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# Toward TQM Application in the Lube Oil Plant at Azzawiya Oil Refining Company: Situation Analysis

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**Abstract**

Total Quality Management (TQM) is a management system uses an integrated collection of principles: philosophies, sciences, techniques and tools, to manage all and achieve excellence. To introduce TQM to a running organization, situation analysis is needed first. This paper presents a situation analysis carried out in the period 2014-2015 to examine and identify the possibilities, needs and steps, to introduce TQM to the Lube Oil Plant at Azzawiya Oil Refining Company. Data was collected through surveys and interviews with a representative sample from the plant workforces. The sample was selected from different levels, jobs, fields, departments, ages, education, gender and experience. The collected data cover, measure, assess, and identify the situation in four TQM's dimensions. To extract the necessary information and conclusion, statistical analysis using SPSS is presented. The results illustrate a partial application of TQM's principles. The plant strength and weakness points to apply a TQM system are given in the form of weighted moving average values of four sets of parameters; one set in each dimensions.

*Keywords:* TQM; situation analysis; gap analysis; continuous improvement; production capacity.

## 1. Introduction

Azzawiya Oil Refining Company (ARC) was established in Zawia City, Libya, and started production in 1974. In 1983, the Lube Oil Plant (LOP) property was transferred to the Company. This plant produces 60,000 tons per annum of lubricating oils through its production lines for blending and filling of mineral oils [1]. In September 2014, ARC announced a development project to improve the company overall performance including the development of the LOP [2]. According to given information in [3], the project is to:

- Increase the plant capacity to 100,000 tons/year.
- Increase the flexibility of mixing to produce new types of oil according to the market needs.
- Change the packaging to cans of its creditors (Plastics) instead of metal cans.
- Improve the canning processes to provide cans of different sizes depending on market requirements.

In parallel to these goals, one of the additional goals that could be suggested is to develop the applied QMS by introducing TQM to the LOP. Since its recognition in 1980s, TQM is used to improve the individuals, components, and overall performance of almost any type of industrial organization [4, 5]. Figure 1.1 gives the project phases for a QMS implementation [5]. The scope of work in this paper is lying in the analysis phase shown in this figure; definitely comparison between current and desired situation in TQM to identify the gab.

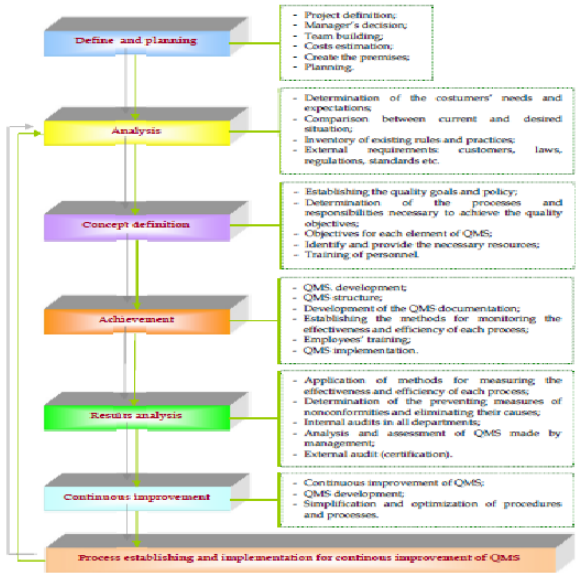


**Figure 1.1:** Project phases for a QMS implementation, [5]

## 2. Material and Methods

To identify the gap between the existing management system and a desired QMS based on TQM, the following steps/stages are implemented:

### 2.1. Design

1. Setting the study plan components; goals, limitations, procedure tools, and initial time based program.
2. Implement in and out of field meetings and interviews with management and staff for initial data collection and review.
3. Data from step A-2 was used as a feed back into A-1. The steps are repeated until a satisfactory study plan was reached.

### 2.2. B- Implementation

1. Review the available data and literature.
2. Introductory meetings/interviews with staff to collect initial data.
3. Design the required data collection tools and templates about:
   - The LOP's background, structure, resources and management.
   - Products types and specifications.
   - The triggered development project.
   - The current operational situation.
   - The production processes.
   - Management practice.
4. Specify the study basic parameters. Based on commonly used equations to determine the sample size, [6], with 95% confidence, 5% standard error, and 50% for the true and false probabilities of items to be studied, a sample size (90) was determined for the total population size (118); the LOP's manpower size during the study period. Taking into consideration the commonly used guidelines for data collection and questionnaire design [7-9], a questioner was designed using third Likert scale. The weights for the choices (agree, neutral, and disagree) are 1, 2 and 3 respectively while the weighted mean of the possible attitudes are (1.00-1.66), (1.67-2.33) and (2.34-3.00) respectively with a period size (0.66).
5. Carry out preliminary tests. At the questionnaire testing and modification phase, 20 questionnaires are distributed. Collected feedbacks were used to improve the draft. Reliability and internal consistency tests are carried out using SPSS (Statistical Package for Social Sciences) where the calculated Cronbach's alpha coefficient, [10-11], is found equal to (0.963). Later, the questionnaire in its final form is distributed to collect the required data. In addition to basic information about surveyed persons/sample (age, gender, job, position, education, experience, training, and awareness about quality management), the questionnaire collect data about organizational structure and management system; planning processes, leadership, factual approach, customer focus, continuous improvement, and production capacity improvement.
6. Explain and distribute the questionnaire to the surveyed sample.
7. Collect back the questionnaires and exclude any improper/incomplete ones. Number of collected questionnaires was (81) and number of suitable ones, for analysis, was (76).
8. Put collected data into suitable format for statistical analysis.
9. Feed the data into SPSS.

### 2.3. Analysis

1. Define the basic characteristics (age, gender, job, education, experience, and awareness and training on quality principles) of the surveyed sample using the proper descriptive statistical measures.
2. Calculate the arithmetic Weighted Average Value (WAV) and Standard Deviation Value (SDV) of each parameter in the dimension.
3. Calculate the average and standard deviation of each dimension.
4. Identify the strength and weakness in each dimension.
5. Identify the gap and the proposed improvements.

## 3. Results and Discussion

### 3.1. Basic characteristics of the surveyed sample

- Age distribution: Table 3.1.
- Gender distribution is: 92% Males and 8% females.
- Job distribution is given in Table 3.2.
- Education distribution is given inTable 3.3.
- Experience distribution is given in Table 3.5.
- Percent of employees attended training programs on quality issues: 18%
- Percent of employees interested in quality issues: 13%
- On a Likart scale of five, the overall WAV of the surveyed sample‘s knowledge/awareness/understanding about ISO9001, TQM, Six Sigma, CE Diagram, Illustrative Diagrams, Process Flow Chart, Histogram, Statistical Sampling, Pareto Chart, and Inspection is 1.44; very weak.

**Table 3.1:** Age distribution of surveyed sample

| Age (years) | 20-30 | 30-40 | 40-50 | 50- |
|---|---|---|---|---|
| Percent % | 20 | 37 | 32 | 11 |

### 3.2. TQM dimensions and related parameters

The considered TQM dimensions and its related parameters in the study are given in Table 3.4. For each dimension, the index value is used to represent its parameters on the horizontal axis of Figures 3.1 through 3.4.

#### 3.2.1. Leadership

The management role and performance in the leadership dimension was measured based on the sample response to the stated (14) parameters in Table 3.4. In Figure 3.1, series (1) is used to represent the WAV of each parameter while series (2) was used to represent the corresponding SDV. The Overall Weighted Average Value (OWAV) for Leadership (OWAVL) is equal to (1.67), the Corresponding Standard Deviation (CSD) is (0.16), and the Coefficient of Variance (COV) is (9%). The results show a partial application for the leadership dimension. The WAV of introduction to employee parameter reflects a priority to direct additional work on the introduction of TQM to employees.

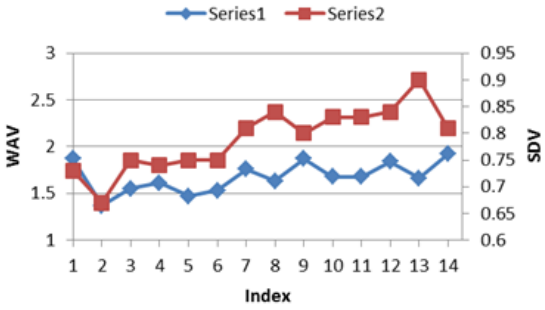


**Figure 3.1:** WAV and SDV of Leadership TQM‘s related Parameters

### 3.3. Factual Approach

In same manner, Figure 3.2 shows the WAV and SDV calculated from the sample response to the (15) factual approach related parameters given in Table 3.4. The OWAV for Factual Approach (OWAVFA) is (1.86); a partial application for the dimension. The CSD is (0.14) and COV is (7%). The results show a need for additional work on quality based evaluation for suppliers.

### 3.4. Customer Focus

Figure 3.3 gives the WAV and SDV for the (11) customer focus related parameters given in Table

**Table 3.2:** Jobs distribution of surveyed sample

| Job | Administrative employee | Technician | Customer Service employee | Department Head | General Manager |
|---|---|---|---|---|---|
| Percent % | 16 | 64 | 3 | 12 | 5 |

**Table 3.3:** Education distribution of surveyed sample

| Education | B.Sc. | Higher Institute Diploma | Middle Institute Diploma |
|---|---|---|---|
| Percent % | 9 | 36 | 55 |

3.4. The OWAV for Customer Focus (OWAVCF) is equal to (1.99), CSD is (0.17), and COV is (8%). All the parameters of this dimension are either fully or partially applied.

### 3.5. Continuous Improvement

In Figure 3.4, the WAV and SDV are given the (10) continuous improvement related parameters given in Table 3.4. The OWAV for Customer Improvement (OWAVCI) is equal to (1.77), the CSD is (0.22) and the COV is (12%). The results reveal a strength point for the quality training programs on specific tasks the company provides. The WAV of the 5$^{th}$ parameter, encouragement of innovation and modernization of working procedures, reveals a weakness that deserve additional efforts to improve the performance of the company on this issue.

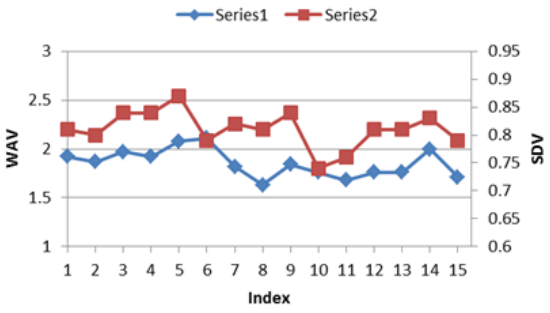


**Figure 3.2:** WAV and SDV for Factual Approach TQM's related Parameters

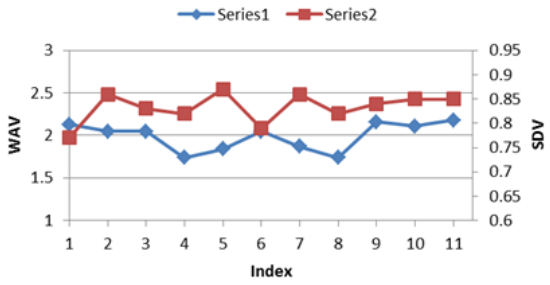


**Figure 3.3:** WAV and SDV for Customer Focus TQM's related Parameters

**Table 3.5:** Age distribution of surveyed sample

| Experience (years) | 1-5 | 6-10 | 11-20 | 21- |
|---|---|---|---|---|
| Percent % | 17 | 21 | 43 | 19 |


**Figure 3.4:** WAV and SDV for Continuous Improvement TQM's related Parameters

## 4. Conclusion

TQM is an increasingly used management system in different industries. The study is carried out

**Table 3.4:** The considered TQM dimensions and parameters

| Index | Dimensions and Parameters | | | |
|---|---|---|---|---|
| | Leadership | Factual Approach | Customer Focus | Continuous Improvement |
| 1 | Awareness | Human capacities | Quality improvement for competition and surviving | Design and production goals are based on market demand |
| 2 | Introduction to employees | Identification and solution of organizational problems | Customers desires and requirements | Modernization and development for production quality improvement |
| 3 | Application | Error solving instead of punishing | Relationships with customers | Importance of training on quality |
| 4 | Working environment | Clear duties and responsibilities of each employee | Diagnoses for quality level changes | Encouragement of continues technology development |
| 5 | Bonus and incentives system | Maximum utilization of tools and equipment | Customer focus to achieve TQM | Encouragement of innovation and modernization of working procedures |
| 6 | Financial and human resources | Quality and price factors in procurement | Response to complaints on quality issues | Commitment of top management to continuous assessment and change programs |
| 7 | Mutual trust with employees | Minimum utilization loss of resources | Monitoring and measurement of outputs | Operations continuous quality control |
| 8 | Clear strategy | Quality based evaluation for suppliers | Honesty in customers service | Quality training programs on specific tasks |
| 9 | Practical and realistic policies to achieve goals | Quality documentation and records for resources and goods | Seeking society satisfaction to achieve the company goals | Increased society recognition of the factory and its projects |
| 10 | People involvement | Knowledge of working standards | Measure the stakeholders satisfaction | Focusing on management and procedural system improvement to satisfy society demands and integration |
| 11 | Improvement of bonuses and incentives system | People involvement in production quality assessment | In-time product and services delivery | |
| 12 | Studies to ensure contracts satisfaction | Decision support information system | | |
| 13 | Resources utilization | Financial control system | | |
| 14 | Effective communication systems | Modern systems for maintaining files and reports | | |
| 15 | | Impact of information and communication systems and techniques on factory service quality | | |

to identify the possibilities to apply TQM in the LOP at AORC. The study covers four TQM's dimensions: leadership, factual approach, customer focus and continuous improvements. A set of parameters for each dimension is considered and the WAV of each parameter was used to identify the strength and weakness points to apply the TQM's principles. In general, the results illustrate partial application of these dimensions; which represents a good chance to start if the top management decided to adopt TQM in parallel to the development project it has announced in the year 2014. The results illustrate a need for additional work on parameters of remarkable low WAV such as: introduction of TQM to employees in the leadership dimension, quality based evaluation for suppliers in the factual approach dimension, and encouragement of innovation and modernization of working procedures in the continuous improvement dimension. Additional studies are advised for either additional parameters on the considered dimensions or other TQM's related dimensions such as relationship with suppliers, people involvement, process approach and system approach.

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