

# Soap-making

## A short guide to the technical constraints

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### Ingredients

Most naturally occurring fats may be used for making soap. In general, the hard fats from animal origins and coconut oil will give hard soaps and the more liquid vegetable oils (Saff-flower, soy-bean, peanut etc.) will give soft, liquid soaps. (Coconut oil soap will lather in sea-water). Different alkalis may be used to further modify these



properties so that soaps from caustic potash (potassium hydroxide) will be more liquid than those from caustic soda (sodium hydroxide). Soaps can also be made using slaked lime (calcium hydroxide) as the alkali. Such soaps have a greasy feel and actually find application in making greases. They have the ability to disperse water in oil but are not really suitable for domestic washing duties.

If no oils or fats are locally available, clays such as bentonites may be used as soap substitutes. Another substitute that may be considered is the sap or leaves of some shrubs and bushes which contain lecithins. (These are naturally occurring soaps.) If there is a local source of fats or

oils, the small-scale manufacturer will usually find that high purity alkalis are obtainable from wholesale outlets in the major cities. Smaller quantities may be available from hard-ware shops. Often such alkalis are imported. Caustic soda is a solid and will be easier to transport than caustic potash and because it makes a harder bar of soap, it is favoured by most manufacturers. However it may be more expensive than the liquid caustic potash in your area.

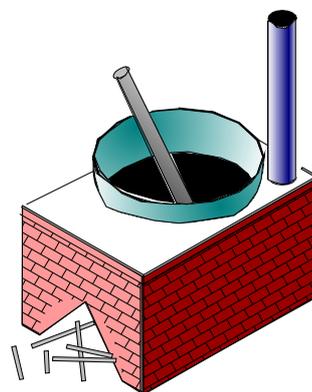
If caustic soda is not available, caustic potash can be extracted with water from wood ashes (which explains the name potash.)

To do this, it is necessary to collect the ashes while they are fresh and to keep them in an air-tight and water-proof container (such as a biscuit tin) until they are needed. Different timbers and agricultural products give different amounts of potash. For example, very little potash is obtained from rice-hull ash. Some experimentation will be necessary to get the correct quantities for any particular potash.

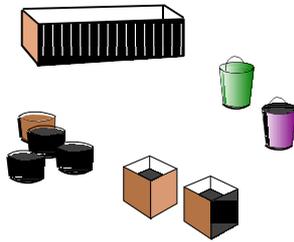


### Equipment

The process involves heating the ingredients. Although a clay-pot will



suffice, there is usually a high fuel cost associated with using such a poor conductor of heat. Most small-scale soap manufacturers favour a steel or iron pan which may be heated over an open fire. A 45 or 200 litre steel can previously used for oil or water storage may be used once the top is cut off. A wooden paddle will be required to stir the soap. Aluminium should not be used for any of the equipment used to make soap. The caustic is destroyed by the aluminium which becomes corroded and much weakened. In addition, hydrogen gas is evolved which may explode causing bad injuries. All caustic solutions should be treated with caution because they can inflict unpleasant burns and cause permanent eye damage. Hot caustic solutions are particularly dangerous.



One or two buckets will also be useful. They can be enamelled, galvanized or even plastic. A plastic cup will be useful for measuring quantities and a thermometer will be useful but not essential.

Moulds will be necessary for the soap. This can be a wooden frame, or made of split bamboo tubes, half coconut-shells or plastic or even paper cups. For ease of removal, the mould should be flexible. If it is not, line it with paper or plastic sheet. (Newspaper is quite suitable.)

For a semi-commercial unit, it is advisable to build a small platform using bricks or concrete for the soap-pan to sit on. This makes it possible for a fire to be tended under the pan without the risk of being scalded and burned by the soap boiling over.

Any fuel can be used but most will burn more efficiently if a chimney is fitted at the back of the platform to provide a draft. Dry wood or charcoal will make a fire which is easily controlled. (See also "Soapmaking in Mali")

## Quantities

This is most difficult to assess because of the variety of ingredients used. The following quantities are only a guide:

To make 10kg of soap you will need:

- \* 33 cups of animal fat or vegetable oil.
- \* 6 or 7 cups of caustic soda crystals
- \* 13 cups of clean water (preferably rainwater.)

## The Process

1) Slowly add the caustic soda to the water. It will get quite hot which is why you should never add the water to the caustic for it may scatter the caustic or throw it into your eyes ! Stir the solution (called lye-water) until all the crystals are dissolved. You should let it cool to 37 °C which is about the same temperature as your hand. You may test this temperature by putting your hand against the vessel. Do not put your hand into the lye-water or it will try to turn you into soap ! It will certainly give you a serious burn. If you do get burns, wash the area with lots of water until the pain has almost gone and then wash with vinegar or lime-juice to neutralize any remaining alkali. Permanent scars will be avoided provided washing commences immediately.

2) Place the liquid oil or fat into the soap-pan and add the lye-water in a thin stream quite slowly while stirring.

3) Continue stirring as you heat the soap and boil it. When the soap falls off the paddle in sheets and the liquid generally behaves like a sugar-syrup, pour it into the moulds and let it set for two days.

4) The soap can be removed from the moulds and cut into bars using a piece of thin wire stretched tightly between your hands or in a wooden frame. These bars should be stacked to allow drying to take place. In most places this will take up to a month. (You may find that your soap will not dry in the monsoon period.)

Any pieces of left-over soap may be melted in the next batch and re-moulded. Do not be tempted to use the liquid left in the moulds as a liquid soap for it is quite caustic: There are reports from Papua-New Guinea<sup>1</sup> that girls temporarily lost their hair after using it as a shampoo!

## Some alternatives

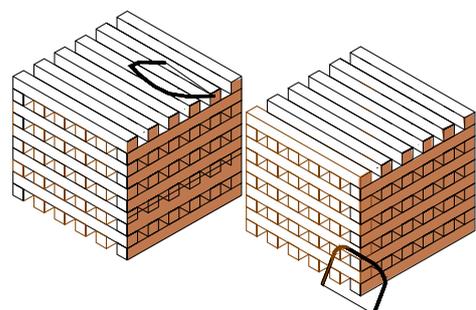
The oil extracted from seeds such as the coconut does not have to be particularly pure. Indeed, in Sri Lanka, I have made soap from shredded raw coconut boiled for an hour in water before the lye-water is added. This soap lathered well in sea-water and still contained tiny shreds of coconut which aided its scouring action in laundry applications. Soap made from shredded copra has a reddish colour while being boiled but this turns brown when exposed to the air during drying.<sup>2</sup>

Multiple washing (3 washes or more) of fresh shredded coconut with water at 75°C at a pH of 8 produces an oil-rich cream comprising 85% of the total available oil. This oil may be used to make soap<sup>3</sup>. It can also be concentrated and reacted with an organic alkali such as di-ethylamine to produce an excellent liquid detergent.<sup>3</sup>

Palm oil made from pressing palm-oil nuts previously boiled has been used for making soap<sup>4</sup>. The process of skimming the oil from above boiled nuts should also provide a suitable oil.

Good soaps have been made using beef tallow, mutton tallow, pig-fat and even butter !

Fat-soluble dyes such as childrens wax-crayons may be added to the oil or fat to produce coloured soap. Turmeric does the job quite well but may turn bathers and their washing a little yellow!



Perfumes can be added immediately before pouring into the moulds but it is wise to cool the melt almost to solidification before vigorously mixing in the perfume. Patchouli, lavender, spikenard, rosemary and pine oils have all been used with success. Some of these perfumed oils can be made by skimming the oil from above the water in which leaves of the plant are being boiled.

If your soap grows whiskers or remains too soft, you probably have too much free caustic in the soap. You can check this with pH paper because your finished soap should have a pH of about 10.5. If the pH is above 11, you can re-dissolve the soap and then add borax and/or ground wood resin to the molten soap. You should also reduce the quantity of alkali used in the processing stage of future batches.

If you want to make a soap that looks as good as the commercial product, you will have to shred your soap and wash it with salt-water to remove excess caustic and glycerol. This may involve dissolving your soap in the minimum amount of fresh water and salting out the soap. The granules can be sold as soap-powder or compressed into tablets. (Incidentally, most commercial soap manufacturers sell the glycerol as a valuable by-product.)

## References

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- 2) Iuli, S .:"Simultaneous Oil Extraction and Saponification of Coconut Oil"; School of Engineering Final Year Project, University of Auckland, New Zealand, (1980)
- 3) Cooper, K.T.: "Investigations of Oil Extraction and Detergent production from Fresh Coconuts"; School of Engineering Final Year Project, University of Auckland, New Zealand. (1982)

4) Hale, P.R. and B.D. Williams (ed): "Liklik Buk";Liklik Buk Information Centre, P.O.Box 107, Wewak, Papua-New Guinea, 1978 p95

## Further Reading

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