"Don't Take the Risk – Manage It"

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Don't take the risk: manage it

Greg Lamberson, International Construction Consulting, LLC, USA, examines the best methods of managing execution risk in upstream projects.

One of the major considerations intrinsic to any upstream energy project is risk. This is particularly true when major pipelines form a significant portion of the project, due to the high profile and linear nature of pipelines. Pipelines can cover extremely long distances and are highly visible as assets.

When evaluating projects, whether in developing countries or in developed countries, management must aggressively evaluate and manage both the project and business risks. By managing risk, a company can greatly reduce financing costs, project costs and ultimately increase stakeholder returns.

Project risk takes many forms. It should be pointed out that global project risk factors such as financing, political, business, markets, etc., are not covered in this discussion, nor are the associated mitigations such as insurance programmes, derivative contracts (forward, futures, options or swaps), production sharing agreements, etc. For the purpose of this article, the following project risk categories will be expanded upon:

- Pre-FEED or conceptual risks.
- Technical risks (engineering and design).
- Execution risks (construction, installation, start-up and commissioning, operations).

This paper seeks to identify risks by major project phase and describe a system that can be used to manage risks on all projects, both domestic and international. This same system should be used as a tool to identify and communicate execution risks to management before the start of each major project phase. A definitive process is required in order to systematically and properly identify, assess, control and reduce risk

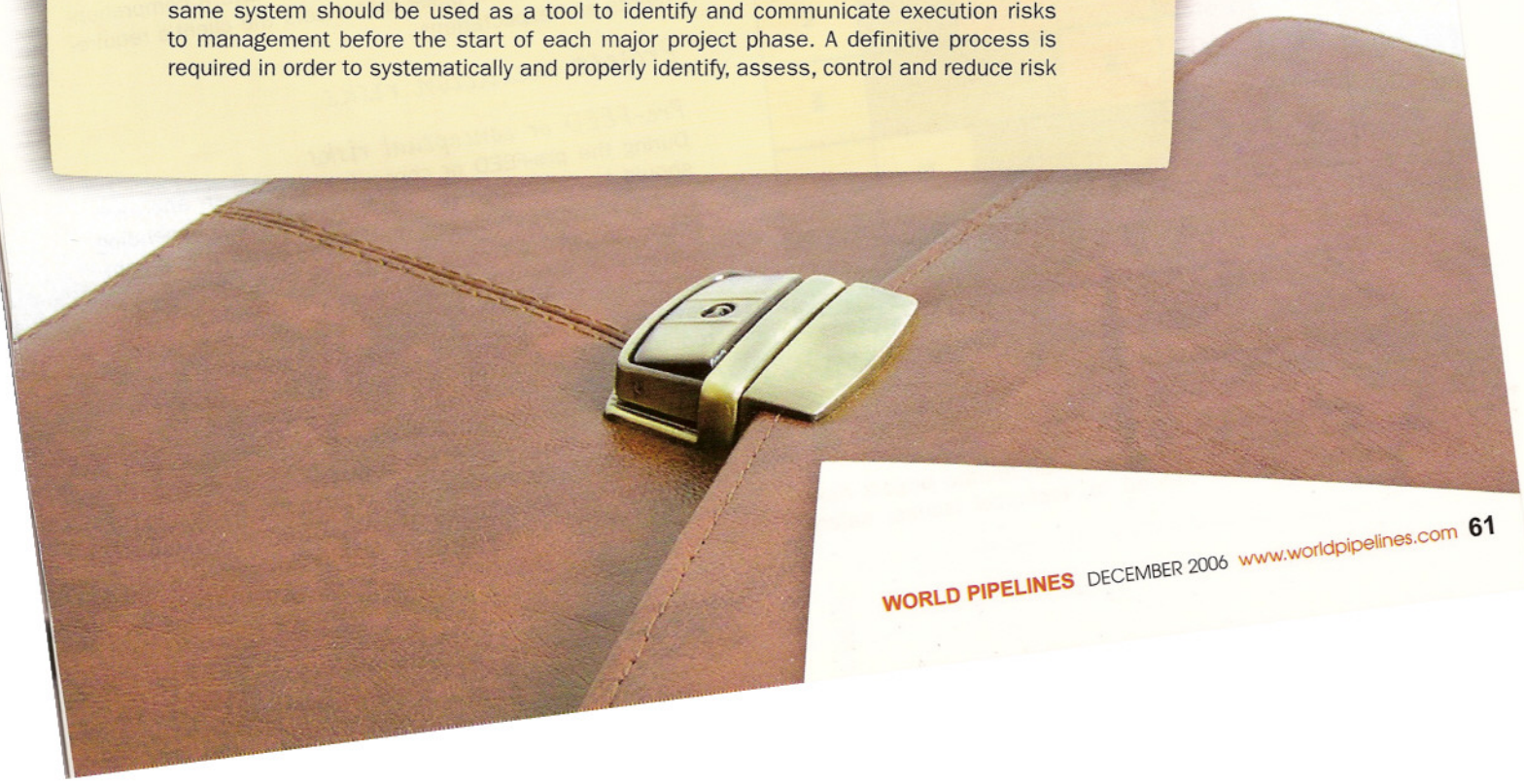


Table 1. Consequence definitions	
I	Loss of life, loss of critical propriety information, loss of critical assets, significant impairment of mission, loss of system, large community disruption, major environmental impact. Quantifiable loss US$ 10 million or greater.
II	Severe injury to employee or other individual, loss of propriety information, severe asset loss, unacceptable mission delays, unacceptable system and operations interruptions, small community disruptions, serious environmental impact. Quantifiable loss of US$ 1 - 10 million.
III	Minor injury not requiring hospitalisation, undetected or delayed detection of unauthorised entry resulting in limited access to assets or sensitive information, minor community impact, moderate environmental impact. Quantifiable loss of US$ 100 000 - 1 million.
IV	Less than minor injury, undetected or delay in the detection of unauthorised entry with no asset loss or access to sensitive information, no systems or operation disruption, minimal to no public disruption, minor or no environmental impact. Quantifiable loss of US$ 10 000 - 100 000.

Table 2. Event probability categories	
A	Possibility of repeated incidents. More than one per year.
B	Possibility of isolated incidents. More than one in five years.
C	Possibility of occuring sometime. More than one in ten years.
D	Not likely to occur. More than one in 100 years.
E	Practically impossible. More than one in 1000 years.

Risk / Probability Matrix

	A	B	C	D	E
I	IA	IB	IC	ID	IE
II	IIA	IIB	IIC	IID	IIE
III	IIIA	IIIB	IIIC	IIID	IIIE
IV	IVA	IVB	IVC	IVD	IVE

Red = Action must be taken
Brown = Mgmt must review & make recommendations
Yellow = Accept w/Mgmt review
Green = Acceptance, no review

Figure 1. Risk/probability matrix.

during all phases of a project.

The system should address all related project risks including, but not limited to, technical issues, safety, health, environmental, cost, schedule and execution, plus their potential consequences. Risk should be addressed for the project as a whole, including all stakeholders, involved parties, all phases and all types of project exposure and uncertainty. The system should be developed in order to properly address all actions to be undertaken to fulfill requirements contained in any and all contractual obligations, and the incorporation of the results of all risk assessments.

In this discussion of risk management, specific project details such as control valve operation, construction yard locations, or installation sequencing will not be addressed directly. These details should be captured by HAZOPs or other risk assessments that are specified in the project Risk Management Plan (RMP). Each project should define in the Project Execution Plan (PEP) specifically which processes, plans and procedures will be used or developed for risk assessment and management on a project-by-project basis. Each project will develop a project wide RMP that defines the specific assessments to be conducted, the timing of the assessments and the roles and responsibilities of those involved. Risk management, while required for all projects, is scalable and each RMP will define the level of detail and analysis that is prudent.

An Initial Risk Management Plan (IRMP) should be developed for assessments to be conducted prior to detail design. The final plan should be re-evaluated and updated prior to the start of detail design and again revisited prior to the start of construction/installation activities. A key part of the plan is a process for follow-up and close-out of all issues contained in the assessments.

All companies, small and large, whether they are E&P companies, engineering firms or EPC contractors, should have a comprehensive and systematic approach to managing project risks. The E&P company, as the client, will have a system to manage all related risks (including project, business, commercial, political, financial, etc.) and should also have detailed co-ordination procedures that outline the goals and expectations of the contractors' risk management plan. These co-ordination procedures should be clearly communicated to the contractor during the tendering phase. The engineering firm or EPC contractor on the other hand should have a comprehensive programme in place that meets the client's requirements and expectations.

Project execution risks

Pre-FEED or conceptual risks

During the pre-FEED or conceptual phase, an approach should be developed (as part of the IRMP), depending on the project complexity, that seeks to identify a comprehensive list of project issues. The analysis should be systematic, focusing on all aspects of the project. The scope can be broad and include aspects such as field development (drilling and initial operations), logistics requirements, geographical locations, technical issues, etc.

The IRMP will address how issues are classified and assimilated, but all significant issues (those with a substantial negative or positive impact) need to be brought to the attention of senior management. A scenario based assessment can be used along with a probability/consequence matrix (Figure 1). The IRMP should address

the resolution of key issues, along with guidance on the levels of appropriate senior management involvement.

Scenario-based assessments utilising a risk matrix approach are recommended in order to properly address rank and present assessment results for all phases. An example matrix is shown in Figure 1.

Definitions for probability and consequence are project-specific, and an example set of definitions can be found in Table 1.

Scenario-based assessments involve the gathering of experienced project discipline personnel (i.e., construction, procurement, operations, engineering, regulatory, safety, environmental, logistics, schedule and control, etc.) in a workshop environment and utilising the experience of the individuals to brainstorm potential issues and problems. Comprehensive checklists should be a part of a thorough RMP. The same group would then develop a listing of potential mitigations. The potential mitigations are quantified with regards to costs and then re-risked to determine if the cost of the mitigation corresponds to the value of the result (i.e., if the mitigation moves the risk/probability from the red into the brown, yellow, or green in Figure 1).

Once the costs are quantified and re-risked, the mitigations can be discussed and agreed upon where possible and in those instances where mitigations cannot be agreed upon, a resolution process (contained in the IRMP) would be used to reach final recommendation. These final risk mitigation measures and action plans will be put in place after approval by the level of management required by the indicated processes in the IRMP. These mitigation measures and action plans must be tracked to completion.

Risk assessments during the pre-FEED or conceptual phase should be performed as set out in the IRMP. As the project progresses, new issues will be identified and analysed in the same manner.

The Conceptual Risk Assessment (CRA) should be conducted prior to FEED. This assessment generally involves the appraisal of multiple concepts and multiple cases within each concept. The results of the assessments are utilised to make go or no-go decisions. Additionally, these assessments may simply be a review of a single concept. The purpose is to identify specific areas and further work that needs to be done in the definition phase of the project.

Depending on the complexity of the project, a preliminary hazards and operability (HAZOP) review may be warranted. A preliminary HAZOP can be conducted on the facilities design using the design detail available in the draft Basis of Design (BOD), including layouts, preliminary P&IDs, equipment data sheets, flow diagrams, information on likely hazardous materials, etc., as well as the draft project design specifications. The purpose is to identify potential design hazards that need to be addressed in the detailed design phase.

Departures from required asset performances and reliability should be considered during the conceptual risk assessment. All areas of project risk should be assessed. The CRA is based on preliminary drafts of the key early project documents, including the Initial Project Execution Plan (IPEP).

Technical risks (engineering and design)

As the project moves into the definition phase, the same scenario-based approach is used for an Engineering and Design Risk Assessment (EDRA), which is conducted before or at the kickoff of detail design. Depending on the size and complexity of the project, the EDRA scope can be very broad and may cover, in addition to specific design aspects such as number of trains, operability, sparing philosophy, etc., a broad range of project aspects such as: regulatory/approvals and 3rd party interfaces, contracting strategies, system abandonment at end of the assets operational life, as well as construction. The EDRA may, but does not generally, address specific project details such as control valves or detailed procedures. These are normally covered during HAZOPs and subject specific risk assessments (again, when required, these will be spelled out in the RMP).

The PEP, Work Breakdown Structure (WBS), BOD, and operating philosophy are typical project documents that are reviewed and used as the basis of the EDRA.

HAZOPs

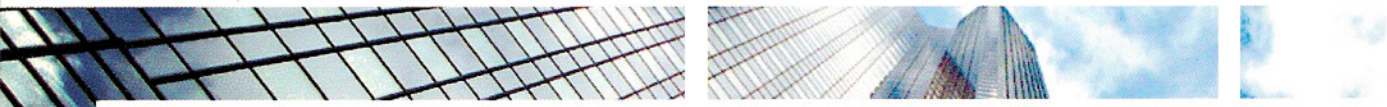
HAZOPs are a key ingredient of sound project risk management. HAZOPs are normally conducted after the design is frozen and/or prior to key deliverables, such as PFDs, P&IDs, etc., being Issued for Construction (IFC). All plot plans, layouts, data sheets, and vendor information needs to be available for review prior to the HAZOP. The purpose of the HAZOP is to address all potential process and operational hazards prior to finalising procurement and moving into the construction/installation phase.

Keys to HAZOP success include a well-documented, structured process where the complete design is systematically analysed for deviations from design and operational intent by a team of experienced technical, construction and operations personnel. It should be noted that the presence of an operations representative is highly recommended in order to capture all of the anticipated operational issues (normal, cold or hot start ups; normal or emergency shutdowns; normal, temporary and emergency operations, etc.) of the facility.

The results of the HAZOP will include a comprehensive list of issues along with recommendations covering, in addition to engineering and operations, safety, health, and environmental.

Responsibility for follow-up/close-out of HAZOP items (co-ordination of the 'list', as well as for each individual item) is documented, understood and

Figure 2. The Petrobras P-36 platform that overturned and sunk off the coast of Brazil in March 2001.



followed up by project management to ensure issues are resolved satisfactorily and closed-put in a timely fashion. The HAZOP co-ordinator/team leader should agree with actions to ensure the recommendations have been addressed.

After completion of the HAZOP, it is a prudent policy to mandate that no changes can be made in engineering, design, construction or operation that materially affect the results of the HAZOP without a thorough re-analysis. This should be rigorously covered under the project Management of Change (MOC) Plan, including appropriate approvals for initiation, evaluation and acceptance of changes.

Lastly, all issues and action items stemming from the HAZOP must be ultimately resolved and all impacted project deliverables should be upgraded before the completion of detail design.

Execution risks

The Construction Risk Assessment (CRA) is conducted prior to start of construction. The CRA scope can be very broad and may cover all aspects of the construction phase of the project such as: Government/regulatory approvals and interfaces, contractor/subcontractor performance, component integration, weather window implications, interfaces and issues associated with the final construction plan. The CRA does not usually address very specific project details such as individual yard safety programmes, welder qualification or detailed contractor procedures. These detailed issues are covered by required subject specific RAs as identified in the RMP.

Detailed design documents and drawings, construction contracts and contractor plans are example input documents to be used when conducting the CRA. The purpose of the CRA is to identify project level issues and hazards and plan to mitigate or eliminate the risks that would have a project wide impact. It is also used as a communication tool to identify project risks to management before starting construction.

Other risk assessments

Other areas of the project subject to specific risk assessments will be defined in the PEP and RMP. These areas may include, but are not limited to: special design details; contracting strategies; fabrication and load-out activities; heavy lifts, installation activities; early construction work; hook-up and commissioning activities, etc.

Conclusion

As stated, all projects are subject to exposure, vulnerabilities and uncertainties: these are all combined to define 'risk'. Properly managing this risk requires a structured approach, open communications, experienced personnel and flexibility.

One of the keys to success is the early identification, assessment, evaluation and resolution of risk in all phases and at all levels of the project. A solid method of achieving these results is to use the scenario-based approach. In all phases, regardless of the source or which party has liability, there must be a concerted and co-ordinated effort to work together to manage the risk and share information related to it. If you do not manage project risk... project risk will manage you.

International Construction Consulting, LLC

(Independent Consultant to the Oil & Gas Industry)

KNOWLEDGE

27 years industry experience; a BSc and an MBA with a focus on international business.

EXPERIENCE

Routinely perform feasibility studies; conceptual to detail cost models and estimates; write execution plans; provide planning expertise and documents, etc.

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RELIABLE EXECUTION

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