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.

Volume 1, Issue 2 **June 2009**

Research Spotlight:
Best Practices for Reducing Turnaround Expense Costs

Hunter Mayo

Tough economic times require the elimination of unnecessary expense costs (*expense spending* is defined as all costs associated with operating and maintaining a manufacturing asset). When a facility must be shut down for maintenance and inspection, the costs can be quite high. Although the time between shutdowns (turnarounds) varies, these shutdown events typically require spending large sums of expense money in a short time span, often more than $1 million per day. And, with the average turnaround costing $18 million, the stakes for turnarounds are high. But cost efficiency in turnarounds is not out of reach—on the contrary, just 10 percent improvement in turnaround execution can result in well over $1 million in savings per turnaround.

Recognizing that a successful manufacturing business is effective in *both* capital and expense spending and that turnaround effectiveness is critical to the bottom line, IPA began studying the drivers of turnaround outcomes in 1997. This article looks at four areas that play key roles

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NEW COURSE!

Practices for Shorter & More Cost Effective Turnarounds

Turnarounds (TARs) are critical to the overall operating efficiency of a facility. Minimizing the time a facility is shut down and optimizing the cost for completing these maintenance tasks are important for getting the facility back into profitable production.

The IPA Institute offers this 2-day course to present key learnings and Best Practices for TAR planning and execution. The learnings communicated are based on the industry's actual experience, which provides an empirically grounded industry-wide benchmark for assessing and comparing practices and results between various TARs and maintenance systems.

This course is intended for those who manage TARs, participate in the planning of TAR activities, managers of projects executed during TARs, and those who participate in plant site capital project programs. This course can also be customized for your organization's needs. Customization can include using your company's TAR experiences as part of the course case studies, and the development of a "roadmap" designed specifically for your organization, to assist in planning more successful TARs.

Course Content

- Measuring Success and Failure in TARs
- TAR Work Process
- Scope Definition
- Execution Planning and Strategy
- Team Effectiveness
- TAR Contracting Practices
- Capital Project/Shutdown/TAR Interface
- Implementation Strategies

Inside this issue:

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in improving the cost efficiency of turnarounds: (1) the level of planning completed prior to turnaround start, (2) clarity of business objectives, (3) owner-led versus contractor-led turnarounds, and (4) estimating practices.

The primary driver of turnaround effectiveness is the level of turnaround definition, or Turnaround Front-End Loading (TFEL). The TFEL Index is IPA's measure of TFEL completeness, and combines over 15 specific planning practices into one numerical index. The relationship between the TFEL Index and cost performance is strong. Improving the TFEL Index from the average level of *Fair* to the *Best* level results in 12 percent less costs expended for the same scope. Similarly, cost predictability improves as a function of the TFEL Index. Recognizing the importance of TFEL, most companies have developed a TFEL process that contains many of the Best Practices for turnaround efficiency. However, despite having a turnaround planning process in place, only 28 percent of turnarounds reach *Best* TFEL status.

Research has shown that one of the most significant contributing factors to TFEL is the role that business plays in setting, documenting, and communicating clear objectives and constraints. When the business kicks off the TFEL process with clear objectives and realistic constraints, maintains good integration with the turnaround team, and revisits the goals and constraints throughout the planning process, the TFEL Index is consistently better than turnarounds that did not have good business integration. Figure 1 illustrates the level of improvement in the TFEL when these Best Practices are followed.

Although all components of TFEL are correlated with improved outcomes, freezing the turnaround scope is a critical early step that shapes the TFEL phase. Research shows that when the turnaround scope is frozen less than 1 year from the turnaround start, the likelihood of reaching *Best* TFEL status declines; accordingly, turnaround cost effectiveness declines. Freezing the scope includes the identification of all scope, including the authorization of all small projects. All too often, business fails to support an early scope freeze by adding late projects.

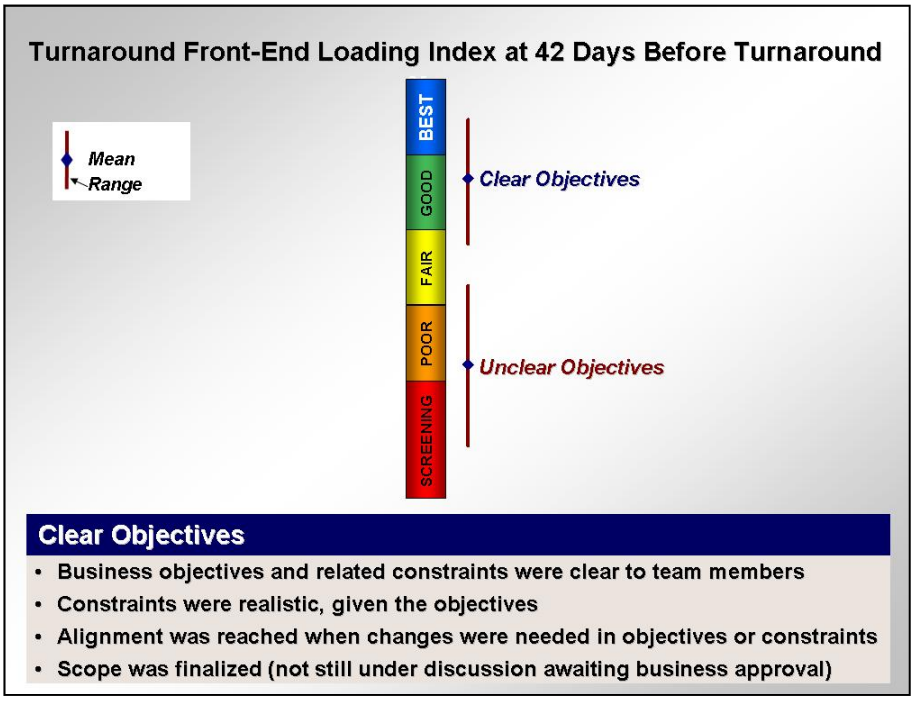

Figure 1. **When business clearly defines objectives and constraints, it enables better TFEL.**

In addition to TFEL, the role that contractors play during the planning and turnaround (execution) phases is also a critical driver of turnaround effectiveness. Research shows that there are two dominant strategies regarding the role of contractors during planning and execution. The *owner-led approach* consists of the owner leading the development of TFEL and the management of the subcontractors working during the execution phase. This approach often includes the use of third-party contract assistance, but these third-party contractors report to the owner. The *contractor-led approach* includes contracting TFEL and execution management as a service. Research shows that both approaches attain similar levels of TFEL at the 42-day benchmark. However, the contractor-led approach comes with a 13 percent cost penalty (worse cost effectiveness) for the same scope of work.

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Figure 2 shows that there is a sharp decline in turnaround cost effectiveness when owners shift too much responsibility to contractors. We also found that, although cost predictability is similar in the use of the two approaches, schedule slip is larger among the contractor-led turnarounds; on average, contractor-led turnarounds suffer 7 more days of slip during the turnaround, including 2 days during the startup phase. Another perhaps surprising finding is that contractor incentives do not improve either schedule or cost predictability. Clearly, leveraging owner resources and leadership during TFEL and execution is a key driver of cost effectiveness.

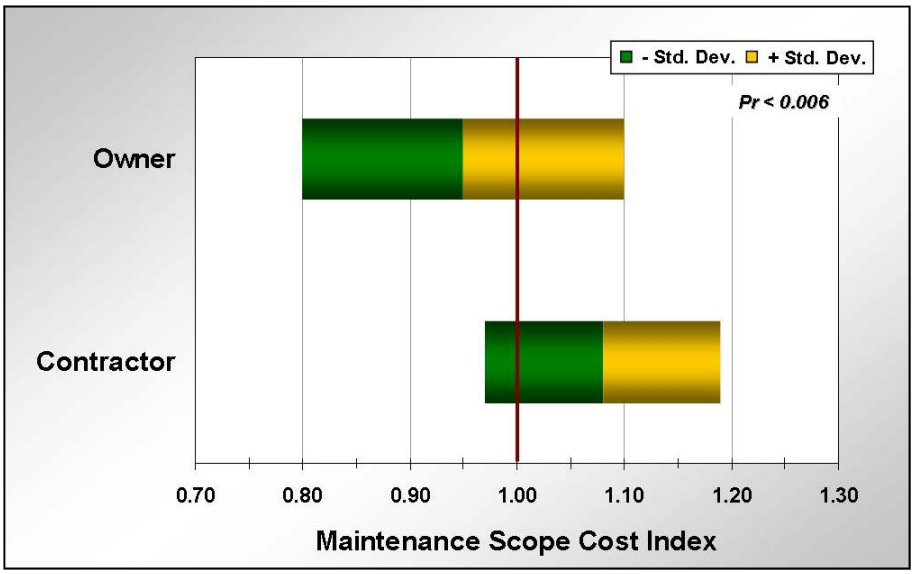

Figure 2. **Shifting responsibility comes with a price.**

The final area that we discuss is estimating strategy. Many companies put pressure on their turnaround teams to avoid overruns because of the stress that an overrun places on the overall expense budget for the business. Because this is a directive, many teams deliberately use estimating practices that prevent overruns. They typically develop estimates with an 80 percent or greater probability of producing an underrun.

As shown in Figure 3, however, conservative estimating does not save costs but, in fact, *drives up costs*. Conservative estimates lead to 3 percent higher costs (controlling for other drivers) for the same scope of work compared with turnarounds from companies that use a balanced approach (a balanced estimate, including contingency, has a 50/50 chance of an overrun/underrun). Because the risk of a turnaround overrun is real, some companies have adopted a more balanced estimating approach and use a management reserve fund to protect expense budgets. The management reserve fund is a holding fund that can be used for any turnaround, but is at the control of the business; each turnaround, therefore, does not have to build extra contingency in its estimate.

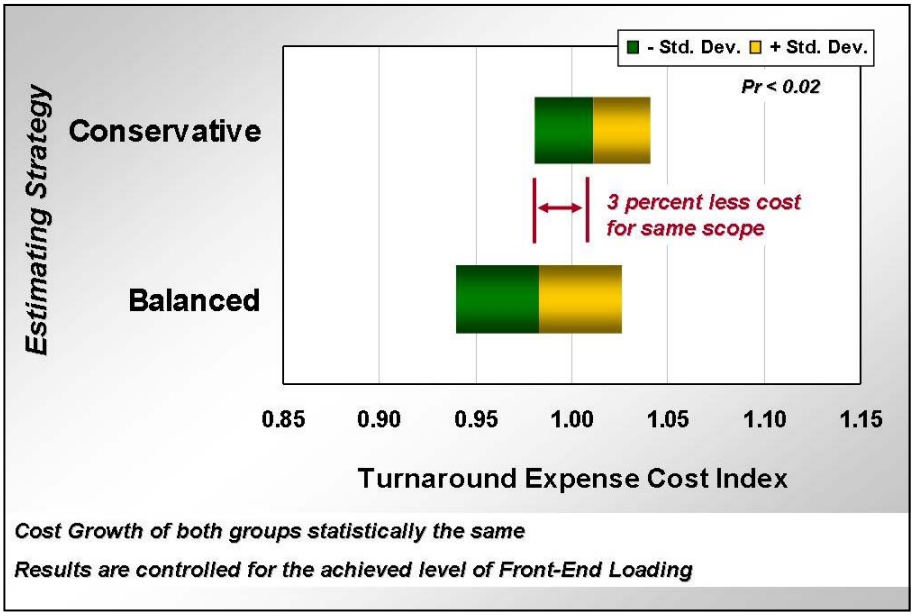

Figure 3. **Conservative estimating yields expensive costs.**

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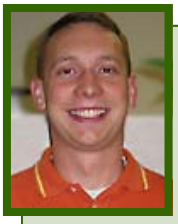
In conclusion, keeping turnaround expense cost competitive is a key component of manufacturing excellence. TFEL is a critical driver of turnaround success, and business must kick-off and shepherd the TFEL phase appropriately. While many owners would prefer to shift the risk and responsibility of TFEL planning and execution management to contractors, the owner has the primary influence over the results of the turnaround, and results are better when owners take the leadership role during the TFEL and execution phases. Finally, the estimating strategy plays an important role in turnaround cost effectiveness. A balanced estimate results in improved performance compared to the same turnaround with a conservative estimating strategy.



Professional Profile: *Hunter Mayo, Senior Analyst*

Since joining IPA in 2001, Hunter has been primarily involved with turnaround evaluation and research, as well as project and turnaround system improvement. During this time, he has completed research studies, analyzed industry trends, developed statistical models, and developed workshops to assist companies with their turnaround performance. He has also been involved in evaluating individual turnarounds, turnaround systems, and plant-based small project systems. Most recently, Hunter presented a paper entitled, “Achieving Accurate and Competitive Turnarounds" at the National Petroleum and Refining Association Maintenance and Reliability Conference on May 20 in Grapevine, Texas. Previously, Hunter spent 4 years in manufacturing facilities at International Paper and Trex, Inc., serving as a process engineer and maintenance engineer. Hunter obtained a B.S. in Engineering Science from the University of Virginia.

Your Input Is Requested!

THE IPA INSTITUTE
ADVANCING PROJECT KNOWLEDGE

Contracting In The Current Market Seminar

The IPA Institute is considering hosting a 1-day seminar in Houston, Texas, this fall 2009. The purpose of the seminar would be to present new research that discusses topics related to contracting in the current market. The potential topics for the seminar, based on the input we receive, will include the following:

- The current market conditions
- Owner behavior in various market conditions
- Contractor selection process
- How to effectively re-bid projects
- Responding to risk

If your company is interested in sending participants to this 1-day seminar, and to provide input on what topics would be of the greatest interest to you and your company, please contact Kelly Sonnhalter, Senior Project Analyst at 703-554-8834 or **ksonnhalter@ipaglobal.com**.

Major Components of Process Facility Costs

Robert Brown, Francisco Tschen, and Andy Ratliff

IPA tracks price trends related to capital project costs. Recent years have witnessed a spike in costs for goods and services essential to capital projects. The costs and price trends associated with a capital project are aggregated from a series of major cost categories: engineering services, bulk materials, major equipment, and construction labor & field services. We present the major cost categories for a capital project in Figures 1-4 and present the aggregated process plants escalation index in Figure 5.

With the exception of construction labor, most EPC goods and services are procured on a global market; therefore, we have opted to present the world open price trends as these provide the most robust escalation trends for Industry. The exception to this rule is construction labor which is driven by the regional and/or local marketplace.

A review of these escalation trends indicates that prices for most EPC goods and services are leveling off or even decreasing to some extent. The price for global engineering services (*Figure 1)* has remained flat for most of 2009 and signals a cooling of the engineering services market. IPA has yet to observe a dramatic decline in engineering prices as wages have tended to remain stable – however, the large rate of increase observed in both base wages and "all-in" wages from 2003 to 2008 has slowed substantially and points to more stable pricing for 2009.

The pricing for bulk materials (*Figure 2)*, which is more closely tied to raw

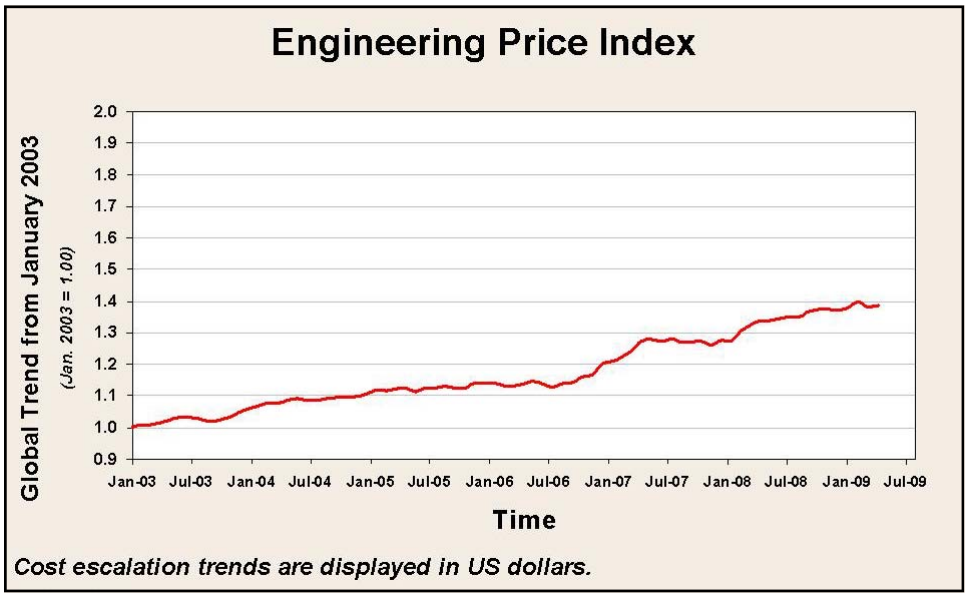


Figure 1. **Engineering Price Index**

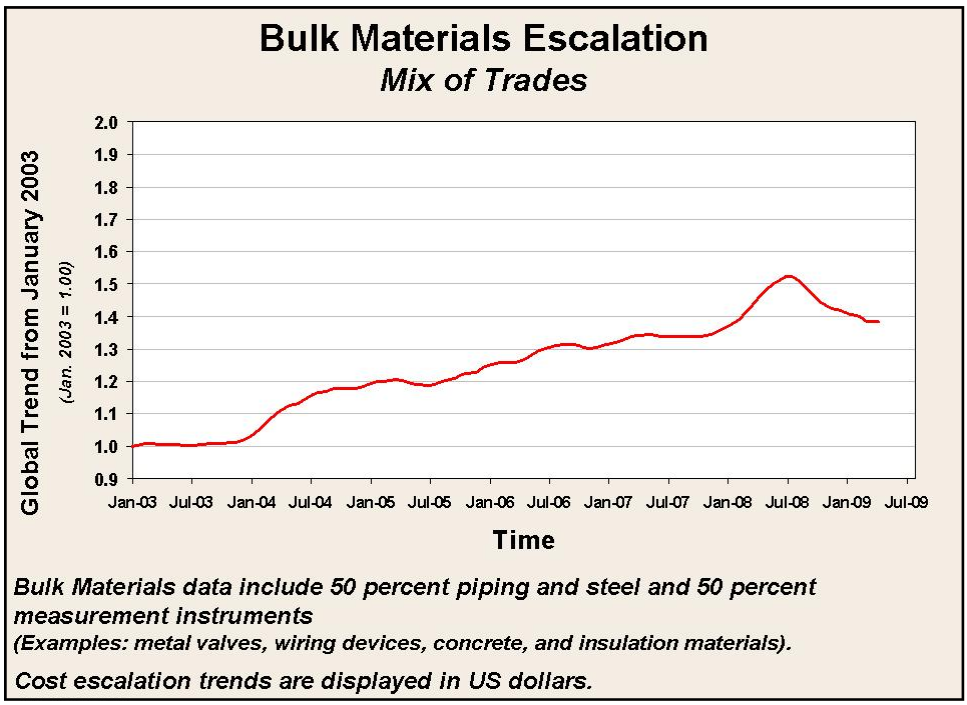


Figure 2. **Bulk Materials Escalation**

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commodity prices, has experienced greater volatility with recent declines in 2009 of over 20 percent. These drops are not surprising given that a large portion of the costs for bulk materials are composed of highly volatile commodities (most notably base metals), which have shown large price decreases in 2009.

Since 2003, major equipment pricing (*Figure 3)* has been extremely volatile for both fabricated and mechanical items. Price increases were driven by an increase in base metals as well as a shortage of shop space for many types of equipment. These factors resulted in an increase in prices as well as extended procurement durations. For 2009, the market has contracted with procurement durations returning to more normal levels and prices stabilizing or (even in some cases) declining.

For most of the major capital project regions, the price for construction labor (*Figure 4)* (defined as the "all-in" subcontractor wage) has generally leveled off. While wages have likely remained flat, the all-in wage has declined as the amount of additional pay – e.g. overtime, per diems, retention bonuses – has dropped, due to the re-

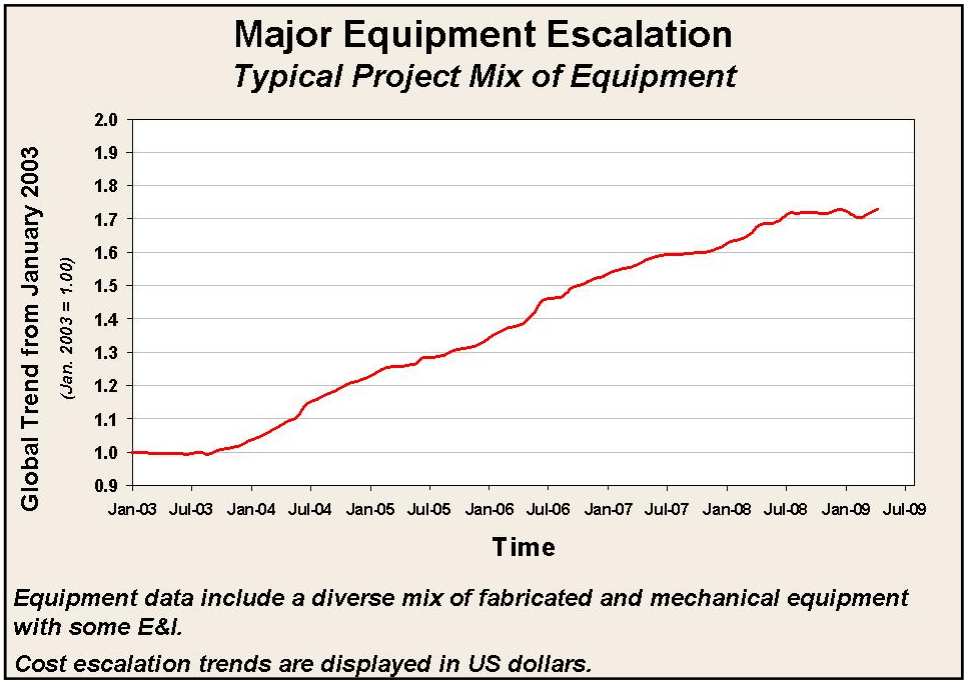

Figure 3. **Major Equipment Escalation**

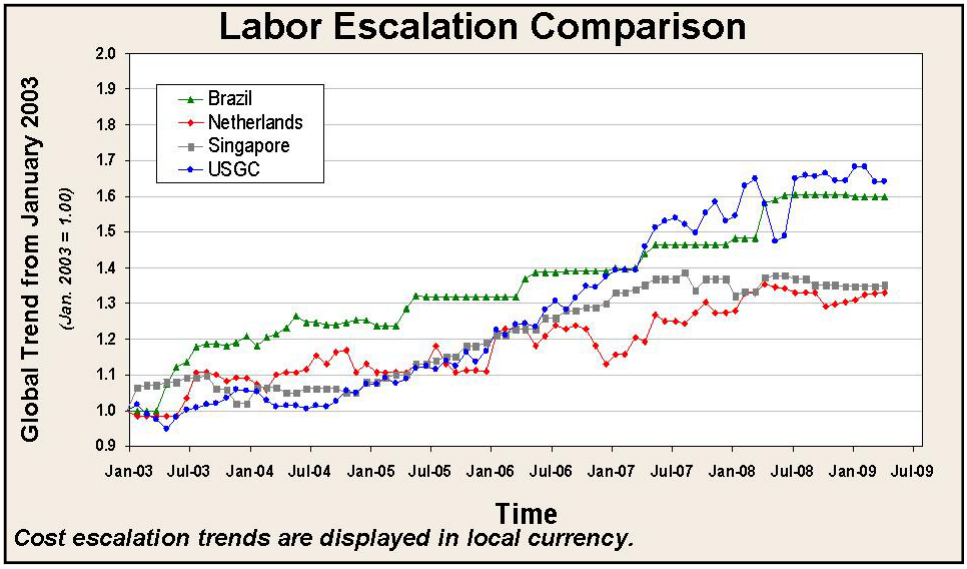

Figure 4. **Labor Escalation Comparison**

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laxed market for construction labor.

In conclusion, the overall prices for EPC goods and services has stabilized in response to the recent global economic contractions. In many instances, the drop in prices for EPC services has lagged the overall economy with many EPC services showing a price stabilization as opposed to a major decrease.

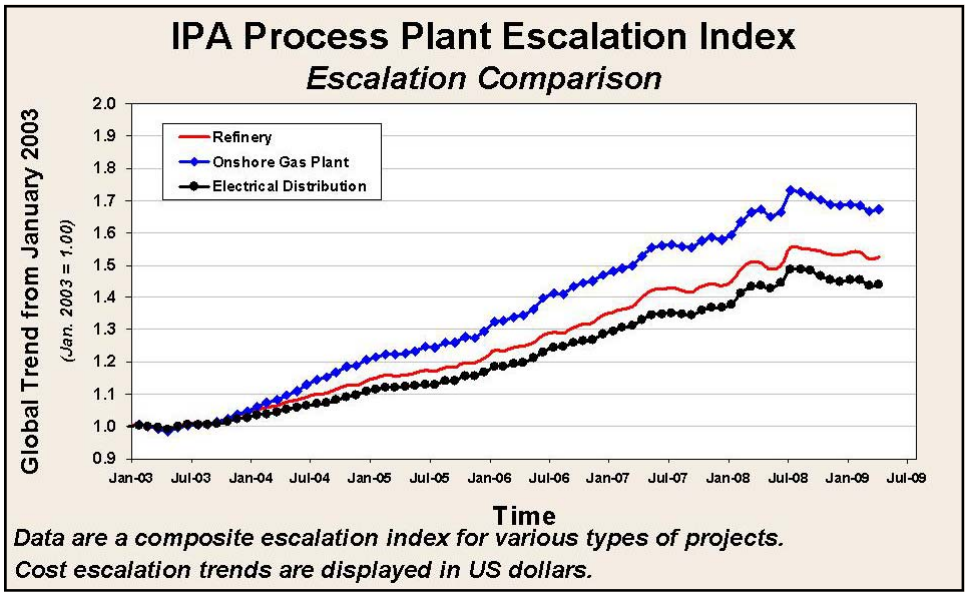

Figure 5. **IPA Process Plant Escalation Index**

Author: *Robert Brown*

Robert Brown manages IPA's cost engineering group and is responsible for IPA's Cost Engineering Committee. He has been at IPA for over 8 years and worked as a project analyst for 6 years. He has analyzed and benchmarked hundreds of projects for the process industries.

Prior to joining IPA, Robert worked at the Pacific Northwest National Laboratories focusing on integrated assessment for energy policy and global change. Robert has a M.S. from Duke University and an A.B. from Davidson College.

Contributor: *Francisco Tschen*

Francisco Tschen joined IPA in 2007 as an Associate Research Analyst in the Product Development Group. He has developed cost models and conducted research on Pharmaceuticals and Compression Projects. Additionally, Francisco works with the cost engineering group, developing tools and detailed cost analysis of projects. Prior to working at IPA, Francisco worked for MonierLifetile, a concrete roof tile manufacturer, as a Process Engineer.

Francisco received a M.S. in Material Science and Engineering and a B.S. in Chemical Engineering both from Texas A&M University.

Contributor: *Andrew Ratliff*

Andrew Ratliff has been a Research Analyst within IPA's Product Development Group since 2007. He is currently a member of IPA's Cost Engineering Group, leading the group's cost analysis of equipment and bulk materials. In addition, Andrew has developed tools for cost analysis of projects within the petrochemical and specialty chemicals industries. Previously, Andy worked at PBS&J, an environmental consulting firm, as a Senior Scientist.

Andrew has a B.S. in Integrated Science and Technology from James Madison University.

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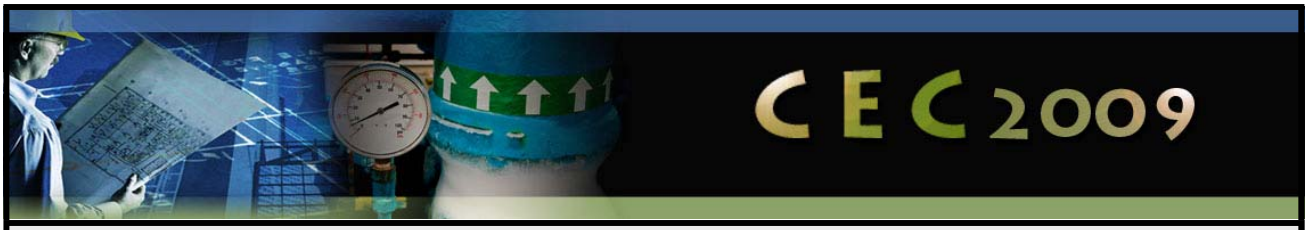

2009 Cost Engineering Committee (CEC) Annual Meeting

CEC Mission: Improving the role and competency of cost engineering within Industry.

The Industry Benchmarking Consortium (IBC) Cost Engineering Committee (CEC) was formally organized in 1997 and is an approved subcommittee of the IBC. The purpose of the CEC is to extend the IBC forum to cost engineering practices with a focus on cost and schedule metrics. By using these cost and schedule metrics and research findings, companies can improve their project and business results.

DETAILS: The 11th Annual 2009 CEC Annual Meeting will be held ***September 15 - 17, 2009*** at the ***Dulles Hilton in Chantilly, VA***.

ATTENDANCE: CEC membership is open to all eligible IBC members in good standing. CEC member companies generally have an internal/owner cost engineering organization to support the company's capital project development process. In most cases, the CEC meeting is attended by cost engineering and controls professionals.

KEY BENEFITS: The main output of the CEC is the Cost Metrics Report and associated tools. The cost metrics in these reports are developed from data in the IPA Project Evaluation System (PES®) downstream database. Companies can use the metrics in these reports to do the following:

- Support conceptual estimate and schedule development.
- Support estimate and schedule reviews (particularly contractor submittals).
- Assess company performance against industry norms.
- Support calibration and improvement of company tools and databases.
- Improve asset cost evaluation and concept development.

2009 TOPICS:

- A review of current market trends
- Equipment procurement
- Spending curves
- Schedule Best Practices
- Full updates of all metrics, and explanations on the proper use of the metrics

For more information on the IBC Cost Engineering Committee, please contact **Robert Brown** at (703) 729-8300 or at **rbrown@ipaglobal.com.**

Upcoming IPA Events and Presentations for 2009

June 18

IPA will present at the Project Management Institute - Arabian Gulf Chapter (PMI-AGC)

Patricia Velazquez Griffith, Managing Director for IPA's two European offices, will present *The Capital Projects World 2009 - Let's Use the Lull Wisely.* This technical presentation will provide insights into the capital markets and industry Best Practices in project planning and execution, as well as highlight the importance of the interface between business and engineering to better align project execution with business strategy.

The PMI-AGC is sponsoring the Technical Presentation and Dinner on June 18, 2009 at Gulf Hotel in Manama, Bahrain. For more information please contact the PM-AGC secretariat at **pmi-agc@aramco.com**, or visit **www.pmi-agc.com**

July 7 - 9
November 17 - 19

The IPA Institute is hosting a seminar on Project Management for National Companies and Partners

This 3-day seminar is designed to provide participants with Best Practices and learnings that have been shown to improve capital project effectiveness. The ultimate objective is to provide project professionals in these organizations a clear understanding of the deliverables and requirements that, with the support of PMCs, need to be completed during the development and execution phases of the projects.

The seminar in July will be hosted in Abu Dhabi, U.A.E. The second seminar in November will be held in Beijing, China. To register, or for more details, please contact the IPA Institute by e-mail at ipainstitute@ipaglobal.com or by phone at (703) 729-8300.

August 4
August 5
August 10

IPA 2009 Seminar Series - Capital Project Effectiveness in Australia

IPA invites you to its inaugural half-day *Capital Project Effectiveness in Australia Seminar Series* to be held in 2009 across Australia. The seminars will present current IPA research that shows that projects executed in Australia are costing more and taking longer to execute than the same projects executed by their global competitors and peers. Drawing from research the series will discuss the importance of sustaining capital effectiveness and governance in the current economic downturn and will explore the gaps in performance between projects executed in Australia and those executed globally.

To register online, please visit our website at **www.ipaglobal.com**, or for more information please contact **ipaseminar@ipaglobal.com**.

September 15 - 17

Cost Engineering Committee (CEC) 2009

The **Cost Engineering Committee (CEC)** will be held in Dulles, VA, USA. The purpose of the CEC is to extend the IBC forum to cost engineering practices with a focus on cost and schedule metrics. By using these cost and schedule metrics and research findings, companies can improve their project and business results. For more information on the IBC CEC, please contact **Robert Brown** at **rbrown@ipaglobal.com**.

October 12 - 15

IPA will present at the Petrochem Arabia Conference

Patricia Velazquez Griffith, Managing Director for IPA's two European offices, will present at the Petrochem Arabia Conference. This technical presentation will provide insights into the timing of projects for the commodities industry. The conference will be held October 12 to 15, 2009 in Abu Dhabi.

November 9 - 11

Upstream Industry Benchmarking Consortium (UIBC) 2009

The **Upstream Industry Benchmarking Consortium (UIBC)** will be held in Tysons Corner, VA, USA. The UIBC provides an independent forum for each participating company to view its performance against the performance of other companies. The consortium highlights Best Practices, reinforcing their importance in driving improvements in asset development and capital effectiveness. For more information on the UIBC, please contact **Rolando Gachter** at **rgachter@ipaglobal.com**.

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2009 IPA Institute Course Offerings

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

Best Practices for Small and Plant Projects (21 Professional Development Units)

June 23 - 25: Salvador de Bahia, Brazil
October 20 - 22: Houston, TX, USA
November 3 - 5: Dusseldorf, Germany

Project Management Best Practices (21 Professional Development Units)

June 30 - July 2: Rotterdam, The Netherlands
July 7 - 9: Lima, Perú
August 4 - 6: Houston, TX, USA
October 6 - 8: Newark, New Jersey, USA
October 13 - 15: Singapore, Singapore
November 3 - 5: Johannesburg, South Africa
December 1 - 3: Bogotá, Colombia

Exploration and Production Project Best Practices (21 Professional Development Units)

June 30 - July 2: Aberdeen, Scotland
September 29 - October 1: Asia
November 4 - 6: Rio de Janeiro, Brazil

Project Management for National Companies

July 7 - 9: Abu Dhabi, U.A.E.
November 17 - 19: Beijing, China

Successful Megaprojects - A Seminar for Those Involved with Large and Complex Projects

August 11 - 13: Santiago, Chile
September 29 - October 1: Houston, TX, USA

Establishing Effective Capital Cost and Schedule

August 25 - 26: Rio de Janeiro, Brazil
November 17 - 18: Johannesburg, South Africa
December 1 - 2: Santiago, Chile
December 7 - 8: Singapore, Singapore

Best Practices for Mining Projects (21 Professional Development Units)

August 25 - 26: Toronto, Canada
November 3 - 4: Santiago, Chile

Best Practices for Power Projects

New Course! See Page 11 for More Details!

September 22 - 23: San Francisco, CA, USA

Contracting in the Changing World of Projects - A Seminar on Contracting Strategy

September 22 - 23: São Paulo, Brazil
December 9 - 10: Singapore, Singapore

Practices for Shorter, More Cost Effective Turnarounds

New Course!

September 23 - 24: The Hague, The Netherlands

Regional Meeting: Executing Successful Projects in Turbulent Times

See Page 11 for More Details!

September 29: Mexico City, Mexico

Gatekeeping for Capital Project Governance

October 6 - 7: Rio de Janeiro, Brazil

New Products and Offerings...

Introducing a New IPA Institute Course: *Best Practices for Power Projects*

This program integrates findings from IPA's extensive quantitative research that links project management practices to project outcomes. Learnings presented in this program are derived from IPA's database of over 700 power projects including power generation, transmission, and distribution investments. These projects range in size from small revamp and maintenance projects of less than US $1 million to large new power facilities costing over US $1 billion.

The program will include the following content:

- Defining power facilities that best meet business needs
- Practices to manage the interface between commercial and project management functions
- Building an effective team
- Implementing contracting and procurement strategies
- Implementing technology improvements
- Understanding and managing risks
- Setting and achieving predictable cost and schedule results
- Controlling a project as it progresses through execution
- Implementing practices to improve construction safety

Update to IPA's Regional Labor Productivity Research

The UK government has asked IPA to investigate labor productivity for the process industries in Britain versus the United States and other selected countries in Europe. This study revisits IPA's 2001 construction labor productivity study, and will update construction labor cost and productivity in these selected "high-wage" countries. The methodology involves creating groups of projects of very similar scope and then comparing the field labor cost and hours. This study leverages our capability to develop research that provides specific regional productivity information to interested clients. For further information regarding IPA's research on labor cost and productivity please contact Kelly Sonnhalter, Senior Project Analyst at 703-554-8834 or **ksonnhalter@ipaglobal.com**

Executing Successful Projects in Turbulent Times - *September 29, 2009*

The IPA Institute is hosting a one-day conference in **Mexico City** to share Best Practices for improved capital effectiveness and for managing risk in this difficult economic climate. The information shared during this conference is based on 30+ years of IPA's quantitative research into capital effectiveness. IPA has evaluated over 11,000 projects executed around the world. Currently the IPA database has over 900 projects executed in Latin America and about 150 in Mexico.

The conference will cover project success drivers, risk management, implementation strategies, and two case studies of projects executed in Mexico. Additionally, the conference provides participants with a great opportunity to interact and discuss issues in planning and executing projects with professionals from other companies. All professionals who are involved in the capital project delivery process are invited to attend. For more information contact Sonia Kaestner at **skaestner@ipaglobal.com**, or visit our website at **www.IPAInstitute.com**.

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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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