Fertilizer and Nitrogen Plant Turnaround Benchmarking Study

Prospectus
Pursuing Competitive Turnaround Outcomes in the Fertilizer and Nitrogen Industry

In the current market, with shrinking margins, it is becoming harder for companies to be profitable. Turnarounds have a major impact on the business and offer companies an opportunity to reduce cost and downtime through better execution. Based on our experience working with the Fertilizer and Nitrogen industry, AP-Networks has identified a need for this industry to better understand what is superior turnaround performance and how it can be achieved. This prospectus describes a joint-industry turnaround benchmarking study that will identify top-quartile turnaround performance levels for fertilizer and nitrogen plants and identify opportunities for improvement for sponsoring companies.

The ability to deliver competitive, predictable turnaround outcomes has become a differentiating factor between leaders and laggards in industries across the globe, prompting many to ask the question: “What does good turnaround performance look like?” Recently, AP-Networks has watched this question take on an increased urgency in the fertilizer and nitrogen industry—and we are well-positioned to deliver an answer.

AP-Networks has conducted wide-ranging consortium benchmarking studies in the Canadian Oil Sands and maritime dry docking industries to identify unique turnaround cost drivers and the practices that lead to successful outcomes. Now, we’re turning our attention to fertilizer and nitrogen plants. As a long-time solutions provider to the industry, we have the experience needed to help chart a path forward.

AP-Networks will facilitate the study design, ensure alignment with Industry standard definitions, collect and verify the data, and interface with each turnaround organization. AP-Networks will then prepare and deliver a custom report to each study sponsor detailing the sponsor company's competitive position relative to the industry. Furthermore, each report will provide observations and actionable recommendations to drive improved performance.

<table>
<thead>
<tr>
<th>Invited Companies</th>
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<tr>
<td>Agrium</td>
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<tr>
<td>Borealis</td>
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<td>CF Industries</td>
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<td>Dyno Nobel</td>
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<td>EuroChem</td>
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Data Collection

AP-Networks will employ a standardized benchmarking data collection tool. Study sponsors will independently provide turnaround performance data, with key turnaround representatives participating in data and practices validation.

Objectives

- Identify specific practices that owners can employ to execute more competitive turnarounds.
- Rank individual turnaround performance by quartile against industry competitors.
- Identify levers that drive efficiency and performance improvements, based on empirical data.

Study Workflow

1. AP-Networks will facilitate individual sponsor review of the study components.
2. AP-Networks will utilize our custom data collection tool and study plan.
3. Each study sponsor will provide their own set of data.
4. AP-Networks will analyze compiled data using statistical tools.
5. AP-Networks will prepare and deliver custom reports for each study sponsor.

Process Units Included

Units involved in the benchmarking study include, but are not limited to:

- Urea
- Urea Ammonium Nitrate
- Nitric Acid
- Ammonia
- NPK
- Calcium Ammonium Nitrate
- Technical Ammonium Nitrate
AP-Networks Turnaround Database and Study Design

Measuring and tracking turnaround performance is essential for long-term operational success. The AP-Networks Turnaround Database houses data from more than 1,500 unique turnarounds. It contains information on planned and actual turnaround outcomes, key characteristics, and planning and execution practices that are correlated with outcomes. Data analysis facilitates the insights into causal factors behind success and failure, and allows individual turnarounds to be benchmarked against industry average and top quartile performance. It also allows for the identification of demonstrated practices that lead to successful outcomes.

The study will differentiate less controllable and more controllable performance factors. AP-Networks will weigh individual criticality by applying statistical analysis tools to the compiled data, focusing on leading indicators and best practices specific to the fertilizer and nitrogen industry and its challenges.

The study will adjust all cost data to a constant US Dollar basis. Additionally, location will be adjusted for using specific location factors such as: productivity, remoteness, logistics, weather, and more. Through the use of these and other methods, company and turnaround data will be normalized in order to facilitate “apples to apples” comparisons.

The study will investigate and adjust for turnaround indicators associated with less controllable factors, such as:

- Location and Infrastructure.
- Availability of qualified labor and supervision.
- Production process, equipment size, and type of service.

…and more controllable factors, such as:

- Turnaround interval and size.
- Scope characteristics and key ratios.
- Turnaround organization and staffing.
- Turnaround process.
- Planning practices and standards.
- Budgeting and estimating practices and standards.
- Contracting and contractor management practices.
- Continuous improvement, performance management, and learning.
What is Involved?

Sponsor organizations will provide turnaround performance data to AP-Networks for analysis. AP-Networks will validate this data to ensure compliance with the study’s standardized definitions. Required sponsor steps include:

- Review the benchmarking code of conduct and complete an agreement that ensures confidentiality of all study data.
- Complete the standardized data collection survey for each turnaround in the study. All sponsors must contribute data to ensure equitable participation in the study.
- Make key turnaround representatives available for the submission and validation of turnaround performance and practice data.

Confidential reports will be customized for each sponsor. Each report will provide a comparison of component performance against the sponsor group and Industry. All individual sponsor data is blinded and cannot be viewed by any other sponsor organizations.

Examples of Report for Individual Study

Study Deliverables

- Complete list of study sponsors and turnarounds included in the study and the statistical sample.
- Customized benchmarking data collection tool designed for the study.
- Industry mean, average, and standard deviation values for each benchmark for the sponsor group sample of turnarounds (blinded for confidentiality). List of metrics can be found at the end of this document.
- Detailed gap analysis: Your turnaround’s detailed performance compared to the rest of industry.
- Identified best practices and any observed association between practices and turnaround performance outcomes.
- Individualized conclusions, observations, and recommendations.
### Executive Summary

- Key Findings
- Data Sample and Project Overview
- Insight from the AP-Networks Turnaround Database
- Benchmarking Results: Performance Outcomes

### Cost Performance Relative to Company and Turnaround Averages

- Cost Execution Efficiency Index (Competitiveness)
- Cost Component Breakdown
- Cost per Direct Labor Hour
- Cost Per Piece of Equipment Worked
- Cost Predictability
- Cost Predictability and Complexity
- Contingency and Discovery Allowances

### Schedule

- Schedule Execution Efficiency Index (Competitiveness)
- Schedule Component Breakdown
- Schedule Predictability

### Labor Hours

- Labor Hour Growth by Turnaround
- Labor Hours Per Piece of Equipment Worked

### Safety, Environmental, and Operability

- Safety Performance
- Environmental Performance
- Trips (Number of trips within 2 months of startup)
- Operability (planned up time versus actual up time)
- Operability (planned capacity versus actual capacity)

### Benchmarking Results: Practices and Leading Indicators

- Practices and Leading Indicators
- Issuance of Engineering Packages
- Scope Freeze
- Changes to Scope
- Planned Versus Actual Equipment Count
- Scope Control Process
- Field Productivity
- Pre-Turnaround Work Slippage
- Adequate Resource Selection
- Timing of Awarded Contracts
- Contractor Capabilities
- Risk Management
- Turnaround Readiness (as available)

### Summary of Findings:

- Identified Best Practices and Recommendations

*Participating companies may request additional metrics and analysis to meet their business needs.*
Benefits to Study Participants
Each study sponsor will receive a customized performance benchmarking report comparing the sponsor’s turnaround performance metrics to that of the aggregate sponsor group. The report will:

- Identify specific practices that owners can employ to execute turnarounds that meet key targets.
- Provide a quartile ranking of turnaround performance against industry competitors. This will be done at both the turnaround level and the company level across a wide range of metrics.
- Identify levers that drive cost and schedule efficiencies and performance improvements, based on empirical data.

Study Pricing
The study sponsorship cost is established on a per-turnaround basis (as far back as 5 years) for each operating site in the study.

<table>
<thead>
<tr>
<th>Company Sponsorship, one turnaround</th>
<th>US$22,000</th>
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<tr>
<td>Includes a customized company report</td>
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<tr>
<th>Each additional turnaround at a company (2-3)</th>
<th>US$15,000</th>
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<tbody>
<tr>
<td>Each additional turnaround at a company (+3)</td>
<td>US$12,000</td>
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<tr>
<td>Each additional company turnaround that has previously submitted data to AP-Networks</td>
<td>US$10,000</td>
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*Site sponsorship requires the signing of a Study Terms, Conditions, and Confidentiality agreement to confirm participation.*

Study Schedule

<table>
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<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Study Kickoff</td>
<td>March, 2017</td>
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<tr>
<td>All Agreements Signed</td>
<td>July 28, 2017</td>
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<tr>
<td>Data Collection/Site Visits</td>
<td>August/September, 2017</td>
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<tr>
<td>All Data Submitted and Validated</td>
<td>Sept 29, 2017</td>
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<tr>
<td>Conclusion and Report Delivery</td>
<td>November 30, 2017</td>
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Benchmarking Case Study: 2014 Oil Sands Consortium
Asset Performance Canada (AP-Canada) conducted a consortium benchmarking study in 2014 that identified a turnaround (shutdown) cost gap of more than 50 percent between Oil Sands operators and the rest of industry in Alberta. But that paled in comparison to the 80 percent cost gap identified between the Oil Sands and the U.S. Gulf Coast.

AP-Canada’s 2014 Oil Sands Turnaround Cost Performance Benchmarking Study identified several factors that impact Oil Sands turnarounds to a greater degree than turnarounds in other regions: Reduced labor productivity, high pre-turnaround costs, and increased logistical costs. However, a significant portion of these factors were identified as being controllable, meaning that prudent turnaround preparation and management of field execution could have significant, positive impacts on these cost components.

The petroleum industry continues to adapt to a changing energy environment, and the Oil Sands sector is no exception. The insights and recommendations provided by the 2014 Oil Sands Turnaround Cost Performance Benchmarking Study provided study sponsors with the necessary information to chart a path forward in this challenging environment.

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1 Minimum fee for study sponsorship is $22,000. Payment terms: 50 percent of total cost will be invoiced at sponsorship commitment and 50 percent at study conclusion. Any related travel costs are additional and will be billed at actual cost.

2 Minimum requirements for the study to take place:
- Minimum Companies: 4
- Minimum Turnarounds: 12
About AP-Networks

Asset Performance Networks (AP-Networks) is Industry’s premier turnaround benchmarking and assessment firm. We aim to advance the state of Industry knowledge, and to drive continuous improvement.

For more than a decade, our company has worked to understand and improve turnaround and capital project performance in a multitude of different industries. We are currently engaged with turnaround teams from fertilizer and nitrogen companies including: Agrium, Dyno Nobel, Incitec Pivot, Koch Nitrogen (KAES), Orica, and Yara. We work to help these companies achieve their goals in executing turnarounds and turnaround-like events.

By combining our detailed turnaround event knowledge with the insight gained from our Industry-sponsored studies, we offer our clients access to the largest database of turnaround metrics in the world: the AP-Networks Turnaround Database.

The database contains information from more than 1,500 unique turnarounds from Industry, and provides quantifiable insights pertaining to:

- Estimated/Planned and actual turnaround outcomes.
- Characteristics of turnarounds (e.g., total field labor hours, types and numbers of modifications, new procedures, etc.), correlated with outcomes.
- Turnaround practices (e.g., scope freeze, logistics planning, team alignment, etc.), correlated with outcomes.

The AP-Networks Turnaround Database is used to facilitate better understanding of the causal factors behind success and failure and the practices that drive superior outcomes.

For More Information

Asset Performance Networks

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www.ap-canada.ca
www.turnaround-network.com
Benchmarking Code of Conduct

AP-Networks benchmarking studies are governed by a strict code of conduct. Principles that our studies adhere to include the following:

- **Legality** – Adhere to all laws and regulations.
- **Exchange** – Provide fellow sponsors with the same level of information that you request.
- **Confidentiality** – Information exchanged is confidential to individuals and organizations.
- **Use** – Benchmarking information is used only for its intended purpose.
- **Contact** – Follow study procedures and respect corporate cultures.
- **Preparation** – Commit to the study objectives and timelines by being prepared and providing information in a timely manner.
- **Completion** – Follow through with study commitments.
- **Understanding and Action** – Treat fellow sponsors with respect and meet expectations.

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