



SAGD WELLPAD OPTIMIZATION PROCESS

GPO & Associates provides a major oil sands player with services to develop a process for SAGD well pad optimization, driving to deliver cost reduction and improved program sustaining well pad project economics.

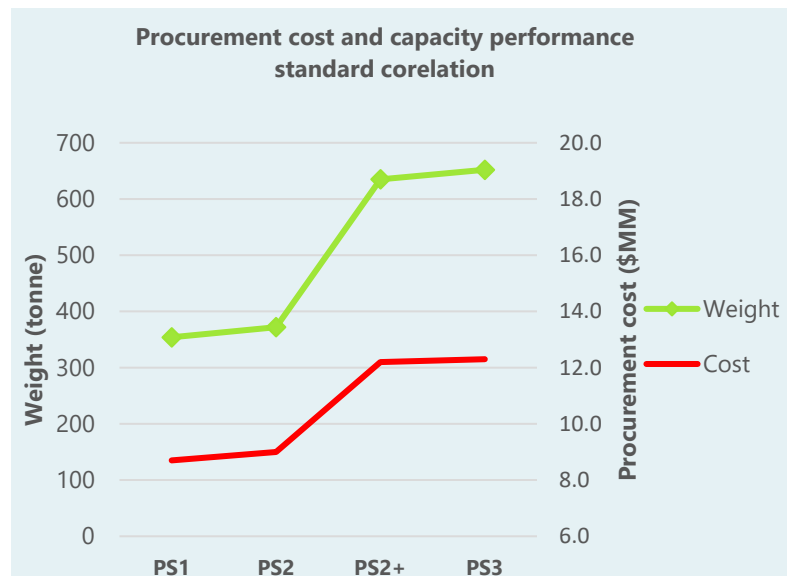
BACKGROUND

A major new entrant to the Oil Sands SAGD sector had, through benchmarking, established their program sustaining well pad costs were industry highs and that they had a significant impact on program economics. GPO & Associates assisted the client in defining a process to deliver well pad optimization and subsequent standardization.

WHAT WE DID

GPO & Associates worked with the client to:

- Define a process to drive the definition of a minimum facilities approach to well pad design.
- Develop an improved approach based on a measurable definition of a minimum facilities performance standards, challenging the existing class of facility approach.
- Deliver an iterative optimization between subsurface, drilling and completions and surface facilities design basis.
- Define a ranking process using client business and project drivers to identify the optimum solution based on defined decision criteria.
- Integrate risk assessment into the ranking process.



OUR IMPACT

GPO & Associates delivered:

- A structured process that optimized solutions to meet defined business drivers.
- An approach that offered an opportunity to reduce costs and significantly improve program economics.
- Collaborative, integrated work between the subsurface and surface teams to establish a risk and value focused optimum design basis.



CHALLENGES IN WELLPAD DESIGN

The oil and gas industry faces challenges in improving capital efficiencies. This is most marked in basins with marginal economics and where significant sustaining capital is required. An example of such basins includes Alberta's Oil Sands and Shale Gas players.

THE GPO & ASSOCIATES' MINIMUM FACILITIES APPROACH

GPO & Associates' Minimum Facilities Approach focuses on defining the safe, legal, and operable minimum scope facility. It applies a rigorous process starting with ensuring definition of the critical design philosophies that influence capital cost, reliability, safety and operation. A minimum design standard is defined, detailed in the Statement of Design Requirements, and applied in the FEED and Detailed Design processes.

Driving to define and deliver a Zero based design Utilizing GPO's Minimum Facilities Approach

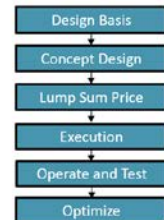
Issues we have seen:

- There is little fact based data used to support Design Decisions and Basis
- Typical Approach is to copy last wellpad design and seek execution savings (Design one build many approach)
- Company Specifications result in Over Design and high cost
- Class of Facilities Quality or similar processes define value as a business driver over cost, resulting in over design and high cost
- There is little focus on challenging and reducing scope
- Subsurface and surface non-alignment

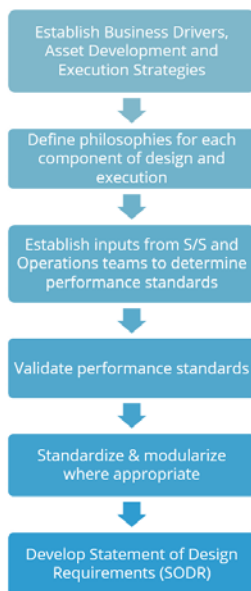
The minimum facility concept drives to delivery of minimum scope to deliver a safe, operable pad that meets legislative requirements

The Solution

- Define the Design Basis for a Minimum Facility to meet Company objectives and Design, Build, Test and Optimize the minimum facility.
- Utilize a Modular Plug and Play approach to address the issues related to designing for resource variability and flexibility in technology and design concepts.
- Optimize the test facility through rigorous performance testing and comparison with existing wellpad facilities.



Aligning decisions to business drivers



Key Theories

1. Business drivers and design and execution philosophies should be established by Management.
2. Develop a minimum project performance standard in conjunction with the project performance standard.
3. Establish a risk, cost and value assessment for each selected performance standard that is greater than the minimum.

Advantages

- This approach drives **decisions** based on standards selected that **align with business drivers**
- **Clear objectives** are established by defining performance standards to be used by **multi-disciplinary teams**
- Inputs are validated both quantitatively and qualitatively **assessing cost** against **value** and **risk**
- A Statement of Design Requirements (SODR) ensures that **business drivers** of the project can be met **before** entering define/execution stage

The approach has deep roots in cost reduction initiatives successfully applied historically within global oil and gas basins. GPO & Associates Consultants were involved in developing and delivering those initiatives. GPO's process is supported through international experience and development with local major SAGD players, derived directly from:

- North Sea CRINE Initiative and Design approach to reduce costs
 - Including modularization
- Norwegian NORSOK initiative
- Gulf of Mexico Cost Reduction Drive
- Quality Function Deployment Process
- Continuous Improvement from application to SAGD projects



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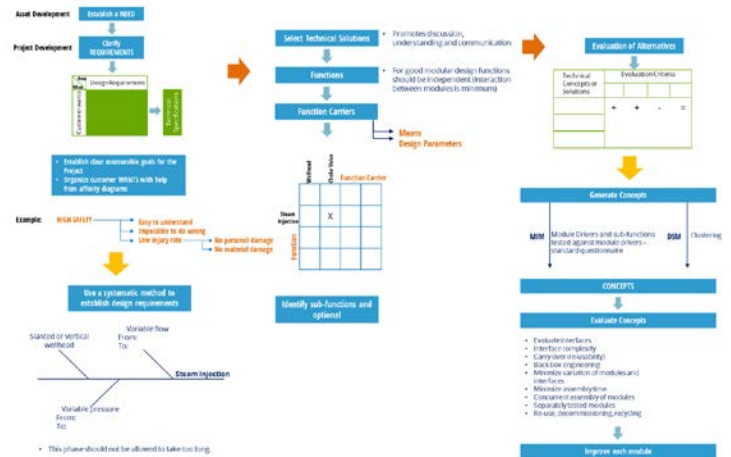


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A UNIQUE MODULAR FUNCTION DEPLOYMENT APPROACH

GPO & Associates has developed a unique Modular Function Deployment process that defines the optimum strategy and approach to modularization and facilities layout and allows a simple 'plug and play' design and construction approach to be applied. Minimum Facilities and Scope Definition combined with Modular Function Deployment delivers capital efficiency improvements and a strategy for sustaining well pads that delivers flexibility to utilize alternate technologies and equipment configurations.

Concept Development and Selection Process Modular Function Deployment Process



GPO & ASSOCIATES' LEARNINGS HELP DELIVER ASSET AND PROJECT SUCCESS

Through the application of GPO & Associates' process, significant capital efficiency savings have been demonstrated. Importantly, GPO & Associates have been able to work with its clients, assisting in delivery of deep understanding of the impact of design basis decisions on delivery of project business drivers.



Learnings from applying the process to SAGD projects in Alberta

Critical Success factors

- Defining minimum standards for critical design philosophies is effective in driving capital costs down (example critical design philosophies):
 - Capacity
 - Isolation and Maintenance
 - Control and Operability
 - Flexibility
 - Modularization and Standardization
- Alignment between subsurface and surface design basis is essential
- Understand subsurface uncertainty and capacity design basis
- Moving to Industry standards and specifications drives capital costs down
- Movement from opinion to factual based decision making
 - RAM based design decisions require to be supported by reliability data, FMEA and RCA studies
 - Operability driven design decisions require to be challenged based on the safe, legal operable minimum design criteria (and needs vs nice to have)
- Cost targets and drivers should be clearly stated and differentiated from statements relating to value
- HAZOP / HAZID and Design Reviews should not be used as design tools
- Standardization objectives and approach needs to be clearly defined

