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RESTRICTED

IMPROVEMENT OF THE OPERATIONS OF THE SOAP FACTORY OF THE GOVERNMENT-OWNED BUSINESS UNDERTAKING BRITISH CEYLON CORPORATION LIMITED

IS/SRL/74/063

SRI LANKA

TERMINAL REPORT

Prepared for the Government of Sri Lanka by the
United Nations Industrial Development Organization,
executing agency for the
United Nations Development Programme

United Nations Industrial Development Organization

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United Nations Development Programme

IMPROVEMENT OF THE OPERATIONS OF THE SOAP FACTORY OF THE GOVERNMENT-OWNED BUSINESS UNDERTAKING BRITISH CEYLON CORPORATION LIMITED

IS/SRL/74/063

SRI LANKA

Project findings and recommendations

Prepared for the Government of Sri Lanka
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Hans J. Lehmann, expert in industrial economy

United Nations Industrial Development Organization
Vienna, 1977

Explanatory notes

The monetary unit in Sri Lanka is the rupee (SRs). During the period covered by the report the value of the rupee in relation to the United States dollar was $US 1 = SRs 8.66.

From 1977, Sri Lanka is adopting the metric system and therefore all weights and measurements in the report will use that system.

The following forms have been used in tables:

Three dots (...) indicate that data are not available or are not separately reported

A dash (-) indicates that the amount is nil or negligible

ABSTRACT

By request of the Government, an expert went on a follow-up mission to Sri Lanka on the project "Improvement of the Operations of the Soap Factory of the Government-owned Business Undertaking British Ceylon Corporation Limited (BCC)" (IS/SRL/74/063), from 12 June 1976 until 11 September 1976.

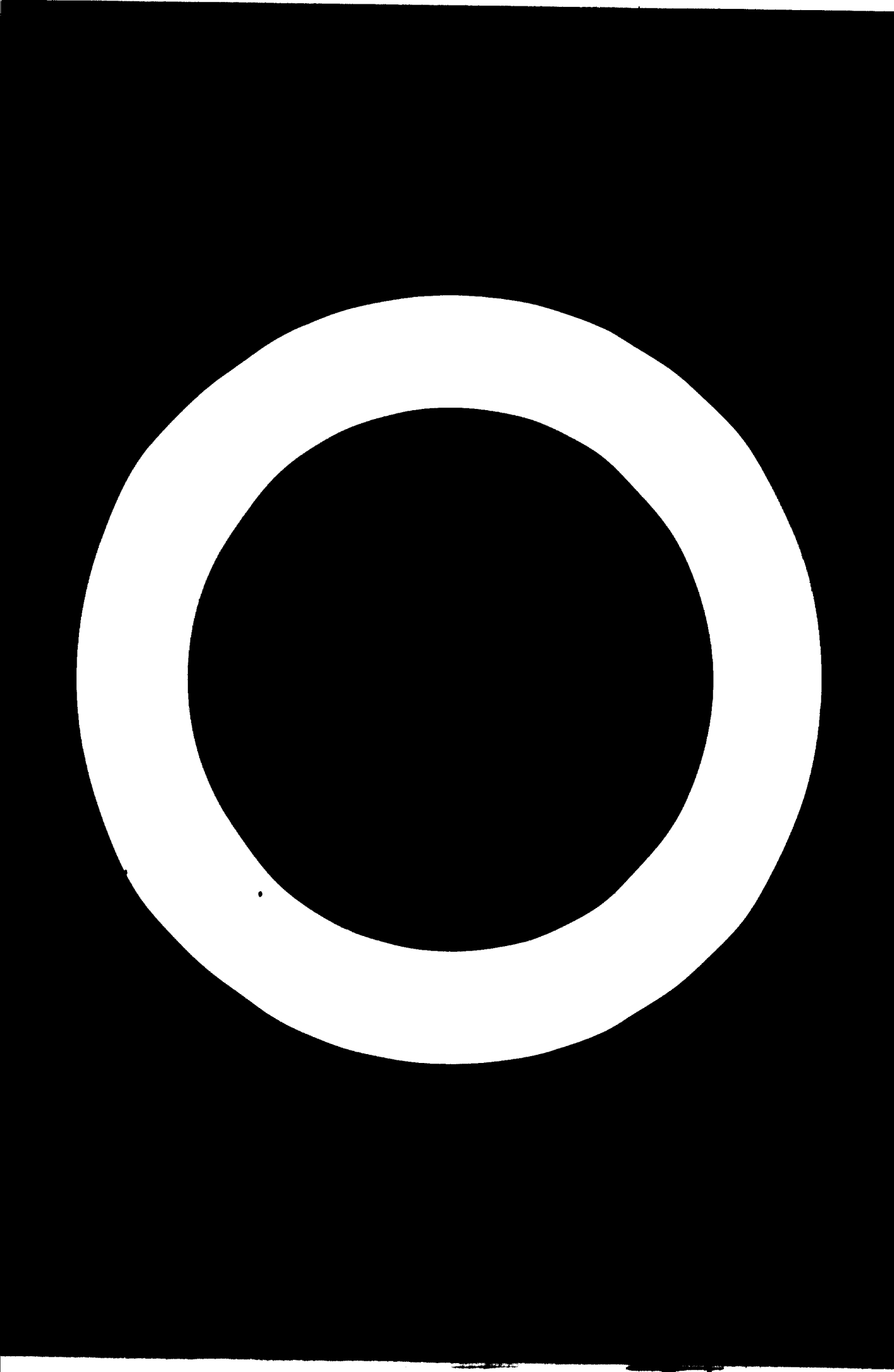
The purpose of the project was to review the soap factory production economy from all viewpoints, including new investments, and issue specific recommendations for organizational, economic and technical improvements.

The contribution of BCC during 1975 was 27% and 7.6% respectively of the total laundry and toilet soap production of Sri Lanka. A larger percentage of the market is desirable and measures have been described to obtain a higher production capacity with the existing equipment. An additional spray-drier and processing plant capacity of 2 tons/hour have been recommended to replace uneconomical and inefficient soap-bar producing equipment and to enable a higher output of laundry soap bars produced with inferior and cheap raw materials.

A comprehensive production planning and accounts system has been implemented. Improvements in factory organization, production methods and quality control have been recommended. Selling prices of the main soap products are not in line with material and manufacturing costs. The soap requires improvement in design and better, more suitable raw materials to improve quality.

To improve efficiency, a study of fat-splitting, fatty-acid distilling, glycerine condensation and distillation plants has been strongly recommended as well as an investigation into the possibilities of setting-up a hydrogenation and margarine manufacturing plant in order to use the plant capacity of the existing edible oil refinery and to meet a general shortage on the consumer market.

The expert also recommended that additional assistance on this project be requested by the Government of Sri Lanka.



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INTRODUCTION

By request of the Government of Sri Lanka, an expert undertook a preliminary study of the factory efficiency of the Government Business Undertaking of the British Ceylon Corporation Ltd. (BCC). In his report (1974), the expert pointed out that BCC is unfavourably affected by the following:

(a) An unbalanced input of fatty acids and caustic soda in comparison with the output of soap;

(b) Lack of appropriate materials and product measurement processes and documentation;

(c) Lack of appropriate cost measurement techniques for reasons mentioned above;

(d) Inappropriate utilization of men, materials and machinery.

As a follow up to this report, the Government of Sri Lanka requested further assistance from the United Nations Development Programme (UNDP) on 21 January 1975. UNDP agreed to this request and an industrial expert went on mission to Sri Lanka on the project "Improvement of the Operations of the Soap Factory of the Government-owned Business Undertaking Limited (BCC)" (IS/SRL/74/063). His mission was for three months, 12 June 1976 until 11 September 1976, with a possible extension of six months to be considered. The United Nations Industrial Development Organization (UNIDO) was the executing agency. The UNDP contributed $US 18,000.

The BCC was founded in 1835 by Edward Price and Company and was under British management until 1896 when Fredenberg and Company became the owners and remained so until 1914. Thereafter, it was the Ceylonese Private Shareholder Company until 1972 when it was taken over by the Government and re-named the Government of Sri Lanka - Successor to the Business Undertaking of British Ceylon Corporation Limited.

The company's head office, as well as all manufacturing units, are situated at Hultsdorf, part of the city centre of Colombo, on a site occupying about 14 acres (56,656.04 m^2). There is room for limited expansion inside the compound but practically none outside.

A channelled waterway passes the site, which was used by lighters many years ago. However, the channel has been neglected and has almost dried up. Instead a pipe-line was built to the nearby Colombo harbour (about 2,500 metres distant) to supply coconut oil to storage tanks for bulk shipments.

The plant comprises the following production units:

1. The oil mill, supposed to be the largest coconut oil mill of Sri Lanka, producing about 95 tons of coconut oil per day, amounting to about 40% of the total average quantity of 250 tons per day produced in the whole of Sri Lanka. This unit operates about 320 days of the year, the rest being official holidays.

2. The drum plant, capable of producing 300 drums per hour, supplies the oil mill with 500 drums per day, and also supplies outside customers. According to requirements, various kinds of steel drums are manufactured.

3. The provender plant, producing about 1,000 tons of cattle and poultry feed per month, out of coconut oil cake and various other raw materials.

4. The solvent extraction plant, continuous-horizontal sieve-plat conveyor type built by De-Smet of the Netherlands in 1953 with a capacity of 100 tons of oil cake input and about 10 tons of extracted oil output per day. This plant has been virtually unused for several years owing to the high loss of solvent per ton of oil and to the shortage of oil cake for extraction. Plans are under discussion to modify the unit in order to reduce the loss of solvent and if successful, to put the plant into more regular operation.

5. The edible oil refinery, produces "Cocolanka" (neutralized coconut oil) and "Cooks Joy" (refined and deodorized coconut oil).

6. The soap factory, the main concern of the following report, produces approximately 27% and 7.6% of Sri Lanka's total production of washing and toilet soap.

BCC employs a total staff of:

Executives	35
Clerical, supervisory and allied grades	350
Manual workers	850
Total	1,235

The expert's duties were to review the economy of the soap factory, including new investments, and issue specific recommendations for organizational, economic and technical improvements. Specifically, he was expected:

(a) To evaluate and classify jobs in the soap factory and refinery;

(b) To make a techno-economic analysis of nominal plant capacity and actual utilization, and evaluate the condition and suitability of the installed machinery and equipment in relation to the budgetary situation;

(c) To suggest which product diversification would best increase the production capacity of the vegetable oil refinery;

(d) To recommend, and put into operation, improvements in the documentation for material, product, and process control operations;

(e) To suggest suitable quality control methods and techniques to reduce waste and production losses in order to lower production costs;

(f) To evaluate the possibility of setting-up a glycerine recovery plant.

The expert's recommendations are made at the end of each chapter; the main ones (27 in all) are given under the heading Conclusions and Recommendations.

I. FINDINGS

A. Soap and oil products and production statistics

There are 43 different kinds of BCC soap products (annex I). In addition, five different disinfectants and three kinds of edible oils are included in the manufacturing range.

Production figures reveal (table 1) that whereas the production of washing soap and the over-all soap production were more or less steadily maintained from 1970 to 1973, a remarkable drop occurred in 1974 and 1975, except in the case of toilet soaps, which enjoy a steady upward trend.

Table 1. BCC soap production, 1970-1976
(Kg)

Year	Washing soap	Toilet soap	Other	Total
1970	5,088,880	246,480	64,972	5,400,332
1971	5,093,004	277,418	53,746	5,424,168
1972	5,661,152	410,583	66,548	6,138,283
1973	6,019,291	322,890	50,291	6,392,472
1974	5,269,217	323,778	35,309	5,628,304
1975	4,265,445	455,962	45,263	4,766,670
1976[a/]	4,141,000	446,000	50,000	4,637,000

a/ Estimated

A breakdown of these production figures (annex II) into the various brands indicates the names and importance of the few main products.

As shown in table 2, there is a limited range of soap products on which future development should concentrate. However, it must not be overlooked that some shortages in raw material have slightly influenced the ratio of production of such main brands, especially the amount of foreign brand soaps produced under licence. Special attention will have to be paid to the Night and Day toilet soap, the only BCC soap brand showing a remarkable gain in production figures from year to year.

Table 2. Breakdown of the main products, 1975
(%)

Laundry soap	
Sovereign bar	75
Snowite	23
Others	2
	100
Toilet soap	
Night and Day	41
Suvendra	31
Sandalwood	19
Foreign brands	4
Others	5
	100
Edible oil	
Cooks Joy	45
White oil	40
Cocolanka	15
	100

An attempt has been made to establish the material cost per case or selling unit for all BCC major products and to compare it with the ex-factory selling price, indicating the margin available for cost of labour, general overheads and profit. In the opinion of the expert, the proper direct labour and overhead costs to be established for each product can only be reliably calculated after the projected re-organization of the soap factory and the production administration is fully implemented.

No proper relationship between production costs and selling price exists with most of the BCC products (annex II). In the absence of accurate cost values of labour, general overheads, depreciation etc. a temporary standard margin to cover these expenses should be considered, on top of material costs, as follows: washing soap - 15%-20%; toilet soap - 25%-30%.

With one exception, none of the net ex-factory selling prices cover even production (table 3) costs. Unaccounted for are manufacturing costs such as steam, electricity, service and repairs on machinery, labour cost, general overheads and depreciation.

Table 3. BCC soap production costs and losses
(SRs)

Brand	Production cost per case	Ex-factory selling price	Loss per case
Sovereign bar	160.77	156.00	4.77
Snowite	184.71	176.00	8.71
Night and Day	70.95	72.00	(1.05)
Suvendra	81.50	72.00	9.50
Sandalwood	76.55	72.00	4.55

Source: Based on data supplied by the cost accounts department of the BCC.

An investigation shows that the projected selling price for the proposed Lotus Toilet Soap is as much as 22% below production costs. From a commercial point of view, the Lotus project can be considered unfeasible unless the cost of raw materials can be reduced and the selling price raised. The success of the project will stand or fall on the selection of low-priced raw, and packing, materials. This could be the first task to be investigated by a development department which the expert has recommended be established.

Recommendation

1. If the soap factory is to be operated on a sound commercial basis and if additional funds are to be obtained for new investments, the selling prices of all major soap products of BCC must be revised.

B. Production, sales and marketing

Production

Table 4 shows that fluctuations in the yearly production figures of the leading soap manufacturers occur, for the most part, simultaneously.

Table 4. Sri Lanka soap production and *per capita* consumption, 1960–1975

Year	Laundry soap (tons)	Toilet soap (tons)	Total (tons)	Population	Consumption *per capita* (kg)
1960	13,426	1,927	15,353	9,896,000	1.55
1961	15,025	2,977	18,002	10,168,000	1.77
1962	15,977	2,422	18,399	10,442,000	1.77
1963	16,559	2,318	18,877	10,625,000	1.78
1964	17,131	3,048	20,179	10,965,000	1.84
1965	18,127	2,859	20,986	11,164,000	1.88
1966	18,752	3,001	21,753	11,440,000	1.90
1967	19,916	2,223	22,139	11,701,000	1.90
1968				12,455,000	
1969					
1970	19,488	2,446	21,934		
1971	23,168	3,189	26,357		
1972				13,650,000	
1973	20,209	6,449	26,658		
1974	19,304	5,269	24,573		
1975	15,903	5,990	21,893	14,600,000	1.50

Sources: Figures for 1960–1967 are based on data in the report of H.G.R. Reddy (1968) of the United Nations Economic Commission for Asia and the Far East, figures for 1970–1975 are based on data supplied by the Department of Census and Statistics and the Ministry of Industries and Scientific Affairs on the largest soap producers of Sri Lanka, i.e., the Lever Brothers, BCC, Harischandra and Swadeshi companies. The production of the remaining smaller soap factories has been estimated at 15% of the total for laundry soap and 10% of the total for toilet soap.

The following facts can be ascertained from table 4:

1. Production of laundry soap is declining.

2. Production of toilet soap increased until 1973 then started declining.

3. Since 1966, the *per capita* consumption has declined from 1.9 to 1.5 kg. (*Per capita* consumption, including detergents, in other countries is 3–12 kg.)

Although there is a high demand for soap, a shortage exists throughout Sri Lanka and it is assumed that the production capacity of major soap producers is not fully used for various reasons. One reason is definitely due to the

fact that laundry soaps are price controlled by the Government and can only be manufactured without loss if coconut oil prices are low or cheap low-grade oil raw materials can be imported. Proof of this is the fact that if coconut oil prices are low there is sudden heavy competition on the soap market from a great number of small soap factories that is almost lacking when the coconut oil price is raised high enough to cause production costs to run above the break-even point.

Other factors hindering the maximum use of existing production equipment must be found within the factory organizations concerned.

Soap production must be raised to meet market requirements, and the Government-owned BCC is in great need of a larger share of such production (tables 5-8). BCC should not find it too difficult to multiply their output, particularly of toilet soap. The output of laundry soap could also be increased, within limits, as soon as the C2 plant is used to its full capacity and the frame-cooling area is expanded.

Table 5. Breakdown of laundry soap production in Sri Lanka, 1970-1975
(Tons)

Year	Lever Bros.	BCC	Harischandra	Swadeshi	Others	Total
1970	10,538	5,089	938	-	2,923	19,488
1971	13,516	5,093	1,084	-	3,475	23,168
1972	...	5,662	1,453	44	...	...
1973	10,744	6,019	415	-	3,031	20,209
1974	10,725	5,269	414	-	2,896	19,304
1975	8,763	4,266	484	5	2,385	15,903

Table 6. Producers contribution to total production of laundry soap, 1970-1975
(%)

Year	Lever Bros.	BCC	Harischandra	Swadeshi	Others	Total
1970	54	26	5	-	15	100
1971	58	22	5	-	15	100
1972	...	...	...	...	15	100
1973	53	30	2	-	15	100
1974	56	27	2	-	15	100
1975	55	27	3	-	15	100

Table 7. Breakdown of toilet soap production in Sri Lanka, 1970–1975
(Tons)

Year	Lever Bros.	BCC	Harischandra	Swadeshi	Others	Total
1970	1,329	247	212	414	244	2,446
1971	1,839	277	202	552	319	3,189
1972	...	411	185	411	...	...
1973	4,981	322	204	297	645	6,449
1974	3,967	323	225	227	527	5,269
1975	4,465	456	232	238	599	5,990

Table 8. Producers contribution to total production of toilet soap, 1970–1975
(%)

Year	Lever Bros.	BCC	Harischandra	Swadeshi	Others	Total
1970	54	10	9	17	10	100
1971	58	9	6	17	10	100
1972	...	...	...	...	10	100
1973	77	5	3	5	10	100
1974	75	6	4.5	4.5	10	100
1975	74.6	7.6	3.9	3.9	10	100

Production costs

A complete review must be made of ex-factory costs of BCC products compared with competitors' products. A comparison of prices of BCC's main products with the main products of other companies is given in annex III. Lever Bros. has a large share of the market almost entirely owing to Sunlight soap. This realizes SRs 0.72 per bar and is thus much more favourably prioed than BCC's similar product, Snowite, at SRs 0.68 per bar. Therefore, when cooonut oil costs rise Lever Bros. can still produce laundry soap at a profit, whereas BCC then loses on every bar.

Development department

To meet competition, BCC urgently requires a development department to work on the following:

(a) A consumer survey of the appearance of BCC's products, such as, the name, design, shape, colour, perfume, general quality of the bar and packing material;

(b) A study of the economic aspects and possible changes in formulation and product;

(c) Consistent techno-experimentation on production equipment to improve output, quality, and technical operation with the aim of developing the most appropriate production methods.

This department should be established permanently in order to deal with problems that arise daily on raw materials, product changes, sales requirements etc.

Marketing

Higher production output may soon impose a pressure on the marketing department. Programmes should be prepared in time to meet increasing competition and to secure a larger proportion of the market.

Sales

The BCC presently exports Snowite and Health Joy laundry soaps to China through Government agreements and possibilities of private exports have been discussed with the Department of Export Promotion. However, whereas Lever Bros., possibly with the help of its international set-up, has succeeded with limited exports to the Middle East, only minor opportunities for the export of soaps, other than by governmental barter arrangements, could be expected by BCC.

Recommendations

1. A development department, attached to the soap factory and staffed with chemists, economists and mechanics, should be established.

2. Product quality should be improved to match the standard of competition.

3. New marketing measures should be programmed to deal with improved production output.

4. Sales programme and product range should be focussed on main products.

C. Production planning and administration

The necessity to end the accounting system of recording the flow of materials and yield was generally agreed to and a new system was put into operation during the present project. All the required forms have been designed and produced in a temporary version until final versions printed in blocks with coloured duplicates and running numbers can be made available.

A production planning and accounts unit office has been installed at the soap factory site and staffed in co-operation, and in agreement, with the BCC general office cost and material accounts section.

Code numbers for raw materials have been given with an additional code numbering system for finished soap products. For each product, formulation cards have been prepared based on 100 kg batch requirements of raw and packing materials. In future, requisitions for, and the supply of, materials for programmed production batches will have to conform to the information on these formulation cards.

The requisition of materials will, in future, be made only by the production planning and accounts unit. Full responsibility for the issuance of raw materials from the stores, and all oils and caustic soda from the storage tanks, must lie with the storekeeper. Regulations must be made to prevent the access of the manufacturing unit to materials without permission from the storekeeper.

All production reports should be controlled and signed by the management of the soap factory before copies, together with all copies of receipts, are forwarded to the material accounts section of the BCC general office. The factory production accounts unit will use figures based on these reports for production statistics.

By recording the time spent by production staff on products detailed in the production reports, information on direct labour costs can be submitted to the cost and material accounts section. For this purpose, punch-card clocks with provisions to record the time a given person has attended in connexion with any particular production batch, should be obtained and installed on the soap factory premises.

Recommendations

1. To make full use of the newly-invented closed system of production planning and material accounting production should be stopped, as soon as possible, and

a complete stock-taking made of all raw materials in stores and storage tanks, as well as all finished and semi-finished products in process inside the various parts of the soap factory.

2. All storage rooms and storage tanks must be secured and metric measuring devices installed on various containers to enable the control of supplies.

3. Punch-card recorders suitable for cost account purposes should be installed on soap factory premises.

4. Final versions of forms with printed running numbers must be put into operation with the production planning and accounts unit, in accordance with the written procedure.

D. Raw materials

Oils and fats for soap manufacture

The standard fat compositions in use outside Sri Lanka are:

Laundry soap: 85%-90% of low-quality tallow, palm oil, hardened marine fatty acids, hardened non-edible vegetable fatty acids, acid oils or soap stocks, etc., and 10%-15% of coconut oil or palm kernel oil of low quality or their fatty acids or soap stocks.

Toilet soap: 80%-85% of good grade beef tallow refined or as distilled fatty acid, palm oil bleached and refined or its fatty acid, and 15%-20% of coconut white oil or distilled fatty acid, palm kernel oil or its fatty acid.

Tallow gives to soap hardness, a fine creamy lather and, in the case of good quality prime or distilled tallow, a neutral odour of the soap base which is the basic condition necessary for the full effect to be realized of the perfume which is added to soap. Its nearest substitute is palm oil which, however, adds a special odour to the soap base.

Coconut oil or its fatty acid gives the soap its rich lather and improves its solubility when in use. The percentage to be added to the fat composition is determined by the following factors:

(a) There must be a minimum of 8%-10% to show any effect in lather improvement;

(b) In most countries in the world, coconut oil is the most expensive item of the fat composition and therefore only the minimum necessary to meet the required soap (lather) quality is used;

(c) For dermatological reasons, the coconut oil or palm kernel oil part of the fat composition should never surpass the upper limit of 20%-25% as it has been established that soaps containing higher percentages irritate the skin and may cause rashes on sensitive skins.

The Sri Lanka Government has imposed a ban on the import of tallow and other oils and fats for soap-making. For this reason, soap manufacturers in Sri Lanka are at present forced to use mainly coconut oil and a limited amount of other locally-available oils more or less suitable for soap manufacture, such as, kapok, rubber-seed, palm, cotton-seed, and ground-nut oils. Whereas rubber-seed oil is in demand for the paint industry, palm, cotton-seed and ground-nut oils should be reserved for edible use.

Quality tests have been carried out at the BCC laboratory to compare the content of coconut oil in the fat composition of soaps made in Sri Lanka with that of soaps made elsewhere, with normal fat compositions (annex IV).

The object of the tests was to establish solubility which factor determines how quickly the soap (a) lathers, and (b) develops soap sludge when lying in a moist soap-tray or on a basin. Such sludge is washed down the drain prior to the soap piece being used again. The very rough test applied in other factories has produced indications of the behaviour of soap pieces under normal consumer conditions.

Manufacturing methods

After establishing the weight, each piece of soap is placed freely in a 500 ml beaker and covered with 300 ml of tap water at room temperature. After a certain time, the piece is carefully removed, the sludge on the outside washed off by use of a gently-running water tap and the piece allowed to dry naturally for several days at room temperature. The weight loss of each piece is established and expressed as a percentage of the original weight. The results with regard to solubility show that a ratio of 50:50 of tallow and coconut oil in the fat composition is the highest acceptable percentage of coconut oil in toilet soaps (see annex IV).

Various soap brands, produced by some of the main manufacturers of Sri Lanka, were tested. The fat compositions of these brands are not known, but owing to the circumstances prevailing in the island, it can be assumed that they consist of 80%-100% coconut oil whereas the BCC's test pieces had a fat composition of 100% coconut oil.

The results of these tests strongly support the assumption that by using high percentages of coconut oil in local soap manufacture, the consumer value of the soap may be reduced by up to 50% owing to high solubility. This could mean that a Sri Lanka family with a limited income of SRs 100-200 may have to spend SRs 10 per month on soaps, whereas the same amount of washing, cleaning and hygiene could be obtained with half the quantity of soap made with tallow and cost only SRs 5, i.e., saving up to 5% of the total income of a worker, which is an important social factor.

Coconut oil is in high demand in international markets as a food product. The import c.i.f. value for suitable grades of tallow for laundry and toilet soaps in bulk shipment from Australia, New Zealand or the United States would, on average, not be higher than the f.o.b. value of coconut oil exports available in exchange. The present difficulties with bulk shipments could be overcome by setting up storage facilities and arranging return loads of coconut oil or similar products, probably by barter agreements.

In addition to the fact that the import of tallow in exchange for the export of coconut oil is likely to produce a slight surplus in export revenues for the Government, the following savings should result as soon as soap is produced with a normal content of tallow and coconut oil:

1. Less money will have to be spent for soap due to its higher consumer value.

2. More soap can be produced for the same amount of coconut oil thereby allowing the soap producers either to meet higher local demands or to make additional quantities of soap available for export.

3. There will be an approximate 30%-40% reduction of salt used in the fully-boiled soap manufacturing process.

4. There will be a savings of about 40 kg of caustic soda 100% (NaOH) in the saponification process of each 1,000 kg of tallow. About 140 kg of NaOH is required to saponify 1,000 kg of tallow whereas about 180 kg is required for the same quantity of coconut oil, with both resulting in the same quantity of finished soap.

5. Soap made from coconut oil dissolves, to some extent, in salt water (spent-lye). The spent-lye drained during the soap manufacturing process generally contains small amounts of soluble soap which are a loss from the yield of finished soap.

6. Owing to these reasons, spent-lye from coconut oil soap, when processed for glycerine and sodium chloride (NaCl) recovery, will require more hydrogen chloride (HCl) and sulphate of aluminium or similar chemicals.

Caustic Soda

Caustic Soda is produced locally by the Paranthan Chemicals Corporation and supplied as a liquid solution in 40°-50° Bé concentration. The quality of their product is poor (it has a high percentage of NaCl (2%) and Na_2ClO_4C (1%))- because the equipment used is not modern; it can be used without particular problems in the fully-boiled process but creates difficulties in the semi-boiled process. Because of the high NaCl content, the soap, when left to cool, tends to separate some traces of "niger" or spent-lye (annex V). To avoid dark separation marks and lines which would render semi-boiled bar soap unfit for sale, imported caustic soda has to be used unless more modern equipment is made available. If it is, soap can be produced, according to the fully-boiled process, using only caustic soda produced by Paranthan Chemicals Corporation. As soon as the recommended new vacuum spray-drying unit is installed, the BCC will require no more imported caustic soda, saving foreign exchange capital which can be used to pay for the spray-drying plant.

Dyes

The import of dye-stuffs for soap production has been banned for some time. At the moment, it is not clear what will happen when the soap dyes still in stock are exhausted. It may be disputed whether the colour of toilet soap has any influence on quality, however, there exists a connexion between the colour and perfume and consumer acceptability of soap. The import ban on soap dyes is of little value when considered that there are dye-stuffs on the market, of which 1 kg of red, green, blue or yellow, costing approximately SRs 100 c.i.f. Colombo, may be sufficient to dye 30,000 kg of toilet soap. This means that 5-10 kg of concentrated toilet soap dye together with some 300 kg of titanium dioxide, would meet roughly the entire demand for one month's toilet soap production in Sri Lanka. The use of dyes for laundry soap production can be stopped, especially as small additions of red palm oil can be used instead of a yellow dye.

Perfumes

The importance of perfumes for toilet soap is also being disputed and the argument put forward that local essential oils be used instead.

As perfume compounds for soap are made from as many as 50 different components and it requires great experience and skill not only to create pleasant odours but, what is much more difficult, to create mixtures which harmonize together and with the soap, and which also have stability during storage time and use of the soap, it is doubtful whether restrictions to use local essential oils would be economical or successful. An investigation should be made as to whether the export value of such natural essential oils would not be greater than the import costs of specialized soap perfume compounds. Another possibility that could be considered is a joint enterprise with one of the experienced foreign soap perfume manufacturers.

Chemicals

Other chemical materials for soap manufacture are:

1. Hydrosulphite, Blankit etc., for the removal of metal impurities in soap.

2. Edta, Trilon B, Sequestrene etc., as complex binding agents for metals.

3. Magnesium sulphate together with sodium silicate as a soap preservative and stabilizer.

Import of these chemicals should be permitted in order not to endanger the quality and storage standard of the soaps.

Packing materials

The poor quality of paper available locally means that the soap wrappers and corrugated cardboard boxes used are not up to the standard of those in most other countries. The absence of "stiffener" cardboard for the inner wrapping of toilet soap pieces and the low quality of the outer wrapping material may be of little consequence to the sales of soap on the local market. However, the quality of the corrugated cardboard boxes should be strengthened and water-resistant glue used in their manufacture to provide adequate protection for the contents even under moist and humid storage and transport conditions. Later on, stronger cartons should replace the use of wooden soap-boxes for the packing of Sovereign bar and other soaps scheduled for export. This should not only reduce the cost of packing material for washing soap, but also conserve a valuable natural resource, wood, for more important purposes.

Recommendations

1. Every effort should be made to obtain permission to import beef tallow, or similar substitutes for the production of laundry and toilet soaps, in

exchange for the export of coconut oil.

2. Stronger cardboard boxes must be made available to replace wooden soap-boxes.

3. If export markets are to be found, Sri Lanka must produce soap of international standards by using standard fat compositions, dyes, perfumes, chemicals and packing materials such as aluminium-foil laminated wrappers.

E. Staff

Working under the supervision of the soap factory manager of BCC are 405 staff members:

Assistant manager	1
Secretary	1
Production planning and accounts	3
Factory supervisors	12
Graded workers	64
Ordinary workers	201
Women workers	123
	405

Considering this number in relation to the present output of finished goods, and comparing it with similar production figures of other manufacturers with a similar output of finished goods, it appears that the BCC factory is over-staffed. On the other hand, when judging the efficiency, skill and manual speed of factory staff members, they appear to be of normal, quite acceptable standards. The discrepancies are explained by the prevailing situation, which is described below.

1. According to information received, the average staff member is annually entitled to:

14	days annual leave
7	days casual leave
21	days medical leave
42	days official leave, taken mainly during the first six months of the year. In addition, the average staff member takes the liberty of:
80	days unpaid medical and casual leave
52	Sundays official rest
20	official holidays
194	days

The average employee, therefore, is absent 194 days out of 365 days.

2. Staff membership in one of the four labour unions acting on the soap factory premises is determined by political motivations. Having four different unions acting in the interests of members within the same working team or department creates a constant rivalry and presents serious difficulties to management in establishing labour efficiency and, at the same time, avoiding long disputes and strikes.

3. Production norms were established at a time when the necessary skill to operate existing production equipment had not been fully established. Owing to the union situation, as described above, these norms are now maintained in such a way that production is halted the moment they are fulfilled regardless of whether, because of equipment development or improved skills, a higher output could reasonably be expected. Such interruptions, added to lunchtime and rest intervals, sometimes amount to several hours production loss within one eight-hour shift.

4. An outdated and highly uneconomic plant manufacturing semi-boiled laundry soap via frame-cooling and cutting is operated by 129 staff members whereas about 25 of them, using an up-to-date spray-drying and processing plant with a wrapping machine and cardboard boxes for packing, could produce perhaps three times the quantity of soap within 24 working hours.

5. Although a brand-new packing machine has been available for several years, 65 women are engaged in hand-wrapping toilet soap. The machine however cannot be commissioned because some parts are missing which have been used to repair another packing machine of the same model operating on the Snowite processing line.

An efficient duty description exists for every job in the soap factory. Job evaluations were recommended by the soap factory manager some time ago but no measures have been finalized by the factory's personnel department to encourage efficiency by remunerating the efforts and skills of the individual worker.

The factory works management should delegate more responsibility. At present, horizontal arrangement from the manager and assistant manager to all factory supervisors is observed, with the supervisors keeping direct contact with the staff members within his department. A new organization chart has been prepared (annex VI) with the aim of delegating the responsibilities for

various production groups on down to minor foremen and machine operators. It is expected that such measures will stimulate interest, efficiency and responsibility in a greater number of staff members and restrict the number of people each manager, supervisor or foreman has to contact regularly. It should also create the necessary respect for staff members with leadership ability and create a basis for justified salary incentives.

Recommendations

1. Establish a more effective salary-bonus system for non-absentees.

2. An agreement must be reached between the BCC top management and the prevailing labour unions allowing the full use of existing factory equipment in order to supply the country with the maximum soap output which is urgently needed. Compensation for higher work efficiency should be made, preferably by means of incentive arrangements.

3. In order to produce the highest possible output of toilet soap, the GD packing machine must be completed with spare parts and put into operation. The increased output of other plants of the soap factory, and the re-conditioning and putting into operation of some existing old machinery, will necessitate that all women at present engaged on hand-packing on the toilet-soap line, be found other acceptable working places in the same factory.

4. The new staff organization should be put into operation as early as possible, together with a scheme of payment grades and efficiency incentives. The responsibilities of every supervisor should be revised to co-ordinate with those of sectional heads, according to the new organizational chart. As shift work is continuing, additional supervisors may be necessary, especially for the department of soap boiling and Sovereign bar manufacturing.

F. Buildings

Layout and building design are generally well planned and well situated to allow an economic flow of materials during processing. Except for the new factory building which houses material stores, the soap flakes and talcum powder plants, as well as the social rooms, laboratory, offices and the rest of the buildings are in need of general repairs to floors, walls and windows and to stop leaks in the roof. Generally, all walls and ceilings in all buildings need whitewashing and the stairs and railings need painting.

In addition, the upper and first floors of the soap boiling section should be made watertight and gullies installed to enable regular washing of the floor. It is recommended that the walls of the upper floor be tiled.

The existing sales store for finished soap products is of sound structure and very suitable. It is said to have previously been a hanger. It consists of two sections, the main hall being 50 m long and 32 m wide, i.e., 1,600 m^2, with a minimum height of 11 m. The annex is 34 m long and 12 m wide, i.e., 408 m^2 of floor surface with a minimum height of about 7 m. The building is a steel structure with corrugated-sheet walls and roof and concrete floor.

Recommendations

1. Repair rain-leaks in roofs.
2. Repair floors.
3. Repair broken windows.
4. Whitewash walls and ceilings.
5. Alter two floors in the boiling section for washing purposes.
6. Tile the walls of the upper floor in the boiling section.
7. Walls should be repaired and unnecessary openings closed.
8. An extension should be considered to enlarge the frame-cooling zone of the semi-boiled soap section.

G. Machines and equipment

Generally, all machines and equipment are in need of more care and expert servicing and adjustment. Pipes must be re-insulated where necessary and painted according to the colour code. Many valves, cocks, steam-traps etc. leak. Re-packing or replacements are required.

More care must be taken with electrical wiring, connexions to motors etc. Most of the motors require cleaning and opening of cooling arrangements. Switch-cabinets and switchboards should be painted and the main switches on switchboards clearly labelled.

It is recommended that all machines be labelled with a BCC numbering code. Identity cards and statistical records of servicing instructions and servicing should be established, together with spare part requirements and maintenance costs for each machine.

An account is given below of all existing production equipment with comments on its condition and some recommendations for improvements.

Soap boiling department

1. Dissolving and storage tanks for caustic soda: seven dissolving tanks, each capable of delivering about 4,000 kg every four hours, are available together with a chain-block for the caustic soda drums, providing ample facilities for any quantity required for production. There is also an underground tank for liquid caustic soda arriving in tankers. Measures have been initiated for replacement of the pump which supplies the caustic soda solution to the boiling room.

Recommendations

A circulation pipeline with cocks should be installed so that the pump can be used for circulating caustic soda during the dissolving process.

2. Drum evaporation unit which processes five drums at a time. No comments.

3. Four concrete tanks for spent-lye 10–15 m^3 each and three steel storage tanks for spent-lye, about 10 m^3 each. Sufficient facilities are available for spent-lye, if operated properly and under the provision that spent-lye can be drained to the canal or is collected frequently for glycerine processing.

Recommendation

If spent-lye is sold for glycerine processing, neutralization may have to be carried out with acid treatment in spent-lye tanks. A perforated pipe could be installed for mixing the lye with the help of compressed air.

4. Five oil storage tanks, 35 m^3 each. Two oil storage tanks, 25 m^3 each. These tanks are now being installed with heating coils. The total capacity is limited considering the production capacity of the boiling pans. The centralized tank filling and oil pumping station is adequate.

Recommendation

Suitable level-indicators in metric measurement to be installed on every tank. A large storage tank for coconut oil holding about 500 tons should be erected to provide adequate stock reserves for the soap factory.

5. There is a tower which serves to cool the water of the soap factory and extraction plant. This unit has been re-started and is powerful and effective.

Recommendation

The tower's inside wooden slats should be replaced and a circulation pump-line constructed to enable cooling water circulation even when the extraction plant is not operating.

6. Salt-dissolving tanks.

Recommendations

These should be removed from their present site inside the soap boiling section as soon as possible as the handling of salt has already resulted in considerable damage to the building, iron-stairs, elevator etc. New dissovling tanks of a greater capacity (minimum 10 m^3 each) and with a propeller and agitator pump should be erected outside the boiling section, next to the spent-lye tanks.

7. Seven square-shaped boiling pans about 40 m^3 capacity each, of welded steel-plate construction, covered with steel-plates and installed with an exhaust fan. The whole set-up is well designed and the piping for raw materials and overhead feed-tanks is well planned and in good shape except for valves and cocks. The steam-heating pipes in all kettles should be improved according to the arrangement of kettle no. 1, altered during the lifetime of the project. All kettles must be equipped with additional skimmers (syphon pipes and joints) in order to make full use of the pan capacities and to apply proper boiling procedures. The drain-pipes for spent-lye and the W & S niger transfer pump work adequately.

Recommendations

The steam-heating pipes should be altered and syphon pipes and joints installed; cocks and valves on supply pipes should be exchanged; the bottom insulation on boiling pans should be covered with galvanized sheets.

8. Two soap storage tanks, each of a capacity of seven tons, with hot water heating and insulated, with two intermediate crutchers of a 500 kg capacity. The feeding of soap from kettles into storage tanks via crutchers is inadequate because of missing soap-pumps.

Recommendations

Two new soap pumps should be installed, one for kettles no. 1-4 and the other one for kettle no. 5-7, as soon as the syphon-pipes are installed;

storage tanks should be equipped with slow-moving impellents for the mixing of additives and occasional mixing during storage time.

Toilet soap finishing lines

9. Mazzoni C1 vacuum spray-drying plant, normal capacity 250 kg/h.
The plant has been serviced and adjusted as far as possible during the project. Generally it is well equipped and in good shape, except for missing thermometers and manometers, leaking steam valves etc. The attached unit for refrigerated water has been re-constructed according to the original design and re-started. A new water circulation pump has been installed. Pipe-lines have been insulated and painted.

Recommendations

All missing and broken measuring instruments should be replaced; steam valves should be repaired and replaced; fine-vacuum indicators should be exchanged for Bennert-vacuum meters, which are more exact; the over-head water tank should be replaced or repaired - there is a weak motor which should be replaced with a stronger one.

10. Only one of two projected storage bins, each holding about three tons of dried soap, have been completed. The second storage bin is required to enable a smooth operation. For this reason, the soap elevator must be completed with a suitable overhead conveyor to feed the second bin.

Recommendation

The second storage bin should be completed with one overhead soap conveyor.

11. Silo-scale.

Recommendation

The silo-scale for weighing soap-base batches for the amalgamator must be equipped with a movable arrangement to serve the seoond storage bin. Rails and wheels should be attached to the silo-scale.

12. W & S Bafra double-through-amalgamator.

Recommendation

The mixer is in good working condition but is being operated without any safety cover. One should be made and used.

13. W & S Farin - 3-roller mill.

The roller-mill is adequate, however, it is in need of a general overhaul. It is, at present, very noisy which indicates that repairs are necessary to bearings and gear-wheels.

Recommendation

A general overhaul should be made and the cooling water arrangement must be re-connected to the refrigerated cooling water circle, in order to minimize the loss of perfume by evaporation.

14. The Mazzoni Duplex-Plodder 250/250 is in good working order.

Recommendation

Semi-spherical mouth-whole discs should be obtained to improve the quality of the extruded soap bar.

15. The Mazzoni TV chain-cutter is in good working condition.

16. Mazzoni TR 500 crusting-dryer.

Recommendations

The main conveyor belt will need to be replaced in the near future. A general service of all moving parts is recommended together with cleaning and opening of congested air inlets and outlets. The latter should be extended onto the roof. Sight-glasses should be cleaned for inspection.

17. Mazzoni STU soap stamper, suitable for box and capacity dies. This unit is in a very bad state of repair. The room around the stamping die is heavily corroded because of the use of unsuitable stamping lubricants and the lack of proper maintenance. The die-cooling arrangement is not connected or used.

Recommendations

A general overhaul should be made with anti-corrosion treatment and resurfacing of the stamping section; the die-cooling arrangement should be conneoted; the stamping dies are generally worn out and require replacements.

18. Four hand-stampers attached to the toilet soap line should be serviced to safeguard the exact die operation. The stampers are useful to improve the output capacity in connexion with the STU stamping machine to match the 500 kg/h capacity of the rest of the finishing line.

Recommendations

The hand-stampers should be overhauled and re-serviced and the stamping tools should be replaced.

19. Packing table and GD 4000 S packing machine. The present simple hand-packing arrangement will not be able to cope with the actual capacity of the finishing line. The existing new GD packing machine which has never been installed must be completed with spare parts to replace the ones taken out of it.

Recommendations

The existing GD packing machine should be repaired; it requires treatment with grease, and covering against corrosion; the GD machine should be installed and commissioned on the toilet-soap line as soon as possible; size groups for all major toilet soap products to be wrapped have to be obtained together with properly registered and measured soap-wrappers; the use of cardboard stiffener from reels is advisable for proper toilet soap wrapping.

Proposed second toilet-soap line

The second toilet-soap line can be assembled from existing old machinery; the line should be used to manufacture small size toilet soap (hotel soap), soap needles and soap flakes and serve as a standby, and give assistance, to the first toilet-soap line.

20. Soapmixer-amalgamator, with a soap-batch capacity of 50-100 kg. This is the only unit lacking. It is believed, that such a unit could be manufactured locally with the Bafra mixer of line 1 serving as a sample.

Recommendation

A new mixer to be ordered locally; a trough of stainless steel and a protection cover is recommended.

21. Vickers Armstrong 3-roller mill, 325 mm roller diameter. This machine, at present in the soap flakes department in the new building, should be moved to the proposed line and re-equipped for the continuous passage of soap. The machine is in good working order.

Recommendation

The Vickers Armstrong roller-mill should be moved to the site of the proposed second toilet-soap line.

22. Vickers Armstrong soap plodder, 200 mm screw diameter. This machine was replaced when the Mazzoni plant was installed.

Recommendation

The Vickers Armstrong soap plodder should be overhauled and re-installed on the proposed second toilet-soap line; it should be equipped with a "needle sieve" plate.

23. The Mazzoni T1b soap cutter was originally supplied with the C2 vacuum-drier, but was at one stage put aside and replaced with a simple cutting table. The machine is badly in need of an overhaul, but is nevertheless a valuable, quite modern machine which could be useful on the proposed additional line.

Recommendation

The T1b cutter should be overhauled and placed in the proposed second toilet-soap line.

24. Six hand-stampers, capable of matching the output of the second toilet-soap line.

Recommendations

The stampers should be overhauled and re-painted and suitable soap dies obtained for small soaps etc.

25. The 3-roller soap-flakes mill, a small unit, situated in the soap flake department in the new factory building, is in need of re-conditioning. The flaking roller is completely worn down and must be replaced together with a proper toothed knife blade. The machine should then be attached to the second toilet-soap line for manufacturing soap flakes.

Recommendation

The soap flake mill should be re-conditioned and moved to the second toilet soap line.

26. Soap-chips drying cabinet.

Recommendation

The old drying cabinet in the soap flakes department should be moved to the second toilet-soap line to be used for the final treatment of soap needles and soap flakes.

Line for fully-boiled laundry and toilet soap

27. Mazzoni C2 spray-drying plant, 500 kg/h normal capacity. Much attention has been given to this unit during the project. This plant has been particularly badly serviced and incorrectly operated. After general repairs to all leaking steam and soap lines of the pumping section, the vapour booster and refrigerated water unit have been put into operation, the heat-exchanger was re-fitted and the pumps for silicate/salt solution dosing and perfume dosing were re-installed. Excessive pipe-lines have been removed and the correct one re-connected. All pipe-lines have been painted according to the colour code, all plant parts inspected and the ducts cleaned. New vacuum indicators have been installed. Finally, the main spray-pump should be replaced by a new type which arrived towards the end of the project. The supervisor and operators have been trained and acquainted with the functioning and basic operation of the C1 and C2 plants. The circulation pump for refrigerated water has been replaced by a more efficient one. All scrapers in the vacuum-chamber were replaced.

Recommendations

All missing and broken thermometers and manometers should be replaced; semi-spherical mouth-hole discs should be obtained; vacuum indicators should be replaced with Bennert vacuum meters for exact reading in Torr, and also all leaking steam-valves should be replaced; the feed-tank of the salt-dosing pump should be reconditioned for pre-heating; a main feed-tank to supply salt solution to the feed-tank of the dosing-pump should be provided and the perfume-dosing pump completed with a magnetic valve or excess pressure valve to avoid sucking in of perfume by the vacuum alone; the baffle-plates of the barometric condenser should be replaced and the badly corroded overhead cooling-water tank repaired; sight-glasses should be replaced with windscreen wipers.

28. The cutting-table replacing the former Mazzoni T1b cutter requires one person to operate it and one person to cut the soap bars. In general, especially if toilet soap has to be produced on this line, a chain-cutter with an imprint roller for laundry soap would not only free two operators for other work, but also do the imprinting thereby obviating the need for additional personnel.

Recommendation

One new chain-cutter with imprint roller attachments should be obtained.

29. The Mazzoni crusting drier TU 64 is functioning perfectly, however, it requires some servicing and reconditioning.

Recommendations

The TU-drier should be reconditioned and the cooling-radiator should be connected to refrigerated water. There should be an extending exhaust pipe on the roof.

30. The W & S Pegel automatic-twin-bar stamper is badly in need of a general overhaul but would most probably be suitable for the stamping of Snowite and Health Joy soaps. It should be considered that the STS stamper may be required for the first toilet-soap line.

Recommendation

The Pegel-stamper should be reconditioned.

31. The Mazzoni ST-6 implo soap-stamper is in running order but needs proper servicing and adjustments. The area around the die must be freed from rust and carefully repainted. New dies have to be obtained as existing ones are worn out beyond acceptable limits owing to bad machine adjustment and the corrosive lubricants used for soap stamping. Blocked ventilation screens in the motor-compartment must be freed.

Recommendation

General overhaul of the stamper; replacement of stamping tools and replacement of the conveyor-tapes.

32. The GD packing machine on the Snowite line is functioning well; anti-rust treatment and greasing of blank parts is recommended. When not in use, the machine should be cleaned, greased and covered with plastic foil.

Recommendations

Check servicing and lubrication: protect blank metal parts.

33. Semi-boiled soap kettles and measuring plant. The plant consists of one double-measuring unit for oils, one double-weighing unit for caustic soda solution and eight soap crutchers each of about 600 kg capacity. The entire plant is well planned and constructed as far as can be done with this type of process.

Recommendations

Stop leaks on measuring and weighing units and repair and tighten all cocks; recondition and paint the unit as well as the crutchers and their material-storage tanks.

34. A large number of movable cooling-frames of the Henry Simon type are used for cooling and semi-boiled soap. About five days of cooling time is required for each frame. The time limit, together with the limited floor area, determine the production capacity of this section. Apart from 35% offcuts resulting from cutting procedures, there are very frequently additional losses due to leaks in frames or capsized frames; the frames themselves are worn out. A building extension is projected, in order to increase output. However, rather than invest any more money in the extension of such outdated and uneconomic equipment, a new modern spray-drier is recommended.

35. Slabbing machine for soap blocks.

36. Six cutting-tables to cut soap plates into bars.

37. The W & S automatic bar-soap stamper, type Pair, is in good condition and working at a capacity of 44 bars/min, about 3,000 kg/h. This capacity would match the requirement for the newly-proposed vacuum spray-drier.

38. The hand-stampers for bar-soap are frequently used to increase the output capacity of the Pair-automatic stamper.

39. Several packing-tables and transport rollers. These units are adequate for the present production system. Items 34-39 could, however, with the exception of item 37, be replaced with the proposed spray-drier.

40. Two steam-heated kettles with impeller are situated in the caustic soda dissolving room and used for the preparation of liquid soap, soft soap and disinfectants.

Recommendations

Supply one additional melting kettle with a hot-water jacket for the melting and dissolving of components; clean, repair and paint the existing kettles.

41. The talcum powder plant consists mainly of:

1 Sifter from Arenco-Alite Ltd (England)

1 Albro twin-filler for powder tins

These units were not used during the project; they seem to be in good condition.

Recommendations for additional equipment

1. One set of bar-soap manufacturing machines, suitable for semi-boiled and fully-boiled laundry soap with 55%-75% fatty acid contents with a capacity of 2,000 kg/h consisting of:

Vacuum spray-drying unit
Chain-cutter
Imprint-roller
Crusting-dryer

2. One to two forklifts with a lifting capacity of 2,000 kg, lifting a minimum distance of three metres. These units, together with a required amount of standard-sized pallets, could take over the entire system of transport of semi-finished and finished soap inside the soap factory and from the soap factory to the sales stores. They will eliminate the need for man-power for loading, unloading and hand-carrying soap boxes and make possible new production procedures within the soap factory. The forklift can be used to transport raw materials to production sites. It will also, by making use of the height of the store with palletized high stacking, triple the storage capacity of the sales store which will be important when production capacity is increased.

3. One melting apparatus for offcuts (annex VII). This can be manufactured locally and installed in the soap boiling section next to the elevator. The device will only be required until the proposed additional spray-drier is installed. Clean offcuts from the present processing of cutting soaps cooled in frames, will be put into the melter. As soon as a sufficient quantity of soap is melted, it can be put into an empty frame. The device would greatly

reduce the amount of soap condemned for recycling in the semi- and fully-boiled processes. It will also preserve the colour and perfume content of offcuts.

4. Wooden or plastic storage containers with stacking ability must replace the gunny-bags presently used for waste soap and offcuts. The measurements should be standardized. At the same time, smaller trays are recommended for soap transport during the production process.

5. Two hand-operated hydraulic transporters, each of a capacity of 1,000 kg. These transporters should be used for inner factory transport of containers and pallets.

H. Laboratory and quality control

The central laboratory of the BCC is situated inside the main building of the soap factory. The room and equipment were scrutinized by the expert and extensive discussions regarding analytical methods and quality control were held with the quality control officer.

The main laboratory has adequate space. The existing equipment and facilities are limited or in bad repair. There are quite a number of laboratory employees, however, they have limited skills and are unreliable. The present situation creates a serious threat to the efficiency of product accounting and quality standard as these are dependent on correct information from the laboratory. As much as it may be desirable that the quality control officer, also in charge of the analytical laboratory, is taking an additional six-months training in quality control in the Netherlands, it is regrettable that the executive head of the laboratory is unable to attend to the problems in his department at the vital time when a new important system of production control of the soap factory is starting to operate. It is hoped that the BCC management will find temporary measures to overcome present shortcomings.

Recommendations

1. Reliable measures should be taken to ensure that all analytical and quality tests are carried out efficiently, reliably and regularly in accordance with the report of the quality control officer.

2. All basic laboratory equipment, as listed in the quality control officer's report, should be obtained as quickly as possible. In addition, the laboratory and factory departments urgently require:

50 areometers, 0°-50°Bé, 15° or 20°C

5 Bennert vacuum-meters (for spray-drying plants).

3. Additional laboratory staff should be recruited in accordance with the report of the quality control officer.

II. PRODUCTION

A. Methods

The methods and procedures used by BCC for:

Semi-boiled and fully-boiled soap preparation
Soap cooking and drying
Soap finishing and packing
Soft soap, liquid soap, disinfectants
Talcum powder production etc.

are basically in line with manufacturing procedures in use in other countries.

The one exception is the outdated frame-cooling and cutting arrangement in use for Sovereign bar manufacture and this procedure should be replaced as soon as possible with a modern spray-drying plant.

The staff of the department for fully-boiled soap is in need of expert training for the proper execution of the boiling procedure. A standard procedure has been recorded (annex VIII) and the soap-boiling staff was given repeated demonstrations of proper processing in saponification, washing and graining-out of the soap. Difficulties have been observed because of the importance of missing "skimmers" (syphon- or swivel-pipes) and soap-pumps for transfer of settled neat soap to storage tanks. The direct "open" steam-heating pipes of the boiling kettles are not ideal. A re-designed version was built into kettle no. 1 and found to be very successful. It is planned to change kettles no. 2-7 accordingly. As soon as skimmers and soap-pumps have been obtained, the full capacity of each kettle can be used and the average batch quantity raised from about 10 tons to 20 tons neat soap with 63% fatty acid content. More attention must be given to the washing processes to obtain a good separation of soap and spent-lye and to neutralize the free alkali down to a minimum. With these measures, the problems outlined in annex V can be completely overcome.

The spray-drying plants C1 and C2 have not been operated according to the operating instruction manual and some of the auxiliary equipment has not been used. Beside re-connecting such auxiliary equipment, servicing mechanical parts, cleaning ducts, pipes, dust collectors, barometric condensers etc., considerable time was spent on training operators and establishing an operation control system.

Considerably more effort will have to be made in the operation of the finishing and packing lines in order to keep the space free and clean and the machines clean, properly serviced and accurately adjusted. All stamping tools are worn out largely owing to poor fitting and stamp adjustment and unsuitable stamping lubricants. More attention must be given to quality control of outgoing soap bars, soap surface on stamping, more regular weight control of soap pieces, and quality control for cracking and grittiness during wash-down tests etc.

To ensure even quality and steady production with minimum handling to avoid damage to soap pieces, every effort must be made to obtain uninterrupted production, from the spray-dryer up to the packed cartons or cases, without unnecessarily touching the soap before packing. Intermediate storage in boxes or on trays has to be abandoned. For this reason, the existing GD packing machine must be installed on the toilet-soap line as quickly as possible.

It should never be forgotten that the main objective is to produce good quality soap rather than try to keep attending staff occupied.

Generally, a cleaner working area, the removal of all unnecessary items and some painting will create a better working atmosphere and will induce in people a more quality-conscious attitude to soap production.

Gunny-bags should not be allowed for the handling of waste soap. They must be removed, to the very last bag, from the entire soap factory compound as their fibres are hazardous to filters and may pollute the finished soap-pieces. Gunny-bags must be replaced by standard wooden, metal or plastic containers suitable for stacking to reduce storage space.

A better method of producing soap flakes or soap needles using soap of about 10% moisture content has been recommended.

Most of the suggestions made in this chapter could not be completed during the lifetime of the project because machinery needed repairing, spare parts had to be obtained and equipment and machinery had to be re-arranged.

B. Capacity

Semi-boiled soap production (Sovereign bar soap)

At present the average daily production is limited to 48 crutcher batches, or frames, of 385.4 kg each, or a total of 18,500 kg, plus offcuts. Production is limited due to the available area for frame-cooling. An expansion of the cooling area is planned. This will raise the daily production output to approximately 25,000 kg. Assuming 25 working days/month, the average daily production during 1975 was 10,661 kg.

Fully-boiled laundry and toilet soaps

Number of boiling-pans	7
Capacity of each boiling-pan	43 tons
Average batch quantity of soap 63% fatty acid	20 tons

Boiling-time, in hours, for each batch acoording to the method recommended:

Niger neutralization and washing	1
Settling and draining of spent-lye	1
Diluting, saponification and first washing	6
Settling and draining of the spent-lye	4
Diluting, bleaching and second washing	3
Settling and draining of spent-lye	5
Diluting, coconut saponification and soap finishing	3
Niger settling	36
Pumping of neat soap	2
	61

Maximum capacity per boiling-pan on a three-shift operation (24 h/day):

1 batch of 20 tons of soap every three days

10 batches/month

70 batches with seven boiling-pans

1,400 tons of soap with 63% fatty acid

As soon as distilled fatty-acids are available, the second washing stage and its settling stage could be avoided, reducing the batch time cycle to 48–53 h, bringing the total capacity of settled soap to about 2,000 tons/month. This quantity would be sufficient to match the maximum requirement after implementation of the proposed additional spray-unit for laundry soap.

A new salt dissolving unit and a large oil-storage tank will be required, as well as larger storage tanks, as auxiliary equipment for the boiling department.

The C1 processing line for toilet soap

The Mazzoni vacuum spray-drier C1 has proved able to process 400 kg/h of dried soap with 78%–80% fatty-acid content. An average capacity of 350 kg/h can be maintained. The capacity per day is 24 x 350 kg = 8,400 kg (less one hour for cleaning).

The processing line for toilet soap is capable of producing 400 to 500 kg of finished and packed toilet soap, depending on the weight of the pieces. The bottle-neck on this line is the STO stamper which has a maximum capacity of 60–80 tablets/min. However, the existing hand-stampers, if equipped with proper stamping dies, can compensate the lower production output of the STO stamper. It is also possible to pass the toilet soap from the crusting drier to the ST-S implo stamper, so long as this stamper is not used for production on the C2 laundry soap line. The Pegel twin-bar stamper could be used with the C2 line on occasion.

The proposed setting up of a second toilet soap line with the existing older machinery would also contribute an additional 100–300 kg/h to the production of toilet soap.

First toilet soap line	400 kg/h
Second toilet soap line	200 "
	600 "

It should be possible to make use of the entire output of dried soap from a 24-hour run of the C1 drier in two 8-hour shifts on the processing lines, i.e., 16 x 600 kg = 9,600 kg (less two hours for cleaning).

The C2 processing line for laundry soap

The Mazzoni C2 drier, with a guaranteed 500 kg output/h, has been serviced and regulated to produce up to 800 kg/h of laundry soap, with a fatty-acid content of 65%–68%. If efficiently operated, the unit can maintain an output rate of 750 kg/h. The daily capacity, therefore, is: 24 x 750 kg = 18,000 kg/day.

In the case of Snowite soap, at 130 g/piece, this would average 96 pieces/min. The ST-Simplo stamper, the GD packer and the rest of machinery is capable of handling up to 120 pieces/min. With proper adjustment of these machines it should not create any problem to process 750 kg/h.

The proposed new processing line for laundry soap

An additional vacuum spray-drier and processing equipment for fully- or semi-boiled laundry soap with an output capacity of 2,000 kg/h is recommended to replace the present frame-cooling and cutting section. The use of this unit would reduce offcuts to practically zero, and open ways to use cheap raw material and soap stock by the fully-boiled process thereby raising the output of laundry bars to a maximum of 24 x 2,000 kg = 48,000 kg/day.

In table 9 are given monthly averages of present and estimated soap production. Table 10 shows the monthly average of the soap production of BCC during 1970-1976.

Table 9. Monthly averages of present and future soap production
(Tons)

Soap	Present monthly a/ average	Estimated future monthly a/ average
Bar soap	266	1,200 (625)
C2 laundry soap	81	450
C1 toilet soap	38	200
Total	385	1,850

a/ 25 working days per month.

Whereas the production of bar soap can, at present, be raised only to about 625 tons by extending the frame-cooling area, the theoretical capacity of the C1 and C2 plants can be reached as soon as the machines are serviced, repaired and properly adjusted and the second toilet soap line installed (see previous chapter "Machinery and equipment"). When considering the total production capacity, it should be kept in mind that the BCC share of the laundry and toilet soap market should be increased.

Theoretical maximum capacity is required only at times of maximum market requirements. Machines occasionally break-down and need repairs as well as normal servicing which, at times demands a standstill and a stop in production. Sufficient extra capacity is required to recover lost production time. The finishing lines and the soap boiling section should normally operate 8 to 16 h/ day, i.e., one or two shifts. Usually, better supervision and work quality is obtained during normal working hours.

Table 10. Monthly averages of BCC's soap production, 1970-1976
(Kg)

Year	Washing soap	Toilet soap	Others	Total
1970	424,073	20,540	5,414	450,027
1971	424,417	23,118	4,479	452,014
1972	471,762	34,215	5,546	511,523
1973	501,607	26,908	4,191	532,706
1974	439,101	26,982	2,942	469,025
1975	355,454	37,997	3,772	397,223
1976[a/]	345,088	37,104	4,167	386,359

a/ Estimated.

III. EDIBLE OIL REFINERY

The oil refining plant is housed in a very old, but not unsuitable building.

The equipment, mainly from Rosedown, England, consists of:

1 drum evaporation unit
2 neutralizers, capacity nine tons each
2 vacuum-drier/bleachers, capacity nine tons each
4 bleaching filter-presses
1 vacuum-pump
1 deodorizer, capacity nine tons
2 vacuum-coolers, capacity five tons each
Oil-storage tanks
Packing room with filling equipment for bottles and tins.

The UNIDO report (1974), when reporting the production capacity, did not take into account the existence of two separate drier/bleachers. Also the bottle-neck in the BCC refinery, outlined in this report, can be overcome by using one or two of the old deodorizers still installed at the refinery as a vacuum-cooler after deodorizing. In these circumstances an eight-hour shift can be maintained in all plant sections.

If the refinery is to be operated at full capcity, one more wet-vaccum-pump will be required to serve the drier/bleachers independently of the vacuum-pump attached to the deodorizer.

The equipment for batch-operation is old, but can be considerod suitable and adequate and not basically different from modern batch-plant equipment.

The building and equipment need a face-lift; as the plant is handling edible material a decent hygienic standard must be reached. In this respect, the implementation of all measures to be undertaken, as outlined in the report of the factory manager (annex IX), received the full backing of the expert.

According to the production statistics, in 1975 the refinery produced:

	Tons
Unrefined coconut white oil	504
Refined and deodorized coconut oil	566
Refined coconut oil	196
Edible oil	1,266

As the existing equipment is able, theoretically, to produce every 24 hours about 27 tons of refined and deodorized oil, and additional quantities of filtered unrefined oil, it is evident that the total productive capacity of the refinery is not utilized. Assuming 300 working days in 1975, the average quantity of refined oil produced during that year was 2.5 tons/day.

If the 1,266 tons of edible oil sold during 1975 are distributed among the 14.6 million inhabitants of Sri Lanka, total sales are as low as 87 g per capita. The BCC edible oil refinery is able to produce about 20 times its present production and the domestic market should easily absorb this.

The reasons for low production are (a) the only available type of edible oil processed by BCC is coconut oil; (b) the types of finished products; and (c) the size and types of packaging and their costs.

A study should be prepared of the quantities available in Sri Lanka of cotton-seed, ground-nut, and palm oils, and the preferences of the local consumer as to these oils.

Margarine is produced in large quantities by Lever Bros. As palm oil and other edible oils are available, the establishment of a hydrogenation and margarine production plant should be considered.

Edible oil is contained in drums, large and small tins, and bottles. Many consumers purchase oil for cooking and frying in very small quantities because of their very limited income. Retailers, therefore, measure oil from large tins into the consumers' containers. Bottles have proven to be too expensive as containers for the average consumer. The return of empty bottles has been considered but involves high costs of return transport and cleaning problems. Other possibilities, such as polyvinyl (PVC) sachets (cushion) or tetrapack have been considered but are unrealistic because the plastic packing material required would have to be imported. This problem should be considered by a marketing expert or a packing material consultant.

Recommendations

1. Repair and improve the existing refinery building.
2. Repair and improve existing refinery equipment.
3. Prepare a marketing study on the use of edible oils other than coconut oil and on a suitable container.
4. Investigate the possibilities of setting up a hydrogenation and margarine production plant.
5. Obtain one additional vacuum-pump.

IV. GLYCERINE PLANT

Establishment of a glycerine plant has been under consideration by the BCC for several years. The UNIDO (1974) report included an economic calculation of the capital expenditure involved and subsequent returns based on a quotation available at that time. The report concluded that a glycerine recovery plant would be a favourable investment.

The BCC is still interested in setting up such a plant but the project has now to be viewed in the light of the recently projected development of the BCC soap factory. Till now, glycerine, a by-product of soap manufacture, has not been recovered from spent-lye and cannot be recovered in the case of semi-warm soap production. Limited amounts of spent-lye are being supplied to Lever Bros. for processing. This, however, involves technical problems of the quality of spent-lye and transport and can never be of economic value.

There are two methods of glycerine recovery: the first is from a fat-splitting process and the second is from spent-lye. The first is more efficient as it (a) recovers almost the entire glycerol content; (b) requires less chemicals for the process; (c) reduces the initial costs of the condensating plant; and (d) produces a better quality of glycerine.

The second method, using spent-lye, should only be considered if the establishment of a fat-splitting plant is absolutely unfeasible. Such a decision would result in the total loss of glycerine from the oils and fats used for semi-warm soap production.

Taking into account the proposed expansion of the soap factory, i.e., setting-up of an additional vacuum-spray-drying plant for laundry soap, the total capacity of soap produced by the BCC itself, as outlined in the chapter "Production capacity", will require a glycerine concentration and distillation plant capable of handling a maximum of five tons /day of top quality distilled glycerine. This includes a slight over-capacity required to allow time for cleaning, servicing, repairs or re-distilling rejected glycerine, and similar reasons which require the plant to make up lost production time.

The glycerine concentration plant should be completed with a glycerine distillation plant as only high class qualities, up to pharmaceutical standards, will be economical and will enable export sales to direct consumers in all parts of the world.

Quotations for suitable glycerine plants should be obtained and an economic study produced. Whether to choose batch plants or continuous plants must be decided after economic evaluation.

Recommendation

One glycerine concentration and distillation plant should be erected on a site near the soap factory; it should have a capacity to produce five tons/day of pharmaceutical glycerine.

V. FAT-SPLITTING AND FATTY-ACID DISTILLATION PLANTS

Setting-up fat-splitting and fatty-acid distillation plants by BCC to produce fatty-acids mainly for consumption by the soap factory will enable:

(a) Almost total recovery of the glycerol content of all fats and oils used for soap manufacture, including that contained in oils used for semi-warm soap production;

(b) Low-grade tallow and other suitable raw materials to be used for soap production through distillation;

(c) The output of fully-boiled soap to be increased owing to direct saponification without a washing stage and a saving on salt consumption and less problems connected with spent-lye disposal;

(d) A general improvement of quality soap produced, especially of colour and odour, owing to the use of clean distilled raw materials.

The Government of Sri Lanka wishes to increase the soap production of the BCC as much as possible. Therefore, it can be expected that the proposed soap factory production expansion will soon be implemented. For this reason, the present consumption of oils and fats for soap production by BCC should not be considered as a guide-line. On expansion, the BCC soap factory will require a maximum of up to 50 tons of fatty-acid per day. In addition, it may be desirable to produce distilled fatty-acids for other smaller soap manufacturers. An early decision should be made to determine the final requirement of plant capacities.

Maximum requirement of fatty-acid for soap production:

	kg
C1 plant, 8,400 kg of toilet soap of 80% fatty-acid	6,720
C2 plant, 16,800 kg of laundry soap of 65% fatty-acid	10,920
Proposed plant 48,000 kg of laundry soap of 65% fatty acid	31,200
	48,840

A study of the economy of the fat-splitting and distillation plants will have to be carried out as soon as suitable offers have been received and the most suitable type of plant chosen.

Recommendation

A fat-splitting plant, minimum capacity of 50 tons/day, and a fatty-acid distillation plant with a matching capacity should be erected near the BCC soap factory on a site already reserved for this purpose.

VI. SOLVENT EXTRACTION PLANT

The solvent extraction plant was shut-down for a long time owing to the lack of a continuous supply of raw materials for extraction and to high operating costs. Some parts of the plant need re-conditioning. The management has decided to renovate the plant, but they are not sure with the current problems in procuring raw materials, whether it is worth spending money for re-conditioning the plant.

It should be pointed out that solvent extracted oils could become of special importance as cheap raw material on the establishment of the proposed fatty-acid plant.

The Government-owned Ceylon Oils and Fats Corporation has obviously succeeded in reducing the loss in solvent recovery to an acceptable minimum. Before requesting UNIDO assistance it should be investigated whether the required assistance for BCC could be obtained from experts of said Corporation.

Recommendations

Management should consider seeking assistance from international bodies to obtain the services of a solvent extraction plant expert for a period of one month to study the possibility of procuring raw materials as well as suggest ways and means of running the plant continuously and reducing plant operation cost with special stress on the solvent recovery efficiency (by modifying the condensers if necessary).

VII. CONCLUSION AND RECOMMENDATIONS

Based on an estimated 25 working days per month, the existing equipment of the BCC soap factory is theoretically capable of producing 43,500 kg of soap/day (24 working hours) but only 15,400 kg soap/day were produced in 1975. Production figures have declined further, while selling prices of all main soap products of BCC do not cover material and manufacturing costs. A higher production is required for BCC to obtain a larger share of the Sri Lanka soap market.

Recommendations have been outlined in detail; the following is a summary of the most important items.

Recommendations to be implemented with the means available in Sri Lanka

1. A development department should be set up attached to the soap factory management.

2. A long-term marketing programme should be designed and prepared in time to meet problems arising from the projected higher soap production.

3. The BCC's finished products must be improved in design and quality to meet competition on the domestic and international markets.

4. A solution must be found to reduce the content of coconut oil in the fat composition to below 20% and to import tallow or other suitable raw materials instead.

5. A complete stock-taking is required as soon as possible; the metric system has to be implemented throughout the factory departments; and final printed forms with running numbers must be used. The production planning and administrative department should assume full responsibility for this work.

6. The new soap factory staff organization must be put into effect in order to fully utilize machines and equipment. The system for salary incentives payable for non-absentees and efficiency levels as well as salary grades based on skills of workers must be implemented as soon as possible.

7. Soap factory buildings should be repaired and improved.

8. General repairs on mechanical and electrical installations must be carried out in accordance with special recommendations for each machine made in this report.

9. A new salt-dissolving plant should be constructed.

10. The second soap storage bin in the C1 plant must be completed.

11. A new soap mixer amalgamator with 50-100 kg batch capacity for the second toilet soap line can be built either locally or imported from overseas.

12. A melting apparatus should be built and set-up for the re-processing of offcuts from semi-warm production.

13. The laboratory and quality control must accept more responsibility to ensure reliable analytical and quality tests. Additional laboratory staff with suitable skills should be recruited in accordance with the recommendations of the quality control officer.

14. The edible oil refinery building and equipment must be repaired and improved in accordance to specifications contained in this report. A survey should be carried out by a suitable expert to study the availability of other edible oil raw materials and to investigate possibilities of setting-up a hydrogenation and margarine production plant.

15. All soap stock from the refinery must be collected and used for soap production.

Recommendations requiring foreign exchange

16. A new additional soap cooling and processing plant with a capacity of 2,000 kg/h for laundry soap with 55%-70% fatty-acid content should be installed to replace the obsolete equipment for bar soap manufacture.

17. A glycerine recovery and distilling plant with a capacity of five tons of pharmaceutical glycerine per day is highly recommended.

18. A fat-splitting plant of a minimum capacity of 50 tons/day and a fatty-acid distillation plant with a matching capacity are recommended as the most efficient method of recovering glycerine for export and to provide possibilities for the use of low-grade oil raw material for soap production.

19. One new chain soap-cutting machine should be obtained for the C2 plant to reduce the amount of offcuts.

20. All boiling pans should be equipped with skimmers (syphon-pipes and joints).

21. Two new soap-pumps should be installed for the removal of settled soap from soap storage tanks.

22. All soap plodders should be equipped with semi-spherical mouth-hole discs.

23. Two forklifts with a capacity of 1,000-2,000 kg and a minimum of a three-metres lifting height should be obtained together with locally manufactured standard pallets to provide more economic internal factory transport and to use the maximum storage capacity.

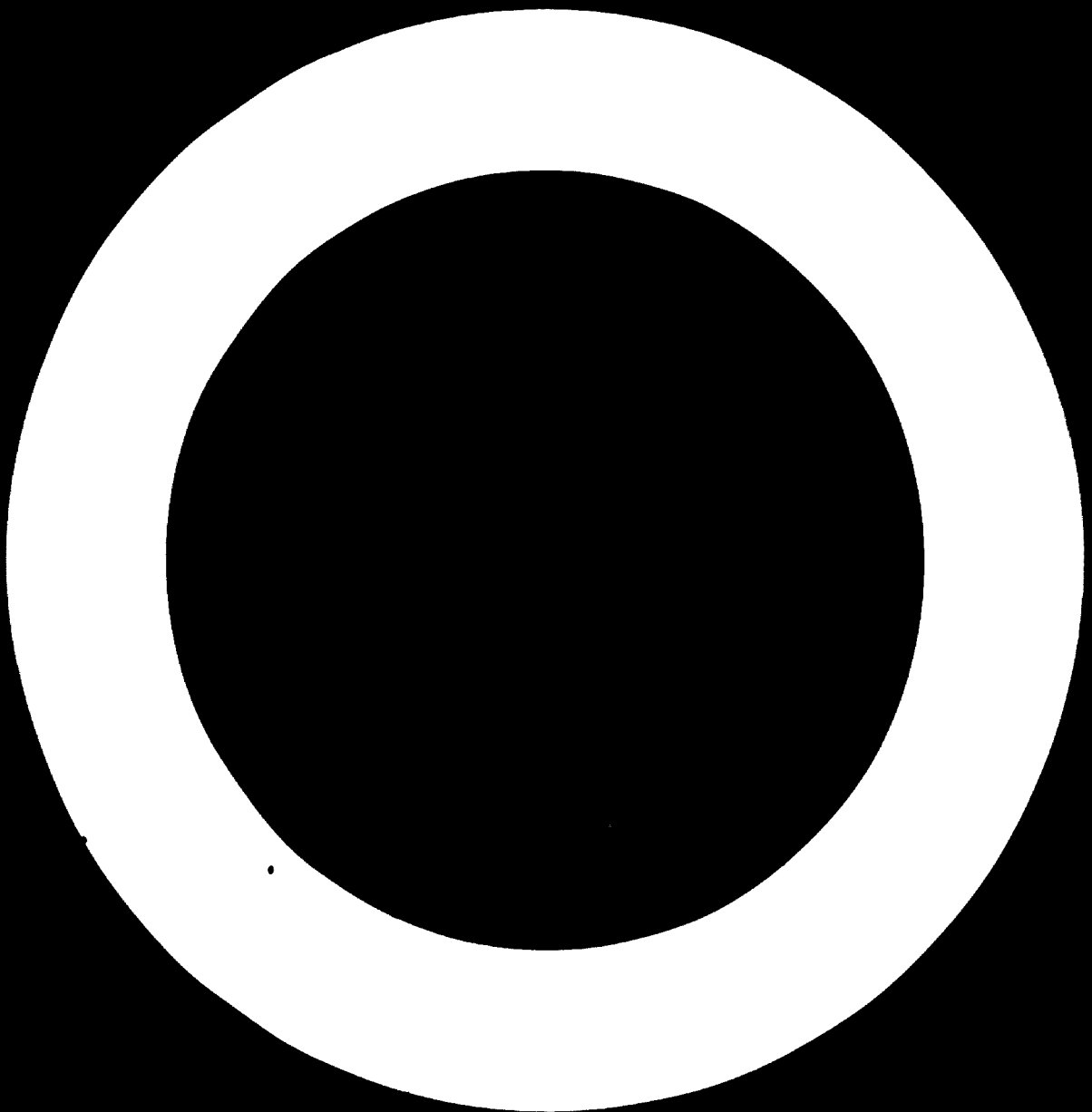
24. One additional vacuum-pump should be obtained to be attached to drier/bleachers at the edible oil refinery.

25. All the required basic laboratory and quality control equipment must be obtained as soon as possible.

26. The chief chemist and manager of the soap factory and refinery should visit Europe to study possibilities of new operating methods for the following plants:

Glycerine condensating and distillation
Fat-splitting and distillation
Edible oil hydrogenation
Margarine manufacturing
Modern soap processing

27. It should be investigated whether the required assistance for a solvent extraction plant can be obtained from the Ceylon Oils and Fats Corporation. If not, the Government of Sri Lanka should seek assistance from other sources.



Annex I

FINISHED SOAP PRODUCTS OF BCC AND CORRESPONDING CODE NUMBERS

Semi-warm soaps

3310 - Sovereign bar, 750 g
3320 - Lotus Export, 240 g
3330 - Health Joy (export), 170 g
3340 - Elephant brand (export), 120 g
3350 - White soft soap, 28 lb tin
3351 - White soft soap, 14 lb tin
3360 - Green soft soap, 28 lb tin
3361 - Green soft soap, 14 lb tin
3370 - Brown soft soap, 28 lb tin
3371 - Brown soft soap, 14

Fully-boiled soaps

Local

3410 - Snowite, 130 g
3415 - Health Joy, 130 g
3420 - Lotus, 80 g
3425 - Night and Day, 80 g
3430 - Suvendra, 80 g
3435 - Sandalwood, 80 g
3436 - Sandalwood, 25 g
3440 - Margosol, 80 g
3445 - Coal Tar, 80 g

Foreign brands

3610 - Johnson and Johnson baby soap, 85 g
3615 - Ashes of Roses baby soap, 85 g
3620 - Wright's Coal Tar, 85 g
3625 - Goya Love Affair, 85 g
3630 - Goya Entice, 8'
3635 - Goya Gardenia, 85 g
3640 - Goya Wild Silk, 85 g

Shaving soaps

3710 - Shaving cake, 50 g (carton)
3711 - Shaving cake, 50 g (plain)
3715 - Shaving stick, 40 g (plastic)
3716 - Shaving stick, 40 g (refill in carton)

Soap powders and flakes

3810 - Snow flakes, 400 g
3811 - Snow flakes, 200 g
3820 - Soap powder for the army, 25 kg
3825 - Soap powder for tooth-paste, 25 kg
3830 - Soap powder for scouring powder, 25 kg

Liquid soaps

3910 - Lustrol shampoo, 5 l
3911 - Lustrol shampoo, 20 l
3915 - Carbolic soap, 5 l
3916 - Carbolic soap, 20 l
3920 - Bus washing compound, 5 l
3921 - Bus washing compound, 20 l

Talcum powders

3990 - Sovereign, 120 g
3995 - Suvendra, 120 g

Annex II

COSTS AND SELLING PRICES OF VARIOUS SOAP PRODUCTS

Product code	Brand	Unit	Production cost SRs	Selling price SRs
Semi-warm				
3310	Sovereign bar	Case	160.77	156.00
3320	Lotus (export)	Case	110.91[a]	...
3330	Health Joy (export)	Case	132.22	153.70[b]
3340	Elephant brand (export)	Case	64.19[a]	...
3350	White soft soap (large)	Tin	44.31[a]	...
3351	White soft soap (small)	Tin	23.15[a]	...
3360	Green soft soap (large)	Tin	44.31[a]	...
3361	Green soft soap (small)	Tin	23.15[a]	...
3370	Brown soft soap (large)	Tin	45.07	64.00
3371	Brown soft soap (small)	Tin	29.76	35.00
Fully boiled (local)				
3410	Snowite	Case	184.71	176.00
3415	Health Joy (local)	Case	212.85	182.00
3420	Lotus toilet	Case	55.31	43.20
3425	Night and Day	Case	70.95	72.00
3430	Suvendra	Case	81.50	72.00
3435	Sandalwood (large)	Case	76.55	72.00
3436	Sandalwood (small)	Case	159.76	157.00
3440	Margesol	Case	55.06	68.50
3445	Coal Tar	Case	96.75	137.00
Foreign brands				
3610	Johnson and Johnson	Case	175.90	270.00
3615	Ashes of Roses	Case	197.34	275.00[b]
3620	Wright's Coal Tar	Case	130.71[a]	...
3625	Goya Love Affair	Case	224.23[a]	...
3630	Goya Entice	Case	227.58[a]	...
3635	Goya Gardenia	Case	183.35[a]	...
3640	Goya Wild Silk	Case	229.61[a]	...
-	Goya Black Rose	Case	209.78[a]	...

Shaving soaps				
3710	Shaving cake (cartons)	Case	159.60	135.00
3711	Shaving cake (plain)	Case	127.98	123.00
3715	Shaving stick (plastic)	Case	284.03	315.00
3716	Shaving stick (refill)	Case	139.20	123.00
Soap powder and flakes				
3810	Snow flakes (large)	Case	106.95	122.00
3811	Snow flakes (small)	Case	55.67	65.00
3820	Soap powder for the army	56 lb bag	165.40	177.00
3825	Soap powder for tooth-paste	112 lb bag	225.29[a]	...
3830	Soap powder for scouring powder	112 lb bag	214.10[a]	...
Liquid soaps				
3910	Lustrol	5 l	28.92[a]	...
3911	Lustrol	20 l	130.68[a]	...
3915	Carbolic soap	5 l	13.79[a]	...
3916	Carbolic soap	20 l	70.16[a]	...
-	Carbolic soap	45 gal drum	555.55[a]	...
3920	Bus washing soap	5 l	16.13[a]	...
3921	Bus washing soap	20 l	79.52[a]	...
-	Bus washing soap	45 gal drum	660.85[a]	...
Talcum powder				
3990	Sovereign talc	Case	758.85	865.00
3995	Suvendra talc	Case	775.48	900.00
Disinfectants				
-	Pynal	5 l	80.02[a]	45.00
-	Pynal	20 l	114.24[a]	...
-	Pynal	45 gal drum	1,051.45[a]	...

a/ Only raw material and packing costs. Variable overheads cannot be obtained as selling price is not available.

b/ Suggested selling price.

Annex III

RETAIL PRICES OF BCC AND COMPETITORS' PRODUCTS
(SRs)

	BCC		Lever		Harischandra		Swadeshi Industries	
Product	No. of cases/ annum	Retail price/ tablet	Product	Retail price/ tablet	Product	Retail price/ tablet	Product	Retail price/ tablet
Washing soap								
Sovereign bar	96,000	2.90			Sal Bar	2.90		
Snowite	48,000	0.68	Sunlight	0.72	Deepthi	0.70		
Health Joy	1,800	0.70	Lifebuoy	0.83	Sal Health	0.70		
					Vanitha	0.55		
					Blue washing soap	0.58		
Toilet soap								
Sandalwood (L)	13,200	1.15			Sandalwood	1.00	Rani Sandalwood	1.25
Sandalwood (S)	900	0.43						
Suvendra	30,000	1.15			Saman	0.85		
BCC coal tar	1,800	1.10						
Night and day	27,000	1.15	Pears Rose	1.05	Namal	0.88		
Margosol	600	1.10	Rexona (medium)	0.95			Konomba	1.15
Lotus	24,000	0.70	Rexona (small)	0.40				
			Pears baby cream	1.75				
			Lux (small)					

Annex IV

AMOUNT OF TALLOW AND COCONUT OIL IN THE FAT COMPOSITION OF SOAPS

Brand	Manufacturer or country of manufacture	Tallow : coconut oil
Lucina	Turkey	80 : 20
Saza	Zaire	80 : 20
Margosol	BCC	75 : 25
Coal Tar	BCC	50 : 50
Sandalwood	BCC	50 : 50
Suvendra	BCC	0 : 100
Suvendra I	BCC	25 : 75
Suvendra II	BCC	25 : 75
Night and Day I	BCC	25 : 75
Night and Day II	BCC	25 : 75

Annex V

EXCERPTS FROM A LETTER TO H.J. LEHMANN, UNIDO EXPERT, FROM A. KARUNARATNE, CHIEF CHEMIST AND MANAGER OF THE BCC SOAP FACTORY AND REFINERY

From June 1976, I have requested the supervisory staff of the soap factory to maintain a record book of the analysis of spent-lye. I give below the results obtained during June 1976.

Spent-lye analysis

Date	°Bé	Percentage NaOH	Quantity of NaOH (kg)
1.6.1976	12	5.4	348.49
1.6.1976	-	-	-
1.6.1976	-	-	-
2.6.1976	20	1.80	64.728
3.6.1976	20	4.10	206.353
3.6.1976	20	4.32	155.34
4.6.1976	20	3.86	120.27
5.6.1976	20	3.20	107.36
9.6.1976	6	4.02	211.22
10.6.1976	20	2.40	103.129
18.6.1976	-	3.45	124.75
18.6.1976	14	4.08	146.06
18.6.1976	-	3.40	221.31
19.6.1976	14	2.32	99.70
21.6.1976	-	4.50	162.77
21.6.1976	14	6.66	238.49
21.6.1976	14	4.21	190.95
22.6.1976	14	2.64	63.04
22.6.1976	14	4.26	172.91
22.6.1976	14	3.33	127.21
22.6.1976	14	4.80	235.78
23.6.1976	14	4.24	141.70
23.6.1976	14	4.01	229.77
24.6.1976	14	2.16	82.51

Date	°Bé	Percentage NaOH	Quantity of NaOH kg
25.6.1976	14	1.84	70.82
25.6.1976	14	0.98	60.83
26.6.1976	-	1.12	46.33
28.6.1976	14	3.40	162.35
28.6.1976	14	4.00	152.80
28.6.1976	14	4.48	192.51
29.6.1976	20	3.40	103.51
29.6.1976	21	4.40	178.51
30.6.1976	14	2.72	123.38
		Total	4,644.880

On the basis of these findings, we have some sort of realistic figures of the caustic soda lost in the spent-lye.

At this point, I would like to draw your attention and obtain your assistance on the following:

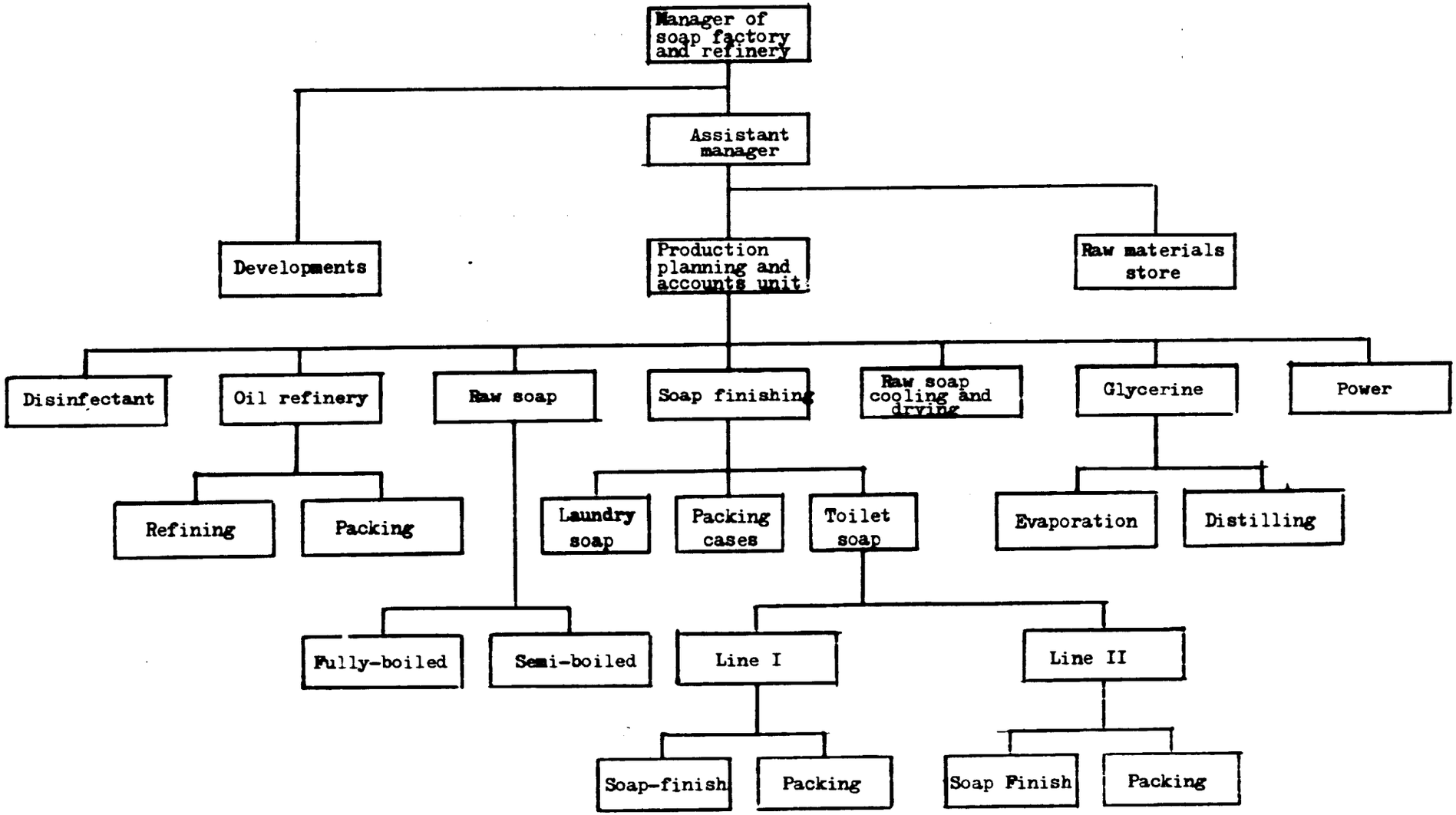
1. The analysis of spent-lye figures in June 1976 shows a wide variance in the caustic soda going with the spent-lye. For instance on 26 June 1976 the spent-lye had only 46.33 kg in 4,136 litres, whereas on 1 June 1976 there was 348 kg in 3,309 litres. What steps are required to minimize and regulate the caustic soda in the spent-lye?

In this connection, a very close and critical study of the present methods of graining-out the soap will have to be made, your suggestions to improve the situation conveyed to me, so that before your departure we could actually try out ways and means of controlling this vital factor.

In this connection, I would also like your observations whether the use of such high percentages of coconut oil in our fully-boiled soaps necessarily means that the percentage free caustic soda in the lye is much higher than the conventionally accepted figures for free alkali in spent-lye. For instance, Mr. Varnkulasingham, the UNIDO expert, has stipulated that this figure should theoretically be 0.2%. It would be very evident that our figures are very much greater. The question is whether the percentage allowed by Mr. Varnakulasingham is realistic considering the materials we are compelled to work with. In the event you agree that Mr. Varnakulasingham's figures are realistic, what concrete steps should be taken to limit to a bare minimum the free caustic soda in spent-lye?

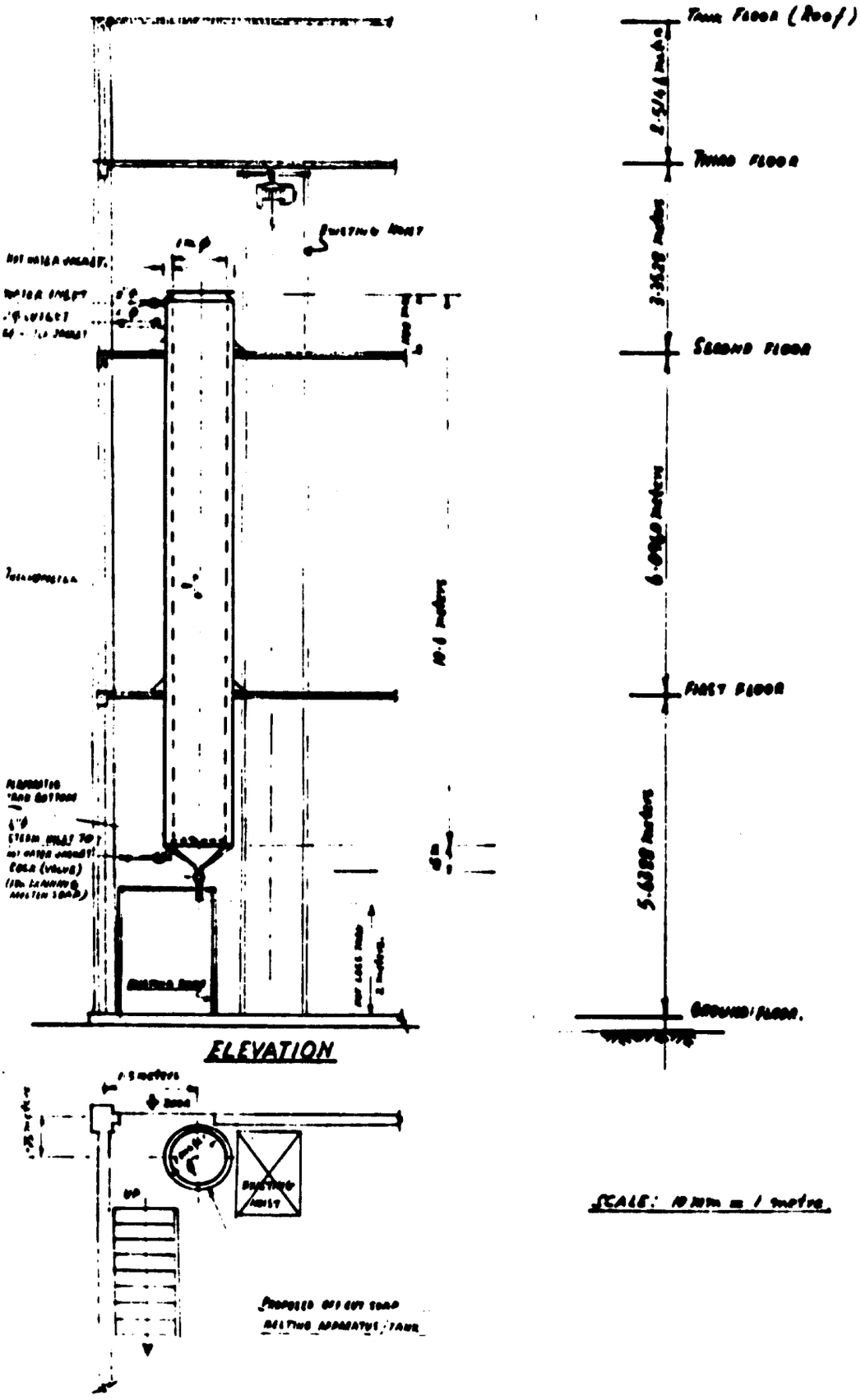
Annex VI

SCHEME FOR THE ORGANIZATION OF THE SOAP FACTORY



Annex VII

PROPOSED MELTING APPARATUS FOR SOAP OFFCUTS



Annex VIII

PROCESS FOR FULLY-BOILED BASE SOAP

First day

In case the boiling pan is empty

Fill the boiling pan with water and add about 200 g caustic soda solution to cover at least the centre steam pipe and the medium steam pipe. Open steam and bring the solution to boiling point. Then start saponification adding oil and caustic soda in proportion.

In case the boiling pan is filled

If the boiling pan is filled with niger from the previous batch, open steam to bring the niger to boiling point, then add the dirtiest quality of oil and fat of the entire composition to be used for the next batch to neutralize completely the free alkali content, so that phenolphthalein will no longer give a reaction. Then add brine solution for separation and drain the spent-lye.

After one of the above procedures has been carried out, the entire quantity of tallow, palm oil and other oils, except coconut white oil, is being saponified by pumping oil and caustic soda in a steady proportional flow to the continuously boiling soap. Intervals must be allowed for regulating the caustic soda content. About one ton of this oil is being retained. After allowing sufficient time (minimum one hour) for saponification in a state of slight excess of caustic soda, the retained ton of oil is added together with brine solution to ensure that the soap remains sufficiently liquid as the oil neutralizes the entire excess of caustic soda. Brine solution is added continuously until the soap separates into curd soap and spent-lye.

Second day

After draining the rest of the spent-lye from the previous washing, a small amount of caustic soda solution and water (caustic soda and water can be mixed in advance to facilitate an even mixture of the water with the soap) is added until the soap in the kettle contains sufficient water to boil easily in a state of good soap emulsion. The caustic soda is regulated to ensure an excess of approximately 0.2% NaOH. Allow for a good saponification of about

two hours slow boiling and if after this time the free caustic soda content is maintaining steadily, the reduction bleaching agent - hydrosulphite, Plunkit etc. - is added as a solution and bleaching time of at least 30-45 minutes is allowed. After this, brine solution is added, slowly, and a quantity of coconut white oil may be added to neutralize the excess caustic soda, as required. The soap is separated as usual and left for the settling of the second spent-lye.

Third day

The rest of the second spent-lye is drained. After that, steam is opened for the soap to start boiling and caustic soda and water are added as on the previous day. As soon as the water and caustic soda are adjusted, soap should be allowed to boil thoroughly, caustic soda being present in slight excess; the entire remaining quantity of coconut white oil is pumped in and the caustic soda solution added, in proportion, at the same time. Full saponification of the coconut oil is then allowed for approximately two hours, the excess of caustic soda steadily adjusting and sufficient brine solution and water slowly added to reach the required final point of niger separation. As soon as the saponification time is completed, and the excess caustic soda remains steady, water and brine are present in sufficient quantities, steam is closed and the soap allowed to settle at least 36 hours.

Fourth day

Settling time.

Fifth day

In the morning, the settled curd soap is pumped off from the soap base by a siphon pipe. After this, the procedure given above under the first day is followed.

This procedure should be followed for normal fully-boiled soap containing more than 30%-40% coconut or palm kernel oil. In case higher percentages of the above oils are used, separate instructions may follow.

Annex IX

MEMORANDUM

To: H.J. LEHMANN, United Nations expert

From: A. KARUNARATNE, Chief chemist and manager of the soap factory and refinery

Suggestions for improving the refinery

The Refinery handles Edible Coconut Oil as a general rule for the local market, but also processes Edible Coconut Oil for the Export market. One of the most important requisites for such a production unit, is a high standard of hygienic production. The present building while undoubtedly old, could be improved in order to meet this fundamental requirement and these improvements should be initially effected to the Ground-floor of the building. The following should be effected:

1. Wall-tiles should be provided for the entire ground-floor walls, up to a height of approximately 4 feet. The remaining sections of the walls should be repaired wherever necessary and thereafter colour-washed.

2. In keeping with accepted Industrial Health recommendations steps should be taken to re-design the ventilation facilities to the Ground floor area. The installation of the Tallow Bulk Storage tanks has restricted the movement of fresh air and it is opportune at this stage (though very late) to effect such changes as would permit the workers access to fresh air, as well as enabling them to work in a more comfortable atmosphere.

3. Wall-tiling, repairs to walls and colour-washing should be eventually extended to the First-floor, Second-floor, the Tallow Filter room and the Soda Room.

The Refinery is a Production Unit whose overall lay-out was never carefully planned. Over the years various equipment and pipe-lines were installed to meet the immediate needs at that time. As a result of this, pipe-lines have been changed from time to time and to this day several pipe-lines just end blind. A well organized Production Unit should have as simple a system as possible, aesthetic acceptability should also be taken into consideration. From this general point of view, the following suggestions are being made:

Initially, a detailed plan of the existing set-up in the Refinery including steam-lines, oil supply lines, tanks etc., should be made. Thereafter, a new

simplified scheme could be organized, so that the superfluous lines and tanks could be removed as well as re-organizing the existing set-up in accordance with what has been stated above. Examples.

(1) All the Oil Filters could be re-located on the Centre Hall of the first-floor.

(2) Provision could be made for a scheme whereby oil leaking from the filter presses as well as filter residues may be led to a collection point on the ground-floor.

(3) General improvements could be made regarding ventilation, lighting, etc.

(4) A ceiling could be provided for the first-floor.

(5) The inlet of the pipe-line to feed Fulmont to the Dryers could be extended to the Ground-floor. This would enable us to maintain better cleanliness in the Refinery.

(6) The open sides of the first-floor could be covered with glass shutters, in order to prevent smoke from boilers entering this area, etc.

Meanwhile, it will also be necessary to study the situation, regarding the older deodorizers and dryers. It may be possible to re-design these driers, so that they could function as coolers for oil presently deodorized in D_3. If this could be done, it would permit the release of D_3 for processing additional quantities of coconut oil. In the event this arrangement cannot be effected, the older deodorizers as well as the driers should be dismantled.

Certain other studies will also have to be undertaken in the refinery, in order to improve and increase the efficiency of its performance. The recommended studies would be as follows:

(i) There is a considerable market for the export of COCOLANKA in 24 oz cans to Middle Eastern countries. The existing equipment for this production is completely outdated and its capacity does not permit any substantial increase over the production levels being presently obtained. It is suggested, that this undertaking contrives to obtain the market potential for refined coconut oil, refined deodorized coconut oil, etc. in small packs, such as mentioned above and on the basis of such projected market potential install a completely new plant for packing these oils;

(ii) The production of other industrial fats, confectionery fats and margarine will have to be seriously studied, since at the moment only Lever Bros. is capable of manufacturing these products;

(iii) A study will also have to be made, whether the existing D_3 plant could be equipped with more sophisticated arrangements for establishing vacuum at a higher level. Once this arrangement is effected,

deodorizing of coconut oil could be effected at very much lower temperatures and ensuring at the same time that less damage is done to the oil. Quite apart from providing a better quality oil, this will also reduce the consumption of steam in the refinery.

Apart from what has been mentioned above, certain other routine maintenance work has to be carried out in the refinery and these are listed below:

(a) Attention to the floor of the soda room;

(b) Better ventilation and lighting for the soda room;

(c) Replacement of the laggings for the neutralizers and the deodorizer;

(d) The D_3 condensor water-pump belt should be replaced;

(e) Caustic soda and salt dissolving tanks should be repaired and painted;

(f) Steam pressure gauges and vacuum gauges for the D_3 plant have to be repaired or replaced.

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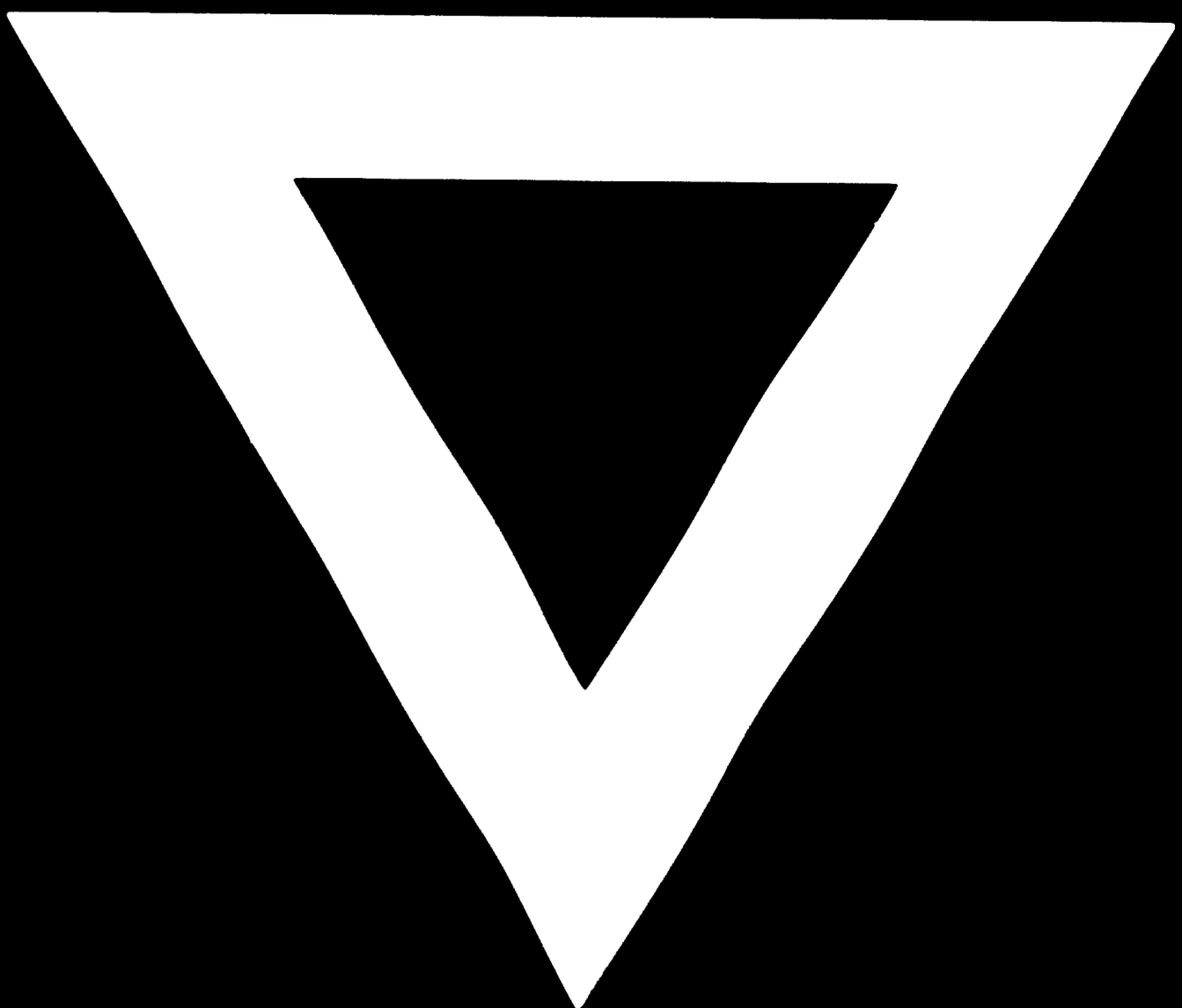

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