

# SOAP MAKING

REVERSE GRAINING IN THE  
MANUFACTURE OF WASHING SOAP.

By

R. L. Datta & Others.



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## **Soap-making**

# **Reverse Graining in the Manufacture of Washing Soap**

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## Reverse Graining in the Manufacture of Washing Soap.

In soap-boiling for the manufacture of the grained soap the two principal operations are the saponification and the graining. Both of these involve, according to the customary procedure, boiling for considerable lengths of time, the latter process also requiring considerable skill on the part of the soap-boiler. It has been shown\* that the period of boiling can, with advantage, be considerably reduced in the case of the saponification. The present investigation concerns the shortening of the period of boiling for the purpose of graining the soap, and the results obtained and set forth in these pages go to show that considerable reduction in the length of boiling is possible together with a simplification of the process of graining.

At the end of the saponifying operation the soap is obtained in the fluid condition incorporated with much lye as well as impurities. The soap has to be separated from all these, and graining is the process which accomplishes this. It effects a total separation of the soap from the superfluous lye and collects the separated soap in the form of neat pea-like grains which coalesce and become a homogeneous, solid mass on cooling. The soap obtained in this condition is the grained soap. It is evidently much concentrated in course of the process of granulation, and is also freed from the adhering and washable impurities.

The separation of the soap from the lye-medium can be initiated by rendering the latter saline, or a little strongly alkaline, or both, by the addition of common salt, dry or in solution, or strong caustic lye. It is completed by boiling the charge in this saline or alkaline medium for several hours. The initial separation, or cut, as it is called, may, according to necessity, be fine or coarse, in other words, slight or sharp, depending on whether the medium is made mildly or strongly saline or alkaline, by the use of a small or large quantity respectively of the separating ingredient, viz., salt or alkali. The fine cut, therefore, requires a small quantity of the ingredient, and the coarse cut a large quantity of it.

The density of the medium plays a very important part in the graining of the soap, the formation of the grains being completed only on the medium attaining, by gradual concentration, an optimum density which varies according to the composition of the charge. In the case of the fine cut the density is low to start with and increases slowly with the progress of boiling. In a coarse cut, on the other hand, the initial density is fairly high and the optimum density is reached quickly. The fine cut necessitates a long boil, and the charge is subjected to the action of the graining lye for a considerable length of time. It has, accordingly, ample opportunities for discharging its colour, and also, if the medium be wholly or partly alkaline, for the conversion into soap of any unsaponified fat or oil requiring a fairly strong caustic lye for its saponification. The fine cut is thus both a cleansing and a saponifying

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\*Soap-making: A new method of saponification in a strongly caustic medium. By R. L. Datta, T. Basu and P. K. Ghose. [Bulletin No. 53, Department of Industries, Bengal.]

operation and is generally made use of when unsaponified fat or oil and washable colour are present in the charge in appreciable proportions. The density of the medium in the coarse cut is made to rise rapidly by the addition in a short time of a comparatively large quantity of salt or alkali. The medium accordingly takes less time to reach the optimum density and a short boil accomplishes this. This method is, therefore, the quicker of the two and is resorted to in cases in which there is less of obstinate fat or oil to be saponified or colour to be got rid of.

The above do not by any means exhaust the comparative merits of the respective processes. The fine cut, for example, gives the final soap a better texture and a softer consistence than those of the products of the coarse cut. If, however, the boiling is proceeded with in the former case for a yet longer time, the resulting soap will partake of the nature of a coarse-cut soap, and it will then be a case of coarse-graining without its attendant advantages. Where, however, considerations of texture and body do not weigh, the choice of the method of graining is largely influenced by the relative costs of the materials consumed, salt and alkali on the one hand and fuel on the other. It should, however, be stated here that the use of caustic soda as a graining ingredient need not be tabooed on the ground that the separated lye contains varying quantities of unused alkali. This alkali is not, however, a waste, for it can be fully utilised and the method for doing so is described in our bulletin<sup>1</sup> on the utilisation of the last traces of alkali of the spent lye. Nor is the separated saline lye without any further use, for it has been shown in another<sup>2</sup> of our bulletins how repeated use can be made of the spent saline lye.

For the manufacture of good washing soap the saponified mass has to be grained more than once, but the graining need not be of the same character in all the cases. Except in the final graining the separation of the soap from the lye, alkaline or saline, must be quick, clear cut, and complete—purposes for which the coarse cut is admirably suited. At the conclusion of each such operation the separated soap has, as already stated, a high concentration and a solid body. For the final graining, however, the usual practice is to re-dissolve the solidified soap of the penultimate stage, cut it mildly with salt or alkali, and boil the pan gently till the soap becomes free from the froth produced during the cutting. All this takes considerable time, consumes much fuel and necessitates long attendance of a skilled soap-boiler.

It appeared during the investigation that the speed of the final graining admitted of variation, and could be much accelerated on the proper control of the froth. While the development of froth can be traced to various causes it is in the graining operation of an average soap charge, traceable to the density of the lye-medium, the higher the density the less the froth. The result of the investigation is the development of the very quick method of reverse graining which consists in liquefying the soap in a medium which has already a density slightly higher than the optimum one, the medium being thereafter diluted back

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<sup>1</sup>Soap-making: The purification of oils and fats and the utilization of the last traces of alkali of the spent lye. By R. L. Datta and T. Basu. [Bulletin No. 54, Department of Industries, Bengal.]

<sup>2</sup>Application of the cold process and emulsification in increasing the efficiency of saponification and securing the complete utilization of all caustic. By R. L. Datta and T. Basu. [Bulletin No. 58, Department of Industries, Bengal.]

to the proper density. The comparatively high density of the medium prevents the development of froth at any time from the commencement to the end. The process is described below.

A strong solution of common salt, or of caustic soda, or both, is taken in a pan. The density of this solution should, in the room temperature, lie in the neighbourhood of 1.2. The lye is to be heated and the solid soap, cut if possible into small pieces, or the salted soap in the hot state, put into the pan gradually. Water in a thin stream should be continuously added to the pan to make up for the loss by evaporation. The supply of water will have to be carefully regulated. If very dry soap is treated, the supply of water should be such as to provide the necessary water of solution. If, on the other hand, hydrated soap is handled, small quantities of water, if at all, need be added.

Further, if the soap be already in a considerably hydrated condition, which, however, will only be a rare case, the operation is to be started with dry salt and no water. The hydrated soap in a small quantity will, in such cases, be the first to be taken in the pan and heated, the dry salt being thereafter shovelled in. As this soap melts, more soap is to be added with or without addition of dry salt depending upon the quantity of salt added initially and the degree of hydration of the soap. As there can be no definiteness of the degree of hydration, no hard-and-fast rule can be laid down for the quantity of salt to be added. The character of the soap and the density of the lye will, however, provide the necessary indications.

The soap will melt in a short time in the lye, a dried or cold soap taking, as expected, longer time than an hydrated or hot one. If the strength of the lye, added—as in the case of the dried soap, or extracted—as in the case of the hydrated soap, is maintained correctly, the soap will melt without the development of any froth and will from the start have the appearance of the neat soap and the lye of clear, coloured water. Should any froth appear, it would show that the lye is below the proper strength. A contingency like this should be avoided, for the success of the method depends on just the opposite position, *viz.*, melting in a very strong lye. Should this occur, it can be readily set right by adding gradually quantities of solid salt and boiling briskly.

The melted soap which will float on the lye should be tested between the fingers. The pressure of the soap is an indication of the type of grain. In the initial stage the soap will be a quickly drying, hard and brittle one, and require softening. The addition of water in a thin stream already referred to will do this. As the boiling proceeds, the grains of soap take up more and more water and become softened thereby. Addition of too much water may break the grains altogether and completely liquefy the soap—a situation which must not be allowed to arise. Before the grains break or become too soft, considerable froth is thrown up. This is a very dependable sign for the stopping of further addition of water. As soon as the froth starts to appear, the water should be stopped and the pan boiled for a short while till disappearance of the froth. The entire soap will now be found in a neat condition, completely separated from the lye and having little or no froth at the top. The heating should now be stopped and the pan left undisturbed for some time in order to let the convection currents and the oozed-out lye subside. The period of rest may be anything from 15 minutes to 15 hours, depending upon the size of the charge.

After allowing due rest, the soap may be removed into frames, or, if moulded soap is to be made, into earthen cups.

The method has the following limitations:—

- (i) The process being one of simple melting in a short time, there is little chance of any unsaponified fat being converted into soap during the graining even if the lye may be partly alkaline. As the process is of the nature of a finishing operation, it is only proper that thoroughly saponified soap alone should be subjected to it.
- (ii) As the soap is not dissolved at all, there is little likelihood of its being exhaustively washed of any colour. Before being put to this process, the soap should be as free from all washable colours as possible. Heavy impurities, however, are removed and also washable colours to a certain extent.

The advantages of this process may be summed up as follows:—

- (i) It melts solid soap to a condition ready for framing or moulding in a very short time.
- (ii) As no froth is allowed to form, there can be no superficial frothy layer and the quantity of soap removable from the pan into the frame or the moulds is greater in this case than in the usual one. In other words, the output of soap per boil is larger than in the corresponding process of the existing method.
- (iii) Since the soap is not allowed to fob nor even to liquefy, the quantity of soap that can be treated in the pan is larger in this case than in the normal one, so that for the same cost on attendance a larger quantity of soap is passed through the process, and that at the expense of less fuel, thereby lowering the cost of production to a considerable degree.

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