TODAY

Tomorrow & Beyond

LEVERAGING LEADERSHIP, DIVERSITY AND INNOVATION

2016 ECC CONFERENCE 48TH
Brownfield Project Success

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Independent Project Analysis

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BP

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Hargrove Engineers & Constructors
Characteristics of IPA’s Database
Over 17,000 Projects in Total

- Small Brownfield Projects Less Than $20 million
- Large Brownfield Projects
- Large Greenfield Projects
- Large Brownfield Projects More Than $20 million

Source: Independent Project Analysis, June 2016
## IPA’s Large Brownfield Projects Database

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Projects</td>
<td>3,532</td>
</tr>
<tr>
<td>Median Project Cost (2016 USGCS*)</td>
<td>$58 million</td>
</tr>
<tr>
<td>Range of Total Project Cost</td>
<td>$20 million to $992 million</td>
</tr>
<tr>
<td>Median Authorization Year</td>
<td>2005</td>
</tr>
<tr>
<td>Range of Authorization Year</td>
<td>1986 to 2017</td>
</tr>
<tr>
<td>Companies Represented</td>
<td>295</td>
</tr>
<tr>
<td>Construction in a Turnaround</td>
<td>73 percent of projects</td>
</tr>
<tr>
<td>Median Execution Duration (Authorization to Startup)</td>
<td>20 months</td>
</tr>
<tr>
<td>Range of Execution Duration</td>
<td>7 months to 58 months</td>
</tr>
<tr>
<td>Average Cost Growth</td>
<td>3 percent</td>
</tr>
<tr>
<td>Range of Cost Growth</td>
<td>-36 percent to 88 percent</td>
</tr>
</tbody>
</table>

* USGC = US Gulf Coast
Keys to Successful Brownfield Projects

- **Scope**
- Site Constraints and Limits
- Relationships and Teamwork
Scope

- Existing site requires modifications to accept the Brownfield project
  - What modifications are necessary and what is urban renewal?
  - Get scope agreement early, strict change order policy, place change authority at a high level
- Inspect and test existing equipment
Changes After Authorization Are Costly

Cost Growth

Number of Major Design Changes After Authorization

Actual Costs = Estimate

Pr < 0.03

Source: IPA
Scope Definition

• As the owner, what are the most critical elements to scope definition?
Scope Definition Key Takeaways

- Think both Technically and Organizationally when defining scope.

- Technically:
  - Don’t assume. Assess the plant.
  - INTEGRITY, CAPACITY and PERFORMANCE

- Organizationally:
  - Understand the Owner’s organization.
  - Understand the objective. Setup governance.
  - Talk value or total cost of ownership; not just cost and schedule.
Keys to Successful Brownfield Projects

- Scope
- Site Constraints and Limits
- Relationships and Teamwork
Site Constraints and Limits

- Material management
  - Purchasing, receiving, laydown areas, moving to work site
- Permitting near operating units
- Existing contractual alliances with local contractors
- Turnaround issues
  - Recognize the detailed planning phase requires sufficient time—early delivery of engineering packages
Typical Schedule for Greenfield Project with Minimal Turnaround Scope

- Front-End Loading
- Detailed Engineering
- Construction
Typical Schedule for Brownfield Project with Major Turnaround Scope

*Require Early Delivery of Engineering Packages to Support Detailed Integrated Planning*
Site Constraints and Limits

• As the constructor, what are the most critical elements to site constraints and limits?
Site Constraints and Limits Key Takeaways

- Well-defined Change Management process
- Dedicated field design engineer(s) assigned to the site
- Specific plans to transition from Pre-Outage construction into Outages/Commissioning
- Early involvement of Contractor (FEL3) – Execution Planning
- “You are in someone else’s home”
Keys to Successful Brownfield Projects

- Scope
- Site Constraints and Limits
- Relationships and Teamwork
Brownfield Projects Require Key Input From Site-Based Resources

Operations
Materials Management

Maintenance
Safety

(Plant) Engineering
Turnaround

Greenfield

Brownfield

Site Interface
Team Integration is Essential During Definition Operations and Maintenance Functions Most Common Gap

Cost Performance

Industry Average

Missing at Least One Key Function

Integrated Team

Source: IPA
Relationships and Teamwork

- As the engineer, what are the most critical elements to relationships and teamwork?
Relationships and Teamwork Key Takeaways

• Conduct a team chartering session – make it happen regardless of project size.

• Openly discuss the difficult subjects early to align expectations – create an environment of candor.

• Understand who the project owner is – plan communications accordingly.
Summary

Keys to Successful Brownfield Projects:

- Scope
- Site Constraints and Limits
- People: Relationships and Teamwork