

THE MANUFACTURE OF SOFT SOAP

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The Manufacture of Soft Soap.

Soft soap is an important industrial and commercial commodity. Besides being used in enormous quantities by the jute and cotton mills for the dressing of fibres, it is extensively used for various washing purposes in railways, steamships, buildings, etc. In fact, it is almost universally used in all washing operations of magnitude with soap solution. The advantage of this soap is that it is cheap—being easily made, and as it is soft in consistency, a solution can be prepared readily even in the cold. Furthermore, the soap admits of the use of soft stocks of any description as ingredients in its composition. Even foul smelling fish and whale oils can be employed in the manufacture of the cheaper classes of soft soaps meant for washing purposes, where the odour of the oils inevitably imparted in a small degree to the soap, is not a handicap.

India, specially Bengal, has an extensive market for the product. With the growth of industries the market is likely to increase. This country possesses special facilities for the establishment of this industry, which in fact can be considered a section of the soap industry. Oils and fats of the soft class required for the manufacture of soft soap are specially abundant in India, and there are greater varieties of these than of those classed as hard stocks required for the manufacture of normal washing and toilet soaps. The development of this industry will be of great assistance, in fact a necessity, in the utilization of the softer and inferior saponifiable stocks available in plenty in India.

Bengal, already noted for the progress it has made in the soap industry, has every opportunity to take the lead in the field. Some of the factories have no doubt been producing it but the output is meagre and the quality unimpressive. Proper attention does not appear to be given as yet to this branch of the industry by the soap-makers of the Presidency.

The ease of manufacture and the simple nature of the manipulation involved, show that the industry has possibilities even on a cottage scale, or on a small scale, and large quantities can be made with very little investment in plant and equipment.

Investigations into the technique and various aspects of soft soap making have recently been undertaken at the Industrial Research Laboratory, and details have been developed for manufacturing it readily and securing a satisfactory quality. The application of the Hardness Number, discovered by one of us and Basu, in the compounding of charges for soft soap, has made the process absolutely fool-proof and automatic, so that by the application of the principles developed, and by following the method described, a correct soft soap

¹Bulletin Department of Industries, No. 61, 1933; Soap Trade Review, 1933, 252, 268.

can always be made by suitable blending, irrespective of the nature of the stocks used.

Soft soap, as its name implies, is to remain always in the soft state. It is a semi-boiled soap finished with saponification, and normally contains 40-44 per cent. fatty acids. Its consistency is invariable for the same blend when finished properly. Even if the soap is finished hard in the pan, it reverts, on standing, to the consistency normal to itself.

The general principles in keeping the soap plastic with this percentage of fatty acids are to use soft stocks of a low I. N. S. and Titer and consequently a low Hardness Number, and to substitute caustic potash, either partially or wholly, in the place of the usual caustic soda. The softer stocks, viz., oils with a high iodine value and low titer including oils of the fish and whale class contain unsaturated acids in major quantities and hence give soft or plastic soap. The substitution of caustic Soda by caustic potash gives still softer soaps as potash soaps are found to be very much softer than the corresponding soda soaps. The manufacturer should accordingly have regard to these principles—that is to say, he must select as far as possible, the softer materials and substitute partially or wholly the caustic soda by caustic potash so that the final product is a soap which remains soft and is of a short grained structure.

Soft soaps are usually made with the softer vegetable oils such as linseed oil, poppyseed oil, rape seed oil, maize oil, soya bean oil, cotton seed oil, etc. Small quantities of coconut or palm kernel oils may be used to advantage in improving the lathering features of the soap. Oils of the marine class, e.g., fish oil, whale oil, etc., are also used in making the cheaper qualities of soft soap. Rosin is usually used to the extent of 5-15 per cent. due to its agreeable odour, its keeping qualities and lathering features. Though rosin has a low I. N. S., its high titer makes it almost as hard as tallow and if used in higher percentages, the extra hardness must be counterbalanced with large proportions of the softer stocks. Castor oil yields softer soap than what is indicated by the Hardness Number on account of the presence in it of hydroxyacids, e.g., ricinoleic, isoricinoleic and dihydroxystearic acids. Use of this oil in large proportions will enable soft soap to be made with larger percentages of caustic soda than usual.

A good soft soap should be short in texture and not show threads when drawn out. It should contain free caustic alkali within the limits of 1 to 1.5 per cent. It may be made to "fig", if desired, to suit the requirements of the market. The term "figging" is applied to a peculiar star-like formation which is met with in some soft soaps,—streaks of white crystals striking inwards from the sides of the vessel containing the soap. "Figging" at one time was held to be the indication of a good soft soap but it is no longer considered essential as a bad soap can also be made to fig. Figging is brought about by using some comparatively hard stocks like tallow, containing stearic acid and also by the use of some caustic soda in place of caustic potash. It is caused by the separation of sodium stearate in a crystalline form. It is best, however, to avoid figging; since, in trying to produce the phenomenon, the proper and desirable consistency and texture are interfered with.

The best manipulation for saponification consists in taking the calculated quantity of caustic alkali sufficient to effect complete saponification with an excess to furnish 1 to 1.5 per cent. free alkali to the

finished soap. This excess is furnished by using the theoretical quantity plus 2.5 per cent. excess calculated on the oil charge, since 100 parts of oil yield approximately 240 parts of finished soap. The process is carried out in direct-fire-pans, as during the finishing operation, brisk stirring is helpful. The caustic solution, preferably at a density of 30°Tw., is brought to boil and then the melted charge is added as quickly as can be managed without the contents frothing over. Emulsification follows with rapid saponification, and the process is usually completed with a few hours' boiling adding water when necessary. If rosin be a constituent of the charge, it is best added towards the end on completion of the saponification of the other stocks. In this procedure, the quantity of the alkali, being more in excess than usual from the start, favours rapid and complete saponification. After complete saponification and gradual thickening, the soap attains a stage at which it begins to congeal and finally assumes a neat and glossy appearance with the froth subsiding. This stage has to be regarded, if not as the exact end-point, at least the point without reaching which the soap cannot be held as finished. There is a limit to the amount of moisture that can be retained by a properly finished soap which possibly depends on the nature of the blend. The moisture content of soft soap made from different blends, however, varies within narrow limits. The finished soap is preferably allowed to stand and cool to assume a coherent mass before being packed away.

The above process of saponification as developed in the Industrial Research Laboratory has the following advantages over the orthodox process:—

- (1) Calculated quantities of caustic alkalies with the just necessary excess being added, the alkalinity of the final soap will be the same as required.
- (2) The necessity of testing the end-point for free alkali or free fat which introduces uncertainty is dispensed with provided the charge is boiled enough to ensure complete saponification.
- (3) A high concentration of alkali will be present from the start and hence the saponification will proceed with extreme rapidity. This concentration is further increased by adding the rosin towards the close after the saponification is quite complete.
- (4) There is no trouble of adding alkali of different strengths and the sudden solidification during the addition of alkali particularly when the alkali added is all reacted upon.

The usual and orthodox process of saponification is carried out by the gradual addition of alkali, the first addition may be of a density of 23°Tw. and the final of 40°Tw. The final consistency of the soap should be regulated by the use of direct or indirect steam as required. If direct-fire-pans are used, a start may be made with a lye of 14°Tw. or so, and then 23°Tw., and ultimately 40°Tw. may be used. The end-point in this process should be tested for completion as follows:—

If the soap on cooling has a grey colour and is dull in appearance and the mass broken or granular, then excess alkali is indicated which must be neutralized with cautious additions of further oil. If the soap has a fatty or opaque appearance, then free fat is present and should be reacted upon with cautious additions of further alkali. The finished

soap must have a clean and translucent appearance which indicates a properly saponified soap containing excess of neither alkali nor fatty oil.

The proper consistency and texture of a soft soap depend on a number of factors. Correct conditions of manufacture governed by these factors can produce a desirable soap correct to specifications.

A semi-boiled soap, made from average stocks with caustic soda is either solid or semi-solid according to the hardness of the blend used. If the stocks selected are only comparatively soft, and if only caustic soda be used, a gelatinous stringy soap is the result which shows that though the soap has become softer yet it is not soft enough to furnish soft soap of right consistency and non-thready structure. The soap must further be softened by the substitution of soda by potash. A non-stringy soap is softer than a soap which is stringy as the power to gelatinise is an indication of greater hardness than non-gelatinization of soap.

Stocks containing abnormally soft fatty acids can form non-stringy soft soap even with soda alone. Castor oil is an example; it contains 85 per cent. of ricinoleic acid, a hydroxyfatty acid not present in other common stocks.

The softest stock found in nature other than castor oil cannot form a non-stringy soft soap with soda alone so that a soft soap charge cannot be worked with caustic soda only, if castor oil be excluded. Castor oil, by itself, can form a soft soap with caustic soda, and with the substitution of varying proportions of caustic soda by caustic potash, soft soaps can be made with castor oil in which varying proportions of other stocks have been introduced. Even if the whole of the alkali be caustic potash, all stocks, irrespective of hardness cannot form soft soap and there is a limit to the hardness which must not be exceeded if a non-stringy soft soap of a desirable body and texture is to be made. This is because the saturated acids present in comparatively hard stocks give stringy soap even with potash. The higher these acids are in the homologous series, the more pronounced is the stringiness.

The Hardness Number of blends of soft soap should not exceed 175 if the whole of the alkali is caustic potash. With ordinary stocks the potash can be substituted to a maximum of 15 per cent. by an equivalent amount of caustic soda when the Hardness Number of the charge does not lie beyond 120. If it be desired to substitute more of potash by soda, it will be necessary to introduce castor oil into the blend. The percentage of caustic potash which can be substituted by caustic soda will depend on the percentage of castor oil introduced into the blend. Practical experiments indicate that about 2 per cent. of caustic potash can be substituted by caustic soda for every one per cent. of castor oil introduced into the blend, the Hardness Number of the charge as usual not lying beyond 175. It may be mentioned that the translucency and gloss of a soft soap are not affected if caustic potash is replaced by different percentages of caustic soda in blends containing varying proportions of castor oil.

Typical experimental results are given to support the above conclusions. Potassium palmitate and stearate, salts of the saturated fatty acids of the normal range, have a gelatinous stringy nature. Potassium

oleate and linoleate, salts of the typical unsaturated acids, give non-stringy soft soaps. These properties are confirmed by the tendency of the soaps to gelatinise in aqueous solutions. A 25 per cent. solution of potassium stearate gelatinises at a higher temperature than a solution of potassium palmitate of the same strength. Potassium oleate solution of a strength as high as 50 per cent. does not gelatinize even at the room temperature. That is to say, the less the power to gelatinize, the better and more non-thready will be the ultimate texture of the soap. A typical low molecular saturated fatty acid as potash caprylate, however, gives a non-thready soft soap which shows that the texture is also dependent on the molecular weight of the fatty acid.

Linseed-soda soap is stringy whereas the corresponding potash soap is non-stringy with a desirable body. Groundnut-soda soap is stringy unlike the groundnut-potash soap which is non-stringy. Cottonseed-soda soap is a solid soap having none of the properties of a soft soap while the potash soap is very sticky and stringy. This is as it should be since the Hardness Number of cottonseed oil lies beyond the range set forth above. Potash resinates has gum-like stickiness with stringiness. Potash-cocoonut soap is non-stringy, evidently due to the presence of low molecular, though saturated, fatty acids. The results of some experiments with different blends are given below:—

Experiment 1.—

	Parts.	Hardness number.
Groundnut oil 40 × 196.3 = 7,852
Linseed oil 20 × 70.5 = 1,410
Cotton seed oil 20 × 205.6 = 4,112
Tallow 20 × 327.6 = 6,552
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	100	19,926

$$\text{Hardness number of the blend} = \frac{19926}{100} = 199.3$$

This blend with 80 per cent. caustic potash and 20 per cent. equivalent caustic soda gives a highly stringy soap, but with caustic potash alone it is rendered almost non-stringy.

*Experiment 2.—*Groundnut oil 20, linseed oil 40, cottonseed oil 20, tallow 20; Hardness Number=174.1.

This mixture with 80 per cent. KOH and 20 per cent. equivalent NaOH gives a stringy soap but with 100 per cent. caustic potash, the soap has the correct non-stringy body.

*Experiment 3.—*The following charges with the Hardness Number lying between 148 and 128 give a stringy soap with 80 per cent. KOH and 20 per cent. equivalent NaOH but have the right non-stringy body with KOH only—

(a) Groundnut oil 20, linseed oil 50, cottonseed oil 20, tallow 10; Hardness Number=148.4.

(b) Groundnut oil 20, linseed oil 50, cottonseed oil 20, tallow 5, rosin 5; Hardness Number=147.8.

(c) Linseed oil 60, cottonseed oil 30, rosin 10; Hardness Number=135.6.

(d) Linseed oil 65, cottonseed oil 25, rosin 10; Hardness Number=128.9.

Experiment 4.—Linseed oil 67, groundnut oil 13, cottonseed oil 10, tallow 5, rosin 5; Hardness Number=125.5.

This blend with 80 per cent. KOH and 20 per cent. equivalent NaOH gives an almost non-stringy soap with only a slight thready tendency. This experiment shows about the highest limit of Hardness Number for 20 per cent. equivalent caustic soda.

Experiment 5.—Linseed oil 73, cottonseed oil 15, rosin 10, coconut oil 2; Hardness Number=120.6.

This blend with 70 per cent. KOH and 30 per cent. equivalent NaOH gives a non-stringy soap. This shows the lowest limit of potash for the highest Hardness Number of the blend but to be on the safe side, it is best to stick to the limit already indicated.

Experiment 6.—Linseed oil 73, castor oil 20, rosin 5, coconut oil 2; Hardness Number=95.5.

With the introduction of 20 per cent. castor oil, this blend gives a correct non-stringy soap with 60 per cent. KOH and 40 per cent. equivalent NaOH.

Experiment 7.—The following blends with higher percentages of castor oil give non-stringy soap with caustic soda alone:—

(a) Linseed oil 38, castor oil 50, coconut oil 2, rosin 10; Hardness Number=118.9.

(b) Linseed oil 32, castor oil 45, coconut oil 3, rosin 20; Hardness Number=144.3.

(c) Linseed oil 50, castor oil 35, coconut oil 3, rosin 12; Hardness Number=120.9.

The oils used in the above experiments have the following constants:—

			I.N.S.	Titer.	Hardness number.
Tallow	..	..	150	48	327.6
Cocoonut oil	..	..	250	22.5	333.2
Rosin	..	..	50	72	316.4
Cottonseed oil	..	..	85	32.6	205.6
Groundnut oil	..	..	102	25.5	196.3
Castor oil	..	..	96.5	3	107.6
Linseed oil	..	..	15	15	70.5

In addition to the above experimental results, examples of various soft soap blends are appended to afford a ready guide to the soap manufacturers. The blends have been under (1) soft soap charges containing no castor oil, (2) charges with the highest Hardness Number containing castor oil in varying proportions, (3) charges for soda soft soap containing maximum proportions of castor oil required in accordance with varying "Hardness Numbers".

1. *Soft soap charges containing no castor oil.*—

Stock.			Per cent.	Hardness Number.	Saponifying Caustic Alkalies (Proportions of KOH and NaOH).
1.	Mustard Oil	90	124·47	KOH = 85 per cent. Equivalent NaOH = 15 per cent.
	Sesamum oil	.. ..	10	
2.	Linseed oil	50	124·69	Ditto.
	Sesamum oil	.. ..	47	
	Rosin	.. ..	3	
3.	Linseed oil	45	125·17	Ditto.
	Mustard oil	.. ..	26	
	Ground nut oil	.. ..	25	
	Cocanut oil	.. ..	4	
4.	Sesamum oil	55	125·28	Ditto.
	Linseed oil	.. ..	45	
5.	Sesamum oil	30	125·54	Ditto.
	Groundnut oil	.. ..	20	
	Linseed oil	.. ..	50	
6.	Linseed oil	50	125·86	Ditto.
	Fish oil	.. ..	47	
	Rosin	.. ..	3	
7.	Linseed oil	65	127·31	KOH = 86 per cent. Equivalent NaOH = 14 per cent.
	Sesamum oil	.. ..	20	
	Rosin	.. ..	15	
8.	Linseed oil	75	131·98	KOH = 87 per cent. Equivalent NaOH = 13 per cent.
	Rosin	.. ..	25	
9.	Sesamum oil	50	144·75	KOH = 91 per cent. Equivalent NaOH = 9 per cent.
	Mustard oil	.. ..	50	
10.	Sesamum oil	50	145·46	Ditto.
	Groundnut oil	.. ..	20	
	Linseed oil	.. ..	30	
11.	Sesamum oil	50	146·39	Ditto.
	Groundnut oil	.. ..	10	
	Cottonseed oil	.. ..	10	
	Linseed oil	.. ..	30	
12.	Fish oil	50	146·71	KOH = 92 per cent. Equivalent NaOH = 8 per cent.
	Groundnut oil	.. ..	20	
	Linseed oil	.. ..	30	
13.	Sesamum oil	50	147·32	Ditto.
	Cottonseed oil	.. ..	20	
	Linseed oil	.. ..	30	
14.	Sesamum oil	50	147·96	Ditto.
	Karanja oil	.. ..	20	
	Linseed oil	.. ..	30	
15.	Linseed oil	50	149·56	Ditto.
	Sesamum oil	.. ..	30	
	Rosin	.. ..	20	

Stock.		Per cent.	Hardness Number.	Saponifying Caustic Alkalies (Proportions of KOH and NaOH).
16.	Sesamum oil	80	150.18	KOH = 93 per cent. Equivalent NaOH = 7 per cent.
	Linseed oil	20		
17.	Linseed oil	50	150.31	Ditto.
	Fish oil	30		
	Rosin	20		
18.	Linseed oil	45	150.92	Ditto.
	Mustard oil	28		
	Rosin	25		
	Cocoanut oil	2		
19.	Sesamum oil	50	151.62	Ditto.
	Punnal oil	20		
	Linseed oil	30		
20.	Sesamum oil	50	153.15	Ditto.
	Linseed oil	35		
	Mowha oil	10		
	Rosin	5		
21.	Groundnut oil	50	153.32	Ditto.
	Linseed oil	30		
	Sesamum oil	20		
22.	Linseed oil	40	159.78	KOH = 95 per cent. Equivalent NaOH = 5 per cent.
	Mustard oil	30		
	Rosin	25		
	Cocoanut oil	5		
23.	Sesamum oil	100	170.1	KOH = 99 per cent. Equivalent NaOH = 1 per cent.
24.	Groundnut oil	60	170.88	Ditto.
	Linseed oil	15		
	Sesamum oil	25		
25.	Fish oil	50	172.73	KOH = 100 per cent. Equivalent NaOH = 0 per cent.
	Cottonseed oil	20		
	Groundnut oil	20		
	Linseed oil	10		
26.	Linseed oil	40	174.99	Ditto.
	Sesamum oil	30		
	Rosin	25		
	Cocoanut oil	5		
27.	Sesamum oil	80	175.34	Ditto.
	Groundnut oil	20		
28.	Sesamum oil	85	175.43	Ditto.
	Cottonseed oil	15		
29.	Linseed oil	40	175.57	Ditto.
	Fish oil	30		
	Rosin	26		
	Cocoanut oil	4		
30.	Sesamum oil	80	176.27	Ditto.
	Groundnut oil	10		
	Cottonseed oil	10		

2. *Charges with the highest Hardness Number containing castor oil in varying proportions.—*

Stock.			Per cent.	Hardness Number.	Saponifying Caustic Alkalies (Proportions of KOH and NaOH).
1.	Groundnut oil	80	175·62	KOH=90 per cent. Equivalent NaOH =10 per cent.
	Linseed oil	.. ..	14	
	Cocoanut oil	.. ..	1	
	Castor oil	.. ..	5	
2.	Linseed oil	37	175·34	Ditto.
	Groundnut oil	.. ..	33	
	Rosin	.. ..	25	
	Castor oil	.. ..	5	
3.	Sesamum oil	65	175·28	KOH=80 per cent. Equivalent NaOH =20 per cent.
	Cottonseed oil	.. ..	23	
	Cocoanut oil	.. ..	2	
	Castor oil	.. ..	10	
4.	Linseed oil	34	174·68	Ditto.
	Groundnut oil	.. ..	31	
	Rosin	.. ..	25	
	Castor oil	.. ..	10	
5.	Linseed oil	35	174·63	KOH=70 per cent. Equivalent NaOH =30 per cent.
	Groundnut oil	.. ..	21	
	Rosin	.. ..	24	
	Cocoanut oil	.. ..	5	
	Castor oil	.. ..	15	
6.	Sesamum oil	57	174·49	Ditto.
	Cottonseed oil	.. ..	25	
	Cocoanut oil	.. ..	3	
	Castor oil	.. ..	15	
7.	Linseed oil	30	174·95	KOH=60 per cent. Equivalent NaOH =40 per cent.
	Groundnut oil	.. ..	22	
	Rosin	.. ..	25	
	Cocoanut oil	.. ..	3	
	Castor oil	.. ..	20	
8.	Groundnut oil	40	174·60	Ditto.
	Sesamum oil	.. ..	36	
	Cocoanut oil	.. ..	4	
	Castor oil	.. ..	20	
9.	Linseed oil	25	175·03	KOH=50 per cent. Equivalent NaOH =50 per cent.
	Cottonseed oil	.. ..	25	
	Rosin	.. ..	25	
	Castor oil	.. ..	25	
10.	Groundnut oil	75	174·13	Ditto.
	Castor oil	.. ..	25	

Stock.		Per cent.	Hardness Number.	Saponifying Caustic Alkalies (Proportions of KOH and NaOH).
11.	Groundnut oil	25	174.56	KOH=40 per cent. Equivalent NaOH = 60 per cent. †
	Rosin	25		
	Linseed oil	20		
	Castor oil	30		
12.	Sesamum oil	30	174.96	Ditto.
	Groundnut oil	30		
	Tallow	10		
	Castor oil	30		
13.	Groundnut oil	34	175.44	KOH=30 per cent. Equivalent NaOH = 70 per cent.
	Rosin	20		
	Linseed oil	11		
	Castor oil	35		
14.	Groundnut oil	30	175.55	Ditto.
	Cottonseed oil	25		
	Mowha oil	10		
	Castor oil	35		
15.	Rosin	25	174.49	KOH=20 per cent. Equivalent NaOH = 80 per cent.
	Groundnut oil	22		
	Linseed oil	13		
	Castor oil	40		
16.	Groundnut oil	26	174.96	Ditto.
	Cottonseed oil	25		
	Tallow	9		
	Castor oil	40		
17.	Rosin	25	175.09	KOH=10 per cent. Equivalent NaOH = 90 per cent.
	Groundnut oil	21		
	Linseed oil	9		
	Castor oil	45		
18.	Karanja oil	25	174.50	Ditto.
	Cottonseed oil	20		
	Tallow	10		
	Castor oil	45		
19.	Rosin	25	175.69	KOH=0 per cent. Equivalent NaOH = 100 per cent.
	Groundnut oil	20		
	Linseed oil	5		
	Castor oil	50		
20.	Karanja oil	25	175.00	Ditto.
	Mowha oil	25		
	Castor oil	50		

3. Charges for soda soft soap containing maximum proportions of castor oil required in accordance with varying "Hardness Numbers".—

Stock.	Per cent.	Hardness Number.	Saponifying Caustic Alkalies.
1. Castor oil	42.5	125.27	NaOH = 100 per cent.
Groundnut oil	31.0		
Linseed oil	26.5		
2. Castor oil	44.0	134.63	Ditto.
Groundnut oil	38.0		
Linseed oil	18.0		
3. Castor oil	45.5	144.62	Ditto.
Groundnut oil	45.5		
Linseed oil	9.0		
4. Castor oil	47.0	155.36	Ditto.
Groundnut oil	45.0		
Cottonseed oil	8.0		
5. Castor oil	48.5	165.39	Ditto.
Sesamum oil	24.0		
Rosin	17.5		
6. Castor oil	50.0	175.43	Ditto.
Sesamum oil	25.0		
Rosin	25.0		

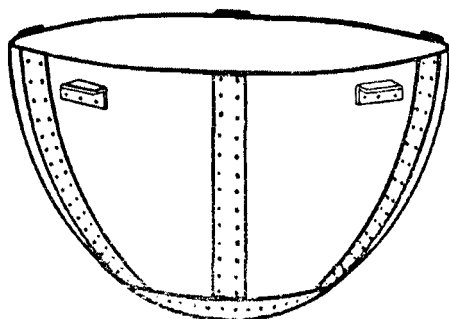
The following table gives the average values of the I. N. S., Titer and Hardness Number for oils used in the above charges.

Hardness Number = I. N. S. + 3.7 × Titer (loc. cit.).

Name of stock.	I.N.S.	Titer.	Hardness Number.
Cocoonut oil	250	22.5	323.2
Tallow (average)	150	48.0	327.6
Rosin	50	72.0	316.4
Mowha oil	128	40.0	276.0
Punnal oil	105	33.0	227.1
Karanja oil	93	21.3	208.8
Cottonseed oil	85	32.6	205.6
Groundnut oil	102	25.5	196.3
Fish oil	68.3	28.2	172.6
Sesamum oil	85	23.0	170.1
Mustard oil	75	12.0	119.4
Castor oil	96.5	3.0	107.6
Linseed oil	15	15	70.5

Equipment and manufacturing cost of soft soap.—The main equipment necessary for the production of soft soap is the pan set up on a direct-fire-furnace. The most convenient size that can be used for fairly large outputs is a semi-circular one having a diameter of 72" and a depth of 36" with a gross capacity of 42½ mds. It is best made in

accordance with the following drawing consisting of segments of mild steel plate, preferably $3/16''$ thick, rivetted with outside strips



The pan can be readily managed with hand stirrer and a charge of 8 maunds of stock can be worked giving an output of 20 maunds of soft soap which can be completed in a working day. Smaller pans can be used, if desired, but larger ones are not recommended for difficulty in manipulation by hand.

To get through an output of 20 maunds of soft soap daily, the cost of equipments will be as follows:—

	Rs.	a.	p.
One 72" × 36" round pan	250	0	0
Fixing and fire place	250	0	0
Lye tank, trowels, etc.	100	0	0
	<hr/>		
	600	0	0

The cost of production of soft soap will be as follows:—

	Rs.	a.	p.
Average cost of one maund of mixed stock	12	0	0
24 lbs. caustic alkali consisting of 50 per cent. caustic potash (Rs. 35 per cwt.) Rs. 3-12-0; and 50 per cent. soda (Rs. 14 per cwt.) Re. 1-8-0	5	4	0
Fuel and labour, say	1	0	0
Overhead and depreciation charges	0	8	0
	<hr/>		
Total	18	12	0

The yield from 1 maund of stock will be $2\frac{1}{2}$ maunds of soft soap; that is to say, the cost of production of 1 maund soap will be Rs. 7-8. The average selling price of a maund of soft soap of good quality will be Rs. 9 so that the profit per maund of soap will be Re. 1-8 or 20 per cent.

It must be pointed out that the cost will depend on the percentage of caustic potash used in the charge. If the caustic potash is increased beyond 50 per cent., the soap will be better in quality and hence will be slightly more expensive; on the other hand, if the caustic potash is reduced to 20-25 per cent., the cost will be less than what is given in the example. In fact, to meet the demands of a cheaper quality soft soap, it will be necessary to use increasing proportions of the cheaper alkali, caustic soda.

BULLETINS OF THE DEPARTMENT OF INDUSTRIES, BENGAL.

Chemical Section.

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