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Designation of Soap Molder Machine and Procedure for Transparent Soap

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Abstract. Transparent soap is actually the combination of actual soap and solvent. The solvent is added into the soap solution to produce the transparent characteristic. The problem from the previous production is that tiny air bubbles were observed inside the soap resulted in less attractive appearance. Current method of producing the soap bar had taken more than 8 hours and having difficulties to take out the soap bar from the plastic mold with low production rate. It is expected that the air bubble problem can be solved using this new soup molder machine. The soap production rate is believed to increase with the invention of soap molder machine. By reducing the production time from 8 hours to 2 hours, it improve production rate significantly.

Keywords: Soap; air bubble; soap molder machine; transparent soap

1. Introduction

Soap is defined as the alkali salt of fatty acids and was discovered accidentally thousands years ago. According to Roman legend, the soap was first discovered near Mount Sapo, a location near Rome where animal sacrifice was conducted [1]. Initially, the chemical used in a soap making process are animal fat, mixed with the wood ashes as a source of alkali, and rainwater which resulted in a strange yellow mixture. Roman housewives found out that their cloth become cleaner and brighter when using the yellow mixture compared to ordinary water.

Soap is produced by the saponification process, by combining triglycerides (fats and oils) or fatty acids with alkali. According to Palmaist et al [2], saponification reaction is considered as an auto-catalytic since the soap produced is capable of dispersing neutral fatty acid into a colloidal suspension

and also capable of dissolving lye. The selection of alkali material depends on the final product solubility and hardness. Two common alkali materials used are sodium and potassium where sodium is used to produce a hard soap while the potassium is used in liquid soap due to its greater solubility. The characteristics of triglycerides and fatty acids also play an important role not only in the features and performance of the final product, but also in its production cost. Commercial triglyceride used in soap production consists of plant source (palm kernel, oils of coconut, olive, etc) and of animal origin (fats of tallow, lard, etc) [1].

Transparent soap is actually the combination of actual soap and solvent. The solvent is added into the soap solution to produce the transparent characteristics. Transparent soap is created by the semi boiled process where the complete mixing and the hardening period only take a few hours. Initially the soap is made using a hot process method where lye (sodium hydroxide), water and oils are mixed together. However, the combination of fatty acids and alkali will produce a soap that is opaque as the fatty acid crystal do not allow light to pass them as a result of light reflection by the crystal. In the production of transparent soap, a solvent consists of one or more substances which act as retarders will be added to reduce the formation of crystals [3]. Mabrouk [4] recorded a few substances that can be used to reduce the formation of crystal in the transparent soap making process namely castor oil, sugar, glycerine and ethanol. Richardson [5] enlarge the list to include cane sugar or sorbitol, glycerol, ethyl-methyl alcohols, and alkali-metal salts of rosin. The solvent was added to dissolve the soap until the crystal formed are so small that the light can freely pass the soap, which renders the soap to be transparent. The solvent used may vary depends on the available material and price.

Several steps are needed to produce the transparent soap where the processes can be quite tedious. However, there have been companies that produce and sell transparent-soap-base commercially. The base has the ability to be fabricated, cooled, melted and re-cooled again and make it convenient to the soap makers. Even though the market-readied transparent soap base has high transparency, yet handling the transparent base quite difficult in the final stage. It also yields tiny air bubbles inside the soap and make it less attractive as can be seen in Figure 1. The problem had caused huge losses in the sale since buyers are not interested and dissatisfied with the product appearance. Another problem is the low production rate since the production was done using a lab scale PVC pipe that only allows few soap bars are produced per cycle. Apart from that, the current method of producing the soap bar had taken more than 8 hours and having difficulties to take out the soap bar from the plastic mold. This paper attempt to discuss the proposed procedure to overcome the air bubble problem and also to design specific equipment that allows higher rate of soap production rate in shorter time. The authors had developed a relatively simple and faster transparent soap production method as discussed below.

Figure 1: Tiny air bubble observed inside the soap

2. Experimental

2.1. Preparation of transparent toilet soap base

Transparent soap base materials use are lye solution, blended oil, solvent and sugar solution. First, the blended oil is heated using a slow cooker until the temperature reaches between 57°C - 62°C. Then, sodium hydroxide is mixed with water inside another container to create a lye solution. For safety purpose, always add the sodium hydroxide gradually into the water. Then, the lye solution is added into the container when the temperature of lye solution almost same with the blended oil. The solution is stirred gently until a thin emulsion was formed. The mixed solution is allowed to cook for almost 2 hours for saponification process. After that, solvent and sugar solution are added and allow to cook for almost 30 minutes or until all the solution completely dissolved. The durations required depend on the amount of the base that wanted to produce. The soap base is then poured into a pipe mold (450 millimetre of length with 40 millimetre in diameter) and cool for 24 hours in room temperature (as shown in Figure 2). The pipe is slanted to about 30° as to provide smooth liquid flows (Figure 3).

2.2 Procedure

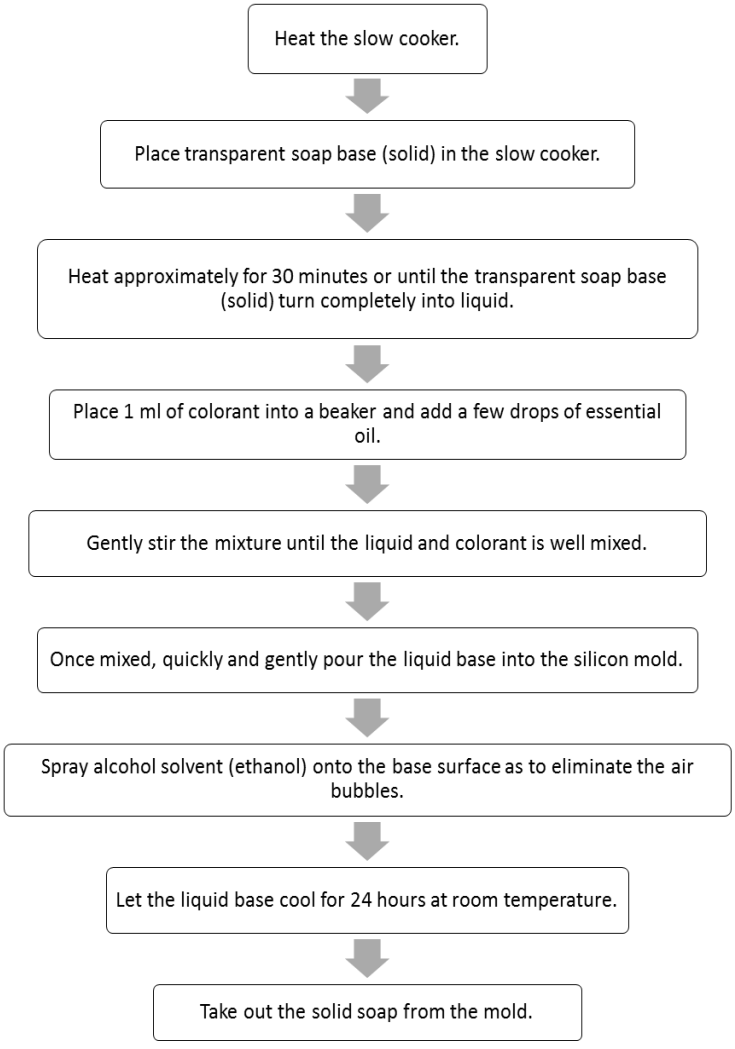

Figure 2: Flowchart

Figure 3: Method of pouring the liquid soap into the plastic mold

Once the soap bars cooled, it was wrapped to prevent moisture exposure and stored for 2 weeks. This is to stabilize the chemical reaction inside the soap. Once it is completed, the transparent soap base can be used for re-melt and pouring process and proceed with the addition of colour and fragrance for the final touch. At this stage, the occurrence of tiny air bubbles is unlikely to happen. If it happened, it is still not affecting the product, since the soap base is not the final product.

2.3 Preparation of transparent soap using soap molder machine

This soap molder machine was designed to increase the production rate and to meet the demand. The machine was designed based on the earlier lab scale method and procedures. The plastic mold is replaced with the aluminium mold with the same height and diameter. The machine consists of two parts where the upper part is the mold and lower part is a mechanical system that able to release the soap from the mold by pushing mechanism. The process involved are discussed below. First the transparent soap base is heated in a slow cooker until temperature reaches 57°C - 62°C. Next the colorant and essential oil is added to the soap base gradually. The amount of colorant and essential oil depends on the market demand and also cost of operation (as shown in figure 4, figure 5 and figure 6).

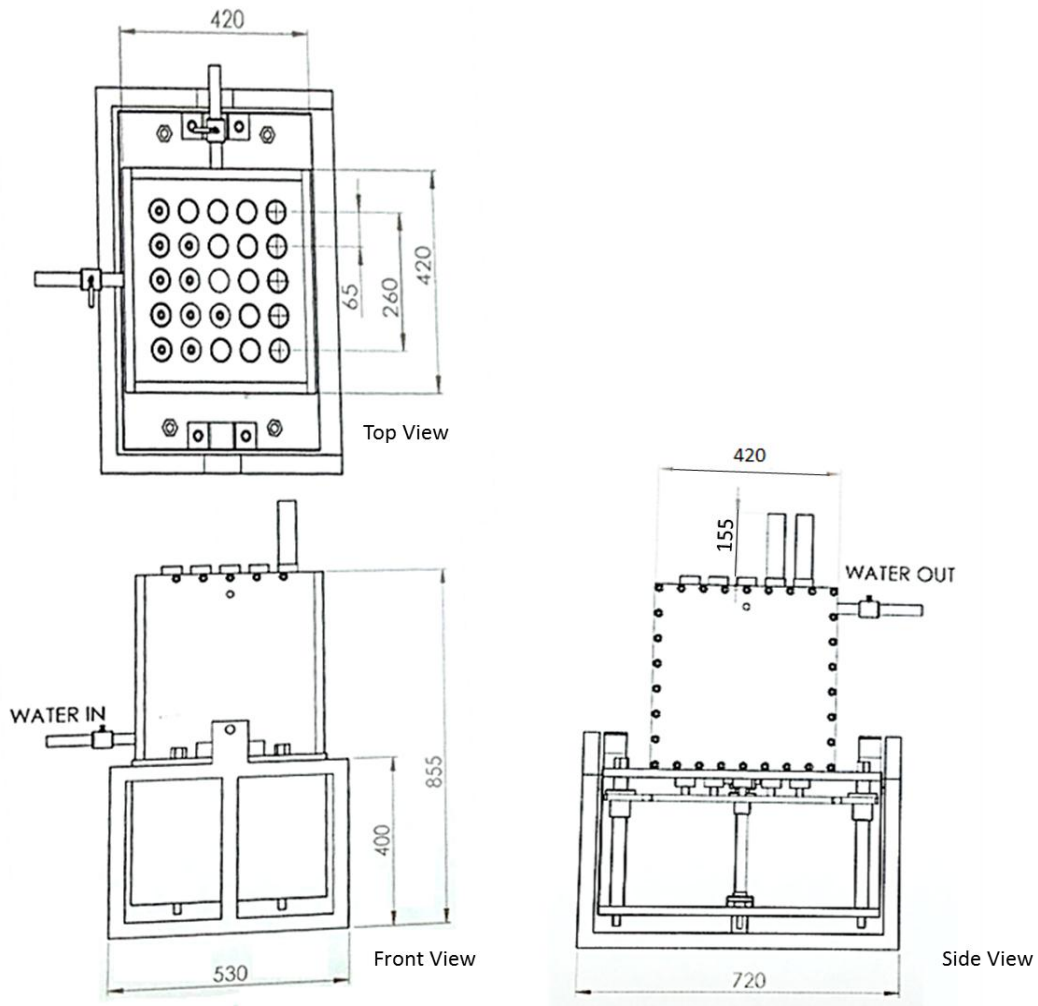

Figure 4: Layout diagram of the soap molder machine

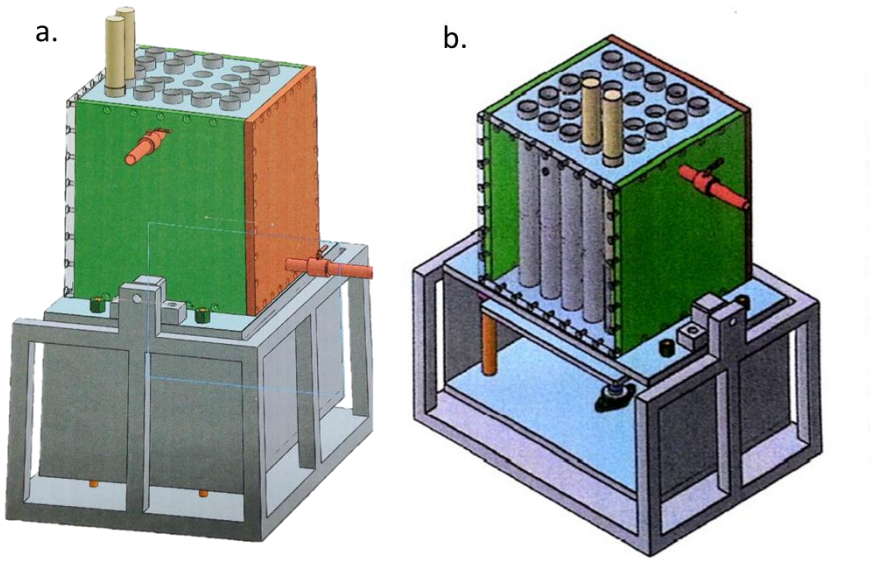

Figure 5: Diagram of the soap molder machine; a. Isometric View b. Sectioning View

Once all the substances are well mixed, the soap is poured into the mold. This molder machine has 25 aluminium molds (5×5) as depicted in Figure 3. During the pouring stage, the mold part can be adjusted to tilt up to 30° to have the same pouring mechanism as Figure 2. The soap mixture is allowed to cool for about 1 hour at room temperature.

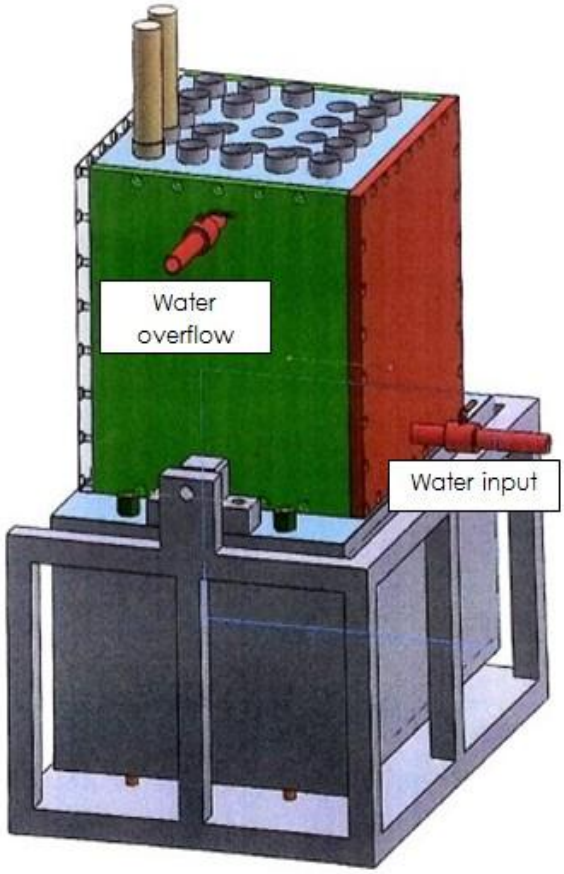

Figure 6: Location of water input and outflow

The cooling process involved passing the cool water into the mold part through the pipe located at the side of the upper part as shown in Figure 5. The temperature of the water ranges between 10°C to 16°C in order to increase the cooling rate of the soap bars. The water will be left for about 1 hour before the soap can be removed from the molder machine.

3. Experimental Result

Observation on the soap produced clearly show no presence of air bubble. The laboratory experience indicate that it is important to ensure the temperature of the transparent soap base is heated in the suggested range before it is poured into the mold. The arrangement of the aluminium mold is critical in order to promote good heat transfer in each mold. It also allows faster cooling period for the soap. This in turn provide enough time for the air bubble produced during the pouring stage to float and moves up to the surface. The slanted pouring method also helps in reducing the liquid turbulence in order to minimize the air bubble formation. This soap production rate is believed to increase with the invention of this soap molder machine. By increasing the numbers of transparent soap molder machine in operation, it will produce a larger number of soap bars. While the reduction in production time from 8 hours to only 2 hours will absolutely have the positive impact on the production rate.

4. Conclusion

The production of high quality transparent soap can be achieved via controlling the temperature and soap base mixture. A new transparent soap molder machine was design to produce transparent soap. Experimental result shows that the soap produced using this machine is transparent and solved the air bubble problem. Furthermore, this machine allows the soap production rate to reduce from about 8 hours to 2 hours.

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