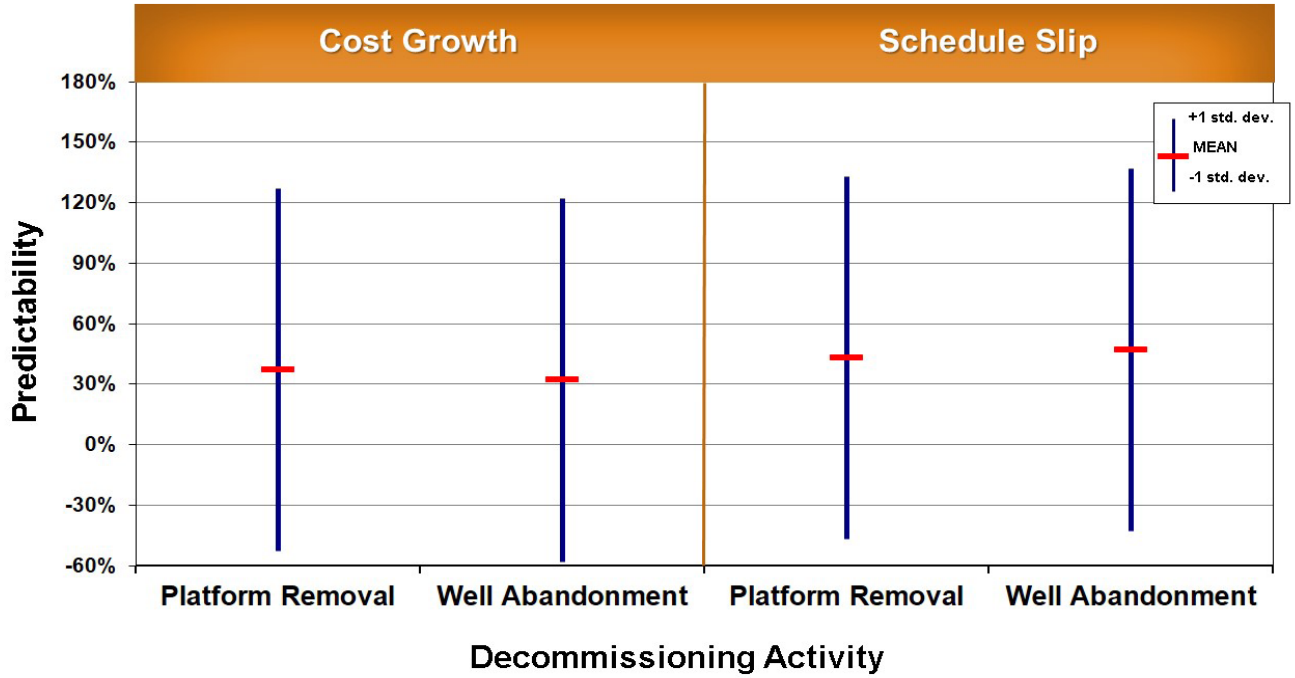

Figure 1. Substantial Decomission Project Cost, Schedule Estimate Variations

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said IPA Associate Analyst Jonathan Jordan, the study's lead investigator. Unlike estimating for capital projects, decommissioning activities are often considered to be operating expenses. "The guidelines will allow for better estimating, which can help companies plan annual budgets for planned decommissioning activities," Jordan said.

IPA expects to continue working closely with operator companies to collect more GoM decommissioning activity data to increase the accuracy and understanding of cost and schedule drivers and to identify additional Best Practices. Furthermore, IPA is interested in expanding the scope of its work with operators to include platform removal and well abandonment activities worldwide. —*Geoff Emeigh, IPA Staff Writer*

For more information about the GoM Decommissioning Study, contact *Tom Mead,* IPA Deputy Manager of E&P Research Development, at *tmead@ipaglobal.com.*

Examining the Challenges Facing Capital Projects in Western Canada

Since 2013, IPA has been closely examining the challenges facing capital projects in Western Canada. To help project teams understand what they are up against, IPA addresses and quantifies these local challenges through the biannual ***Western Canada Capital Projects Journal***.

Continuously building upon research topics covered in previous editions, the following is an overview of the third and current edition:

- ***Database Update:*** Key characteristics of 101 projects recently added to the Western Canada database.
- ***Project Performance Measure (Metric) for the Period:*** A look at what the most successful projects in the region are doing.
- ***Managing Projects in a Labor-Short Environment:*** What do module fabrication yards need from owner companies to be successful?
- ***Western Canada Technology Developments:*** Why is there a significant discrepancy between publicly available reported costs for *in situ* development projects and those in the IPA database, and what does it mean for owners?
- ***Quantifying Regional Context and the Link to Performance:*** A detailed analysis measuring the effect of winter construction days compared against a control group.
- ***EPC Discussion:*** A discussion with IPA's Olfa Hamdi, subject matter expert on WorkForce Planning, offering insights into the benefits of this popular Western Canadian practice.

The ***Western Canada Capital Projects Journal*** is exclusively available to subscribing companies. For more information, contact ***Keith Mayo***, Regional Expert - Western Canada, at ***kmayo@ipaglobal.com***.

Research Corner: Updates for IPA's Current Research Initiatives

Achieving Better Project Outcomes in West Africa

The group of coastal countries stretching from Guinea to Angola is home to vast mineral wealth and 35 percent (>350 million) of Africa's total population. It is also very possibly the single most difficult region in the world in which to develop and execute successful industrial capital projects. The motivation for this joint industry study is to find ways to reduce project risks in this uncertain region. The goal of this study is to find the commonalities in the successful projects from this region as well as catalog the practices to minimize risks by addressing the following: characteristics and frequency of successful projects in West Africa; nature and capability of the local supplier markets; key risks that contractors price most aggressively; possible strategies for reducing risk premiums; and effective approaches for using expatriates. The study is currently in the framing phase and the analysis is expected to start in July 2014, with completion targeted for April 2015. The study is open to owners and contractors.

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Global Equipment Procurement for Capital Projects

IPA is conducting a study that aims to advance Industry's understanding of the current trends and practices in equipment procurement for capital projects. A key focus is to evaluate the total cost of procurement in various global regions, taking into account equipment prices, the costs associated with transportation and setting up and maintaining regional procurement organizations, and other costs tied to addressing potential quality problems. IPA will also assess how companies' organizational structures, procurement approaches, contracting strategies, and other purchasing practices and strategies affect procurement effectiveness. The study results will help companies devise more effective equipment sourcing strategies. IPA kicked-off the study in April 2014 and the study remains open to additional participants.

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Common Cost Coding Structure for the Mining and Minerals Processing Industry

The global mining and minerals processing industry currently uses a variety of company-, region-, and project-specific cost coding structures for major projects. As a result, making comparisons, collecting and collating historic data, and benchmarking for competitiveness are difficult. A standard cost coding structure for the industry could provide significant benefits in estimate preparation, estimate validation and comparison, and project control development and execution. The value of implementing a common coding structure has already been proven with the availability and use of the NORSOK uniform coding structure in the oil and gas sector.

Four thought-leading mining and minerals companies are the first to fund the research and work with IPA to steer the establishment of a common industry cost coding structure. IPA and the sponsoring companies welcome additional participants to steer the creation and adoption of this industry standard - owner and contractor companies are invited to participate. The study has launched and the first study Industry Steering Committee meeting was held in May 2014.

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Understanding Drivers of Rising Owner's Cost in the Oil & Gas Industry

Today's landscape in which oil and gas projects are executed is a difficult one. Projects are complex, much larger, executed in frontier regions, and done against a backdrop of demographic and supply chain constraints. Yet, the number of projects continues to increase, leading to significant sector inflation. One such area of inflation is owner's costs. At the request of several clients, IPA launched a study to determine what is driving owner's costs in the oil and gas industry. This study will establish a common basis for comparing owner's costs, identify trends and drivers, and test correlations between higher owner's costs—either in its entirety or by category—and project outcomes. IPA is currently assessing the data provided by the participants and identifying the potential drivers of owner's costs to further evaluate. Companies are welcome to join the seven operators already participating in this effort.

Jonathan Walker, Study Principal Investigator: ***jewalker@ipaglobal.com***

Project Authorization Processes and Durations

Company to company and project to project, authorization durations and processes (the time and approval levels required to receive full funding) can vary considerably. For example, at Company A, a $10 million project may be approved by the facility manager in about 1 month's time, whereas at Company B, the same project requires approval from the CFO, taking 6 months. Factors that influence these durations and approval levels include portfolio size, project size, organizational structure, project risk, and more. Given this variability, what is the "right" level of approval and optimal duration for your project? And how do durations (especially when approval takes considerably longer than planned) affect project execution? IPA will address these questions in a multi-client study open to all companies.

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Oil Sands Tailings Management

As regulatory requirements for tailings management continue to tighten, the major players in the Canadian oil sands industry face significant challenges in reducing the amount of tailings they generate during bitumen extraction and in reclaiming the large volumes of tailings that already exist on their sites. Tailings management projects are increasingly capital intensive with no direct return on investment. At the request of several clients, IPA launched a study to determine a benchmarking methodology for these unique projects and to investigate the drivers of cost and schedule in tailings management capital investments. By collecting real data from multiple owner companies, we will be able to establish an industry baseline and build a database for tailings management project data. We will use the data to develop a capacity-based cost benchmarking methodology; generate detailed cost metrics; establish a schedule benchmarking methodology; and identify the Best Practices in Industry for tailings management strategies. IPA is currently working with the study participants to isolate the data requirements for the research and to create a data collection tool specific to tailings management projects. We will begin collecting data in July 2014 and interested organizations are welcome to join the companies already participating in this effort.

Jennifer Nicolaisen, Study Principal Investigator: ***jnicolaisen@ipaglobal.com***

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Evaluating the Performance of In Situ Oil Sands Development Projects

Industry currently faces substantial capital cost challenges for *in situ* oil sands developments. As it currently stands, the majority of the future oil sands development will involve some form of the *in situ* process. Recently, projects in Alberta have had highly unpredictable costs, schedules, and production attainment. In addition, a comparison of the *in situ* oil sands project costs from IPA's proprietary database of owner information with those publicly reported shows a dramatic difference. The public source *in situ* data under-report the project costs by about 30 percent. There is an urgent need to better understand what success looks like for *in situ* oil sands developments in Alberta and the practices that drive better cost, schedule, safety, and production attainment performance. The purpose of this study is to pool the learnings and data from *in situ* projects in Alberta from multiple owner companies to aggregate the practices and outcomes from these projects into the industry metrics. In addition, these data will be used to benchmark the performance of individual companies against Industry as a whole and to guide the later projects on cost and schedule planning. We are targeting oil companies that currently have *in situ* oil sands projects in operation or are planning to in the future. IPA has issued a formal prospectus and is evaluating feedback from potential participants. IPA hopes to kick-off the study before the end of summer 2014 and the study is currently open to all interested participants.

Keith Mayo, Study Principal Investigator: ***kmayo@ipaglobal.com***

Improving Mining, Minerals, and Metals Operating Cost Estimates

IPA's recent experience with Mining, Minerals, and Metals (MMM) sector projects has found that operating expenditure (OPEX) costs are volatile and commonly higher than anticipated at project sanction. This underestimation of OPEX costs heavily erodes net present value (NPV) and ultimately undermines the selection of the right scope to achieve the business case. The scope of this multi-client study is to investigate the OPEX estimating practices employed on large capital projects during Feasibility and link these with the operating cost line items that commonly overrun and do not meet expectations at project completion. The study objective is to enable participating MMM companies to achieve greater capital effectiveness through the implementation of improved OPEX estimating practices. The results of the study will be reported to participating companies and we are currently seeking commitment to allow the study to proceed.

Tim Mumford, Study Principal Investigator: ***tmumford@ipaglobal.com***

Sustaining Capital for LNG Facilities

Every LNG facility must spend capital to sustain production and comply with regulations, yet the amount of capital to be allocated to a given facility is often hotly contested. With close to 100 export or import LNG facilities currently in operation and more than that in development, the cost of constructing these facilities is well known. However, the necessary capital investment to sustain the facilities year after year is more challenging to predict. To help companies compare and forecast their sustaining capital expenditure and ensure that their LNG facilities are neither over- nor under-capitalized, IPA is developing a multi-client study. The study will produce benchmarks for annual sustaining capital spend at LNG facilities, normalized for such factors as LNG production, number of trains, and facility gross book value. This study is open to additional participants.

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Getting the Best Performance From a Project Management Contractor (PMC)

For many companies and for a variety of reasons, owners rely on PMCs to successfully deliver their capital projects. In some cases, the project portfolio has grown faster than the owner staff can reasonably manage. In other cases, the owner strategy is to maintain an owner organization geared to a contracting strategy in which the PMC approach is the primary vehicle for delivering the projects. The outcomes from PMC-led projects vary significantly. IPA is proposing to conduct a multi-client study on the practices that deliver top performance in projects executed with a PMC. IPA will analyze projects from the oil and gas, chemicals, power, and mining and minerals sectors from all over the world. In addition, IPA will conduct surveys of both owner companies who employ PMCs as well as contractors who have either themselves acted as a PMC or have been an EPC contractor managed under a PMC to gather information on the practices that each key stakeholder sees as critical in successful projects. This study is currently in the framing phase and is open to additional participants.

Mark Etchells, Study Facilitator: ***metchells@ipaglobal.com***

Line Pipe Procurement Best Practices for Pipeline Projects

The purpose of this study is to understand the causal relationship between line pipe procurement practices that, without sacrificing quality, yield faster procurement durations and lower total line pipe procurement costs for pipeline projects. Line pipe constitutes a significant portion of the capital spend on pipeline projects and IPA research shows that there is a wide range in the price that pipeline projects pay for that line pipe. Although line pipe prices have stabilized over the past few years, increased capital project activity is likely to put upward pressure on pricing and delivery times for line pipe suppliers. The study will provide decision makers with the appropriate information to support and validate current procurement practices and develop (or maintain) a competitive advantage on their pipeline projects. IPA is currently forming the study group and several participants have already joined; the study is open to owners and contractors.

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Benchmarking Tank Maintenance Study

At the request of clients in the refining and transportation/logistics sectors, IPA developed a study to compare the cost and schedule competitiveness of tank maintenance programs. This study developed cost and schedule metrics ($/barrel, days/barrel) for tank maintenance by activity (e.g., cleaning, inspection, repair, etc.) and product (e.g., crude, gasoline, diesel). The metrics allow companies both to compare their historical performance versus industry peers and set competitive targets for new tank maintenance work. Tank maintenance projects do not generate revenue, but can be quite costly to execute. Further, they typically require taking tanks out of service. Hence, executing tank maintenance efficiently is vital. The study also investigated the different practices that companies use to define and manage their tank programs. The study remains open to additional participants both in North America and other regions. Please contact IPA for additional information.

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Hot Market Study Phase II Complete

A flood of capital spending in the United States is threatening to once again strain project supply chains, forcing companies to find and procure engineering services, materials, and equipment for their large projects earlier.

A recently completed multi-client study by IPA explored the consequences of the stretched supply chains on projects in the United States. Conducted in two phases, Phase I examined project outcomes and supply chain trends during the last U.S. "hot market" for capital spending from 2004 to 2007. Phase II focused on strategies companies can use to mitigate risks in project construction as the market begins to heat up yet again. Kristin Lewis, IPA Associate Analyst and the principle investigator for the study, said the coming increase in capital spending will outpace the previous U.S. hot market. *"The question is whether more projects will experience failure and how engineering services and the rest of the supply chain will hold up,"* said Lewis.

Phase I of the study wrapped up in fall 2013 and found that the failure rate for capital projects—projects that experienced more than 25 percent real cost growth or execution schedule slip or incurred a fatality—doubled during the last heated market. The study identified several failure modes that contributed to poor project outcomes. Some failure modes, such as open scope at Front-End Loading (FEL) 2 and reliance on weak owner engineering, are common during regular markets, but many other failure modes were directly related to project supply chain issues. In particular, stretched supply chains forced companies to compete for limited engineering contractor resources. The number of changes in engineering increased and engineering quality declined. In addition, projects that maintained the planned start date of construction after engineering slipped had poor field productivity. These factors contributed to the 60 percent failure rate of large projects between 2004 and 2007 compared with the pre-hot market failure rate of approximately 30 percent.

Phase II of the study, completed in spring 2014, examined major announced capital projects to create U.S. capital spending scenarios based on historical project performance seen in Phase I. For example, the study factored in project kill ratios based on the Phase I findings. Phase II of the study further offers strategies project teams may consider to mitigate project risks in the coming hot market. For instance, the study takes an in-depth look at the perceived benefits of using offshore engineering value centers (EVCs). Although valued for their "guaranteed" labor, EVCs pose additional challenges to contractors and owners alike, particularly around communication and quality management. These challenges require additional owner resources, which can be difficult to secure in a resource-short environment. The study also examined the pros and cons of selecting modular construction strategies. Companies must agree to pursue a modularization strategy early on and project teams should have a firm understanding of why they believe modular construction is appropriate for their project. The team should also recognize the logistical challenges that are involved with modular construction, Lewis said of the study.

The entire study relied on IPA's extensive project database and two-and-a-half decades of experience evaluating thousands of projects in the United States and abroad. Phase II also involved interviews and surveys of industry experts and information collected from other outside sources, including trade journals and statistical data from federal and state agencies.

The study, ***Supply Chain Risks to Large Projects in the United States***, is complete and open to new participants. Participants will receive full access to the study results, which include two 3-hour presentations by Kristin Lewis.

For more information, contact ***Kristin Lewis, IPA Analyst and Study Principal Investigator*** at ***klewis@ipaglobal.com*** or ***Elizabeth Sanborn, IPA North America Region Director*** at ***esanborn@ipaglobal.com***.

Upcoming IPA Events & Presentations for 2014/2015

June 16

IPA to Speak at the AACEI 2014 Annual Meeting in New Orleans, Louisiana

The AACE International annual meeting brings together the industry's leading cost professionals in a forum focused on learning, sharing, and networking. For more information, visit ***www.aacei.org/am***.

Maggie Stewart, Project Analyst, will present a paper titled *Benchmarking Mining and Minerals Processing Projects.* She will discuss her findings about key drivers of performance—level of definition and project team development—that tend to be poor in minerals projects, and point out how industry benchmarking can serve as a vital part of improving project performance for minerals companies.

Carlton Karlik, P.E., Senior Project Analyst, will participate in a panel discussion titled *Construction Cost Estimating - Challenges and Opportunities*.

Luke Wallace, Associate Director of PRD Cost Analysis, will participate in a panel discussion titled *Effective Use of Independent Reviews*.

June 24 - 25

IPA to Speak at the Marine Seismic Surveys Conference in Singapore

Manoj Prabhakar, Project Analyst, will present at the Marine Seismic Surveys Conference in Singapore. Mr. Prabhakar will discuss marine seismic survey practices and project risks in the oil and gas industry. For more information, visit ***www.marineseismicsurveys.com***.

September 5

IPA to Speak at the Construction Users Roundtable in Brazil

IPA will present at the Construction Users Roundtable (CURT) conference on September 5 in Rio de Janeiro, Brazil. IPA's presentation will focus on market trends for construction in Brazil.

September 16 - 17

CEC 2014 Annual Meeting in Tysons Corner, Virginia

The ***Cost Engineering Committee (CEC)***, an approved subcommittee of the Industry Benchmarking Consortium (IBC), focuses on all aspects of cost (or investment) engineering, including cost estimating, scheduling, and project control practices and metrics, with the goal of expanding the capability of the owner cost engineer. For more information, contact ***Luke Wallace*** at ***lwallace@ipaglobal.com***.

Sept. 23 - Oct. 3

IPA to Speak at the International Pipeline Conference 2014 in Canada

René Klerian-Ramírez, DEP Manager, Hydrocarbon Processing & Transportation, will present at the International Pipeline Conference 2014 in Calgary, Canada. His presentation, titled *Best Execution Practices for Pipeline Projects*, will focus on the importance of good project execution planning to pipeline project results.

November 17 - 19

UIBC 2014 in Leesburg, Virginia

The annual meeting of the ***Upstream Industry Benchmarking Consortium (UIBC)*** provides an independent forum for each participating company to view its performance against the performance of other companies. The consortium meeting highlights Best Practices, reinforcing their importance in driving improvements in asset development and capital effectiveness. For more information, contact ***Neeraj Nandurdikar*** at ***nnandurdikar@ipaglobal.com***.

January 19

IPA President to Present at 15th PMI-AGC International Conference

IPA's President and CEO, Ed Merrow, will give a keynote speech at the PMI-Arabian Gulf Chapter 15th International Conference, Seminars, and Exhibitions. The conference will be held at the Gulf Hotel, Manama, Kingdom of Bahrain. The theme for the conference is "Delivering GCC 2030 Vision through excellent Project Management." For more information, please visit ***www.pmiagcconference.com/2015/***.

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- **The 7 Deadly Sins in Industrial Megaprojects** *(also available in Russian)*
- **What Is the Business Stake in Mining Projects?** *(only available in Spanish)*

For a free assessment or to learn more, contact Andrew Griffith, Director of the IPA Institute, at agriffith@ipaglobal.com or +1 703-726-5375.

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2014 Public Course Schedule

To view full course descriptions, pricing, up-to-date registration details, and special discounts, please visit our website at www.IPAInstitute.com

Megaprojects - Concepts, Strategies, and Practices for Success (22 PDUs)

- June 24 - 26: Calgary, Canada
- October 7 - 9: London, UK
- October 8 - 10: Perth, Australia
- November 11 - 13: Lima, Peru

Best Practices for Small Projects (22 PDUs)

- June 24 - 26: Paris, France
- August 12 - 14: Johannesburg, South Africa
- October 14 - 16: Orlando, Florida
- November 11 - 13: Seoul, South Korea

Exploration & Production Project Best Practices (22 PDUs)

- July 22 - 24: Aberdeen, United Kingdom

Project Management Best Practices (22 PDUs)

- July 22 - 24: Bogotá, Colombia
- August 19 - 21: Macau, China
- September 23 - 25: Dubai, UAE
- October 7 - 9: Salvador, Brazil
- November 18 - 20: Johannesburg, South Africa

Gatekeeping for Capital Project Governance (16 PDUs)

- August 5 - 6: Santiago, Chile
- September 23 - 24: Gold Coast, Australia
- October 21 - 22: Calgary, Canada

Best Practices for Mining Projects (16 PDUs)

- September 2 - 3: Sao Paulo, Brazil

Establishing Effective Cost & Schedule Processes (14 PDUs)

- September 23 - 24: Calgary, Canada

Practices for Shorter, More Cost-Effective Turnarounds (14 PDUs)

- November 11 - 12: The Hague, The Netherlands

IPA
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IPA improves the competitiveness of our customers through enabling more effective use of capital in their businesses. It is our mission and unique competence to conduct research into the functioning of capital projects and project systems and to apply the results of that research to help our customers create and use capital assets more efficiently.

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The IPA Institute's mission is aligned with the overall IPA mission to improve the capital productivity of its clients. The programs offered provide a forum for in-depth understanding of key elements of the capital project process and how to apply these learnings to effect positive changes and improvements, resulting in the more effective use of capital.

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