DISSERTATION REPORT

A STUDY ON BENCHMARKING OF OPERATIONAL KEY PERFORMANCE INDICATORS

(With reference to an Oil Major Explorations and Productions Company)

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A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR

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APPENDIX – I

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This is to acknowledge with thanks the help, guidance and support that I have received during the Dissertation.

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APPENDIX – II

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DECLRATION BY THE GUIDE

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Further I certify that work is based on investigation made, data collected and analyzed by him and it has not been submitted in any other university or institution for award of any degree. In my opinion, it is fully adequate in scope and utility, as a dissertation towards parts fulfilment for award of degree of MBA.

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APPENDIX – II

STUDENT DECLATION

I, Tushar Das, student of MBA (Oil and Gas Management) studying at University of Petroleum and Energy Studies, declare that the project work entitled "***A Study on Benchmarking of Operational Key Performance Indicators***" - *with reference to an Oil Major Explorations and Productions Company* was carried out by me in the partial fulfilment of MBA (Oil and Gas Management) program me under the University of Petroleum and Energy Studies. This project was undertaken as part of an academic curriculum according to the university rules and norms and it has not commercial interest and motive. It is my original work and not submitted to any other organization for any other purpose.

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APPENDIX – IV

PREFACE

"The Benchmarking of KPIs is meant to improve and transform the organizational performance"

According to Einstein *"Not everything that can be counted counts, and not everything that counts can be counted."* What he is referring to is the fact that not all measurable figures are important, and that not everything that is important can be measured. Non-measurable related factors impacting the success of innovation programs like the level and quality of management support, effective marketing and communication strategies and the usage of innovation advocates cannot be measured within a tool.

Quite often the important things to measure in business, namely Key Performance Indicators, are hard to measure, and it's often because we are thinking about measurement in the wrong way. The challenge is to count the things that count (good KPIs) and to get the right numbers right (ROI). So what makes a performance indicator important?

By definition, a KPI is a measurable metric that informs us how the business is doing against Critical Success Factors that are aligned to the overall objectives and goals of an organization. KPIs are characterized by being easy to understand and helpful to analyze our success. But ultimately KPIs lead to actions – KPIs that do not support you in making decisions are just metrics

Some practices are lacking or are inconsistently applied in relation to those employed by top performing assets and present an opportunity for Major Oil and Gas Industry to significantly enhance its efficiency and effectiveness. Major Oil and Gas Industry is a large and complex organization that recently completed an organizational restructuring effort and work continues to resolve underlying ambiguity. Throughout the last 18 years, I have been working with Oil and Gas companies it make me clear that lack of cost awareness across the organization hamper those initiatives geared to optimize cost. My observations during the assessment of inconsistency and process ownership uncertainties can be inherent in large organizations, especially following restructuring activities, indicating a need for additional clarity. Additionally, benchmarking recommendations to be structured as part of a multi-part framework and shall be focused on the need for the Organization.

We cannot achieve anything worthwhile in any field of knowledge solely on the basis of theoretical knowledge from books to order to achieve practical, positive and concrete results, the classroom learning needs to be effectively wedded to the reality of the situation outside the classroom. Project work provides an opportunity to apply the theoretical aspect in practical. As a management student, we must have some practical knowledge regarding research and research methodology.

The education institutions like University of Petroleum & Energy Studies offering management programs play a significant part in uncalculating the much needed managerial skills in their students, the aspiring managers. The real success of management lies in applying the professional management techniques in all managerial activities. Practical study is eminent, and plays vital role for the students of management, because classroom coaching and theoretical study alone are not enough. To survive in this highly competitive world, practicality outweighs theoretic. Students are supposed to learn the various principles of business administration conceptually but accuracy and efficiency in their implementation is possible only through exposure to practical environment.

Through this project report work we can better understood the different aspects like research design, measurement and scaling techniques, questionnaire and form design, data collection, analysis and interpretation. Through this report we can understood business research methodology in practical term.

Hence, to attain this objective and to have the outlook of all intricacies of corporate world I have undertaken the project on ***"A Study on Benchmarking of Operational Key Performance Indicators"*** *- with reference to an Oil Major Explorations and Productions Company*. I have tried my best and have applied all my efforts, knowledge and sources available, in this project.

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APPENDIX – V

ABSTRACT

This report consider the Benchmarking Study of Production Facilities at upstream Oil and Gas Company. The project was managed mainly in two part, with first part objectives to obtain data for operating costs, production efficiency data, and cost drivers. Whereas next part consisted of focusing on a few areas with assessments of company's practices and procedures compared to industry leaders and then implementing action plans for a few focus areas.

The success of the company is underpinned by having a world-scale resource base in the Oil Field which is categorized by its large reserve base and shallow depth, with many wells on natural flow and used production artificial lifting method, mainly ESPs.

The company's strengths include a large quantity of qualified and committed personnel, along with many systems and tools with a large data set. On the other hand, challenges for the organization include lack of coordination and integration of some teams, lack of systematic performance management, and a reluctance to change. With the reduction in crude oil prices in 2014, operating companies have made various strategic decisions to maximize their cash flow. Benchmarking and implementation of its recommendations has seen operators reducing their costs ~30% by implementing world-class processes, eliminating non-value adding activities, re-structuring contracts with suppliers, etc. The operators achieved cost savings while maintaining production. For the same period, company's costs have remained relatively flat. Making cost efficiency a higher priority now will be a significant benefit as higher cost pressures faces, resulting from more wells on artificial lift and higher water production. The benchmarking approach categorized each of its production facilities as an entity to determine relative performance of the facilities and for the peers in cost competitiveness and efficiency along with production efficiency. The benchmarking analysis indicates that the greatest opportunities for improvement are in the areas of Well Servicing, Maintenance, and Production Efficiency. Estimated cash flow improvements for these areas are 25 million United States dollars (MM USD) in Year 1, growing to 51MM USD in Year 2, and to 82MM USD in Year 3. There are

additional cash flow improvement opportunities beyond Year 3. In study, the results of assessment indicate that overall organization is doing a number of things well and employs practices in several areas that are consistent with the best oil and gas business in the world. However, some practices are lacking or are inconsistently applied in relation to those employed by top performing assets and present an opportunity for company to significantly enhance its efficiency and effectiveness. The Company is a large and complex organization that recently completed an organizational restructuring effort and work continues to resolve underlying ambiguity. Their lack of cost awareness across the organization hamper those initiatives geared to optimize cost. The observations during the assessment of inconsistency and process ownership uncertainties can be inherent in large organizations, especially following restructuring activities, indicating a need for additional clarity.

The benchmarking activities have resulted in nine recommendations that are presented herein. The recommendations are structured as part of a three-part framework and are focused on the need for the company to:

- Make strategic decisions that define Upstream requirements and expectations regarding overall ESP performance
- Improve production efficiency and reliability o increase production
- Achieve cost optimization through work process enhancements across the company focusing on optimizing manpower levels part of the long-term maintenance contracts

As oil fields mature and water cuts increase, artificial lift (e.g., Electrical Submersible Pumps (ESPs) becomes a more crucial part of the operations to ensure reliable production of hydrocarbons. The well servicing costs for the company have increased significantly when compared to peers mainly driven by ESP Performance. There needs to be a companywide appreciation that there are multiple factors that contribute to artificial lift failures. For example, quality of data provided by field development or reliable power from Operations.

Company's production efficiency declined from 98.7% (2015), to 96.5% (2016) to 84.5% (2017). This is not a positive trend and should add urgency in the implementation of the current program to enhance the management of production losses. The benchmarking study believes that company is making progress towards improving its loss management process. The prize is significant. However, the most immediate need is to improve the data flow, quality, and currency of data within Finder while the program is evolving. Succinctly stated, proper and effective defect elimination (surface and subsurface) and maintenance are the critical drivers of reliability and availability that top performers focus on. Reliability and availability directly impact production, revenue, and costs. Benchmarking recommendations are targeted to help company to achieve sustainable performance improvement with the goal of becoming a top-performing business and closing the gap that exists in production efficiency, ESP performance and maintenance performance. Moving forward, company must more clearly define ownership of some key work processes and emphasize uniform implementation of those processes. Addressing these areas will require a change in focus and the way teams work in many parts of the organization. From production driven to margin driven.

The purpose of this paper is to provide an integrated approach that prioritizes organizational key performance indicators (KPIs) in terms of the criteria of benchmarking and analyzing the scope of improvement as goal setting through appropriate Design, methodology and approach set by this Benchmarking process.

This paper gives a novel approach for prioritization of KPIs. The proposed approach has a holistic mechanism; it could empower decision-making teams; it is capable of enhancing advanced quality engineering approaches; and provides great opportunities for future research.

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LIST OF ABBREVIATIONS

Bbl/d	Barrels per day
MMCF	Million Metric cubic feet
E & P	Exploration and production
HSE	Health, safety and environment
ICMR	International Conference on
IEA	International Energy Agency
IOCs	International oil companies
KPIs	Key performance indicators
LNG	Liquefied natural gas
MGT	Management
NG	Natural gas
NOCs	National oil companies
O & G	Oil & gas
OPEC	Organization of Petroleum Exporting Countries
OSCs	Oil services companies
PMA	Performance Measurement Association
R & D	Research and development
SPSS	*Statistical Package for the Social Sciences*
ESP	*Electrical Submersibles Pumps*

Chapters

Chapter 1

1 INTRODUCTION

This project is being performed for benchmarking of key performance indicator for an upstream oil major company owns various fields and production units (facilities). Based on the results of the benchmarking analysis, it is focused on identifying and implementing opportunities for Improvement.

> "KPIs that do not support you in making decisions are just metrics."

Due to intense competition, globalization and an explosion of technology in recent year's organizational learning, knowledge creation and innovation capability have emerged as the dominating factors of competitive. Businesses currently must operate within a dynamic environment of fierce competition, shrinking budgets, and heavy price pressures. As a consequence, organizations deal with many key performance indicators (KPIs) in different areas.

Quite often the important things to measure in business, namely Key Performance Indicators, are hard to measure, and it's often because we are thinking about measurement in the wrong way. The challenge is to count the things that count (good KPIs) and to get the right numbers right (ROI). So what makes a performance indicator important? By definition, a KPI is a measurable metric that informs us how the business is doing against Critical Success Factors that are aligned to the overall objectives and goals of an organization. KPIs are characterized by being easy to understand and helpful to analyze our success. But ultimately KPIs lead to actions – KPIs that do not support you in making decisions are just metrics.

Which KPIs should I measure?

"KPIs should not constitute every company metric for analysis and evaluation. Rather, KPIs should reflect the most important objectives of the business."

To select the right KPIs for innovation program your management should first define the goals and ambitions of your organization – not in the context of innovation, but in the context of your business activities. What does your organization want to achieve in the next 6 months – or in the next 10 years? What business model should you follow? What are your business targets? Some organizations struggle to do that. If that is the case for you, try to push your management to accomplish this task. Without strategic business goals your innovation program will not be able to steer in the right direction and deliver a substantial part of your organizational success.

How to benchmark ?

Imagine you are the CEO of an organization that wants to start a new innovation program. What targets should you focus on? What are achievable outcomes? What participation-levels should you try to reach? Those questions are often answered by looking at already innovative organizations. Let's try to do that. You're the CEO of Company 1 in the below comparison:

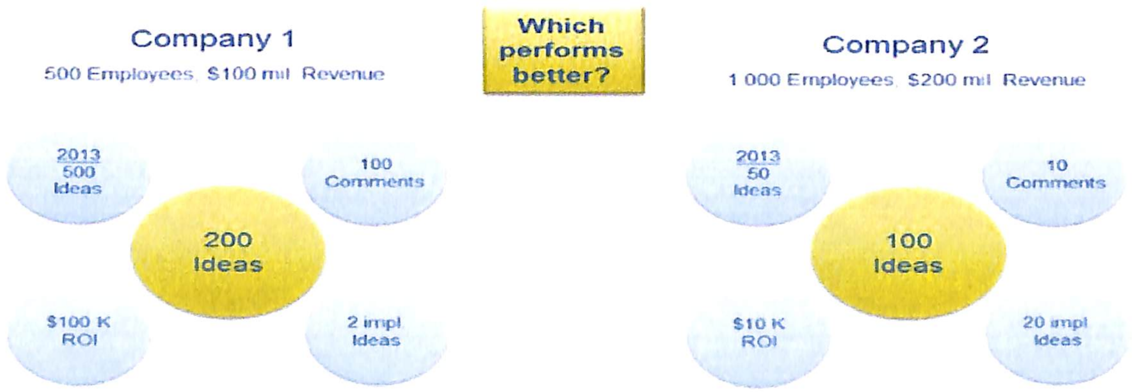


Figure 1.1: Innovation-performance of two organisation

Would you believe that you are outperforming Company 2? Let's look at the detail success metrics:

Figure 1.2: Success-metrics of two organization

As you can see the each organization is better in some and worse in other measurable metrics. The metric that actually is a KPI is the one related to the ROI and the value that has been generated. Ask yourself as the CEO of Company 1: *Would you like to have as many implemented ideas as Company 2 (10x the amount of ideas your organization gets implemented) - with the ROI of Company 2?*

What makes benchmarking so difficult next to those aspects is the fact that, as previously mentioned, numerous factors that impact an organizations innovation performance simply cannot be measured. Let's take a look at two organizations that have a nearly similar performance:

Figure 1.3: Nearly similar innovation-performance of two organization

Do the numbers tell you anything about the culture, the structure, the level of management support, the market or the competitors of any of those organizations? Do they tell you anything about the "Innovation Journey" that both organizations went through, and which obstacles they had to solve and hurdles they had to jump over? An innovation culture is not fully represented by the sheer numbers you create and measure, but also by softer aspects that cannot be quantified.

Every organization is different, even the seemingly similar ones, which is why comparing yourself to others purely based on numbers might lead you to making wrong decisions. So what can help us to get a good view on our performance?

Internal Benchmarking

We have seen organizations achieve better results by conducting internal benchmarking, and rating themselves against their own past performance. Additionally, you can also run campaigns with very generic topics multiple times (e.g. annually). Are future iterations of those campaigns performing significantly better in terms of higher ROI or participation? Example campaign topics could be how to save energy / water / electricity / costs etc. These campaigns can be run numerous times with an identical setup, and then be compared against each other. If they perform better over time this can be an indicator for a healthy innovation program. Are there other indicators next to this one?

Summary & Recommendations

Analytics is about making better decisions and reducing risk in your business activities. There is no point having good data and sophisticated analysis if the results are not acted upon, either because of you organizational culture or business processes.

Hence, our recommendations can be summarized as follows:

- Define quantifiable and actionable KPIs that are tied with business goals
- Focus on value / ROI – that's what management is requesting
- Conduct internal benchmarking – compare yourself to past results
- Monitor your performance continuously – evaluate your success over time

The objective of Benchmarking to implement sustainable best practices within its own various organizational similar activities and compare with other peer organization having similar business. Outcome of the study will help to designing and assisting the oil and gas major with implementing a meaningful and actionable operations and follow up with optimization programs that will deliver tangible benefits.

1.1 Overview

The major Oil Company is an upstream oil production industry in Middle East. The core segment of this company includes reservoir study, drilling, crude oil & gas production and processing and exporting to generate country's revenue. Exploration and Production activities spreaded across different location of the country in various oil field areas with potential more than 1.5 million oil production per day. It has number of gathering process units/production facilities, where crude oil collected from vicinity reservoir with different oil specification including low/high sulphur, high/low crude API etc. These process units ensure the export quality of oil and gas being achieves the target specifications.

The first part of this thesis brings an introduction to the theoretical fundamentals, which will be the basis for the subsequent parts of the thesis. The theory gives an insight to the strategic controlling in general, which tools are available, their definitions, descriptions, and meanings and the importance of performance indicators. After the introduction, the strategic controlling tool benchmarking will be described in detail.

The second part of this thesis is the descriptive analysis that is the first part of the benchmarking-process. This part deals with the economical development of the defined performance indicators during the defined period. It also includes an analysis why the performance indicators developed the way they did (refer to chapter 3).

The third part is dedicated to the benchmarking-process itself. This chapter tries to answer the question after the company with the best practice or the most success and relates it to the Oil & Gas major. The Company is benchmarked first with its competitors in the oil producing countries followed by a benchmark with the members of the E&P Peer Group (see chapter 4 and 5).

The fourth and last part of this thesis contains the conclusions of the previous parts and some recommendations and best practices about them (chapter 6 and 7)

1.1.1 Period of the Study

This study with analyses, conclusion and recommendation will take 6 weeks from the date of approval from University of Petroleum & Energy Studies, i.e. 1^{st} June, 2019 to 15^{th} Sep, 2019 based on the Benchmarking Study carried out for Oil Major E&P Company based on primary data analyzed between 2015 to 2017.

1.1.2 Expected Outcome

The outcome of the dissertation would analysis and discuss of the results to understand findings of the studies in comparison with the primary and secondary research objectives. The study contributes to the benchmarking literature by identifying key areas of benchmarking. This chapter would try to find the company with the best practice. The study would review a major section of the literature on benchmarking practices in order to achieve better perspectives for emerging benchmarking research streams. The study will try to cluster in absolute monetary performance indicators (EBIT, CAPEX), relative monetary performance indicators (EBIT/BOE, CAPEX/BOE, ROACE, finding costs, production costs) and non-monetary performance indicators (annual oil and gas production, annual proven oil and gas reserves, reserves versus production ratio). Within these three groups, causalities would search to find the best practice.

This paper would present an approach for systematically defining the object of study of benchmarking of such oil major, based on deriving improvement actions from customer expectations and strategic decisions through business processes, and prioritizing improvement actions that will most contribute to strategic objectives. The study would be based on management concepts such as business process mapping, performance measurement and other tools. After some introductory theoretical background and discussion of the proposal, a set of steps to guide the implementation of such an approach would be presented and detailed.

1.2 Background

Due the recent fluctuation in crude oil price and change in global oil supply-demand scenarios due to various geo-political situations, oil price forced to stabilize at lower side. It is no more golden day for oil major crude export countries, which mainly depends on crude as major resource for country's income. In the last few years, the lower crude oil price has shaken the company and forced to take all needful actions, which reduce the BOE and optimize the concerned area to ensure the maximize the income where company has been ignoring so far due to enjoying high crude price per barrel.

This thesis in hand would try to verify this statement with the help of a strategic controlling tool. In this case, a benchmarking-study compares performance indicators that are able to prove or to disprove the leading position of the Oil Major to its peer's in similar sector.

With the reduction in crude oil prices in 2014, operating companies have made various strategic decisions to maximize their cash flow, which were analyzed for benchmarking process study

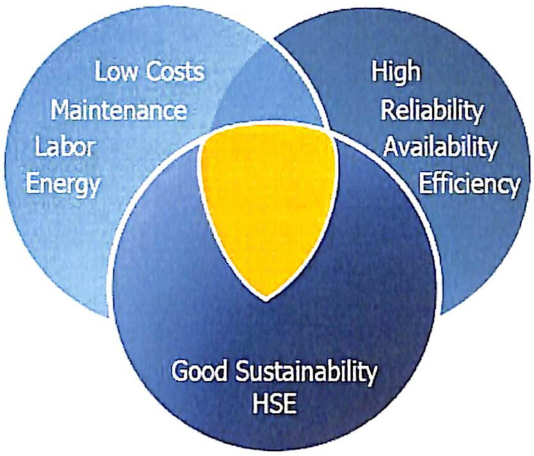
- They significantly reduced their operating costs by ~33%
  (e.g., implementing world-class processes, eliminating non-value-adding activities, re-structuring contracts with suppliers, etc.).

- The operators achieved the cost reductions while maintaining production.

- Operating costs are modestly lower in Maintenance and relatively higher in 2015 and 2016 for Well Servicing.

1.3 Purpose of the Study

The international market of the exploration and production business of the petroleum industry is becoming more and competitive, because of decreasing crude oil and natural gas reserves, a higher consumption of fossil energy in China, India and the United States, a higher rivalry between the exploration and production (E&P) companies and national petroleum companies, and an increasing "Petro-Nationalism" in countries like Venezuela, Iran or Russia. These lead to more and more strategic alliances and acquisitions of the world wide operating E&P companies or to a concentration of their resources into niches. Under these conditions it became more important to operate efficiently to obtain profitability, success, and to hold the strategic position or to profit higher from own strengths.1



In the last few years the oil Major has realized the need of cost cutting due to fluctuation of crude oil price and uncertainty of maintaining its high profit margin.

This thesis in hand tries to verify this statement with the help of a strategic controlling tool. In this case, a benchmarking-study compares performance indicators that are able to prove or to disprove the leading position of Oil Major to be compared to its Peer's company in the E&P sector as discussed in Chapter 4.

The Oil Major has been successful in meeting production targets and proactive in anticipating and taking action to meet future production targets (e.g., facility expansions for increased water handling, waterflood development, drilling and work-over programs).

1.3.1 Maximizing Business

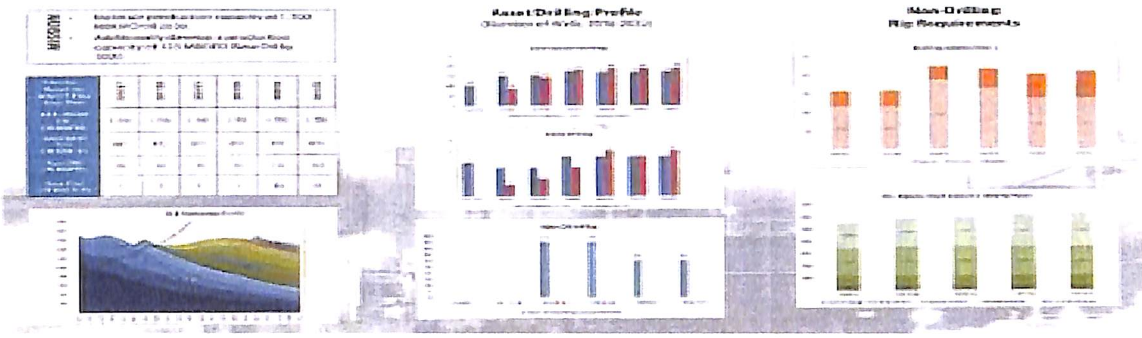


Figure 1.4: Trends of various Operating KPIs and Structure (generic view)

Characteristics of best-in-class operators:

- Balanced focus on cost, production efficiency, reliability, and HSE performance
- Rigorous and systematic in performance management, the Plan-Do-Check-Act Cycle
- Continuous improvement for key metrics
- Periodic benchmarking for Capital Efficiency (Projects), Production Efficiency, Operating Costs, and HSE

1.3.2 Enhancing Operating Business Result

It is observed that companies at times might be reluctant to use benchmarks. One of the most popular reason for this is the belief that they are their own organization, and hence, do not need to emulate any other organization. This is where it is critical to underline the fact that

Benchmarking does not mean blindly 'copying' what competitors do. It simply means to understand what the acceptable standard in the industry is, and where does the organization stand vis-à-vis that standard. Benchmarking helps organizations to stay in sync with the market and customer needs.

Observation: Strength and OFI

Production	Costs	HSE/PSM
Strengths • Large resource base • Individuals are committed to maximizing production • Facility expansions for water handling • Waterflood development • Infill drilling **Opportunities for Improvement** • Production Efficiency is declining • Implement rigorous and systematic processes, with accountabilities	**Strengths** • The majority of costs appear to be managed, but by contract • Robust IT systems **Opportunities for Improvement** • Make contracts variable which allows for more timely interventions • Implement rigorous and systematic processes, with accountabilities • Raise cost awareness • KPIs for cost management	**Strengths** • Process Safety Management (PSM) being implemented • PIMS and FIMs KPIs **Opportunities for Improvement** • Accelerate PSM • Implement rigorous and systematic processes, with accountabilities, example is the increase in flaring

Table 1.0: shows Strength and OFI

In this paper, benchmarking will ensure cost optimization in various segments of its operations and operating fields, which shall be identified after accomplishing benchmarking process and effort would be made to report on some of the findings from an ongoing program of research into the nature and value of benchmarking as an approach to the improvement of organizational performance and change through various case studies.

It will also seek to understand the positive and negative impacts of benchmarking on the organization, and why these experiences differ between and within organizations.

1.3.3 Primary Research Objectives

The main objectives of this study are to propose a guideline to simplify benchmarking process of Oil Major Company. It will suggest the method for the user to achieve the goal of benchmarking projects. Deros et al. argues that benchmarking encourages a company to become more open to new methods, ideas, processes and practices to improve effectiveness, efficiency and performance. Towards the implementation, simplicity is one of the significant factors to be emphasized so that the users are not confused along the way of implementing benchmarking. A template will also be recommended and it serves as the core activity to benchmark the data. From here, the users will obtain the benchmarking results and start to plan for the continual improvement activities. The structure of this study will discuss about what is benchmarking, the advantages of implementation and framework study. These will then be followed by the guideline for benchmarking implementation and future research is suggested in the conclusion of this study.

1.3.4 Academic Objectives

- For the partial fulfillment of the requirement of the award of the MBA (Oil & Gas).
- To Enhance individual performance by meet the curiosity in this stated subject
- To share and utilize the knowledge gather from this project wherever and whenever required.
- Thus, all these objectives will help me to complete the study successfully.

Therefore, the purpose of this study would be to present a benchmarking guideline, conceptual framework and computerized program to assists the Oil Major to achieve better performance in terms of quality, cost, delivery, supply chain and eventually increase their competitiveness in the market. The study begins with literature review on benchmarking definition, barriers and advantages from the implementation and the study of benchmarking framework.

1.4 Research Hypotheses

Research methodology is a systematic way to solve he research problem. It is a science of study how the search is actually done. It presents the source of data collection, the sampling procedures and tools of investigation and limitations of the study. My research project has a specified framework for collecting the data in an effective manner. Such framework is called "research design".

1.4.1 Research Design

This study would be exploratory and descriptive in nature. It helps in breaking vague problem into smaller and precise problem and emphasizes on discovering of new ideas and insights. Exploratory research would be conducted during the initial stage of the research process which would help to refine the problem into researchable one. It has progressively narrowed the scope of research topic.

1.4.2 Research Strategy

Research strategy is considered to be another important aspect of research methodology. Research strategy of this study is consistent with the deductive method, as the research begins with a defined meaning of benchmarking process and aims to evaluate whether its application in Oil Major E&P to such an extent. The data were collected through well-structured questionnaire consisting of closed ended and opened-ended questions, the field helps to test the hypothesis identified. In addition, since the study aims to explore and evaluate the subject matter, by definition it is consistent with the deduction research strategy by observing through field data and development and conducting analysis to obtained the results. Furthermore, the study is constructed based on quantative methodology and exploratory study necessitate deductive research.

Chapter 2

2 REVIEW OF LITERATURE

Benchmarking is a process of measuring the performance of a company's products and services against those of another business considered to be the best in the industry. The point of benchmarking is to identify internal opportunities for improvement. By studying companies with superior performance, breaking down what makes such superior performance possible, and then comparing those processes, you can implement changes that will yield significant improvements.

The **strategic planning** is a very powerful tool to introduce a template for future success. But its limitations are that the future is uncertain and may differ from expectations of the plan, it is not process-based, the planning is difficult, expensive in time and money and it limits choices and activities for the organization in the future.

The **strength-weakness analysis** gives the entrepreneur a good general overview about the organisation and the market position. But its limitations are that this view contains only certain parts of the organisation and that the evaluation of the resources does not correspond to reality because assumptions are only subjective.

The **SWOT analysis** is useful to reduce a large quantity of factors into a more manageable profile, but this leads very often to a simplification of the business situation. Another problem is the classification of strengths and weaknesses or threats and opportunities. For example, a technical change can be a threat or an opportunity, or the culture of a company could be either strength, or a weakness.

The advantages of the **GAP analysis** are that deviations of the plan and the reality can be shown very easy and quickly and it is clear to understand what was missing during the completion of the project or process. But its limitation is that the process has to be started first before a GAP analysis can be done.

2.1 A General Overview of Benchmarking

The traditional definitions of economical targets and productivity are no longer useful. Only if a company or business orientates itself based on the industry best practices, the best methods and techniques, it will be possible to obtain the best performance. The process was discovered and developed by the XEROX Corporation in the early 1980's and was called "benchmarking".

'Benchmarking is the process of comparing one's own organisation with peers worldwide.'

More and more companies use this technique to define operational performance. Benchmarking is a structured process that supports the individual initiative of every employee. It is a process of comparison of an organisation to find out whether a performance is good or bad in relation to organisations, which carry out the same activities. This will help to identify "best practice" and will so lay the basis for improvement.

2.2 Benchmarking - An Introduction

Benchmarking is based not only on the internal view on a company; also the external world has to be continuously under investigation. Only the continuous search after the best methods, and the implementation into the own business process will lead to success.

The main steps to understand benchmarking and to gain success are listed below:

- Understand the own business processes. It is of importance to know the weaknesses and strengths of the internal sequence of operations. Only with this knowledge, a company will be able to turn weaknesses into strengths, to be successful within the future.
- Understand the leading companies in the industry. A company makes only progress with its resources in the industry if it knows the strengths and weaknesses of the other competitors and, the more important point is, that only the understanding of the best practice will lead to top performances.
- Imitate the best. Learn from the leading companies in the industry. Find out in which business segment they have their strengths, why they have it there, and how they reached it. Imitate and copy these strengths, adapt it to the own business and try to overflow it.

- Achieve the superiority. If all the former points are successfully implemented into the own business and all weaknesses were removed and the own strengths were optimized, and then the company will be in a position of superiority.

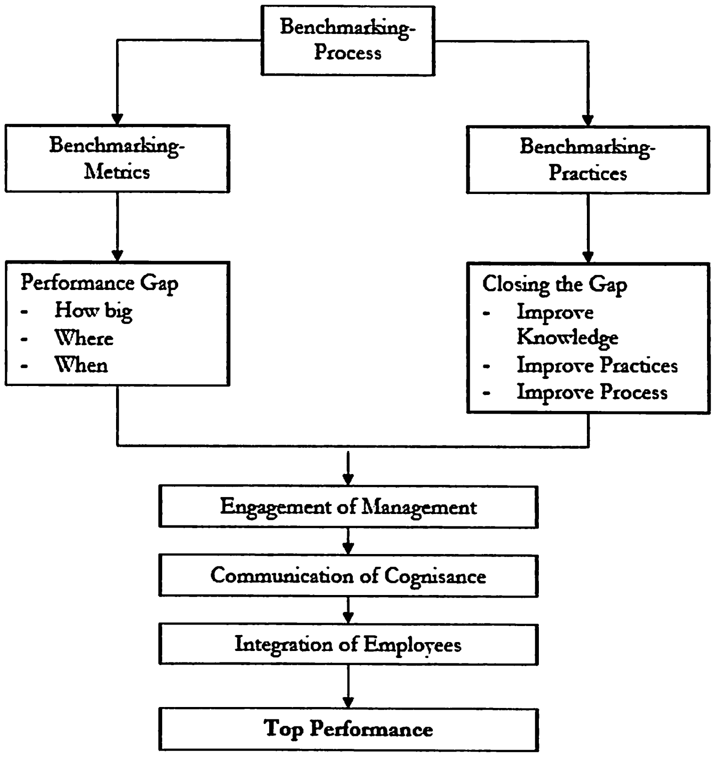


Figure 2.1: Bench Marking Process In General

With the help of Figure 2.1, the basics of a benchmarking process can be described.

The target of the management, with the help of the benchmarking process, is to identify companies, which have top performances in the functions that should be benchmarked. Therefore, it is inconclusively that these companies are in the same branch of industry. Benchmarking process steps shown by XEROX is illustrated in Figure 2.2.

Therefore, if an organisation knows how to compare to its competitors, it can help to:

- understand the factors and circumstances that make an organisation successful
- identify the areas where weaknesses and problems occur
- find out where improvement is necessary

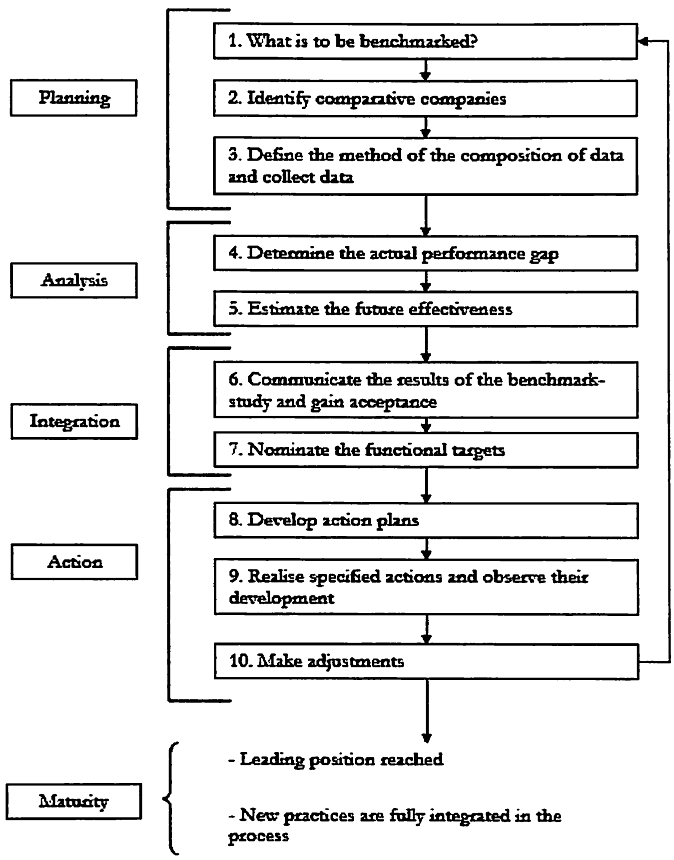


Figure 2.2: Main Steps of the Benchmarking-Process shown by XEROX

	Internal Benchmarking	Competitor Benchmarking	Functional Benchmarking	Generic Benchmarking
Performance Benchmarking	b	a	b	C
Process Benchmarking	b	c	a	A
Strategic Benchmarking	c	a	c	C

Relevance/Value High a Medium b Low c

Table 2.1: Benchmarking Matrix

The benchmarking matrix (see Table 2.1) shows the relevance and dependence of the different benchmarking varieties and how they can be linked together.

2.3 Reasons for Benchmarking

This part answers the question, why benchmarking should be done. There are certain reasons to execute benchmarking and a better understanding of the most important reasons will lead the study into the right direction. There are five essential advantages for benchmarking:

1. Better understanding of customer requirements
2. Definition of targets based on consensual point of view
3. Definition of real performance indicators
4. Acquire a competitive position
5. To become conscious of the best practice in the industry and to search after them

2.4 Identification of Benchmarking Partners

This chapter leads to an important aspect of benchmarking, in particular to find and to use the sources of information needed. It describes the way to find the right companies and benchmarking-partners. During this chapter, not only the process of identification of benchmarking-partners will be looked at, but also how to filter the information of the first rated sources of information and the description of the four fundamental types of benchmarking will also be a part of this chapter. It is possible to do benchmarking upon internal functions, external direct product competitors, leading industry and in general upon functional processes. Some of these can be done easily but others like the benchmarking against competitors are compellingly. Every possibility must be examined on its value of the information. Tab.2.2 shows a comparison of same of the key characteristics to different types of benchmarking.

Types of benchmarking	Relevance	Data easy to get	Innovative practices
Internal functions	x	x	
Direct product competitors	x		
Leading companies in the industry		x	x
Generic processes		x	x

Table 2.2: Key Characteristics

At the beginning, these types can be used to check how they can bring relevant data for the benchmarking operations, their potential for innovation and if the data is easy to get. Internal comparison and comparison with competitors seem to be the most interesting

2.5 Methods for Collecting of necessary Information

The sources of the necessary data and information decide the method for the data acquisition. Before the start of the data acquisition, it is necessary to think about the quality of the data. Some criteria and characteristics need a particular consideration. This means accuracy, reliability, procuring costs, expenditure of time and the question if specialists are needed. The volume of the gained data results not only of the accuracy but also of the use of the data. The procurement to gain the necessary data and information is expensive and it takes a lot of time. Therefore, it is important to find the accurate benchmarking-method. It is also necessary to analyze the importance of specialized knowledge. Although contacts with competitors are favorable, so it is sometimes better to contact the manufacturer directly. The way to gain necessary data and information leads from internal sources of information to the research in public sources until independent studies and searching.

Internal Sources

To gain internal information many sources are possible. The only limiting factor is the person, who does the research. The three most common internal sources are the product analyses, specialists and the footboard studies. In the product analysis, it is the common practice to analyze competing products in-house. These products are used or disassembled to study their functions, materials, and characteristics. This is one of the obvious. These studies allow the continuous benchmarking-process to keep cheaper, because the persons who work on the continuous process to stay at their working place and to interchange with other experts.

External Sources

The second category of sources of information are that ones that are public available. The amount of information is enormous and so the key is to find this information within a justifiable expenditure of money and time. External information exists in many shaping. The traditional sources are – journals, annual reports and other printed documents. Other not so common sources are – seminar lectures, conference reports, articles, and others. The advantage of such associations is that they are concerned with the topic and so they are useful for contacts and references in the functional areas. External experts like consultant companies, brokers, system developers and universities, could have valuable information for benchmarking-activities. Also if they do not have direct knowledge so are they able to give useful hints to other persons or places where new information and data may available.

Own Inquiry

If the search with the help of the former discussed internal and external sources is not successful the own inquiry is asked. The essential disadvantage of self-employed investigation is the costs and the time that has to be invested. Possibilities of such own searches are questions forms, followed by firm visits and later on by advanced techniques like discussion circles with benchmarking-partners. The advantages of questionnaires are the throughout documentation of the questions of interest, the complete representation of the data, and they secure anonymity. There are four kinds of questions: (1) open questions, (2) multiple choice questions, (3) exactly one answer of multiple possibilities, and (4) an evaluation as performance indicator. Every method has its advantages and disadvantages, but the most important thing is the formulation of the question. They should be as neutrally as possible. Another option to gain benchmarking-information is telephone surveys. These phone calls should be from expert to expert to ensure the best success. The most interesting and successful benchmarking-method is a visit at the benchmarking partner. This option needs a good preparation and planning to concentrate on the critical questions during the visit.

2.6 Identification of the Gap in Performance

After the measurement of the company's performance, the visits at benchmarking-partners or other methods of data composition and acquisition the next step is to analyze the data for comparison to the internal functions. This comparison will show a positive or negative gap in the examined function. A positive gap means an advantage compared to the competitors, whereas a negative gap shows deficits in the performance. There are three kinds of performance gaps: negative, equal, and positive (see Tab. 2.3). Important during the analysis is the objectively evaluation of the gaps quantity and an explanation of the gaps existence.

Special attention needs the performance gaps that have different external practices. These have to be analyzed in particular, if they can be adopted into the existing functions and practices. A negative gap means that external functions represent the benchmark. Their best practice is definitively superior and it will take great effort to change the internal practices to get equal with the external performances or even to beat them.

Sort	Description	Conclusion
Negative	The external practices are superior	Benchmarks are based on external practices
Equal	There are no significant differences	Further analyses are necessary
Positive	The internal practices are superior	Benchmarks are based on internal practices

Table 2.3: Sorts of Performances Gaps

2.7 Communication of Benchmarking Results

The communication of benchmarking results is a critical step. It is important to convince the opposition to accept the results with the help of a good planned communications campaign. Therefore, it is necessary that the persons who have to adopt the new practices will also do this. That means that the communication has to be customized to the target group. The results of the benchmarking-study have to be communicated internal and external of the corporate hierarchy. There are three main steps to communicate the results to the affected persons and organisations. The method of communication must be customized to the audience and the benchmarking-knowledge must be arranged in a way so that it can present in an optimal and understandable way. The management has to identify itself with the new benchmark to support the implementation. It is also necessary to inform the employee to get their support. Different methods for communication proved to be successful. These methods include written reports, reports of visits, memos or a benchmarking-newspaper and a benchmarking-network. A written report that summarizes the results in the right level of detail is an effective tool to reach understanding. The benchmarking-study must have a structure that enables a good presentation. It should contain a summary, a description of the processes, a presentation of the results, and a presentation of the used data and information. The summary should concentrate on the main results, conclusions, and recommendations. It should also contain a comparison of the best practice to the present practices. The importance lies on the performance gaps and their effects. With the actions taken from this analysis it is possible to reach the required final state in a short time.

2.8 Characteristics of Benchmarking in the E&P Industry

In the past, the amount of acreage and the owning of the latest and newest technology were interpreted as success factors, but the low oil price during the 1990's and a hard competitor-ship forced the companies to reconfigure their definitions and indicators.

Like in every business, it is also necessary to find the functions that should be taken under consideration for a benchmarking process. Besides the "usual" financial indicators like earnings before interest and taxes (EBIT), the capital expenditures (CAPEX), and the returns on average capital employed (ROACE) there exist some indicators that are typical for the E&P business. These indicators are the proven oil and gas reserves, the annual oil and gas production, the relation between the former named indicators, the production and the finding costs. Because of the duty of publication of these indicators for example in annual reports, information about these indicators is available and so it is possible to benchmark them. A limitation of the financial performance indicators are the influence of the crude oil and natural gas prices. These prices are market dominated and speculates have a big influence too. The international petroleum companies do only have limited possibilities to influence the development of the crude oil prices although these prices have a direct influence to the performance and profitability. These prices and stock prices are more influenced by politics or organisations like the OPEC or state owned companies like the Russian Gazprom. A company can only influence its profitability by controlling its costs. Another important indicator is the reserves. This indicator is important related to the growth of a company. For the existence of a petroleum company and for a long-term strategy, reserves and their replacement are of high importance. If the topics that should be benchmarked are identified and defined, the next step that must be taken is the identification of benchmarking partners. As already mentioned this can be done in two ways. The first on is the search after companies that have the same function, services or output, even if the benchmarking partners are not in the same branch.

Another possibility is the definition of peer groups. Members of these peer groups may be companies of the same size, same area of interest or a similar organisation structure. The phase of planning is finished if the composition of the data is defined and the data is collected. The composition of data means the sources of the collected data like annual reports, databases, or direct communication with the benchmarking partners. For the E&P industry, the visualization with the help of histograms could be useful. This allows a quick look on possible gaps respectively a look at the company's position related to its competitors.

Chapter 3

3 ANALYSIS OF THE DATA

The data use for this analysis would be gained from the selected companies' annual reports and from papers of consulting companies. The definition which performance indicators should be used for the following analysis would be done with the help of several meetings with the advisors of this diploma thesis. The first step would be, to find a source for operational and financial indicators, which are used in the petroleum industry. A helpful source would be the homepage of John S. Herold with nearly thousand performance indicators. With the help of the advisors of the Oil Major Company and the Department of Economics, several indicators would be identified during a workshop. After the check of the availability of data for these indicators, a second workshop would be followed and the advisor of the Oil Major Company identified following all of the performance indicators may be considered for benchmarking

Note# However, in this study benchmarking scope only key operational performance indicators were considered for analysis

3.1 Performance Indicators of Oil Major E&P

3.1.1 Operational and Economical performance indicators

3.1.1.1 Strategic Objective- Highly Profitable:

- Operating Expenditure
- Operating Profit
- Profit Margin
- Gross Margin

3.1.1.2 Strategic Objective- Maximizing Shareholder's value:

- Return on Average Capital Employed (ROACE)

3.1.1.3 Strategic Objective- Achieve Sustainable Crude Production Capacity:

- System Crude Production Capacity

- Available Crude Production Capacity
- Crude Export Capacity
- Oil Gain
- Wells Drilled
- Wells Drilled / Wells Planned
- Well WO Conducted / Well WO Planned
- WS Jobs Completed / WS Jobs Requested
- New Artificial Lift Installed / New Artificial Lift Requested

3.1.1.4 Strategic Objective- Achieve Sustainable Non-Associated Gas Production:

- Non-Associated Gas Production
- Gas Flared
- Gas Export
- Gas Processing & Handling Capacity

3.1.1.5 Strategic Objective- Effective & Reliable Supplier:

- Justified Customer Complaints
- Crude and Gas Delivery within Export Quality Tolerance

3.1.1.6 Strategic Objective- Local & International Image:

- Recruitment or supporting job creation – local/ supporting country's job demand
- Publications and Presentations
- Community Involvement

3.1.1.7 Strategic Objective- World Class HSSE:

- Fatal Cases
- LTIs (Lost Time Injuries)
- Motor Vehicle Accident Frequency Rate (MVAFR)
- Volume Spilled
- Environmental Incidents
- HSSE Training Compliance
- HSSE Audits & HSE Audit Register
- Major Incident Exercises & Emergency Response Time

3.1.1.8 Strategic Objective- Strive for World Class Operational Excellence:

- Total Operating Cost Per BOE
- Production Cost Per BOE
- Customer Satisfaction
- Facility Integrity Management Index (FIMS) &
- Pipeline Integrity Management Index (PIMS)
- CAPEX Spent / Approved Capital Budget
- Contract Cycle Time Reduction
- Timely Renewal of Service Contracts
- Project Delivery
- Slow Moving Item" Inventory Reduction
- Procurement Cycle Time
- Shutdowns
- Processes Automated

3.1.1.9 Strategic Objective- Manage Risks:

- Risk Index
- ERM Actions Closed

3.1.1.10 Strategic Objective- Facilitate Technology and Capability Transfer:

- Annual Spent on R&T/R&D
- Full Scale Technology Application
- Added Value from Technology

3.1.1.11 Strategic Objective- Effective Communications:

- Media Briefings

3.2 Statistical Tools used for Analysis

3.2.1 Statistical Methods Used : Percentage Analysis, Bar Charts, Pie Diagram

3.2.2 Simple Percentage Analysis:

It is simple analysis tool. In this method, based on the opinions of the respondents, percentage and bar chart is calculated for the respective scales of each factor.

3.2.3 Unit and Measures for various definitions:

- Earnings before Interest and Taxes (EBIT), USD million
- Earnings before Interest and Taxes per BOE (EBIT/ BOE), $/ BOE
- Capital Expenditures (CAPEX), USD million
- Capital Expenditures per BOE (CAPEX/ BOE), $/ BOE
- Return of Average Capital Employed (ROACE), %
- Total Oil and Gas Production, MMBOPD, MMSCFD /yr
- Total Proven Oil and Gas Reserves, MMBOE /yr
- Reserves/Production
- Finding Costs, $/BOE
- Production Costs, $/ BOE

3.3 Description of the Performance Indicators

There are two types of performance indicators, which are of interest for this thesis. These indicators are the absolute und the relative ones. An absolute performance indicators can be numbers, sums, or differences like the earnings before interests and taxes (EBIT) or the capital expenditures (CAPEX). A relative performance indicator is a relative number where two absolute indicators stand in relation to one another. Such relative indictors are the productivity, the profitability, or the liquidity.

The earnings before interest and taxes (EBIT) are an absolute performance indicator. It is a measure of a company's earning power from on-going operations, equal to earnings before deduction of interest payments and income taxes. The EBIT excludes income and expenditure from unusual, non-recurring, or discontinued activities, and it represents the amount of cash a company will be able to use to pay off creditors. The EBIT is also called operating profit. As a result, it is possible to compare the operational profit of different companies directly without the risk, that the results are influenced or distorted by interests, taxes or other extraordinary factors. The EBIT is influenced both by the upstream and the downstream.

The earnings before interest and taxes per barrel of oil equivalent (EBIT/boe) are a relative performance indicator. It shows the relation between the operating profit per year and the annual oil and gas production.

The total annual oil and gas production is an absolute performance indicator and is the sum of the produced hydrocarbons within a year.

The annual proven oil and gas reserves is an absolute performance indicator and are the sum of proven hydrocarbons of an exploration and production company.

The reserves versus production ratio is a relative performance indicator. It is the relation between the total proven oil and gas reserves and the total annual oil and gas production. The result shows the average years of remaining production.

The capital expenditures (CAPEX) is an absolute performance indicator. It is the money spent to acquire oil or gas fields, or companies, or to upgrade physical assets such as buildings and machinery. This tends to be a very large expense for companies with significant manufacturing facilities, and usually much less of an expense in the services sector. The CAPEX are expenditures creating future benefits.

The capital expenditures per barrel of oil equivalent (CAPEX/boe) is a relative performance indicator and show the relation between the invested money and the annual oil and gas production.

The return on average capital employed (ROACE) is a relative performance indicator and shows the profitability of a company. It is the most common financial indicator for the international oil and gas industry. The ROACE is a financial measure of the profit generated on the total capital invested in the company before any interest expenses are payable to lenders and it is net of any tax effect. It is calculated by the net operating profits after taxes (NOPAT) divided by the average capital employed.

The “finding costs” is a relative performance indicator and is defined as total exploration expenses divided by changes in proven reserves (extensions, discoveries and revisions of previous estimates). It is the per-barrel costs of adding oil or gas proved reserves.

The "production costs" is a relative performance indicator and is defined as the costs of material and personnel during production excluding royalties. It is the per-barrel costs, associated with the extraction of mineral reserves from a producing property.

3.4 Development of the average Crude Oil Price

Crude oil price plays an important role as it has a major impact on the earning and performances of all of the discussed oil companies.

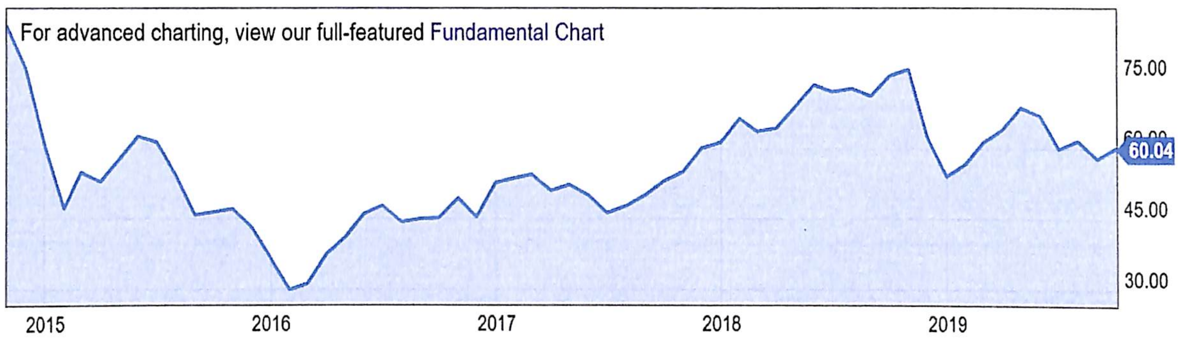


Figure 3.1: Average Crude Oil Price Chart

The Average Crude Oil Spot Price calculates an equally weighted price of the WTI Crude Oil Price, Brent Crude Oil Price, and Dubai Crude Oil Price. This metric gives a nice overview of the broad crude oil market, rather than looking at one type of crude oil price alone. One of the most notable times for the Average Crude Oil Spot Price was in 2008. Prices for the Average Crude reached as high as $114/barrel because of large cuts in production. However, because of the financial crisis and an abrupt loss of demand for oil globally, the price of Average Crude fell as much at 70% off highs in January of 2009.

Average Crude Oil Spot Price is at a current level of 60.04, up from 57.67 last month and down from 75.36 one year ago. This is a change of 4.11% from last month and -20.33% from one year ago. Average crude oil Price Chart is shown in Figure 3.1.

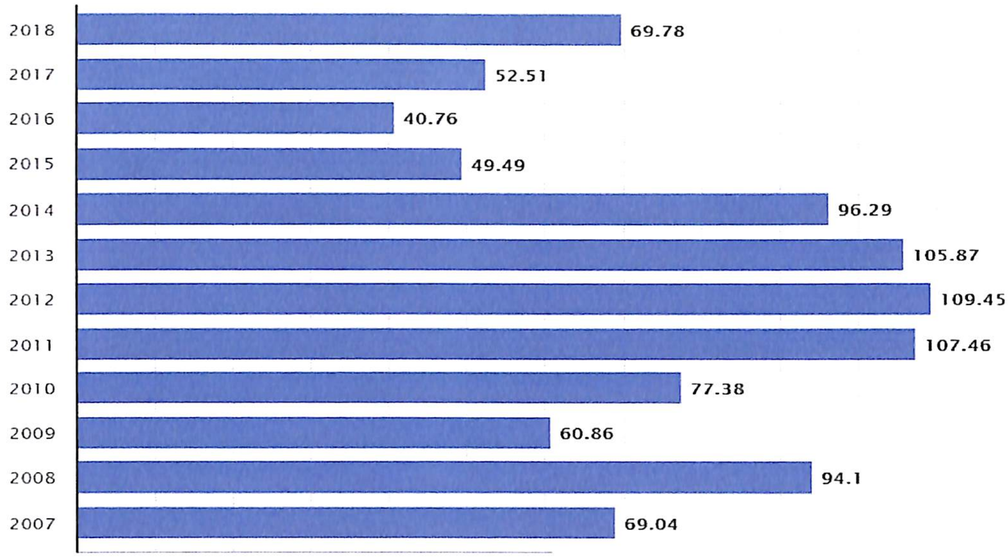


Figure 3.4: Average annual OPEC crude oil price (10 years , in U.S. dollars per barrel)

The positive impact was that the financial performances of the oil companies especially the revenues, sales and profits highly increased. Nearly every company, private or state-owned, made high profits with the high oil price. Another positive effect was that the companies had enough money for investments or modernisations. Although there is no causal connection between high oil prices, high profits, and large investments the following, analysis showed a continuous increase of the capital expenditures of the oil companies. On the other hand, every company had to face an increase of costs for services and exploration. This development had an impact on indicators like the finding costs or the production costs. The high production costs resulted of the fact that higher investment for the mature fields was necessary and that the costs for services of the service companies and contractors increased. Finally, it is possible to say that a high oil price enabled the oil companies to invest their profits to increase their production and their amount of reserves. This enabled the oil companies to a long-term survival and expectant profits.

3.5 Source of Data

The data would be collected for the study is mainly through the manager's interviews, distribution of questionnaire; observation at different departments, historical data of the last few studies, to be precise the data would be collected for study through both primary and secondary sources:

PRIMARY DATA

Primary data is a data, which is gathered by the researcher himself. For the collection of information and data the researcher would take the help of following methods:

- ***Observation Method:*** Observation is a systematic data collection approach. Researchers would use all of his senses to examine people involved in the organisation directly or indirectly. Observation methods are useful to researchers in a variety of ways. They provide researchers with ways to check for nonverbal expression of feelings, determine who interacts with whom.

- ***Interview Method:*** Interviewing involves asking questions and getting answers from respondents in a study. Respondents were managers and employees of Oil Major Company from various departments who have the best knowledge about the operations and strategies of the organization would be interviewed.

- ***Questionnaire Method:*** A questionnaire is a sheet of paper containing questions relating to contain specific aspect, regarding which the researcher collects the data. Because of their flexibility the questionnaire method is by far the most common instrument to collect primary data.

SECONDARY DATA

Published Data is the most basic secondary source of information for data collection. Published data can be obtained from various sources like books, magazines, newspapers, journals and periodicals etc. Published data is the most reliable secondary source of information.

SAMPLING

This qualitative study would be conducted using theme interviews as a data collection method. 10-15 senior employees working with Oil Major Company would be interviewed. The data would be analysing using thematic analysis.

Chapter 4

4 BENCHMARKING STUDY

4.1 Methodology

Key points of benchmarking methodology and specific assumptions are as follows:

- The benchmarking reviews are an "asset-to-asset" comparison—cost comparisons include expenses at and below the first level of field supervision only. This analysis method allows a focus that falls solely on the daily expenses of oil and gas production to allow the main analysis to focus mainly on immediate, actionable changes at the asset level.
- As the cost accounting systems for E&P companies worldwide differ significantly, benchmarking has developed a standardized set of cost categories that are used in every benchmarking study. This important step levels the comparison of operating expenses for each project. These cost categories include: Well Servicing, Surface Repair and Maintenance, Energy, Chemicals, Field/Asset Labor, and Miscellaneous and G&A.
- The major challenge of benchmarking is to compare assets that have common core characteristics that affect operating costs such as type of recovery (primary, secondary, EOR), water cut, acid gas content, or use of compression.
- The expense category of Fuel Gas Deemed Cost captures a cost that is often ignored in operating cost studies. All operations will have a cost for purchased energy in the form of electricity, purchased gas, or diesel. The value of produced gas used as fuel reflects the amount of revenue that is sacrificed to use this gas instead of incremental electricity, gas, diesel, or propane. For this study, all produced gas used as fuel was valued using a regional average price for the study year. Benchmarking's key approach for cost normalization is to

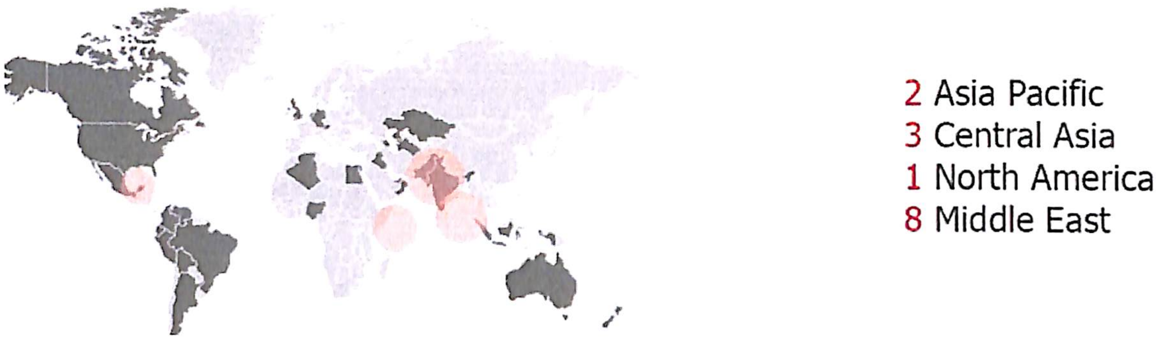
define relations between cost drivers related to each cost category. The process involves the following key steps:

- Cost driver identification based on benchmarking's expertise with onshore operations.
- Statistical analysis on empirical data collected for hundreds of onshore assets.
- Evaluate a Normalization Factor (NF) for each cost category through a normalization model. The NF measures asset size and complexity by quantifying a group of cost drivers related to the particular cost category. The impact of each cost driver on the cost category is determined by the model with constraints of weight and scale factors: – the weight factor reflects the importance of a cost driver's impact on a particular cost category. – The scale factor reflects a cost driver's impact by economy of scale.
- Derive an NF for a particular cost category by combining the impacts of all related cost drivers.
- Derive a standard operating cost through "NF to cost" modelling.
- Implement a bottom-up approach to model all major cost categories individually first, then combine all cost categories to determine total operating cost.

4.2 Peer's Selection

This chapter is dedicated to the descriptive analysis of the Oil Major Company in comparison with its E&P Peer group. For each performance indicator a detailed analysis is done. If the description of a company is not as explicit as that of others, it shows the problem to get enough reliable information.

Peer Group Selection – Location



The Oil Major Company defined an E&P Peer Group, with whom they compare themselves. These companies do have approximately the same size and the same business fields of interests.

In this study, the operating expense structure of the production facilities or production facilities were mapped to standard operating cost structure and compared with the costs of other oil & gas property assets. Nine prioritized producing characteristics were used to select similar fields from the benchmarking database, yielding one asset group for this analysis

With comparison assets having similar producing characteristics, the cost influence of these more uncontrollable field conditions is diminished. Therefore, it is the choice of operating practices in response to these conditions that generally separates the cost structure for each field and company.

The Primary Oil Asset Group includes following comparable assets. The criteria used to select comparison asset is listed below in Table 4.1.

Criteria	Unit	Average	GC Average
Annual Gas Sales	MMcf	56,406	22,242
Annual Oil Sales	M bbl	46,975	44,075
Watercut	%	39	33
Compressors Power	hp	73,461	7,107
Wells	#	375	88
Rod Pumps	#	Yes	Yes
ESPs	#	Yes	Yes
Oil Quality	Sweet	Sweet	Sweet
Depth	ft	7,583	4,023

Table 4.1: Peer Group Selection – Parametrs MMCf = million cubic feet; M bbl = thousand barrels; hp = horsepower; ft = feet

The location and number of the peer assets are as follows: 2 in Asia Pacific, 3 in Central Asia, 1 in North America, and 8 in the Middle East.

4.3 Study Metrics

Table 4.2 summarizes the properties assessed in this report.

Statistics	Onshore Oil	Company
Number of Fields, #	28	14
Gas Sales and Fuel Gas, MMcf/d	2,986	18
Liquid Sales, M BOE/d	3,562	1,691
Volumes Processed for Other, M BOE/d	38	0
Total Throughput, M BOE/d	**4,059**	**1,694**
Reported Direct Operating Cost, MM USD	2,694	519
Fuel Gas Deemed Cost, MM USD	262	18
Total Field Operating Cost, MM USD	**3,058**	**537**
# Producing Wells	6,595	1,240
# Total Wells	10,006	1,698
Total Compressors Horsepower, hp	1,113,736	85,286
# Direct O&M Staff	5,251	921

Table 4.2 summarizes the properties assessed in this report

4.4 Study Boundary

Study boundary covers wells from subsurface to wellhead equipment, surface gathering and processing facilities/equipment, in-field flowlines/pipelines before the terminals, chemicals, energy, field labor, and the asset or facilities general administration that directly supports the above operations. Figure 4.1 provides a detailed look of what is included in the benchmarking analysis.

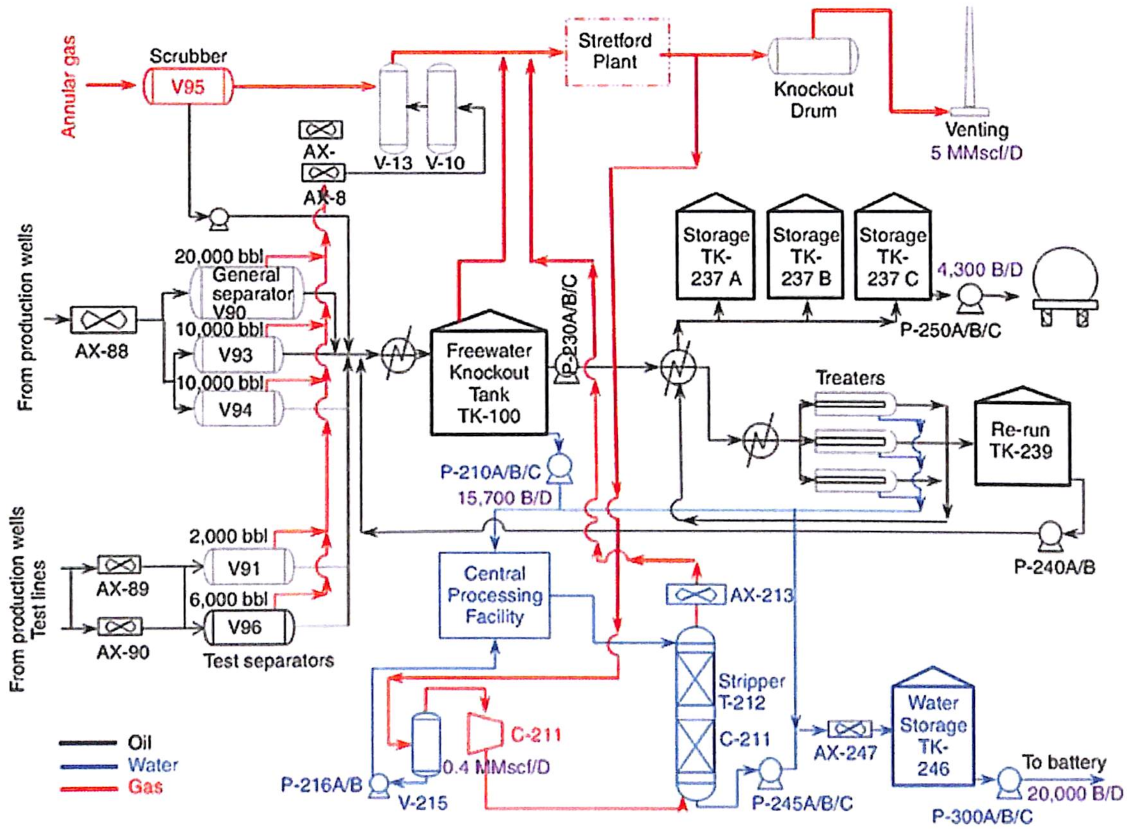


Figure 4.1: A schematic of the production facilities shows the processing flow paths for the oil, water, and gas flows.

Fig. 4.1 illustrates the general layout of the production facilities. The gas produced from the well annular was directed to a test separator and mixed at the exit with the gas that came from the general separators. The total gas stream entered the V-13 and V-10 separators for liquid removal before being transferred to a Gas Plant.

The resulting sweet gas was directed to a knockout drum to remove liquids and then to a venting tower. A part of the sweet gas exiting the Stretford plant was directed to a stripper tower to contact the acid water. The resulting sour gas was then redirected to the Stretford plant.

The design of the water processing system factored in the formation of acid water. The water was separated from the oil within a free water knockout (FWKO) tank, and the treaters were directed to corrugated plate separators. After that, they went to the stripper tower in order to normalize the pH of the acid water, which normally has a value between 7 or 8 but was as low as 3 in some wells. The sweet water coming from the stripper tower continued into the skim tank, and the water was transported to a distant central processing facility to continue its treatment.

The liquid stream was sent to the FWKO tank to remove the free water. The emulsion coming out of this tank continued to the thermal treaters after passing through an oil/oil exchanger and a steam/oil heat exchanger. The dehydrated oil from the treaters was then directed to storage tanks, and crude oil from the treaters that were out of specification was sent to a rerun tank.

The surface facilities were equipped with sensing devices for real-time surveillance, mainly pressure, temperature, and flow rates. A supervisory control and data acquisition (SCADA) system was implemented with all the required software, hardware, and control systems.

Lima said the pilot project helped Pacific E&P gain experience in the design, construction, and management of an in-situ combustion process and this experience will be useful to the company as it develops future projects. The implementation of enhanced oil recovery projects of this type helped the company better understand the relationship between surface and subsurface process.

4.5 Key Assumptions

Direct asset operating costs are included in normalization and competitive analysis, whereas processing fees and total management and support costs are evaluated on United States dollars per barrel of oil equivalent (USD/BOE) (competitiveness). Unit costs are presented in SD/BOE. Throughout this report, "M" represents 1 thousand and "MM" represents 1 million. Volume conversion factors to BOE include: gas at 6:1, oil and condensate at 1:1, and natural gas liquids (NGLs) at 1.44:1.

Volumes of produced gas consumed as fuel are collected for all assets. Deemed costs for fuel gas are evaluated in the main analysis. Volumes are also added to the total throughput calculation. A global average gas price of 2.62 (2015) and 2.12 (2016) USD per thousand cubic feet (MCF) is applied to all peers in this analysis.

Costs for taxes, security, and insurance are heavily impacted by geopolitics and local conditions. These costs are excluded from this benchmarking study.

4.6 Key Performance Summary

Costs were relatively the same from 2015 to 2016 while production slightly declined, as illustrated in Figure 4.2 below. It is recognizes that OPEC production cutbacks, which started in January 2017, have contributed to some of the production decline.

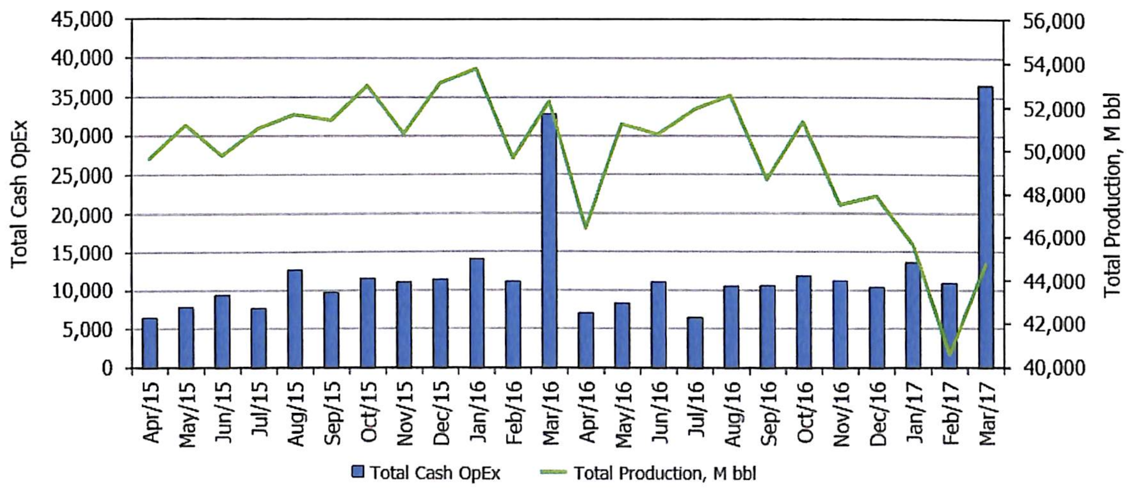


Figure 4.2: Opex vs Production Industry Trend – Operating Cost and Production

In the same period, some operators have reduced operating costs by 20% while maintaining production, as illustrated in next Figure 4.3.

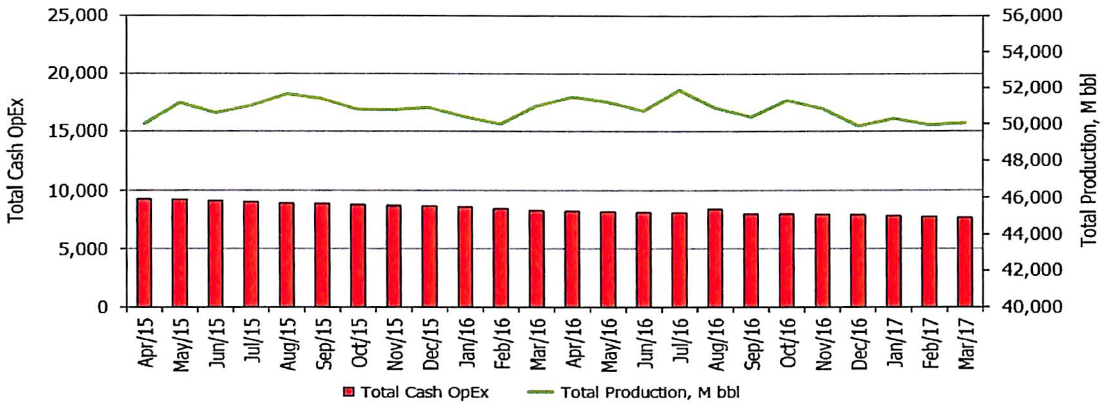


Figure 4.3: Opex vs Production Industry Trend – Sample Operating Cost and Production Post 2014 Drop Oil Prices

4.7 Strength

Following are the key areas of strengths identified during the project:

- Company is optimizing major surveys by developing a 5-year plan and starting the planning and preparation 2 years prior to the start of Major Survey. It also starting to use risk-based inspections (RBI), which result in the inspection frequencies for tanks and vessels being expanded. While this area has many strengths, there are also opportunities for improvement as noted in the Opportunities for Improvement section.
- Company has developed a good framework for process safety management (PSM). Examples of the PSM framework include: Facility Integrity Management System (FIMS), Pipeline Integrity Management System (PIMS) process, and implementing KPIs as discussed in Chapter 3. Although benchmarking acknowledges the PSM framework as a strength, there are opportunities for improvement as noted in the Operations Excellence item in the Opportunities for Improvement section.
- World-class systems and tools, including comprehensive data bases.
- Capable and skilled workforce. Rotation of personnel on a periodic basis is an excellent way to train and develop staff.
- Basic performance management elements. The QPRs and the associated KPMs are good performance management elements. The 2016/2017 Asset Action Plan is a good document to ensure line of sight and alignment within the company.

4.8 Challenges

Following are the key areas of challenges identified during the project:

- Complex organization which includes many groups that create silos and are not aligned or linked through KPMs to common work processes that can impact efficiency and effectiveness.
- A reluctance to change.
- Long cycle times to fully implement new processes.
- Long cycle times to implement projects.
- Significant technology and data investments that have not been effectively utilized to run the business.
- Increasing water cuts that will continue to bring significant challenges on operations and the wells and facilities. None of the challenges are considered to be insurmountable. However, the importance of leadership to foster changes is important to ensure that changes are sustained.

4.9 Cost Reduction Areas

The benchmarking assessment evaluated against peers and identified where company is competitive and where there are cost opportunities relative to the leader group of peers. Table 4.3 summarizes the 2015 results and Table 4.4 summarizes the 2016 results. For both figures, the black font shows a gap versus the Peer Leader Group Average, while a green font in parentheses indicates that company is performing better than the Peer Leader Group Average.

To Leader Group Average, MM USD/yr

Surface R&M	Labor	Energy	Chemicals	Field G&A	Well Servicing	Total to Achieve Leader Group Average	% of Field Operating Cost
2.7	6.7	(0.6)	0.6	(1.4)	(1.6)	6.3	18.2
(0.5)	3.9	(1.0)	0.3	(1.5)	(6.7)	(5.5)	Achieved
6.4	3.2	(0.6)	0.6	(1.0)	(4.8)	3.7	10.9
4.6	3.1	(0.3)	0.7	(1.1)	(3.3)	3.6	9.4
1.1	2.7	0.3	0.5	(1.2)	37.7	41.2	62.9
2.1	2.0	(0.9)	0.5	(1.3)	(4.2)	(1.9)	Achieved
2.8	5.5	1.4	0.5	(1.1)	(4.6)	4.5	19.5
(0.4)	3.6	(1.3)	0.1	(1.6)	5.3	5.7	17.4
0.3	6.3	(1.1)	0.0	(1.5)	(5.4)	(1.4)	Achieved
2.4	1.4	(0.6)	0.3	(1.3)	(5.5)	(3.3)	Achieved
4.5	4.0	(1.1)	0.6	(1.2)	(4.1)	2.5	8.6
(1.0)	(0.1)	(0.7)	(0.0)	(1.6)	5.5	2.1	8.5
Total	28.3		5.0		28.3		

Table 4.3: Cost Gap – Major Categories (Normalized) – Opportunities to Improve Cost Performance – 2015

To Leader Group Average, MM USD/yr

Surface R&M	Labor	Energy	Chemicals	Field G&A	Well Servicing	Total to Achieve Leader Group Average	% of Field Operating Cost
0.7	5.6	(0.3)	0.3	(1.7)	(3.1)	1.4	4.9
0.2	5.7	(1.4)	0.5	(1.8)	(3.5)	(0.2)	Achieved
7.3	10.8	(0.8)	0.1	(1.4)	0.9	17.0	36.6
4.6	8.8	(0.3)	0.3	(1.6)	1.1	13.1	28.2
3.4	6.9	(0.9)	1.1	(1.2)	72.5	81.8	77.4
2.0	4.8	(1.8)	0.3	(1.5)	(2.7)	1.1	3.5
1.2	5.9	(0.1)	0.3	(1.2)	(4.4)	1.8	6.7
0.4	5.3	(0.1)	(0.0)	(1.6)	5.3	9.4	28.5
1.2	5.7	0.2	0.2	(1.7)	1.6	7.2	23.2
(0.7)	0.2	(1.1)	(0.2)	(1.6)	(3.3)	(6.7)	Achieved
0.2	3.3	(1.3)	0.3	(1.6)	(5.4)	(4.4)	Achieved
(0.9)	0.6	0.2	0.4	(1.6)	1.2	0.0	0.1
Total	28.3		5.0		28.3		

Table 4.4: Cost Gap – Major Categories (Normalized) – Opportunities to Improve Cost Performance – 2016

Advantages = ($$)

Gaps = $$

For both 2015 and 2016, the analysis of benchmarking data indicates that Surface R&M, Chemicals, and Well Servicing provide the largest areas for cost reduction. While Labour is included in Figure 5 and Figure 6, Labour is not within the scope of this project and there will not be any savings recommended or comments for this category.

4.10 Gap Analysis

The charts in below summarize the gaps in performance against Leader Group overall averages. These charts graphically show the data provided in Figure 4.4 and Figure 4.5

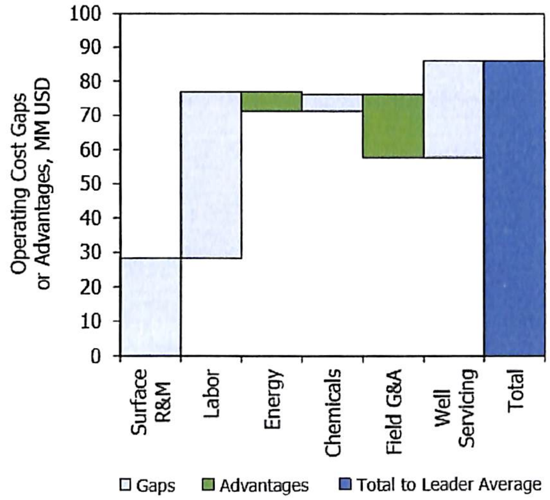


Fig 4.4: Compared to Leader Group Averages – 2015

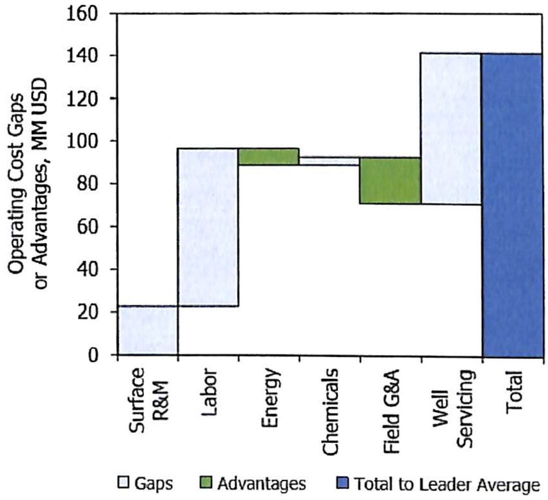


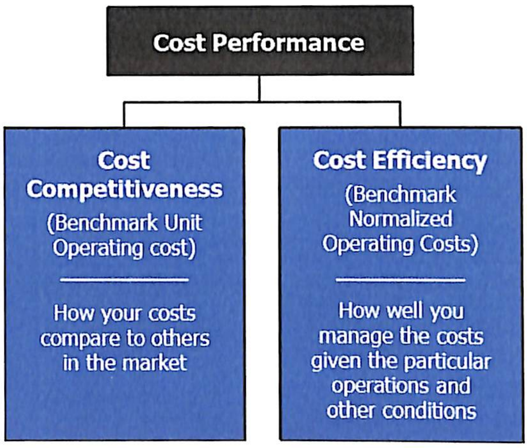
Fig 4.5: Compared to Leader Group Averages – 2016

“Gap” is the opportunity to pursue; these are categories with higher costs than Leader Averages. “Advantages” are categories with lower cost than Leader Averages.

4.11 Cost Competitiveness & Efficiency Analysis

Benchmarking reviews are an asset-level comparison—cost comparisons only include expenses at and below the first level of supervision. Only costs directly related to production operations, from bottom hole to the delivery point to the export pipeline, are included.

Benchmarking relies on several different views to assess cost performance of upstream assets. The historical approach is called "cost competitive analysis," and measures cost on a unit of production basis (e.g., USD/BOE) by overall cost and cost subcategory. It is essential because it represents an economic reality, but it is a competitive measure. It is very sensitive to relative productivity of the assets, and does not compare against performance limits. The figure illustrates both views of cost performance analysis.



Operating Cost Efficiency is a measurement to evaluate how well operating costs are managed for a given asset with certain characteristics, such as reservoir quality, well productivity, complexity and scale of facility and equipment, fluid property, etc. The Operations team cannot change these characteristics, other than to handle day-to-day challenges and operate the asset in the most efficient way they can. In order to evaluate operating cost efficiency of oil and gas fields with different technical characteristics, Benchmarking developed a set of technically validated statistical models to normalize various technical drivers and to derive a number of cost efficiency key performance indicators (KPIs).

The benchmarking normalization models are developed for each cost category. Inputs to the model for a particular category are operating costs and technical drivers that have significant impacts on this cost category. Outputs from the model are Normalization Factors and Standard Costs for all properties in the Peer Group based on all peer performance trends. The Normalization Factor for an asset represents the overall complexity and size/scale of this asset against peers. The Standard Cost for an asset is the cost predicted by the model based on the asset's complexity and size of operations.

"Cost Efficiency" for a cost category is measured by the Cost Efficiency Index, which is the ratio of Actual Cost and the "Standard Cost" predicted by the normalization model. A Cost Efficiency Index of higher than 100% indicates higher cost than expected, and vice versa.

4.12 Cost Composition

The two graphs below in Figure 4.6 demonstrate company's percentage costs by benchmarking cost category compared to the Peer Group Average.

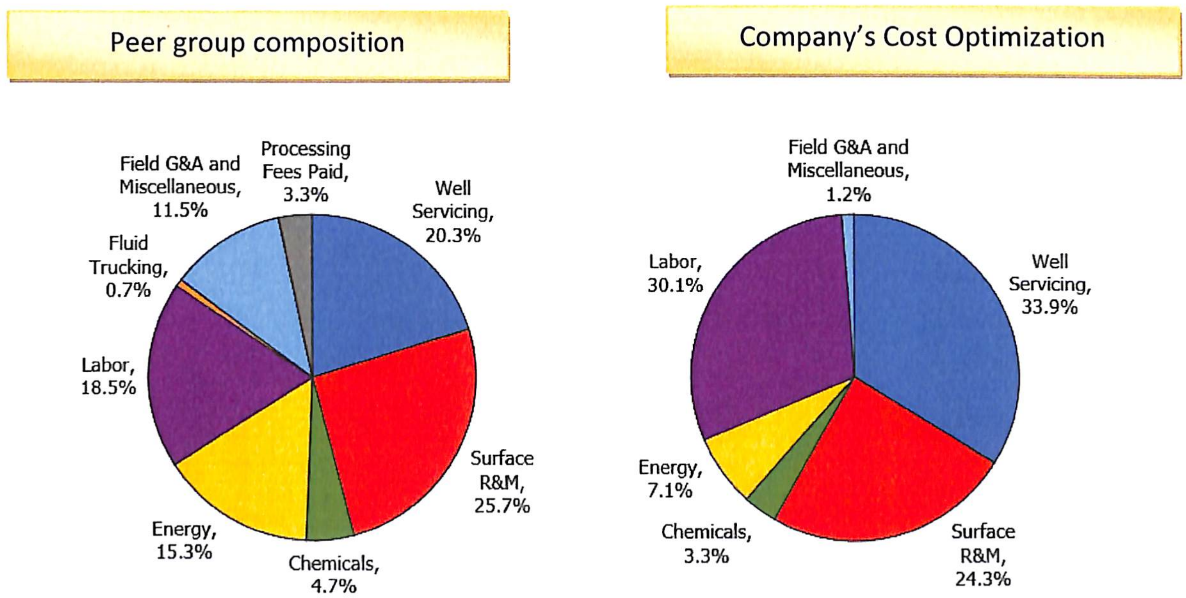


Figure 4.6: Total Operating Cost Competitiveness – 2015

Organisation's percentages of costs for Well Servicing are significantly higher than the Peer Group Average, mainly driven by two facilities. On the other hand, for 2016, it's percentage of costs for Energy and Field G&A and Miscellaneous are significantly lower than the Peer Group Average (refer to Figure 4.7 below). However, one of the facility is still a significant contributor to the Well Servicing costs being higher than peers.

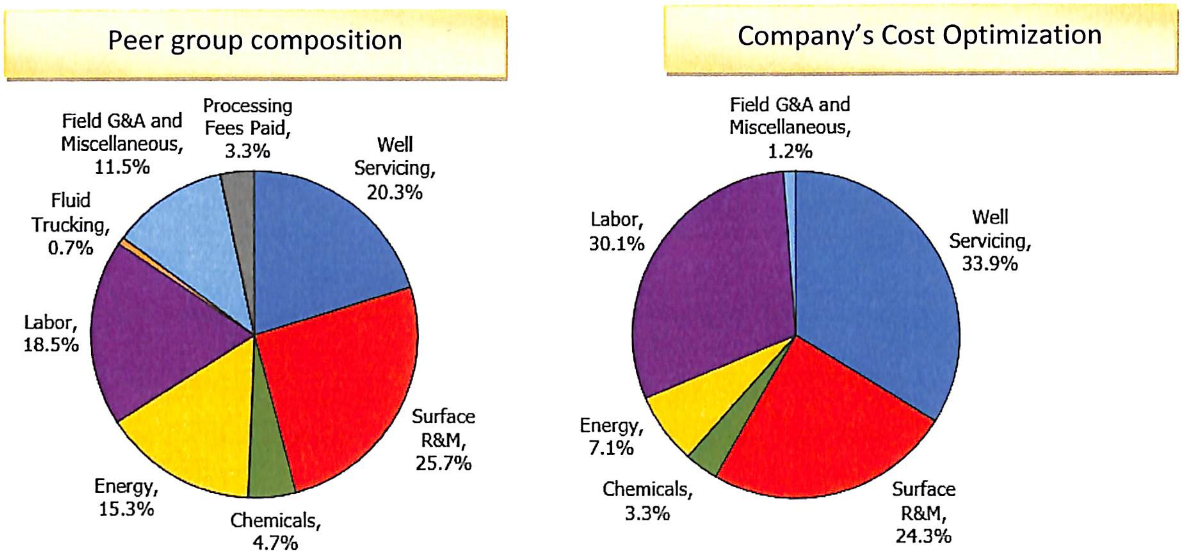


Figure 4.7: Total Operating Cost Competitiveness – 2016

4.13 Total Operating Cost Competitiveness

The 2015 and 2016 Field Cost Profile shown in Figure 4.8 and Figure 4.9 represents the Total Unit Operating Cost for each field in comparison with other asset group fields. This cost is an arithmetic average of the operating costs of each field – a volume-weighted average would not be representative as the large fields normally dominate the numbers. In this chart, the assets are divided into three groups as the Leading Low cost group (blue area), the Middle cost group (white area), and the High cost group (red area).

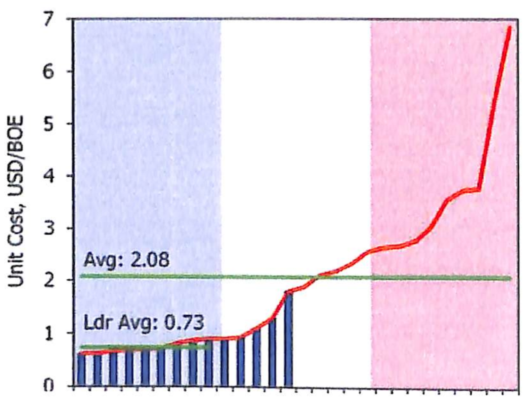


Figure 4.8: Total Operating Cost Competitiveness – Field Cost Profile for various asset– 2015

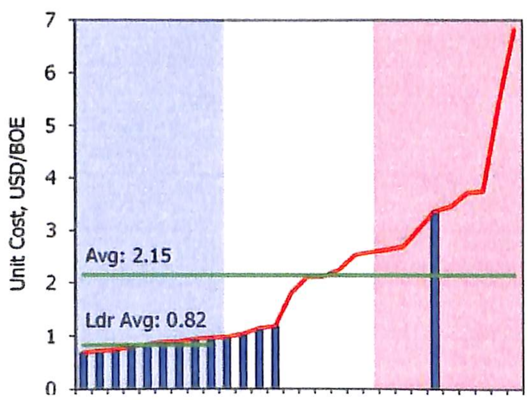


Figure 4.9: Total Operating Cost Competitiveness – Field Cost Profile for various asset – 2016

Company's competitive cost performance for both 2015 and 2016 is good, as shown in the Unit Cost Profile charts, with most of their properties in the Leader group. One facility is the highest unit costs facility in both years, with 2016 significantly higher than the other facility due to well servicing costs.

4.14 Total Operating Cost Efficiency

When all cost categories are normalized according to the complexity and size of all operations (as shown in the Total Operating Cost Index charts in Figure 4.10 and Figure 4.11, Company achieved Leader status for 2015 contribution from two facilities, while other achieved Leader status for 2016. There is an opportunity to improve the majority of the facilities to leader performance.

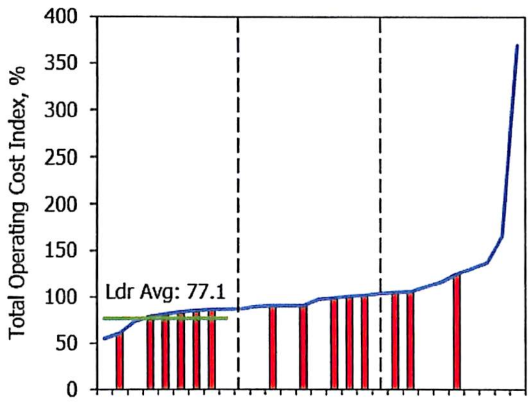


Figure 4.10. Total Operating Cost Index – 2015

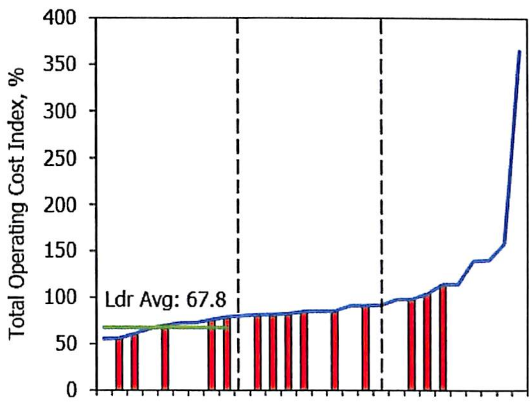


Figure 4.11. Total Operating Cost Index – 2016

4.15 Well Servicing

Well Servicing includes all costs for repairs and maintenance (R&M) of downhole equipment (including wellhead facilities) necessary to sustain production. This includes related service rig and wireline costs, routine service work such as sand control and cleanouts, and downhole equipment replacement and repair. It also includes workover costs to stimulate or remediate an existing producing zone to attain normal production. Well Servicing costs should be reported regardless of whether a firm's policy is to expense or to capitalize the costs:

→ ***Subsurface R&M:*** The costs associated with non-rig Well Servicing and relatively frequent operations (such as washouts, reaming, or oil cutting, in which a wireline or coiled tubing unit is employed). Generally these operations do not require the use of heavy-duty workover rigs and extensive circulating equipment.

→ ***Expense Workover & Remedial:*** The costs associated with non-routine, major repairs involving the pulling and replacement of downhole equipment using a workover rig or a drilling rig operating in a workover mode. The effects of this level of effort are extended beyond the sand face

4.16 Unit Cost Profile

For 2015, Figure 4.12 indicates that some facilities are at or lower than the Leader Average for Well Servicing (on USD per BOE basis). Well Servicing for two facilities are high. For 2016, Figure 4.13 indicates that two facilities are at the Leader Average and Well Servicing for the other two production units.

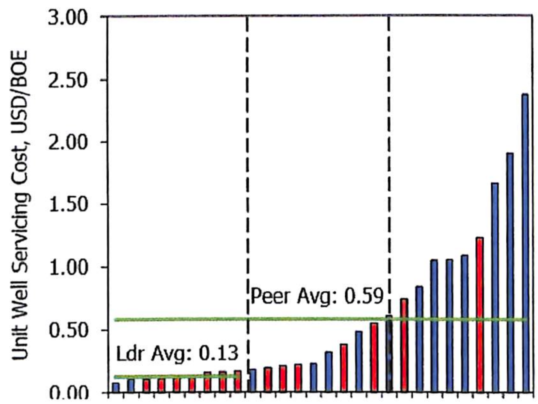


Figure 4.12. Well Servicing Unit Cost Profile – 2015

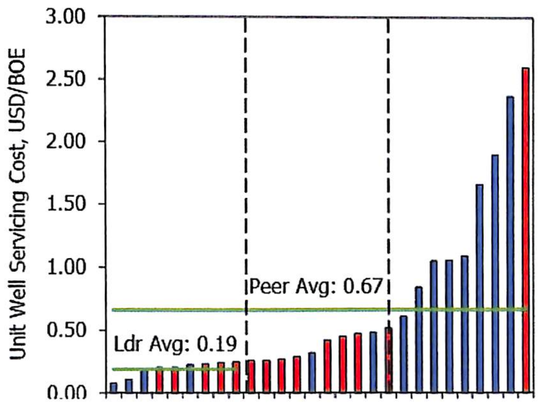


Figure 4.13. Well Servicing Unit Cost Profile – 2016

4.17 Production Efficiency and Reliability

Artificial lift failure rates were among the lowest in the study for all units except two. Overall company's number of failures per well per year are below industry average. Refer to Figure 4.14

below.

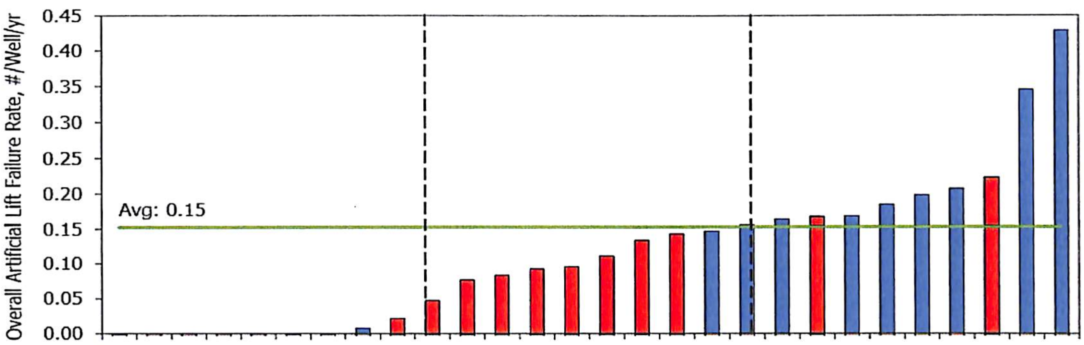


Figure 4.14. Artificial Life Systems Failure Rate (Weighted Average) – 2015

4.18 Surface Repair & Maintenance (SRM)

This category includes the costs of repairing and maintaining all surface facilities and equipment (except wellheads) incurred by company and contract personnel. This includes gathering systems, tanks, compressors, processing facilities, and product shipping facilities. Included in this category are the costs of maintaining, repairing, including structural features and flow and control lines, as well as the cost of painting surface facilities:

→ Compressor/Generator R&M: The costs associated with the repairs and maintenance of compressors and generators.

→ Equipment/Facility R&M: The costs associated with the repairs and maintenance of surface equipment and various facilities.

→ Other Surface R&M: The costs associated with items that do not fall under the subcategories mentioned above.

As shown in Figure 4.15 (2015 Unit Cost Profile chart), six facilities are among the Leaders in SRM cost. And for 2016, Figure 4.16 indicates that eight facilities are at or below the leader average. The remaining facilities are slightly above the leader average, but still below the peer average.

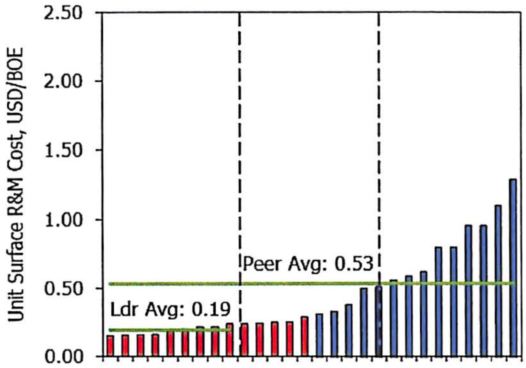


Figure 4.15. SRM Unit Cost Profile – 2015

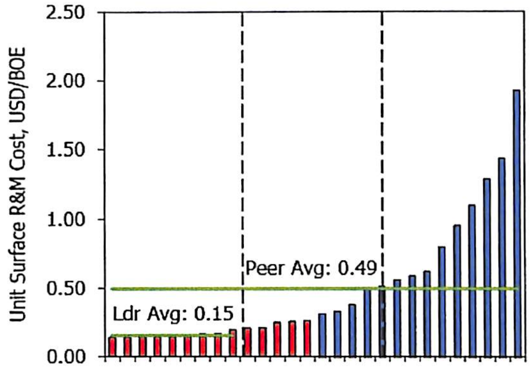


Figure 4.16. SRM Unit Cost Profile – 2016

4.19 Major Surveys (Turnarounds)

Turnaround performance typically is a major factor in total SRM performance. The peer group turnaround philosophies run the spectrum from essentially no planned turnarounds, to limited opportunistic turnarounds, and all the way to regularly scheduled major turnarounds. The costs provided by Company cannot be distinguished from non-turnaround costs and therefore no comparison is provided for turnaround performance relative to peers.

4.20 Energy

Energy includes payments to third parties for fuel or utilities such as diesel fuel, purchased natural gas, or utilities (e.g., electricity). However, it does not include any fuel gas charges your company may assess itself. The volumes of fuel gas have been reported separately.

Energy cost includes both purchased energy (fuel & electricity) and field fuel gas deemed costs.

Company's facilities are very competitive among peers in energy unit cost, in the Leader Group (refer to the Unit Cost Profile chart in Figure 4.17 and Figure 4.18. One apparent reason is that Company's power which is supplied from the grid is significantly lower cost per kWh than their peers.

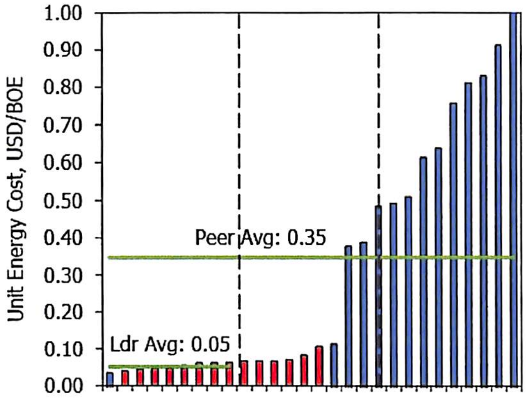


Figure 4.17. Energy Unit Cost Profile – 2015

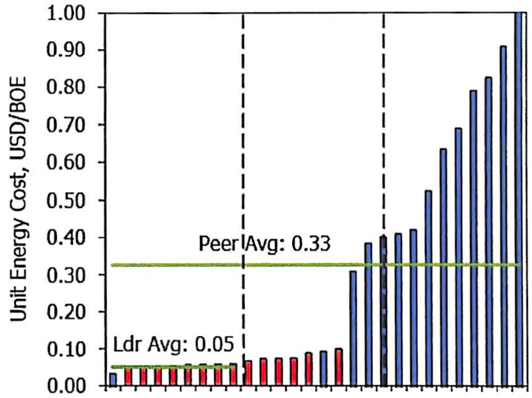


Figure 4.18. Energy Unit Cost Profile – 2016

4.21 Electricity Cost

Figure 4.19 and Figure 4.20 show Company's all production units significantly below the average for electricity costs in both 2015 and 2016, but interestingly the data shows a varying electricity cost across the production facilities.

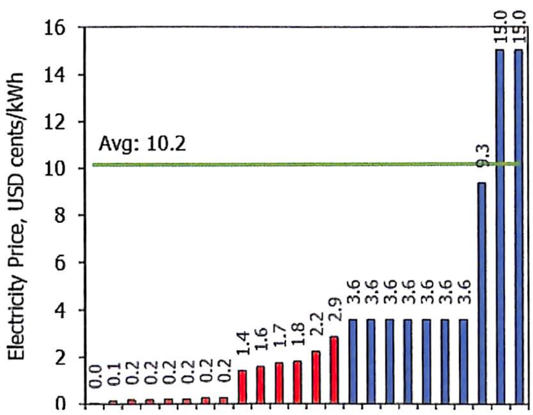


Figure 4.19. Electricity Cost – 2015

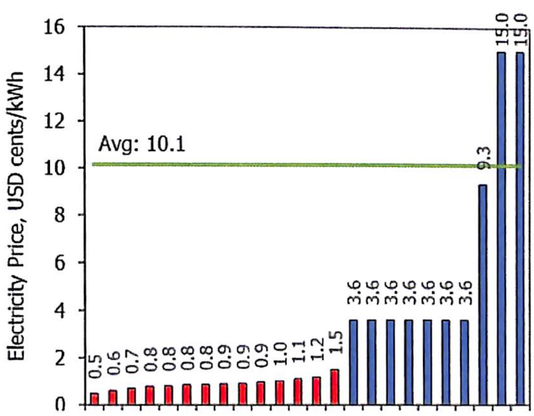


Figure 4.20. Electricity Cost – 2016

4.22 Chemicals

This section includes the full costs of chemicals used for surface and subsurface operations, including the costs of all chemicals used for treatment, processing, flow assurance, and corrosion reduction. Based on competitive analysis, company's relatively high productivity has allowed it to maintain overall chemical unit costs lower than peer average. Refer to Figure 4.21 and Figure 4.22 below.

Based on competitive analysis, comapany's relatively high productivity has allowed it to maintain overall chemical unit costs lower than peer average.

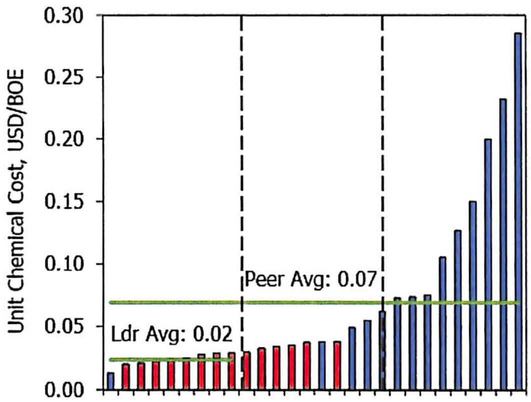


Figure 4.21. Chemical Unit Cost Profile – 2015

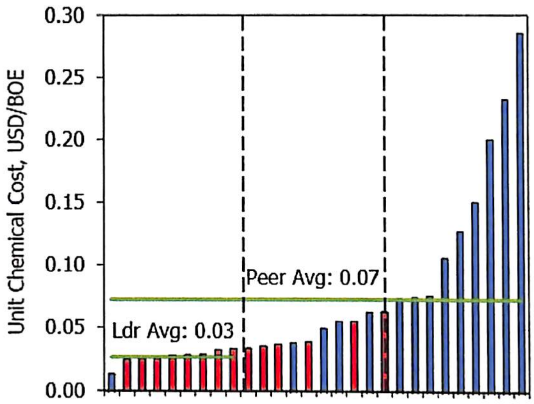


Figure 4.22. Chemical Unit Cost Profile – 2016

4.23 Miscellaneous and G&A

Miscellaneous and G&A costs are typically related to, as an example, HSE, field communication and other direct administration and miscellaneous charges (e.g., the cost of insurance, computer and communications equipment, accommodation, catering, etc.). When compared to its peers, all of facilities are below peer trends on a Field G&A Unit cost basis.

4.24 Trend Analysis

The colored block chart in Figure 4.23 shows the percentage change in total operating costs year over year (2015–2016) of Company's all facilities versus the percent production change over the same period. Increases in cost or volumes are shown as positive values.

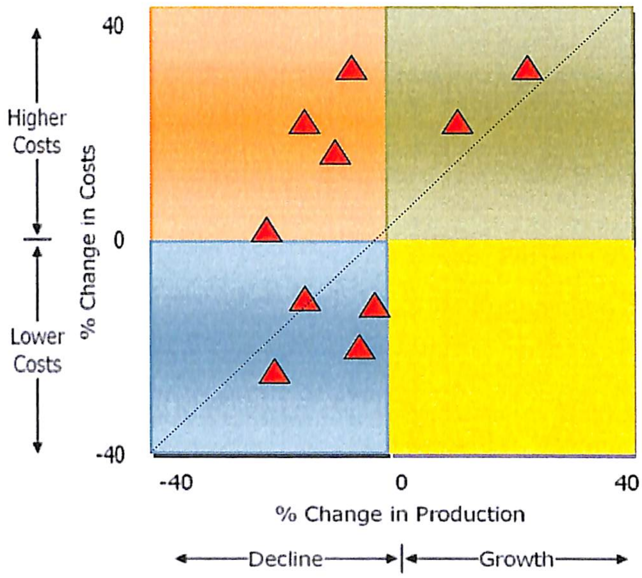


Figure 4.23. Trend Analysis
(% Change in Costs & % Change in Production)

The regions of the chart are color-coded for ease of understanding. An explanation of each region follows:

→ The 45° line represents a line of constant efficiency (i.e., the gain or loss in volume along the line is exactly equal to the gain or reduction in costs). All points below the 45° line and to the right show improved efficiency. Those points above or to the left of the line show declining efficiency.

4.24.1 Operating Efficiency

The yellow quadrant shows fields where operators were able to reduce total costs while increasing production, the most desirable situation.

Dark green under the diagonal represents increasing production, but also rising costs. Fields in this area have increased their efficiency; the gain in volume is greater than the increase in costs.

Dark blue under the diagonal represents declining production and costs, where the cost decline is greater than the volume loss, reducing unit costs and adding value.

4.24.2 Declining Cost Competitiveness

Light green above the diagonal identifies situations where costs have increased faster than volumes, resulting in lower efficiency; this situation often occurs during the start-up year of new facilities.

Light blue above the diagonal represents declining volumes and costs, where the cost decrease is less than the production decrease, reducing cost efficiency.

The red quadrant represents declining production and rising costs, the worst situation to be in, particularly for high-cost operations. Fields in this category require scrutiny.

Chapter 5

5 INTERPRETATION OF RESULTS

5.1 Study Results

The study results were as follows:

→ Production Facilities reported declining production, of which only 5 were able to reduce costs as well. Benchmarking acknowledges that cutbacks due to OPEC quotas contributed to some of the production decline. However, benchmarking evaluated this and the results do not materially change.

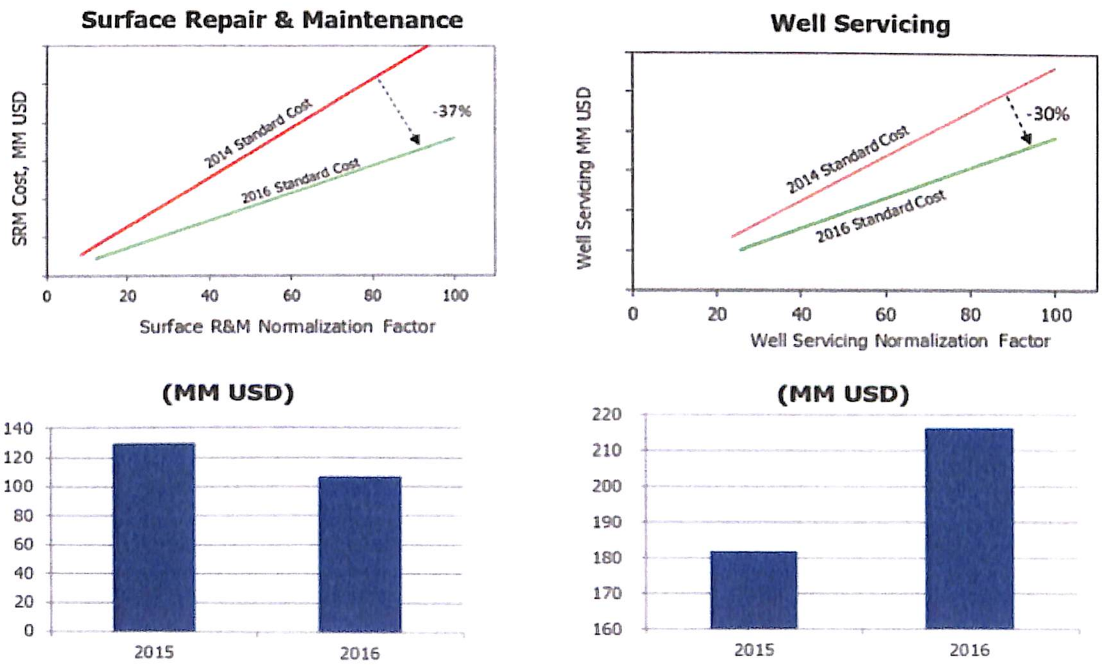


Figure 5.1 -5.2. Cost Reduction in Well Servicing and Surface Maintenance

Operators significantly reduced their operating costs by ~33% (e.g., implementing world-class processes, eliminating non-value-adding activities, re-structuring contracts with suppliers, etc.).

The operators achieved the cost reductions while maintaining production. Company's operating costs are modestly lower in Maintenance and relatively higher in 2015 and 2016 for Well Servicing. No evidence that company has reduced their operating cost since then.

Trend Performance:

Comparing 2015 and 2016 fiscal years, the graphs below summarize total cost per year broken down by main cost category and the production volume for the year. Highlights of the two facilities performance are illustrated are included as follows:

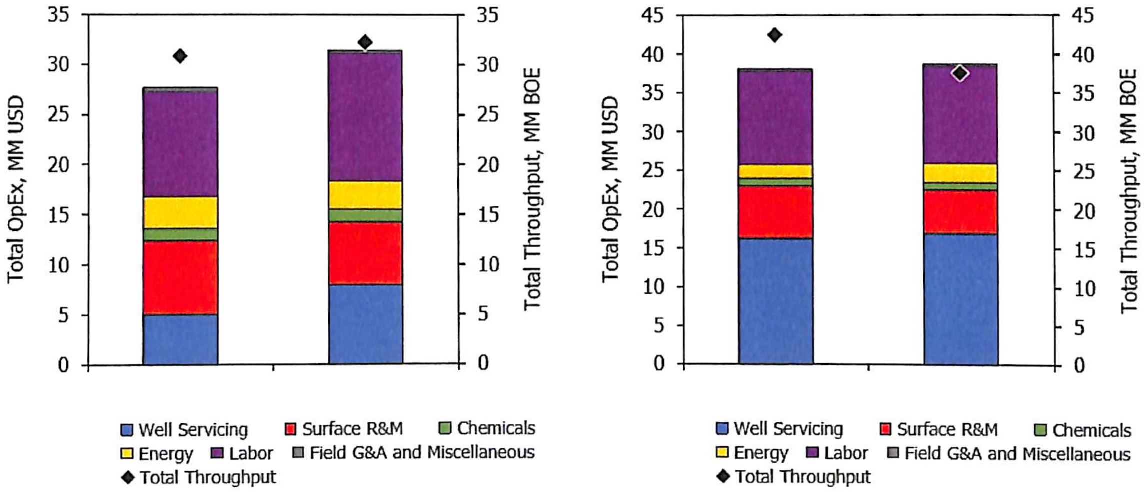


Figure 5.3. Total Operating Cost of Two Operating Units during 2015 and 2016

One facility total operating cost has risen 14%, over the last 2 years and production has increased over 4% during the same period. Operating cost increases are primarily driven by increases in Well Servicing and Labor. Unit Cost grew 0.90 USD/BOE in 2015 to 0.98 USD/BOE in 2016.

Whereas, other facilities' total operating cost was relatively stable between 2015 and 2016; however, production throughput decreased 13% in 2016. As a result, unit cost increased 14% in 2016 (from 0.90 USD/BOE to 1.03 USD/BOE).

5.2 Production Efficiency and Reliability

The following definitions are utilized in the analysis and reporting of Production Efficiency and Reliability results:

- ***Total Production Efficiency:*** The actual production relative to the predicted production capacity (PPC) that could be anticipated from analysis of the daily production profile. Mathematically, it is the ratio of Actual Production over PPC. This is the single most important measure for operators.

- **Production Efficiency (Unplanned):** The efficiency achieved when planned and external downtime events are disregarded. Mathematically it is the ratio of actual production plus planned and external losses over PPC, that are derived from daily production profile regression. Again, the broad operations management team (including key departments such as engineering, geological and geophysical (G&G), purchasing, etc.) has a key role to play in optimizing planned versus unplanned downtime.

- ***Mean Time Between Incidents (MTBI):*** The average time between incidents measured in days. Benchmarking evaluates MTBI using total uptime in days divided by the number of uptime periods. For comparison purposes, incidents caused by external sources, including Midstream Downtime, Market Limitations, and Weather-Related issues, are excluded from MTBI calculation.

- ***Mean Time To Recover*** *(MTTR):* The average time (measured in days) for production to return to more than 95% of the 15-day moving average production. For comparison purposes, incidents caused by external sources are excluded from MTTR calculation.

- ***Reliability Index (RI):*** The ratio of the MTBI to MTTR. A higher RI indicates fewer incidents and with quick recovery; lower RI indicates more incidents and slower recovery.

The principal objective of these studies has always been to provide information that the operator can use to assess the status of past performance and to set future targets. Key metrics are identified in Figure 5.4 below:

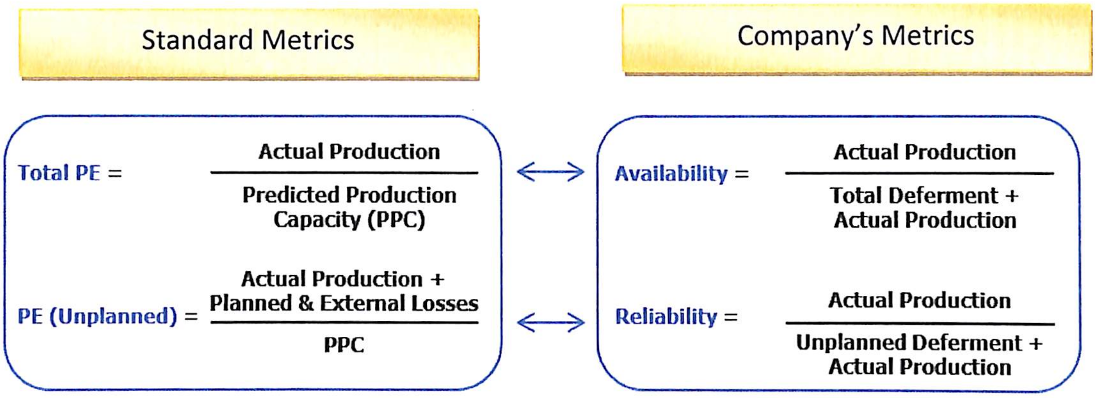


Figure 5.4. Key Metrics

5.2.1 Production Efficiency Analysis

The Company delivered overall strong performance in production efficiency and reliability in 2015. The Total Production Efficiency shows that only one production unit is below the 95% benchmark

For Production Efficiency, Figure 5.5 indicates that two overall performances is better than the leader average for MTBI. Figure 5.6 indicates that no production units are performing at or better than the leader average for MTTR.

Following is the industry recognized formula that has been used to determine Production Efficiency:

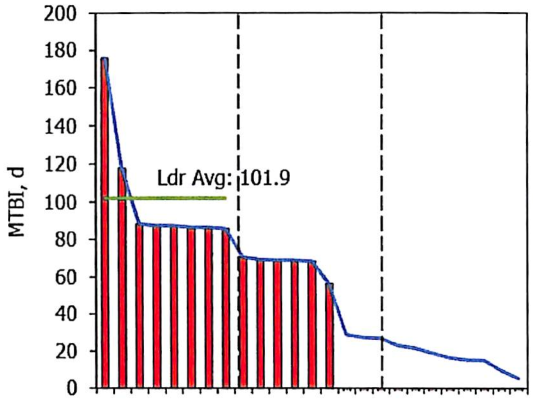


Figure 5.5. MTBI

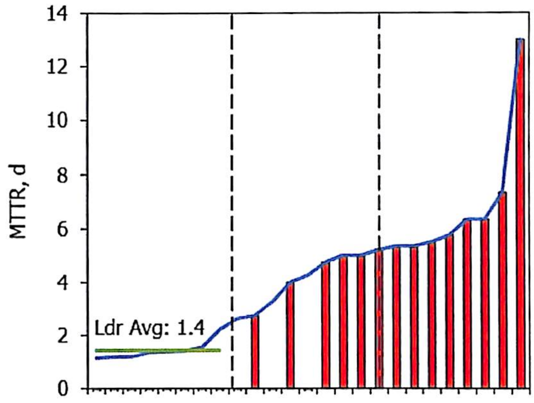


Figure 5.6. MTTR

Production Efficiency = 1 - (production loss / (production+ production loss)) expressed as a percentage

Figure 5.7 includes Cutback from OPEC quotas as production losses. The production efficiency declined from 98.6% (2015), to 96.4% (2016), to 89.0% (January to April 2017). Cutbacks from OPEC quotas are considerable in 2017

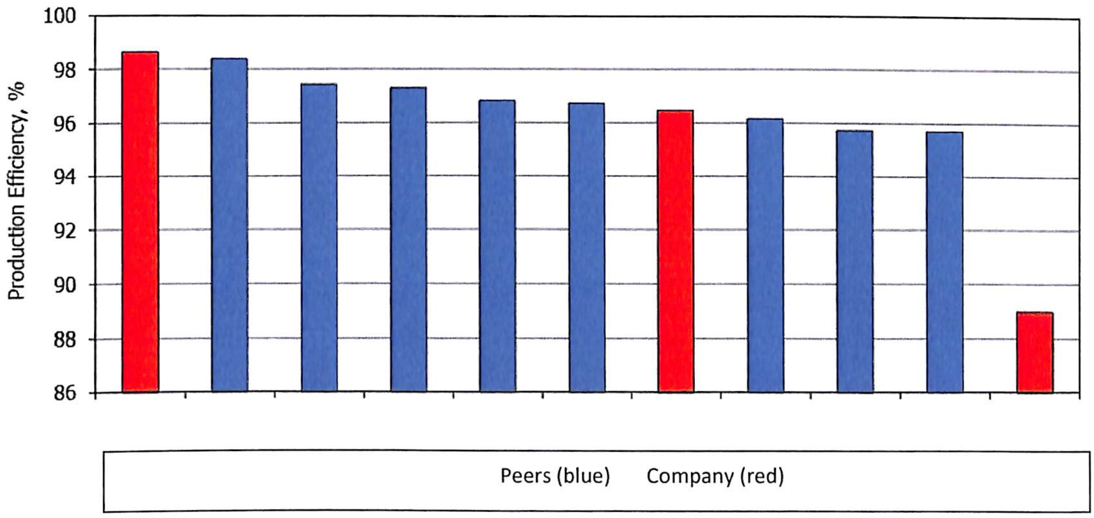


Figure 5.7.Production Efficiency – Cutbacks Included

Figure 5.8 excludes Cutback from OPEC quotas as production losses. The production efficiency declined from 98.7% (2015), to 96.5% (2016), to 92.9% (January to April 2017).

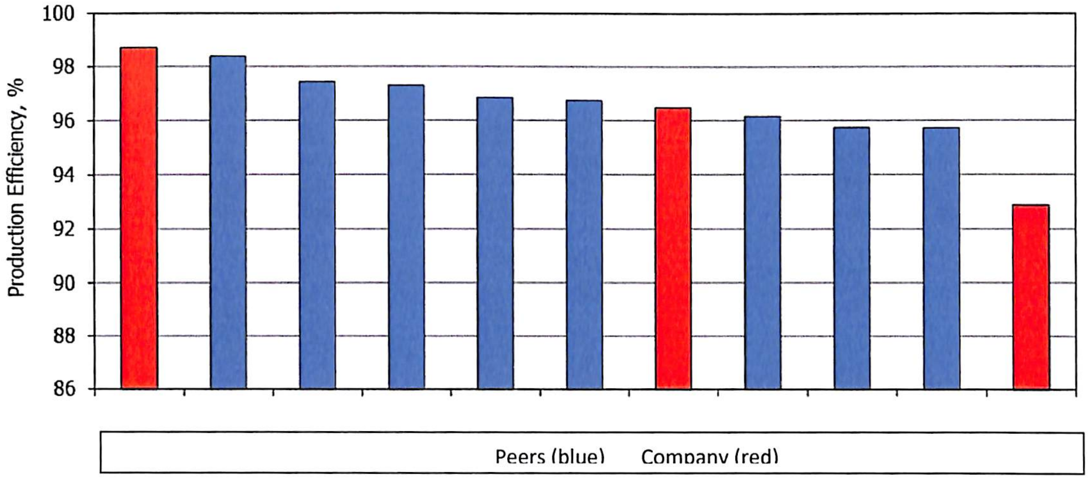


Figure 5.8. Production Efficiency – Cutbacks Excluded

There is an opportunity for improvement in Production Loss Management, which will pay off quickly in increased production, often also favourably impacting costs.

5.2.2 Production Reliability Analysis

Company has 50 reason codes for production losses and there are very small volumes for the majority of the reason codes. Refer to Figure 5.9, Figure 5.10, and Figure 5.11 for the 2015, 2016, and 2017 production losses

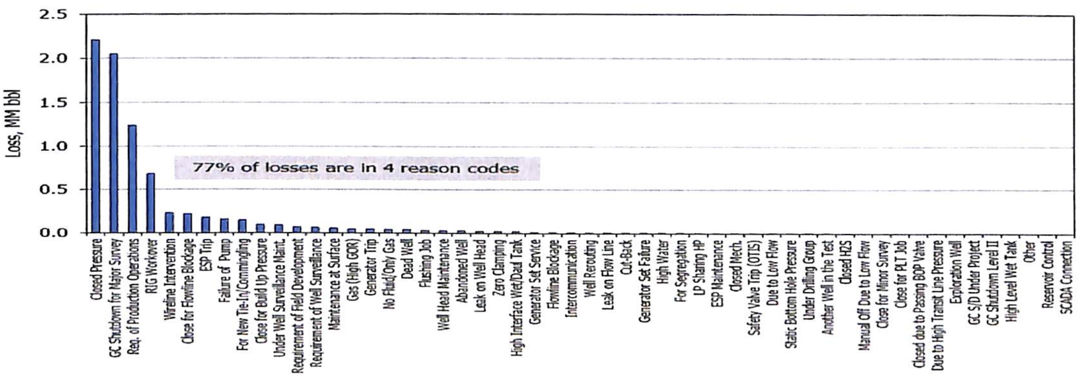


Figure 5.9. Production Reliability Improvement – 2015 (Jan to Dec) Production Losses

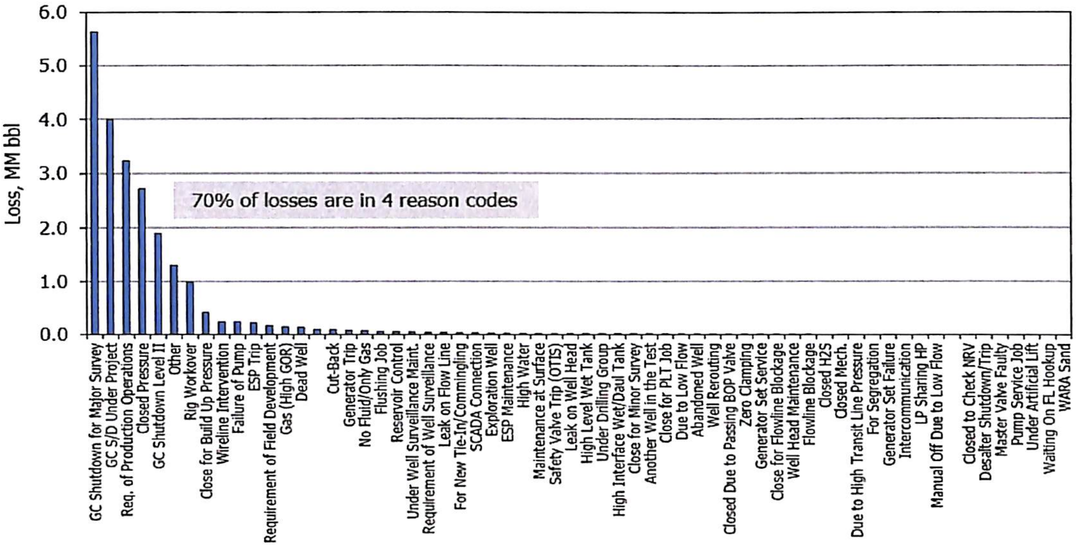


Figure 5.10. Production Reliability Improvement – 2016 (Jan to Dec) Production Loss

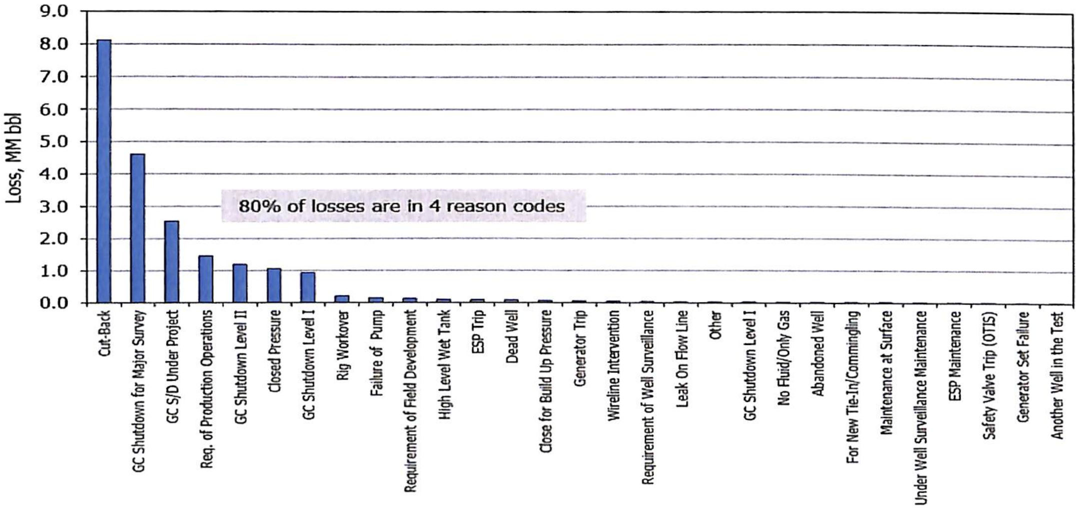


Figure 5.11. Production Reliability Improvement – 2017 (Jan to Apr) Production Losses

Chapter 6

6 FINDING AND ANALYSIS

The following sections provide opportunities for improvement, including what industry leaders are doing and evidence from the oil major company.

6.1 Best Practices

6.1.1 Production Efficiency

Managing Production Efficiency is important to optimize production and therefore to maximize revenue. The two main options to maximize production are to drill new wells or to maximize production efficiency from the existing wells or the "Base". Typically, the most cost-effective production is to maintain the "Base" or existing production from wells that have been drilled. Best-in-class operators realize that maximizing production efficiency is important and they are rigorous and systematic in managing production efficiency.

Benchmarking assessment identified opportunities for Production Efficiency. Based on this benchmarking assessment, a series of technical screening assessments were conducted to identify areas of opportunity. The following are the key areas identified that are creating the gap in Production Efficiency relative to best-in-class organizations.

Production efficiency has a significant impact on cash flow. Based on a 45 USD/bbl crude price and 1.5MM bbl/d production rate, each 0.25% improvement in production efficiency is worth 60MM USD in annual cash flow.

6.1.2 Production Efficiency Framework

Best-in-class operators are systematic by having a documented process which explains the work flows and the roles and responsibilities for managing production efficiency. There is clear accountability for all production deferrals, and the accountability includes root cause investigations and follow-up on actions to minimize repeat failures.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is a systematic process documented to:
  - Provide clear definitions.
  - Document all loss events.
  - Ensure all production deferrals are assigned owners, preferably when the event is first documented.
  - Investigate significant production deferrals for root cause and implement actions from root cause investigations.
  - Differentiate between planned and unplanned events.
- Determine vulnerabilities. Vulnerabilities are areas or equipment where a significant production deferral may occur in the future. There are detailed processes for determining vulnerabilities.

Evidence this Recommendation is Needed

- There is no systematic process for managing root cause investigations.

6.1.3 Performance Managing Production Efficiency

Best-in-class operators strive for continuous improvement in production efficiency (i.e., production efficiency increasing year on year). They also ensure the visibility of Production efficiency KPIs at various levels in the organization.

Best Practices/World-Class Processes Addressed with this Recommendation

- Strive for continuous improvement, year-on-year improvement in Production efficiency.
- Production efficiency at various levels and for functional teams as applicable (for major surveys)

- Production efficiency is part of routine performance management process at various levels in the organization

6.1.4 Target Areas of Low Production Efficiency

Best-in-class operators focus on the Reason Code categories where high volumes of deferrals are occurring. Conduct root cause investigations into Reason Code "Request of Production Operations" for facilities. Pending the results of the root cause, develop and implement a systematic process.

Best Practices/World Class Processes Addressed with this Recommendation

- Strive for continuous improvement, year-on-year improvement in Production efficiency.

Evidence this Recommendation is Needed

- Target areas of Low Production Efficiency.

6.1.5 Maintenance

Benchmarking assessment identified cost optimization opportunities within the Maintenance area of the facilities and identified it as one of the larger opportunity areas for the company. Based on this benchmarking assessment, a series of technical screening assessments and interviews were conducted to identify the areas of opportunity relative to best-in-class performers.

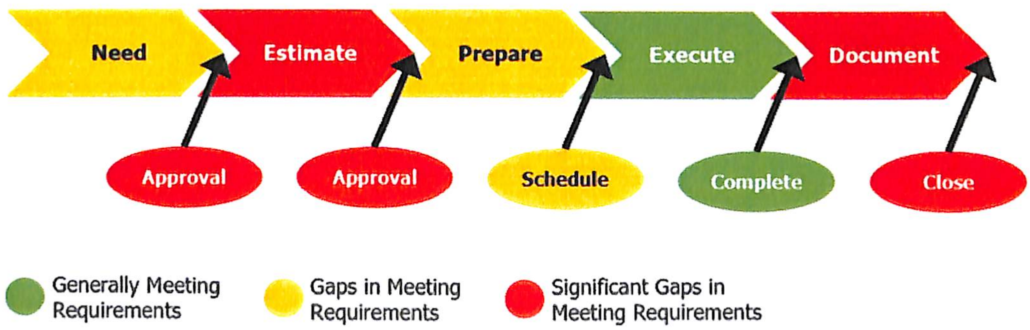


Figure 6.1: World-Class Processes and Practices – Maintenance

The company utilizes two primary Maintenance contractors, with more than 800 personnel. In addition, based on interviews, it was told that a significant level of this contract manpower is not charged against work orders, preventing a better understanding of the manpower utilization.

There is a large gap between the number of maintenance contractors per facility (91) compared to Regional Peers (75) and Rest of the World Peers (42). The number of maintenance contractors should be considered as an opportunity for improvement.

6.1.6 Work Management Framework

Best-in-class operators have a formal work management system and process in place to manage all work activities in maintenance with all relevant equipment data and strategies within the system. This includes, for example, Preventative Maintenance (PMs), Corrective Maintenance (CM), and Major/Minor Surveys (i.e., turnarounds) in all disciplines including Mechanical, Electrical, and Instrumentation. In addition, the process covers through a formal work process of activities from initial identification of potential work through to completion and documentation of the executed work activity. This includes all Maintenance costs including materials, labour, and services, which are managed and charged through to the individual work orders.

Best Practices/World-Class Processes Addressed with this Recommendation

- The maintenance function is process-driven and executes its responsibilities by following those processes, measuring performance, and eliminating obstacles to drive process efficiencies.
- The maintenance process addresses both proactive and reactive work demands.
- The majority of maintenance work results from predefined Maintenance Strategies.
- Detailed costs, labour hours, and repair details are captured at the equipment level to provide history and support reliability analysis.
- All maintenance work activities have work orders associated with the work.

Evidence this Recommendation is Needed

- Current (Maximo) system handles only a small portion of the maintenance activities in all the disciplines.

- Many of the maintenance activities are managed through separate manual systems for Mechanical, Electrical, and Instrumentation.

6.1.7 Planning and Scheduling

Best-in-class operators have a formal and robust maintenance work process and have a keen focus on two critical steps that have a major influence on maintenance costs: planning and scheduling. Typically unplanned maintenance work is up to three times more expensive than planned work, and therefore demonstrates why top performers focus on planning and scheduling their maintenance work. This planning and scheduling work includes both routine maintenance activities (e.g., preventative and corrective) in addition to major/minor survey maintenance activities (i.e., turnarounds). In addition, having effective planning and scheduling processes typically improves production efficiency while also reducing incidents.

Best Practices/World-Class Processes Addressed with this Recommendation

- Detailed work planning accurately predicts duration, labour requirements, materials, needed equipment, and forecast expenditures for each work request.
- The CMMS (Computerized Maintenance Management System) facilitates planning with embedded master data and calculation ability to facilitate resource planning, cost approval, scheduling, and material management.
- The week-ahead schedule is comprehensive and includes all work to be performed in the facility during the upcoming week.
- The operations/maintenance coordinator prepares a 3-week partial look-ahead schedule projection.
- Major survey (i.e., turnarounds) planning is accomplished by dedicated planners who are experienced in planning major surveys.
- Maintenance supervisors spend the majority of their work time facilitating the field work of maintenance technicians

Evidence this Recommendation is Needed

- A 5-year major survey schedule is maintained and updated periodically, however, no detailed planning is done; each team working during the outage (i.e., projects, major survey, etc.) handles their own activities and therefore, they are not fully integrated

6.1.8 Contract Maintenance Wrench Time Evaluation

Best-in-class operators ensure their maintenance organizations (direct or contract) maximize the "wrench time" of the personnel in the field to drive improvements in costs and utilization of personnel. This process helps ensure the whole process of how maintenance work is delivered in the field incorporates the various administrative actives (e.g., include lock-out-tag-out, permits, etc.), material availability, service and equipment support, operations readiness, etc.

Best Practices/World-Class Processes Addressed with this Recommendation

- The operations, maintenance, and reliability organizations equally share responsibility for controlling maintenance expenses.
- The maintenance organization's primary methodology for controlling expense is through accuracy or repair, qualification of personnel, and efficiency of the workforce.
- Obstacles and exceptions to efficient work are identified, categorized, and eliminated by a defined process.

6.1.9 Chemicals

Managing chemical usage is a balance between chemical injection volumes, chemical costs, and the effectiveness of chemicals. Best-in-class operators maintain production, while minimizing: corrosion, scale precipitation, asphaltenes, and process upsets and also effectively managing chemical costs. Best-in-class operators are systematic by having a documented process. Best-in-class operators strive for continuous improvement in managing chemicals.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is a systematic process documented to ensure roles and responsibilities for maintaining chemical injection at specified rates.

- Chemical management strategy exists and is integrated with asset integrity and maintenance strategies
- Performance-based contracts with chemical suppliers

6.1.10 Complex Contract and Accountability Approach

Best-in-class operators have aligned their artificial lift operations and accountabilities to ensure seamless and high-performing sustainable operations. Personnel are trained to focus on reviewing and optimizing the equipment performance and intervening on a timely basis if there are performance issues or failures.

In addition, the number of contracts is typically a couple to provide competition while also ensuring a material size to get the best support and focus from the contractor. Incorporated with this, the best-in-class operators are utilizing a performance-based contract process to encourage long-term reliable performance for maximum production while optimizing cost performance. Aligned with the above, the contracts elements include on contract terms (up to 10 years) to drive long-term sustainable performance delivery on production and costs.

Best Practices/World-Class Processes Addressed with this Recommendation

- Contracts aligned to have clear accountability of performance
- Contracts would be performance-based including incentives
- Minimize complex ownership and management processes

Evidence this Recommendation is Needed

- contractors in place to manage the ESPs, with each having a defined number of ESP wells they manage
- Variable Speed Controllers on the surface; however, the ESP contractor owns the ESP, generator, SCADA system if present, and motor control centre

6.1.11 Cycle Time Management

As water cut increases and artificial lift system numbers increase, the management of these assets becomes critical to ensure production delivery. Since many teams and expertise are involved in the installation, operation, repair/maintenance, and replacement of these systems, the work process across the multiple teams is crucial to minimize downtime and production losses. Therefore, this work process including decision process, handoffs, and KPI metrics such as cycle time in the performance management of this activity is important in delivering the production performance. This would also include the appropriate mobile equipment utilized to manage the replacement of ESP or other artificial lift systems.

Best Practices/World-Class Processes Addressed with this Recommendation

- Robust work management process in place to manage the complex interaction between the required teams to deliver effective and efficient artificial lift system management.
- Metrics and KPIs used to align the various teams and personnel across the work process.

Evidence this Recommendation is Needed

- Multiple teams across various directorates and support teams involved in the process.
- Witnessed limited work processes and KPIs that align the various teams to ensure seamless delivery.

6.1.12 Operations Excellence

Operations excellence is an important management system to minimize and manage process safety risks. Best-in-class operators are systematic by having a documented process which explains the work flows and the roles and responsibilities for operations excellence activities. Best-in-class operators strive for continuous improvement in operations excellence.

During benchmarking assessment identified opportunities within the operations area. Based on this benchmarking assessment, a series of technical screening assessments were conducted to identify areas of opportunity. The following are the key areas identified that are creating the gap in operations relative to best-in-class organizations.

6.1.13 Flaring Volumes

Best-in-class operators are keenly aware that flaring is an indicator of potentially serious process safety issues since flaring is typically the last barrier prior to a significant event. Leading operators are systematic by having a documented process which explains the work flows and the roles and responsibilities for managing flared volumes.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is a systematic process documented to ensure roles and responsibilities for managing flared volumes
- Leading operators rigorously monitor flaring, intending to continuously reduce flared volumes
- Interviews indicated clear accountability for managing flared volumes

6.1.14 Hydrocarbon Releases

Best-in-class operators are systematic in reducing hydrocarbon leaks. Leading operator rigorously monitor and resolve all types of hydrocarbon releases.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is a systematic process documented to ensure roles and responsibilities for managing hydrocarbon releases.
- Leading operators rigorously monitor leaks, intending to continuously reduce leaks
- Leading operators categorize hydrocarbon releases into API Tier 1,2, 3, or 4 and they participate in industry benchmarking studies to determine their performance relative to peers
- Interviews indicated there is an accountability for managing hydrocarbon releases
- Interviews indicated there automatic monitoring system installed for gas leaks

Evidence this Recommendation is Needed

- Site visits indicated oil leaks in drip pans and on the ground that had not been cleaned up

6.1.15 Flow line Corrosion

Best-in-class operators are rigorous in managing corrosion through all parts of the process flow. Leading operators understand and manage corrosion, starting with subsurface corrosion, progressing to flowlines, the process facilities, and pipelines.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is a systematic process documented to ensure roles and responsibilities for managing corrosion throughout the process flow.
- There is a process to understand and manage the risks of corrosion in flowlines.
- Interviews indicated there is plan to manage flowline corrosion

Evidence this recommendation is Needed

- Interviews indicated that flowline corrosion is a concern within the company
- Interviews indicated that minimizing hydrocarbon leaks is a priority

6.1.16 Energy Mass Balance

Best-in-class operators are rigorous in managing energy usage.

Best Practices/World-Class Processes Addressed with this Recommendation

- There is an energy mass balance for all major facilities. The energy balance documents sources of purchased energy (including fuel gas) and the energy users.
- There is a systematic process to manage energy consumption.

Evidence this recommendation is Needed

- Interviews indicated there is no energy management in the company
- Electric power is subsidized, contributing to low energy costs, and good performance relative to benchmarks. However, the subsidies create a false sense of security since the subsidies may be eliminated in the future.

Chapter 7

7 CONCLUSIONS, SCOPE AND ASSUMPTIONS

To improve overall performance in both Operating Cost and Production Efficiency, The Company must focus on improving Reliability and Availability by enhancing the efficiency and effectiveness of maintenance activities as a path to achieving overall Operations Excellence and delivery of competitive business results

7.1 Conclusion and Recommendation from Benchmarking Study

These highlights in operating costs, production, and reliability performance formed the basis of our most important conclusion and recommendation for the company resulting from the benchmarking analysis:

The details of the recommendations are discussed in Previous Chapter, However Benchmarking Study Conclusion and recommendations are highlighted below:-

- ***Production Efficiency***
  - → Production efficiency is declining: 98.7% (2015), to 96.5% (2016), to 92.9% (2017)

- ***Maintenance***
  - → Cost optimization opportunities within the Maintenance area of the Production Centers are one of the larger opportunity areas for the Oil Major Company.
  - → Contract manpower is not consistently charged against work orders, preventing a better understanding of the manpower utilization.

- ***Well Servicing***

  → Evaluate the well servicing process; specifically cycle time to return wells to production and ESP performance (i.e. failure rate)

- ***Cost Management and awareness across the organization***

  →Alignment and Allocation of all Costs to the Economic Unit (i.e. Production Centers)

7.2 Opportunities for Improvement

The benchmarking assessment process, which included an evaluation of Cost and Production Efficiency benchmarking and screening interviews, highlighted a number of areas that the company has potential opportunities relative to best-in-class operators.

Table 7.1 Shows Company's estimated cash flow improvements for implementing opportunities for improvement. The cash flow improvements consist of revenue from increased production efficiency and cost savings for well servicing, maintenance, and chemicals. Please note that MM USD is million United States dollars. The cash flow improvements are only shown for Years 1 through 3; there are additional benefits beyond Year 3.

	Year 1 MM USD	**Year 2 MM USD**	**Year 3 MM USD**
Production Efficiency	20	40	60
Well Servicing	3	5	10
Maintenance	1.5	4	8.3
Chemicals	0.7	1.7	3.7
Total	**25.2**	**50.7**	**82**

Table 7.1: Cash Flow Improvement Opportunities

Based on 45 USD/bbl crude price, 1.5M bbl/d production rate, each 0.25% improvement in production efficiency is worth 60M USD in annual cash flow.

Chapter 8

8 Summary of Best Practices & Scope of Future Work

The scope of the assessment was to focus on the most leveraging areas identified in the Benchmarking process: □ ESP Performance □ Production Losses □ Maintenance- Wrench Time Analysis

8.1 Best Practices Assessment Process

Best practice assessment process is illustrated in Fig.8.1 below

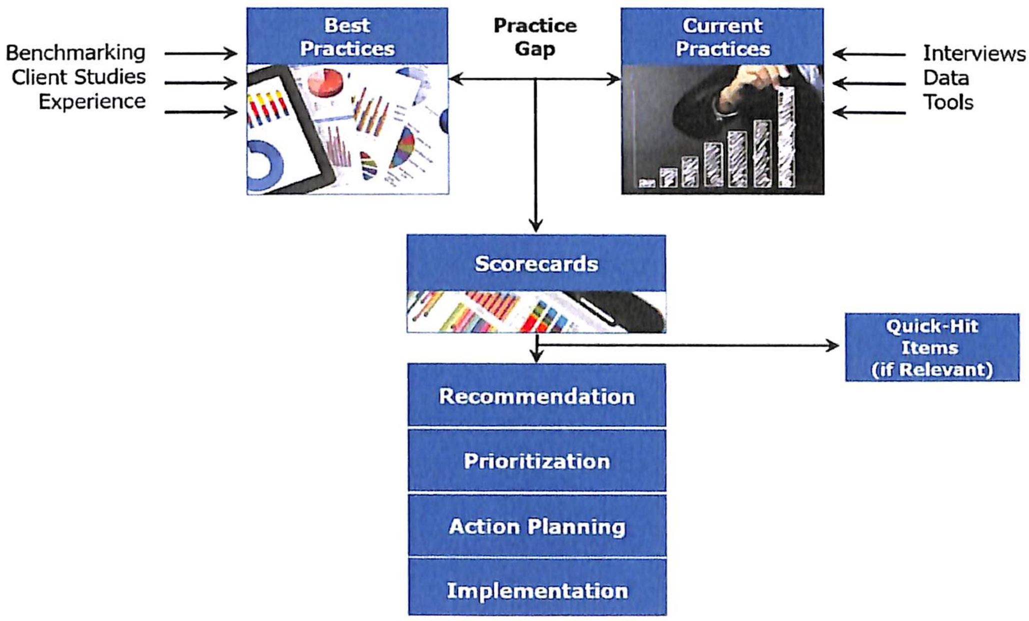


Figure 8.1: Best Practices Assessment Process

8.2 Process Practices Scoring Methodology

Best practice scoring methodology is illustrated in Fig.8.2 below

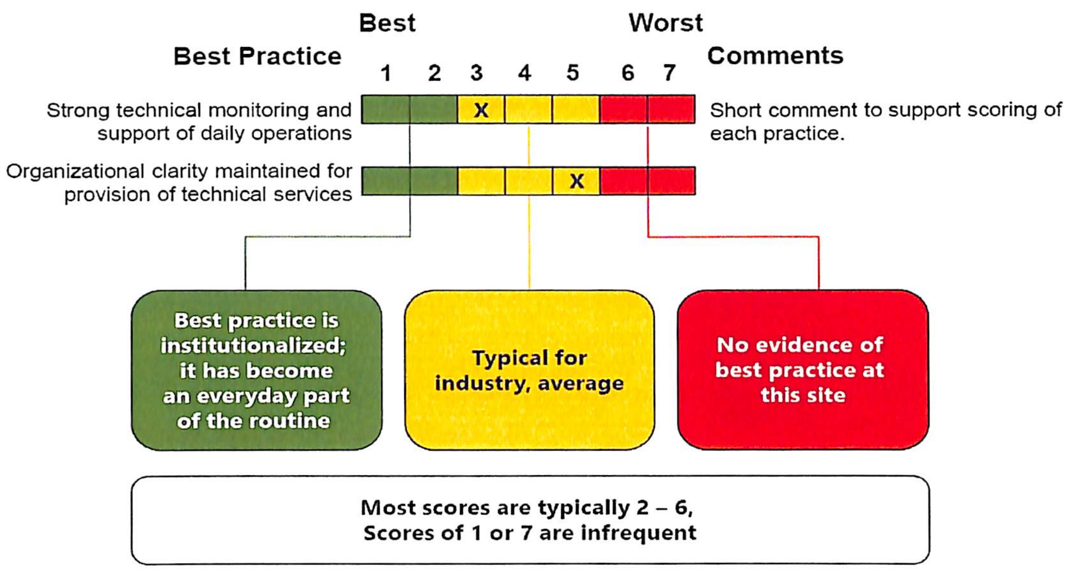


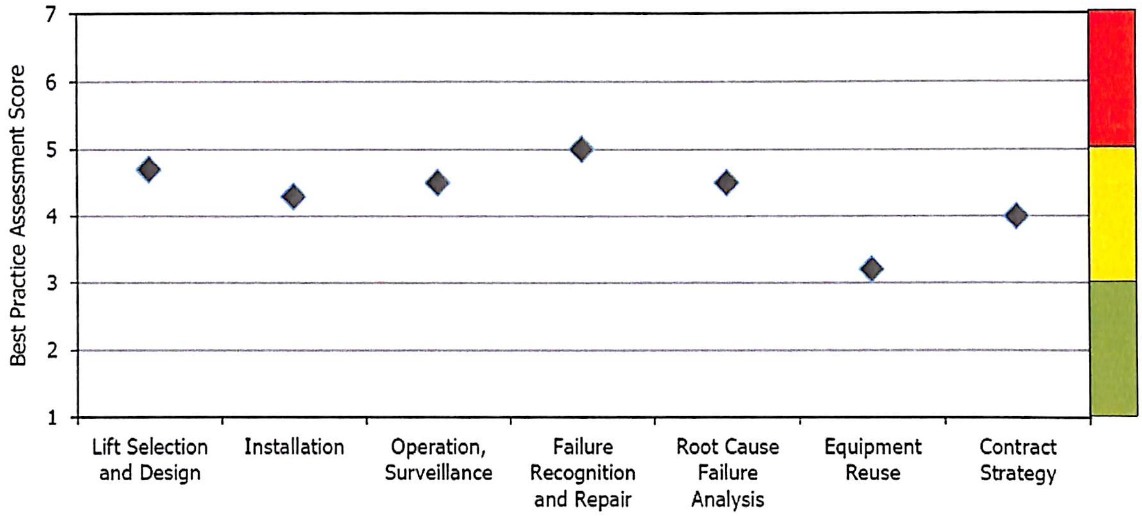
Figure 8.2: Process Practices Scoring Methodology

8.3 Best Practice Scorecard Summary

Following Best Practice Elements of the assessment was to focus on the most leveraging areas identified during the in the benchmark study

- ESP Performance
- Production Loss
- Maintenance

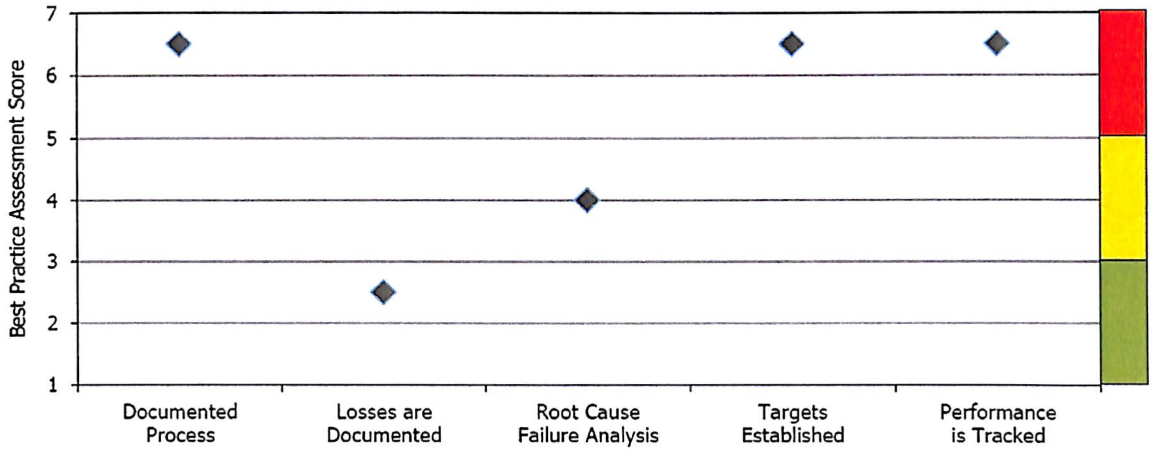
8.3.1 ESP Performance - Systems and Processes



ESP Performance - Observations

- Company's definition of failure is much more restrictive than the industry has adopted. In general, the industry considers any failure of the entire pump installation to perform as an ESP failure.
- A failure tracking process is not evident in place to monitor progress in evaluating failure causes and recommendations for actions to improve run times.
- KPIs should be kept to track the number and causes of failures to identify opportunities for making design or operating changes to improve performance.
- Operations report is kept in the production centers. Loss events are captured and work is scheduled. Priorities are set at a local level.
- Multiple teams across various directorates and support teams involved in the process. We witnessed limited work processes and KPIs that align the various teams to ensure seamless delivery

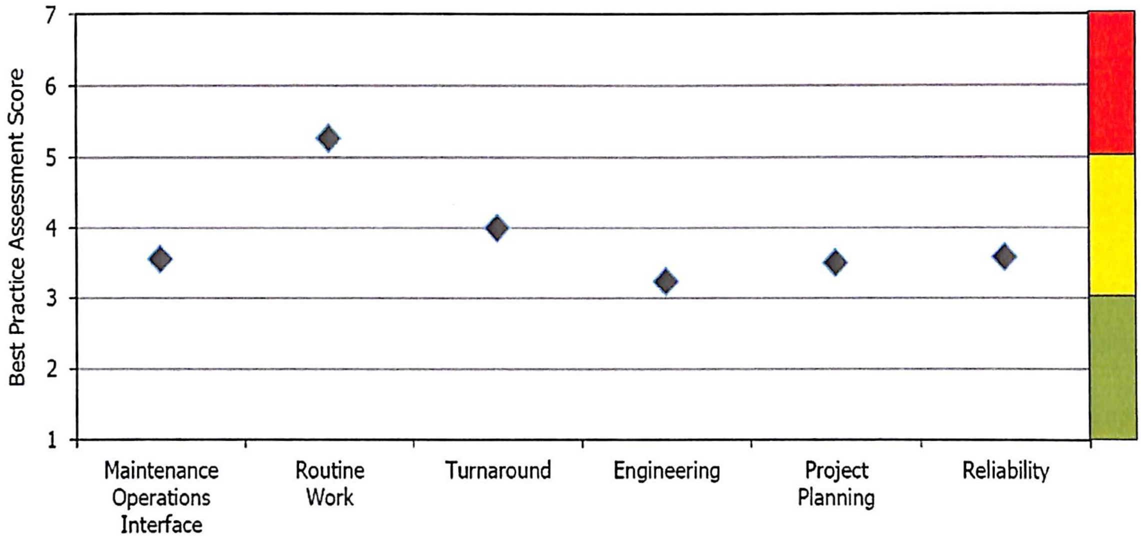
8.3.2 Production Loss



Production Loss - Observations

- Loss Management process does not appear operationalized and performance managed at the most critical levels in the organization – local operational and technical support teams
- No assigned roles to manage individual production losses. Production loss data is captured in company's online database system, but there is no evidence of documented practice or process.
- A formal top loss failure report is not available. A task force is formed to address some issues
- Operations efficiency is not talked about. Business objective is production target based.
- Losses are documented, but are not reported or prioritized.
- Performance is reviewed on a systematic basis though not daily and not against a dynamic model.

8.3.3 Maintenance



Maintenance - Observations

- Better utilization of management tools such as EBeams system
- Contracts review and management (based on hard data) for future favorable negotiation outcome for the Company.
- Better planning and coordination across teams to balance workload – a 3-week partial look ahead schedule usage is recommended.
- Sharing of maintenance resources across Gathering facilities streamlining work across contractors.
- Reduction of surplus personnel available at the Gathering facilities.
- Reduction of overtime with reduced variability of workload
- Reduction of repeated tasks that can be avoided with elimination of defects
- Through training/coaching Company personnel impart a cost consciousness mindset while executing maintenance tasks
- Consider a work and manpower optimization solution to help the organization to prepare for growth in providing maintenance services as it strives to be a global leader in industry.

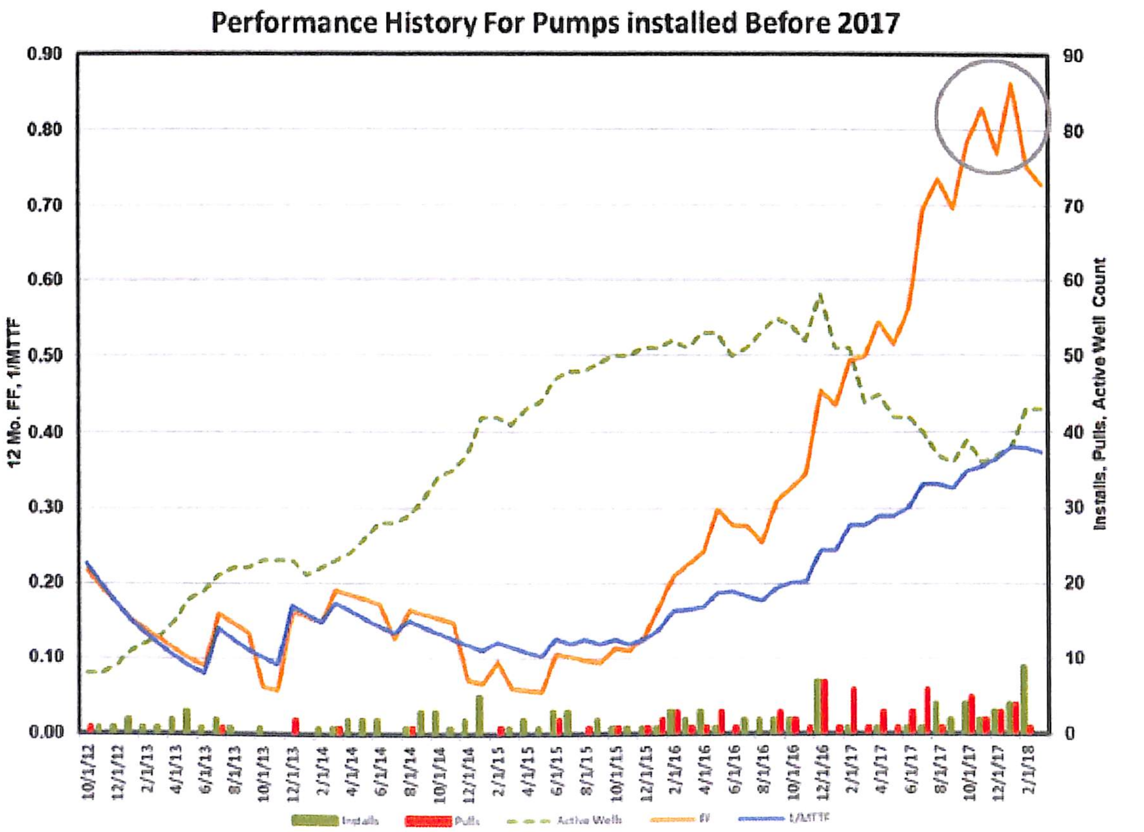
8.4 Benefits and Future Scope

Following future scope were identified for the benefit of the organisation, obtained during the Benchmarking analysis

8.4.1 Improve ESP Performance

Action Plan - Premise

- From the benchmarking analysis, well servicing costs are increasing and well servicing as a percentage of total operating cost is also increasing.
- The failure frequency of ESPs is increasing.
- Data shows there is a significant opportunity to reduce the cycle time between a pump failure and restoring production.



Action Plan – Activity

Following activities to adhere for improving ESP performance

- Work on ESP Work Process
- Prepare Cycle Time Tracking Template
- Suggest Failure Tracking Template
- Prepare Failure Tracking Workbook
- Present Elements of an Effective Artificial Lift Program
- Prepare KPIs
- Guide in selection of proper EFT vendor
- ESP team for standardization of Wellhead
- Adapter thereby reducing costs for the company

Action Plan – Benefits

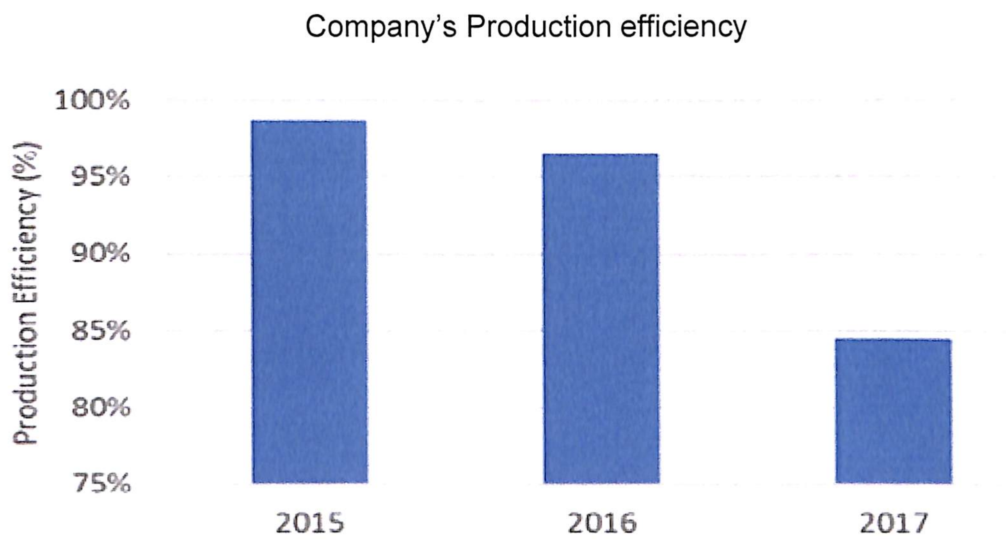
The range of outcomes by implementing the Action Plan and improving ESP operations is significant.

Annual Benefit, MM USD	Scenario	Comments
260	A	• This is likely the minimum benefit achievable. • Reduction of 80 ESP failures per year (0.8 to 0.6 FF for 400 wells & 60 days to restore production from 94 days) • Reduce average downtime days for each failure from current 94 days to 90 days (0.6 FF*400 wells-240 fails) 1000 bbl/d per well, and 45 USD/bbl.
693	B	• Reduction of 174 ESP failures per year (achieves 0.365 FF (1000 day run target) from current 0.8, 60 days to restore production from 94 days). • Reduce average downtime days for each failure from current 94 days to 60 days (0.365FF*400 wells-146 fails) 1,000 bbl/d per well, and 45 USD/bbl.

8.4.2 Production Loss

Action Plan – Premise

- From the benchmarking analysis, production efficiency declined from 98.7% (2015), to 96.5% (2016) to 84.5% (2017)
- The highest volumes of production losses are associated with the following downtime reasons: Closed Pressure,
- ESP Trip/Failure, Request of Operations, and Rig Workover.



Action Plan – Activity

Following activities to adhere for Production Loss:

- Template KPI Reporting and Owners for Each Key Loss
- Top Management Production Report
- Manager Report – Closed Pressure
- Manager Report – ESP Trip/failure
- Manager Report – Request for Operations
- Manager Report – Rig Workover Submitted
- Manager Report – Shut Down for Major Survey
- Manager Report – Shut Down for Project
- Company's Production Loss Report – Distribution List

Action Plan – Activity

Key Process	Industry Leaders Prior Assessment	Industry Leaders After Assessment
1. All key losses have owners	🔴	🟢
2. Losses are forecasted and performance managed continuously. Success in performance management is a gradual reduction for overall losses and high-volume losses	🔴	🟢
3. Monetary value of losses is documented and communicated to stakeholders	🔴	🔴
4. A management systems document (practice, procedure, guideline) defines the roles, responsibilities, processes, KPIs, etc.	🔴	🟢

Action Plan – Benefits

- In 2017, Company produced approximately 1.4 million barrels of oil per day.
- A 1% reduction in oil losses, will contribute an additional 5 million barrels of oil per year. At oil price of 45 USD per barrel, the 1% improvement contributes 225 million USD in value. From company's past performance, a 1% reduction in losses or 5 million barrels is a reasonable expectation.
- Closed Pressure Loss Category
- Closed Pressure Losses were 11.6 million barrels.
- 5.2 million USD benefit if reduces 2017 Closed Pressure by 1%.
- 1% X 11.6 million bbls X $45/bbl= 5.2 million USD

8.4.3 Maintenance

Wrench time Analysis

Conducted a Wrench Time Assessment to provide details manpower levels and activities of the contract maintenance personnel.

	Facility -1			Facility-2		
	Instrument	Electrical	Mechanical	Instrument	Electrical	Mechanical
Contractor hours per day on site	8	8	8	8	8	8
Number of instrument contractors on site	11	6	10	20	12	16
Days in the study	22.75	22.75	22.75	23	22	23
total hours on site	2002	1092	1820	3680	2112	2944
Hours working	1013	998	1378	2387	1467	1826
Wrench time (hours per day)	4.0	7.3	6.1	5.2	5.6	5.0

Action Plan – Activity

Average per facility as per the above Facility-1 and 2.

Man Days	Instrument	Electrical	Mechanical
OnSite	15.5	9	13
Personnel Working	9	7	9
Onsite Excess Resources Initially	6	2	4
Target to Reduce (Short Term)	3	0	3

Action Plan – Benefits

	Facility -1			Facility-2		
	Instrument	Electrical	Mechanical	Instrument	Electrical	Mechanical
Total Average hrs Per Day - Onsite	88	48	80	160	96	128
Total Average hrs Per Day - Working	44.5	43.9	60.6	103.8	66.7	79.4
Difference	43.5	4.1	19.4	56.2	29.3	48.6
Excess Man-days	5.4	0.5	2.4	7.0	3.7	6.1
Cost per Person (USD26K/Yr)	141,286	13,429	63,143	182,707	95,284	157,978
Total Excess Cost per Man-day per Year	217,857			435,969		
Total Per All GCs	3,050,000			6,103,564		

- Phased reduction in contractor personnel an annual direct trade specific total cost reduction potential of 3M to 6M USD (reduction availability of 3.8M to 7.4M) USD
- Additionally, reducing the repeated and redundant activities will add additional savings for the company. The estimate is based on the Wrench Time study conducted on two facilities and extrapolated to all other facilities in the company.

Chapter 9

9 CLOSING SUMMERY

9.1 Challenges

Complex organization which includes many groups that create silos and are not aligned or linked through KPMs to common work processes that can impact efficiency and effectiveness. An optimized workforce that is properly organized within the company can smooth out many of the challenges.

- A reluctance to change.
- Long cycle times to fully implement new processes.
- Long cycle times to implement projects.
- Significant technology and data investments that have not been effectively utilized to run the business (i.e. quality of data)
- Lack of cost awareness
- Increasing water cuts that will continue to bring significant
- Challenges on operations and the wells and facilities.
- None of the challenges are considered to be insurmountable. However, the importance of Company's leadership to foster changes is important to ensure that changes are sustained.

9.2 The Potential Prize....

- Significant potential value exists with continuing implementing our recommendations that address proactive defect elimination, cost awareness and optimization, and standardization of key work practices:
- By improving Production Efficiency, company have an opportunity of 450MM USD to get to leader level (+2% efficiency gain)
- By addressing ESP Performance have an opportunity of 280-693MM USD to get to leader level
- By addressing Maintenance, Reliability, and Contract Management, Company have an opportunity to optimize manpower, overall contract cost, and ultimately eliminate defects (i.e. less losses). Contract manpower alone can Provide 4-7 million per year.
- Key to develop holistic and consistent Performance Management approach to ensure transparency, improved alignment and teamwork, and aligned scorecards to drive more consistent performance across the organization (Field development Well Surveillance, etc.)
- Consistent benchmarking of Company's operations and Best Practices becoming a culture in the company can provide continuous improvements making a leader in the similar organization.

Chapter 10

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APPENDIX – X

INTERVIEWER SCRIPT

- What are operational KPI's?
- What are operational key performance indicators KPIs?
- What are KPIs what is benchmarking and how do you do it?
- How do you write KPI's?
- What are key performance indicators examples?
- What is a good KPI?
- What are the four types of benchmarking?
- What are the most important KPI?
- How do you find KPI targets?
- What is benchmark example?
- How is benchmarking used to evaluate performance?
- How do you analyze benchmark data?
- What is a benchmark analysis?
- How do you write an effective competitor analysis?
- How do you Analyse assessment data?