**Soap Industry**

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**History:**

Soap got its name according to an ancient Roman Legend from “Mount Sapo” where animals were sacrificed.

Rain washed a mixture of melted animal fat or f and wood ashes down into the clay soil along the Tiber River. Women found that this clay mixture (Soap) made their wash cleaner with much less effort.

**What is Soap….??**

Soap is a cleansing agent created by the chemical reaction of a fatty acid an alkali metal hydroxide.

Raw materials mostly obtained from animal kingdom (fat) and plant kingdom (oils). Soap is of natural origin so it is biodegradable and eco friendly.

**Raw Materials:**

Traditionally soap has been manufactured from alkali and animal fats. Although vegetables products such as palm oils, coconut oils, almonds oils are used now a days.

**Composition of Soap:**

* **Alkali materials** KOH, NaOH (50% of fats)
* **Fat** (Tallow with 20% grease)
* **Oil** (Coconut 15%)

**Alkali Materials:**

Alkali material most commonly used today is NaOH. KOH can also be used. Potassium based soap creates more water soluble products than sodium based soap. So it is called “soft soap”. Soft soap alone or with sodium based soap commonly used in shaving products.

**Fat or Tallow:**

Tallow is obtained from suet and used in making soap. Tallow is the fat obtained from rendering beef or mutton. Tallow is the harder and less fusible fat in animals and vegetables. Tallow is white (nearly tasteless) solid rendered fat of cattle and sheep used for making candles, soap and pet foods.

**Oil:**

Almond oil extracted from seeds of sweet almonds is used as an emollient in high quality soap. Almond oil prevents dehydration of skin. Palm oil and coconut oil produced by processing of palm fruit and coconut can be used in soap. Soap from coconut firm and lather well. Coconut reduces hardness to increase solubility. Fish oil can be used and better in processing of soap.

**Examples of Soap:**

* Sodium Stearate (C17H35COO- Na+ )
* Sodium Palmitate (C15H31COO-  Na+ )
* Sodium Oleate (C17H33COO- Na+ )

**Types of Soap:**

* Laundry Soap
* Toilet Soap

**Laundry Soap:**

Laundry soaps or washing soaps are made from cheaper materials such as expired materials, residue from edible oil refineries and caustic soda.

Used only for washing of clothes and cannot be used for bathing due to excess of alkali. It is cheaper in rate.

**Toilet Soap:**

It is made from best quality animal or vegetable fats. The higher the fatty materials in this soap, the better the cleansing ability.

Toilet soap contains more fatty materials than laundry soaps (i.e. 60-80%).

Mostly KOH is used in toilet soaps. Some color additives and perfumes are used in toilet soaps. And they don’t harm the skin.

Most of the toilet soaps present in market are Lux, Lifebuoy and Dettol etc.

**Soap Molecules:**

A soap molecule has two ends with different properties.

* A long hydrocarbon part which is hydrophobic (i.e. it dissolve in hydrocarbons).
* A short ionic part containing COO- Na+ which is hydrophilic (i.e. it dissolve in water).

**Mechanism or Cleansing action:**

Soap molecule is made up of two very different ends hydrophilic and hydrophobic.

Hydrophobic end attach to the dust, dirt, oil or other material which we want to remove, detaching takes place, get suspended in water and can be easily removed. While other part remains in water.

**Soap Manufacturing through Batch Process:**

Consists of four steps:

1. Preparation of raw materials
2. Saponification
3. Glycerin removal and soap purification
4. Finishing

**Preparation of raw materials:**

Calculated amount of raw materials is selected in order to get desired products. Exact amount of raw materials is determined by determining the Saponification value.

Saponification value is the number of milligrams of alkalies required to completely saponify the one gram of specific fat.

Imported tallow contains mixed glycerides having low melting point and can solidify at room temperature so the ships and storage tanks have heating system in which steam is circulating in pipes. Liquid tallow fed to settling tank and then filter press where unwanted materials are settled down and removed.

Solid alkalies are diluted by adding water according to required concentration (40-50%). After that pure tallow and alkali fed to the soap kettle.

**Saponification:**

In soap kettle triglycerides in fats/oils reacts with aqueous NaOH/KOH and converted into soap and glycerol.

Reaction is exothermic and heat is controlled by gradual addition of NaOH/KOH.

Helical pipe agitator is used in soap kettle which is circular pipe having perforations and steam is used for mixing. Resins are added in order to create transparency. Free fatty acids reacts with alkali metal to produce soap and glycerin. Glycerin is a by-product of soap making.

CH2 ----O ----OCR Na+ O- ----OCR CH2 ----OH

CH -----O ----OCR + 3NaOH Na+ O- ----OCR + CH -----OH

CH2 ----O ----OCR Na+ O- ----OCR CH2 ----OH

Triglyceride Caustic soda Metal soap Glycerin

Metallic salt of fatty acid is a chemical name of soap. Laundry soap use harsh alkali NaOH while toilet soap use KOH.

**Glycerin removal and Soap purification:**

Glycerin is more valuable than soap. So it must be removed from soap and some of glycerin is left in soap to help to make it soft and to avoid from shrinkage of skin.

Salt is added to wet soap causing it to separate out into soap and spent alkali and to avoid bunch formation.

The product is washed with water in order to remove all unwanted materials. Spent alkali and solid soap are withdrawn from soap kettle.

**Finishing:**

The solid soap from pan is blended with builders and additives in a special machine called “Crutcher”. Sodium Silicate is added in laundry soap which act as a inhibitor which is then shaped into bass and cutting is carried out.

Soap still contains little quantity of water which is evaporated by dry air. After drying specific perfumes and colors are used for toilet soap and after that final packing is carried out.

**Advantages and disadvantages:**

Soaps are eco friendly and biodegradable because of natural origin.

Soaps are not effective in hard water because when it reacts with magnesium and calcium salts which makes water hard to produce insoluble precipitate called scum.

When we use soap and hard water the amount of lather produced is very small.

They have weak cleaning properties than detergents because no specific additives and builders are used in soap.

**Soap vs Detergent:**

The fundamental difference between soaps and detergents is that soaps are produced from natural ingredients, while detergents are made from synthetic sources. Soap is limited in its applications while detergents can be formulated to include other surfactants (surface active agents) for all sorts of cleaning purposes. Soaps are composed of sodium or potassium salts of long chain carboxylic acids whereas detergents are composed of salts of long chain sulphates and sulphonates. Cleaning action of soap is very effective only in soft water (because it contains negligible calcium and magnesium ions) while detergents are effective in case of hard water also because calcium and magnesium salts of detergents are soluble in water. That’s why detergents are better than soaps.

**Current status of soap industry in Pakistan:**

Industry is facing problems now a days because of low prices, lot of taxes and also due to increasing demands of detergents instead of soaps. That’s why Govt. urged to solve the issues of soap industry.

The president of the Pakistan Businessmen and Intellectuals Forum (PBIF), Mian Zahid Hussain, has emphasized the need for issues of the soap industry should be resolved on priority basis. Congratulating Tanveer Ahmed Sufi, Tariq Zakaria and Naveed Farooq Afridi as the newly elected chairman, senior vice chairman and vice chairman of the Pakistan Soap Manufacturers Association (PSMA) for the year 2017-18, he said that smuggling of all types of soaps into the country continue to damage the local industry, and this must be stopped for expansion of the local industry, jobs 200,000 people and payment of around Rs 17 billion in taxes.

Mian Zahid Hussain said that the easy availability of imported and smuggled beauty soaps, toilet soaps and laundry soaps at lower prices is eroding the market share of the local manufacturers. He added that the prices of raw materials such as tallow, coconut palm, cotton seed and rice bran should be curtailed to make the soap industry more competitive. Some commercial importers are involved in gross under-invoicing and selling their product in the market at much lower prices and capturing a sizable market of finished soaps in Pakistan.

He said that in the current situation the local industry cannot compete with the landed cost of imported soap, which is very low and is being sold in the market at cheaper rates, and the government should use different tools to make soap production more competitive for the local industry. Some countries are also exporting soaps to Pakistan through third countries, which has created problems for the local industry which has some 500 soap-making units in the un-organized sector and 100 in the organized sector. Yearly production of laundry soap in Pakistan in metric tons is 500,000; toilet soaps, 125,000; carbolic soap, 45,000; and detergents, 150,000, in which the use of imported raw material is 80 percent and of local raw material 20 percent.