Benchmarking change orders (variation order) in oil and gas contract versus FIDIC, AIA, EJCDC and CONSENSUS DOCS Baselines

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ABSTRACT

Change Orders (variation) are very common in oil and gas projects, they induces a change in the project original contractual scope of work. They, often lead to project overruns, dissatisfaction of stakeholders and can end in claims and disputes. Thus, the purpose of this paper is to explore the best practices related to change management. This paper aimed to analyse change contractual clause of four different standard forms; EJCDC, AIA, FIDIC and Consensus Docs. Then, compare them with the change clause of an oil and gas contract. The analysis and comparison were conducted using Multi Attribute Decision Making non-compensatory and compensatory methods. The result of the analysis showed that the oil and gas contract is the most efficient contract regarding the variation (change) management. This contract defined the modifications that are not considered as variation to the contractual scope and established means to manage the disagreements about change orders during the project life cycle. The variation terms in the oil and gas industry has to set up more adequate methods to evaluate the cost and time effects of the change orders.

Key words: Variation order, Change order, change request, request for information, impact of change order, causes of change order, oil and gas project, change control

INTRODUCTION

Nowadays, the oil and gas market is very unstable due to the recent dropping in prices and to the fact that the “easy oil” approaches its end. A lot of companies plunged into the red and several projects have been cancelled or frozen since 2015. The project owners are obliged now...
to adapt their organization and project execution processes to a lower price future. On the other hand, the contractors are constrained to lower their prices and reduce their margins to stay competitive.

The projects have to be more efficient and adaptive to their changing environment and establish sustainable project management processes. The industry research showed that “approximately 40% of construction projects undergo more than 10% change in their scope of work” 3. Those variation orders lead often to delays, cost, overruns and many other negative impacts such as the relationship degradation between owner and contractor, claims or disputes.

It is important to understand the best practices in regard to change or variation management in order to ensure a successful project delivery and enhance the performance of project management in the oil and gas industry. Evaluate the effectiveness of the variation terms and clauses in oil and gas contracts, identify the best way for the contractor to prove that there’s a change in scope of work and analyze the ways the variation and change orders are kept control in oil and gas projects.

In this paper, the author explores the variation clause of an oil and gas contract and compares it to the major references in construction projects, such as, AIA, EJCDC, FIDIC and Consensus Doc. The author uses the Multi Attribute Decision Making techniques to analyze the different statements on change (variation) in an oil and gas contract and the reference documents listed above, evaluate the issues and try to determine any improvement in order to ensure a successful project delivery and enhance project’s performance.

METHODOLOGY

1. Problem Definition
The purpose of this paper is to examine whether the current practices related to change (variation) management in the oil and gas industry are effective and investigate if the major references in construction projects can be used to improve those practices.

The aim of this paper is to analyze and answer the following questions:
- What are the best formats to introduce a change to the project (evaluation of the pro forma of change request and change order)?
- What is the best way to calculate the cost and time impact of change in a project? Do contract clause include full estimate of consequences: loss of productivity, delay, cumulative impact and any other direct or indirect costs?
- How disagreements about change orders or a change requests are managed?

2. Feasible Alternatives and Attributes

In order to answer the problematic above, AIA, EJCDC, FIDIC, Consensus Doc and an EPC oil and gas contract will be compared in term of variation (change) clause and analyze which one is the most adequate and effective:

- The baseline oil and gas contract is the most effective contract
- AIA is the most effective contract
- FIDIC is the most effective contract
- EJCDC is the most effective contract
- Consensus Docs is the most effective contract

3. Development of the outcomes

In this paper, the author explores the variation clause of an oil and gas contract and compares it to the major references in construction projects, such as, AIA, EJCDC, FIDIC and Consensus Doc.

First, baseline oil and gas contract is the best contract to be chosen: chosen is an EPC contract for a Natural Gas Liquids (NGL) train in the Middle East region.

Second, AIA general conditions of the contracts for construction. AIA, The American Institute of Architects, is a professional organization for architect based in the US. AIA general conditions of the contracts for construction are often adopted in owner/contractor contracts and referred as a “keystone” document in the construction. It is well adapted for large scale projects.

Third, FIDIC, the International Federation of Consulting Engineers, is an international standard organization for the consulting engineering and construction. In the orange book of the organization, the conditions of contract for Design-Build and Turnkey have been developed over 50 years and constantly updated.

Fourth, EJCDC, the Engineers Joint Contract Documents Committee, developed standards that represent the best thinking in contract management.

Fifth, Consensus Docs, which are “the only standard contracts development by a diverse coalition of 40 leading associations with members from all stakeholders in the design and the construction industry”. This paper will focus on Consensus Doc 200-Standard Agreement and General Condition between Owner and Contractor, which is the most appropriate to compare to the baseline contract that is an oil and gas EPC contract.

4. Selection of criteria

This paper starts by analyzing the change (variation) terms in an oil and gas contract and compare it with four standard forms: AIA, EJCDC, FIDIC and Consensus Doc. The objective is to assess the different change (variation) contract clauses on an established set of adequacy criteria.
In order to decide which alternative provides the best practices in terms of change (variation) management in the contract clauses, the following attributes have been selected:

- **Clarity of statement**, to evaluate if the statements are easy to understand and avoid any confusing or misunderstanding from both parties (owner/contractor)
- **Timelines**, to check if the contract clause imposes deadlines in the process of change orders approval. This can help to avoid any claims or disputes at the end of the project as well as reduce the risk (if any) of not implementing the change.
- **Quality of the change order forms**, to examine if the change orders include all the necessary information to manage the change (authorize it or not?)
- **Cost effect of change**, to analyze if the contract clause in the alternatives include the methodology to determine the impact on the contract price.
- **Time effect of change**, to analyze if the contract clause in the alternatives include the methodology to determine the impact on the contract price.
- **Disagreement management**, to examine if the clauses include the way to handle a disagreement about a change request or a change in order to avoid waste of time and money causing delays and cost overruns in the project.
- **Adjustment due to risk**, to check whether the clauses take into consideration changes due to external risks (e.g., new regulations or laws, modifications in raw material prices...)

The five alternatives mentioned above are assessed using the Multi Attribute Decision Making non-compensatory techniques. These techniques help to compare the alternatives in order to rank them and select the most adequate one using a number of qualitative criteria.

The **Disjunctive Reasoning method** allows to analyze the content of each alternative in terms of change and variation orders and assess the effectiveness of the statements according to the selected criteria. The table below shows the results:

<table>
<thead>
<tr>
<th>Selection Attributes</th>
<th>Baseline contract</th>
<th>EJCDC</th>
<th>FIDIC</th>
<th>AIA</th>
<th>Consensus Doc</th>
<th>Ordinal ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity of statements</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Timelines</td>
<td>1</td>
<td>1</td>
<td>NA</td>
<td>NA</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Quality of Change order forms</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Cost effect of change</td>
<td>0</td>
<td>1</td>
<td>NA</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Time effect of change</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>NA</td>
<td>2</td>
</tr>
<tr>
<td>Disagreement management</td>
<td>1</td>
<td>NA</td>
<td>NA</td>
<td>1</td>
<td>NA</td>
<td>2</td>
</tr>
<tr>
<td>Adjustments due to risks</td>
<td>1</td>
<td>NA</td>
<td>1</td>
<td>NA</td>
<td>NA</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 1: Ranking of the alternatives according to the selected attribute

The **Dominance method** helps to compare the baseline contract to each of selected alternative. The aim is to evaluate if the baseline contract can be improved using parts of one of more alternatives. The table below shows the results of the dominance analysis.
Table 2: Comparison of the baseline contract to the alternatives

<table>
<thead>
<tr>
<th>Selection Attributes</th>
<th>Baseline contract VS EJCDC</th>
<th>Baseline contract VS AIA</th>
<th>Baseline contract VS Consensus Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity of statements</td>
<td>Equal</td>
<td>Equal</td>
<td>Equal</td>
</tr>
<tr>
<td>Timelines</td>
<td>Equal</td>
<td>Better</td>
<td>Better</td>
</tr>
<tr>
<td>Quality of Change orders form</td>
<td>Equal</td>
<td>Equal</td>
<td>Better</td>
</tr>
<tr>
<td>Cost effect of change</td>
<td>Worse</td>
<td>Worse</td>
<td>Worse</td>
</tr>
<tr>
<td>Time effect of change</td>
<td>Worse</td>
<td>Better</td>
<td>Better</td>
</tr>
<tr>
<td>Disagreement management</td>
<td>Better</td>
<td>Better</td>
<td>Better</td>
</tr>
<tr>
<td>Adjustments due to risks</td>
<td>Better</td>
<td>Better</td>
<td>Better</td>
</tr>
<tr>
<td>Dominance?</td>
<td>Maybe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2: Comparison of the baseline contract to the alternatives

From the **Disjunctive Reasoning method**, it appears that FIDIC cannot bring any add value to the baseline contract its ordinal ranking low and the score in all the attributes is low or not applicable. Therefore in the dominance method the baseline contract is compared only to AIA, EJCDC and Consensus Doc. FIDIC won’t be selected in any further the analysis in this paper.

The **Dominance method**, shows that the attribute “*clarity of statements*” is equal quality in the four alternatives. Therefore, this attribute will be discarded from further analysis in this paper.

**FINDINGS**

1. **Analysis and comparison of the alternatives**

First, the Dominance analysis, shown in the table below, helps to analyse the content of change (variation) clause in the four alternatives selected oil and gas contract, EJCDC, AIA and Consensus doc. Then compare the oil and gas contract with each of the rest of the alternatives.
a. Analysis of the baseline- oil and gas EPC contract

This contract has a clear statement regarding the change (variation) under its article 15 named “Variations”. There are 7 subsections in this articles that refer to different aspect of change (variation)

Subsection 1: explains the different types of changes (variation) that the owner can require the contractor to execute during the project life cycle and highlight that the contractor is obliged to do so and shall submit a full estimate of the consequences.

Subsection 2: explains under which conditions the contractor can raise a change (variation) request. It highlights that the contractor has 14 days to issue in writing a variation order to the owner from the moment the contractor was aware of the necessity of the change (variation).

Subsection 3: refers to what should be included in the contractor’s estimate, especially to mitigating measures taken or proposed to be taken, and the Article or Articles of the CONTRACT under which the CONTRACTOR considers itself to be entitled to a VARIATION.

Subsection 4: refers to the adjustments to contract price, schedule of key dates

Subsection 5: explains under which condition the owner will authorize a change (variation) if the contractor has suffered a delay affecting the schedule of key dates and/or incurred cost as a direct result.

Subsection 6: explain how to manage disagreement on Instructed or Requested VARIATIONS

Subsection 7: lists all the situations that are considered as NO Variation by the owner

This contract gives clear instructions of what to shall be included in the change (variation) request as well as clear approval's timelines. It also take into consideration the adjustment of the contract prices and evaluate the cost and time effect of the change (variation) and any delay and/or additional cost caused by the risk of the owner.

b. Analysis of AIA

AIA general conditions of the contracts for construction provides under article 7, gives clear definition of the change (variation) terms:

- The content of change order/ change request is clearly explained. All the necessary information are listed: the definition of the change in the work and the amount of adjustments in the contract
- The method to estimate the cost and time effect are defined
- The ways to manage the disagreements about change between the architect and the owner are set.
- The management of minor change in works
AIA doesn’t specify any timeline regarding the approbation of the change request from the contractor or the execution of the change order. It’s important to define the deadlines that the owner has to approve a change order request from the contractor to minimize the risk impact of non-implementing the change. The baseline contract takes into consideration the risks caused by the owner which AIA doesn’t refer to.

c. Analysis of EJCDC
The EJCDC contract clause 11 amending the contract documents; changes in the work is very clear and well structured. It developed in details the following points:

- Three different ways to amend or supplement the contract documents: change order, work change directive or field order.
- The process of authorizing a change order
- The change of contract price is structured and include all the situations that a contractor or an owner can face.

EJCDC’s statements are clearer and easier to understand comparing to FIDIC and AIA. However, the baseline contact structured better which help to catch all the meaning quickly. EJCDC is more precise than the baseline contract or any other of the standard references regarding the evaluation of the cost of the change. EJCDC and the baseline contract include timelines in the change proposal process, FIDIC and AIA doesn’t refer to that. EJCDC omitted to explain what shall be done in case of a disagreement about change, it directly refers to article 12 Claims.

d. Analysis of Consensus Doc
The statements in Consensus doc related to change (Article 8) are clear and easy to understand. It includes:

- The way to manage changes by the owner and by the contractor
- Clear methodology on how to determine the cost of change. It offers several methods to calculate the cost: unit price, a mutually accepted itemized lump sum, cost of the work.
- Timelines for the changes notices: 14 days for the owner or the contractor.
- Refers to incidental changes that “the owner direct constructor to perform incidental changes in the work upon concurrence with the constructor that such changes do not involve adjustments in the contract price or contract time”.

Consensus doc statements are easy to understand and well structured. The methods to determine the cost of change are more developed in consensus than in any other alternatives.

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4 Consensus Doc 200-Standard Agreement and General Condition between Owner and Contractor
studied in this paper. However, Consensus Doc omitted the parts related to adjustments in the price contracts due to any risk and the management of disagreement about change.

To support and check the results shown in the dominance analysis, the author uses another MADM method that is based on compensatory techniques. The aim is to measure how the alternatives score is relative to one another. The analysis is based on Additive Weighting Technique and the results are shown in the tables below:

<table>
<thead>
<tr>
<th>Selection Attributes</th>
<th>Step1</th>
<th>Step2</th>
<th>Relative Rank</th>
<th>Normalized weight (A)</th>
<th>Baseline contract</th>
<th>EJCDC</th>
<th>AIA</th>
<th>Consensus Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timelines</td>
<td>3</td>
<td></td>
<td>0,14</td>
<td>1,00</td>
<td>0,14</td>
<td>1,00</td>
<td>0,00</td>
<td>1,00</td>
</tr>
<tr>
<td>Quality of Change</td>
<td>1</td>
<td></td>
<td>0,05</td>
<td>1,00</td>
<td>0,05</td>
<td>1,00</td>
<td>0,05</td>
<td>1,00</td>
</tr>
<tr>
<td>orders form</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost effect of change</td>
<td>6</td>
<td></td>
<td>0,29</td>
<td>0,50</td>
<td>0,14</td>
<td>0,29</td>
<td>0,50</td>
<td>0,29</td>
</tr>
<tr>
<td>Time effect of change</td>
<td>5</td>
<td></td>
<td>0,24</td>
<td>0,50</td>
<td>0,12</td>
<td>0,24</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>Disagreement</td>
<td>4</td>
<td></td>
<td>0,19</td>
<td>1,00</td>
<td>0,19</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustments due to</td>
<td>2</td>
<td></td>
<td>0,10</td>
<td>1,00</td>
<td>0,10</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUM</td>
<td>21</td>
<td>1</td>
<td></td>
<td>SUM 0,74</td>
<td>SUM 0,71</td>
<td>SUM 0,62</td>
<td>SUM 0,48</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Additive Weighting Technique

The baseline contract has the highest score compared to the three other alternatives, followed closely by the EJCDC standard. This confirms the results of the dominance method.

It appears as well that EJCDC and Consensus Doc have a better score for the cost effect of change criteria. It means that we can improve the baseline contract in term of evaluation of the change impact on the contract’s price using those two references.

Regarding the Time effect of change criteria, the score of EJCDC and AIA are higher than the one of the contract baseline. It’s important to investigate how those two references deal with the impact on change on the contract’s schedule and evaluate how they can be used to improve the baseline contract.

2. Selection of the preferred alternative

Based on the dominance method and the additive weighting technique analysis conducted, it appears clearly that the baseline contract statements related to change are good and better than the other alternatives. The management of disagreement about change between the owner and the contractor is very well explained and go through several steps before coming to raising a claim, which can save the owner and the contractor loosing time and money and reach to an agreement quicker.
The baseline contract take into account also the adjustments to contract price and contract time according to the risk due to the external environment, this shows fairness to both parties (owner and contractor).

### 3. Performance monitoring and post evaluation of result

The analysis showed that two aspects can be improved in the baseline contract:

1. The determination of the impact of the change on the contract’s price:

   The contract should include how to evaluate the impact of the change of the project cost. The contract has to stipulate when the cost effect of the change will an agreed lump sum, a unit price for the change (as subsequently agreed in the contract) or a cost of work plus fee. The necessity to determine the methodology to evaluate the impact of the change is to provide more control over the change and try to avoid as much as possible cost overruns. It also helps the contractor to manage better its cash flows.

2. The evaluation of the time effect of the change is key success factor for the project: The contract should include the methodology to evaluate if the change will cause any delays in the project. A monitoring of the impact on the critical path should be required by the owner. On the other hand the contractor should include any change or variation on the project schedule, it can be a good method to keep record and control over the change orders.

### CONCLUSIONS

This paper assesses baseline oil and gas contracts with the four major references in the construction industry and aims to reply to the following questions:

- What are the best formats to introduce a change to the project (evaluation of the pro forma of change request and change order)?

   The change orders format and templates used have all the necessary information to permit to the owner to evaluate whether to allow the change or not. The minimum information that should be included in the change order are:
   - Description of the work to be performed under the change (variation);
   - Detailed schedule for the execution of the change( variation) showing the required resources;
   - The effect of the change on the contract price, including the calculation method;
- The effect on the change on the contract time, including the critical path updates;
- The reference to the contract article under which the change belong; and
- All approval and signature parts.

The baseline contract includes the timeline for approval which decrease the risk of further claims or the risk of not performing the change in time.

- What is the best way to calculate the cost and time impact of a change? Do contract clause include full estimate of consequences: loss of productivity, delay, cumulative impact and any other direct or indirect costs?

During the analysis, we discovered that the determination of the cost and time effects of change are very basic and doesn’t include the evaluation of all the cumulative impacts of all changes, such analysis are not required by the contracts clause for change. The impact of the change of the loss of productivity is not addressed as well.

- How disagreements about change orders or a change requests are managed?
The oil and gas contract gives a clear definition of what is a disagreement about change, by stating different situations that can occur. It also defines what is NOT considered as a change (variation). Stated like this, it reduces the risk that the contractor and the owner enter into dispute. It also preserves a good relationship between them and reduce conflict. It can preserve the project from delays and cost overruns in trying to resolve misunderstandings.

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Meryem Benachour is an enthusiastic and confident project engineer with extensive experience in managing complex Projects in the Energy and IT Industries. Meryem graduated in industrial engineering from the Polytechnic School of Algiers. She gained significant project management experience in her career during her tenure in a leading Engineering Firm. This experience consists in large onshore and offshore Oil & Gas construction projects in both Algeria and France. Meryem has also worked as an Operations Lead for Google Italy, supporting Google Maps Projects in very challenging contexts.

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