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UPSTREAM & MIDSTREAM PIPELINES AND FACILITIES

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Considerations in Developing Contracting Strategies

When developing contracting strategies for upstream oil & gas projects, there are many factors and complexities that go into the decision. Deciding on a contracting strategy is probably the most important decision to be made with regards to project execution and has far reaching impacts; therefore it is a decision path not to be taken lightly. There are a mind boggling number of factors to be taken into consideration; I have attempted to address some of the more key ones here and due to space limitations have thrown them out in more of a quick listing and not at all exhaustive nor by priority.

Market Conditions – market conditions determine what resources are available to support the Project and often, due to host country requirements, what resources the Project must utilize.

Owner Company Work Scope – often the Owner Company keeps part of the work scope for itself due either to risk or economics.

Contractor Capabilities – The WBS work packages must be formatted to allow available Contractors to bid on the packages.

Host Country Contracting Requirements – host country requirements often influence the world market condition. The host country might state in its contract requirements (such as a PSA) that a certain percentage of local content be used.

Logistics – an activity normally shown on a large projects WBS that deals with the transport of people, materials, fuel, etc. There are advantages & disadvantages to having a single Contractor supply all logistics.

Infrastructure – often part of a work package on a typical WBS. Infrastructure can be its own work package, but it is often included with other work packages, such as Facilities. The existing infrastructure in the area must be evaluated to determine if it is sufficient to support construction and the needs of the entire labor force.

Schedule Drivers – can play a role in the way Work Packages and Activities are distributed on a WBS. An example is that a Project may face schedule windows and begin a scope of work, suspend work for a given time period, and then continue work when the next window of opportunity occurs.

Risk allocation – often the Owner Company wishes to transfer risk to the Contractor to provide incentives to perform, but it does not help the Company to transfer risk to a Contractor who most likely can not perform.

Cost Estimating – As part of the contracting strategy development process, cost estimates for the work packages, and for the project, in general, must be generated based on the contracting strategy and WBS. Not only should cost be included for the work associated with each work package, estimates need to also be developed for costs associated with the project management team, CAR insurance, other non-EPC costs, drilling, infrastructure support, contingency, etc.

I can assist in developing optimum contracting strategies for projects world-wide and can also assist in developing Staff Plan's to meet the contract strategy requirements.

INSIDE THIS ISSUE

Free Stress & Pipe Bends in Liquid Pipelines

There is a neutral surface within the pipe section that contains the centroids of all sections and is perpendicular to the plane of the load for such deflections. In a pipe section, the neutral axis of the pipe is the horizontal, central axis. Tensile or compressive stress and strain on the neutral axis are essentially zero. At all other points within the pipe section, the stress is a tensile stress if the point lies between the neutral axis and convex surfaces of the pipe section, and is a compressive stress if the point lies between the neutral axis and concave surfaces of the pipe section.

In order to determine the maximum amount of free stress bends that can be imposed on pipe, calculations need to be performed to determine and confirm that the stresses on the line pipe during construction and installation do not exceed 80% of the yield strength (SMYS), of the line pipe material. The minimum field bend radius should then be included in the construction specifications that are provided to the pipeline contractor.

Bending stress can be defined as the compressive and/or tensile stress resulting from the application of a non-axial force. It is generally assumed that the pipelines are locally unrestrained and are not subject to torsional loading. Since the pipeline is unrestrained, the stress due to temperature change is typically not included. If there is a large temperature change, additional study should be undertaken to determine if the pipeline meets the code requirements. In addition, if there are any other sustained external stresses, these stresses should be considered in the total combined stress equation.

Free stress bends for liquid pipelines are governed by ASME B31.4 paragraph. 419.6.4(c). The minimum bend radius should be calculated to maintain stress level below 80% of SMYS.

A pipeline bending crew at work.

If the pipeline has been concrete coated, there is concern that the concrete may fail under the bending stress. Due to its low tensile strength, the concrete could fail in tension at the interface boundary of the steel and concrete. If the concrete has a good bond to the pipe, it may crack at the pipe surface. This will eliminate the stress in the concrete, and as long as the concrete coating thickness is thicker than the crack is deep, there will be no cracking visible on the concrete outer surface.

If the bond to the pipe is weak, the pipe and concrete will separate which will reduce the stress in the concrete and there will be no visible cracking at the concrete surface. In the event there is visible cracking on the concrete surface, the concrete can be repaired to seal the cracks. If cracking is a concern a test should be conducted under controlled conditions to evaluate the severity of the problem and propose practical solutions.

For plant piping (B31.3), fiber elongation is a factor to be considered when selecting materials. For certain materials, the fiber elongation is limited to 50% of the minimum elongation for the material. That means for cold bends, depending on the material, you may get into heat treating the material to remove the effects of deformation from cold bending.

Project Finance – Contingencies, What Are They For?

Every estimate, regardless of the project's stage of development, has factors that are not known to a high level of accuracy. Contingencies are added to capital costs estimates in an effort to account for these unknowns and is generally increased by an amount (often a percentage factor determined from company or industry databases), which is identified as "contingency" in order to bring the capital cost estimate to a level of confidence required by the Owner company.

Contingency generally covers unknown and undeveloped scope. The unknown or undeveloped scope is a factor of the level of engineering and design that has been done. Very early in a project, very little engineering may be complete and there may be a significant number of items contributing to the final cost that have not yet been identified. As engineering and designs mature, the amount and impact the "unidentified" items are reduced.

Contingency is not used for improving estimate accuracy or to cover additional scope that was not in the project design.

The challenge is setting the contingency commensurate with the risks identified and at a level to afford an equal chance of overrunning or under-running the total capital cost estimate (P-50). Contingency should account for risks that may occur on a project such as design changes (design evolution), variations in material and equipment prices, and normal execution-related issues such as material shipping delays, rework, and other inefficiencies.

Unless specifically requested by the Owner company, Contingency should not account for unusually inclement weather, civil unrest, hyperinflation, unexpectedly large currency fluctuations, or discretionary changes to the project scope and objectives.

Estimate accuracy improves as the project is better defined, provided the scope does not change. In fact, although other correlations such as technical innovation and process complexity exist, the strongest driver of the need for contingency is the level of project definition or front-end loading.

There are several methods for determining the amount of contingency needed, each with advantages and disadvantages. These include estimator judgment, percentages based upon the level of engineering detail and class of estimate, Monte Carlo analysis, or a parametric statistical approach.

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