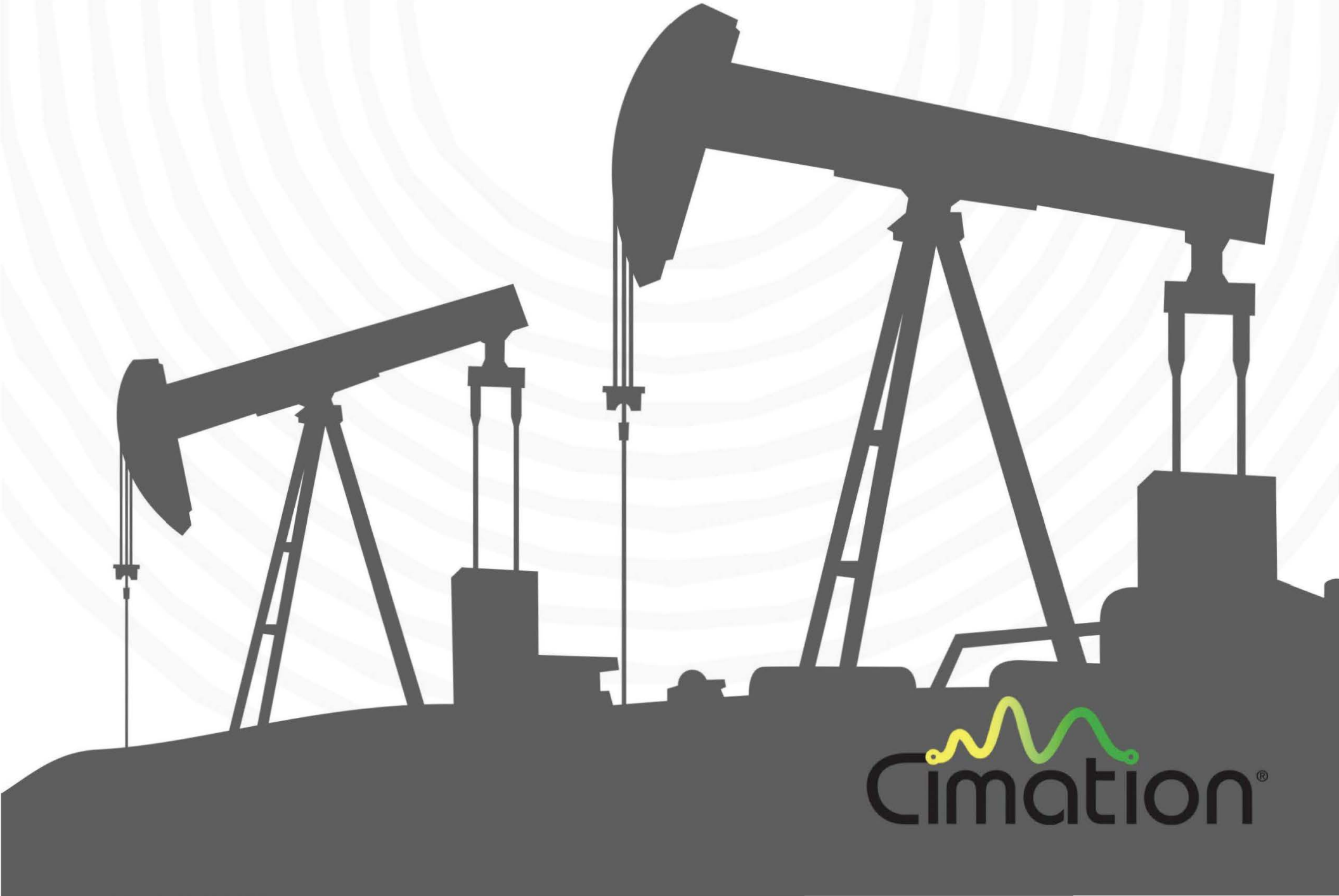
WHAT IS A FEED STUDY?

An Overview of Front-End Engineering Design Studies



AUTHOR BIOGRAPHY

Marc Talamantez

Marc Talamantez joined Cimation in 2012 as the VP of Engineering Services, charged with expanding the company's standards library and improving our ability to provide repeatable solutions to our growing customer base. Marc is responsible for developing company-wide standards based on industry best practices that provide clients and end-users with the lowest risk and most cost-effective solutions. Marc brings more than 20 years' experience in automation and measurement to his role as Cimation's key technical lead. Marc spent 15 years with a Global Leader in Custody Measurement Systems where he developed standardized measurement control system solutions for complex oil and gas projects around the globe.

INTRODUCTION

It is all too often that businesses squander the opportunity to take advantage of front-end planning and FEED studies. Since most costs are committed during the conceptual phase of a project, wouldn't it make sense to dedicate funds to planning? What happens when businesses do not perform FEED studies?

Poor management of the design phase affects every stage of the project lifecycle, so it is critical to define processes, standards and execution guidelines to gain the most benefits from any project. In this paper, we will provide an overview and definition of a FEED study as well as detail out the anatomy of typical activities and products of a FEED. Most importantly, we will help you decipher when to engage in a FEED study and outline the many benefits it affords.

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What is a FEED Study?

Front-End Engineering Design, also referred to as **Front-end Loading**, is the process of conceptual development of projects in processing industries (i.e. upgrading a facilities control system, developing communication strategies, improving network reliability etc.). It is the basic engineering that comes after the **conceptual design** or **feasibility study**. The objective of a FEED study is to establish and define technical requirements, applicable standards and project guidelines, including scope, schedule and cost. These requirements serve as the basis for bidding during the execution phase as well as the basis for design. A proper FEED reflects the client's project-specific requirements and helps prevent major changes, reduce risk and address resource commitment during the execution phase. A FEED study is typically performed by a Operational Consultant.

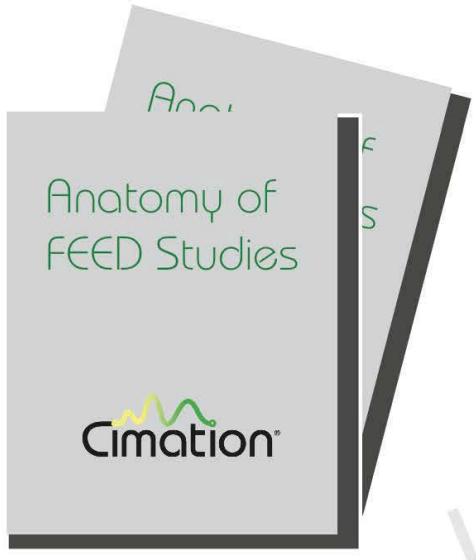
What is an Operational Consultant?

An operational consultant is a vendor-independent entity that focuses on a full solution for the client. Being vendor-independent allows the consultant to objectively analyze the platform and product. This assures the client that they are not being "sold" on one platform that may not be the best solution. An operational consultant recommends the best platform and technology that makes the most sense for the project or application. Being vendor-neutral ensures the project is designed to best meet the client's requirements. The operational consultant will ensure that the entire control system definition, and all key aspects are clearly and formally documented and agreed upon. The operational consultant fully understands the processes of implementing fully functional systems and requirements set forth by industry associations.

A FEED Study can take 6 to 18 months.

To see return, invest your time up front.

Anatomy of a FEED Study



A typical FEED Study defines all requirements of the project execution phase. The various parts of a FEED Study incorporate technical requirements, applicable standards, project guidelines, analysis and drawings. A typical FEED Study will include, but is not limited to, the topics below:

Objectives: You need to define the system or process in which you are performing your study. This is where you provide your top-level recommendations and decide whether it is feasible. Providing a plan overview and regulatory requirement sets the stage for the rest of the FEED Study.

Analysis: This section is used to call out the issues within a project. It details to the client what is currently in place and helps advise the client of any existing issues.

Appendices: The appendix includes drawings and materials. It usually includes items such as various project schedules and a comprehensive budget estimate.

Functional Requirements: This section helps define the study and serves as the foundation for communications, infrastructure, design guidelines and general specifications. This should be one of the most detailed parts of the FEED Study. Since Communications is the backbone of the system, you have to get this portion right before anything else works. Communications Architecture helps serve as the core foundation for the rest of the FEED.

I/O Requirements: This part of the FEED defines items such as input/output types, third party data, cable specifications, etc. It is important to clearly define these specifications by sitting with important technical advisors, such as the instrument engineers and process engineers, then capture this information within an instrument index. Ensure you have everything accounted for and understand the current methods and advise from there. Another piece of the I/O requirement can include electrical specifications. It is important to leverage this piece because some Operational Consultants can dip into a multi-discipline pool of expertise.

Feasibility: While Feasibility is mentioned in the Objectives and Executive Summary, this portion of the FEED maps out the details, explaining project infrastructure and scalability guidelines.

Implementation Plan: This gives the client an overview of how the project will be executed by providing a Communications Implementation plan, a Project Implementation Plan and Support Commitments. These plans define system design and workflows, training and documentation handoff, as well as onsite and future support commitments. Items like support commitments detail how the vendor should provide continued support after the project is developed. The implementation plan also includes estimated costs and risk management. In most cases a FEED Study is +/- 10%.

When should companies engage in FEED Studies?

The FEED Study is a critical phase in the development of large projects. Companies should engage in FEED Studies early in a project's lifecycle when the ability to influence changes in design is high and the cost to make those changes is low. FEED Studies are typically performed in high-capital industries with projects that have long lifecycles. While there are some upfront costs and time associated with this stage of a project, these costs are minimal compared to the cost and effort of changes during later stages of project. Getting involved earlier in the project lifecycle enables you to identify risks and define and execute solutions for the entire project lifecycle.

Why should you involve an Operational Consultant?

The most successful FEED studies involve an operational consultant from the beginning. As opposed to an Instrument Control Departments provided by most EPCs, an operational consultant is a more appropriate choice when performing a FEED Study. Vendor independence is a key feature. By operating apart from resellers, operational consultants leverage their relationships with platforms based on experience and expertise, not to sell a product or platform. When operational consultants do have relationships with particular platforms, it is only to help the end-client with discounts or training.

What are the key benefits of FEED Studies?

Performing a FEED Study helps developers to implement the best design, achieve efficient cost goals and better manage the project as a whole. Benefits of performing a proper FEED Study before going into a project include:

- ☑ Improved safety
- ☑ Lower total investment costs, project cost savings and higher ROI
- ☑ Faster project cycle time and efficiency
- ☑ Enhancement in system operability and design consistency

Quick Reference Guide

Front-End Engineering Design/Front end Loading: *The process of conceptual development of projects in processing industries.*

Conceptual Design/Feasibility Study*: An assessment and analysis used to uncover weaknesses or strengths in a proposed project or venture.*

Operational Consultant: *A vendor-independent entity that focuses on a full solution.*

Safety & FEED Studies

Safety is always a number one priority and one of the best benefits provided by performing a FEED Study. It is important that the Functional Requirements address and define all safety considerations, such as process hazards, required reliability, failure mode, etc. The end-user must confirm that what the FEED Study lays out within the Safety portion is acceptable and correct. One of the most imperative pieces of safety requirements within a FEED is to define how to react to a safety event. The client must understand this recommendation and the reasoning behind it. This helps determine what the high priority risk are versus low priority risks. Having safety analysis and structure helps the design team fully comprehend the methodology, it helps the design team fully comprehend the methodology, saving additional time, effort and ultimately cost.

FEED Study Best Practices

- ☑ Consistently follow a defined Front End Planning process using Front End Planning Tools.
- ☑ Identify and understand risks of new project types, technologies, or locations.
- ☑ Ensure there is adequate scope definition prior to moving forward with design and construction.
- ☑ Ensure the project team and the key stakeholders are properly aligned by thoroughly defining existing conditions and contract strategy early.
- ☑ Staff capable and experienced personnel in the critical areas, such as project scoping and design; make sure this is clearly outlined. Plan to address labor force skill and availability during the process.
- ☑ Provide leadership at all levels for the Front End Planning process, including executive and project, owner and contractor.
- ☑ Look for a provider that recommends training or operator training simulations. This is essential for any green members of the project team.

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Cimation's team of industry-leading experts develop and integrate innovative technology that fundamentally changes the way companies do business by providing real-time data that enables smarter decisions, safer operations and improved efficiency.

We are headquartered in Houston, Texas and currently have six offices located in energy hotspots throughout the United States and Canada. Since our inception in 2009, Cimation has earned numerous accolades, including places on the Inc. 5000 list in 2012 and 2013, Forbes's list of America's Most Promising Companies in 2013, and the Houston Business Journal's Fast Tech 50.

Cimation solves the most complex problems the energy industry has to offer. Contact an expert to learn more.

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