Benchmarking and the Alberta Report – a Government/Industry Partnership

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Benchmarking Committee
Canada’s oil reserves are second in the world behind Saudi Arabia

Of 179 billion barrels of Canada’s oil reserves, the oil sands represents 97%

For each permanent oil sands related job, 9 additional direct, indirect and induced jobs are created in Canada

Currently 240,000 jobs in Canada are directly or indirectly linked to the oil sands

Between 2000 and 2020, oil sands development has the potential to generate at least $124B (Cdn) in royalty and tax revenues for Canada’s federal and provincial governments
Why Benchmarking in Alberta?

- Alberta was experiencing major cost overruns on it’s mega-projects.
- Many of these mega-projects were in Alberta’s oil sands sector.
- Oil sands are an important and growing sector of Alberta’s economy.
- Something had to be done to rein in rising construction costs, Alberta was being viewed as a high cost jurisdiction in which to do business.
Alberta Government Involvement

- Due to rising costs for developing the oilsands, the Alberta government could see the province’s competitive advantage being eroded and was having trouble attracting foreign investment.

- The Alberta government supports the oil sands sector in its pursuit of higher productivity and lower development costs.

- Alberta always compared unfavourably to the US Gulf Coast for costs and productivity.

- What gets measured gets improved!
Development of Benchmarking in Alberta

- Benchmarking initiative started in 2003 with the development of Alberta specific metrics (isolated, camp conditions, winter weather, size)

- The Construction Industry Institute (CII) chosen for their expertise in benchmarking

- Phase I now complete
  - Company reports generated for participants
  - Alberta Report done

- About to embark on Phase II
  - Many enhancements added
  - Alberta Report 2
37 (out of a total of 78) projects were analyzed in August 2008 resulting in the “Alberta Report”

27 of the 37 oil and gas, half are grassroots

Total installed costs range from less than $5M (Cdn) to over $100M (Cdn), with eight projects over $1B (Cdn). Average = $368M (Cdn)

In general, Alberta not so bad with respect to measures of construction productivity when compared to US projects
Productivity metrics assessed both engineering and construction productivity (overall and in specific disciplines)
- Metrics are defined as ratios of work hours to quantities
- Performance metrics used included cost, schedule, safety, change and re-work

14 Best Practices assessed for impact on performance metrics

18 COAA specific metrics for Alberta included
- Direct and indirect costs
- Use of modularization
- Peak workforce
- Overtime

Comparisons made between Alberta projects and comparable projects in the CII database for the USA
Alberta Report - Costs

- 19% average cost growth for Alberta projects (actual costs exceeded initial planned cost by 19%).

- Cost growth lower as % detailed engineering complete increased.

- Use of Project Risk Assessment Best Practice reduced project cost growth.

- High indirect costs (additional supervision, bussing, camps, etc.)
  - Averaged 21% of total project costs
  - Indirect cost growth increased as project size increased

- Best Practice of Planning for Startup reduced cost growth in startup.
Alberta Report - Schedule

- Average schedule growth was 17%
- Constructability Assessments led to reduced schedule growth
Alberta/USA Comparisons

- US database 353 projects, 250 Gulf Coast projects
- Similar industrial projects - no adjustments made for differences in project size, economic conditions or other significant project drivers.
- Median project size in Alberta dataset is $186M (Cdn) vs. $40M (Cdn) in the US dataset
- Project cost growth much higher in Alberta (19%) vs. US (3%)
- Alberta project cost growth had much wider range (-27% to 69%)
- Development and scope changes similar between Alberta and the US
Alberta/Gulf Coast Comparisons – Engineering Productivity

- Engineering productivity measured as the ratio of direct engineering hours per installed quantity in the field
- Comparisons based on weighted averages (i.e., larger projects count more in the average productivity than smaller projects)
- Engineering productivity for concrete better in Alberta than in US
- Structural steel engineering productivity worse in Alberta
- Engineering productivity for piping comparable.
Construction productivity measured as the ratio of field direct work hours per installed quantity

Comparisons based on weighted averages

Construction productivity for concrete slightly worse in Alberta

Instrumentation devices construction productivity much worse in Alberta (non-weighted average between the two was comparable, further research is warranted)

Construction productivity for structural steel was comparable

Insulation construction productivity was better for the Alberta dataset
Economy of Scale may not be equal
Construction Approach is Similar
Before this study it was perceived that Alberta’s productivity was much worse overall than similar US based projects

Productivity similar between Alberta and US

So why the higher cost growth in Alberta vs. US data?
- Average wage rates are higher in Alberta than where most of the US projects occur
- Indirect costs are higher on mega-projects than on smaller projects
- Initial cost estimates on mega projects weak
- Starting projects with very low % engineering complete
Alberta Report - Appreciation

- **Phase 1 Funding Partners**
  - Alberta Finance and Enterprise
  - Construction Owner’s Association of Alberta
  - Several Owners & Contractors

- **Construction industry Institute (CII)**
  - Dr. Stephen Mulva
  - Research Students
COAA Benchmarking Phase II

- 3-Step Process

- Online Questionnaire → COAA Benchmarking Database → Data Mining and Reporting Engine
Phase II Features

- **Customized Questionnaire Development**
  - Absolute Metrics
  - Indirect Costs
  - Pipeline Projects
  - Modularization (Productivity in Fab Yard)

- **Alberta-Based Benchmarking Lab**
  - Full-Time Alberta-Based Support
  - Real-Time (OTJ) Training

- **Alberta Report #2**
Phase II System Enhancements

- Internal (Process Unit, Project specific) Benchmarks
- Automated Key Reports
- Company-Level Reports
- Executive Dashboard
- Full Data Mining Capability
  - Comparisons with CII (U.S.) Database
  - “Level 1” Productivity Metrics (All Disciplines)
Phase II Data Mining

- Web-Enabled Queries
Project-Level (Eng) Productivity

Project Level Engineering Productivity Metric

25th to 10th Percentile = 11% Improvement
Executive (Portfolio) Dashboard

- All Projects
  Number of Project: 20

Overall Project Performance

Percentile
- 1st Quartile
- 2nd Quartile
- 3rd Quartile
- 4th Quartile

Cost Performance
- 10%
- 15%
- 10%
- 65%

Schedule Performance
- 31%
- 31%
- 25%
- 13%

Dimension Performance
- 40%
- 25%
- 15%
- 20%

Practice Use Performance
- 11%
- 33%
- 11%
- 45%
## Project Key Report - Construction Productivity - Structural Steel

<table>
<thead>
<tr>
<th>Metric</th>
<th>Wk-Hrs</th>
<th>Installed Quantity (MT)</th>
<th>Unit Rate (Wk-Hrs/MT)</th>
<th>Weighted Database Mean</th>
<th>4Q</th>
<th>3Q</th>
<th>2Q</th>
<th>1Q</th>
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<tr>
<td>Structural Steel</td>
<td>62,067</td>
<td>744.8</td>
<td>83.33</td>
<td>49.961</td>
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<td>Pipe Racks &amp; Utility Bridge</td>
<td>20,765</td>
<td>261.3</td>
<td>79.48</td>
<td>33.628</td>
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<td>Miscellaneous Steel</td>
<td>13,230</td>
<td>114.3</td>
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<td><strong>Total Structural Steel Productivity</strong></td>
<td>96,062</td>
<td>1,120.4</td>
<td>85.74</td>
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<td>Estimated Total Structural Steel Productivity Rates</td>
<td>79,684</td>
<td>1,038.7</td>
<td>76.71</td>
<td>28.267</td>
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<td>Total Installed Unit Cost</td>
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<td>Estimated (S/MT)</td>
<td>Actual DB Mean (S/MT)</td>
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# Project Key Report - Best Practices

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<th>Metric</th>
<th>Project Score</th>
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<td>Front End Planning</td>
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<td>Project Risk Assessment</td>
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<td>Team Building</td>
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<td>Alignment during Front End Planning</td>
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<td>Design for Maintainability</td>
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<td>Constructability</td>
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<td>Project Change Management</td>
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<td>Safety (Zero Accidents)</td>
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<td>Automation/Integration (AI) Technology</td>
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<td>Pre Fabrication, Pre Assembly, Modularization and Offsite Fab. (PP_MOF)</td>
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Phase 2 - Appreciation

- **Phase 2 Partners thru 2010**
  - Alberta Finance and Enterprise
  - Construction Owner’s Association of Alberta (COAA)
  - Construction Industry institute (CII)
  - Owners & Contractors
    - Nexen Inc.
    - Shell Canada Energy
    - Suncor Energy Inc.
    - StatoilHydro Canada Ltd.
    - MEG Worley Ltd.
    - Bantrel
    - Enbridge Inc.
    - JV Driver Projects Inc.
    - Boilermaker Contractor Association (BCA)
    - Electrical Contractors Association of Alberta (ECAA)
    - Industrial Contractors Association of Alberta (ICA)

MORE PROJECTS REQUIRED!!

Several other Potential Interested Owners & Contractors
Workshops

- Workshop Sessions @12:45 and 2:30
- Benchmarking - Phase 2 Plan
- Alberta Report – Overview of Results
Engineering Complete Before Construction Start

% Design completed before construction started vs. Construction Phase Cost Growth
Construction Indirect Cost Growth

![Graph showing the relationship between adjusted total project cost and construction indirect cost growth. The x-axis represents the adjusted total project cost in millions of Canadian dollars (CDN) in 2007, while the y-axis represents the construction indirect cost growth. The points on the graph are scattered, indicating variability in cost growth across different project costs.]