Faculty of Engineering

Department of Textile Engineering

COMPARATIVE STUDY BETWEEN BIOCHEMICAL AND CHEMICAL ETPS".

Course code: TE4214 Course title: Project (Thesis)

Submitted by
Farhad Ahmed,
ID: 162-23-4670

Tanoy Kumar Saha, ID:
162-23-4679

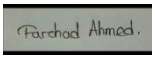
Supervised by
Sumon Mozumder
Assistant Professor
Daffodil International University

A thesis submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Textile Engineering

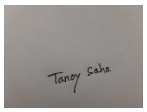
Advance in Wet Processing

DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Sumon Mozumder,** Department of Textile Engineering, Faculty of Engineering, Daffodil International University. We also declare that, neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma



Farhad Ahmed
ID:162 -23- 4670
Department of TE
Daffodil International University



Tanoy Kumar Saha
ID:162 -23- 4679
Department of TE
Daffodil International University

LETTER OF APPROVAL

This project report prepared by **Farhad Ahmed (Id: 162-23-4670)** and **Tanoy**

Kumar Saha (Id: 162-23-4679), is approved in Partial Fulfillment of the Requirement for the Degree of **BACHELOR OF SCIENCE IN TEXTILE ENGINEERING**.
The said students have completed their project work under my supervision. During the research period I found them sincere, hardworking and enthusiastic.

SUMON MOZUMDER

ASSISTANT PROFESSOR

DEPARTMENT OF TEXTILE ENGINEERING FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

ACKNOWLEDGEMENT

Firstly, we express our gratefulness to almighty Allah for his divine blessing makes us possible to complete this project successfully.

We are grateful to our supervisor **Sumon Mozumder,** Assistant Professor,

Department of Textile Engineering, Faculty of Engineering, Daffodil international University. Deep knowledge and keen interests of our supervisor in the field of textile dyeing and finishing influenced us to carry out the project work. His endless patience, scholarly guidance, continual encouragement, energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting these at all stages have made it possible to complete this project.

We would like to express our thanks to **Prof. Dr. Engr. Md. Saifur Rahman** , Head,

Department of Textile Engineering, Faculty of Engineering, Daffodil international University for his kind help to finish our project report. We would like to express our thanks to **Prof. Dr. Md. Zulhash Uddin**, Dean, BUTex and **Prof. Dr. S.M. Mahbub Ul Haque Majumder** for providing us necessary information to complete the report on time.

We would like to deliver thanks to our entire course mates in Daffodil International University, who took part in the discussion while completing the course work.

Finally, we would like to express a sense of gratitude to our beloved parents and friends for their mental support, strength and assistance throughout writing the project report.

DEDICATION

This projects report is dedicated to our Beloved Parents

ABSTRACT

The Effluent Treatment Plant is one of the most important parts in the textile industry, mostly necessary for the dyeing, printing and washing section. We faced lack of water due to global warming. For this reason ETP is a major part of every factory. Here we choose two factories, one factory can be used chemical ETP and another factory can be used biochemical ETP. We are working to learn about biochemical treatment plants and chemical treatment plants, which types of procedures are used and what tests are done before releasing water. We deeply studied about this and learned about the standard procedure. Doing this project we noticed how much water withdrawn each day and how much water released each day. We learned about the chemical utilization and cost. Biochemical ETP labs are more developed but chemical labs are poor, but try to collect the test results. We try to compare with lab data and the government standard data. In biochemical ETP plant maximum test is done but in chemical ETP plant only three tests are done. Then we try to compare with government standard data. Both industries try to properly utilize chemicals. PAC is used in large quantities in both ETP plants. One month's data is taken. Biochemical ETP processed 7200m^3 waste water per day and the chemical ETP processed 90 m^3 per day. In biochemical ETP , pH is 7.44, BOD is 18, COD 143, TSS 28.27 and TDS is found 798.In chemical ETP , pH is found 7.45,TDS data is found 797. Every month an audit is held by the ITS. They mainly check the procedure and condition of discharge water and every process is done by the standard measurement or not. Chemical cost for biochemical ETP is 1726337 BDT, and chemical cost of chemical ETP is 855490 per month .From this project we learned about which types of process sequence is done and which process is done before discharging water. We compared two types of ETP .From this comparison we think that biochemical ETP is costly but the discharging water is eco-friendly for the environment.

Table of Contents

List of Figures:

List of Table:

Chapter-1

Introduction

The Waste-water Treatment is the process that, takes contaminated water and processes it several times through different cleaning process. We have worked on chemical treatment process and bio-chemical treatment process of a & b garment industries. To assist cleansing, chemicals are used in wastewater treatment processes. Chemical reactions including chemical process are called chemical unit process which are utilized nearby biological and many types of physical cleaning process follow many types of water standards. Specialized chemicals for example poly aluminum chloride, polyacrylamide, de-color etc. can be used for chemical ETP and polyacrylamide, aluminum chloride, de-color, Anti-foam, phosphoric acid, urea etc. are used for bio-chemical ETP. All these are utilized for diverse work like coagulation, flocculation, to evacuate water odour and color etc. In the time of cleaning, chemical coagulation and chemical precipitation, chemical oxidation, and advanced oxidation, ion exchange, and chemical neutralization and stabilization can be applied to wastewater [1].

1.1 Objectives of the study

The wide objective of the thesis work is to consider on bio-chemical effluent treatment plant and chemical effluent treatment plant (ETP) the particular targets of the work are as takes after-

1. To know about the chemical ETP plant.
2. Analyzing the Bio-Chemical ETP plant.
3. Selection of chemicals used both chemical and bio-chemical ETP plants.
4. To assess the average amount of waste water that are processed and on each day and in a month basis average chemicals are used to run among ETP.
5. To know treatment cost of chemical ETP & bio-chemical plant (ETP) and cost of power consumption both of ETPs.

Chapter-2

Literature Review

2.1 Effluent Treatment Plant

Effluents are generated of extremely by textile wet process, variable composition and constitute an environmental risk specially water pollution of major concern. Rapid disposal of untreated water disturbs To secure the environment from hazardous impact of waste water from textile industry, industries begun setting ETP in their ranges. So that refusal waste water can loss no biological creature. On ETP the treatment of mechanical effluents and squander waters is done. ETP plants are utilized greatly within the mechanical segments. During the fabricating handle, shifted effluents and contaminants are created. Effluent treatment plants are utilized within the evacuation of tall sum of organics, flotsam and jetsam, dirt, grit, contamination, harmful, non-toxic materials, polymers etc. from squander water .ETP plants utilize vanishing and drying strategies, and other assistant strategies such as centrifuging, filtration, cremation for chemical preparing and effluent treatmentthe ecosystem.1500 m3 of profluent is delivered each day by any 10-ton capacity composite manufacturing plant. Which contains chemicals counting salts, colors and dyes.

Beneath the 1997 rules fabric coloring and chemical handling “Red industries” are bound to utilize effluent treatment plant [2] organic creature.

2.2 Types of ETP

Wastewater treatment processes may be grouped into two general categories, the first being physical/chemical.

There are various types of ETP. They are chemical, biochemical and biological.

2.3 Chemical ETP

category includes screening, sedimentation, filtration, precipitation, and chemical destruct systems. The dissolved inorganic components can be removed by adding an acid or alkali, by changing the temperature, or by precipitation as a This solid. The precipitate can be removed by sedimentation, flotation, or other solid removal processes [1]

2.3.1 Advantages of chemical ETP:

- Less amount of space needed.
- Initial investment is low.

2.3.2 Disadvantages of chemical ETP:

- water is not purified properly.
- Only chemicals are used ,so it is not eco friendly for the environment.

2.4 Biological ETP

The second category is biological, includes processes which rely on living organisms to remove pollutants from the wastewater. This includes processes such as waste stabilization lagoons, trickling filters, rotating biological contactors, and activated sludge.

Biological Growth Equation=(λS)/(KS+S) BB1 μ = Specific Growth Rate Coefficient λ = *Max growth rate*

S= Concentration of limiting nutrient

Ks= Monod Coefficient

Organic + Bacteria + Nutrients + Oxygen → New Bacteria + CO_2+H_2O+ Residual Organics + Inorganics

The activity of bacteria is affected by several environmental factors. As well as the rate of biochemical reaction. Toxic materials, nutrient concentration, dissolved oxygen, pH, temperature are the most important factors. These all can be controlled by the biological treatment system named bioreactor, to make sure that the growth of microbial is under maintenance of bioenvironmental condition. For biological treatment the optimal temperature ranges from 20-40^0 Celsius. Aeration tank and filters operate at 12-25 degree Celsius. The air temperature rate has an important and outstanding effect on heat loss. High temperature increases the biological activity, which helps to increase the substrate removal rate. But sometimes it may cause problems with oxygen limitation [3].

2.4.1 Advantages of Biological ETP:

- There are no toxic chemicals used.
- This ETP is Eco-friendly ,less maintenance cost.
- Sludge can be reused in this ETP.
- Rate of efficiency is high.

2.4.2 Disadvantages of Biological ETP:

- Huge amounts of places are required.
- Firstly higher investment is needed.
- The Presence of toxic heavy metals eliminates microorganism growth.

2.5 Biochemical ETP:

In most cases wastewater treatment is accomplished through the use of a combination of physical/chemical and biological treatment processes. It is also called biochemical effluent treatment plant. For instance, a typical treatment plant might include preliminary treatment (physical) to remove large debris and grit, primary treatment (physical) to remove settle able suspended solids, secondary treatment (biological) to remove the remaining particulates and dissolved organic material, chemical precipitation to remove nutrients, tertiary filtration (physical) to remove remaining fine particulates, and chemical or ultraviolet light disinfection.

2.5.1 Neutralization:

Controlling of the pH of wastewater, no matter in case it's acidic or alkaline. In the event that there's not adequate soluble base an addition of base is required to alter pH to reach an movable run. CaO, Ca(OH)2, NaOH, Na2CO3, these are ordinarily utilized for altering the pH. And for the need of causticity base addition will be of H2SO4, H2CO3 and other common chemicals [1].

2.5.2 Advantages of Biochemical ETP:

- Less space is required for this ETP
- Very good treatment efficiency.
- Initial cost is lower.

2.5.3 Disadvantages of Biochemical ETP:

- Different chemical which is used in this ETP which may have adverse effect on environment
- Maintenance cost is higher.

2.6 Properties Tested

2.6.1 Water Color test/Jar Test

The Color of discharged water is tested first at a small amount to make sure the amount of the chemicals might be required for discharged water.

2.6.2TDS

Total dissolved solids (TDS) is a measure of dissolved content of all types of inorganic,organic substances which are in liquid either molecular,sometimes ionizedand micro-granular suspended form. TDS can be tested as both types of ETP.

2.6.3 P^H

P^H scale which is used to measure the amount of acidic, alkali and basic in water-based solution. Acidic solutions pH scale range is 0-7, on the other side basic solutions contain high pH. Pure water P^H is only 7,at 25 degree centigrade. pH can be tested for chemical and biochemical ETP.

2.6.4 Suspended Solid

Suspended solids which reveal tiny solid particles can be found in suspension of water as colloids, can be removed by the sedimentation for their largest size. It is commonly expressed as one indicator.

2.6.5 COD

COD which is known as chemical oxygen demand. The amount of oxygen which is consumed by a reaction. The amount of water easily measured by COD test. [3].

2.6.6 BOD

BOD which is known as biological oxygen demand. Bacteria consume which amount of oxygen,microorganisms which decompose the organic matter.BOD is tested during the effluent treatment process. [4].

2.7 Industrial processes which contributes to wastewater:

2.7.1 For biochemical ETP:

De-sizing:

Removal of size applied during denim fabric making warp yarn is known as desizing. In the sizing process starch and wax, other materials are CMC, and polyvinyl alcohol is commonly used. The size material is applied in various types of woven fabrics to strengthen the yarn during the weaving process.

In numerous sorts of sizes there are two major bunches: Water-soluble carboxy-methyl cellulose .Waterinsoluble starch-based sizes.

- Starch-based sizes which are commonly used for their low prices and accessibility.

Methods for removing sizes from denim jeans are:

- Garment washing with high alkaline agents
- Garment washing with highly acidic agents
- Garment washing with oxidative chemicals

Stone Washing:

One of the most utilized essential prepare that can be utilized alone or combined with other forms to get twist particular impacts is stone wash. Indigo colors don't enter into the fiber, and the colored surface fiber is expelled by scraped spot of the stones on the strands. The stones and denim are spun together in mechanical washing machines to pick up an matured and worn out appearance since of scraped spot. This prepare expels the surface uncovers the white insides of the yarn, improves the hand of items and produces a shinning appearance. Pumice stones of different sizes make distinctive blurs. Varieties can be accomplished by changing the sum of alcohol proportion, article of clothing stack, estimate and shape of stones, number of stones, cycle time, and chemical expansion. As a result, the texture experiences different cleaning, flushing, softening and drying forms [5].

Enzyme washing:

Wash of enzymes could be a modern strategy and has nearly replaced stone washing. In denim fabrics, since of an enzymatic scraped area, colors are discharged from yarns, giving contrasts in blue color. The fibrillation delivered whereas maturing prepare is the result of the activity of cellules and mechanical activity. The pumice stones harm the washing machine and diminish the strength of texture since of scraped spot within the stone washing handle. Celluloses avoids harm

to the machine and articles of clothing, evacuates the time for expulsion of utilized stones, increments the sum of pieces of clothing within the washing machine and progresses the quality of wastewater [5].

Acid Washing:

Sodium hypochlorite, potassium permanganate or bleach solutions with the pumice stones and after that tumbling comparable to stone but washing with a little sum of water to get lighter colors. Ice, ice or white washed pants are gotten with these acid wash application methods. Acid wash as well has the tendency of yellowing, so it ought to neutralize as well [5].

Tinting and overdyeing:

Request for tinted and over dyed looks on pieces of clothing are one of the foremost common patterns. An extra coloring prepare is brought to color the piece of clothing somewhat or totally. These are as a rule carried out after the washing processes, to donate the ultimate denim a dirty, vintage and worn out see. Pants are colored in part by using coordinate dyestuffs during tinting, Overdyeing is the method of coloring the complete garment with responsive dyestuffs or metal complex dyestuffs [5].

Spray applications:

Spraying may be a distinctive strategy by applying the chemical only to the surface and to the specified parts of the denim piece of clothing. Air pressurized hand guns are utilized to spray the chemical on the surface of articles of clothing, which are placed on swelled vertical mannequins. Diverse chemicals are splashed for diverse purposes. Rather than manual spraying, splash robot machines are now broadly utilized within the laundries. The robot sprays chemicals within the right position and within the right sum on all of the pants within the bunch, and so the same impacts will be obtained after the washing method. This standardizes the spraying process to ensure standard quality. Potassium permanganate is utilized to somewhat differentiate and a variety of impacts. It is connected particularly on sanded parts of the article of clothing to extend the differentiation. After this handle, they are neutralized, washed, softened and dried.

spraying of polyurethanes for coating purposes, to get a leather like see and to increase the strength of the articles of clothing. Micro-silicones and greasy acids are utilized as splashing chemicals to get an extremely delicate handle. Within the overdyeing of one color over another, shades are showered to color as it were the exterior of the piece of clothing. Resins are too connected by the splashing method to create the fold's lasting in wanted parts of the pants, to grant 3D wrinkle impacts, to get simple care items, etc. [5].

Bleaching:

Bleaching of denim garments implies lightening the color of the indigo dyed piece of clothing. Sodium hypochlorite, calcium hypochlorite, hydrogen peroxide and potassium permanganate can

be applied to lighten the pieces of clothing. Dying can be applied rather than stone washing, sometimes together in conjunction with stone washing. To halt yellowing impact, neutralization may be a must after fading. And to avoid any kind of wrinkle check or yarn harm, articles of clothing or fabrics must be put away carefully. The squander water from dying as well as neutralization contributes to the ETP waste water inlets [5].

2.7.2 For Chemical ETP:

Scouring :

Scouring is a very important process before fabric dyeing, for better dyeing scouring is must. In this process we used caustic soda containing highly alkaline . Oil, grease, fat and another is wax found in water. [5].

Dyeing:

There are various types of dyes used in the dying process. The water is highly colored. The water contains various dissolved solids. [5].

Finishing:

Fabric softener and inorganic salts which is used for textile finishing. Which contains highly alkaline and low BOD. [5].

2.8 Flowchart for Biochemical ETP:

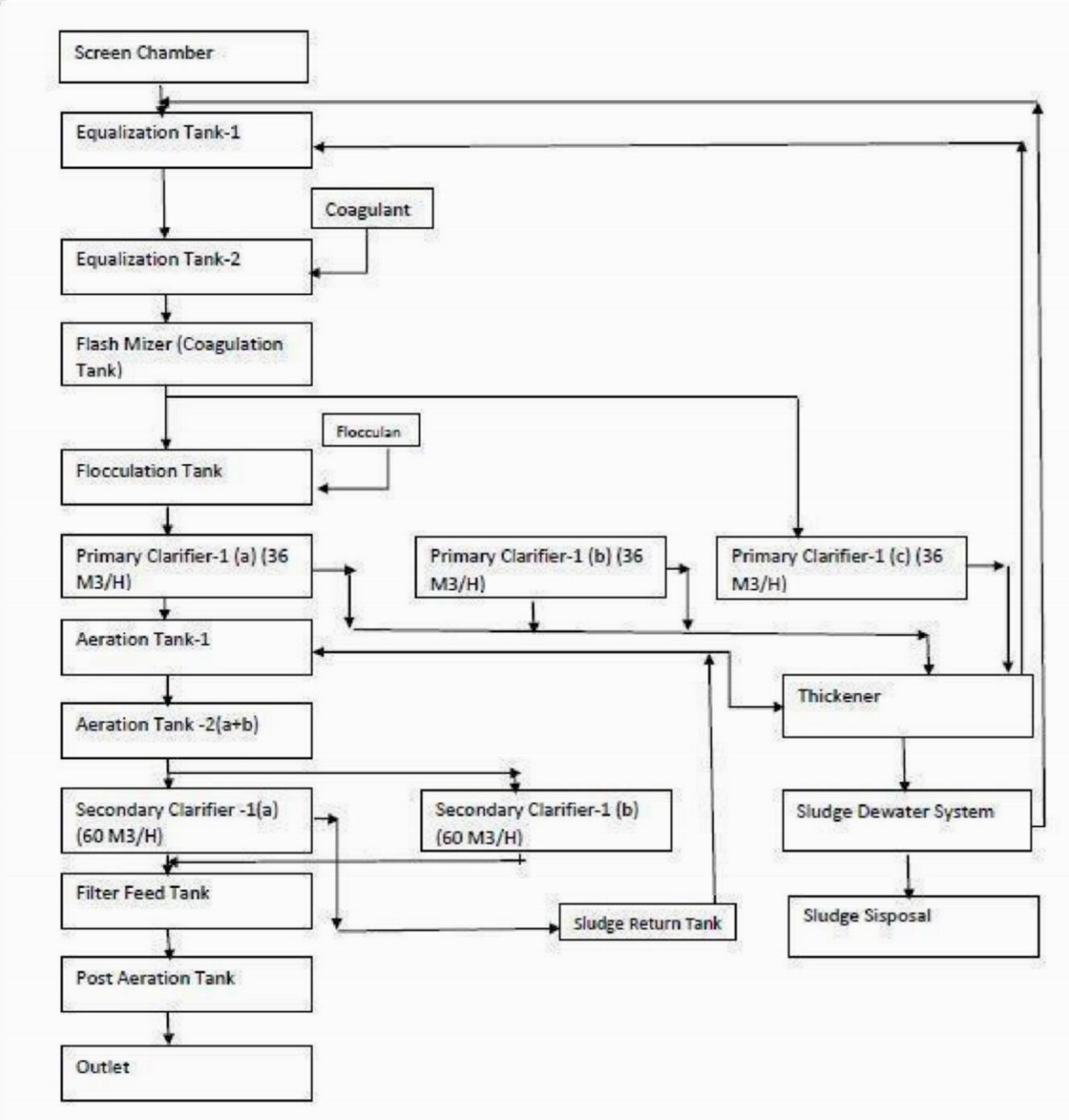


Fig-2.1: Flowchart of biochemical ETP

2.8 Flowchart for Chemical ETP:

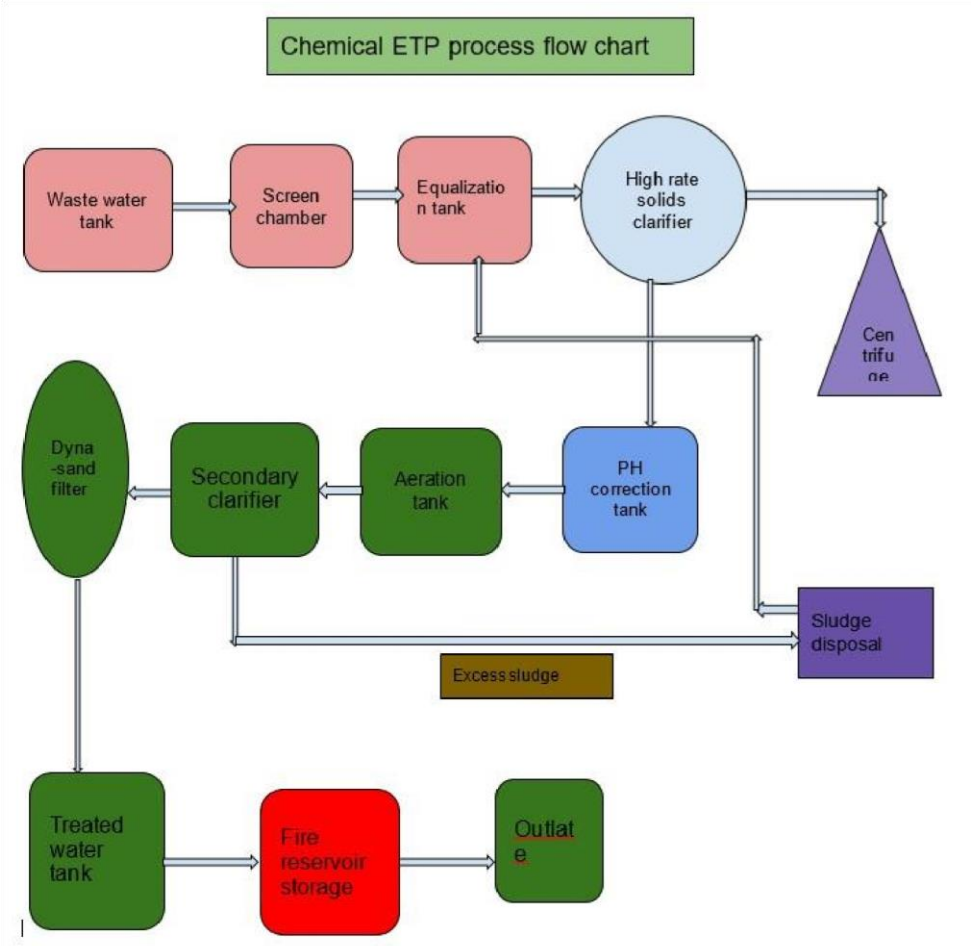


Fig-2.2:Flowchart of chemical ETP

2.9 Process Description for Biochemical ETP:

2.9.1 Greet removal:

Usually utilized to evacuate materials like little stones or sand molecule from waste water. Large particles get blended with water and clogs the drainage framework. And the particles can make

1.2-2.5 mm gaps. This can be why greet removal is done [6].

2.9.2 Equalization Tank

Industrial waste incorporates the water parameters such as COD, BOD, SS are screened, at that point they are settled in equalization tank. Here, diverse fluids from distinctive segments are blended, at that point their concentration is made lower. In an equalization tank, pH can be adjusted, color of waste water can be changed into light color. Pressure driven maintenance of this tank must be least 8 to 10 hours. Discuss bower and diffuser changes over all the materials in same concentration for oxidation, the bio life forms begin to spoil absent. As well as the temperature

increments a bit. Temperature increments 10% - 20%. The organic prepare happens in ideal temperature. Pre-aeration quickens the lessening of alkali. And as a result nitrification happens on the fluid [6].

2.9.3 Flush Mixer

In this tank, the waste liquid is treated in three steps.

- Chemical mix
- Coagulation
- flocculation

Process: For coagulation and flocculation chemicals are blended independently. For Hydraulic retention time ought to be 5 to 10 minutes. Each chemical ought to be dosed independently. pH constrain is 8.5 -9.5. In this tank the color of the waste water changes and suspension of strong squander can be found. These are called flocculants. The measure of a good flocculent is 0-0.1 mm [6].

2.9.4 Primary Clarifier:

The flocculants are turned into suspension here. There are two sorts of clarifier. Bridge clarifier and circular clarifier. Its hydraulic retention time is 3-4 hours. Suspensions are found on the foot of this tank. The estimate of the flocculants here are 0.1 to 3 mm. Fiber sheets are utilized under it, which ought to be cleaned once a week, and after each 15 days, fiber sheets have to be be changed. Sludge's foot of it are expelled after each 1 to 2 hours. Water temperature ought to be between 30-350 Celsius. For the floating waste, a V-notch is utilized. And water flood ought to be kept up. And sludge setting ought to be kept up here [6].

2.9.5 P^H Adjustment:

In case the pH of waste water isn't neutral, or more or less than 7 or 8, pH must be kept up. If pH is under 7, it'll got to be adjusted by soluble chemicals. And on the off chance that it's over 7, it must be neutralized with acidic solution [6].

2.9.6 Aeration Tank:

In this tank, bacteria culture and microbes wastewater treatment is done. This tank is called an air circulation tank since discuss is provided here by a diffuser with the assistance of a blower.
Hydraulic retention of this tank ought to be between 12-24 hours. Bacteria can live appropriately since of appropriate discuss supply.DO here ought to be between 2.5- 4 ppm. In this tank aerobic

and facultative microbes are show. For bacteria activity, nutrition could be a must. Such as urea, DAP, Potassium, Calcium. pH constrain is 7.5-8. Temperature must be 29-32 degree Celsius [6].

2.9.7 Secondary Clarifier:

From the biological tank, a few biogas and floating microscopic organisms are exchanged into this clarifier. In this tank activated sledges are assembled. From this tank a few sludge are recycled.

And a few sludge is sent to sludge thickener. Hydraulic retention is 3-4 hours [6].

2.9.8 Sludge Thickener:

In this tank, sludge from primary and secondary clarifier are brought. Hydraulic retention time is 45 minutes to 1 hour. Every day sludge dewatering should be done for 2 to 3 times. In this tank aeration filter is used [6].

2.9.9 Multi grade sand and activated carbon filter:

It clears the water, and reduces the amount of suspended solids. Reduces a small amount of TDS.

This tank must be backwashed per day [6].

2.9.10 Post Aeration Tank:

In this aeration tank, DO which is increased by aeration. Hydraulic retention period may be 3040 minutes [6].

2.10 Process description for chemical ETP:

2.10.1 Screen chamber:

At first the waste comes from a waste water tank. The various types of particle like part of thread, yarn everything is processed in this section by screening process. This chamber is used to remove large solids. To avoid clogging and abrasion of mechanical equipment.

2.10.2 Equalization tank:

After the screening process water inter in the equalization tank. The main function of this tank is to mix various types of waste water, like dyeing water, finishing water etc. For This reason sometimes it's called a mixer tank. effluents show different concentration in every moment.

Subsequent treatment systems can eliminate shock loading. It can eliminate settling of solids.

2.10.3 Clarifier:

The extra sludge is clarified in this process. The sludge deposit under the secondary clarifier tank. Then the extra sludge inter sludge disposal section.

2.10.4 Aeration tank:

In this process pH ,DO and TDS is checked . The pH is 6-9 ,TDS is 2100,and DO is 4.5-8. Water gets direct contact with the air to dissolve the oxygen into water. After that process the water is ready for drainage.

N.B I have given the description of the ETP where I am completing my internship.

CHAPTER-3

METHODOLOGY

3.1 Chemical used for the treatment of waste water:

3.1.1 For Chemical ETP:

- Poly Aluminum Chloride
- Water de-coloring agent
  Poly electrolyte

3.1.2 For Bio-Chemical ETP:

- Poly Aluminum Chloride
- Water de-coloring agent
- Poly electrolyte
- Urea
- Anti-foaming agent Phosphoric acid

3.2 Function of the chemicals:

3.2.1 Poly Aluminum Chloride:

Poly aluminum chloride which is known essentially as PAC, is commonly utilized as a coagulant during water purification. This chemical is more effective during destabilizing and the evacuation of suspended materials than other aluminum salts. PAC is utilized for increasing the speed of flocs shaping and settling faster. Flocs shaped are simple to filter from the waste water [11].

3.2.2 Water de-coloring agent:

Water de coloring Agent may be a sort of high proficiency with decolorizing flocculants which is utilized to evacuate color and a uncommon material for de-coloring and flocculating. Water decoloring agents which can be utilized before and after the biochemical treatment. It is recommended to be dosed after the biochemical treatment which can be with low consumption, and low impact to the bacteria [7].

3.2.3 Polymer (Anionic):

Polymers are utilized to coagulate suspended solids and create large curds of solid materials (floc) [7].

2.3.4 Antifoam:

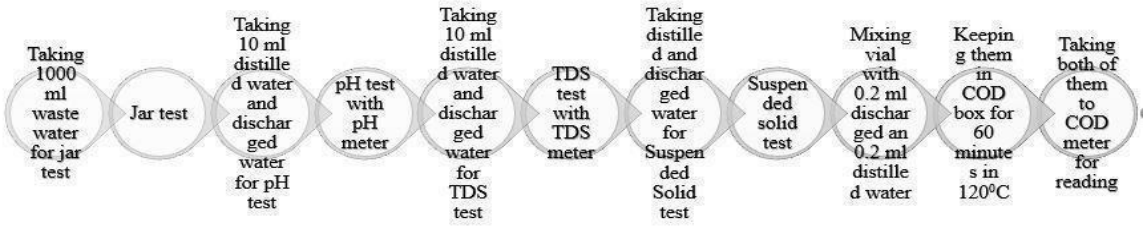
Antifoam destroys the foam. It is more effective to reduce gas bubbles.[4]

2.3.5 Phosphoric acid:

Phosphoric acid maintain the Ph and helps in corrosion inhibition.[5]

Urea: coagulation and flocculation is done by urea in biochemical ETP. Which is more helpful for increasing the bacterial growth.

3.3 Lab tests:



3.3.1 Water color test/ Jar test:

At first the waste water from the previous day is collected. 1000 ml water is taken, and 5 ml decolor and 12ml PAC is blended. At that point the solution is mixed at 80 r.p.m. for 10 minutes. After 10 minutes the solid particles begin to precipitate. According to this test, the lab director chooses how much PAC and decolor will be required for bulk waste water.

Figure: 3. 1 Jar test

3.3.2 Measurement of TDS:

TDS is measured with a TDS meter. Here, they utilize the water that's progressing to be released, not the waste water. After the result they coordinate it with the standard result and take the decision of releasing it.

Figure: 3. 2 TDS and pH meter

3.3.3 Measurement of pH:

pH is also measured with a pH meter. The reading is taken from discharged water. The result is compared with the standard.

3.3.4 Measurement of Suspended solid:

For suspended solid both released water and distilled water are required. On the meter, distilled water is utilized for calibration. After calibration is done, discharged water is set within the box and the result is compared to the standard.

Figure: 3. 3 Suspended solid measuring instrument

3.3.5 Measurement of COD:

COD can be measured only one time in a week. The cost of the COD test is higher than all of the tests. To test COD there's two instruments.

3.3.6 Test with vial:

Vial is a solution of potassium dichromate. For vial test, two tubes of vial are utilized. One will contain vial with 0.2 ml of distilled water, and other will contain vial with 0.2 ml of discharged water. After they are blended, the temperature increments within the tubes quickly. The tubes at that point kept the interior a compact glass jar. There both tubes are kept for 30 /60/ 120 minutes for 100/120/1500C temperature. After that, they are kept 60 minutes to cool. After cooling they are taken to the COD meter. Where at to begin calibration is done with refined water, and after that reading of discharged water taken. At that point compared to the standard.

Figure: 3. 4 Vial

Figure: 3. 5 Vial placement with discharged and distilled water

Figure: 3. 6 COD measurement

3.3.7 Measurement of BOD:

BOD test is the lengthiest test of all. It nearly requires 5 days to grant a result. BOD test is done interior a glass bottle. Where 244 ml water taken. At that point Nitrification drops 5ml which includes the interior of the bottle with water, and 5 drops of potassium moreover included on the cap of the bottle. Then the bottle is kept interior the BOD machine at a low temperature. After five days the result showed and compared.

Figure : 3. 7 Glass bottle with distilled water and nitrification

Figure: 3. 8 BOD measurement

CHAPTER-4

DISCUSSION OF RESULT

4.1 Monthly chemical used in both ETP

4.1.1 Quantity of chemical used per month:

According to the various sorts of water different sorts of chemical are utilized in ETP. Their amount which is additionally shifting from each other. We as of now know that diverse sorts of impurities display in industrial waste water, an increment of impurities moreover increment the amount of chemical required to minimize those from water. Here Table appears the chemicals quantity used monthly basis.

	Chemical ETP			**Bio-Chemical ETP**					
DAY	PAC(Kg)	Poly Electrolyte(Kg)	Water De-coloring Agent(Kg)	PAC(Kg)	Poly Electrolyte(Kg)	Water De-coloring Agent(Kg)	Antifoam (Kg)	Phosphoric Acid(Kg)	Urea(Kg)
Day-1	450	3.0	140	750	08	360	100	70	0
Day-2	450	3.0	140	825	10	120	40	0	0
Day-3	455	3.1	143	750	06	30	120	0	0
Day-4	457	3.2	145	825	08	0	0	0	0
Day-5	445	2.9	141	750	08	240	50	0	0
Day-6	450	3.0	140	600	09	30	30	0	0
Day-7	452	3.0	142	800	09	30	10	0	0
Day-8	447	2.7	138	850	08	0	0	0	0
Day-9	452	3.0	142	1000	09	30	0	0	0
Day-10	450	3.0	142	875	10	0	0	0	0

Day-11	447	2.9	141	975	06	150	10	0	0
Day-12	447	2.9	140	675	08	120	0	35	50
Day-13	450	3.0	140	700	09	180	25	0	0
Day-14	452	3.0	142	1025	08	210	50	0	0
Day-15	455	3.1	142	950	10	240	25	0	0
Day-16	450	3.0	140	925	09	180	0	0	0
Day-17	452	3.0	142	850	12	300	60	12	30
Day-18	450	3.0	141	750	09	330	20	0	0
Day-19	448	2.9	143	900	10	360	40	35	5
Day-20	450	3.0	143	1025	08	420	20	0	17
Day-21	452	3.0	138	1175	10	360	50	0	16
Day-22	452	3.0	139	1075	14	450	70	35	10
Day-23	455	3.1	140	1200	08	390	100	0	50

Day-24	452	3.0	138	850	10	360	50	25	50
Day-25	447	2.8	137	1100	10	450	100	25	90
Day-26	450	3.0	140	1100	11	420	120	35	50
Day-27	450	3.0	141	1150	16	340	100	35	50
Day-28	452	3.0	150	1100	18	380	110	35	50
Day-29	448	3.9	198	1100	16	450	100	35	50
Average each day chemical consumption	450	3.0	140	919	10	239	41	13	18

Table: 4. 1 Quantity of chemical used per month

Table 4.1 shows how much chemical is every day consumed by Chemical and Bio-Chemical ETP. The most expended chemicals are PAC and de-coloring operator in both of treatment plant. The slightest utilized chemical is Phosphoric Acid. Which is close the consumption of Anti-foam.

4.1.2 For Chemical ETP

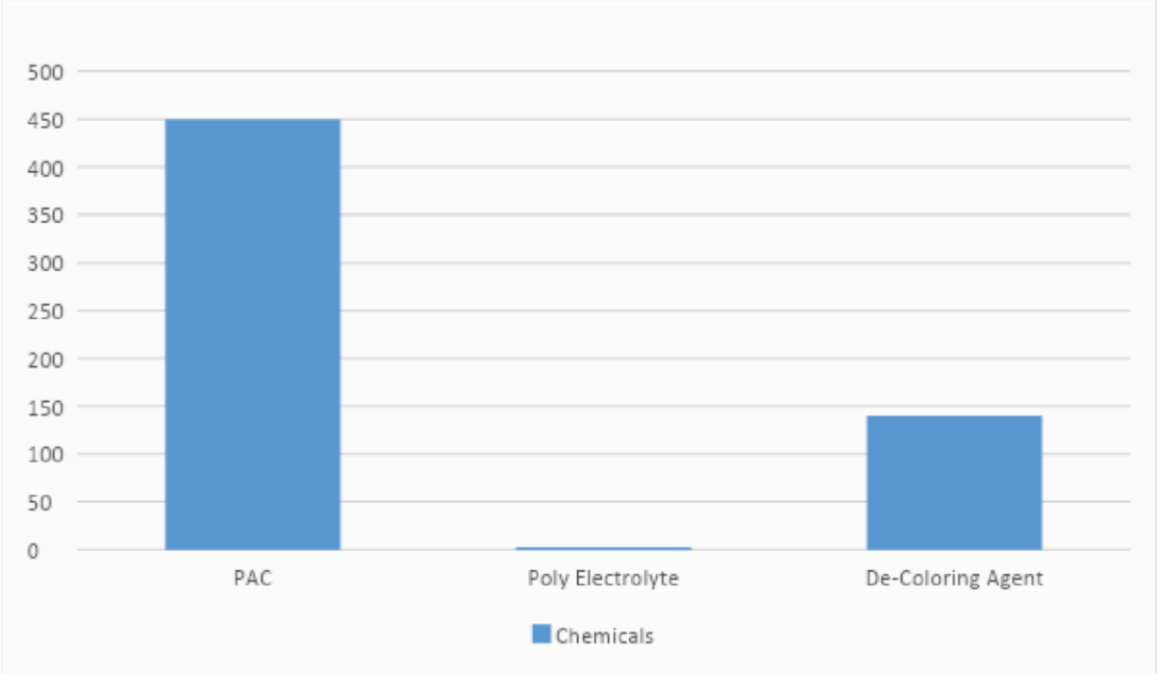


Figure: 4. 1 Average chemical used per day (kg)

Figure 4.1 shows a bar graph which represents chemicals used on each day on average (in kg).

The most utilized chemicals are PAC and water de-foaming agent. De-coloring agent can be utilized to remove color from waste water. PAC is utilized as a coagulant in water purification. It is more effective at destabilizing and evacuation of suspended materials than other aluminum salts. PAC increments the speed of flocs forming and settling makes faster. Flocs formed are simple to filter from waste water. Usually why these two are utilized more than other chemicals. PAC is utilized approximately 500 kg per day. Though slightest utilized comparatively less than each other chemical. DE color is utilized 140 kg per day. In any case, the chemicals are used to run the treatment plant without making any risk within the environment. This much chemical per day helps to discharge hazard free water that does not harm the environment.

4.1.3 For Bio-Chemical ETP

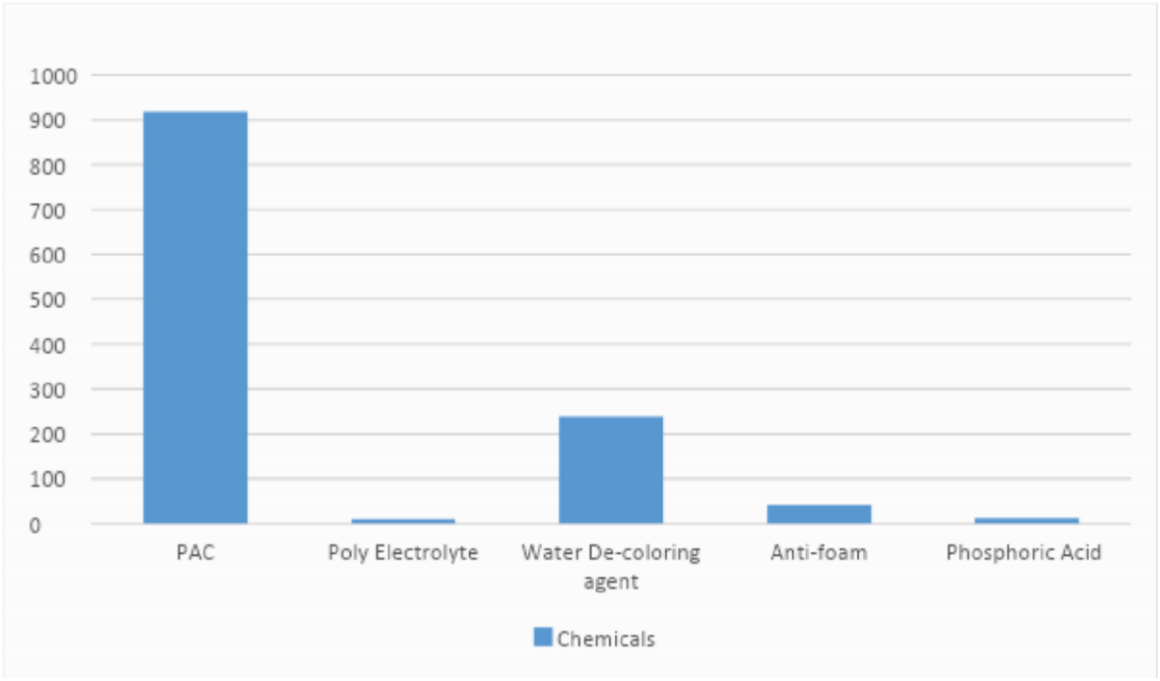


Figure: 4. 2 Average chemical used per day (kg)

Figure 4.2 shows a bar graph which represents chemicals used on each day on average (in kg).

Here, in bio-chemical treatment process PAC is used 939 kg. Poly electrolyte is used 239 kg. And antifoam can be used to resist foam formation during the treatment process.

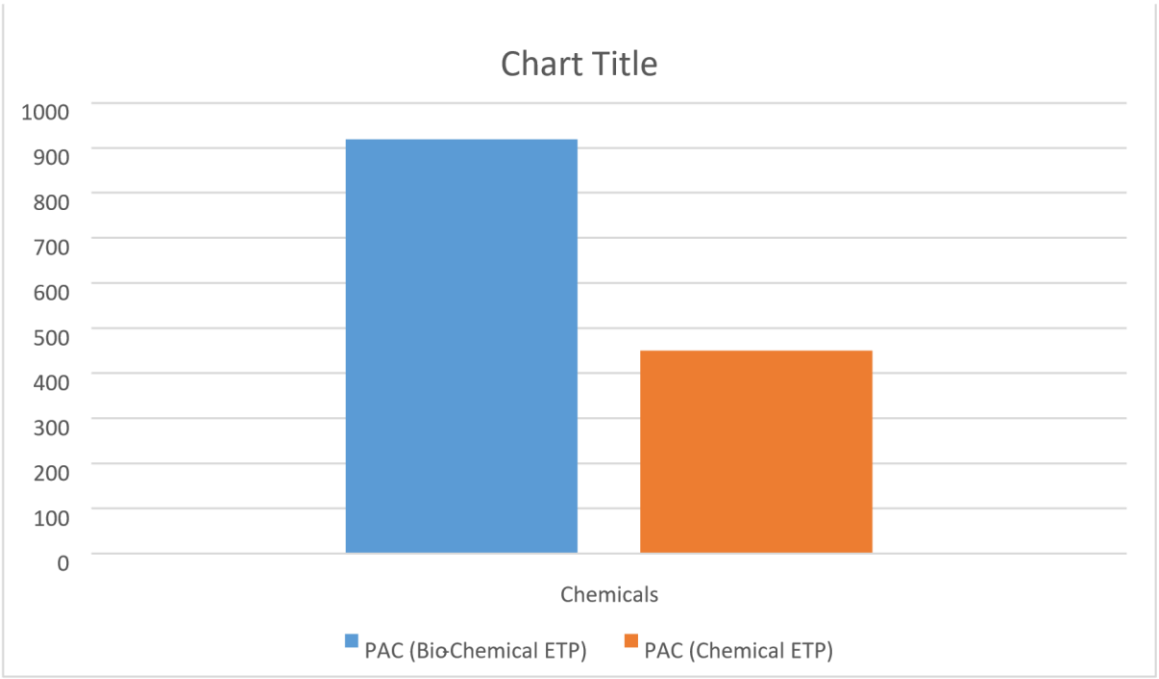


Figure: 4.3Compare Average chemical used per day in both ETP (kg)

Figure 4.3 shows a bar graph which represents a chemical used on each day in both ETP (in kg).

Here, in bio-chemical treatment process PAC is used 939 kg. And in chemical treatment process PAC is used 450kg.

Inlet and Outlet Parameters in both ETP

Bio-Chemical ETP				**Chemical ETP**			
Inlet Parameter		**Outlet Parameter**		**Inlet Parameter**		**Outlet Parameter**	
P^H	6-8	P^H	6.5-9	P^H	8-9	P^H	6-8
BOD(20C)	150-350 mg/l	BOD(20C)	30 mg/l	COD	400-450mg/l	COD	200mg/l
COD	350-450 mg/l	COD	200 mg/l	TSS	300mg/l	TSS	150mg/l
TSS	250 mg/l	TSS	150 mg/l	Colour	Dark	Colour	ADMI 150
TDS	1500-2000mg/l	TDS	2100mg/l				
Colour	Dark	Colour	ADMI 150				

National Standard Value

Table 3.3: National Standards – Waste Discharge Quality Standards for Industrial Units and Projects: Quality at Discharge Point

Parameter	Unit	Location of Final Disposal		
		Inland Surface Water[1]	Public Sewer[1]	Irrigated Land[1]
Ammonia (free ammonia)	mg/L	5	5	15
Ammoniacal Nitrogen (as N)	mg/L	50	75	75
Arsenic (As)	mg/L	0.2	0.5	0.2
BOD_5 20°C	mg/L	50	250	100
Boron (B)	mg/L	2	2	2
Cadmium (Cd)	mg/L	0.05	0.5	0.5
Chloride (Cl^-)	mg/L	600	600	600
Chromium (hexavalent Cr)	mg/L	0.1	1.0	1.0
Chromium (total Cr)	mg/L	0.5	1.0	1.0
COD	mg/L	200	400	400
Copper (Cu)	mg/L	0.5	3.0	3.0
Cyanide (CN)	mg/L	0.1	2.0	0.2
Dissolved Oxygen (DO)	mg/L	4.5–8	4.5–8	4.5–8
Dissolved Phosphorus (P)	mg/L	8	8	10
Electrical Conductivity	µMho/cm	1200	1200	1200
Fluoride (F)	mg/L	7	15	10
Iron (Fe)	mg/L	2	2	2
Lead (Pb)	mg/L	0.1	0.1	0.1
Manganese (Mn)	mg/L	5	5	5
Mercury (Hg)	mg/L	0.01	0.01	0.01
Nickel (Ni)	mg/L	1.0	1.0	1.0
Nitrate (N molecule)	mg/L	10.0	Undetermined	10.0
Oil and Grease	mg/L	10	20	10
pH		6-9	6-9	6-9
Phenol Compounds (C_6H_5OH)	mg/L	1.0	5	1
Radioactive Materials	As determined by Bangladesh Atomic Energy Commission			
Selenium (Se)	mg/L	0.05	0.05	0.05
Sulfide (S)	mg/L	1	2	2
Temperature – Summer	°C	40	40	40
Temperature – Winter	°C	45	45	45
Total Dissolved Solids (TDS)	mg/L	2100	2100	2100
Total Kjeldahl Nitrogen (N)	mg/L	100	100	100
Total Suspended Solids (TSS)	mg/L	150	500	200
Zinc (Zn)	mg/L	5.0	10.0	10.0

Comparison between the amounts of chemicals used in both treatment process

4.1.4 pie-chart for chemical ETP:

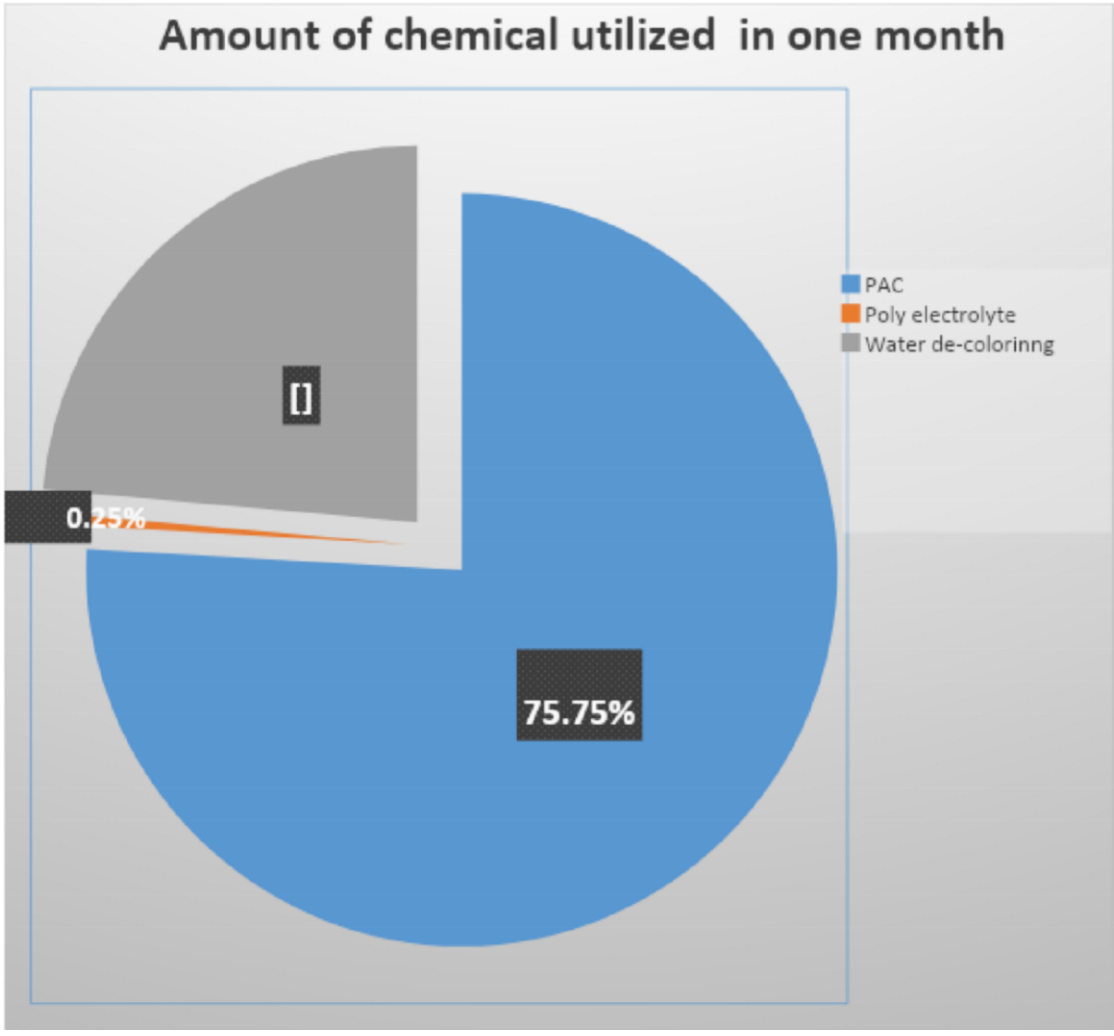


Figure: 4.3 monthly chemical used in chemical ETP.

4.1.5 For Bio-Chemical ETP

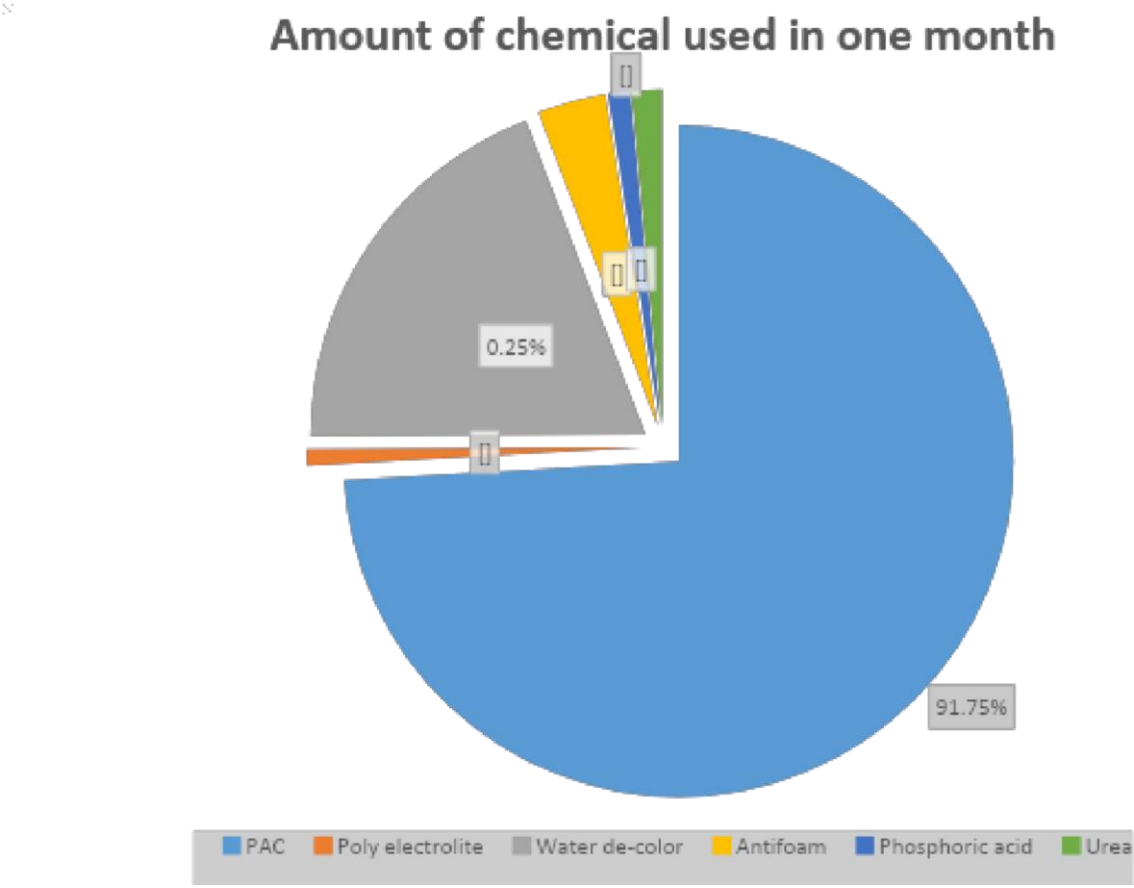


Figure: 4.4 Monthly chemical consumption

Figure 4.3 and 4.4 is a pie chart, showing the percentage of different chemicals used in a month for both treatment processes.

Here we can see that the highest used chemical is PAC in both treatment processes are 92% & and second is poly aluminum chloride is 48%.

In comparison we can see poly aluminum chloride and salt are two most used chemicals in large scale. Where sodium hypochlorite is used the least amount follows by a de-foaming agent. As we saw in our daily chemical consumption chart, the amount of most used chemical was PAC and salt, this pie chart however shows the same percentage as day consumption.

It shows the percentage of chemicals that might be used in any biochemical water treatment plant.

4.2 Cost of chemicals and electricity

This study, focused on investigating the most excellent financial effluent treatment plants is around chemicals costing that are utilized in a Bio-chemical treatment plant and a chemical treatment plant. Here we are able see that cost of Poly electrolyte in chemical treatment plant per kilogram is about 180 Taka and in bio-chemical treatment plant per kilogram is approximately 120 Taka and after that we calculate them for month to month costing, for each chemical we found the costing from their sum that are given in table 4.2. To run both are ETP we moreover require power and maintenance cost.

Table-4.2: Cost of chemicals

	Chemical ETP		**Bio-Chemical ETP**	
Name of the chemicals	**Price per Kg(in Taka)**	**Price per month for (in total chemical Taka)**	**Price per Kg (in Taka)**	**Price per month for total chemical (in Taka)**
Poly Aluminum Chloride	37	482850	32.52	866690
Poly electrolyte	180	15660	120	34800
Water decoloring agent(Lime powder)	83	336980	88	609928

Antifoam	Not used	0	150	178350
Phosphoric Acid	Not used	0	79	29783
Urea	Not used	0	13	6786
Total chemical cost per month		835490BDT	1726337BDT	

CHAPTER-5

CONCLUSION

- After completing this project, we have come to know the difference between chemical ETP and Bio-Chemical ETP and what factors should be considered while using an ETP.

- We've learned which parameters are commonly tested on both treatment plant. And which tests are brought to test in the effluent as well as the discharged water.

- We moreover learn almost the sorts of chemicals utilized in both ETP and their work and costing.

- In the bio-chemical treatment plant of creative wash ltd on average more than 7200m3 waste water can be processed in 24 hours.

- Whereas in chemical ETP on average more than 1500m3 waste water can be processed.

- Both of are ETP runs for 24 hours. In case the amount of waste water is around 7400m3 in 24 hours, not all of them can be processed. Approximately 7000/7100m3 can be handled in 24 hours. And the rest is included in another hour, which is entered in another day's information.

- The amount of waste material that are found, TDS is found the foremost. In spite of the fact that in both DOE and BSR restrain, TDS's restrain is 2100mg/l, so 800mg/l is secure. BOD and COD can be measured once in a week, as they both require time. Yet these moreover don't cross the BSR and DOE restrain which is 30mg/l and 200mg/l individually. On average we found BOD 18mg/l and COD 143mg/l, which is in the long run on the secure side. TSS can be found 150 mg/l in outlet. And rise in temperature and pH appears no abnormality. There's a very little rise in temperature, and pH is close to the neutral value.

In case of chemical cost and power consumption, it can be seen that around 17, 26,337 takas are spent in one month for bio-chemical treatment plant and about 8,35,490 takas are spent for chemical treatment plant, for maintenance cost almost 2,73,800 takas and for electricity around 3,34,874 takas are spent in a month. Creative Wash Ltd. not just as it were bear the full appropriately cost and do all the tests but also each month ITS visits once to get monthly report approximately the treatment prepared and the amount of materials that are found.

Reference

[1] https://www.thomasnet.com/articles/chemicals/wastewater-chemicaltreatment/

(Retrieved date 02/04/2020, Retrieved time 9:10 PM)

[2] https://www.cleanwaterchems.com/chemical/water-decoloring-agent/ (Retrieved date 08/04/2020 , Retrieved time 10:10 PM)

[3] https://www.researchgate.net/publication/280133730_Biochemical_Treatment _of_Aqueous_Waste-water_Effluents_from_a_Local_Textile_Industry (Retrieved date 10/04/2020 , Retrieved time 11:00 PM)

[4] http://www.internationaltextile.com/index.php/effluent-treatmentplan#: ~:targetText=Afterwards%20it%20goes%20to%20Aeration,the%20bott om%20of%20clarifier%20tank. (Retrieved date 16/04/2020 , Retrieved time 9:30 PM)

[5] https://www.omicsonline.org/open-access/biochemical-impact-of-sludgeobtainedfrom-wastewater-treatment-plant-on-soil-properties-within-portharcourt-environment21610525-1000540-99001.html (Retrieved date 03/05/2020 , Retrieved time 10:00 PM)

[6] https://www.researchgate.net/publication/319403531_Textile_Industry_Waste water_Treatment_Using_DAP_Urea_and_Polymer_AQUATREAT_AR_06 (Retrieved date 10/05/2020, Retrieved time 9:00 PM)

[7] https://www.researchgate.net/publication/316479652_Textile_Industry_Waste water_Treatment_using_DAP_Urea_and_Polymer_AQUATREAT_AR_06 (Retrieved date 05/06/2020, Retrieved time 9:00 PM)

[8] https://www.polyaluminium-chloride.net/pac_polyaluminium-chloride/ (Retrieved date 06/06/2020, Retrieved time 10:00 PM)

[9] http://old.doe.gov.bd/pollution-image/15_etp_assesment_guide-pdf (Retrieved date 12/06/2020 , Retrieved time 9:00 AM)

[10] https://www.osti.gov/biblio/5633274-wastewater-treatment-using-ferroussulfate (Retrieved date 14/06/2020, Retrieved time 10:00 AM)

[11] https://www.suezwaterhandbook.com/processes-and-technologies/reagentstorageandfeeding/special-applications/using-polyelectrolyte-polymers (Retrieved date 20/06/2019 , Retrieved time 10:10 PM)

Document Viewer

Turnitin Originality Report

Processed on: 01-Nov-2020 11:52 +06
ID: 1432499156
Word Count: 7209
Submitted: 1

162-23-4670 By Farhad Ahmed

Similarity Index	Similarity by Source	
15%	Internet Sources:	9%
	Publications:	6%
	Student Papers:	9%

include quoted include bibliography excluding matches < 10 words mode:
quickview (classic) report Change mode print refresh download

6% match (student papers from 10-Apr-2018)
Class: April 2018 Project Report
Assignment: Student Project
Paper ID: 944224384

3% match (publications)
F. Kalaoglu, R. Paul. "Finishing of jeans and quality control", Elsevier BV, 2015

2% match (Internet from 08-Oct-2015)
http://www.michigan.gov

1% match (publications)
A.K.R. Choudhury. "Environmental impacts of denim washing", Elsevier BV, 2017

1% match (Internet from 25-Oct-2020)
https://www.intechopen.com/books/wastewater-treatment-engineering/biological-and-chemical-wastewater-treatment-processes

<1% match (Internet from 19-Oct-2020)
http://dspace.daffodilvarsity.edu.bd:8080

<1% match (student papers from 25-Sep-2019)
Submitted to Florida International University on 2019-09-25

<1% match (Internet from 29-Oct-2020)
https://www.thomasnet.com/articles/chemicals/wastewater-chemical-treatment/

<1% match (Internet from 28-Sep-2010)
http://www.michigan.gov

<1% match ()
http://ir.uitm.edu.my

<1% match (student papers from 12-Jul-2018)
Submitted to Hellenic Open University on 2018-07-12

<1% match (Internet from 26-Oct-2015) http://www.textiletoday.com.bd

<1% match (student papers from 18-May-2020)
Submitted to University of Bradford on 2020-05-18<1 % match (publications)

Cheng Ding, Zhaoxia Li, Jinlong Yan. "Effect of p-Chlorophenol on Soil Respiration and Urease Activity", 2008 International Workshop on Education Technology and Training & 2008 International Workshop on Geoscience and Remote Sensing, 2008

<1% match (student papers from 14-May-2018)
Submitted to Institute of Technology, Nirma University on 2018-05-14<1% match (Internet from 21-Jul-2020) https://www.coursehero.com/file/36143518/Final-project-thesispdf/

<1% match (Internet from 29-Nov-2013) http://www-bcf.usc.edu

<1% match (Internet from 16-Jul-2020)

https://archive.org/stream/fa_Encyclopedia_of_Water/Encyclopedia_of_Water_djvu.txt