

Benchmarking Quality Management System (QMS) Audit Process on Oil and Gas Projects

Shobhendu Prabhakar

Project Quality Manager, TechnipFMC, Houston, TX, USA

Corresponding Author: shobhendu@gmail.com

ABSTRACT

This research paper discusses when and why there is a need to benchmark QMS audit process, illustrates objectives of QMS audit benchmarking exercise and details steps to carry out QMS audit process benchmarking exercise on oil and gas projects.

Keywords-- Benchmarking, Quality Management System Audits, Best in class performance and Continuous improvement

According to a study by Strategy & (a global consulting firm), due to lower oil prices, the companies in oil and gas sector are facing enormous challenges. To address these challenges, the companies' corporate strategic objectives will increasingly focus on a) sustainable profitability and b) differentiated capabilities will become a key factor for future success [2]. One of the most effective ways to boost profitability is 'Benchmarking' through process improvement. According to a research, companies whose best practice performance measures rank in the top quartile of their industry are 10 times more profitable than companies that rank in the bottom quartile [3].

Since Quality Management System (QMS) and QMS audits are critical parts of oil and gas projects execution and can contribute significantly to cost savings and thus profitability, a diligent review of company's QMS audit process is prudent.

This research paper:

- discusses symptoms that should prompt a company that there is need to benchmark its QMS audit program
- details objectives of QMS audit benchmarking exercise
- provides detailed steps to carry out QMS audit benchmarking exercise
- details a meaningful guideline survey questionnaire to identify gaps and opportunities for improvement in QMS audit process with respect to company's peers and best in class companies
- provides a prioritization matrix to effectively implement suggested recommendations from QMS audit process benchmarking.

I. INTRODUCTION

Crude oil prices have not been great in last few years. In fact, in early 2016 oil prices reached as low as around \$28 per barrel from as high as around \$ 105 per barrel in mid-2014, refer to Figure – 1 [1]. This represents a 73% decline in oil prices in a span of only year and a half. Though oil prices have seen an upward trend since mid-2017 (around \$40s) and Q1 2018 (around \$60s), they are still nowhere near when compared to period of 2011 – mid 2014.



Fig.1 – Crude Oil Prices – 10-year chart

II. OBJECTIVES OF QMS AUDITS BENCHMARKING

Before diving into the objectives of QMS audits Benchmarking on Oil and Gas projects, let me detail the reasons why and when a company in Oil and Gas industry should decide to perform benchmarking exercise on its QMS auditing process.

Despite of QMS audits:

- Company has high/significant cost of poor quality (i.e. the cost of poor quality is above the target established by the company and/or higher than the cost of poor quality of company's competitors). Cost of poor quality is typically defined as an additional cost incurred by the company in fulfilling the gap between desired and actual product/service quality [4].
- Company's customer satisfaction ratings have been declining and/or customer complaints have been increasing.
- Non-conformances are not identified at the right time and the right phase during project execution. A typical example would be engineering related non-conformances are identified in procurement and/or construction phase OR procurement/equipment related quality issues are identified during installation phase. Late identification of non-conformances not only drives cost of correction up but also bullwhips efforts and complexity to correct the non-conformances. The term bullwhips here is taken from the bullwhip effect observed in the distribution channel. It refers to increasing swings in inventory in response to shifts in customer demand as one moves further up the supply chain [5, 6, 7]. Applying the same concept, if the non-conformances are identified late (i.e. farther from the project phase), the efforts, complexity and cost to correct the non-conformances increase as illustrated in Fig.1.

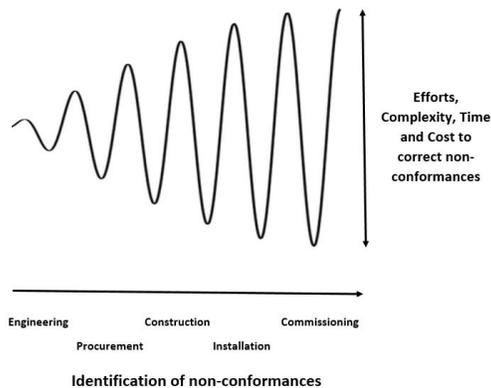


Fig.1 – Bullwhip effect of late non-conformance identification

- Recurring similar types of non-conformances and/or quality issues on projects within the company.
- Company's current QMS audits are not risk based and do not address risk mitigations effectively on the projects.
- Existing QMS audits are perceived by the company, client, supplier and sub-contractors as:
 - routine procedural compliance tools as opposed to continuous improvement tools.
 - verifications from 10,000 ft level (i.e. high level) as opposed to verification of detailed process(es), sub-process(es) and steps within the subjected process(es) and sub-process(es).
 - too frequent or too sporadic.
 - minimum value added for project execution and process improvements.

If a company is facing one or more of the above scenarios despite of QMS audits, it is time to re-evaluate, benchmark and improve its QMS audit program.

Objectives of QMS audits benchmarking include:

- Identify what is working and what is not working for QMS audits
- Identification and adoption of QMS audit best practices from best in class peers
- Re-defining goals and key performance indicators of QMS audit program
- Reduction in cost of poor quality due to QMS audits benchmarking

Company should also analyze changes in the marketplace and role of QMS audits to help company sustain its competitive advantage.

III. STEPS OF QMS AUDITS BECHMARKING

Like any other benchmarking project [15], there are following steps to be followed for QMS audit benchmarking.

- Planning
- Analysis
- Integration
- Action

Planning:

Planning phase of QMS audit benchmarking project involves following tasks:

- Mission statement – this statement should include purpose, scope, value proposition and desired future state [8] of QMS audit program.
- Competitive landscape – this landscape should define company's key competitors and best in class peers with respect to whom the company's QMS audit program will be compared.

- Research – company should conduct a research on following items within recent past (3-5 years):
 1. Functional areas on which QMS audits were conducted
 2. Scope and frequency of QMS audits
 3. Cost benefit analysis of QMS audits
- Survey – the company should decide which survey media (online, phone and/or face to face) will be used. An in-depth and meaningful survey questionnaire should be developed by the benchmarking team. Below survey questionnaire lists some of the useful questions that should be asked. These questions are for guideline only. Company's benchmarking team should tailor the survey questionnaire based on the company needs and goals.
 1. Do your company have a defined QMS audit program?
 - Yes
 - No
 2. Are there defined criteria to select areas to be audited?
 - Yes
 - No
 3. What are the criteria to select areas to be audited (select one or more)?
 - Risk ranking
 - Non-conformances
 - Cost of poor quality
 - Lessons learned
 - Customer complaints
 - Equipment post-delivery issues
 - Warranty claims
 - Audit team judgement
 4. What is the frequency of audits?
 - Monthly
 - Quarterly
 - Half yearly
 - Annually
 - More than a year
 5. Typical number of auditors to conduct a QMS audit
 - One
 - Two
 - Three
 - More than three
 6. What is the structure of audit team?
 - Quality Assurance (QA) personnel only
 - Subject Matter Experts (SMEs) only
 - Combination of QA personnel and SMEs
 7. Are there separate audit checklists for each area to be audited?
 - Yes
 - No
 8. What type of questions are in the audit checklist (select one or more)?
 - verification of documented procedures and related records
 - check of process risks and mitigation measures
 - assessment of cost and schedule impacts
 - implementation of lessons learned from past issues
 - review of corrective and preventive actions from past non-conformances for effectiveness in current business environment
 - review of customer complaints and assessment of actions taken to prevent recurrence
 9. Who receives the audit results and reports?
 - Auditees only
 - Auditees and process owners
 - Auditees and their respective managers
 - Auditees, their respective managers and process owners
 10. Are root causes identified for non-conformances?
 - Yes
 - No
 11. What tools are used to conduct root cause analysis for audit findings (select one or more)?
 - None
 - Verbal thru informal interviews only
 - 5-why
 - Fishbone diagram
 - Any other (list the name of the tool)
 12. How systematic is the root cause analysis process on a scale 1 thru 10? (1 - poor, 10 – excellent)?
 - 1
 - 2 - 5
 - 6 - 9
 - 10

13. Who checks and verifies implementation of corrective and preventive actions for audit findings?
- Auditor only
 - SMEs only
 - Auditor or SME
 - Auditor and SME
14. Are audit findings from one location or one project shared among other locations or projects?
- Yes
 - No
15. If answer to question 14 is a 'yes', how are these audit findings shared?
- Email
 - Meeting
 - Central website
16. Are cost and schedule impacts quantified for each audit finding?
- Yes
 - No
 - Yes. However, it is done on a case by case basis but not for each audit finding
17. Who reviews QMS audit findings data?
- Quality Leadership Team (QLT) only
 - Process Owners only
 - QLT and process owners
18. How frequently review mentioned in question 17 conducted?
- Weekly
 - Monthly
 - Quarterly
 - Half yearly
 - Annually
 - More than a year
19. Are the audit findings trended?
- Yes
 - No
20. What type of trending is performed (select one or more)?
- Cost impact
 - Schedule impact
 - Non-conformance types
 - Non-conformance root causes
 - Recurrence of same or similar non-conformances
 - Recurrence of same or similar customer complaints non-conformances
21. Is Return on Investment (ROI) calculated for QMS audit program?
- Yes
 - No
22. Are inputs to improve QMS audit program collected?
- Yes
 - No
23. If answer to question 22 is 'yes', from whom the inputs are collected?
- Internal stakeholders only
 - Clients/customers
 - Suppliers/Sub-contractors
24. If answer to question 22 is 'yes', are these inputs analyzed and actioned?
- Yes
 - No
25. Are QMS audits perceived as value added from internal stakeholders, clients/customers and suppliers/sub-contractors?
- Yes
 - No
26. If answer to question 25 is 'no', are further questions asked as to relevant stakeholders as to why?
- Yes
 - No
27. If answer to question 26 is 'yes', are responses from stakeholders analyzed and actioned?
- Yes
 - No
- Next step after developing the survey questionnaire is to define the survey distribution list. To get most value out of the survey questionnaire, benchmarking team should send the survey to both internal and external stakeholders along with personnel from peer best in class companies. List of internal stakeholders, external stakeholders (clients/customers and suppliers/sub-contractors) and personnel from peer and best in class companies should typically include:
- Company leadership
 - Department and/or Functional heads
 - Process owners
 - Project Managers
 - Auditees
- It should be noted that getting survey responses from internal and external stakeholders is easier in

comparison to getting responses from personnel of best in class companies specifically if they are competitors. That said, there will be personnel from competitors and/or best in class companies who will be willing to participate in the survey to know the results as well as for the improvement of QMS audit program across the oil and gas industry. The other option is to outsource the survey and competitive research to an independent third party who conducts research for benchmarking and research purposes [9].

In parallel to the survey questionnaire, the benchmarking team should also decide whether they should conduct office and/or site visits internally and externally to understand more about positives and improvement areas for QMS audit program.

Analysis:

After collecting the required data in the planning phase, the benchmarking team should analyze the collected data. Following steps should be carried out to analyze the data.

Gap analysis – benchmarking team should perform a gap analysis to understand in which aspects the company’s QMS audit program is superior, inferior or at par with those of competitors’ and best in class companies. A typical gap analysis template is provided below.

Activity	Superior / At Par / Inferior in comparison to competitors and/or best in class companies	Gaps	Barriers
Activity 1	Superior		
Activity 2	At par		
Activity 3	Inferior		
...	Inferior		
...	At par		
...	Superior		
Activity X	Inferior		

Table 1 – Gap Analysis Template

Next step in the gap analysis is to determine up to what extent the company’s QMS audit program is inferior to that of its competitors and the best in class companies. Since the purpose of benchmarking exercise is to improve, the company should focus on areas of improvement. The company should also focus on whether historically the performance gap has been narrowing or widening or remaining the same.

Similarly, the company should also analyze the what-if scenarios i.e. if the company does X to improve, what will be the reaction of competitors and the best in class companies and what steps the company should take to minimize the impacts.

Summary metric – development of a summary metric (single or multiple) is highly desirable to interpret and compare the data at hand. For QMS audit program benchmarking exercise, typical summary metric should at least include following:

Metric	Actual (Current Status)	Target
Defined criteria to select areas to be audited		
Frequency of QMS audits		
Quantity and quality of audit team		
Separate audit checklists (by areas) including questions on		
- risks and mitigation measures		
- cost and schedule impacts		
- lessons learned implementation		
- corrective and preventive actions effectiveness		
- customer complaints resolution effectiveness		
Systematic root cause analysis for audit findings		
Frequency of QMS audit findings data review		
Return on investment for QMS audit program		
Analysis of inputs to improve QMS audit program		

Table 2 – Typical Summary Metric – QMS Audit Program

Compilation of best practices chart: Upon analysis of survey responses and QMS audit program of best in class/competitor companies, the benchmarking team should identify and compile a chart of best practices. Compilation of best practices provides the benchmarking team with an understanding of value added elements of QMS audit program. A typical best practices chart would be like the one depicted in Figure – 2.

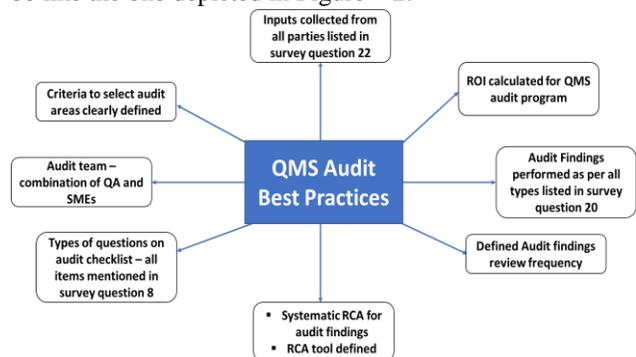


Figure 2 – Typical QMS Audit Program Best Practices

Integration:

List of personnel to whom the benchmarking exercise result will be communicated:

Identification of a comprehensive distribution list to whom the benchmarking exercise results will be communicated is critical so that:

- no stakeholders are left out.
- personnel with right management and supervisory levels know the results.
- the results are not going inadvertently to inappropriate personnel.

The benchmarking team should finalize the distribution list after consulting with the relevant stakeholders.

Mode of presentation:

The benchmarking team also decide on the mode of presentation to the relevant personnel based on the company style, culture and organizational practices. Some companies prefer a formal approach such as PowerPoint presentation or flash presentation format, whereas other

companies may choose verbal discussions or a combination of both. Independent of the presentation mode, the content should be informative as well as persuasive. Informative because the benchmarking team is trying to educate the stakeholders about the benchmarking exercise findings and results *and* persuasive because the purpose of benchmarking exercise is to identify gaps and continuous improvement [10, 11, 12].

Organization of findings, results and recommendations:

Though analysis phase provides findings, the benchmarking team not only need to interpret the findings to gain meaningful insights, extract results, draw conclusions and provide recommendations but also need to organize these items in such a way that the findings, results and recommendations make sense and are clearly understood by relevant stakeholders [13]. To do this, the benchmarking team should consider following:

- Data collection, Data processing and Data analysis process.
- Emerging themes and patterns from the data analysis.
- Significance of results from statistical point (if it can be proven).
- Do findings and results lead to additional data request?
- Do findings and results pass ‘the making sense’ test?

Following is typical representation of benchmarking study report structure:

- Scope
- Purpose
- Executive Summary
- Methodology
- Team structure
- Competitor and Best in Class Companies analysis
- Comparative Study

Company’s QMS audit process status with respect to Peers and Best in Class Companies

- Key Findings
- Recommendations
- Recommendations – prioritization matrix

Since action(s) for every recommendation requires efforts and cost by stakeholders, it is highly desirable that the Benchmarking team should create a prioritization matrix explaining cost/effort vs benefits/returns of suggested recommendation. This prioritization matrix will help management and stakeholders to decide recommendations to be addressed in short and long terms. A sample prioritization matrix of ten (10) recommendations is illustrated in Figure - 3.

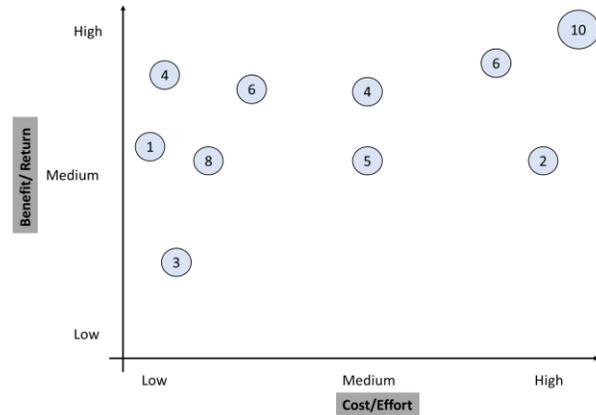


Figure 3 – Recommendation Priorities Cost/Effort vs Benefit/Return Matrix

Review and revision of functional goals:

The company should review and revise functional goals to align them with the recommendations and future state of QMS audits program.

A case in point can be that one of the recommendations from Benchmarking team is as follows:

- Expand the horizon of audit findings trending to include cost and schedule impacts.

Therefore, the company’s functional goal should be that for every audit finding, cost and schedule impacts shall be determined and reported.

Action:

Based on the prioritization matrix depicted in Figure - 3, the company should determine recommendations implementation priorities.

As a guideline, path mentioned in Figure – 4 can be one of the paths that the company can take to decide on implementation priorities. In this path, the company plans to implement recommendations that require lower cost/effort and higher benefit/return.

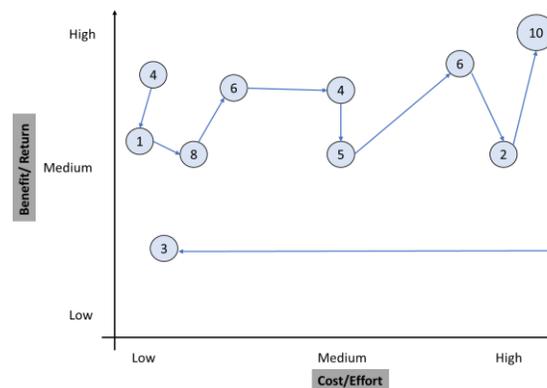


Figure 4 – Recommendations’ implementation priorities – driving factor (cost/effort)

Depending on severity of recommendation(s) and budget availability, the company may decide to implement recommendation 10 first and then move towards left.

Other criteria to determine implementation priorities are training required, probability of success and controls needed [14].

Further, it is important to clearly define and detail action plans for each agreed recommendation based on the implementation priority. Action plans should as a minimum include – specific tasks along with desired outcomes, schedule that includes task sequence, start and end dates, resources, key responsible personnel along with a monitoring system to track progress [14].

Benchmarking team along with assistance from stakeholders should monitor implementation progress and results at an agreed frequency.

IV. SCOPE OF FUTURE RESEARCH

Like QMS audits, the author would like to identify and analyze other Quality Management System processes to be benchmarked on the Oil and Gas projects.

V. CONCLUSION

Reduction in cost of poor quality, timely identification of non-conformances and increase in customer satisfaction ratings play a critical role in any company's profitability. These items are becoming even more critical for companies in the oil and gas industry due to lower oil prices for few years now. If not addressed, a decrement in profitability is certain. Therefore, companies in the oil and gas industry should thoroughly look at their QMS audit program and identify if the time has come to benchmark and revamp it. If the answer is yes, this research paper provides details on how to carry out QMS audits benchmarking exercise.

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

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