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OIL & GAS CONSULTING

UPSTREAM PIPELINES AND FACILITIES

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Constructability Program – What Is It & Why Have One?

Constructability is defined by the Construction Industry Institute (CII) as "***the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives***."

The objectives of a Constructability Program is to meet the requirements of sound Project Management which is to provide guidance and upgrades which will enhance project safety, quality, cost, schedule and risk management.

There are quantifiable benefits from a comprehensive Constructability Program are:

- **Tangible Benefits**
  - Construction Industry Institute (CII) claims reductions of approximately 4% of total project cost and 7.5% schedule reductions are not uncommon
- **Intangible Benefits**
  - Other project objectives enhanced (maintainability, reliability, operability, quality, and safety)
  - Design-Construction Interface Enhanced

A Constructability Program is focused on the execution of EPC projects. And while the program is not intended to directly address maintainability or operability, it can be executed in conjunction with similar programs to achieve relevant upgrades.

The Constructability Program Development Principles are as follows:

- The program should be cooperative & proactive
- The program places responsibility for constructability with the engineering and technical managers
- The program addresses constructability input for facilities construction, fabrication and installation; pipeline construction
- The program provides a structure, which is consistent from project to project.
- The program should be adaptable to other inputs to design (e.g. operability and maintainability)

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Although the above activities are a part of Constructability, they are only a part. It is only through the effective and timely integration of construction input into planning and design, as well as construction, that the potential benefits of constructability will be achieved.

The tendency is to separate the individual project functions involved in capital projects. Design places an emphasis on minimizing design costs. Construction focuses on minimizing construction costs. Fine tuning the individual parts, however, does not yield the most successful project. Constructability integrates the parts, allowing construction knowledge to minimize the overall project cost.

A key goal of the Constructability Program is to provide a structured approach for the development of project-specific Constructability Plans. Each constructability plan would then address these elements:

1. Objectives.
2. Define a structured process for obtaining, reviewing and approving for use early and regular construction knowledge/ input.
3. Project specific methods for achieving constructability objectives
4. Define specific resources needed
5. Define/Assign roles and responsibilities
6. Define plan for documenting constructability improvements.
7. Define Issue resolution plan.
8. Metrics/ verification of plan use and effectiveness

I can develop Constructability Plan's for individual projects or an overall, comprehensive Constructability Program that can be used to manage constructability across all business units & projects.

Onshore Pipeline Buoyancy Control

An empty closed steel pipe, generally of a diameter above 10.750-inch (depending on wall thickness), will float in water and has the potential to float in the soil in which the pipe will be buried if it is saturated with water.

Many onshore pipeline projects have areas that will require some method of buoyancy control, be it across rivers, streams and/or wetlands.

There are several commonly accepted methods to circumvent pipe buoyancy including:

- Continuous concrete weight coating,
- Set-on concrete weights,
- Bolt-on concrete weights, and
- Screw anchors.

The 1st three bullets above are the primary methods of weight control used in the industry for onshore pipelines - continuous concrete coating, set-on and bolt-on weights.

Continuous concrete coating is generally specified at river/creek crossings and/or wetland areas. Concrete coating is generally preferred over set-on or bolt-on weights because it is a very effective method of buoyancy control and it has the added advantage of providing physical protection to the pipeline. There are many different types of concrete coating and they are typically reinforced with steel, fiberglass or other material. Some coatings are wrapped on; some are sprayed onto the pipe, while others are installed using formwork and conventional concrete pouring techniques.

Tie-in at the Mercedes River in the Chiquitana National Forrest in eastern Bolivia.

Set-on weights are generally used in wetland areas, river floodplains and at minor water crossings where sidebooms can easily install the weights. The weights are placed over the pipeline after it is been lowered into the trench and prior to the backfilling. If the ditch cannot be pumped dry, the pipe can be filled with water to allow it to sink prior to placing the weights. This, however, can only safely be done where the water and ditch is shallow and where the ditch has a stable bottom and side walls. If the possibility exists for pipe exposure due to erosion of the overburden, the use of set-on weights is not recommended since the set-on weight requires side wall support to be held over the pipe. Similarly, where pipe movement could occur in soil that does not possess enough shear strength; the weight may rotate on the pipe and be rendered ineffective.

Where set-on weights cannot be installed and concrete coating is not warranted, bolt-on weights can be used. These weights are constructed in two halve which bolt together in the field prior to placing the pipe in the ditch. Since the weights are physically secured to the pipe, these may be used when the trench is filled with water.

Formula for calculating concrete weight coating thickness (T) is:

T = 12 { .5 [(4 Wp - pi Di^2 Dc) / (pi G 62.4 - pi Dc)]^.5 - .5Di }
where,

Wp = weight of pipe and coating,
Dc = density of concrete,
Di = I D of concrete (OD of pipe)
V = volume of OD of pipe, per foot,
G = Desired specific gravity

Project Finance – Leasing Basics

A lease can be described as a contractual obligation that is undertaken to make a series of payments over a specified period of time to acquire use of a capital asset. For accounting and/or tax purpose, a lease can be categorized as either a capital lease or operating lease. However, for economic analysis purposes, the framework for treating both capital leases and operating leases should be the same.

Before considering a lease versus purchase option, the economics of the purchase option must be attractive and an acceptable business decision. Leasing should not be a solution to try to make an unattractive project economic on an NPV or ROR basis, or to lower the capital employed so the Return on Capital Employed (ROCE) impact will be less. It is prudent to evaluate the attractiveness of a project on the basis of total capital employed (and it should be calculated on an unleveraged basis). If using leverage (debt financing, including leasing), keep in mind that Return on Equity (ROE) increases, BUT so does financial risk.

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Leverage shedding is a way of adjusting cash flows. However, it does not translate to an adjustment of the discount rate. The NPV of a project that involves leverage should be based on adjusted cash flows with the discount rate applied.

Only after the asset has been justified for business reasons, should leasing be considered as one of several options to finance the acquisition of the asset.

Lease analysis is generally a two-step process as follows:

1. An asset is justified assuming it is purchased using conventional cash flow analysis.
2. An analysis is performed to determine whether leasing is the lowest cost of financing available.

Should the Owner Company have a low cost of borrowing, leasing is a high cost means of financing an asset. Leasing is generally selected for an asset due to one of the following reasons:

- Better economics of leasing (generally not the case),
- No other options, or
- Required by contract (due to partner or stakeholder requirements).

Should leasing be selected, then it is important to add the capital equivalent of lease payments to the capital cost for reporting purposes and it must be integrated it into the cash flow analysis.