



Risk Management and its positive impacts on efficiencies and saving jobs in Oil and Gas Industry

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Abstract: Risk management is an integral part of day-to-day business activities in the Oil and Gas industry projects. Companies in this industry are facing major risks such as cost overrun and schedule delay which make these companies and investors hesitant to invest in future oil and gas projects. Apart from cost and schedule risks, additional risks related to operations, quality assurance and quality control, and regulatory and health, safety and environment (HSE) also play big role in investment and funding decisions. This paper discusses and analyses types of risks, risk mitigation actions and strategies for oil and gas projects along with number of oil and gas jobs that can be saved and efficiencies that can be brought by implementing appropriate risk mitigation actions and strategies. Importance of this paper becomes more prominent since oil and gas industry is at its trough for few years (in a row) now.

Keywords: Risk Management, Oil & Gas Projects, Project Management, Cost overrun, Schedule delay, Quality Assurance and Quality Control, and Regulations.

I. INTRODUCTION

Energy is important to meet basic needs and improve living standards of human race. Economic growth is closely related with energy demand (and subsequently its supply). Therefore, it is important for any country (that have oil and/or gas reserves) to make a conducive environment for National oil and gas companies, private oil and gas companies and investors to invest in oil and gas projects.

Oil and gas exploration and production projects typically require high capital expenditures (CAPEX) ranging from 10s of millions to 10s of billions USD (US dollars). In addition to CAPEX, oil and gas projects are subjected to stringent regulatory requirements from government agencies, natural hazards, harsh offshore operating and working conditions, and other uncertainties, including those related to the physical characteristics of oil and gas fields. According to EY 2014 report [1], 64% of sampled oil and gas mega projects faced cost overruns and 73% of the projects reported schedule delays. These two risks being major risks along with additional risks such as operational, quality, and regulatory and HSE, it is not only important but also prudent that oil and gas companies take necessary actions to prevent and mitigate these risks. This paper details types of risks to oil and gas projects and suggests risk prevention and mitigation strategies that will save millions to billions USD

for oil and gas companies in exploration, production, and engineering, procurement, construction and installation (EPCI) projects with positive impact on bringing efficiencies to projects execution and saving thousands to millions of jobs in oil and gas industry.

II. RISKS INVOLVED IN OIL AND GAS PROJECTS

Oil and gas projects typically have vast varieties of risks, cost overrun and schedule delay are major risks [1] along with significant operational, quality, non-compliance to regulation and regulatory challenges, and HSE risks. These risks are discussed in detail in the below mentioned sections.

A. Cost Overrun Risks

Cost overrun is defined as any cost incurred by oil and gas project above and beyond budgeted cost. Though sometimes % cost overrun may be perceived as a single digit number, converting it into actual USD values may equate to a loss of millions to billions of USD. Therefore, it becomes prudent to understand main factors that contribute to risk of cost overruns. Factors that cause cost overruns can be categorized into three main categories, a) non-technical, b) technical and c) and geopolitical. Non-technical factors include personnel (quality, quantity, and attitude), leadership, poor planning and governance. Technical factors contain incomplete (or at times absence) of engineering data



during initial project state, engineering design changes after project award, and inadequate procurement strategies. Geopolitical factors range from unstable political situations, security concerns, currency fluctuations, and economic downturn to disruption due to local, civil and environmental groups [1].

B. Schedule Delay Risks

Schedule delay is typically defined as the time overrun either beyond the completion date as specified in the contract, or beyond the date that the contracting parties agreed upon for the delivery of a project [2]. Schedule delay may be caused by several factors that can be categorized into following main categories, a) inadequate contract management, b) quality of project management team and engineers, c) ineffective personnel management and decision making, d) procurement and delivery delays, e) change orders and f) selection of contractor and sub-contractor.

Inadequate contract management typically occurs when contractual requirements are not clear entirely and left to subjectivity and interpretation and one contracting party takes undue advantage of unclear requirements.

In the event of poor project management team, less qualified and inexperienced engineers (of any party i.e. Oil and gas company, its contractor, or contractor's sub-contractor), one can almost guarantee that the oil and gas project will not be completed in time.

Decision making and personnel management play a very vital role in timely project completion. While delay in decision making on individual activities from leadership can compound into overall project delay, not involving engineers in decision making can be demoralizing and may have an overall negative effect on project execution. In the similar vein, if client, contractor and/or sub-contractor's project team personnel are not managed effectively and are not held accountable for deliverables on time, a schedule delay is inevitable.

Procurement activities on an oil and gas project involve complex web suppliers and material delivery logistics. Often times, late identification of long lead equipment, quantity growth, improper selection of supplier [2], inefficient contract management [2] and inadequate expediting cause significant schedule delays.

Issuing premature technical specifications and requirements by Oil and Gas Company at the tendering phase may cause risk of growing number of change orders during project execution stage which in turn have compounding effect on both cost overruns and schedule delays.

Selecting lowest bid cost contractor and sub-contractor often times turns out to be not a right decision since there is a potential that lowest cost bidder may have inadequate processes, poor project management team and ineffective projection execution strategies which essentially cause oil and gas projects not completing on time.

C. Operational Risks

Operational risks are key components of overall enterprise risk management. Defining essential and detailed information in the beginning phase play a key role in risk identification and mitigation. Many times, there is disconnect between tactical and strategic levels This can be due to personnel at strategic level lack visibility into costs and efficiencies across the spectrum of assets portfolios. In the similar vein, there are instances where well and plant level decisions are made based on perspective of an individual plant or asset. These decisions may not necessarily support overall profitability goals set at the corporate level. These disconnects typically have deteriorating effect on companies' ability to manage operational risks [10].

D. Quality Assurance and Quality Control Risks

Quality risks can be divided into following primary categories, a) Quality assurance risks, and b) Quality control risks. Quality assurance risks include lack of effective quality management system from involved parties (oil and gas company, contractor, sub-contractor and/or suppliers), and inadequate quality planning such as type and quantity of quality resources, processes, reporting, and management of contractor and sub-contractors. Quality control risks typically comprise of insufficient inspection presence and frequency, inadequate quality and quantity of inspectors, ineffective development and implementation of inspection and test plans, and passing on defects from one stage to another (e.g. from fabrication at supplier facility to construction site).

E. Regulatory and health, safety and Environmental Risks

Oil and gas industry is highly regulated industry due to effects and impacts it has on people's lives and environment. Regulations are not only constantly revised to take into consideration technological advancements but also becoming more and more stringent due to extreme operating conditions. Keeping up with continuously changing and more stringent regulations as well as government policy uncertainties is challenging, and often poses significant risk to oil and gas projects.



III. RISK MITIGATION IN OIL AND GAS PROJECTS

Depending of the overall cost (10s of millions to 10s of billions USD) of oil and gas projects, the above mentioned risks can cost millions to billions of dollars to oil and gas companies, contractors, sub-contractors and suppliers. Apart from cost impact due to nature of oil and gas industry, these risks have significant impact on lives of human beings and sea creatures as well. Therefore, taking risk mitigation measures and managing these risks efficiently both onshore and offshore is prudent, important and extremely significant. Risk mitigation actions and strategies for above mentioned risks are detailed as below:

A. Risk Mitigation – Cost Overrun

Cost overrun risks due to non-technical factors such quantity, quality and attitude of personnel can be addressed by sound planning and effectively executing ‘the plan’. Entire supply chain (oil and gas companies, contractors, and sub-contractors) of oil and gas project should closely look at human resource requirements including but not limited to resource quantity across different functions, required experience, and training needs. Leaderships of different entities should also be trained to work as ‘one project team’ to achieve the common goal. Poor planning should be mitigated with use of systemic project management tools including use of companies’ quality management system rigorously.

Cost overrun risks that may arise from technical factors such as incomplete (or at times absence) of engineering data during initial project state, engineering design changes after project award, and inadequate procurement strategies shall be looked in detail during the initial stage of oil and gas project and risk management workshops shall be continuously carried out to monitor progress of mitigation actions. To address risks due to incomplete engineering data during initial project stage, oil and gas companies should acquire additional information to reduce uncertainties of geotechnical attributes or adding flexibility to the projects [3]. Engineering design changes after project award can be mitigated adopting modular approach to engineering and design activities such as deploying common design specifications and guidelines for different project types (refinery or production platform or liquefied natural gas plants) and reusing standardized modules [4]. However, there is a word of caution – a thorough analysis and a sound business case should be developed with clear guidelines on which modules and/or submodules can be standardized and which must be customized [4]. Risks due to inadequate procurement strategies can potentially be mitigated by not basing supplier and sub-contractor selection decisions too heavily on ‘cost’,

instead putting significant emphasis on quality [1], HSE performance, fabrication capabilities and past track records. Since contractors and suppliers are paid approximately 90-95% of total project costs, in order to mitigate cost overruns, it is critical that procurement strategies should incorporate and integrate with the capital project procurement from beginning to end. Adopting and using Whole Life Costing (WLC) throughout the procurement for oil and gas project will prevent risks such as rising costs of material and plants during the production period that covers operational and maintenance costs.

EY2014 report [1] argues though risks due to geopolitical factors are external and less predictable or controllable, oil and companies and the industry as a whole can do far more to mitigate and prepare for them to adequately manage their effects within the project environment.

B. Risk Mitigation – Schedule Delay

Title Schedule delay risks stemming from inadequate contract management can be mitigated by defining contractual requirements clearly with little to no scope for subjectivity and/or interpretation. It is equally important to adequately detail the defined particular requirements so that all contracting parties can clearly understand scope and expectations from each other. Provisions should be made in the contract such that it would be difficult as well as discouraging for one party to take undue advantage of other party.

To avoid project delays due to poor project management team, and less qualified and inexperienced engineers (of any party i.e. Oil and gas company, its contractor, or contractor’s sub-contractor), a systematic approach to selecting project management team, engineers and other project personnel should be taken. Personnel assignment should be based on their past professional track records, areas of expertise, leadership qualities and ability to work with and adapt to team environment.

Taking and formalizing decisions in a timely manner minimize schedule delay risk to a great extent and are key factors in ensuring on time project completion. Project leadership from all involved parties should take every step to simplify decision making process and to minimize unnecessary organization layers for approvals. At the time same, project management team should involve engineers and senior management who can have positive impact on making meaningful and well informed decisions. Involving required engineers in decision making process, typically boosts their morale and team spirit. Clear roles and responsibilities along with accountability should be defined



at initial project stages to avoid any personnel management issues later at the execution stage.

Actions to mitigate schedule delay risks due to improper procurement strategies, growing number of change orders in execution phase and selecting lowest bid cost contractor and/or sub-contractor are similar to those of discussed in Section III – A Risk mitigation – cost overrun of this paper.

C. Risk Mitigation – Operational

Oil and gas companies should have a critical look at the ‘quality of data’ available across the enterprise. A thorough review of the completeness of assets data, updated documents, consistency and integration of information stored in companies’ numerous systems, and auditing the quality of available data [10] will help mitigating the risk of disconnect between tactical and strategic levels with respect to relevant data not being available to all appropriate decision makers. With the use of technology and software systems such as Enterprise Governance Risk and Compliance software this disconnect can be reduced [10]. Condition based monitoring that allows sophisticated systems with alerting and integrating capabilities with overall enterprise asset management applications will also help immensely in mitigation of operational risks. Similarly, more and more development of ‘centers of excellence’ that can provide a holistic view of plant and assets across the company will result into effective decision making to support overall profitability goals set at the corporate level [10].

D. Risk Mitigation – Quality Assurance and Quality Control

Mitigation measures to minimize quality assurance risks should be taken since the inception of project with adequate, effective and efficient quality planning by developing budget for quality activities [6], developing clear project quality requirements for contractors, sub-contractors and suppliers, detailed project quality plans by all involved parties, defining roles and responsibilities of quality personnel at all levels (from project quality managers to production facility quality control inspectors), detailing educational and professional experience requirements of quality personnel at all levels [6], defining training needs of project personnel and developing a detailed layout of project quality management system that includes processes across disciplines and reporting requirements within and across all involved parties.

Quality control risks can potentially be prevented and mitigated by assigning qualified, experienced and trained

inspectors at sub-contractors and suppliers’ fabrication facilities at pre-determined frequencies as per inspection and test plans. Selection of inspection personnel shall include interviewing inspectors, reviewing their resumes for past experience for specific types of equipment and required certifications. Quality teams from all involved parties shall ensure that inspection and test plans address critical elements such as clear description of activity, acceptable criteria, verifying documents, person responsible for carried out the activity, inspection points (for oil and gas company, contractor, sub-contractor and/or supplier) [7]. Equipment should be thoroughly inspected as per inspection and test plans during fabrication and inspectors shall assure that no defects are carried over from one stage to another. Identifying and addressing defects in their initial and early stage are less costly than late stage identification and correction.

E. Risk Mitigation – Regulatory and HSE

With the increasing regulatory pressure, oil and gas companies cannot afford the risk of being non-compliant. More stringent requirements for timely reporting on operations, and HSE incidents (e.g. near misses, loss time injuries and fatalities) are required.

Health, safety and environmental (HSE) should be top priority for the oil and gas industry projects. Everything else e.g. schedule and cost should come second since HSE involves lives of personnel. Managing Health, safety and environmental issues successfully requires commitment from top to bottom (i.e. from senior leadership to the lowest level employees) with levels of responsibilities and accountabilities across the organizations from all involved parties. Such commitment should be supplemented with strict enforcement of business principles, standards, policies and guidelines. In order to promote behavioural based safety program should be developed and implemented at enterprise and project levels.

IV. IMPACT OF RISK MANAGEMENT IN BRINGING EFFICIENCIES IN OIL AND GAS INDUSTRY

While the actions and strategies suggested above mitigate risks in cost, schedule, operations, quality assurance and quality control, and regulatory and HSE areas, it is evident that these risk mitigation actions and strategies bring efficiencies to the processes and execution of oil and gas projects as well. Case in point can be mitigation actions for engineering design changes after project award. Since the mitigation action for this risk is adopting modular approach



to engineering and design activities and reusing standardized modules, it is reasonable to state that modular approach will provide a level of standardization and reusability. Thus, this approach will make engineering and design process efficient and less subjected to growing number of changes after contract award. Such efficiencies from mitigation actions suggested in this paper can range from millions to billions of USD for typical projects in oil and gas industry.

V. IMPACT OF RISK MANAGEMENT IN SAVING JOBS IN OIL AND GAS INDUSTRY

According to Financial Times April, 2017 market data [8], Oil and Gas industry market cap is 4.60 trillion USD and Hays Oil and Gas Global salary guide, 2015 [9] stated that average global permanent salaries for oil and gas professionals were USD 82,239 with local talent average of USD 71,569 and an expat talent average USD 99,013. Taking this data into consideration, author of this paper performed calculation on how many jobs can be saved by saving money (1%, 5% and 10% of total Oil and Gas market cap) thru implementing risk mitigation actions and strategies discussed in this paper. Figure – 1 below illustrates the data on number of jobs that can be saved globally across Africa, Asia, Australasia, CIS (Russia and Commonwealth of Independent States), Europe, Middle East, North America and South America regions for local, expat and combined (local and expat talents).

Job savings by implementing risk mitigation actions and strategies in Oil and Gas industry					
Oil and Gas Market cap	\$	4.60			
(April, 2017) [trillion USD] ¹⁷					
1 trillion	\$	1,000,000,000,000.00			
Oil and Gas Market cap	\$	4,600,000,000,000.00			
(April, 2017) [USD]					
Savings thru risk mitigation actions and strategies [USD]					
Year	Type of Oil and gas professionals	Average salary [USD] ¹⁸	1% of Oil and Gas market cap	5% of Oil and Gas market cap	10% of Oil and Gas market cap
			\$ 46,000,000,000.00	\$ 230,000,000,000.00	\$ 460,000,000,000.00
Number of jobs that can be saved					
2014	Local talent	\$ 71,569.00	642,736	3,213,682	6,427,364
	Expat talent	\$ 99,013.00	464,585	2,322,927	4,645,855
	Combined (local and expat)	\$ 82,239.00	559,345	2,796,727	5,593,453

Fig. 1 Job savings by implementing risk mitigation actions and strategies in Oil and gas industry

It is evident from Fig.1 that risk mitigation actions and strategies, if implemented effectively, have a positive impact on saving number of jobs in Oil and Gas industry ranging

from approximately 642 thousand to 6.4 million for local talent, 464 thousand to 4.64 million for expat talent and 559 thousand to 5.59 million for combined (local and expat talents) depending on 1% to 10% cost savings (from risk mitigation efforts) of global Oil and Gas market cap.

VI. CONCLUSION

Risks in the life cycle of oil and gas projects are critical, and if not managed effectively, typically may cost millions to billions USD to oil and gas companies. While it is prudent to mitigate major risks such as cost overrun and schedule delay including other significant risks such as operations risks, QA/QC risks, regulatory and HSE risks during at any given point in time, challenging times (that oil and gas industry have been facing for past few years) demand risk mitigation actions and strategies discussed in this paper to be implemented effectively by oil and gas companies. Effective implementation of these risk mitigation actions and strategies will not only bring cost savings, timely completion of oil and projects, safer operations, quality products and services and efficiencies in project execution but also will ensure saving jobs of thousands to millions oil and gas professionals worldwide.

As a part of future enhancement, author may research qualitative and quantitative analysis of efficiencies that risk mitigation actions and strategies suggested in this paper may bring for typical projects in oil and gas industry.

Disclaimer: This paper does not represent any TechnipFMC position, and it is in no way related to TechnipFMC.

REFERENCES

- [1]. Spotlight on Oil and gas mega projects, EY, 2014 report, [http://www.ey.com/Publication/vwLUAssets/EY-spotlight-on-oil-and-gas-megaprojects/\\$FILE/EY-spotlight-on-oil-and-gas-megaprojects.pdf](http://www.ey.com/Publication/vwLUAssets/EY-spotlight-on-oil-and-gas-megaprojects/$FILE/EY-spotlight-on-oil-and-gas-megaprojects.pdf)
- [2]. Investigating the causes of delay within Oil and Gas projects in the U.A.E., 2008, www.arcom.ac.uk/-docs/.../ar2008-819-827_Salama_EI%20Hamid_and_Keogh.pdf.
- [3]. S.H.D. Hayashi, E.L. Ligerio, D.J. Schiozer “Risk Mitigation in petroleum field developed by modular implantation, Journal of Petroleum Science and Engineering, Vol, 75, Issues 1-2, pp. 105-113, 2010.
- [4]. Jeff Hart, Niels Phaf, and Koen Vermeltfoort, Saving time and money on major projects, McKinsey & Company, Dec 2013, <http://www.mckinsey.com/industries/oil-and-gas/our-insights/saving-time-and-money-on-major-projects>.



- [5]. M. F. Mohammad, A.D.F. Price “Challenges on procurement in the oil and gas industry: developing new strategies”, <https://www.irbnet.de/daten/iconda/CIB6054.pdf>.
- [6]. S. Goswami, Role of Quality Management System in project completion, Pipeline & Gas Journal, Vol. 242, No. 5, May 2015.
- [7]. S. Prabhakar, Well-devised inspection plans can save millions for operators, Pipeline & Gas Journal, Vol. 244, No.1, Jan 2017.
- [8]. Oil and Gas market data, Financial Times, April 1, 2017, <https://markets.ft.com/data/sectors/Oil-and-Gas>.
- [9]. Oil and Gas Global Salary guide – Hays US, 2015, www.hays.com/oil-and-gas/hays-global-oil-gas-salary-guide-2015-1429953.
- [10]. R. Bigliani, Reducing Risk in Oil and Gas Operations, IDC Energy Insights, May, 2013, <https://www.emc.com/collateral/analyst-reports/minimizing-operational-risk-in-oil-gas-industry.pdf>

BIOGRAPHY



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