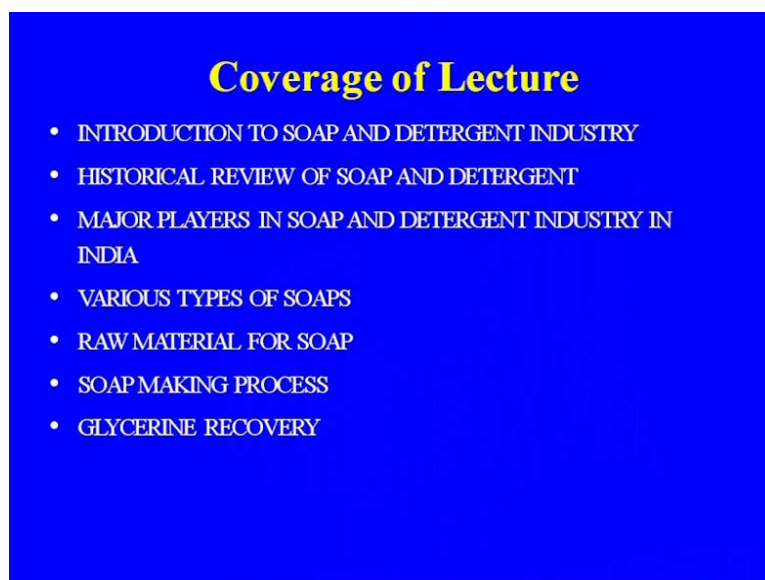


Chemical Technology
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Module - 4
Soap and Detergents
Lecture - 1
Introduction to Soap and Detergents, Soap
Making and Recovery of Glycerine

We are discussing organic chemical technology course, and we have discussed module 1, module 2, and module 3. Today we will be discussing module 4 of the organic chemical technology course, and this deal with the soap and detergent. In the lecture 1, we will be discussing about introduction to soap and detergent soap making, and recovery of the glycerine, because that is integral part of the soap making during the making of the soap we are also getting glycerine and that glycerine has to be recovered. And so the first lecture that will deal with the introduction to soap and detergent what are the historical background.

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Coverage of Lecture

- INTRODUCTION TO SOAP AND DETERGENT INDUSTRY
- HISTORICAL REVIEW OF SOAP AND DETERGENT
- MAJOR PLAYERS IN SOAP AND DETERGENT INDUSTRY IN INDIA
- VARIOUS TYPES OF SOAPS
- RAW MATERIAL FOR SOAP
- SOAP MAKING PROCESS
- GLYCERINE RECOVERY

So, these are the this is the coverage of the lecture, introduction to soap and detergent industry historical review of soap and detergent major players in soap and detergent industry in India various types of the soap, raw material for soap, soap making processes glycerine recovery, and detergent we will be discussing in the lecture 2.

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This is you can see the importance of the soap, and we are using in some another form the soap in for cleaning, washing, shaving and various form because our and you can say the life start with the soap because in the morning, we start with the soap. And time we are getting soap in some other form and soap, you see the washing soap, bathing soap, but all the soaps they are calling the toilet soap or the washing soap.

And in case of the washing soap also already it was the soap that was being used for washing, but now it has been replaced with the detergent, bar detergent. And so, because of the better washing cleaning properties of the detergent, and the cost is also, because we are using the petro chemical route for making raw material, but the wide variety of the soap is available, which we are using in our daily time.

This is the detergent, which we are using various form of the detergent they varies major players are there, who are producing the detergent and that we will be discuss in lecture 2 about the detergent again the detergent. Now, we are we used to have the only you are in this solid bar, but now powder is available, liquid soaps are available and various purpose, we are using and these are if you see that the detergent and the and even the liquid soaps for cleaning purposes, we are using. So, this is the how the importance and this is the shop we can say the where the most of the malls or the big shops, we will find the wide variety of the soap that is there.

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And this is about the soap various Nirma soap and the detergent, Nirma and the again the surf that may be there. Let us come to the soap, soap is one of the oldest chemical produced over 2000 years ago by saponification of the animal fat with the ashes from the plant. So, the history of the soap making is very old, from the prehistoric day we have been making the soap and that was being used. Although, soap are mainly used as surfactant for washing, bathing, cleaning, but they are also being used in the textile spinning and as important lubricating greases of the various soap bases because in case of the lubricating case, one part is soap and other is the carrier is the lubricating oil.

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Introduction

- Now soap and detergent have become integral part of our society.
- There has been continuous development in soap making technology starting with batch kettle making process in cottage industry and to present continuous modern soap making process using either fat saponification or by fatty acid neutralization utilizing a wide variety of natural and synthetic feed stock.

So, different grade of soap we are making in case of the lubricating, this is depending up on the requirement depending up on temperature that maybe multipurpose or the sodium base, lithium base and then the graphite base all the various type of the your lubricating greases, we are making where the base is the soap and lubricating part is from the lubricating oil.

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Introduction

- All soaps and detergents contain a surfactant as their active ingredient. However, detergent has better cleaning properties than soap because good detergency and has become increasingly popular.
- Environmental issues during initial stages because of non biodegradable nature of the detergent caused major concern.

Now, soap and detergent have become integral part of our society as I show you that the different create of the soap and detergent, we are using in our daily life starting from

shaving even if you see the shaving screen, shaving soap earlier we used to have the shaving soap. Now, it has been replaced with this cream. Now, it is gel now, it is the form, so different and we are brushless shaving creams are also available.

So, there has been continuous development in soap making technology, starting with the batch kettle making process in the cottage industry, and to present continuous modern soap making process using either fat saponification or by fatty acid neutralization, utilizing a wide variety of natural and synthetic feed stock in case of the paper, in case of the soap making. All soap and detergents contain a surfactant as their active ingredient however, detergent has better cleaning property than soap and because good detergency and has become increasing popular for the cleaning purposes.

So, mostly the all the soaps which we are being used during the fifties, earlier stages now that has been replaced with the detergent bar detergent soap and the surfactants, which we call the surf and all those thing. So, environmental issues during initial stage because of the non biodegradable nature of the detergent caused major concern because the initial stage, it fairly to make that was non biodegradable, but after coming of the linear alkyl benzene that is in biodegradable nature, there has been lot of the changes in the surfactant industry.

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Indian soap Industry

- India is one of the largest producer of soap in the world However per capita consumption of toilet bathing soap in India is 0.8 kg against 6.5kg in USA, 4.0kg in China , 1.1 kg in Brazil and 2.5 kg in Indonesia.
- Soaps are the largest portion of the fast moving consumer Goods (FMG) markets with bathing soap and toilet soaps contributing about 30% of the soap market.

India is one of the largest producer of the soap in the world, as you know they are population is has we are having a 1.3 around 1.3 billion operation to meet the

requirement of the pool definitely, the requirements of the soap and detergent that will be more. So, however per capita consumption because in all the cases if you find the per capita consumption that is less even the other commodities also, less in comparison to develop and some other developing countries.

India is 0.8 kg against 6.5 kg in USA, 4.0 kg in China, 1.1 kg in Brazil and 2.50 kg in Indonesia; this is the about the per capita consumption of the toilet or the bathing soap is there. Soaps are the largest portion of the first moving consumer good. So, that is what we call it the first moving consumer goods markets with the bathing soap, and the toilet soap contributing about 30 percent of the soap market.

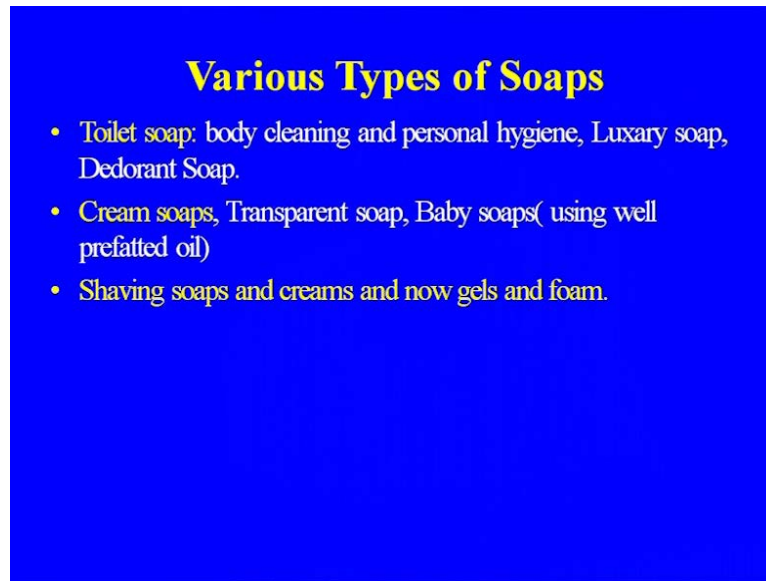
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Indian Soap Industry

- In India soaps are available in five million retail stores out of which 3.75 million are in the rural area. The major player in the personal wash soap market are HLL(now Hindustan Unilever), Nirma and P & G., Tata chemicals. Johnson & Johnson (baby soap), Godrej Soap and now multination company like DOVE.
- In soap industry, the popular sector has witnessed growth with toilet soaps.

In India soaps are available in the five million retail stores out of which 3.75 millions are in the rural area, they measure player in the personal wash soap market Hindustan lever. Now, Hindustan Unilever, Nirma, proctle and Gamble Tata chemicals, Johnson and Johnson they are making various crate of the soaps, another thing for the for babies Godrej soap there was the pioneer in making of the soap in India. And now, the multinational company like dove and other company, they have also entered the market in soap industry, the popular sector has witnessed growth with the toilet soap.

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Various Types of Soaps

- Toilet soap: body cleaning and personal hygiene, Luxury soap, Dedorant Soap.
- Cream soaps, Transparent soap, Baby soaps(using well prefatted oil)
- Shaving soaps and creams and now gels and foam.

Various type of the soap as I told you, the wide variety of the soap that we are making toilet soap, body cleaning and the personal hygiene, luxury soap, deodorant soap, cream soaps, transparent soap, baby soap using well pre-fatted oil, because more softness that is required. Pears soap that we are making pears means, the sometimes transference soap or is also there and that is the again alcohol nil pears or with alcohol that is there shaving soap creams now, jells, foam and as I told you we are having the brushless cream also shaving creams available in the market. So, there has been wide variety of the soap that is available in the market.

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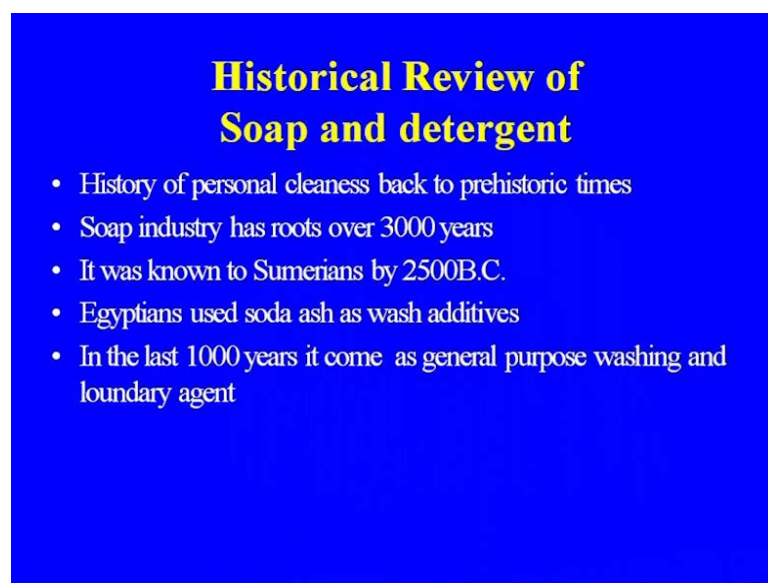


Various Types of Soaps

- Abrasive soap, Hard soap
- Soap flakes and Soap needles
- Soap base for grease: Soda, Lime, lithium, graphite etc.
- Syndet: Synthetic detergent powder, detergent bars

These are the another type of the some of the industrial application is also there, abrasive soap, hard Soap, soap flakes. Earlier we used this soap flakes also for washing purpose, but that soap left. Now, it has been replaced with the detergent powder, soap needles were there soap base for grease. As I told you the soda lime, lithium graphite various basis of the grease there their first step is making of the soap, and then the adding the lubricating or syndet synthetic detergent powder, detergent bars, which has replaced the old soap, which was being used for the cleaning purposes and let us go the history, historical review of the soap and detergent.

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Historical Review of Soap and detergent

- History of personal cleanness back to prehistoric times
- Soap industry has roots over 3000 years
- It was known to Sumerians by 2500B.C.
- Egyptians used soda ash as wash additives
- In the last 1000 years it come as general purpose washing and loundary agent

History of the personal cleanness back to the prehistoric times, as you see the (()) people have been using although it is not exactly in the form of the soap, but some in some other form they are using for cleaning purposes. So, for the hygiene is concern, personal hygienic concern, they are more concern about the soap industry has roots over 3000 years, it was known to the Sumerians by 20500 B C Egyptian used soda ash as wash additive because soda ash. That is one of the very eminent case of the, as if we are using in the soap industry or the detergent and the this soda ash. In the last 1000 years, it came as general purpose washing and the laundry agent.

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Historical Review of Soap and detergent

- By the late nineteenth century the basic chemistry of soap understood.
- Early twentieth century major development took place
- World war I led to development of synthetic soap and detergent

By the late 19 century, the basic chemistry of the soap was understood and the better because you see the saponification that was the important reaction, that is taking place during the soap making. And so there was the basic chemistry what are the factors, which are effecting the saponification all those things, that was known at the later stage only, thing that the making of the soap that was earlier also, but the basic chemistry that was not known.

Early twentieth century major development took place, in case of the soap making or the even the detergent world war 1, led to the development of synthetic soap and detergent because this was the era, when the lot of the industrialization was there. There was need of the time whether, even the development of the petro chemical industry development of the many of the products, which was required at that time.

So, development the thing happen in case of the soap and detergent also because during that period world war 1, world war 2 the development of the petroleum and petro chemical industry was there and some of the products, like propylene that we are using in the in case of the detergent earlier detergent that was available from the refinery. And so, this was the how the development that took place in case of the synthetic soap and detergent industry.

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Historical development of Soap and Detergent in India

- Livers brothers introduced modern soaps by importing during British rule
- 1897: First soap manufacturing plant in Meerut Uttar Pradesh
- 1918: first indigenous soap by Mr Jamsedji Tata
- The Tata Oil Mills Company its first branded soaps appeared in 1930's

Livers brothers introduced modern soap by importing during the British rule, that was the how the soap market was developed in India that was the came to the Hindustan lever, 1897 first soap manufacturing plant that was started in Meerut, Uttar Pradesh. 1918 first indigenous soap by Jamsedji Tata that was Tata chemicals in Bombay that plant still that is running, the Tata oil mills company its first branded soap appeared in 1930 and they are making wide variety of the soap, and other cosmetic material also by Tata oils and mills.

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Major Players in Soap and Detergent Industry in India

- Tata Oils Company: Godrej soap, Hindustan Uni Lever earlier Hindustan Lever, Nirma, Bengal Chemicals, Proctle & Gamble, Swastik(now taken over by Tata chemicals)
- Lifeboy, Lux, Cinthols, Pears, Rexona, Nirma Premium soaps, Hand made soaps, Breeze, Liril, Ayush and Patanjali ayurvedic soap
- Detergent: Surf, Nirma, Tide, Vimal, Swastic, Hipolin

These are the some of the major players in the soap and detergent industry Tata oils, Godrej soap, Hindustan Unilever. Earlier, it was Hindustan lever, Nirma. Nirma that has come in a big way in the soap, and detergent industry and they started with the small scale industry. Now, they have gone to the wide and they even they are big competitor to Hindustan lever also because their cost of production slightly lower and So, they are able to compete to the multi nationals also Bengal chemicals that also one of the very old industry in Bengal. So, they were also making some of the soaps and the cosmetics Proctle and Gamble they are also the some major player earlier.

Swastic was there who started the detergent also, and that was of the non biodegradable. Now, it has been taken over by the Tata chemical these are the various actually, the commercial kit soaps are available in the market Lifebuoy, Lux, Cinthol, Pears, Rexona, Nirma premium soap handmade soaps Breeze, Liril, Ayush and even the Patanjali. They have also entered in the making of the Ayurvedic soap. Detergent, Surf, Nirma, Tide, Vimal, Swastic, Hipolin that was the older detergent that was the in the early stages, when the Nirma, Hipolin or the Vimal's detergent came to the market, but still the major market is by the surf Hindustan lever soap and detergent again, let us discuss in some of the key components of the soaps.

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Soap and Detergent

- Soaps are also key components of most lubricating grease which are usually emulsion of , calcium, sodium, lithium soaps and mineral oil.
- Synthetic detergent is an effective substitute of washing soap have become now very popular replacing the soap.

Soap are also key components of the most lubricating greases, already we have discussed which are usually emulsion of calcium, sodium, lithium, soaps and mineral oil. Synthetic

detergent is an effective substitute of the washing soap have become now, very popular replacing the soap, because of the more higher detergency, higher cleaning properties and the at the same time availability of the raw material with the development of the petroleum, and petro chemical industry.

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Historical Review of Soap and Detergent

- Linear alkyl benzene sulphonates during 1960's to have biodegradable detergent
- Real Break through in detergent industry was due to availability of LAB from petrochemical complexes
- Availability of paraffins from kerosene fractionation and for olefin and benzene from refinery and petrochemical complex led to large scale development of synthetic detergent industry

Again we will be discussing about the linear alkyl benzene in detail, while discussing the detergent, but linear alkyl benzene sulphonate. During the 1960 that was of the biodegradable in nature earlier, propylene tetramer that was being used for alkylating higher propylene, but that was the actually non biodegradable. Real breakthrough in the detergent industry was due to the availability of LAB from petrochemical complex, and reliance that was the first they started their Pathal Ganga plant and manufacturing, and the Polyester.

Availability of the paraffins from the kerosene fractionation and for olefin and benzene from recovery and petrochemical complexes refinery, sorry refinery, and the petrochemical complexes, led to the large scale development of the synthetic detergent industry in India having five major units, which are making the base a linear alkyl benzene, which is used as a surfactant of the sulfonation and adding of the various ingredient.

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Catogrisation of Soap

- Soaps has been graded in terms of total fatty matter. Soap may be catogorised as toilet soaps or bathing soap or specialty soap like baby soap (comparatively of high purity), transparent (soap with high glycerine content), herbal and antibacterial soap.
- Bathing bars may be made from partial soap and partial detergent or wholly synthetic detergent

Now, let us come to the soap soaps has been graded in terms of the total fatty matter soap maybe categorized as toilet soaps, or bathing soaps or a specialty soap like baby soap comparatively of the high purity, transparent soap, soap with high glycerine content herbal antibacterial soap. Even Neem soap is that is the anti bacterial soap. Bathing bars maybe made from partial soap and partial detergent or wholly synthetic detergent. Now, the even in case of the cleaning this detergent bars are available in the market, which has replaced the earlier soap bars.

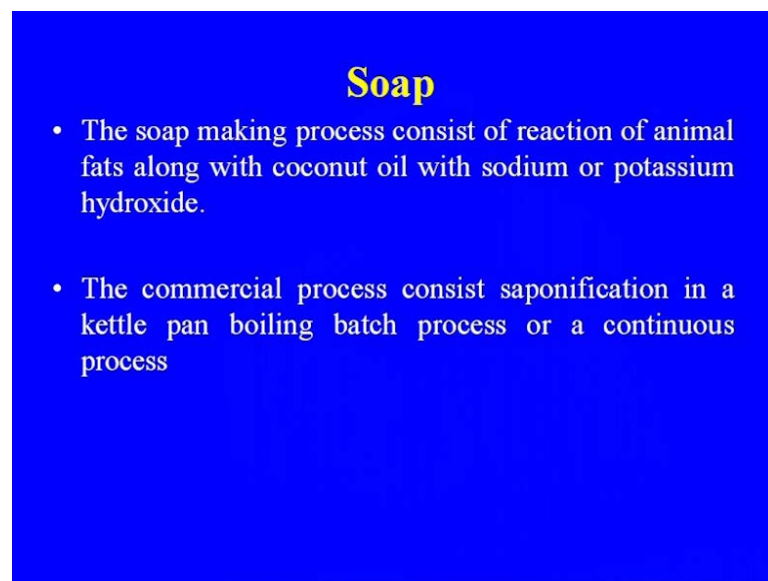
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Catogrisation of Soap

- Bureau of Indian standards (BIS) has catogrised on the basis of total fatty matter(TFM):
- Grade I (Minimum 76%),
- Grade II(minimum 70%),
- Grade III(minimum 60%), bathing bar (minimum TFM 40%).
- Soft soap are made by using potassium hydroxide instead of sodium hydroxide.

This is the B I S bureau of Indian standards has categorized, on the basis of the total fatty matter, grade one minimum 76 percent, grade two minimum 70 percent and grade three minimum 60 percent bathing bars minimum TFM 40 percent. Soft soaps are made by using potassium hydroxide instead of sodium hydroxide. So this is the how this different grade of the soaps are there, and characterization of the categorization of the soap is done.

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Soap

- The soap making process consist of reaction of animal fats along with coconut oil with sodium or potassium hydroxide.
- The commercial process consist saponification in a kettle pan boiling batch process or a continuous process

Soap making process consist of the reaction of the animal fats along with the coconut oil with sodium or potassium hydroxide. The commercial process consists saponification in a kettle pan boiling batch process or a continuous process both processes are, but we started the soap manufacturing of the batch process. Now, the continuous process are available, where the continuous soap making is there recovery part is there recovery of the glycerine.

The production of the soap comprises the saponification, soap making removal of the glycerol soap purification, finishing which consist of mixing and homogenisation of the soap base with the additive such as perfumes, coloring matter, skin grooming substances and final extrusion, cutting, shaping and packing these are the various steps involved in the soap making.

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Soap

The production of soap comprises saponification (soap making), removal of glycerol, soap purification, finishing which consist of mixing and homogenisation of the soap base with additive such as perfumes, coloring matter, skin grooming substances and final extrusion, cutting shaping and packaging.

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Raw Material

- Soaps are commonly made from fats and oil and sodium hydroxide.
- Oils and fats can be classified either lauric or nonlauric oils /fats.

Now, let us come to the raw material the soaps are commonly made from the fat, fats and oil and the sodium hydroxide. Normally, it is very common sodium hydroxide sometimes potassium hydroxide that may be used oil, and fats can be classified either lauric or non-lauric oils or fat.

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Raw Material

- In soap making palm oil, coconut oil and palm oil, kernel oil and animal fat especially tallow. Fatty acid present in tallow are mystERIC acid, palmitic acid, stearic acid, oleic acid, linoleic acid whereas the coconut oil contains lauric acid, mystERIC acid, palmitic acid, stearic acid.

In soap making palm oil, different oil we are using palm oil, coconut oil, and the kernel oil and the animal fat especially. Tallow that we are using in making of the because of the some of the countries they are producing lot of the palm oil, and the palm oil is also in the edible grade. So, there is a big question about the use of the palm oil or the coconut oil, in the soap making because on the cost of the edible oil, how much we can use the palm oil?

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Raw Material

- Different oils produce soaps of varying hardness, odour and lathering properties. normally 75-85% tallow and 15-25 % coconut oil is used in soap making.
- C12 and C14 soaps lather quickly but they produce an unstable, coarse bubble foam while C16 and C18 lather slowly but lead to stable , fine bubble foamed. For saponification caustic lye (50% caustic soda) is used.

So, that is the problem in case of the places where we do not have the palm. Fatty acid present in the tallow are myseric acid, palmitic acid, stearic acid, oleic acid, linoleic acid whereas, the coconut oil contains lauric acid, myseric acid, palmitic acid, stearic acid. So, different oils they are having the different compositions are there that is varying from raw material to raw material. Different oils produce soaps of varying hardness, odour and lathering properties normally, 75 to 85 percent tallow and 15 to 25 percent coconut oil is used in soap making because tallow is cheaper C 12 and C 14 soap lather quickly, but they produce unstable coarse bubble foam.

While C16 to C18 lather slowly, but lead to the stable fine bubble foam for saponification caustic lye 50 percent of the caustic soda means, they in the dilute not the concentrated caustic. But the 50 caustic like that the caustic soda, we call because during the process of making the different concentration of the caustic, we are making that may be depending among the processes because in case of the process.

We have producing around 50 percent in case of the memoriam process we are about the... So, that caustic which is we call that the caustic life, but if you need the caustic life higher concentration because most of the caustic growing plant are based on the memoriam process, the concentration loads will have to concentrate so that is we called is the caustic lead.

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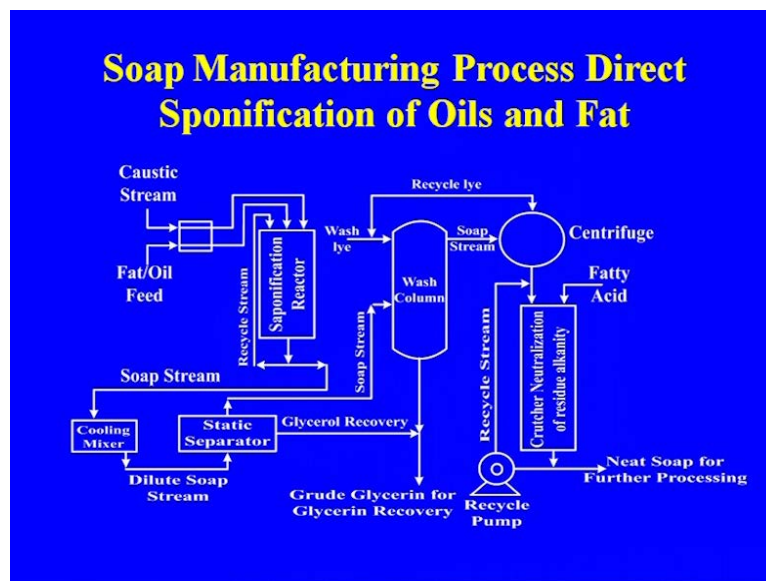
Soap Making Process

- Saponification
- Glycerine Removal
- Glycerine recovery and Purification
- Soap Purification
- Drying
- Storage of soap flakes or nodules
- Finishing of Soap base: incorporation of additives, plodding,
- Cutting, Forming or Shaping
- Packaging

These are the step already I told you that the various step, in case of the soap making or the saponification, glycerine removal that is important part in case of the soap making because the glycerine that is a very value added product, that we are getting from the soap making. It has got lot of the industrial application if in case of the pharmaceutical industry, we are using. So, the glycerine recovery and purification that is very important soap purification because the soap, which is foam during the saponification, lot of the impurities that may be there.

So, purification that will be required drying storage of the soap flakes or nodules finishing of soap base, incorporation of the additives, plodding also that we are doing cutting, forming or shaping. Finally, packaging these are the some of the steps involved in case of the soap making whether, you are making on the batch process or you are making by continuous process.

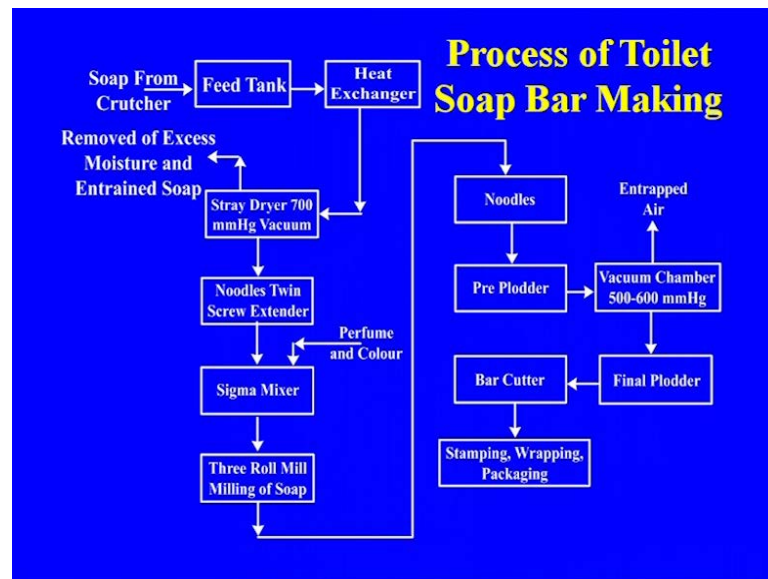
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This is the actually, the flow diagram for making of the soap and we will discuss easy stage in detail. But you see the first this caustic soda and the fat and oil that is going to the saponification reactor, where the saponification is taking place and the after the saponification, here this is the saponification reactor where the saponification taking place. Then after that starts two streams; one is for the separation of the glycerine purification of the glycerine after settling.

The glycerine crude, glycerine here after the wash column the soap that will go for the further processing, and the heavier part that is going to for the glycerine recovery and the various these are the various stages involved, in case of the glycerine recovery, which we will be discussing later on, while discussing glycerine purification, because various steps are involved in that. So, this is the how the fatty acid and your soap, which we are getting after the separation of the your glycerine that is going for further processing, depending up on the requirement whether, you are going for the toilet soap or the bar making.

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So, this is the how the feed that will be the soap from the crutcher that is called from that is going to the that will be the feed tanks. Feed tanks it will go to the various stages that will be the dryer and the noodles, twin screw extender. Then the sigma mixer with the where the additives perfumes and other colour that will be added in the sigma mixer, three roll mills that is the milling of the soap because the infirmity that is inform mixing should be there, and product region we are having the three roll mill mixing.

Milling of the soap noodles again we are getting then the as I told, the pre plodders are there, and the final plodders that is there vacuum chamber for the intent that may be there and then the final pre plodder. And the final plodder these are the two stages in case of the and then the bar that is going for finally, it will be stamping wrapping and the packaging this is the how the bars are made. Now, let us discuss the each step because

this step is very important in making of the soap, a mixture of the in case of the saponification.

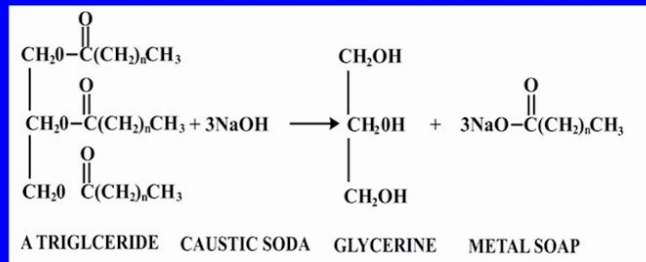
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Basic Steps in Soap Manufacture

- Saponification A mixture of tallow (animal fat), coconut oil, sodium hydroxide and salt are mixed in fixed proportion and fed to a reactor(Kettle or pan) with and heated with steam.
- Effective mixing and proper blending of raw material is very important to ensure a consistent reaction. The soap batch is boiled using steam sparging. The soap produced is the salt of a long chain carboxylic acid.

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Reaction in saponification process



A mixture of the tallow animal fat, coconut oil, sodium hydroxide and salt are mixed in fixed proportion and fed to the reactor kettle or pan with, and heated with steam and so the saponification. So, effective mixing and proper blending of the raw material is very important to ensure a consistent reaction, the soap batch is boiled using steam sparging.

The soap produces the salt of the long chain carboxylic acid. So, this is the saponification stage that we are in.

Next step, this is the reaction that is taking place in case of the caustic soda and the glycerine that is the we are getting and the soap, it may be the sodium or the potassium. Whatever, the base that may be there so that we are then what is happening? Other reaction opening of the grain of the soap and glycerine removal.

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Opening of grain of Soap and Glycerine removal

Upon completion of saponification additional salt to the wet soap causing it to separate out into soap and glycerine in salt water as soap is not very soluble in salt water, whereas glycerine is soluble.

Glycerine is very valuable by product soap, so effective removal is very important process. Upon addition of salt the single phase soap is converted to two layer.

Upon completion of the saponification additional salt to the wet soap, causing it to separate out into soap and the glycerine, because that is part separation of the soap and glycerine that is very important. The salt that we are adding a soap is not very soluble in the salt water whereas, the glycerine is soluble. So, the separation of the soap and the glycerine that is taking place as I told you, the glycerine is very valuable by-product of the soap industry. So, effective removal is very important process upon addition of the salt, and single phase soap is converted to two layers because after this salt is added the glycerine that will be separated from the soap.

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Opening of grain of soap and Glycerine removal

- The bottom layer is high level of salt, glycerol and only small amount of soap while the top layer is soap which is allowed to settle for several hours.
- Aqueous solution called lye is drawn from the bottom which consist of most of the glycerine which is sent to the glycerine recovery plant where glycerol is recovered, purified.

The bottom layer is high level of the salt glycerol and only small amount of soap, while the top layer is the soap, which is allowed to settle as I told in the flow diagram also to the from the bottom we are getting the glycerine. Top layer is your soap that will contain because the glycerol, which you have being that may contain some of the salts also.

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Soap Purification and Drying

- The soap remaining in the kettle still contains some glycerine which is removed by adding small amount of caustic soda in the wash column.
- The soap and lye are separated.

This is why this in the bottom layer is high level of the salt glycerol and only small amount of soap. While the top layer is soap which is allowed to settle for several hours for the separation aqueous solution called lye is drawn from the bottom, which consists

of most of the glycerine which is sent to the glycerine recovery plant, where glycerine is recovered purified. Soap purification and drying the soap remaining in the kettle still contains some glycerine, which is removed by adding small amount of caustic soda in the wash column, this soap and lye are separated at this stage.

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Soap Purification and Drying

- The lye removed is reused in the process.
- The top neat soap layer still contains some caustic soda which is neutralised with a weak acid such as citric acid.
- The separated soap containing water are further dried by heating under vacuum

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Finishing

- Finally additives such as preservatives, colour and perfume are added and mixed in with the soap and it is shaped into bars for sale.

The lye removed is reused in the process because that is the caustic soda, we are using for the saponification. The top neat soap layer still contain some caustic soda, which is

neutralized with a weak acid such as citric acid. The separated soap containing water are further dried by heating under vacuum.

And finishing now, the final stage is finishing, the final additives such as preservatives colour perfume are added and mixed in with the soap, and it is shaped into the bars for sale, so this is how the soap making process is there and as I told you the process of the soap making that maybe batch or continuous. So, let us discuss now the continuous saponification process.

And in both the cases objective is the reaction, is the lye removed is reused in the process because that is the caustic soda. We are using for the saponification. The top neat soap layer still contain some caustic soda, which is neutralized with a weak acid such as citric acid, the separated soap containing water are further dried by heating under vacuum.

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Continuous Saponification Process:

- Continuous saponification process has now replaced old batch process for making soap .
- Although there are variety of commercial system available , however all the process rely on high speed saponification using intense mixing and continuous separation of soap, lye and glycerol, drying and finishing of the soap.

So, continuous saponification process has now replaced the old batch process for making soap because now, the plants are very higher capacity. Earlier it is to be lower capacity. Even hand making we are making the soap in the at the your batch process. Although, there are variety of the commercial system available. However, all the process rely on the high speed saponification using intense mixing and continuous separation of the soap lye and glycerol drying and finishing of the soap because the reaction time if you are able to reduce, if the faster saponification reaction is there. So, definitely time

requirement that will be less and mixing of the product. So, these are the some of the important that is requirement in case of the continuous saponification process. Then the continuous separation of the soap lye and glycerol, and the further recovery, and the throughout processing of the glycerol.

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Continuous Saponification Process:

- In the continuous process the blended oils and fats along with appropriate amount of caustic lye and salt is continuously fed to the a pressurized, heated autoclave[temperature 120 oC and pressure 200 kpa.

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Glycerine

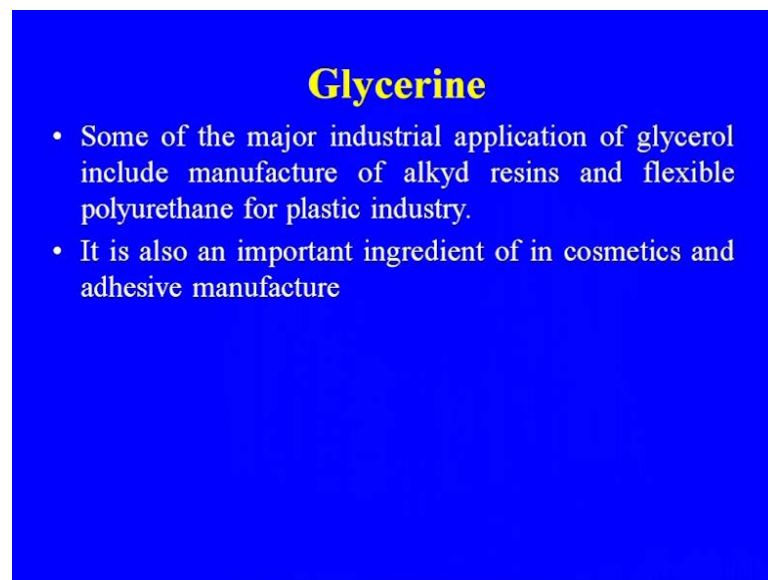
- Glycerol is important by product of soap manufacture. The process of soap manufacture from fats and oils usually yield glycerol to about 10% of the value of the soap formed and because of its application in many uses, its recovery is very important for better economy of soap manufacture.

In the continuous process, the blended oil and fats along with the appropriate amount of caustic lye, and salt is continuously fed to the pressurized heated autoclave temperature is 120 degree centigrade and the pressure is 200 kapa. So, this is a reaction condition

that we are maintaining in the continuous autoclave. Now, let us come to the glycerine recovery part because that is the glycerine recovery section that is the integral part of the soap making.

As I told you the glycerine that is very important by-product of the soap manufacturer and the effective economical recovery of the glycerine, that will add to the economics of the overall economics of the soap making. The process of soap manufacture from fats and oils usually, yield glycerol to about 10 percent of the value of the soap formed and because of its application in many uses, its recovery is very important for better economy of the soap manufacture.

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Glycerine

- Some of the major industrial application of glycerol include manufacture of alkyd resins and flexible polyurethane for plastic industry.
- It is also an important ingredient of in cosmetics and adhesive manufacture

Some of the major industrial application of the glycerol including manufacture of alkyd resins, flexible polyurethane for plastic industry. It is also an important ingredient of in cosmetics adhesive manufacture, and some of the other pharmaceutical uses that we are using marginal purpose. Also, we are using this glycerine because of the softness.

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Major Steps in Glycerine Recovery

- Pretreatment of lye for removal of traces of soluble soap
- Removal of traces of sulphur after pretreatment

These are the major steps involved, in case of the your glycerine recovery section pre-treatment of the lye for the removal of the traces of the soluble soap, even the some caustic soda that may be also there removal of the trace of the sulfur after pre-treatment.

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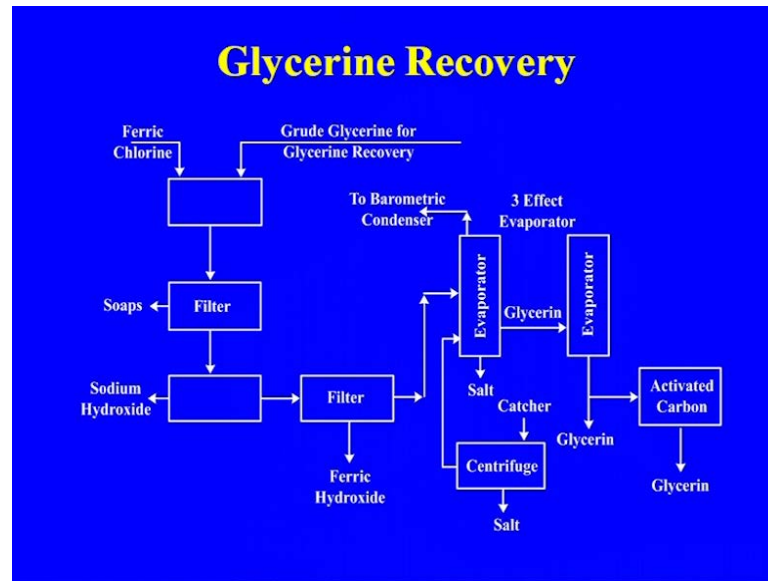
Major Steps in Glycerine Recovery

- Concentration of dilute glycerine in multiple effect evaporator to 54% glycerine and separation of traces of salt
- Concentration of glycerine to 84%
- Further purification of concentrated glycerine
- Bleaching of purified Glycerin

Major steps in the glycerine recovery concentration of the dilute glycerine, in the multiple effective operator because the concentration, which we are getting that is low then the multiple effective operator. We are concentrating the glycerine to 54 percent glycerine and then this where, the separation of the traces of the salt is also taking place.

Concentration of the glycerine to 84 percent further concentration that is required further purification of the concentrated glycerine. And the bleaching of the purified glycerine after concentrating, and using the activated carbon that we are using in the case of the glycerine. And so, the colour you must have seen, the colour of the glycerine lot of the improvement from the raw glycerine to the finish glycerine is there.

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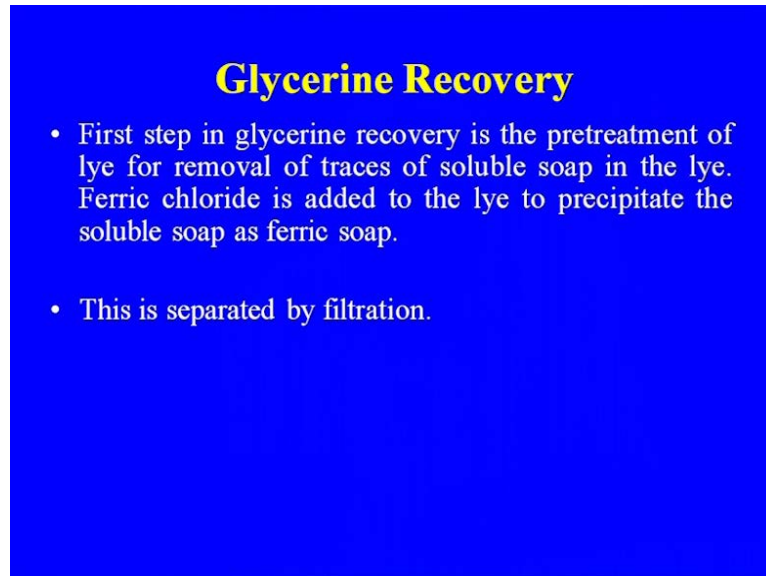


This is the already we discussed about the this part, where we are making the soap. And the this crude glycerine from the wash column that we are getting, that is going to the here we are having the ferric chloride after the ferric chloride, the traces of the soaps which may remain with the glycerine and that will always remain depending up on the washing efficiency. And so, that is removed then we are some sodium hydroxide may be there, and the your product.

So, that is that has to be removed then it is going to because some salt, we are adding for removal of the soap, and the sodium hydroxide then it is going to filter where the ferric hydroxide that may separated. Then it is going to the evaporator and from the evaporator this is the barometric condenser of water is connected, and salt is also separated. The glycerine here we are using the three effect evaporator normally, in the concentration after the finally, again it is the going for evaporation. So, that is the higher concentration of the glycerine you may get and then the glycerine as such here. Actually, the salt which we are getting that may go through centrifuge and the salt that will be recover, and then

the activated carbon that we are using for the purification of the glycerine for improvement of the colour.

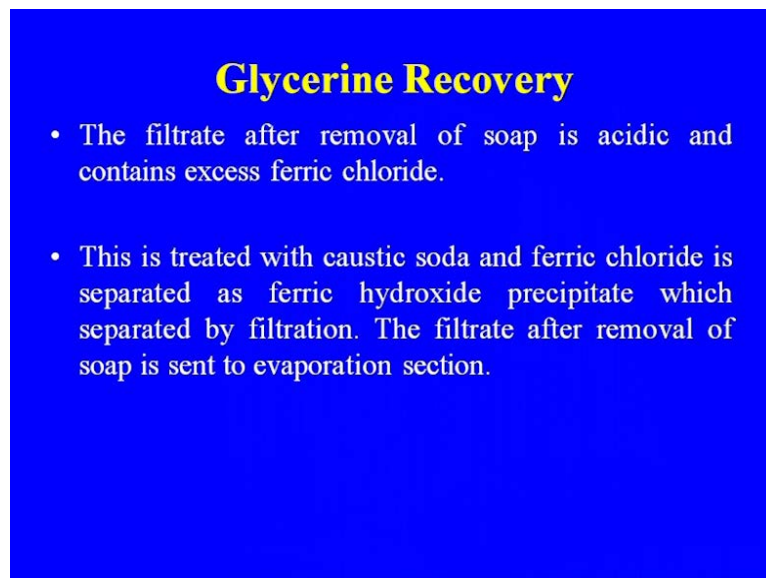
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Glycerine Recovery

- First step in glycerine recovery is the pretreatment of lye for removal of traces of soluble soap in the lye. Ferric chloride is added to the lye to precipitate the soluble soap as ferric soap.
- This is separated by filtration.

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Glycerine Recovery

- The filtrate after removal of soap is acidic and contains excess ferric chloride.
- This is treated with caustic soda and ferric chloride is separated as ferric hydroxide precipitate which separated by filtration. The filtrate after removal of soap is sent to evaporation section.

So, this was the actually the about the glycerine recovery and this is some detail, more detail is there first step, in the glycerine recovery is the pre-treatment of the lye for removal of the traces of the soluble soap. In the lye ferric chloride because that salt which was showing in the flow diagram, where the ferric chloride is added to the lye to

precipitate the soluble soap as the ferric soap, this is separated by filtration in the diagram I showed that the filtration is there. So, that we are separating them.

The filtrate after removal of the soap is acidic and contains excess ferric chloride, this is treated with the caustic soda, and ferric chloride is separated as ferric hydroxide precipitate, which is again separated by filtration. The filtrate after removal of the soap is sent to the evaporation section.

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Glycerine Recovery

- In multiple effect evaporator dilute glycerine is concentrated to 52% glycerine. Some salt is separated at this stage.
- The concentrated liquor after separation of salt is centrifuged and the concentrated glycerine is sent to another single effect evaporator to achieve a concentration of about 84% glycerine.

In multiple effect evaporator dilute glycerine is concentrated to 52 percent glycerine, some salt is separated at this stage. The concentrated liquor after separation of salt is centrifuged, and the concentrated glycerine is sent to another single effect evaporator because there, we are getting around 52 percent and get higher concentration, after the removal of the after the centrifugation, the glycerine is sent to the another single effect evaporator or the finishing evaporator to achieve a concentration of about 84 percent glycerine.

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Glycerine Recovery

- The crude glycerine (84% glycerine) is further refined in special distillation column at 140°C and 755 mm Hg.
- The distillation column contains three condenser in series from which different fractions of glycerine are recovered which is further treated with activated carbon to achieve the finished product.

The crude glycerine 84 percent is further refined in the special distillation column. The distillation column contains three condenser, in series from which different fraction of the actually, here were different grades of the glycerine that are recovered which is further treated with the activated carbon to achieve the finished product, that was that is the final stage, in the case of the glycerine recovery.

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Glycerine Purification:

- A small amount of caustic soda is added to the crude glycerine and the solution then distilled under vacuum in a heated still. Two fractions are taken off - one of pure glycerine and one of glycerine and water.
- The glycerine thus extracted is bleached with carbon black then transferred to drums for sale, while the water/glycerine fraction is mixed with the incoming spent lye and repeats the treatment cycle.

Glycerine purification, a small amount of caustic soda is added to the crude glycerine and the solution then distilled under vacuum in a heated distil, two fractions are taken off

one of the pure glycerine and one glycerine and water. The glycerine thus extracted is bleached with the carbon black, this is the activated carbon. Then transferred to the drum for sales, while the water glycerine fraction is mixed with the incoming spent lye, and repeat the treatment cycle which there, which again the purification all those thing is there steps are involved.

So, this was the about the soap making and the glycerine separation of the glycerine from the soap. You see the next, lecture that will be discussing about the making of this detergent because detergent that has mostly for the cleaning purposes, they have with the better detergency, they have replaced the soap. And so we will be discussing about the evolution of the detergent industry, availability of the raw material. Although, detail we will be discussing in the lecture 2, which will deal mostly with the detergent.