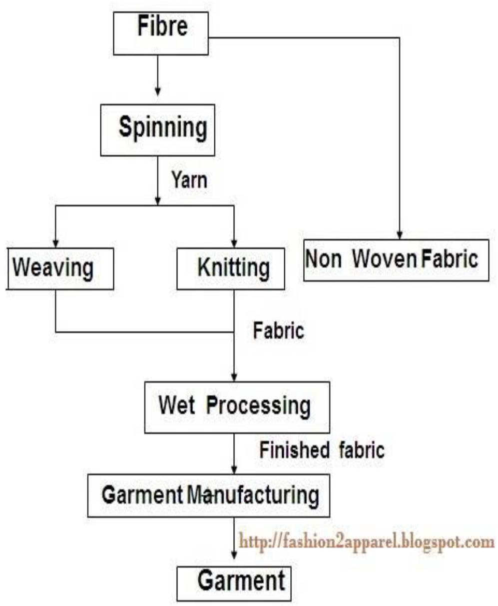
IAT-3 SOLUTION

SUBJECT: INDUSTRIAL WASTEWATER TREATMENT (10CV835)

Cotton is a natural fibre **grown** on a plant related to the hibiscus. The seeds are planted in spring and **cotton** plants grow into green, bushy shrubs about a metre in height. The plants briefly grow pink and cream coloured flowers that once pollinated, drop off and are replaced with "fruit", better known as **cotton** bolls.

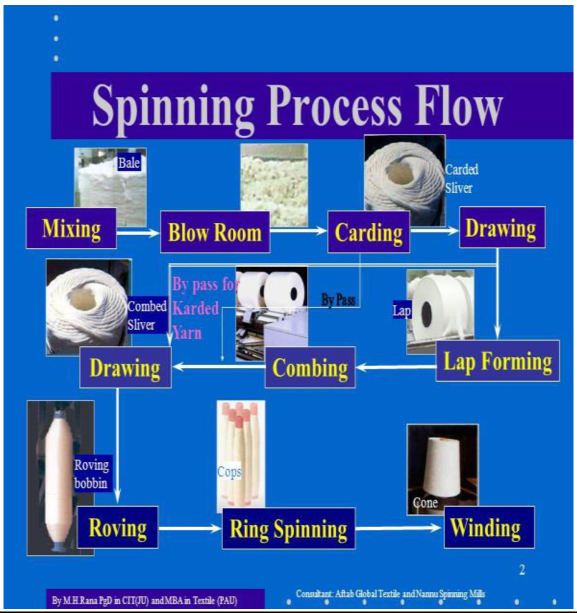
Process flow sheet for cotton textile mills

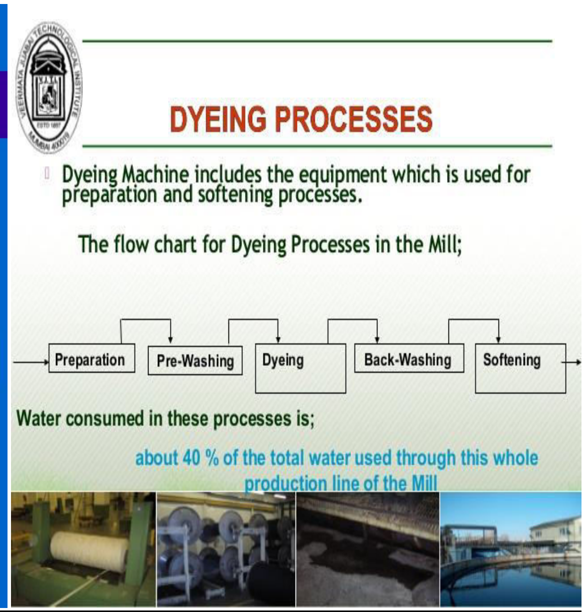


From Raw **Cotton** to **Cotton** Fabrics. The fabric usually used in the clothes we wear is produced through two **processes**: the "**spinning process**," where raw **cotton** is turned into thread, and the "**weaving process**," where the thread is woven into fabric. Here we will explain each **process** in detail using some illustrations.

the **cotton** gin is where **cotton** fiber is separated from the **cotton** seed. The first step in the ginning **process** is when the **cotton** is vacuumed into tubes that carry it to a dryer to reduce moisture and improve the fiber quality. Ginning is accomplished by one of two methods.

Textile mills purchase **cotton** and receive the bales from gin yards or **cotton** warehouses. These mills start with raw bales of **cotton** and process them in stages until they produce **yarn** (fibers twisted **into** threads used in weaving or knitting) or cloth (fabric or material constructed from weaving or knitting).





Cotton is a soft, fluffy staple fiber that grows in a boll, or protective case, around the seeds of the **cotton plants** of the genus Gossypium in the mallow family Malvaceae.The fiber is most often spun into yarn or thread and used to make a soft, breathable textile.

Spinning

A Yarn is usually of substantial length & of small cross section. In the cross section of a yarn there are usually a multiple number of Staple fibers (short fibers) or Filaments (long fibers) of unlimited length.

Yarn made out of Staple fiber is known as Spun Yarn, because the staple fibers should undergo number of process stages so that a yarn can be made out of them. This procedure or process stages in correct sequence is called “Spinning”. Fiber extrusion or conversion of filaments from Polymers was also considered as “Spinning”. Below mentioned is an introduction to the Yarns

Yarn Numbering Systems:

In above we found that there are different types of yarns. The thickness is a very important property of a yarn. So there are methods to determine & define yarn thickness. Depending on the units used for measuring Length & mass, fineness of a textile yarn is given in different units. Such systems having different units employed to indicate fineness are called **Yarn Numbering Systems**. There are two types of systems & they are;

1. Direct System (Mass per unit length)
2. Indirect System (Length per unit Mass)

<u>01. Direct System</u>

a. Tex System
This system represents the weight in grams per 1000 m length (1000m weight in grams)

b. Denier System
This system represents the weight in grams per 9000m (9000m weight in grams)

<u>02. Indirect System</u>

a. Count System (Ne)
In this system, count refers to the number of hank (01 hank equals to 840 yards) in one pound. This system called as English system as well.

Cotton Yarn Manufacturing Process:

In here we have discussed the process of cotton yarn manufacturing. The Initial stage of the Spinning Process involves converting Cotton in Bales into the Cone Winding.

Bale Opening

↓

Blow Room

↓

Carding

Carded Warp/ Hosiery	**Combed Warp/ Hosiery**	
Drawing 1	Sliver lap	Drawing 1
Drawing 2 (with Auto Leveler)	Ribbon Lap	Super Lap former
Speed Frame	Comber	Comber
Ring Frame	Post Comber Drawing	
Cone Winding	(with Auto Leveler)	
	Speed Frame	
	Ring Frame	
	Cone Winding	

Below mentioned is how the Man-made Fibers manufacturing Process.

Bale Opening

↓

Conditioning of MMF Fibers

↓

Blending

↓

Blow Room

↓

Carding

↓

Drawing 1

↓

Drawing 2 (with Auto Leveler)

↓

Speed Frame

↓

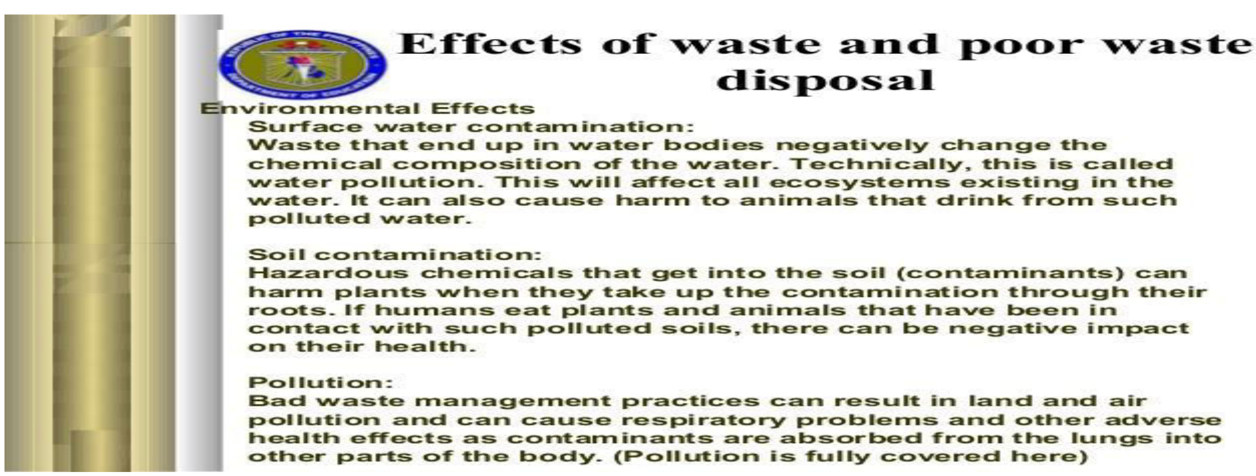
Ring Frame

↓

Cone Winding

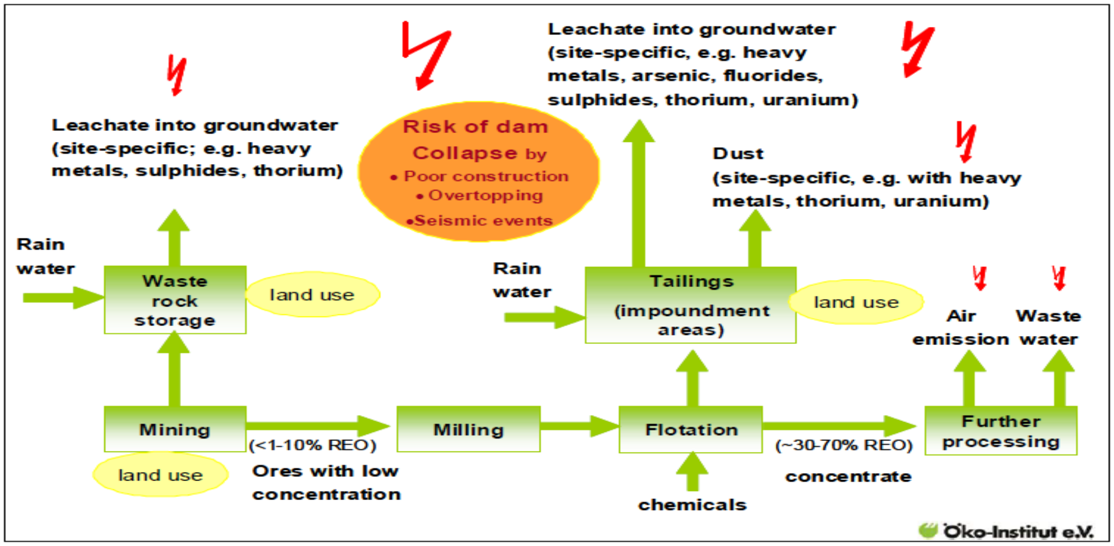
First thing in Spinning Process is converting highly compressed Cotton in Bales into the form of thoroughly loosened, opened & cleaned State. These Steps of processing are carried out in the Blow Room of a Spinning Mill. First stage of Spinning involves converting lightly compressed Cotton bales into the form of Opened & Cleaned Fibre Flocks.

Solution Q 2



One of the greatest environmental problems caused by the mining and refinement of strategic elements, in this case speaking primarily about rare earth elements, is the problem of waste management.

This becomes a problem when mines and refineries that do not adhere to regulations regarding proper waste disposal. This can result in soil and water contamination by substances such as heavy metals and radioactive materials. This affects the ecosystem around the waste disposal site; and, if the contaminants get into the water table, it can affect areas beyond the site.



Acid Drainage:

Acid drainage occurs when sulfuric acid is produced by the oxygenation (via exposure to air or water) of sulfide-bearing minerals (ex. pyrite) . Acidic water facilitates further dissolution of sulfide minerals, thereby introducing more metals and acids into the environment. This acid release can come from exposed waste, mine openings, and pit walls. This process continues until there are no more reactants, which, if there are large amounts of exposed rock, could continue for centuries. Acid drainage is harmful to aquatic life, particularly to fish, some of which cannot live below a pH of 5 or 6.

Carbonate minerals, which are often the dominant minerals in rare earth element ores, are basic, and therefore act as a buffer for sulfides. However, too much carbonate dissolution is just as dangerous to aquatic ecosystems, because it can elevate the pH, and, like sulfides, can allow more contaminants to enter the water.

Heavy Metals:

Rare earth element ores tend to contain high amounts of metals, similar to other types of hardrock. This means that the metal concerns of hardrock mining also apply to rare earth mining. In particular, the elements of concern at rare earth mines include, but are not limited to, aluminum, arsenic, barium, beryllium, cadmium, copper, lead, manganese, and zinc.lead, manganese, and zinc . For more information about the harmful effects of metals, please refer to the environmental problems of refining rare earth elements.

Harmful Minerals:

Fluorine is another dangerous contaminant found in carbonate mineral dissolution. Fluorine is widely known to be harmful to the environment, as too much of it has been shown to cause a decline in plant growth as it accumulates, and can harm the bones of animals that eat plants with a high concentrations of fluorine. Some rare earth element deposits also include the asbestos mineral riebeckite, which is also known to be harmful to the respiratory systems of both humans and animals.

Radionuclides:

Radionuclides are another contaminant associated with rare earth element ores. These are radioactive materials including thorium-232, uranium-238, and their non-stable decay products. These decay products are the most dangerous aspect of this contaminant, because the radiation emitted during radioactive decay can pose a risk of cancer among other things in humans and animals.

Wastestreams:

Wastestreams are locations where it is likely that contaminants could be introduced into the environment. Contaminants may be released in pit mines or in waste rock piles, as well as at the mill. Contaminants are most likely to escape from waste rock piles, since they are less contained than contaminants in a pit. Careful monitoring is necessary, to ensure that waste products are not allowed into the environment.

Chemical Waste That Impact on Aquatic Life or Water Quality

Undoubtedly, over the last one hundred years, humans have introduced a significant number of chemicals into the environment. While some chemicals are designed to get rid of weeds and pests, a significant amount of chemicals are wastes from industrial and agricultural processes. The improper handling of chemical waste has resulted in oceans and the world's water supply being treated like sewage or toxic waste dumps.

While it may seem fine for industrial plants or manufacturers to dispose of two inert chemicals, when those chemicals are mixed the result could be a serious pollutant to the water supply. As streams, rivers, and oceans become polluted, aquatic life can suffer as well as humans. Since water accounts for up to 60 percent of human bodies, it's important for **chemicals to be disposed of properly** and not end up in the water supply.

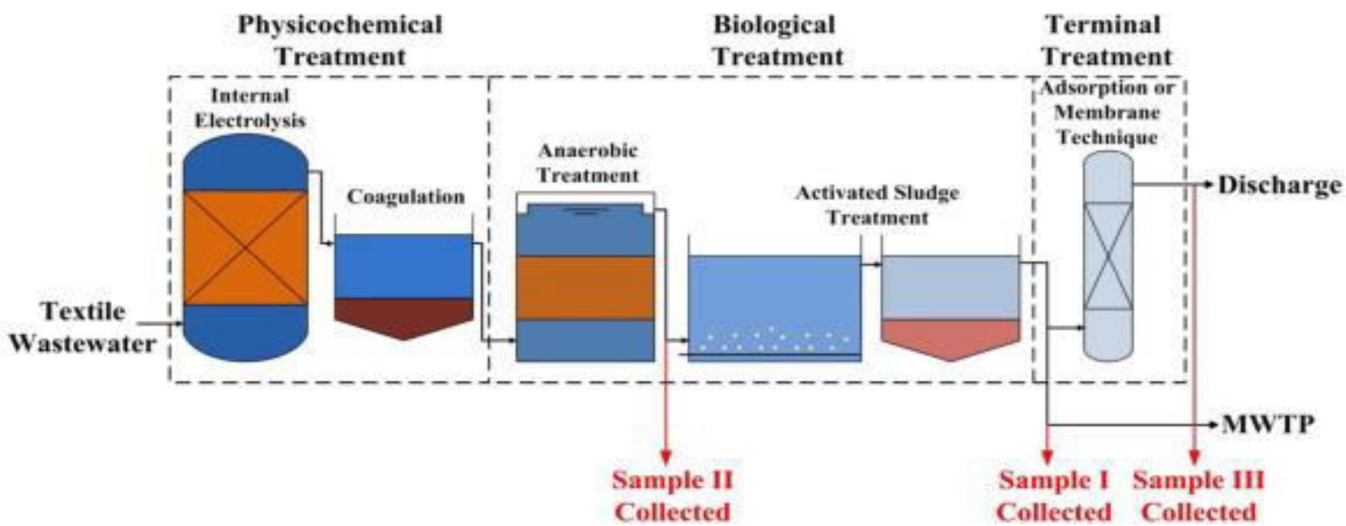
Already **two-thirds of aquatic life is considered to be an endangered species** because of improperly disposed chemicals and other waste. However, businesses do not have to dump chemicals into water sources for the effects to be seen. Anytime you dump or release chemical waste, it will have an effect. As it rains, those chemicals are washed into rivers, which feed the waterfalls and then go into the ocean.

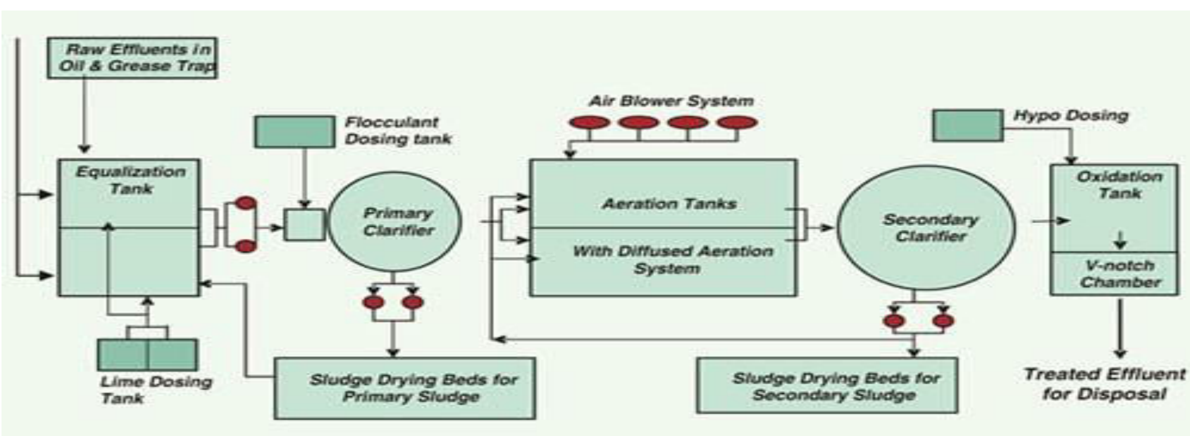
When a toxic waste harms one organism, it can end up destroying an entire food chain of aquatic life. Improperly disposed chemicals pollute marine life and kills sea mammals, corals, and fish. At the same time, sea birds are affected because they eat the fish. In a matter of fact, any organism that digests affected marine life can have adverse effects.

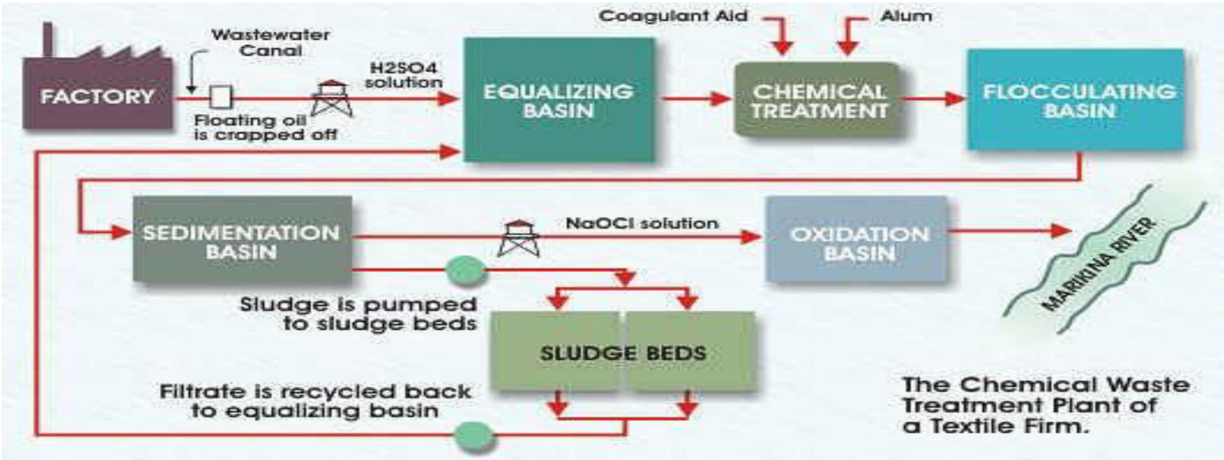
Unaccounted water pollution on ground water and surface water bodies causes main source for spreading water borne diseases.

Solution Q.3

TREATMENT FLOW SHEET FOR TEXTILE WASTE WATER







Solution Q.4

Landfills

Throwing daily waste/garbage in the landfills is the most popularly used method of waste disposal used today. This process of waste disposal focuses attention on burying the waste in the land. Landfills are commonly found in developing countries. There is a process used that eliminates the odors and dangers of waste before it is placed into the ground. While it is true this is the most popular form of waste disposal, it is certainly far from the only procedure and one that may also bring with it an assortment of space.

Incineration/Combustion

Incineration or combustion is a type disposal method in which municipal solid wastes are burned at high temperatures so as to convert them into residue and gaseous products. The biggest advantage of this type of method is that it can reduce the volume of solid waste to 20 to 30 percent of the original volume, decreases the space they take up and reduce the stress on landfills.

This process is also known as thermal treatment where solid waste materials are converted by Incinerators into heat, gas, steam and ash. Incineration is something that is very in countries where landfill space is no longer available, which includes Japan.

Recovery and Recycling

Resource recovery is the process of taking useful discarded items for a specific next use. These discarded items are then processed to extract or recover materials and resources or convert them to energy in the form of useable heat, electricity or fuel. Recycling is the process of converting waste products into new products to prevent energy usage and consumption of fresh raw materials. Recycling is the third component of Reduce, Reuse and Recycle waste hierarchy. The idea behind recycling is to reduce energy usage, reduce volume of landfills, reduce air and water pollution, reduce greenhouse gas emissions.

Plasma gasification

Plasma gasification is another form of waste management. Plasma is a primarily an electrically charged or a highly ionized gas. Lighting is one type of plasma which produces temperatures that exceed 12,600 °F . With this method of waste disposal, a vessel uses characteristic plasma torches operating at +10,000 °F which is creating a gasification zone till 3,000 °F for the conversion of solid or liquid wastes into a syngas.

During the treatment solid waste by plasma gasification, the waste's molecular bonds are broken down as result of the intense heat in the vessels and the elemental components. Thanks to this process, destruction of waste and dangerous materials is found. This form of waste disposal provides renewable energy and an assortment of other fantastic benefits.

Composting

Composting is a easy and natural bio-degradation process that takes organic wastes i.e. remains of plants and garden and kitchen waste and turns into nutrient rich food for your plants. Composting, normally used for organic farming, occurs by allowing organic materials to sit in one place for months until microbes decompose it. Composting is one of the best method of waste disposal as it can turn unsafe organic products into safe compost. On the other side, it is slow process and takes lot of space.

Waste to Energy (Recover Energy)

Waste to energy (WtE) process involves converting of non-recyclable waste items into useable heat, electricity, or fuel through a variety of processes. This type of source of energy is a renewable energy source as non-recyclable waste can be used over and over again to create energy. It can also help to reduce carbon emissions by offsetting the need for energy from fossil sources. Waste-to-Energy, also widely recognized by its acronym WtE is the generation of energy in the form of heat or electricity from waste.

Avoidance/Waste Minimization

The most easier method of waste management is to reduce creation of waste materials thereby reducing the amount of waste going to landfills. Waste reduction can be done through recycling old materials like jar, bags, repairing broken items instead of buying new one, avoiding use of disposable products like plastic bags, reusing second hand items, and buying items that uses less designing.

Recycling and composting are a couple of the best methods of waste management. Composting is so far only possible on a small scale, either by private individuals or in areas where waste can be mixed with farming soil or used for landscaping purposes. Recycling is widely used around the world, with plastic, paper and metal leading the list of the most recyclable items. Most material recycled is reused for its original purpose

Solution Q.5

Pulp and Paper Manufacturing Process in the paper industry

The main steps in pulp and paper **manufacturing** are: Raw material **preparation** and handling, Pulp **manufacturing**, Pulp Washing and Screening, Chemical recovery, Bleaching, Stock **Preparation**, and Papermaking.

Paper plays a key role in our daily life and papers have been used for many years from now. Papers are made with the pulp of the woods, which is an Eco-friendly product.

Paper is made through the following processes:

1) Pulping procedure will be done to separate and clean the fibers

2) Refining procedure will be followed after pulping processes

3) Dilution process to form a thin fiber mixture

4) Formation of fibers on a thin screened

5) Pressurization to enhance the materials density

6) Drying to eliminate the density of materials

7) Finishing procedure to provide a suitable surface for usage

Mechanical Pulping

Mechanical pulps are produced by grinding wood against a stone or between metal plates, thereby separating the wood into individual fibres. The shearing action breaks cellulose fibres, so that the resulting pulp is weaker than chemically separated pulps. The lignin connecting cellulose to hemicellulose is not dissolved; it merely softens, allowing the fibres to be ground out of the wood matrix. The yield (proportion of original wood in pulp) is usually greater than 85%. Some mechanical pulping methods also use chemicals (i.e., the chemi-mechanical pulps); their yields are lower since they remove more of the non-cellulosic materials. In stone groundwood pulping (SGW), the oldest and historically most common mechanical method, fibres are removed from short logs by pressing them against a rotating abrasive cylinder. In refiner mechanical pulping

Pulp and paper are made from cellulosic fibers and other plant materials. Some synthetic materials may be used to impart special qualities to the finished product. Paper is made from wood fibers, but rags, flax, cotton linters, and bagasse (sugar cane residues) are also used in some papers. Used paper is also recycled, and after purifying and sometimes deinking, it is often blended with virgin fibers and reformed again into paper. Products such as cellulose acetate, rayon, cellulose esters that are made from cellulose will be used for packaging films, explosives.

The pulping process is aimed at removing lignin without loosing fiber strength, thereby freeing the fibers and removing impurities that cause discoloration and possible future disintegration of the paper.

Hemicellulose plays an important role in fiber-to-fiber bonding in papermaking. It is similar to cellulose in composition and function. Several extractives such as waxes, oleoresins are contained in wood but they do not contribute to its strength properties; these too are removed during the pulping process.

The fiber extracted from any plant can be used for paper. However, the strength and quality of fiber, and other factors complicate the pulping process. In general, the softwoods (e.g., pines, firs, and spruces) yield long and strong fibers that contribute strength to paper and they are used for boxes and packaging.

Hardwoods produce a weaker paper as they contain shorter fibers. Softwoods are smoother, transparent, and better suited for printing. Softwoods and hardwoods are used for paper-making and are sometimes mixed to provide both strength and print ability to the finished product.

Chemical Pulping and Recovery

Chemical pulps are produced by chemically dissolving the lignin between the wood fibres, thereby enabling the fibres to separate relatively undamaged. Because most of the non-fibrous wood components are removed in these processes, yields are usually in the order of 40 to 55%.

In chemical pulping, chips and chemicals in aqueous solution are cooked together in a pressure vessel (digester, which can be operated on a batch or continuous basis. In batch cooking, the digester is filled with chips through a top opening, the digestion chemicals are added, and the contents cooked at elevated temperature and pressure. Once the cook is complete, the pressure is released, "blowing" the delignified pulp out of the digester and into a holding tank. The sequence is then repeated. In continuous digesting, pre-steamed chips are fed into the digester at a continuous rate. Chips and chemicals are mixed together in the impregnation zone at the top of the digester and then proceed through the upper cooking zone, the lower cooking zone, and the washing zone before being blown into the blow tank.

Sulphite Pulping and Recovery:

The cooking liquor of sulphurous acid (H_2SO_3) and bisulphite ion (HSO_3–) is prepared on-site. Elemental sulphur is burned to produce sulphur dioxide (SO_2), which is passed up through an absorption tower that contains water and one of four alkaline bases ($CaCO_3$, the original sulphite base, Na_2CO_3, magnesium hydroxide ($Mg(OH)_2$) or ammonium hydroxide (NH_4OH)) which produce the acid and ion and control their proportions. Sulphite pulping is usually carried out in brick-lined batch digesters.

Steps involved in the Pulp and Papermaking Procedure:

Preparation of raw Material

Wood that has been received at a pulp mill can be in different forms. It depends on the pulping process and the origin of the raw material. It may be received as bolts (short logs) of round-wood with the bark still attached, as chips about the size of a half-dollar that may have been produced from sawmill from debarked round wood elsewhere.

If round wood is used, it is first debarked, usually by tumbling in large steel drums where wash water may be applied. Those debarked wood bolts are then chipped in a chipper if the pulping process calls for chemical digestion. Chips are then screened for size, cleaned, and temporarily stored for further processing.

Separation of Fiber

In the fiber separation stage, several pulping technologies will be diverged. The chips are kept into a large pressure cooker (digester), into which is added the appropriate chemicals in kraft chemical pulping.

The chips are then digested with steam at specific temperatures to separate the fibers and partially dissolve the lignin and other extractives. Some digesters operate continuously with a constant feed of chips (furnish) and liquor are charged intermittently and treat a batch at a time.

After the digestion process, the cooked pulp is discharged into a pressure vessel. Here the steam and volatile materials are tubed off. After that, this cooked pulp is returned to the chemical recovery cycle. Fiber separation in mechanical pulping is less dramatic.

Debarked logs are forced against rotating stone grinding wheels in the stone ground-wood procedure. Refiner pulp and thermo-mechanical pulp are produced by chips. These chips are ground by passing them through rapidly rotating in both processes.

In the second stage after refining, the pulp is screened, cleaned, and most of the process water is removed in preparation for paper making.

Bleaching Process

Raw pulp contains an appreciable amount of lignin and other discoloration, it must be bleached to produce light colored or white papers preferred for many products. The fibers are further delignified by solubilizing additional lignin from the cellulose through chlorination and oxidation. These include chlorine dioxide, chlorine gas, sodium hypochlorite, hydrogen perioxide, and oxygen.

Bleaching is a multi-stage process that refines and brightens raw pulp. The objective is to dissolve (chemical pulps) or modify (mechanical pulps) the brown-coloured lignin that was not removed during pulping, while maintaining the integrity of the pulp fibres. A mill produces customized pulp by varying the order, concentration and reaction time of the bleaching agents.

Sodium Hydroxide, a strong alkali is used to extract the dissolved lignin from fibers surface. The bleaching agents and the sequence in which they are used depend on a number of factors, such as the relative cost of the bleaching chemicals, type and condition of the pulp.

Mechanical pulp bleaching varies from chemical pulp bleaching. Bleaching of mechanical pulp is designed to minimize the removal of the lignin that would reduce fiber yields.

Chemicals used for bleaching mechanical pulps selectively destroy coloring impurities but leave the lignin and cellulosic materials intact, These include sodium bisulfite, sodium or zinc hydrosulfite (no longer used in the United States), calcium or sodium hypochlorite, hydrogen or sodium peroxide, and the Sulfur Dioxide-Borol Process (a variation of the sodium hydrosulfite method).

Papermaking Procedure

Bleached or unbleached pulp may be further refined to cut the fibers and roughen the surface of the fibers to enhance formation and bonding of the fibers as they enter the paper machine.

Water is added to the pulp slurry to make a thin mixture normally containing less than 1 percent fiber. The dilute slurry is then cleaned in cyclone cleaners and screened in centrifugal screens before being fed into the 'wet end' of the paper-forming machine. The dilute stock passes through a head-box that distributes the fiber slurry uniformly over the width of the paper sheet to be formed.

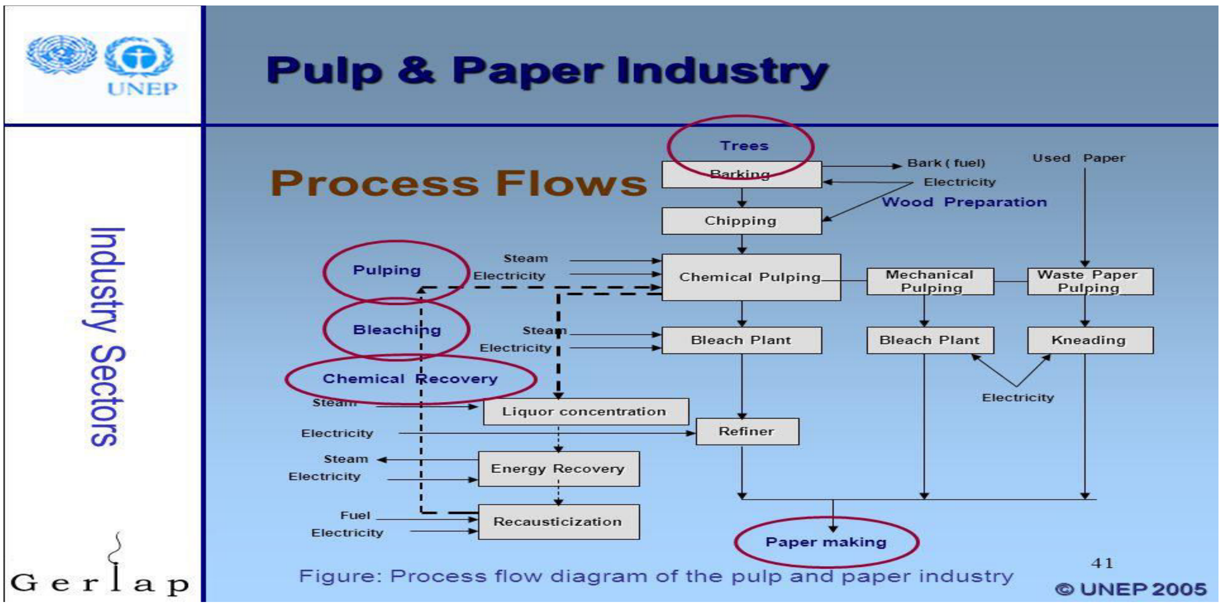
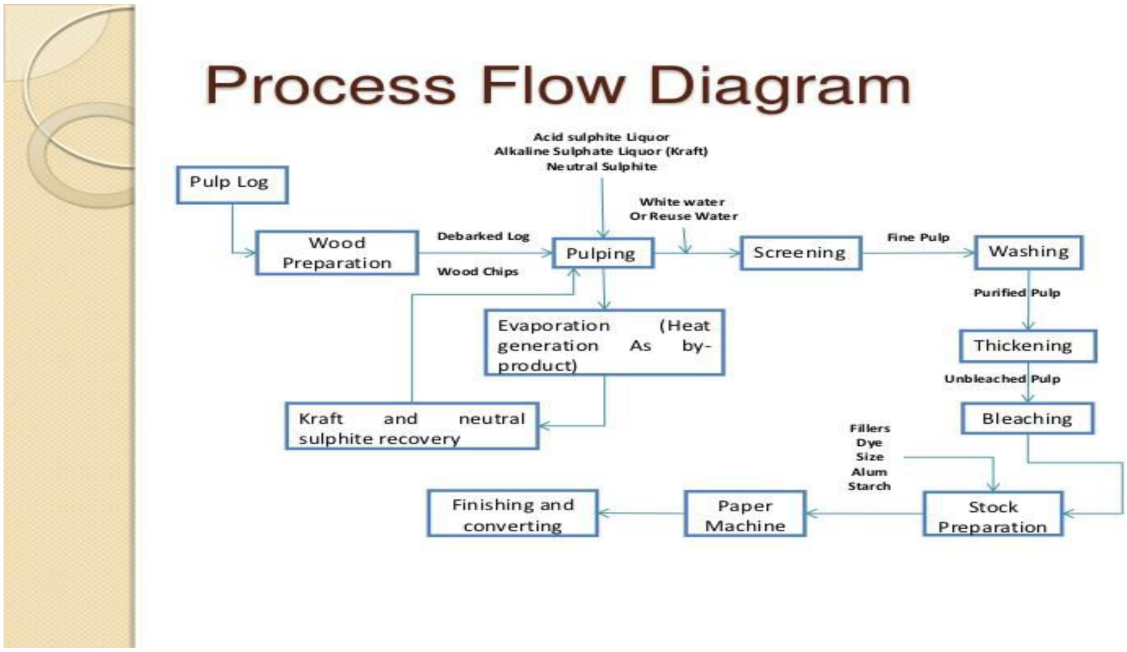
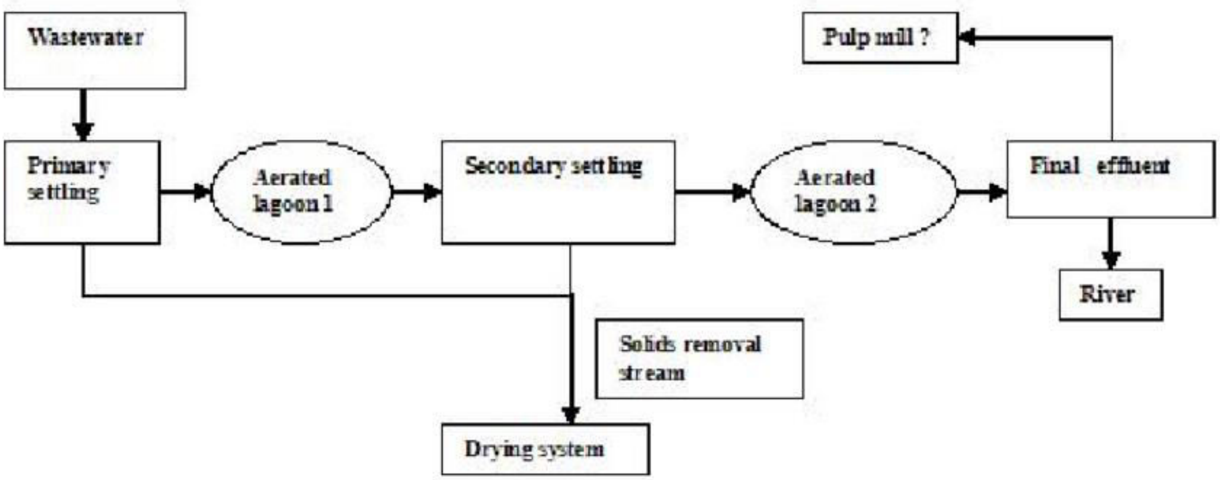


Figure: Process flow diagram of the pulp and paper industry



Solution Q 6



Paper and Pulp Manufacture **Wastewater Treatment**- The **paper industry** uses very high volumes of process water for **pulp** preparation and bleaching among other processes. These systems when engineered correctly can dramatically reduce the water usage of a plant through reuse of treated water.

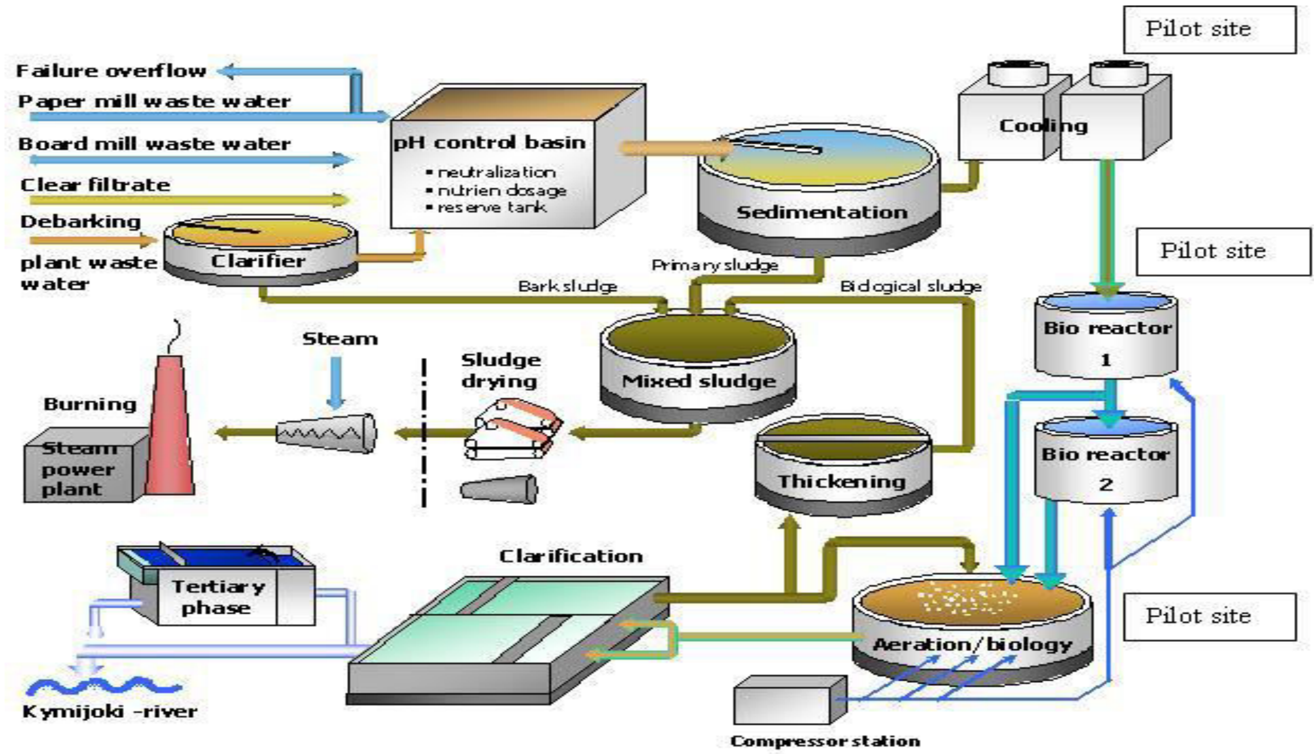
Influent:

Waste water- 60 m³/ tonne of paper produced

• Contain solids and dissolved matter.

• Potentially very polluting

• COD as high as 11000mg/l



<u>**SCREENING**</u>

• Screens

To remove course, bulky and fibrous components from effluents • Grid chambers and settling tanks are used • Efficiency of screening depends on the spacing between screen bars - fine screening, spacing < 10mm -mediun screening, spacing 10-40mm - coarse screening, spacing > 40mm

SEDIMENTATION

• Using gravity to remove suspended solids from water • Removal of suspended particles by sedimentation depends on size and specific gravity of the particles. • Sedimentation tanks are used • Settled sludge is removed • High efficiency is achieved in the subsequent treatment processes.

BIOLOGICAL TREATMENT

• Degrade pollutants dissolved in effluents by the action of microorganisms.

• Pollutants are used as nutrients

• Microorganisms use these pollutants to live and reproduce.

ANAEROBIC TENCHNOLOGY

• Effluents originating from recycle paper mills

• Effluents from mechanical pulping (peroxide bleached), semi-chemical pulping, sulphite and kraft evaporator concentrates

• Bacterial hydrolysis of input materials to break down insoluble organic polymers

• 4 stages:

1. Hydrolysis
2. Acidogenesis(acidogenic bacteria)
3. Acetogenesis(acetogenic bacteria)
4. Methanogenesis (methanogens)

AEROBIC DIGESTION

• Bacteria, fungi, protozoa, rotifiers and other microbes

• Oxygen is supplied to the effluent in the form of air by special aeration equipment

• Complete biological treatment of paper mill effluents.

TERTIARY TREATMENT

To remove specific waste water constituents that cannot be removed by secondary treatment • Nitrogen, phosphorous, additional suspended solids, refractory organics or dissolved solids • It involves- ozone treatment, membrane filtration techniques.

OZONATION

• Ozone has the ability to remove solids from waste water by oxidation • A foam develops when waster water is ozonated • This foam traps a significant amount of solids and nutrient material such as phosphates and nitrates.

ADVANTAGES

• Eliminates odors

• Removes color, phenolics and cyanides

• Reduces turbidity and surfactants

• Increases dissolved oxygen

• No significant toxic side products

MEMBRANE FILTRATION

• Microfiltration

• Ultrafiltration

• Nanofiltration

• Reverse osmosis

USE OF ENZYMES

• For Lignin degradation

• ligninase, cellulase, peroxidase

• Peroxidase- color removal in bleaching effluents

<u>**Solution Q 7**</u>

The characteristics and volume of **wastewater** discharged from **food processing** factories vary with the products and production procedures. ... **The characteristics** of **wastewater** from **food processing** factories are characterized by high BOD, SS, and oil concentrations as well as emitting smells from acidification.

Electrical conductivity (EC), total solids, total suspended solids and total dissolved solids (TS, TSS and TDS)

Electrical conductivity and total dissolved solids of the diluted effluent concentrations namely 1%, 2%, 3% and 4% were determined by using ELICO EC-TDS meter (CM 183, Make-India) where electrode was directly dipped into the respective solutions to display result on a digital scale. Total solids were determined by gravimetric method and then suspended solids were calculated by using equation TS=TDS+TSS.

2. Turbidity and pH

Turbidity of the sample was determined by using CL 52D ELICO Nephelometer while pH of the samples was recorded by using ELICO LI 127 pH meter.

3. Total hardness

The total hardness of the water samples was determined by EDTA titration, where 50 ml of well mixed sample was mixed with 1–2 ml buffer of pH 10 and a pinch of Eriochrome black-T indicator. The contents were then titrated with 0.01 M EDTA till wine red solution changes to blue.
Totalhardness=C×D×1000Volumeofsample

where *C*=ml of EDTA for titration, *D*=mg of $CaCO_3$ equivalent to 1 ml of EDTA.

4. Chemical oxygen demand (COD)

COD determination was carried out with dichromate reflux method with the addition of 10 ml of 0.25 N potassium dichromate ($K_2Cr_2O_7$) and 30 ml H_2SO_4+Ag_2SO_4 reagent in 20 ml diluted sample. The mixture was refluxed for 2 h and was cooled to room temperature. The solution was then diluted to 150 ml by using distilled water and excess $K_2Cr_2O_7$ remained was titrated with ferrous ammonium sulfate (FAS) using ferroin indicator.
COD=(A−B)×N×1000×8Volumeofsample

where *A* is the ml of FAS used for blank; *B* is the ml of FAS used for sample, *N* is the normality of FAS and 8 is milliequivalent weight of oxygen.

5. Biological oxygen demand (BOD)

BOD was estimated by preparing required volume of dilution water with the addition of nutrients namely phosphate buffer, magnesium sulfate, calcium chloride and ferric chloride. The diluted sample was transferred to BOD bottles. After determining initial DO, final DO was estimated of the bottles kept for incubation period of five days. The bottles kept for DO determination and blank were fixed by adding 2 ml manganous sulfate ($MnSO_4$), 2 ml of alkali iodide azide (NaOH+KI+NaN_3).

6. Sodium and potassium content

The sodium and potassium content of the treated and untreated samples were determined with the help of Systronics-128 flame photometer. The air pressure was kept at 0.5 kg/cm² and the gas feeder knob was adjusted so as to obtain a blue sharp flame. Each sample was aspirated into a flame in the form of a fine spray under carefully controlled excitation. After recording readings a standard graph of absorbance Vs concentration was plotted to estimate Na and K contents.

7. Heavy Metals

Heavy metals and minerals mainly Co, Cr, Cu, Fe, Ni, Zn, Cd, Mn, Pb and K were estimated from the wastewater effluents. The samples were digested following the standard method by Toth et al, and were estimated using Atomic Absorption Spectrophotometer (Perkin-Elmer, 3030 A).

8. Electro coagulation treatment

The experimental set up with a rectifier and beakers containing effluent was arranged and the samples were analyzed after 15, 30, 45, 60 min of treatments. A pair aluminum electrodes of the size 10 cm length and 2 cm in breadth were used in the present study and immersed to a 5 cm depth was used in the experiments. The electrodes were connected to a digital DC power supply of 30 V and a current of 3 A. All solutions were magnetically stirred at 500 rpm. All the runs were performed at constant temperature of 25 °C. In each run, 1000 ml of the wastewater solution was placed into the electrolytic cell. The current density was adjusted to a desired value and the coagulation was started. At the end of electrocoagulation, the solution was directly used without filtering in order to check the efficiency of electrocoagulation. Before each run, electrodes were washed with acetone to remove surface grease and the impurities.

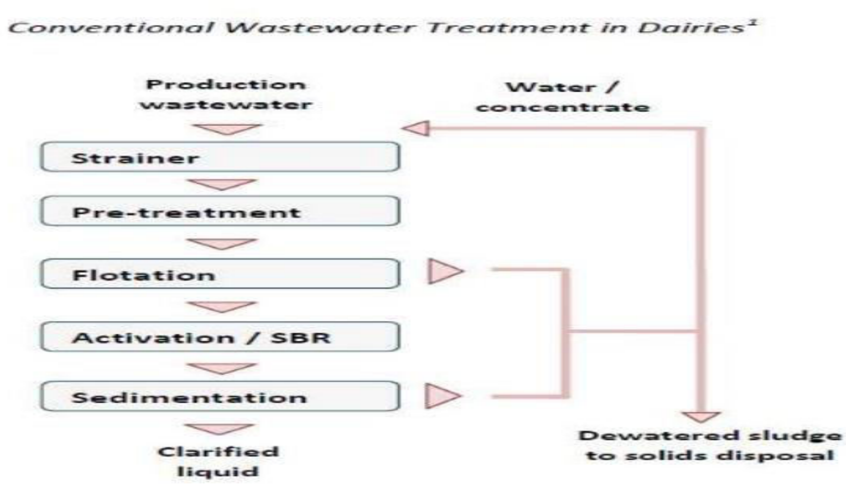
9. Alum treatment

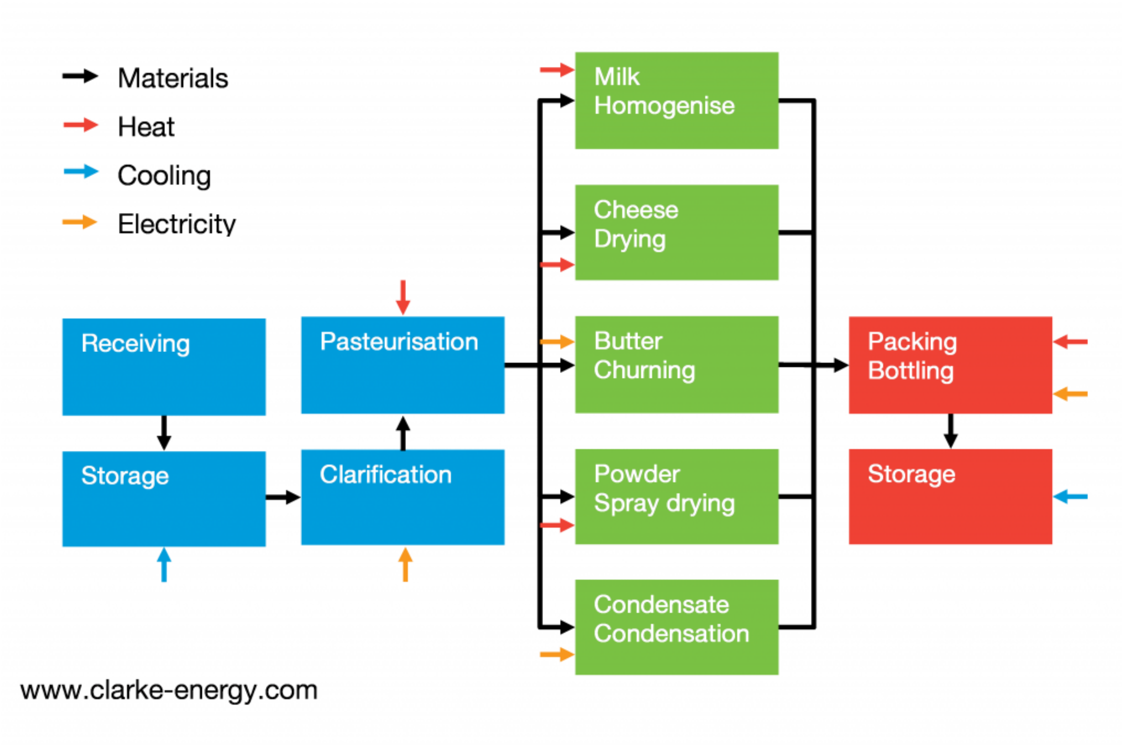
10 g alum was added to 1 l of distilled water to prepare stock solution. Each 1.0 mL of this stock solution will equal 10 mg\L (ppm) when added to 1000 mL of water to be tested.

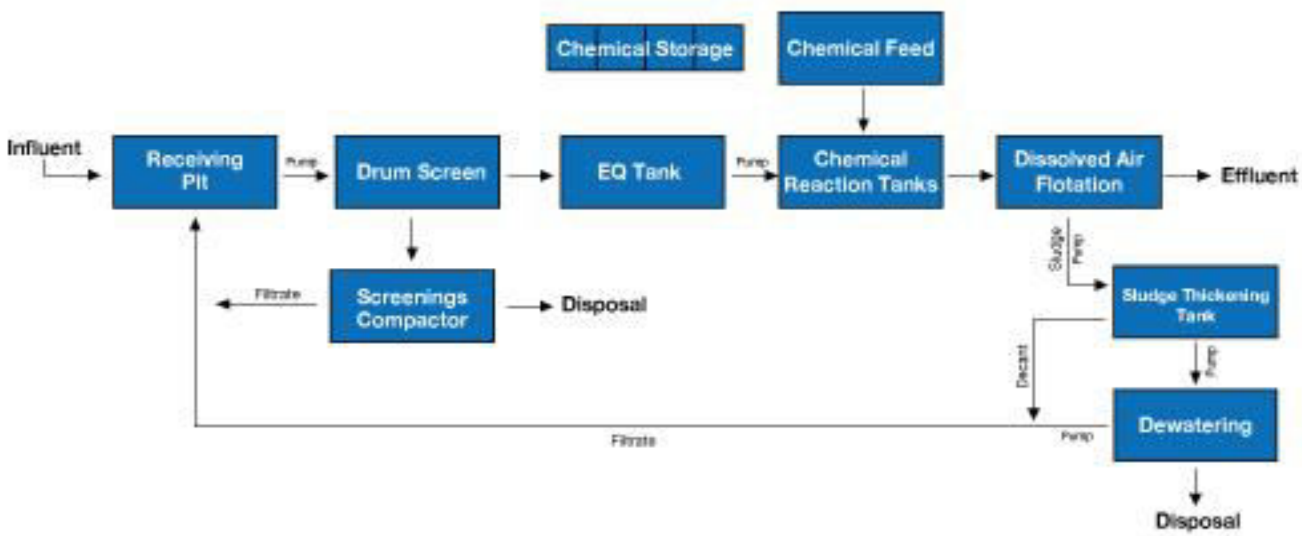
10. Powdered activated charcoal (PAC)

Powdered Activated Charcoal was used for adsorption treatment. Total six dosages were applied 0.5, 1, 1.5, 2, 2.5 and 3 g/L respectively and samples were analyzed.

Solution Q 8







Dairy Industry Wastewater Treatment. Producing **milk**, butter, cheese, or yoghurt, using pasteurization or homogenization produces **wastewater** with high levels of BOD and COD loads and must be reduced before being discharged to municipal **treatment** facilities.

USN | | | | | | | | | |

Improvement Test – May, 2018

Sub:	Industrial Wastewater Treatment					Sub Code:	10CV835	Branch:	Civil	
Date:	23/05/18	Duration:	90 min's	Max Marks:	50	Sem/Sec:	VIII		OBE	

<u>Attempt any four questions from part-A & any one question from part B</u>

		MARKS	CO	RBT
	<u>Part-A</u>			
1	Explain the main processes in cotton **textile industry.**	[10]	CO2	L2
2	What are the effects of waste disposal on water bodies?	[10]	CO2	L2
3	Explain the treatment flow sheet for **cotton textile industry.**	[10]	CO2	L2
4	Explain the alternative methods use for disposal of industrial waste, its reuse and recovery along with flow sheet.	[5+5]	CO3	L2
5	Write down the main processes in the **paper and pulp industry.**	[5+5]	CO3	L2
6	Explain with flow sheet the treatment methods use for **paper and pulp industry**	[5+5]	CO3	L2
	<u>Part-B</u>			
7	Write down the main characteristics of **food processing industry.**	[10]	CO3	L2
8	Explain the waste water treatment flow sheet for **dairy industry**.	[10]	CO3	L2

CCI CI

USN | | | | | | | | | |

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4	Explain the alternative methods use for disposal of industrial waste, its reuse and recovery along with flow sheet.	[5+5]	CO3	L2
5	Write down the main processes in the **paper and pulp industry.**	[5+5]	CO3	L2
6	Explain with flow sheet the treatment methods use for **paper and pulp industry**	[5+5]	CO3	L2
	<u>Part-B</u>			
7	Write down the main characteristics of **food processing industry.**	[10]	CO3	L2
8	Explain the waste water treatment flow sheet for **dairy industry**.	[10]	CO3	L2

CCI CI