

## Semi-boiled saponification plant

Semi-boiled saponification plant is a process which allows the production of soap from any type of neutral fats. It's discontinuous and the soap contains Glycerin ( except if we use fatty acid ) so no washing is necessary.

### Process information

#### Feedstocks

Main feed stocks to semi-boiled saponification plant are listed in the next board:

Main feed stocks	
Oils and fats :	tallow / coconut oil / palm oil / palm kernel oil
Caustic soda ( NaOH )	water solution at 30%
Sodium chloride ( NaCl )	water solution at 20-22%
Process water	

A mixture of fats use to produce a typical soap ( composed of 80-85% of palm oil and 15-20% of coconut oil ) should have some specifications like the titre, the iodine value, ...

#### Product quality

Introducing a mixture of fats composed of 80% of palm oil and 20% of coconut oil, the soap is supposed to have the following specifications at the outlet of the crutchers :

Soap composition	
Total fatty materials :	60-63%
Caustic soda ( NaOH ) :	11%
Free caustic soda :	0.05-0.15%
Sodium chloride ( NaCl ) :	0.3-0.5%
Unsaponified :	< 0.1%
Glycerol :	7.3-7.6%
Density :	0.94-1 kg/dm <sup>3</sup>

#### Consumptions

For a production of 2000 kg/h of finished soap composed of 60-63% of fatty matter, consumptions are listed below :

Consumptions for a 2t/h production	
Saturated steam, average :	3300 kgs/day
Saturated steam, peak :	630 kgs/h
Electronic power installed :	95 kW
Electronic power absorbed :	76 kWh/h

Feed stocks quality effects the consumptions. So, to produce 1000 kg of soap by semi-boiled saponification plant, you will need next feed stocks:

Feedstocks consumptions for 1000 kg of soap produced	
Palm oil:	520 kg
Coconut oil :	110 kg
Caustic soda water solution at 30% ( NaOH ) :	320 kg
Sodium chloride at 20% ( NaCl ) :	20 kg
Water :	50-100 kg

.../...

## Process description

Semi-boiled saponification plant is composed of three steps

- Fats fusion
- Caustic soda dissolution
- Saponification

### Fats fusion

Fats and oils are supplied in drums or in tankers. If supplied in drums, they must be emptied in fusion fats or oil vessel by injection of live steam. The molten fats drain into the vessel and are collected into a well, from where they are pumped to the storage vessel.

If fats and oils are supplied in tankers, they are directly drained in the storage vessel. Because the soap is produced from at least two different fats, two storage vessels are necessary. From there, each fat is pumped to the elevated vessel placed just over the crutchers. Since most of fats used in manufacture are solid or semi-solid at ambient temperature, every vessels of this line are equipped with internal coils for the steam heating.

### Caustic soda dissolving

Solid caustic soda must be mix with water to be turned to caustic solution. To make this solution, top and bottom of each drum must be cut and placed into the dissolving vessel and covered with water. Otherwise, we advice to use granules or flakes soda sold in 25 kgs bags easier to manipulate than drums. A pump makes the water circulation into the vessel and permits to get a solution of caustic soda. During this time, the temperature's growing up because of the great quantity of heat developed. When the good concentration is reached, the solution is pumped to the elevated vessel.

### Saponification

Saponification is carried out in a crutcher. 1/3 of fats and the equivalent of caustic soda are introduced in a crutcher. Fats must be maintained at a temperature of appreciatively 60°C and the concentration of the solution of caustic soda must be around 36 Bè.

Components are stirred in the crutcher and heated by steam until the temperature reaches 85-90°C and exothermicity of the reaction will rise it again to 100°C.

When the first parts of fats are saponified, the remaining fats and caustic soda are gradually added. At the end of the reaction, you have to check if the pH is neutral, if isn't, adjust it with caustic soda or oil.

When the product is neutral, the soap is ready to be dried under vacuum and cooling plant.

Saponification can produce a very viscous mass at the intermediate stages; if so, you'll have to add sodium chloride as a thinning agent: required quantity is about 0.3-0.4 of NaCl on the soap. Chloride sodium solution is prepared in a vessel and added gradually depending of soap appearance during process.



Crutcher

## Saponification process

