Liquid Pipeline Benchmarking Study
Terminal Benchmarking Study
Comparative Performance Analysis
We help you maximize your pipeline and terminal performance.

It’s a complicated task to stay competitive given today’s market conditions. Not only do you have to meet or exceed all regulatory standards of operational performance, you also have to keep cost performance a top priority. The near zero tolerance for environmental impacts has resulted in ever-increasing pressure to improve personnel training, inspection, and maintenance costs. Overall, the need to maintain a high level of pipeline and terminal facility integrity is more critical than ever.

Solomon’s Liquid Pipeline and Terminal Comparative Performance Analysis™ (CPA™) studies provide the foundation to answer the critical questions that will keep you at the top of your game, like “How does our cost performance compare to other diverse pipelines and terminals in our region?” and “How can we truly determine best performance for both cost and reliability?” Participation in these studies allows you to accurately measure current asset performance, providing a sound and consistent basis for managing continuous process improvements. The end result is a means to support the financial and operational optimization of your pipeline and terminal operations.

<table>
<thead>
<tr>
<th>Terminal CPA includes:</th>
<th>Pipeline CPA includes:</th>
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<tbody>
<tr>
<td>Refined products</td>
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<td>Liquefied petroleum gas</td>
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<td>Crude oil terminals</td>
<td>Natural gas liquids</td>
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<td>Pipeline breakout</td>
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<td>storage facilities</td>
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<td>endpoint terminals</td>
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Benefits of the Pipeline and Terminal CPAs

- Quantify performance improvement opportunities through gap analysis.
- Determine competitive position within industry peer groups.
- Establish performance targets and measure progress using Solomon indicators.
- Assess future performance impact of planned capital improvements/modifications.
- Demonstrate performance/capability to financial institutions and security analysts.
- Build corporate trust through performance improvement activity.

Key Features of the Pipeline and Terminal CPAs

- Performance comparisons at business-unit level
- Common nomenclature and rigorous data validation
- Comparisons by geographic regions
- Complexity divisors for reliable comparison of diverse facilities
- Cost and work hour gap analysis based on real data and identification with performance averages
- Detailed analysis of total cash expenditures, work hours, and reliability
- Absolute client confidentiality

The Process

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<tr>
<td>We assist you in selecting the correct combination of business units to maximize value for your pipeline and terminal studies.</td>
<td>We provide you industry tried-and-tested training, input forms, and instructions to efficiently collect data for your facilities.</td>
<td>We segregate the data into the categories that most affect the operational and financial performance of pipeline and terminal facilities, and then normalize the data to provide an accurate comparison of diverse operations.</td>
<td>We provide you with an analysis of your performance—the areas where you are doing well and the ones where you have room to improve.</td>
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The Difference Is Solomon’s Normalizing Factors

We understand that every pipeline system and terminal is unique with different geographic and operating characteristics. That is why we ensure that each operation participating in the study is reviewed from an in-depth perspective with normalized data to provide a view of your true competitive position.

Our correlation (measured by $r^2$) for the Equivalent Pipeline Complexity (EPC™) and Equivalent Terminal Complexity (ETC™) basis indicates that greater than 90% of the controllable fixed costs variability among study participants—what we call manageable non-volume-related expenditures (MNVE)—can be explained using the factors that comprise EPC and ETC. Our correlation ranges are based on analysis results from more than 95 pipeline systems and 110 terminals on four continents.

The MNVE per EPC or ETC metrics each take into account the physical design characteristics of the individual operation such as diameter, length, horsepower, number of receipt/delivery stations, etc. to give you a basis to realistically identify performance improvement in these areas no matter how diverse the other facilities participating in the study.

This means you get the most accurate “apples-to-apples” comparison of your operational performance to any competitor in the study.

### Equivalent Pipeline Complexity

Developed using a patented regression analysis of key pipeline characteristics versus MNVE, EPC provides a better methodology to normalize pipeline industry performance than either barrel-miles (tonne-kilometers) or diameter inch-miles (inch-kilometers).

### Equivalent Terminal Complexity

For storage terminals, traditionally the cost in US dollars per barrel delivered has expressed the competitive comparison with large-throughput land terminals typically having the competitive advantage. By using divisors like ETC, storage capacity, and throughput, Solomon normalizes performance regardless of terminal size and complexity.
We Give You 360 Degree Insight

Solomon studies give you perspectives at two levels: the big picture of where you stand compared to your peers and the details you need to take an informed and targeted approach to improve performance.

Demonstrating how your company is performing in total cash expenditures compared to all industry participants, our analysis uses specific divisors to give you a true view of your standing in areas like MNVE and energy expenses. The analysis reviews the following:

Manageable Non-Volume Expenditures
Reflecting manageable or controllable fixed costs, the MNVE per EPC or ETC provides a basis to realistically identify cost-based performance improvement areas.

Maintenance Costs
A Solomon study analyzes maintenance costs, an important subset of cash operating expenditures and MNVE, by function and activity to provide different perspectives for measuring performance. By using annualized maintenance costs rather than single study-year performance, which can vary widely from year to year, we provide a clearer view of your performance.

Personnel Costs and Work Hours
Understanding personnel effectiveness and efficiency is critical to overall operating performance. We provide personnel cost metrics that indicate the number of work hours required to operate a pipeline system or terminal at optimal levels of performance. Included are all company operations, maintenance, technical support, and administrative employees, as well as contractors.

Energy Costs
Solomon separates energy costs into two components—unit energy cost and energy consumption. Energy consumption per barrel-mile (per m³-km) is comparable globally for pipeline size and liquid peer groups.

Unlike using simple divisors which can mask your true performance level, for instance giving large-diameter pipelines an advantage due to their scale, with EPC (or ETC) as the normalizer, you can realistically identify your competitive position on an apples-to-apples basis no matter what the physical characteristics of other study facilities.
**Know Where Your Operations Are Doing Well and What Areas Need Work**

With a Solomon CPA, you will receive an MNVE gap analysis that can serve as the starting point for your performance improvement program. By breaking it down into cost components, you gain significant insight into enhancement opportunities in both cost and personnel.

**MNVE Gaps**

- **Pipeline**: $14,200
  - Operations: $1,750
  - Maintenance: $(1,900)
  - Technical Support: $(1,200)
  - Administrative: $(1,100)

**Target Group Average**

- **MNVE at Equal EPC**: $11,750

Thousand US Dollars

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**Drill Down to Specific Opportunities for Performance Improvement**

**MNVE Expenditure Detail Comparisons**

- **North America**
  - **Total Study**: $14,200
  - **MNVE Group A**: $11,750

- **Administrative Contract**
  - **Products Average**: 10kEPC
  - **Crude Average**: 20kEPC

**Energy Consumption**

- **High Consumption, MWh/Mbbl-mi***:
  - **Products Average**: 1.4
  - **Crude Average**: 1.2

**Personnel Work Hours**

- **Total Study**: 30 kEPC
  - **North America**: 25 kEPC
  - **MNVE Group**: 20 kEPC
  - **A**: 15 kEPC

By segregating your data into the categories that most affect the operational and financial performance of your facilities, we can pinpoint the specific areas to focus performance improvement efforts.

*Adjusted for third-party energy supplies and thermal energy
Pinpoint Your Improvement Opportunities

The overarching goal of these studies is to help you identify areas to consider when improving operational performance. Our gap analysis is the starting point to provide significant insight into performance improvement opportunities in both cost and personnel.

Other areas included in your analysis are:

Peer Group Analysis
Solomon compares clients’ study results with peers that exhibit physical or operational similarities (i.e., capacity, liquid type, or geographical location). This comparison provides further analysis and additional confirmation of cost and work-hour gaps.

Performance Group Analysis
While masking the client’s identity through data construction, this analysis presents rankings and performance ranges for key performance indicators.

In-Person Study Results Review
By meeting in a face-to-face setting at your office, we can thoroughly review your individual results with a focus on your performance issues and successes. This setting allows for open discussion of the analysis and possible performance improvement solutions.

Individual Client Reports
Each participant receives electronic files that provide immediate insight into your operations; plus, they let you conduct additional in-house, custom analysis. Some reporting features include:

- **Client Tables** - These summary management reports and analysis tools are invaluable for identifying improvement opportunities. Included are three types of tables, customized for each business unit, that provide key performance indicator ranking tables, gap analysis tables, and calculation details for each system.

- **Study Data Tables** - The Study.xls workbook includes all Data Tables with study averages, and enables you to perform your own data analysis. Study averages are provided for both physical characteristic peer groups and performance groups. Cost data is provided for three divisors.

In addition, you receive a printed, bound study book that includes an executive summary, overall general industry observations, and a methodology section.

The Result
With your Solomon CPA, you will be able to yield the maximum result from your pipeline system and terminal by having the data you need to formulate a concrete plan for performance improvement and a method to monitor your success over time.
About Solomon Associates

Solomon, part of the Hartford Steam Boiler Inspection and Insurance Company (HSB), is the leading performance improvement company for the global energy industry. We provide benchmarking and advisory solutions across the energy value chain to help clients achieve operational excellence by increasing efficiency, reliability, and profitability. We also provide forecasting and strategic insight into the North American gas industry for natural gas producers, exporters, pipeline operators, well service companies, and gas buyers.

As an experienced company that values confidentiality and long-term relationships, we strive to develop and hone the most creative and effective strategies to maximize client performance through our Comparative Performance Analysis™ (CPA™) benchmarking studies and advisory services. Our team of experts has an average of 25 years of industry expertise in numerous fields. Our goal is to become your trusted advisor and improve each operation we analyze.

Today, companies in more than 70 countries rely on our benchmarking, performance improvement programs, and unique methodologies to keep their business competitive.

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