

# Soap Industry In Sudan: Challenges And Opportunities

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**Abstract:** The purpose of this study is to identify relationship between the working situation of soap industries in Sudan and their engineering management strategies, considering number of samples of soap industries which facing a problem of misunderstanding of applying the total quality management systems in Sudanese soap factories (which are almost owned by famous rich families), as a one of the total profit indicators when taking into consideration the competition and consumer satisfaction, beside the long term conservation of energy and machinery life. To discover the fact behind this, clear links have been establish between the evaluation of strategies and the summary of findings derived from the raw data, by using the inductive method represented by observation, data collection, pattern of data, hypothesis and generalization a theory, which confirms the prediction, that the chosen samples were suffering directly from engineering management strategies execution, either for energy management or materials management systems, because of lacking or not applying the proper strategy.

**Key words:** Family business, Quality system, Strategy execution, Technical facilities

## 1. Introduction

This review article keep focusing on the important effectiveness of different type of engineering management strategies in chemical industries in Sudan, which the previously paper reflect the textile industry, which witnessed a huge collapse as a direct result of the government policies, which started by reducing the agricultural area of cotton seed and followed by failure into manufacturing process, limit the rehabilitation of old equipment, stop a huge number of workers and engineers, beside the problem of energy (not available on a permanent basis or a significant program) [1].

### 1.1 Soap industries

Soap is a product which is formed by the process of 'saponification', in chemistry soap is a salt of a fatty acid [2]. Soaps for cleansing are obtained by treating vegetable or animal oils and fats (Coconut Oil, Olive Oil, Stearin, Palm ...etc.) with a strongly alkaline solution. Fats and oils are composed of triglycerides; three molecules of fatty acid attach to a single molecule of glycerol [3]. The alkaline solution, which is often called lye (although the term "lye soap" refers almost exclusively to soaps made with sodium hydroxide), brings about a chemical reaction known as saponification. Consumers mainly use soaps as surfactants for washing, bathing, and cleaning, but they are also used in textile spinning and as important components of lubricants.

The Action of soap described; when used for cleaning, soap allows insoluble particles to become soluble in water, so they can then be rinsed away. For example: oil/fat is insoluble in water, but when a drops of soap are added to the mixture, the oil/fat solubilizes into the water. The insoluble oil/fat molecules become associated inside micelles, tiny spheres formed from soap molecules with polar hydrophilic (water-attracting) groups on the outside and encasing a lipophilic (fat-attracting) pocket, which shields the oil/fat molecules from the water making it soluble. Anything that is soluble will be washed away with the water.

### 1.2 History of soaps

The earliest recorded evidence of the production of soap-like materials dates back to around 2800 BC in ancient Babylon [4], for which a formula of soap consisted of water, alkali, and cassia oil Now the global outlook on Soaps and Detergents provides a collection of statistical reports about soaps and detergents industries, a lot of brands and a massive competition between hundreds companies worldwide [5].

### 1.3 Soap-making processes

The industrial production of soap involves continuous processes, such as continuous addition of fat and removal of product. Smaller-scale production involves the traditional batch processes. The three variations are: the 'cold process', wherein the reaction takes place substantially at room temperature, the 'semi-boiled' or 'hot process', wherein the reaction takes place near the boiling point, and the 'fully boiled process', wherein the reactants are boiled at least once and the glycerol is recovered. The glycerin remains in the soap and the reaction continues for many days after the soap is poured into molds. In addition to the handmade soap for small scale industries. The following chart show the steps of soap-making processes.

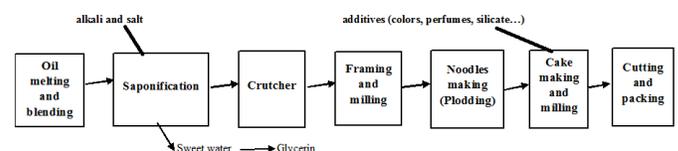


Fig. 1. Soap-making processes flow diagram

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## 1.4 Purification and finishing

In the fully boiled process on an industrial scale, the soap is further purified to remove any excess sodium hydroxide, glycerol, and other impurities, color compounds, etc. These components are removed by boiling the crude soap curds in water and then precipitating the soap with salt. At this stage, the soap still contains too much water, which has to be removed. This was traditionally done on chill rolls, which produced the soap flakes commonly used in the 1940s and 1950s. This process was superseded by spray dryers and then by vacuum dryers. The dry soap (about 6–12% moisture) is then compacted into small pellets or noodles. These pellets or noodles are then ready for soap finishing, the process of converting raw soap pellets into a saleable product, usually bars. Soap pellets are combined with fragrances and other materials and blended to homogeneity in an amalgamator (mixer). Different kinds of detergent additives are included in each type of particular soap (bath soap, medical purposes soap, cosmetics soap, ...etc.) for example sodium laureth sulfate and sodium palmitate added as cleanser with high-foaming properties also add sodium coco ate for sensitive skin [6].

## 2. Materials and Methods

The objectives of this paper are:

- To establish clear links between the Evaluation and the summary of Findings derived from the raw data.
- To generalization law-like theory

By using the inductive method to verify the process of derivation of general principles from the specific observations The general inductive approach [7] has followed the following steps:

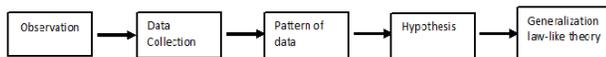


Fig. 2. Inductive strategy method flow chart

## 2.1 Observation/ Sudan Soap Industry Capacities and Status

In Sudan soap industry is distinguished by high range of manufacturing capacities estimated at 520 thousand tons washing soap, 40 thousand tons powder, 20 thousand tons toilet soap which can supply all the demands of the country and there is surplus for export [8]. All this amounts belong to famous family business (for example: Moawia Elberier Group, A.Kambal Factory for Soap & Liquid Detergents, Tawfiq soap factory, Tagooj soap factory and Alteital Group), which the specification qualities of each soap brand so far away from the high quality of the international products.

## 2.2 Data collection

Investigation and evaluation depend on the following types of data:

1. Process technical techniques
2. Chemical and physical specifications
3. Materials consumption and cost
4. Management policies

## 2.3 Pattern of data

### 2.3.1 The Main Ingredients and additives of Soap (Bar, liquid or powder) determine the Qualities of each soap brand

Which chemical and physical characteristic of soap such as Hardness, Cleansing, Condition, Bubbly and Creamy ... etc., are indicators of the soap's qualities. Each recipe content values (either the typical values or especial values) contributes certain qualities to the soap, the following table show the most important characteristic with the international standards (IS)

Table 1 : Toilet Soap chemical and physical characteristic

Characteristic	Definition	Range INS
Hardness	This refers to the hardness of the soap bar	29 to 51
Cleansing	This refers to the soap's ability to grab on to oils.	12 to 22.
Condition	Conditioning refers to the soap's emollient content.	44 to 69
Bubbly /Creamy lather	This value indicates the stability and creaminess of the lather	16 to 48
Iodine	Number of grams of iodine that will react with the double bonds in 100 grams of fats or oils.	136 - 170

INS - A measure of the physical qualities of the soap [9]

### 2.3.2 Soap Materials Specification and Average Cost Estimation

The following tables show the comparison results between different Sudanese brands and Sudanese Standards & Meteorology Organization (SSMO) [10]:

Table 2: Toilet Soap specifications of quality comparison

Product's quality specification	Brand 1	Brand 2	SSMO standard
Free fatty matter (%)	0.35	0.22	Not more than 0.25 %
Total fatty matter (%)	75	77	Not less than 78 %
Free total alkalinity (%)	0.21	0.08	Not more than 0.19%
Moisture contents (%)	10.8	11.6	Not more than 12%
Insoluble matter in water (%)	traces	Nil	Not more than 0.5%
Insoluble matter in alcohol (%)	0.08	Nil	Not more than 0.2%
Colors	Pale	Good	Good color
Perfumes	light	Good	Good smell
Healthy substances	light	Non	Referring to IS
Cosmetics	Non	light	Referring to IS
Others	Non	Non	Referring to IS
packaging	1layer	2layers	Three layers

- Which brand (1) represent: soap produced under quality management system
- Which brand (2) represent: soap produced traditional conditions

Table 3: Toilet soap cost evaluation over view

Ingredient for purpose of	Average component content (%)	Average cost (kilogram) \$	Ingredient cost from average total cost (%)
Color	0.03	1100	$0.22 \times 10^{-3}$
Perfume	0.1	1400	$0.34 \times 10^{-1}$
Health	0.75	1000	1.50
Cosmetics	0.8	12000	19.2
Others	0.4	1600	$1.3 \times 10^{-1}$

- It's very important to note that: prices of the above ingredients have a widely ranges so the real cost evaluation depend on the quality formula of toilet soap, which each factory working on it.

## 3. Results and Discussion

### 3.1 Hypothesis

Applying the total quality management systems (TQM) either on the quality of work or the quality of products, making a high profit with minimum risks and costs through:

understanding (by business owners) the rules and principles, the relation between applying the system and making profit, long term conservation of energy and machinery life also easiness of the adaptation to the market demand which plays a good role for controlling this industry

### 3.2. Points of discussion/ Soap Industry

#### A. High quality soap production to reach high profit

Expert and professional engineers assure that this equivalent concept production could be achieved in soaps and detergents industries, because of the following reasons: -

1. The overall concept of quality it's not necessarily mean a product or service with a high cost but it's the desire of reaching the aspirations of the consumer, by investigate the consumption trends among customers item, so the product can be produced with the total requirements of the majority of users (designated item) and therefore can deliver the products to the consumer with the least possible cost.
2. The way to access to the production of certain items (soap) may pass through the use of many production inputs such as raw materials, energy, labor and technology of production. Which all these elements must be studied carefully and accurately to reach the best formula that what can be closer to satisfy consumer desire, and at the same time be the least expensive in the composition of raw materials, reducing waste, using less energy and workers with higher productivity techniques.

#### B. The importance of Total Quality Management system (TQM) application in soap factories

One of the most important overall quality elements is; to do the right thing from the first time and continue for all coming times, which of course couldn't be real without the executing of all of instructions of TQM system, accurately and regimentation, for all process steps of manufacturing, starting from the requesting of raw materials and other inputs for manufacturing down to the marketing, distribution and sales Quality assurance team always make sure that there is no laxity in following up on any processing points and thus sustainable production as the required quality, required quantity and required cost.

#### C. Business owners' reaction

Despite the willingness of many businessmen to adopt a comprehensive quality policies, however, some of them didn't have the commitment for implement the requirements of this policy and or they are unable to provide the critical supports which required when proceed or making the overall quality application during productivity time, which this, unfortunately, caused by the mistaken belief of the business owners among a lot of money and the introduction of comprehensive quality systems which bring them into unnecessary costs leading them to weaken position in the competitive market. Beside the matter of their employees, whom see the quality system as a burden thrown on them, which need efforts they don't wish to do it or deal with it. Quality for soaps and detergents or any other goods or even services must have a commitment from the top

management of the factory and then descends by this commitment from the top of the pyramid career ladder to less employment, otherwise be trying to implement quality systems like plowing the sea. Convince employers to construct good/proper system formulize all management policies will prove that the quality of their product would not be a discount on their profitability or their market share. On the contrary built their good reputation organization associated with the process of overall quality resulting in savings in materials, energy and effort also raise the efficiency of workers when have and focus on good time management. When workers return to work instructions attached with each process steps of manufacturing production, marketing, accounts, stores,.... etc. makes them more aware of and follow-up to their work and reduces the chances of errors and conflicting responsibilities and burdens between the sections which this makes the work of each one concerned more streamlined, organized and thus easier for those who carried out work in various specialties, in the end, workers may all make quite keen to adopt a quality policy and its continuity.

### 4. Finding & Recommendations

The following table represents the major problems and their recommendation for surviving the problem in a summary way

Table 4: Problems and the Recommendations/ Sample 2

Problems	Recommendations
SSMO wide range of specifications	Standards' new Modification to narrow the soap specification tolerances for each type of soaps
Old factory/ old techniques	Bring modern units and rehab the old processing units which minimize cost of time and money
Management systems existence and continuity	Recruit efficient employees to adopt and implement the quality assurance system
Family business language	Train engineers on cost assessment and evaluation techniques, beside the total quality management applications
Cost & consumer	Assure that during this era the consumer satisfaction due to the combination of quality and price - (market survey)
Vegetable oil production	Develop the vegetable oil industries will be reflected on the quality of soap as a byproduct (soap stock)
Government soap factories	Establish governmental soap factories allowed and facilitate the application of TQM systems

### 5. Conclusions

- In Sudan the quality specification of soap have a widely ranges which allowed the Sudanese soap factories to produce soap with the minimum quality (from the health, cosmetics and promotion point of views) when compared it with the international products
- The total quality management system as concept and outcome benefits well understood by the expert engineer but they couldn't deliver to the business owners and convince them to apply this kind of system into their factories, which related to lack of engineers' knowledge of machine cost estimation, financial and marketing evidence langue's
- Working without quality system standards will affect directly on machine shelf life, market reputation and employee sustainability
- This paper highly recommended to apply the total quality management in soap factories in Sudan and keep working on it, also to be attention that the high quality of soap didn't mean production with high cost.

### 5.1 Generalization Theory

Some of soap industries in Sudan are facing engineering management problems as a direct result of management strategies executions, either this execution related to: planning or problem solving or making decisions, hence created a lot of number of weak points that led to collapse of the quality, machinery and materials conservation systems at this kind of industry.

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