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SUPPLEMENTARY ASSISTANCE IN THE PRODUCTION OF DETERGENTS, SOAP AND COSMETICS

SI/IRQ/77/804

IRAQ

Terminal report

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

Based on the work of Ahmed Mohammed Abou Shady
expert in detergents, soap and cosmetics

United Nations Industrial Development Organization
Vienna

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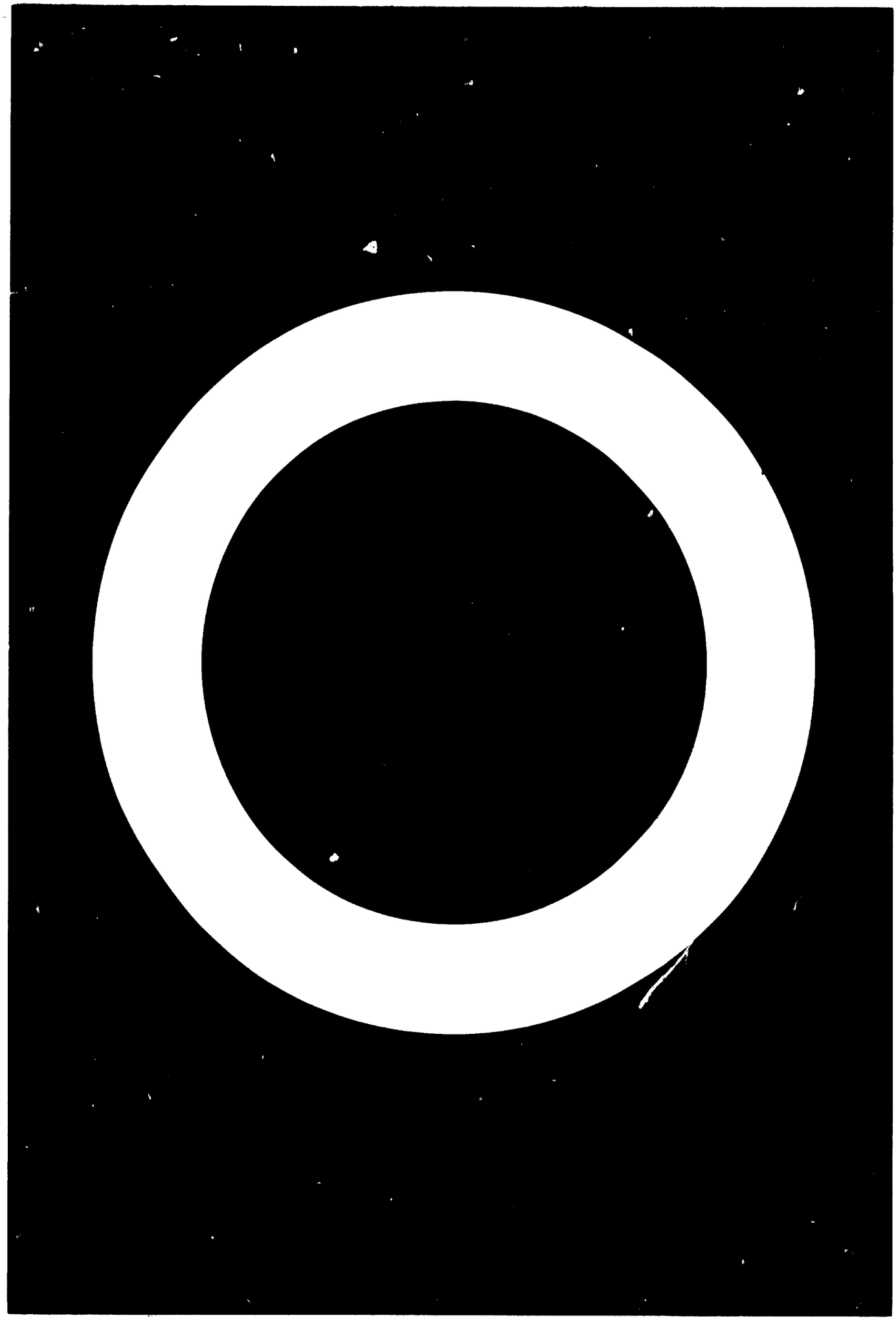

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INTRODUCTION

The General Company for Vegetable Oils, in Iraq is the main company for the manufacture of oils, soaps, detergents and cosmetics.

The Company's research works are mainly concentrating on, the intention of continuous developing and increasing the capacity of the different products, and accordingly on the elimination of industrial problems, which are mostly concerning the different raw materials specifications, and the adopted methods, including the technical formulations and procedures of the different industrializations.

The purpose of the 1st mission, which started in March 1977 was principally to assit the Company in the manufacture and the formulation of the synthetic detergent powders, and demonstrate the efficiency of the recommended improvements respectively.

The purpose of the 2nd and the 3rd mission which started effectively in December 1977, was to follow-up the recommendations of the 1st ones; where it was rather impossible to begin the suggested industrial trials for the production of the new proposed formulations on my presence, because of the delay of importing the necessary recommended chemical ingredients. Although the Company has already taken the necessary steps to carry out the industrial runs duely; putting into consideration that there is an intention for the exchange of the recommended sodium perborate by the addition of sodium percarbonate, which is naturally far to be recommended. especially for the production of higher qualities of detergent powders with a moderate alkalinity, and nonsenstizing effects; an explanatory technical report of such has been submitted.

It was also suggested, during the last missions to assist the Company in manufacturing, and the formulation of toilet soaps, laundry soaps, and cosmetics especially tooth paste, shaving soap creams and hair shampoos.

Moreover, it was scheduled within the last mission to propose the necessary improvements in the process, equipment, and recipies for formulation of the different types of soap and cosmetics, in addition of supervising trial runs in the plants in order to demonstrate the efficiency of the recommended improvements of such.

Training was also a part of the last mission's research works; suggestions were concentrated on the arrangements for training the local technical personnel in operation, quality control, and maintenance of soap and cosmetic plants.

A final report including recommendations, and all surroundings was submitted besides, the programmic academic, lectural courses, in the different lines of technologies.

The draft terminal report includes detailed datas, on the productivity of the different soap, and cosmetic industries and the recorded developments obtained in the different technical directions.

In regard of the synthetic detergent powders research works, a technical report for such, was included in the draft terminal report, already submitted in May 1977.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

I. THE SYNTHETIC DETERGENT POWDER

A summary was stated in the 1st draft terminal report submitted in May 1977, including the following findings:

(1) The Sulphonated Materials : manufactured in the different factories are much darker in colour, due to partial charring of the organic ingredients, and processing system of sulfonation.

(2) The perfuming property of the existing manufactured powders is rather low in effect and stability. The weak effect, and inferior stability of aromatic compounds used, are clearly notified especially on the use of such products after a storaging period.

(3) The Moisture Content, in the finished product is variable from one product to another, it ranges from 7-13%.

(4) The active detergent matter, is rather comparatively higher than most of the up-to-date international products, it ranges almostly between 28-33%, and this increase, might cause the sensitizing feelings to some users.

II. THE SOAP MANUFACTURE

(1) The existing chemical processing method adopted, is the traditional open kettle system, which is actually, economically unsuitable for the production of higher quality.

(2) Delivery and Transportation of the raw fatty materials is not completely equalibrated with the annual increase of productivity

The raw fatty materials, are generally imported for the different types of products, without any specified stable, scientific permanent, technical formulations.

(3) The following data is the existing storaging capacity of the raw fatty materials, in the main factories.

TABLE 1.

STORAGING CAPACITY OF THE FATTY MATERIAL AT THE TWO MAIN FACTORIES

The Factory	Number of Tanks	Tons
El-Rashid Factory	5	4600
El-Mamoon Factory	2	1600

(4) Treatments and purifications of the fatty materials are not a permenent job; depending almostly on the circumstances of the technical inspection of such materials,

(5) Specifications of the sodium chloride, are too much below the standard, it is differently coloured, and contains considerable amounts of mechanical deposits, and higher percentages of magnesium and calcium impurities, which effect colour and solubility of soap.

(6) Toilet soap tablets are exposed to cracking defects The laundry soap cakes, in some cases are defected by the appearance of cristalized powders on the dried surface.

(7) The extent of glycerine recovery of spentlves, is too much below the level of its content, respectively in the treated fatty matters.

(8) The aromatic Compounds, used for perfuming the toilet soap, are less stable, therefore the Company increases the dozes up to 1.25% instead of 0.8-1% normally.

(9) Different industrial productive departments, the oil refinery and the synthetic detergents are sharing with the soap sections, the same preparatory tanks of the sodium hydroxide solutions, which might lead to flactuation in consumption of each.

(10) Toilet and laundry finishing. cooling and drying processing treatments are running side to side in one combined area, and sometimes carbolic soap types are participating in same, which has a direct effect on the toilet soap specifications.

(11) The annual production of soaps in the three main factories; during the year 1977 was:-

-	effective production of toilet soap;	12465 tons
-	Scheduled " " " "	15600 "
-	Effective " " Laundry "	16150 "
-	Scheduled " " " "	16370 "
-	The total annual effective production of soaps;	28615
-	The total annual scheduled production of soaps.	31970

These figures show the capability of increasing the productivity continuously.

III. COSMETICS: The vearly production of the differnt types of cosmetics is nearly 500 tons.

(1) Hair Shampoos, are manufactured in two different specifically nominated types.

A The dry hair quality, does not effectively contain the specified useful, dry hair fatty additives.

B. The fatty hair type, or the nominated anti dandroff type is processed under a special formulation and under continued research trials.

(2) Dental Creams, two types of a promicing quality are manufactured but they are not entirely different from each other. Both types have a slight sticky texture and the colours are not sufficiently white.

(3) The Shaving Soap Creams , two types of a ehite shaving cream are manufactured, one of which contains an effective skin cooling substance;

- the lather property is quite normal, unless it is less dense and moderatlev unstable.
- the existing formulations are including 1% of sodium silicate, which has its influence on the lathers' dense.
- the useful fattv active materials are not supported and equalibrated by anv improving boosters, therefore the lather became thin in a "painty" shape and not easily removed.

(4)Testing units , the cosmetic preparatorv section, is not equipped with the needed apparatus and scales of prior inspections on the different type of production. Thus, sometimes complete finished batches have to be reworked after being inspected by the general control laboratory.

IV. TRAINING:

All the concerned technical staff, in the different productive departments have not the sufficient time to have a look in a technical review or a reference; especiallv in the soap manufacture where thev cannot find sufficient useful references in addition to their complete occupation in different supplementary administrative works,

Moreover the ongoing technologies refer mostlv to the old industrial documentations and reviews of the factories before their national combination.

RECOMMENDATIONS

I. THE SYNTHETIC DETERGENT POWDERS: Recommendations were suggested on the 1st draft terminal report as follow:

(1) Technical and Economical Formulations: were suggested based on reducing the supplementary increase of the active detergent matter, without effecting the cleansing properties of the finished products, and respectively eliminate the senstizing effects and feelings, with a considerable decrease in the cost price.

(2) Improvement for the Stability of the aromatic Perfuming Properties.

(3) Adjust the moisture content, which affects the bulk density of the finished product.

(4) The Use of additional Percentage of soap in the Formulation, has different advantages:

- regulates viscosity and results a more stable densed foam.
- isolate the senstive skin of consumers from the senstizing effects of the active detersive materials
- regulates the bulk density of the finished products.

(5) The Use of Sodium Perborate, Moderately; improves the colouring of the washable materials, and ensure the use of powders in cool water (- °C).

(6) External and internal training of the technical staff personnel, was essentially recommended.

N.B. Two of the responsibles chemical engineers have already assisted and terminated technical training courses in Italy, as previously recommended and supported by the UNIDO Industrial Operation Division on May 1977.

(7) The possibility of developing the sulfonation system, to stop the partial charring of the sulfonated material, which influence the colour of the final product.

II. THE SOAP MANUFACTURE

(1) The Chemical Processing System

Soaps are actually manufactured chemically by the oepn kettles traditional method, which is unsuitably used for such a semi-large production. The mechanical continuous chemical manufacturing system is technically and economically recommended.

(2) Delivery and Transportation of Fatty Materials

Should be reorganized on an effective permenent scientific fat formulation with continuous separation of the contaminated water.

(3) The existing Storage Capacity of Fatty Materials:

Should be reviewed and organized to suit the successive annual increase of production and grading of the different fatty materials based on the suggested scientific formulations.

(4) Sodium Chloride Solutions.:

Should be purified before use to evitate spoiling the colours of the previous bleached fatty materials.

(5) Cracking of Toilet Soap Tablets:

Refers to several chemical and physical reasons which could be technically eliminated, by a perfect chemical control and/or the addition of texture's improving materials.

(6) The Laundry Soap. Defects:

Appearance of cristalized powders, could be evitated by the addition of semi-neutral sodium silicate to the basic neat soaps.

(7) Perfuming Toilet Soap.

Should depend on the use of selected stable qualities of the armmatic compounds; meanwhile useful fixing additives are technically and economically recommended.

(8) Sodium Hydroxide

Solutions for the soap industry, should be prepared independently from the other industrial sections.

(9) Toilet Soap, finishing, cooling, drying ,etc.

up to casing treatments should be completed independently separate from the other processing laundry finishing area.

(10) The annual production of soaps is continuously in increase; the effective production on 1977 did not reach the scheduled programme of production, inspite that the efficiency and capacity of equipment are sufficiently helpful. It is recommended to evitate technical delays by the use of the daily logsheet, controling system.

III. COSMETICS: The following recommendations, are concerning the different development, suggested for the three cosmetic types:

(1) Hair Shampoos: formulations should include the correspondent useful ingredients, conforming with the advertizing nominations.

(2) Dental Creams: formulations should be developed suitable additives to existing formulations are needed to improve the capability effect, of quick removal of sticky deposits after use.

(3) Shaving Soap Creams: additionally to the basic existing formulation, useful lather booster stabilizer and condensing materials should be added and equaliberated with the active matter of the fatty salts. Moreover the addition of sodium silicate should be eliminated.

(4) Inspecting apparatus and equipment: the cosmetic preparatory Section should be supplied and equipped with suitable pilot plants, inspecting quality control units, and waiting vessels.

(5) Raw Materials: for the cosmetic preparations all the liquid raw materials should be stored in stainless steel containers.

IV. TRAINING OF PERSONNEL: abroad training is essentially needed for the technical staff with more than 5 years experience. Training should include academic, and technical industrial courses.

Training should be maintained for at least two graduate technicians of the existing working staff in each principle section. Local training should include the second line of technicians and staff of Formans. Exchange of technology for the staff of formans required by a supplementary technical training at the Egyptian Salt and Soda Co., in Alexandria.

CHAPTER I

"FOLLOW UP", THE RECOMMENDATIONS OF THE PREVIOUS MISSION,

(SYNTHETIC DETERGENT FORMULATION)

The existing production of synthetic detergent powders is still running, without the further recommended changes in the main normal formulations; as previously suggested in the draft terminal report on May 1977.

The reason of delaying the execution of the recommended new formulation is due to obligatory delays for the import and transfer of the needed chemicals.

The Company has the intention to exchange the suggested sodium perborate, as an active whitening material, by the addition of sodium percarbonate such changes, and their probable effects of increasing the PH, (ALKALINITY) in the final product was cleared to the responsibles, especially the probable increase of senstizing feelings.

In concern of fulfilling better controlling of the moisture content in the final product, it is still a matter of mechanical study for the equalibration of moisture in the raw material with same in the final product.

From the ther hand, the use of automatic, moisture controllers was recommended, for an accurate moisture control.

In reference to the previous recommendations in concern of personnel training, which was approved by UNIDO Industrial Operation Division, two of the senior technical staff have already assisted training courses in Italy in the field of synthetic detergent industrialization.

Perfuming the final product, and suggestions concerning the essential need for increasing the fixation range of the aromatic compounds used, taking into consideration that ditergent powders are mostly used at different tempratures, are still under investigation for the selection of the suitable type amongst the different international types already offered under hands.

CHAPTER II

EVALUATION OF THE SOAP, PRODUCTIVITY , (IN THE DIFFERENT FACTORIES)

(1) THE EXISTING, PRODUCTION CAPACITY,

The main factories for the production of soaps, are, EL RASHID, EL MAMOON, and EL AMIN, factories which are all situated in the city of BAGHDAD.

The productivity of the differnt soap types in the three factories during the year 1977, is submitted in the following table 2.

TABLE 2.

SOAP PRODUCTION, IN THE THREE MAIN FACTORIES ON 1977

FACTORY	TOILET SOPA TONS	LAUNDRY SOAP TONS
EL RASHID	4344	7926
EL MAMOON	3309	7140
EL AMIN	4812	1084
THE TOTAL EFFECTIVE PRODUCTION	12465	16150
THE TOTAL SCHEDULED PRODUCTION	15600	16370

CONCLUSION:

From the upnoted figures we notice that the total effective general production on 1977, is 28615 tons, and the scheduled production for the same period is 31970 tons; despite that the company's chemical processing, and finishing equipment are sufficiently capable for the execution of such scheduled production. In such a case it is recommended the use of the daily "LOGSHEET CONTROLLING SYSTEM", which will do in solving delays problems instantly.

The productivity of soap, in general is always in increase, and the following table No. 3, shows the production of soaps during the five successive years, 1975/1978.

TABLE 3.

YEAR	TOILET SOAP	LAUNDRY SOAP	TOTAL PRODUCTION
1975 effective production	9603 tons	9637 tons	19240 tons
1976 effective production	12385 "	15520 "	27905 "
1977 " "	12465 "	16150 "	28615 "
1978 scheduled production	15000 "	18000 "	33000 "

From the figures mentioned in Table 4, we notice that the productivity of soap is continuously in increase annually, especially the toilet soap types, which is also an indication, parallel to the local continuous development in all directions.

TABLE 4

THE INCREASE OF THE SOAP PRODUCTION FROM 1975 TO 1978

YEAR	TOTAL PRODUCTION TONS	INCREASE IN COMPARISON OF BASIC, PRODUCTION, 1975		OBSERVATIONS
		TONS	%	
1975	19240	-	-	Effective production
1976	27905	8665	45	- do -
1977	28615	9375	48.7	- do -
1978	33000	13760	71.5	scheduled production.

Conclusions:

We clearly recognize that the annual increase in productivity of the different types of soaps; especially the continuous elevation in the toilet soap production, which is considerably depending on the treatment of fatty materials glycerides, leads to recommend seriously the development of the existing chemical processing method, actually running in the open kettles to an automatic continuous system, which improves the properties of the product besides the high economically glycerin recovered and the negligable losses in the treated raw materials.

2. EQUIPMENT OF THE CHEMICAL PROCESSING SYSTEM

The Company is still using, in all the factories , the traditional open kettles system for the soaponification and treatment of fatty materials.

The following listed, different equipment are the main company's means for the industrialization of soap:

A. EL MAMOON SOAP FACTORY

The pan room contains, ten open kettles of the different capacities:

1) The Chemical Processing (Saponifying) units: are ten soap kettles:

- 4 kettle of the different capacities, 46/47/46/54 ton respectively
- 4 " " " " " 38/45/46/54 " "
- 2 " " " " " 24/49 " "

The montly total production of these units is about 350 tons of toilet soap types and 800 tons of the laundry types.

2) Spent lye tanks:

- 2 tanks of 100 tons each.

3) Bleaching Units

- 1 autoclave of 13 tons capacity

4) Storage tanks

- 2 tanks of 22 - 26 tons waiting neat soap
- 1 tank of 33 tons, waiting fat charge
- 1 tank of 600 tons external fat container.

5) Sodium hydroxide tanks

- 1 tank of 39 tons capacity.

B. EL RASHID SOAP FACTORY

1) The Chemical Processing (Saponifying) units; are 14 soap kettles:

- 3 kettles of 40 tons
- 3 " " 35 "
- 4 " " 18 "
- 4 " " 12 "

The monthly total production of these units is round 450 tons of toilet soap types and 800, tons of the laundry soap types.

2) 1 complete unit of glycerine recovery from spent lyes, ... of a lower capacity of glycerine at the Rashid Factory

3) Bleaching Unite-

- 1 autoclave of 2.5 tons capacity.

4) Fat Storage Tanks; the main company's station for receiving and sotraging fatty materials is situated at this factories and supported by connections for direct supplies of fatty matters to the soap section.

5) Sodium Hydroxide Tanks; this feeding tank is participated in between the refinary and detergent sections.

3. THE CHMICAL PROCESSING METHODS: (SAPONIFICATION)

The existing open kettle system: is the one used for the saponification and treatments of the fatty raw materials. This traditional method has so many disadvantages, amongst of them the following:

1) The Tremendous Losses; in the recovery of glycerine as a lye product, besides its lower concentration in the spent lyes; which costs much more in treatment, and evaporation.

2) The Processed Kettle's Soap quality; is much inferior which is mostly contaminated with different portions of mineral impurities.

3) Less in uniformity; with chargeable contents of electrolytes (free alkali and salt), and unsaponifiables; which factors lead always to different defects; such as cracking and deformations of the finished soap tablets.

4) Mostly, bleaching chemicals are recommended, for improving the colour of the kettles neat soap, despite the previous bleaching treatments of the fatty materials.

5) The Fatty acid content in the settled neat soap, is variable from a batch to another, depending mostly on the entangled electrolytes in the liquid neat soap.

6) The accurate final settlement, after the fitting operation, depends on several factors; such as seasons variable temperatures, tight adjustments of the pan's connections and the extent of reprocessed defective treatments.

7) Higher losses in the chemicals, and the treated fatty matters

8) To ensure accurate saponification, fine clear settlements, and higher recuperation of highly concentrated glycerine spent lyes; repeated treatments and several washings should be done in a considerably longer periods.

9) Higher Costings in; labour, steam, power, and materials

10) The manufacture area, and floor space, needed for the pan room traditional processing system is much bigger if compared with same of the continuous automatic processing system, of the same capacity.

N.B. All these items were negociated and explained in figures duely.

(4) The Chemical Processing Systems; equipment, and areas needed.

A. THE OPEN KETTLES SYSTEM, needed equipment

- three kettles of $20m^2$ surface area, and corresponding volume of $55\ m^3$
- The manufacture capacity of each kettle, of neat soap is 24 tons
- The occupying period for processing and settling down is 5 days

Thus the corresponding total production of the three kettles in 5 days is..... 72 tons

B. The daily production of a mechanical continuous system (3 tons/hour); ..... 72 tons

THE MONTHLY PRODUCTION, FOR BOTH OF THE SYSTEMS IS..... 2160 "

THE NUMBER OF OPEN KETTLES NEEDED FOR 72 tons daily production is 15

C. The assisting spent lyes, receiving tanks; naturally number of tanks are only needed for the open kettle system, for continuous deliveries and concentrating treatment. The number of tanks depends on the following facts:-

- 50 tons of fatty glycerides are generally needed for the manufacture of 72 tons (neat soap)
- The theoritical content of glycerine in the treated glycerides is around 5 tons
- The average concentration of glycerine in spent lyes is normally by the kettles system 7%

Thus; the spent lyes respectively recoverable for each 72 tons neat soap is 71.5 tons.
The number of receiving spent lyes tanks are respectively 4,-
N.B. a spent lye tank is of 20 m^3 volume, and around $7m^2$ surface area.

CONCLUSIONS

1. The total monthly production of neat soap by the open kettle system is 2160 tons

2. The total monthly glycerides required, correspondingly are around 1500 tons

3. The glycerine spent lyes, monthly obtainable at a concentration of 7% are 2145 tons.

4. Number of chemical processing open kettles of 55 m^3 each needed is 15

5. Number of glycerine spent lyes receiving tanks of 20 m^3 each is 20

6. Number of fatty materials waiting tanks of 25 tons, each is 2

7. Number of neat soap, waiting tanks of 30 tons each is 2.

D. The Floor Space Areas, required for both chemical processing systems

- For the Open Kettles System: the required floor area for the 15 open kettles, pan room, is around 825 m^2, including all the upmentioned needed units with the additionally sufficient space for easy manipulation and transportation.

E. The Ceiling heights: required for a double floor area, for the traditional, chemical processing open kettles system are 7 m - 14 m respectively.

F. The required floor area of the mechanical containuous chemical processing system is 450 m2.

G. The ceiling heights of the continuous system is 6-10.5 m respectively.

N.B. The continuous systems, unit is of a 3 tons/hour capacity, corresponding to 2160 tons of neat soap monthly.

The unit includes identically all the necessary arrangements for glycerine spent lyes circulations etc.

CONCLUSIONS: Comparative conslusions of the needed floor area for both the traditional open kettle, and continuous chemical processing systems are shown in Table 5.

TABLE 5

THE COMPARATIVELY NEEDED FLOOR AREA FOR BOTH THE OPEN KETTLE AND THE MECHANICAL CONTINUOUS SYSTEMS

COMPARATIVE ITEMS	TRADITIONAL OPEN KETTLE SYSTEM	MECHANICAL CONTINUOUS SYSTEM
- Daily Production	72 tons	72 tons
- Monthly Production	2160 tons	2160 tons
- Number of Processing Kettles	15,-	-
- Surface area of a processing soap kettle	20 m^2	-
- Number of the additional circulating receiving tanks	20	included
- Surface area of an additional tank.	7 m^2	-
- Ceiling heights	7-14 m	6-10,5 m
The total needed area	825 m^2	450 m^2

N.B. Area for easy manipulation, circulation, transportation and installing of the other assisting equipment is included for both systems.

4. EQUIPMENT FOR THE FINISHING TREATMENTS

(Cooling, drying, cutting, stamping etc, up to casing)

The company owns several mechanical continuous cooling and drying under vacum units, originally different.

The output of these units is differently distinguised, and their total capacity exceeds 50000tons yearly of the finished soap products.

Most of the units at El-Mamoon Soap Section are working side to side in one combined area for the production of both toilet and laundry soap types.

The output of most of the units, especially at El-Mamoon Soap Factory is not conforming to regular feeding system; the matter of which, the production lines have to be cut for different unregular periods: therefore, sums of the superdried nodles of soap and powders are contaminated into the processed finished soap tablets, and liable to cracking defects.

From the other hand, the disadvantages of processing and finishing the toilet and laundry soap types in a unified area are several; amongst of them, the noticable humid surfaces of both products, due to the exchange of hygroscopicity, especially recognized at the wrapping and casing stages.

Moreover the soap perfuming properties are comparatively inferior,

Noticable quantities of the processed finished, perfumed scrapped toilet soap have to be reworked, and liable to a total loss of the improving additives, especaially the aromatic compounds. The toilet soap scrabs are generally results of the irregularity of the continuous feedings, previously noted.

The soap nodles are transported and fed in a normal coonveying system, such a system leads to the contamination of superdried soap powders, with the normal dried nodles.

Regularity of periodic, selos cleaning is recommended to evitate such superdrying contaminations.

Finally, the use of pneumatic duct conveving systems for the transportation of dried soap noddles is suggested.

The Company's different vacum cooling, drying and continuous finishing units are as follow:-

1	Unit	El-Mamoon, Soap factory of capacity				600	kgs/hour
1	unit	" " " " " "				1500	" "
1	"	El-Rashid " " " "				1500	" "
1	"	" " " " " "				1500	" "
1	"	El Amin " " " "				1000	" "
1	"	" " " " " "				500	" "
1	"	El-Motasem New Factory out of Baghdad				1000	" "

IS STILL UNERECTED.

CONCLUSIONS:

On the scope of the above mentioned figures, we recognize that the company owns cooling and drving, under vacum, finishing units of approximately double of its annual chemical processing productivity.

As a matter of fact; the soap manufacture, general policy should be reviewed however that those figures reflects much more the need of the essential developments of the chemical processing svstem.

5. GENERAL CONCLUSIONS AND RECOMMENDATIONS, on the finished soap types: The existing toilet soap tvpes are manufactured and finished without anv additional modefving or improving materials.

The lather properties, softening, smoothing effects , fixation and stability of perfuming should be continuously checked and developed by the addition of the different suitable chemical improvers.

The cracking fenomena of the finished toilet soap tablets, could be eliminated bv the different treatments and additions of particularly a normal gumming material.

N.B. A separate technical lectural report for such a matter was negociated with the concerned technical staff, and edited in the Arabic language at the request of the company; where the following recommendations were suggested:

- The suitable suggested gumming materials for evitating such a cracking fenomena are:

  - sodium alginate, cetyl alcohol, agar, agar , a balanced mixture of petroleuim jelly and stearic acid, in the presence of additional separate portions of neutral sodium silicate and magnesium sulphate.

N.B. The following important facts should be notified:

A. The addition of sodium silicate and magnesium sulphate solutions should be cautiously added separately, independantly; one of each on the cruching liquid fase (on the neat soap) and the other should be added on the amalgamated dried soap noddles after being dissolved entirely into the liquid additives, such as colouring materials or so. Such precautions evitate largly the contamination of abrasive deposits of magnesium silicates components as clearly shown in the following chemical equation; and the experimental addition test followed.

$$Na_2SiO_3 + MgSO_4 = MgSiO_3 + Na_2SO_4$$

122 gms + 120 gm = 100 gms (DEPOSITS) + 142 gms

In an inspection test made on a sample of toilet soap dried noddles perviously treated by the addition of neutral sodium silicate, and magnesium sulphate solutions both added on the liquid neat soap, the following results were obtained:

alcohol insolubles	1.840 %
Water insolubles	1.054 %

B. The addition of gumming materials has also a direct effect on the stability of perfuming, and respectively on the cost price where a decrease of about 10-20 % of the perfuming aromatic compound could be considerably economized without any slight change on the perfuming property: in the contrary much more stability of perfume is effectively obtained.

The addition of antioxidents and sequestering agents, are recommended for the preservation and protection of deterioration and discoloration of the high cosmetic soap grades.

The existing laundry soap types

The laundry neat soap: cooling and drying processing methods are the same used for toilet soap unless different in the processing, and the soap drying procedure.

The laundry neat soap properties depend mostly on its contents of electrolytes which refer always to the entangled lye; this could be checked chemically before cruching treatments.

The phenomena, of the cristalized soap powders, appeared on the outer surface of the laundry soap cakes or bars is naturally due to physical changes, especially to the exchange of moisture with the surrounding humid area.

Such a phenomena is well known in the old technology of soap making especially it does not occur permenently and it happens only in the supernumid period and different seasons.

To eliminate the appearance of such phenomena, the following facts are notified:

1. The free alkalinity in the neat soap, which is ready for cruching should be 0.15 - 0.20 % N OH.

2. The $N_a$cl (salt content) in the neat soap should not exceed 0.6%.

3. The addition of 2% of the Semi Neutral Silicate ($1N_a20$: 2.4 SiO2) to the laundry neat soap should be governed by:-

   A. The alkalinity of the neat soap, should not be less than 0.15-0.20 N_aOH soap.

   B. Should not contain any traces of the entangled lye.

4. In case of a lower alkalinity in the cruched neat soap, before the addition of the sodium silicate, therefore the equivalent addition of sodium hydroxide is necessary equalibrated and then followed by cruching in the sodium silicate.

5. By the accurate surface crusting of the laundry soap cakes immediately before casing no formation of deposit powders would happen.

6. Dampy, humid storaging, and low grades of carton papers lead generally for the appearance of the surface powder deposits.

7. higher Elkalinity, more than 0.3% Na_2O could be a reason for surface powder deposits, however this case, could be checked and tested easily, and the presence of sufficiently sodium carbonate in the deposits is considered an accurate sign.

8. The addition of thickening, gummy, agents, such as sodium alginate; agar, agar; carboxymethylcellulose within 1-2% appears useful for the protection of the soap cakes from the surface powder deposits, and improves generally its cleansing activity.

CHAPTER III

THE FATTY FORMULATION OF TOILET AND LAUNDRY SOAPS IN RESPECT OF FATTY MATERIALS SPECIFICATIONS

The existing fat charges for the manufacture of the different soap types are not subject to permenent scientific technical bases.

In case of the existing laundry fat charges it is generally liable to changes considerably due to the availability of different kinds of acid oils.

In a separate technical report, during the lectural training courses at the company, explanatory reviews of such technology were issued.

Illustrated technical methods for the formulation of a technical fat charge, either for the production of toilet or laundry soap types are properly depending onthe average chemical and physical specifications of the fat charge.

The definite, specified properties of the needed soap product, should be previously suggested, and the fat charge could be respectively formulated, due to the following specifications of the blended fatty matters.

1. The INS value of a fat which is the difference between its saponification value and its iodine number.
2. The H.N number of a fat is the hardness number respectively specified in the manufactured soap of the same fat.
3. The titre of a fat is the solidifying degree of the fatty acid of a specified fat.
4. By the use of titres relation to the I.N.S. value of the same fat, the N.N. number of the same fat has become accordingly successfully a fact for the formulation of the different fat charges.
5. The palmitic and stearic acids balance, ratio in a fat charge has its direct effect on the foam and hardness properties in addition to the hydroloysis effects of the final soap product.

N.B. The scientific technical formulation of a specified product is a suitable base for the reworked soap, scrabs as blended fatty components.

N.B. An explanatory technical report has already been edited in the arabic language at the request of the Company.

6. Permenent scientific FAT CHARGE FORMULATIONS are recommended

It has been recommended that the company should start investigating the availability of local fatty materials such as soap stock, acid oils residual of the vegetable oils refining and any other distilled fatty materials, which could be proposed in addition to the other acid oils of palm oil, and other grades of grease tallow for the formulation of a permenent fat charge for the production of laundry soap types.

The respective hardness number (HN) of a toilet fat charge should not be below 300 degrees, and that of the laundry soap types should not be below 263 degrees when the fat charge does not contain coconut oil

In conclusion, the following facts are to be notified:

1. A permenet fatty formulation for the production of a toilet soap type based on a respective hardness figure not below 300 degrees and another for the production of washing laundry types, should be prepared not below 263 degrees.

2. The company's policy for importing fatty materials should study first the availability of the maximum utilization of the company's fatty residuals and the other local supplies of acid oils.

3. Soap scrabs which are lower in purity can be retreated as a component of fatty material for the production of laundry grades their fatty contents should be respectively deducted from the original fat charge.

4. Coloured fatty residuals oils and soap stock are preferably distilled and possibly saponified by the use of sodium carbonate.

CHAPTER IV

The Fatty Raw Materials

(1) Receiving and Storaging

The Company depends mostly on the importation of the needed raw fatty materials, for the industrialization of the different types of soap; most of these materials reach Basrah harbours where a located receiving station already equipped with the convenient number of receiving tanks are available for storaging the different qualities of fatty materials, until a convoy of rivers steamers are ready to transfer them to the factory's receiving station at El-Rashid Factory, Baghdad.

A special technical report in this respect has already been submitted and edited in the Arabic Language at the request of the Company.

In the following Table 6 A register showing the existing receiving containers of fatty materials.

Table 6

Factory	No. of existing tanks	Capacity tons	No. of additional tanks	Capacity tons	Fatty material
El-Rashid	1	950	1	950	Tallow
" "	1	1000	-	-	"
" "	1	850	-	-	"
" "	1	850	-	-	Coconut Oil
El-Mamoon	1	600	1	1000	Tallow

Conclusion: The General, fatty material storaging capacity

El-Rashid	5	4600 tons
El-Mamoon	2	1600 "

STUDY ON THE FATTY MATERIALS, STORAGING CAPACITY, FOR THE DIFFERENT SOAP FACTORIES, IN RESPECT OF THE INDUSTRIALIZATIONS REGULARLITY

A separate report on the study of storaging and transportation of the raw materials, has already been submitted at the request of the company.

The study was done; based on the figures of the production of the different types of soap in the three soap factories, on the year 1977. (Ref. Table No. 1); and the following facts are notified:-

A. Toilet Soap Types

1) El-Rashid Soap Factory

- The total annual soap production 4344 tons
- The total corresponding fatty matters. 3900 tons
  - Tallow 3120 tons
  - Coconut oil 780 tons

2) El-Mamoon Soap Factory

- The total annual soap production 3309 tons
- The total corresponding fatty matters 3000 tons
  - Tallow 2400 tons
  - Coconut Oil 600 tons

The total annual fatty materials which are needed for the production of toilet soap in the two main factories are

- Fancy tallow 5520 tons
- Coconut Oil 1380 tons.

B. Laundry Soap Types

1) El-Rashid Soap Factory

- The total annual soap production 7826 tons
- The total corresponding fatty materials 5625 tons

Tallow and/or palmoil 4500 tons
acid oil and/or soap stocks 1125 tons.

2) El-Mamoon Soap Factory

- The total annual production 7140 tons
- The total corresponding fatty materials 5000 tons
  - Tallow and/or palmoil 4000 tons
  - acid oil and/or soap stock 1000 tons.

We recognise clearly the following facts:

(1) the existing receiving tanks are of a capacity of 6200 tons five of 4600 tons totally are situated at El-Rashid factory and two of 1600 tons totally are situated at El-Mamoon Factory.

(2) The needed sotraging capacity for six months production is:-

- Tallow and/or palmoil 4250 tons
- acid oil and/or soap stocks 1150 tons

(3) The total annual fatty materials needed for the production of laundry soap in the two main factories are:

- Tallow and/or palm oil 8500 tons
- acid oil and/or soap stocks 2225 tons

N.B. In case of the production of a highly specified cosmetic toilet soap grade of 2000 tons yearly, for which special extra fancy tallow and mostly coconut oil are needed and the storaging capacity should be as follow:-

Fancy Tallow; Bulk Storaging 4080 tons
Extra Fancy Tallow; Drum's storaging 1440 tons.

Conclusions: TABLE 7

TABLE 7

CONCLUSIVE GENERAL POLICY FOR STORAGING THE RAW FATTY MATERIALS FOR SIX MONTHS PRODUCTION

FATTY MATERIAL	FOR 6 MONTHS PRODUCTION TONS	TANKS NEEDED FOR 6 MONTHS PRODUCTION		OBSERVATIONS
		Number	Capacity	
EXTRA FANCY TALLOW	720	2 400	300 kg	Drums
FANCY TALLOW (TOILET GRADE)	4080	4	1000 tons	TANKS
FANCY TALLOW (LAUNDRY GRADE) AND/OR PALM OIL	4250	5	850 "	TANKS
COCONUT OIL	1380	1	850 "	TANKS AND/ OR DRUMS OF 300 KG EACH INSOLATED TANKS AND/OR BARRLES OF 200 KG EACH
ACID OIL AND/OR SOAP STOCKS	1150	2	600 "	

N.B These studies were done comparatively to the 1977 effective year of production and in regard of the developing elevation of production in the coming five years, a suggested increase of 10% should be added to the estimated figures of the general policy of production and storaging capacity of the fatty raw materials.

2. TREATMENT AND PURIFICATION OF THE FATTY MATERIALS

Most of the imported fatty materials especially tallow are in need of considerable treatments and purifications.

A technical separate report in this connection was edited in Arabic language during the lecturing training programme, and submitted at the request of the company from which the following abstracts are summarised:

The problems of purification of the different grades of tallow fat, are generally due to the contaminated colouring matters and the unpleasant fatty odour, which is basicaly a result of the "BACTERIUM PUTRIFICUS", activities during the storaging and deterioration.

In regard of freeing the fatty material from the unpleasant odour, the following processing system was suggested, and gave promising results after the experimental industrial trials:

1. Heating the fat in an open kettle to 100 - 110 C^{o} by the use of agitating direct steam.

2. Addition of 10% by weight of a clear concentrated purified brine solution of 23-24 Be , while heating and vigerously agitated by the direct steam.

3. After a continuous heating and agitation for at least 60 minutes, it should be kept for cooling and accurate dequentation for at least 3 hours; after which the exhausted brine solutions should be drawn away, which is of a concentration of 12 Be' minimum, to secure emulsification problems. To evitate such a problem, clear dry salt should be added in a sufficient quantity before the end of the heating process.

4. The treated fatty material is preferably transfered for immediate bleaching treatment preferable by the use of a hydrochloric acid's activiated earth which prevents partial charring of any residuals of organic albumines; traces to be found in the salted fat.

N.B. The preparation of a pure brine solution is essential where normal salts are purified from colouring deposits, magnesium and calcium contaminated compounds. Suitable additions of sodium carbonate or sodium hydroxide is suggested.

The rest of contaminated fatty odour after treatment is the natural fatty smell which is easily removed by the other successive treatment; bleaching, saponification soap drying and perfuming.

Losses in such a fat treatment is negligable if it is compared by same of the other chemical refining and autoclave deodaring treatments which are too much costy. This was confirmed by the experimental runs made on refining, bleaching and autoclave deodaring at 140C° which gave mostly reversed colours and high costs at El-Mamoon and El-Rashid Bleaching and Deodorising Sections.

Conclusion:

The Company's policy of importing high qualities of fancy tallow should be based on the correct international specifications of the different grades, where extra fancy tallow should be forwarded in special drums,containers, and never in a bulky transportation.

N.B. an international list of the different tallow specifications, has already been submitted.

CHAPTER V.

THE TECHNICAL MODERN METHODS FOR THE STANDARDIZATION OF A SOAP MANUFACTURE IN RESPECT OF THE FATTY MATERIALS, CHEMICAL AND PHYSICAL SPECIFICATIONS

The up noted subject was introduced in a separate technical report during the lectural courses and edited in Arabic at the request of the company from which the following subjects were abstracted and thouroughly explained and negociated with the concerned technical staff at the factory's work centres.

1. The physical texture's specifications of the soap product in respect of its colour, odour, and softness, which are most important to consumers.

2. The physical technical properties of the soap product, in concern of its hardness, foam properties and stability detergency and cleansing power; such properties are also mostly of the consumers attractives.

3. The chemical soap specifications, especially the completion of saponification, fatty acid content in relation with the contaminated electrolytes, and the chemical specifications of the treated fatty materials, which are all naturally the interest of producers.

4. The palmitic and stearic acids balance, in the final soap product, which is the main kee for the detergency power.

5. The technical method of the formulation of a soap, fat charge in respect of the chemical specifications of the fatty materials. After a study of the intimate relation in between the saponification value, iodine number, and the titre of the fat charge, it became much easier to formulate a basic specified respective hardness number to it. Therefore a typical specified soap quality is obtainable considerably.

CHAPTER VI.

THE GLYCERINE RECOVERY FROM SPENT LYES

(1) The Concentration of Glycerine in the Spent Lyes

The concentration of glycerine in the spent lyes and the efficiency of requperation in regard of its theoritical content in the treated glycerides depend on several technical factors.

The different purely neutral fatty glycerides contain variably 10-13% by weight of glycerine.

In the production of toilet soap type tallow and cocnut oil are mainly the fatty glycerides used, meanwhile in the production of laundry soap quality; generally a mixture of fatty glyerides and different acid oil are used.

The existing method of glycerine recovery does not actually relay to fixed limits of requperation.

The general amount of glycerine annually recovered did not exceed 50% of the theoritical content in the treated fatty glycerides.

The existing saponification system, which is a traditional open kettle ones, and the direct wet steam is the only means of heating in the open kettles.

The main problems for a moderate recovery of glycerine by the open kettle method refer to the unsufficiency of saponifying kettles, and spent lye receivers to ensure several treatments and washes.

N.B. A technical report, in regard of the technology of glycerine recovery was explained during the lectural courses and edited in Arabic at the request of the Company; where by, trial runs in the plants were successfuly carried out which results are explained later on .

The stability of obtaining higher recovery of glycerine and respectively concentrated spent lyes is depending principally on the development of the existing equipment, in addition to a scheduled programme for permenent specified fatty materials formulations.

Moreover, it needs also a reorganization and supplementary additions of the soap processing kettles, and the coifficient spent lyes receiving tanks and circulating pumps.

Those facts were proved by the single experimental trial run at each of the main soap factories, results of such are shown in Table 8.

TABLE 8

EL-MAMOON, EXPERIMENTAL, GLYCERINE RECOVERY

(INDUSTRIAL TRIAL RUN)

GLYCERINE Theoretical content in the treated fatty matter					GLYCERINE Recovered in the Spent Lyes			
Fatty Matter	Kgs.	Glycerol %	Kgs.	Mill in Fatty Mat. %	Glycerine Spent Lye Treatment	Lye/Kgs	%	Glycerol Kgs.
Fancy Tallow	12800	9.846	1260.288	5	Saopinification.	5000	12.15	607.500
Coconut Oil	3200	12.85	411.200	7.5	1st wash	4400	8.61	378.841
					2nd wash	5100	5.16	263.160
					Niger wash	5000	4.229	211.450
Total	16.000	10.447	1671.488	5.5	Total	19500	7.49	1460.951

conclusions:

1. The total theoritical content of glycerine in the treated fat is 1671.488 kgs.
2. The total recovered, spent lye is at 7.49% concentration 19500 kgs.
3. The total content of glycerine in the recovered spent lyes. 1460.951
4. The effective efficiency of glycerine recovery in respect of the theoritical content in the treated fats. 87.7%.

N.B. An industrial exporimental trial of same, was done at El-Rashid Soap Factory and the same results were obtainable.

Conclusions: The following technical datas for a perfect recovery of glycerine are notified:

1. Higher concentrated glycerine spent lyes should be obtainable, by the multiple chemical treatment possible and the multiple washes of the saponified mass.

2. Accurate results, of higher glycerine recovery over 98% and concentrated lyes up to 30% of glycerine, are obtainable by the developing of the fat chemical processing system to mechanical continuous ones.

3. The recovery of high recolts of glyerince, is considerably an economic factor for reducing respectively the cost price in the manufacture of soap.

(2) THE ALKALI CONTENT IN THE GLYCERINE SPENT LYES

In the open kettles treatments a higher percentage of alkali is considerably found in the glycerine spent lyes. Such an excess of alkalinity is almostly liable to a total loss; unless it is requperated by a fatty acid neutralization system. Whatever is the system of treatment of the alkalinity in excess, we recognize also a notable loss of a considerable amount of the original glycerine in the concentrated lyes.

In case of using a counter current saponification system, the higher percentage of alkalinity is naturally equalibrated into the system.

Meanwhile, by the use of the mechanical continuous saponification system, a negligable excess of alkalinity is found in the spent lye not exceeding 0.2 N_aOH.

CHAPTER VII.

THE COSMETIC PREPARATIONS

The Company manufactures about 500 tons yearly of three different types of the following cosmetic preparations:-

1. HAIR SHAMPOOS 2. SHAVING CREAMS 3. DENTAL CREAMS

In concern of the production of hair shampoos, two different specified types are manufactured:-

A. Dry Hair Shampoo B. Anti Dandroff. fatty hair shampoo

continuous investigations and technical trials are always running for the development of such preparations and better selectivity of the different chemicals and ingredients.

(1) For the production of dry hair shampoo, useful oil and chemicals were recommended in order to give better quality, suiting the nominated specified properties. The added materials has its direct softening and fattening on the dry hair.

The existing prepared qualities of hair shampoo are of the clear liquid types.

The developed types are of the semi-liquid lotion shampoo.

It has been already recommended that for the production of hair shampoos the choice depends on the desired physical form of the product, and the needed effect on the hair itself.

Perfumes used in shampoos should all be dermatologically tested and in addition preservatives needed to be added as anti fungi and yeasts grow in detergent solutions.

All formulations should be made up to include perfume, cautiously in order not to effect, the viscosity of the final product, however viscosity should be regulated.

All other additions, dyes, preservatives, colouring materials should be subjected to extensive storage tests as no hard and fast rule can be laid down for the interaction of the micro constituents. Further more it is best advisable to add a small portion of a chelating agent (¼ per cent or so) as traces of iron may have an adverse effect on additives specially dyes in storage.

It is generally suggested when formulating a specified hair shampoo the following specified agents should be regarded:

1. SOLIBILIZING AGENTS, (in the liquid types) such as Butyl Alchohol, Isopropylalcohol, Ethyl Alcohol, Terpinol, Pine oil, Diethyline Glycol, Diethyl Carbitol.

2. SEQUESTERING AGENTS:
Ethylene diaminet[illegible] acetic acid, which prevents formation of calcium magnesium and iron soaps, which causes turbidity to clear liquid shampoo.

3. FINISHING AGENTS:
Isopropyl miristate, Butyl Palmitate, mono and diethanolamide of the fatty acids, polyglycol stearate, Glyceryl Stearate, Synthetic Gums as Carboxy menthyl Cellulose, which should be continuously added in order not to leave films on the washed hair.
Luryl Sarcosine is an excellent finishing agent which gives a soft feel.

N.B. Finishing and conditioning agents are closely related to materials which brings moisture into the hair and reduce its brittleness.

Glycerol, propelene, Glycol, Sorbitol, help in retaining humidity and delay its evaporation and keep the hair much softer.

Carbowaxes, and their stearates, give better slip and body to hair.

Fatty acid amides impart surface slip and smoothness.

4. THICKENING AGENTS
Natural gums, tragacanth, and locust bean, gums.
Industrial gums, hydroxyethycellulose, methyloellulose, carboxy-methylcellulose, polivinyl alcohol.

5. FOAM BINDERS, AND STABILIZER
N.B. The nonionic detergents compounds are severely restricted because of its reversing effects in hair shampoos.
The most suitable as a foam stabiliser is the DIETHANOLAMINE of lauryl acid.

6. ACTIVITATORS:
Mixture of two detergents is better than one, traces of free alcohols activiate and improve the shampoo properties of the alkylsulphates

7. PRESERVATIES
Formaldehyde, methyl, propyl, butyl hydroxybenzoate, alkylanizoles hydroxy quinoline, dehydroxy quinoline, dehydroacetic acid salts, alkyl cresols.
Recently the following preservatives are widely used:
chloromalicyl anilides
the thiuram disulfides.

8. ANTIDANDROFF AGENTS
A therapeutic shampoo based on: Selenium sulphide, where selsun is sold only on medical preparations, it is said to relieve sever itching dandruff.

9. PEARLESCENT AGENTS
Stable pearlescent lotion shampoo should have a viscosity of at 3000 CP (centi poses) and not more.
Too much increase of viscosity leads considerably to decrease and losing lather effect.
Pearlescence can be achieved by heating shampoo from 50-80C° then stirring in stearic acid and zino sulphate in equimolecular proportions, and fully neutralizing the product with the required amount of alkali.

10. OPACIFIERS AGENTS
In case of production of opaque shampoo the following opacifiers are recommended:

1.	Magnesium stearate + Gum; addition of		0.5%
2.	Lanolin	" "	1-2%
3.	Glycol or Glyceryl laurate	" "	1-2%

Generally, it should be notified that all viscosity regulaters, (thickening agents) where hydrocalloids natural and synthetic gums, are incorporated; these additives should not give too much rise to viscosity to the main product in cold climate or to runny preparations in hot weather, moreover must not influence the characteristic flow of the shampoo.

After drying hair there are still residuals which after dry may give the impression of dandruff, by flaking with other igrediants.

One of the most interesting features to be notified when experimenting for the production of a dry hair shampoo or a fatty hair shampoo, that the shape of a microscopic dry hair cell is generally oval or long shaped. The contrary of the fatty hair cell, it is mostly uniformed in a circular round shape.

On adding slight drops of castor oil or lanolin to the dryhair cell, it takes immediatly the round circular shape.

In regards of the experimented trials made at the cosmetic section for the production of a specific dry hair lotion shampoo, castor oil addition gave the best results, and experimental trials are continued to formulate a specified anti-dandroff fatty hair shampoo, by the addition of the suitable raw material, amongst of them resorcine, selenium sulphide, methyl alcohol.

(2) For the Production of tooth pastes, two types are actually manufactured and they are not too much different in the formulation.

The existing formulations are quite suitable unless a slight development for the easy removal of a film of stioky deposits after use.

Different experimental trials have been suggested with the technical recommendations which were previously negociated with the technical responsible of the cosmetic section. Meanwhile trials considrably continued.

The principle technical data for the production of a first quality dental creams should be cincronized on definite care of teeth by the use of a composition of convential tooth paste, from stand point of a well-balanced mixture of cleansing (polishing) agents, and liquid components.

The most important physical characteristics of tooth pastes are homogenity and stability of the paste when it has been pressed from the tube especially on long-term storage stability.

Convential tooth pastes containing essentially the following components:

1. Thickness; which regulate the viscosity of the final produot, and prevent separation of materials and ensure smoothness to the finished cream; such materials are:-

   CMC (Carboxymethlcellulose) , Methycellulose, Sodium Alginate, Agar, Agar, the rate of addition is generally 1% by weight.

2. Water : demineralised, filtered water.

3. Humectants; prevent drying out of creams, the average use is up to 40%. Such materials are:-

   Glycerine; orbitol, propylene glycol, pine or admixture.

4. Preservaties; to prevent decomposition of binders and humectants resulting from bacterial actions, such materials are:-

   Hydroxybenzoic acid , Methylester .
   " " " , Ethylester.

   The average addition of each is up to 0.2% .

5. Polishing Agents, to protect the tooth enamel, it should not contain COARSE PARTICLES, WITH A HARDNESS RATING 2-3 on MOH's scale.

Such materials DCP - DEHYDRATE (Dicalcium phosphate, dehydrate) and chalk, of an average particles size measured by the andersen method is from 12-16 microns, chalk must not be used more than 5-10%, related to the total amount of DCP - DYHYDRATE.

- The addition of small quantities of trimagnesium phosphate, it is possible to prevent reactions between the two polishing agents.
- Very light precipitated chalk is also used as polishing agent.
- Other polishing materials can be cautiously used, such as : tricalcium phosphate, calcium phosphate, aluminium hydroxide, calcium locate, magnesium oxide, magnesium carbonate, precipitated silicas.

N.B. The Combination of insoluble sodium metaphosphate and tricalcium phosphate is the most effective polishing agent for the enamel surface, and has no abrasive action.

Generally, the addition of polishing abrasive materials should be minimized and kept as low as possible in the formulation.

6. Perfuming: is an important factor, the average addition is 0.5 - 1%; the addition of such compound affects generally the consistanoy of the paste. In contrast of methyl salicylate (winter green oil), use of peppermint results in a slight reduction in the viscosity of paste.

Generally, viscosity colour stability and homogenity should be monitored

The storage tests are usually conducted for a period of about one year at 43 c^{o} and for one month at a $5c^{o}$.

7. Foaming Agents; should have the following advantages:-

A. foam forming capacity which is hardly degraded by electrolytes.

B. neutral in taste.

The foam development in toothpaste, is recommended to be qualibrated with the needed cleansing power of deposited ingredients after use.

The foam is generally achieved in toothpaste with small amounts up to 2%.

N.B. Foaming agents have mostly a liquifying effect on the toothpaste mass. This effect is atributed to a reduction in the surface tension.

8. Active Agents

A. Remove Tartar

- Sequestering substances, such as sodium benzoate,
- High molicular weight phosphates
- Sodium metaphosphate,
- Sodium Sulphoricinoleate
-

B. Cleansing, Polishing and bacteriostatic effect
- Potassium chlorate
- Sodium perborate
- Magnisium peroxide
- Alcohol
- Chloroform
- Quanternary amonium basis

C. Controling Caries (Cavities)
- Flurine Compounds
- Borax
- Sodium laurylsarosinate
- Glycocoll.

D. Enzymes

- Pepsin
- Protease
- Pancreatin
- Lipase

(3) Shaving Soap Cream

For the existing production of shaving creams; the company manufdactures actually two types one of which containes a skin cooling substance.

The lather property is in general quite normal, unless it is less dense and moderately unstable.

The existing formulations include useful materials and the addition of 1%, neutral sodium silicate made the lather less dense and unstable.

The relations in between the different components is not equaliberated on a technical scale,

The total fatty matters content in the existing formulations is 41.5% devided in between stearic acid 32% and coconut oil 9.5% and no other active lathering materials are included.

Thus, the influence of sodium silicate additive in addition to the formulas content of glycerine which ranges to 15% affect the lathering properties.

Therefore, in order of making the necessary equaliberation between the different active materials different experimental trials were executed and the following explanatory facts are notified:-

1. The best quality of a shaving cream is one which over a wide range of temperature will not change in viscosity.

2. The prestablized grade of stearic acid is recommended, and not the ordinary grade.

3. Addition of 1-2% of lanolin, is considered an effective emolient, and its addition must be considerably subject to the percentage of glycerine added, besides that any excess will naturally effect the added perfume.

4. TRIETHANOLAMINE LAURYL SULPHATE, is recommended as a lather booster, and stabilizer such addition must be governed and equaliberated by the addition of glycerine, lanoline and the active fatty matters.

5. The addition of glycerine is recommended up to 15% and should be technically linked to the active lathering and fatening components.

6. The preventation of incorporation or entrapment of air should not be entrapped in the finished cream, if it happens it must be expelled.

7. The finished cream must be entirely freed from alkalinity, and should contain 1-4% acidity as stearic acid.

After receiving generally the different technical datas for the manufacture of higher grades of shaving cream, the following formulations were suggested:

Table 9

Shaving Cream Soap Developed Formulation

Raw Material	Existing Formulation	Suggested Developed Formulation A	Suggested Developed Formulation B
Stearic acid - Tripple Pressed	31.960	31.960	29.600
Coconut Oil	9.640	9.640	10.000
Potassium Hydroxide	14.600 50% Koh	14.600 50% KOH	18.820 39.4% KOH
Sodium Hydroxide	1.450 50% $NaOH_2$	01.460 97.5% NaOH	1.600 50% N_aOH
Glycerole	14.900	14.900	13.900
Lanolin	-	00.782	0.920
Cetyl alcohol	0.500	00.313	0.360
Boric acid	0.300	00.860	1.000
Neutral Sodium Silicate	1.000	-	-
Preservative	0.050	00.050	0.050
TRIETHANOLAMINELURYL SULPHATE (EMPICOL or such)	-	01.565	.620 1.840
Perfume	1.000	1.000	1.000
Water	24.600	22.880	22.030
Total.....	100.000	100.000	100.000

N.B. **Formulations water balance:**

	Added	Included	Total
1. Existing Formulation	24.600	7.334	31.934
2. Suggested Formulation A.	22.880	8.100	30.980
3. " " B.	22.030	12.100	34.130

CHAPTER VIII.

TECHNICAL PERSONNEL TRAINING

The technical staff, in all the concerned manufacturing sections are respectively in need of supplementary technical knowledge in the different technical lines of production. They are rather below the number of personnel needed for the continuous technical controlling of the different technologies and routine problems.

Moreover, an additional administratives and accounting works, besides the supplementary daily meetings for other sectors, tend to decrease their efficiency, and the delay of solving the technical involved problems.

The technical staff depend generally on the ongoing existing procedures which were imitated and collected from the previous routine work, without serious interference or changes in the deep technology of the different industrializations.

Despite the continuous assorted technical assistance of the general management in all directions; still the technicians cannot easily carry out the necessary complete research works needed for the continuous development of products.

Technical references and recent reviews, in the technology of soap and cosmetics industries are not sufficient, although the company is actually with the suggestions of supporting the library with such prints.

Suggestions, concerning the recommended centre of training, were cincronized on the A.C.T.I.M in Paris (THE INTERNATIONAL FRENCH TECHNICAL COOPERATION ASSOCIATION), where academic courses are offered, besides the different technical training assistance in the fields of industries.

It has already been cleared, to both the IRAQI Company and the French part, that the financial participation for occuring such training, will be on the Company's unless if there will be any other financial participation offered by the french part; This will be cleared after receiving the explanatory answer to our correspondence, already sent to the commercial French Counsellor in Baghdad, with whom we are negociating such matter.

Therefore recommendations in concern of the technical personnel training were suggested as follow:-

1. Technical training is essential for both the senior and recent academic technical staff.

2. A start of training courses abroad, has to be arranged for a period of at least, three months, in the fields of soap and cosmetic industries.

3. Number of technical personnel suggested for abroad training are at least six of the specialized technical staff of 5 years experience. Another group could be respectively repeated for another year.

4. Internal local training for the recent technicians and staff of formans could be arranged and managed by the trainees of the first group.

5. Training should include academic courses, and technical industrial assistance in the different fields of industries.

6. The manufacturing sections should be supplied sufficiently with the suitable apparatus for the quality control purposes, and possibly pilot plants for the different industries.

N.B.:

1. Exchange of negociations, with the French Commercial Counsellor in concern of training matter, subject to our letter dated 27.3.1978, addressed to the French Counsellor in Baghdad, with a copy to the Vegetable Oil Co., The Resident Representative of UNDP in Baghdad and the Industrial Operation Division, UNIDO, Vienna

2. As a part of participation in the personnel training, a personal special technical scheduled programme in the different soap and cosmetic technologies was remitted, negociated in several lectural courses, and edited in the Arabic language, at the request of the company; copies of each have already been delivered to UNIDO in Baghdad, under disposals.

3. Training of only staff of formans; it has been recommended that such staff could begin an exchange of technology through the Egyptian Salt and Soda Company, one of the oldest advanced oriental comapnies, where they find their technical needs in all directions.

The following technical entitled subjects were submitted in the different lectural courses during the last mission's period:

I. The Modern Methods for Standardization of the following Soap Specifications with Relations to the Fat Charges:

1. The physical texture specifications:

   a. colour b. odour c. softness.

2. The Physical Technical Properties

   a. hardness b. foam property and stability c. detergency and cleansing power.

3. The Chemical Specifications

   a. completion of saponification.

   b. Fatty acid content in neat soap in relation with electrolytes.

   c. Fatty acid content in the neat soap in relation with the chemical specifications of the treated fatty materials.

4. The palmetic and stearic balance in the final product with respect to the detergency power.

5. Soap, raw materials for both laundry and toilet types:

   a. fatty matters b. alkalins c. additives.

6. Applied methods for treating and purifying fatty raw materials.

7. Applied methods for treating and purifying alkaline and brine solutions.

II. The Technical Method to Formulate a Soap Fat Charge with Respect to the Chemical Specifications of the Fatty Materials

1. The relation between the saponification value and the iodine number of the fat charge with its saturation degree.

2. The direct effect of the relation between the saponification value and iodine number of the fat charge and its titre and the use of such relations in illustrating the respective hardness number of the final product.

3. The applied method for measuring the hardness of the manufactured soap and the use of such methods for controlling and adjusting the soap fat charge.

III. The Applied Chemical Industrial Soap Methods

1. The normal open soap kettles method.
2. The developed open soap kettles, combined treatment method.
3. The continuous centrifugal force method.
4. The continuous, with special self fitting treatment- MAZZONI METHOD.
5. The continuous combined fitting - ALFALAVAL.METHOD.

IV. Tne Modern Methods for Finishing, Cooling and Drying Soap

1. The continuous method for finishing the laundry soap, in respect of adjusting, the fatty acid content.
2. The continuous method for finishing the toilet soap.
3. Additives needed to final soap product:-
   (a) additives for laundry products.
   (b) " " toilet "
4. Wrapping and casing the different soap types.

V. The different Technical aspects in the manufacture of Soap

1. Technical aspects in the open kettle saponification method
2. The technology of pan soap washing and separation of spent lye.
3. Technical reviews on the strengthening operation.
4. " " " " fitting operation
5. The technical method of obtaining a concentrated glycerine soap lye.

VI. Study on the Techno-Economy of the Soap Industry, including

1. Recovery of glycerine and alkali from spent lyes.

2. Treatment of fatty materials, with the minimum losses while treated; bleached and saponified.

3. Total fatty acid content in the finished product

4. Useful economic additives to toilet soaps, for the fixation and elevation of the boiling range of perfumes.

5. Drying and eristalization changes in the finished soap, from the technical and economical sides.

6. Economy of materials in the soap finishing process.

7. Selecting and purifying salt solution, in relation to machineries safety and the manufacture of pure unspotted soap quality.

VII. Technical Useful abstracts including the following tables:

Table 1. Glycerides of soap fatty materials included with the respectively theoretical contents of glycerol.

Table 2. Saturated and unsaturated fats.

Table 3. Glycerine content in commercial fatty materials.

Table 4. Practical guide for the consumption of alkali in the saponification of different fatty materials.

Table 5. The respective hardness number of the different fatty matters.

Annex I

A. List of References and Technical [illegible] Manufactures:

(1) The American Soap Makers Guide, New York.

(2) Soap Making, by R.L. Datta
Publisher of Soap, Perfumery and Cosmetics, London

(3) OLEAGENEUX: by the Higher Institute of Fatty Materials, Paris

(4) The SPC (Soap perfumery and cosmetics), Year Book, London

(5) Soap Manufacture, by George Hurst, London

(6) Cosmetics, Science and Technology, by Editor, Edward Sagarin, Interscience, Publishers INC New York.

(7) Formulaire De Perfumerie, et de Cosmetologie, by R.M. Gattefosse, Firardot and Co., Paris

(8) Formulatire De Perfumerie, by Rene Cerbeland et P. Velon, Paris

B. (PERSONAL) Arabic Edited Lectures, submitted at the request of the General Company of Vegetable Oils, Baghdad, in the Technology of the Soap Industry.

C. (PERSONAL) Arabic Technical Reports, concerning the different experimental trial runs for the developments of glycerine recovery at the main factories.

D. (PERSONAL) Arabic reports, concerning the studies on the transportation and storaging capacity of the fatty raw material in relation with the productivity of soap in the company.

E. Copies of the correspondence with the French Counsellor in respect of training, six of the academic staff in France.

N.B. All the upmentioned edited Arabic reports, and correspondence are submitted at UNIDO, Baghdad under disposal.

Annex II

THE GENERAL [illegible] [illegible] INDUSTRIAL [illegible]

I. DEVELOPMENT OF THE CHEMICAL SOAP PROCESSING SYSTEM

(1) Higher Recovery of Glycerine (as by product)

The following table - A shows the effectivlly recovered glyeerine from the treated fatty materials for the production of toilet and laundry soaps by the existing open kettle system on the years 1975, 1976, 1977 respectively.

TABLE A

YEAR	EFFECTIVE PRODUCTION OF SOAPS		EFFECTIVE RECOVERED GLYCERINE TONS
	Toilet Soap TONS	Laundry Soap TONS	
1975	9603	9637	67.186
1976	7909	14373	136.712
1977	7653	14966	168.87

The following Table B shows the different fatty materials treated for the production of the different types of soaps, during the same period 1975, 1976, and 1977.

TABLE B

YEAR	TOILET SOAP PRODUCTION									LAUNDRY SOAP PRODUCTION					
	Finished Soap Tons	TREATED FATTY MATTERS								Finished Soap Tons	TREATED FATTY MATTERS				
		Total Fatty matters Tons	Non Glycerides Fatty matters Tons	GLYCERIDES							Total Fatty matters Tons	Non Glyc. fatty matter Tons	GLYCERIDES		
				FANCY TALLOW			COCONUTOIL						FANCY TALLOW OR PALMOIL		
				Tons	Glyc. %	Glyc. Tons	Tons	Glyc. %	Glyc. Tons				Tons	Glyc. %	Glyc. Tons
1975	9603	7813	2498	4252	9.846	418.652	1063	12.85	136.595	9637	6186	4554	1632	9.319	125.086
1976	7909	6563	-	5250	9.846	516.915	1312	12.85	168.720	14373	9225	6791	2434	9.319	226.824
1977	7653	6350	-	5080	9.846	500.177	1270	12.85	163.195	14966	9607	7072	2535	9.319	236.236

Conclusions: The total theoretically recoverable glycerine of the fatty materials for the production of soaps on the years 1975/1976/1977 are respectively as follows:-

Year	From Toilit Soap	From Laundry Soap	Total
1975	555.247 tons	125.086 tons	680.333 tons
1976	688.635 "	226.824 "	915.459 "
1977	663.372 "	236.236 "	899.608 "

N.B. Glyc: Glycerine

The following notes have to be considered:-

1. Production of soap on 1975 is the total production of the three factories; El-Rashid, El-Mamoon and El-Amin.

2. Production of soap on 1976 and 1977 is the total production of the two main factories only, El-Rashid and El-Mamoon.

3. The productivity of soap at El-Amin Factory depends mostly on the use of the nonglycerides fatty materials; therefore no recovery of glycerine is considerably regarded.

4. The glycerine content in the fancy tallow treated for the production of toilet soap grade is considered 9.846% based on 5% Miu content (Moisture, impurity and unsaponifiables).

5. The glycerine content in the fancy tallow or palm oil treated for the production of laundry soap types is considered 9.319%, based on 10% miu. content.

6. The glycerine content in the coconutoil is considered 12.85%, based on 7.5% miu, content.

7. The laundry fatty materials were considerably treated as a mixture of 25% glycerides and 75% acid oils (of nonglycerides).

The following Table C, shows comparatively the efficiency of glycerine recovery by both treatments of the existing open kettle, and the continuous chemical systems.

TABLE C.

Year of Production	Open Kettles Existing system Glycerine Effectively recovered Tons	Continuous recommended system glycerine recoverable Tons	Efficiency of recovery (existing system) %	Recovery Losses	
				Tons	To Theoritical %
1975	67.186	680.333	9.87	613.147	90.13
1976	136.712	915.459	14.93	778.747	85.07
1977	168.087	899.608	18.68	731.521	81.32

Conclusions: Asuming the recuperated losses of glycerine is sold for 300 ID (IRAQI DINARS) per ton and normally weighting the return of each soap type by its fat contents, naturally a considerable decrease in the cost price of soap is regarded.

(2) Higher Concentration of Glycerine in Spent Lyes

The concentration of glycerine spent lyes recovered by the existing chemical successive treatments ranges between 5-7%; and even sometimes ranges to 3%, meanwhile, the concentration of glycerine spent lyes which are recovered by the mechanical continuous system ranges between 22-30%.

The wide difference in average between the two systems which is 20%, means higher requirements of chemical treatments, besides the higher consumption of steam and power for the evaporation of huge quantitites of water, while treated and distilled.

The following table -D shows comparatively the evaporated water of the treated effectively recovered glycerine spent lyes in 1975/1978, and 1977 respectively.

TABLE D

Glycerine Recuperated		Glycerine Spent Lyes			
		Existing kettle system		Recommended Continuous System	
Year of Production	Tons	Conc. of glycerine 6%	Water to be evaporated tons	Concen. of glyce. 26%	water to be evaporated tons
1975	67.186	1119.8 tons	1052.6	256.2 tons	189.00
1976	136.712	2278.5 "	2141.8	252.8 "	389.10
1977	168.087	2801.5 "	2633.4	646.5 "	478.40

Conclusions: The huge difference of the water to be evaporated, means a higher consumption of steam and power; considering that the ENTHALPY of steam, at 7 atmospheric pressure (7 kgs/cm^2), is 100 K cal/kig).

(3) Reduced Losses of Sodium Hydroxide

Usually alkaline solutions are prepared and fed openly into the kettles' system in a volumetric method; whereby the continuous system, the alkaline solutions of 50 BE', are fed accurately by a special set of proportionmeters, and treatments are running in a closed circuit.

The following table E, shows comparatively the losses of alkaly in both, the kettles' and continuous systems, for one ton of fatty materials, treated for a toilet soap production.

Table E.

Losses of Sodium Hydroxide in the Chemical Treatments of Fatty Materials
(80 % Tallow 20 % coconutoil) by the Open Kettles and the continuous system

System	Fatty materials Kgs	Neat Soap pat 63% temp Kgs	Glycerine Recoverable Kgs	Needed Alkali Theoritically Kgs	Alkali (Naoh) Excess, for saponification based on Theoritical %	Alkali (Naoh) Excess, for saponification average Kgs	Alkali (Naoh) in Neat Soap average %	Alkali (Naoh) in Neat Soap Kgs	Alkali (Naoh) in Spent Lyes Ratio (on fat	Alkali (Naoh) in Spent Lyes Average %	Alkali (Naoh) in Spent Lyes Kgs
Open Kettles	1000	1500	105	150	10-15	18.75	0.15-0.25	3 .	1.5	0.4-1	10.5
Mechanical continuous	1000	1500	105	150	1-2	2.25	0.08-0.12	1.5	0.4	02/04	1.2

N.B. Alkalinity of neat soap, by the kettles system is at its minimum before the fitting operation.

Normally, losses on treatments of laundry fats are maintained by the continuous system; meanwhile are larger in the kettles' system. negligable,

(4) Lower Costings in Labour

The following table F, shows the working hours and labour costs for the production of 72 tons of soap daily.

Table F.

Daily soap Production	No. of Kettles	Open Kettles System			Daily Soap Production	Mechanical continuous System		
		Working hours	Labour 3-Shifts Soap Makers	Assistants		Labour Work-Shifts - 3 Working Hrs.	Operators	Assistants
72 tons	3	120	3	18	72 tons	24	3	3

(5) Reduced Steam Consumption

The following table G shows the needed steam for the chemical production of 72 tons of neat soap by both the kettle and continuous systems.

Table G

Daily Production	Open Kettle System		Mechanical Continuous System	
	K-cal	Steam Kgs,	K.cal	Steam Kgs.
72 tons	28707480	51263	6048000	10800

N.B. (1) Steam pressure at 7 Kg/cm^2.
(2) 1kg of steam, is of 660 k.cal (enthalpy), condensate at 100 C^0.
(3) 1kg of steam has a heat of 560 k.cal (kilo calory).
(4) specific heat of soap is 0.65.
(5) specific heat of glycerine lye is 0.55

Ref. Thermal Engineering data book.

- Soap manufacture, by BAILEY

II. DEVELOPMENT IN THE MANUFACTURE OF TOILET SOAP

(1) Pretreatments of fatty materials

As already mentioned in the original report, the imported fancy tallow for the production of toilet soap is mostly supplementary treated; refined, deodorized and bleached to be freed completely from the unpleasant fatty odours and kept at the standard degree of colours.

Such treatments are costy, in addition to a considerable losses of the fatty matters.

The suggested supplementary treatments, by the use of sodium chloride concentrated solutions, gave practically, industrially promising results, meanwhile actually different toilet soap batches are manufactured without any odour defects, and the method is now adopted in the two main factories.

In the following table, we show the comparative balance between the existing and the suggested methods of treatments:-

Table H

Old Existed Method	Suggested Actual Method
1) Chemical Refining gives: A. Refined Fat B. Soap stock (refining loss = 150% of F.F.A.) with the use of sodium hydrocide, depending on the acidity of fat. (generally with a loss not less than 5%).	1) Treatment: boiling with a concentrated salt solution, with a very negligable loss not exceeding 0.1%.
2) Bleching, autoclave treatment with the normal loss of fat	2) Bleaching, autoclave treatment with the normal loss of fat.
3) Deodorization, autoclave treatment at 140° or more. with a considerable loss of the volatile fatty acids, (generally not less than 5%)	- - - - - -

N.B. In some cases the deodorized fat, gives a darker red colour than its original bleached ones, because of any contaminated organic, albumine deposits which are easily charring by the higher tempratures, thus rebleaching is effectively needed.

(2) SUPER FIXATION OF THE PERFUMING PROPERTIES, IN THE TOILET SOPA PRODUCTION

The following Table I shows comparatively, the reducing costs in the perfuming of 1000 kgs of toilet soap, industrial trial at El-Mamoon Soap Factory

Table I

Treated Dry Noddles	Existing Production			Suggested supplementary treatment			
	Normal Additives		Perfumes Kgs	Supplementary additives			Perfumes kgs
	Sodium silicate kgs	Magnesium sulphate kgs		Stearic Acid kgs	Petrolium jelly kgs	Boric acid kgs	
1000	4.500	1.650	12.500	3.120	4.680	1.200	10.00

III. DEVELOPMENTS IN THE FORMULATION OF SYNTHETIC DETERGENT POWDER

N.B. Please refer to the economical study; (supplementary, CONFIDENTIAL REPORT) attached with the draft terminal report, 1st part, submitted on May 197[illegible].

IV. RESEARCH WORKS ON THE HARMAL OIL

An oil sample of harmal oil has been experimented as a promising new vegetable extracted oil from a wild Iraqi plant under the name (BEGANUM HARMALA).

The oil was tested from the soap making point of view, and a sample was analysed by both the faculty of pharmacy and the company's control laboratories, and gave the following specifications:

(1) Plant oil content, (Extracted) 11-18%

(2) Oil Analysis By the Faculty of Pharmacy

Saponification value	182
Iodine number	112
Unsaponifiables	
Free fatty acids	2.5%
Titre	31C°
unsaponifiables	7.5%
Glycerides of: linoleic acid	56%
Palmetic acid	6%
Stearic acid	[illegible]%
Oleic acid	[illegible]%
Linolenic acid	[illegible]

Colour: Dark green, yellowish.

(3) Soap Analysis (alkaline, alcoholic, saponification)
by Elmamoon Laboratory

Total fatty matters	68.7%
Unsaponifiables	Nil.
Alcohol insolubles	0.96%
Water insolubles	Nil
Free $N_a$oh	0.16%

N.B. The neat soap was repeatedly washed by a concentrated brine solution.

(4) The respective hardness number

- The I.N.S. Value (saponification value + Iodine number = 70.0
- The H.N. (hardness number) ((Titre x 3.7) + 70) = 186.7

Conclusions:

1. The oil is of the unsaturated oils group
2. Its respective degree of hardness (H.N.) make it suitable alone for the production of hard laundry soap.
3. Sufficiently suitable by blending only in a laundry fatty charge up to 30%, depending on the specifications of the other blended fatty materials, which formulation should give a respective hardness number over 263 degrees.
4. Easily used for the production of industrial soft soaps.
5. Should be tested to Toxicity before any industrialization
6. Productivity from the economical side, should be estimated after having the exact cost price of the extracted oil

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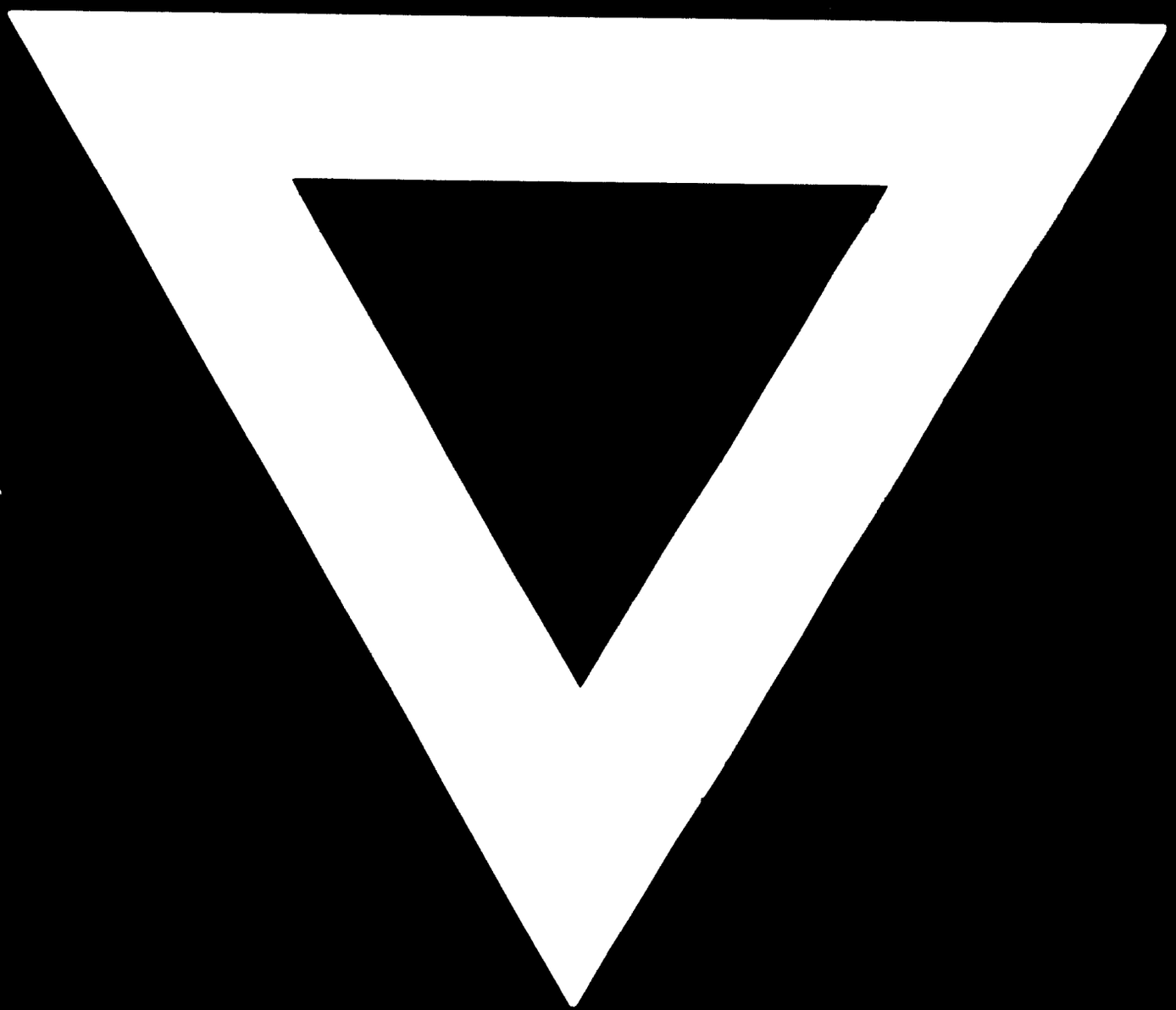

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