

Soap Fact Sheet: Soap Making

Introduction

This fact sheet describes the history of soap, what is soap, how it's made, and two processes to make soap. Soap is a necessary item for good hygiene. Teaching people how to make soap can be a good addition to any water, sanitation and hygiene (WASH) project. Ingredients for making soap can be found almost anywhere and the process is simple. Making homemade soap allows people to make soap that suits their needs and preferences and can also be a business opportunity for local entrepreneurs.



Handwashing with soap

History of Soap

Soap has been available for a long time. A soap recipe carved into a tablet from Ancient Babylon shows that soap has been available since 2200 BC. There is also evidence that the Egyptians used a soap-like substance made of animal and vegetable fats mixed with alkaline salts. Ancient Rome used pomade for their hair that was similar to soap, and Ancient China also has evidence of the use of a soap-like product.

Islamic documents from the 12th century describe the process of making soap and by the 13th century, soap making had become industrialized in the Islamic world, with production centers in Nablus, Fes, Damascus and Aleppo (Soap History, 2014).

Today soap is widely used. We now understand its role in proper hygiene. Handwashing with soap significantly reduces the number of pathogens on hands compared to washing with water alone. Soap helps to break down the grease and dirt that carry the largest concentration of pathogens.

In the late 18th century, industrially manufactured soap was paired with campaigns in Europe and the United States that taught the relationship between soap and health. With this knowledge and promotion, soap has become a household item in many countries (Soap History, 2014).

What is Soap?

Soap is a cleaning agent made of a combination of fats, a base and water. It comes in different varieties such as bars, liquid, and powders (e.g., detergents). Other ingredients can be added to soap to give it different qualities, such as scent or texture.

How does Soap Work?

Soap causes particles that cannot be dissolved in water to become water-soluble. They attach to soap



Source: (KUDIC, nd)

Soap Fact Sheet: Soap Making

particles and are washed away when rinsed with water. Think about dirty, greasy dishes. If you only rinse them with water, they still feel greasy. However, if you add soap to the water, the grease washes away, and the result is clean dishes.

How to Make Soap

Key Ingredients

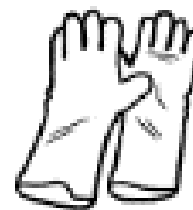
There are 3 key ingredients in soap: oil or fat, lye and water.

1. Oil or fat — beeswax, aloe butter, coconut oil, coffee bean oil, moringa oil, animal fat, palm oil, and shea butter
2. Lye — sodium hydroxide (NaOH) or potassium hydroxide (KOH)
3. Water — bottled, filtered or distilled water

Lye

Lye is one of the main ingredients in soap. Lye is a base, also known as an alkali. Bases can burn and destroy living tissue—such as plants and skin. It can also burn through certain metals such as aluminum.

Lye should be handled with care and should always be kept away from children, flammable materials and aluminum containers. We recommend wearing gloves and long sleeves when working with lye. Vinegar can neutralize lye. Keep a bottle of vinegar nearby when using lye. If you spill on yourself, rinse your skin with water and then with vinegar.



Lye can be bought, but if you cannot find it for sale, lye can be made two different ways. First, it can be made by running a current of electricity through a salt water solution. Or, more traditionally, lye can be made by leaching ashes. This is done by mixing hardwood ashes with water and boiling the mixture for 30 minutes. Once the mixture has cooled and the ashes have settled to the bottom of the pot, the lye can be skimmed off the top and stored. When a sufficient amount has been created, the lye should be boiled until it is concentrated enough for an egg to float in the lye.

To dispose of the leached ashes, bury the ashes in a hole where people do not walk. Don't cover the hole until the ashes are completely dry.

Soap Fact Sheet: Soap Making

Optional Ingredients

Many things can be added to the 3 key ingredients for color, scent, texture and lather.

Color	Scent	Texture
<ul style="list-style-type: none">• Yellow - turmeric• Green - parsley• Brown - cinnamon, cocoa powder, chocolate, cloves• Orange - paprika• Clay - can also be added for color	<ul style="list-style-type: none">• Peppermint• Spearmint• Lavender• Vanilla• Essential Oils	<ul style="list-style-type: none">• Oatmeal• Flower petals• Coffee grounds• Tea leaves• Tapioca pearls• Poppy seeds• Pumice• Cornmeal

Sugar is another optional ingredient added to increase the amount of lather the soap will create. Lather is the tiny bubbles that form when soap and water are mixed. Sugar can be added either to the water before adding the lye or it can be added to the mixture when it reaches trace (Fisher, 2014).

Salt can be added to soap to increase the soap's hardness. To add salt to your soap mixture, dissolve the salt in your water before mixing the water and lye (Fisher, 2014).

Qualities of Soap

When creating soap recipes, ingredients can be adjusted in order to control the qualities of the soap produced. There are seven qualities of soap.

Hardness: The hardness value describes how hard the soap is. Different fats create soaps with different hardness values. The higher the hardness value, the harder the soap will be.

Cleansing: The cleansing value describes well the soap grabs onto oils and, therefore, how well it cleans. However, a soap that has too high of a cleansing value may grab both the dirty surface level oils and deeper, protective oils in your skin. This will have a drying effect on your skin.

Condition: The condition value describes the soap's emollient content. Emollients—or moisturizers—stay on the skin to help the skin retain moisture. Emollients make skin feel soft and soothe the skin.

Bubbly: The bubbly value describes how much lather or bubbles the soap will create. Higher values produce foamy, fluffy lather while lower numbers will produce a creamy lather with fewer bubbles.

Creamy: The creamy value is almost the reverse of the bubbly value. As the creamy value increases, the creamier the lather of the soap will be. The lower the value, the more foamy lather the soap will create. Soap made with olive oil creates creamy soaps that has no bubbles.

Iodine: The iodine value is another indicator of the hardness of a bar of soap. The lower the iodine value, the harder the soap will be.

Soap Fact Sheet: Soap Making

INS: Iodine and SAP, or INS, describes the physical qualities of soap. INS is a combination of the iodine and saponification value. The higher the INS value, the harder the soap will be.

Table 1: Recommended Values for Soap Qualities

Quality	Value Range
Hardness	29-54
Cleansing	12-22
Condition	44-69
Bubbly	14-46
Creamy	16-48
Iodine	> 70 soft soap < 70 hard soap
INS [Iodine and SAP]	136-170 Ideal Value: 160

(Source: Soapcal, nd)

Soap Making Processes

There are two soap making processes that can be done on a small scale: cold and hot. We describe both processes in this fact sheet and provide a recipe for cold process soap.

Cold Process

Although this process is known as the cold process it still involves some heat. When lye is mixed with water it creates its own heat. As well, the oils, particularly if they are solids such as lard or butter, must be melted into liquid first. For the cold process it is necessary for the lye and water mixture to be the same temperature as the oils. Once they are mixed together and poured into a mold, the molds are wrapped in a towel to keep in the heat. This helps the process known as saponification—the process of turning fats into soap.

The measurements of lye and fat must be exact when using the cold process. If the ratios are not properly calculated and measured, the soap will have too much hydroxide. Too much hydroxide in soap will irritate or burn skin when used or the soap will be too soft and greasy. We recommend using www.soapcal.net, to calculate the ratios of soap ingredients.

Advantages	Limitations
<ul style="list-style-type: none"> • Least expensive of the two processes • Soap often has a smoother, creamier texture • Easier process for making fancy soaps—adding swirls and multiple colors 	<ul style="list-style-type: none"> • Calculations must be exact in order for soap to saponify • Requires 4-6 weeks for soap to cure • Requires some practice to get trace right—soap can harden suddenly before you put it in the mold • Can change added fragrances

Soap Fact Sheet: Soap Making

Procedure

1. Dissolve the lye in water.
2. In a separate pot, heat the oils until they are liquid.
3. Mix the lye solution with the liquid oils and stir until they thicken. In soap making terms, this is called trace. Soap has reached trace when a spoonful of soap batter is drizzled into the pot of soap, and an outline of the drizzle remains on the surface before slowly mixing back into the pot.
4. Mix in the optional ingredients and pour soap batter into the molds.
5. Wrap molds in a towel to keep the heat in, promoting the saponification.
6. Leave soap for 12-48 hours. The soap will first become transparent and then return to its opaque state. This is proof that saponification is taking place.
7. After 12-48 hours period, remove soap from its mold and cut into bars.
8. The soap is now safe to use, but it should still be cured for 2-6 weeks for best quality.

“Zap Test”— to test that your soap is fully cured and no leftover lye remains, touch your bar of soap to your tongue. If it tastes like soap, it is ready. If you feel a small zap or buzz, it is not yet cured. (Trew, 2010)

The cold soap process is the least expensive of the processes and the sample recipe provided in this fact sheet is a cold process soap.

Hot Process

The hot process for soap making is very similar to the cold process. Unlike cold process soap, hot process soap does not need to be cured for a period of time. The full saponification process happens while being cooked.

Advantages	Limitations
<ul style="list-style-type: none">• Saponification happens during the cooking time—there should be no leftover lye• No need for soap to cure• Can make transparent or liquid soap as well using this process• Maintains the scent of scented oils	<ul style="list-style-type: none">• This process takes longer to make• Harder to make fancy soaps• Can have air pockets in the soap• Bar of soap doesn't last as long as cold process soap

Procedure

1. Dissolve the lye in water.
2. In a separate pot, heat the oils until they are liquid.
3. Mix the lye solution with the liquid oils and stir until trace. Soap has reached trace when a spoonful of soap batter is drizzled into the pot of soap, and an outline of the drizzle remains on the surface before slowly mixing back into the pot.

Soap Fact Sheet: Soap Making

4. Cook the soap batter at a low temperature for 1.5-2 hours. Use a crockpot or double boiler. Stir occasionally and keep careful watch that the soap does not boil over.
5. Pour soap batter into molds.
6. Cool.
7. Remove from mold.
8. Cut into bars. Soap is ready to be used.

Advantages and Limitations of Cold and Hot Process Soap

	Cold Process	Hot Process
Advantages	<ul style="list-style-type: none"> • Least expensive process • Quick process • Easy to create fancy soaps with swirls • Product is smooth and creamy 	<ul style="list-style-type: none"> • Doesn't require curing time • Can make transparent or liquid soap • Maintains added fragrances
Limitations	<ul style="list-style-type: none"> • Requires several weeks to cure • Requires exact measurements • Can change added fragrances • Hardens suddenly 	<ul style="list-style-type: none"> • A longer process requiring more time than cold process • Risk of air bubbles in bars of soap • Soap doesn't last as long

Sample Soap Recipe

- 2 cups olive oil
- 2 cups vegetable oil
- 2 tablespoons castor oil
- 4 tablespoons coconut oil
- 4 tablespoons & 2 teaspoons lye
- 1 cup water

Soap Making Project Implementation

Soap making projects can be a great addition to community WASH promotion programs. Making soap is an inexpensive way to provide soap for a person's family. It can also be a business opportunity for individuals to earn extra income for their family.

When considering a soap making project, there are some factors to think about:

1. **Project Objectives** — what is the objective of introducing a soap making project in the community? Will soap be produced for hygiene promotion? Will it be used as an incentive

Soap Fact Sheet: Soap Making

for people to practice good hygiene? Will soap be used as an income generating project? It's important to know your project's objectives and design the project to meet those objectives.

- 2. Locally Available Materials** — consider what materials are available locally. A large variety of oils and fats can be used to make soap. Lye can be bought or made. Soap can be made in most places. Design the type of soap based on locally available materials.
- 3. Local Practices and Uses** — consider the type of soap already used and what soap qualities are desirable to the community. These factors will help you decide what type of soap to make. Some groups may prefer soap with small grains in it like pumice or poppy seeds for removing dead skin, while others may prefer smooth soap. Other groups may prefer a soft soap instead of a hard soap.
- 4. Cost** — consider the cost of locally available soap and the cost of making soap. If soap cannot be made for less than locally available soap, starting a soap making business may not be realistic. However, if locally available soap does not meet a group's needs or it is more expensive, then there may be demand for homemade soap. There may also be a market for specialty soaps both within the community or in other markets.

Technical Terms

These are definitions of technical terms used in this fact sheet.

Caustic: a substance that burns or destroys organic tissue by chemical reaction.

INS: a value introduced by Dr. Robert S. McDaniel in his book *Essentially Soap*. It is based on the SAP and the iodine value and it stands for "Iodine & SAP." It is used to predict the physical characteristics of a bar of soap with the ideal value being 160.

Trace: is the term used to describe when the soap batter begins to thicken due to saponification. Soap has begun saponification when a spoonful of soap batter is drizzled back into the soap pot and a "trace" remains visible on the surface.

SAP: is the amount of sodium hydroxide (lye) needed in order for saponification to happen based on the type of oil or fat used.

Saponification: is the process that creates soap—it involves a chemical reaction between a base and a fat.

Additional Resources

Soap Calc. Available at: <http://www.soapcalc.net/info/soapqualities.asp>

- This website will calculate your soap recipe to ensure you have the right ratio of lye to fat. It also has Frequently Asked Questions (FAQs), explains soap qualities and contains a list of oils and their SAP values.

"Soap without a Scale" from My Self Sufficient Home. Available at: <http://myselfsufficienthome.com/soap-without-a-scale/>



Soap Fact Sheet: Soap Making

- The recommended soap recipe in this fact sheet is found on this website. Read this blog for the creator's notes on this recipe.

Soap Making Essentials. Available at: <http://www.soap-making-essentials.com/hot-process.html#.U-kBCmOgr-A>

- This website describes how to make hot process soap. If you are interested in trying hot process soap, this is a good starting place.

References

Fisher, D. (2014). Add a Bit of Sugar for Super Bubbles. *About*. Retrieved 11 August 2014, from <http://candleandsoap.about.com/od/tipstricks/qt/qtsugar.htm>

Fisher, D. (2014). Add a Bit of Salt for a Harder Bar Quicker. *About*. Retrieved 11 August 2014, from <http://candleandsoap.about.com/od/tipstricks/qt/qtsalt.htm>

Hoyt, G. (2010). Soap without a Scale. *Five Sprouts Farm*. Retrieved 11 August 2014, from <http://myselfsufficienthome.com/soap-without-a-scale/>

National Kidney and Urologic Diseases Information Clearinghouse (KUDIC) (2014). Retrieved 11 August 2014, from <http://kidney.niddk.nih.gov/KUDiseases/pubs/eatright/>

Mixon, K. (2014). Glossary of Soap Terms Related to Soap and the Process of Making Soap. *Natural-soap-directory.com*. Retrieved 11 August 2014, from <http://www.natural-soap-directory.com/soap-terms.html>

Soapcalc.net, (2014). Soap Qualities. Retrieved 11 August 2014, from <http://www.soapcalc.net/info/soapqualities>.

Soaphistory.net. (2014). Soap History - All About History of Soap Making. Retrieved 11 August 2014, from <http://www.soaphistory.net/>

Trew, Sally W and Zonella B. Gould (2010). *The Complete Idiot's Guide to Making Natural Soap*. Alpha Books: New York, NY.

Zx1.net. (2014). How to make soap and free soap formulas. Retrieved 11 August 2014, from <http://www.zx1.net/soap/index.html>

Soap Fact Sheet: Soap Making

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