STUDY OF THE QUALITY AND RECYCLING POTENTIAL OF SEWAGE EFFLUENT- A CASE STUDY OF STP JAGRAL, JALANDHAR CITY.

Submitted in partial fulfilment of the requirements

Of the degree of

MASTER OF TECHNOLOGY

In

CIVIL ENGINEERING

By

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2017

DECLARATION

I, Jobanjot Singh (11204889), hereby declare that this thesis report entitled **"Study of the Quality And Recycling Potential of sewage effluent- A case study of STP Jagral, Jalandhar city"** submitted in the partial fulfilment of the requirements for the award of degree of Master of Civil Engineering, in the School of Civil Engineering, Lovely Professional University, Phagwara, is my own work. This matter embodied in this report has not been submitted in part or full to any other university or institute for the award of any degree.

Date: 06-04- 17 **Jobanjot Singh**

Place: Lovely Professional University, Jalandhar.

CERTIFICATE

Certified that this project report entitled "**Study of the Quality And Recycling Potential of sewage effluent- A case study of STP Jagral, Jalandhar city**" submitted individually by student of School of Civil Engineering, Lovely Professional University, Phagwara , carried out the work under my supervision for the Award of Degree. This report has not been submitted to any other university or institution for the award of any degree.

Signature of Supervisor

Ms. Kirti Goyal

Assistant Professor.

ACKNOWLEDGEMENT

This project report is "**Study of the Quality And Recycling Potential of sewage effluent- A case study of STP Jagral, Jalandhar city"**. I am very thankful to my mentor Ms. Kirti Goyal and to School of Civil Engineering in Lovely Professional University. My mentor guided me in right direction and increased my technical knowledge regarding not only the project but also on other technical aspects. Finally, I am very thankful to my parents who blessed me with their kind love and encouraged me in all stages of the work.

Jobanjot singh

ABSTRACT

The water quality depends on the local geology as well as human uses. When the wastewater of industries mixes in the water it will affect the quality of water. The impurities present in the water will affect the quality of water which will affect human health and environment.. The objective of current study is to check the chemical parameters of wastewater. The samples of raw and treated water have been collected from the sewage treatment plant Jagral, to check the efficiency of treatment process. The physico-chemical analysis has been done to check the extent of removal and to explore the recycling potential of treated water. from the analysis it was observed that the wastewater quality values for parameters pH and sulphates have closer values to permissible limit and Chlorides, Total dissolved Solids, BOD values of parameter are within the permissible limit. The Treated water is used for various purposes such as for irrigation purposes, cleaning, washing etc.

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CHAPTER-1

INTRODUCTION

1.1 General

The level and kind of treatment essential is depends upon the character and quality of both sewage and sources of wastewater. Maximum of the biological matters existing in sewage is unbalanced and decays through the chemical and biological actions. Day by Day, the demand of water is increased. In recent years, the wastewater for a public was not so much polluted as nowadays. Water is a universal solvent which dissolves many substances such as organic or inorganic. It is having such an important property but we cannot have it in pure form. There have different types of water we have on this earth depending upon its sources. Ground water is considered as one of the purest form of water and uses for various purposes like bathing, washing, Agricultural, in factories and industries etc. Ground water is the one of the major source of water used in India. It is easily renewable and widely spread resource used in the world for water supply. The wastewater of industries when mix in river it will pollute the river water because harmful acids and chemicals are present in the water which pollute the environment and effect the human health.

Although disposal or recycling is carried out after treatment, it must be considered first. For disposal or recycling opportunities, the objectives of waste management, disposal or recycling are the basis for treatment decisions. Concentrations Acceptable impurities may vary depending on the type of application or landfill. Transport often acceptable concentrations of impurities depending on the place of removal, but expensive treatment needs may encourage the choice of elimination based on the concentrations of impurities. Ocean disposal is subject to international treaties. International treaties can also regulate river across international borders. The waters falling entirely within the competence of a single nation may be subject to the requirements of several municipalities. Concentrations Acceptable impurities may vary widely in different jurisdictions for discharging sewage into evaporation ponds, pools, and infiltration or injection wells.

1.2 Wastewater Characterization

1.2.1 pH Value: The purpose of pH value of wastewater is key , because of the fact that efficiency of certain treatment process is depends upon the accessibility of a right pH

value. The pH can be measured quickly and automatically by potentiometer, which measures the electrical potential of exerted by hydrogen ions, and thus, indicating their concentration.

1.2.2 Chloride Contents: chlorides are resultant from kitchen rubbishes, social feces, and urinary discharge etc. chlorides are generally found present in municipal sewage. The normal chloride content of domestic sewage is 120 mg/l. whereas, the permissible chloride content for water supplies is 250 mg/l. The industries produced large number of chlorides when mix in safe water, it will pollute the water **.**

1.2.3 Sulphates: The determination of sulphates in sewage is rarely called far, although their presence reflects aerobic and aerobic decomposition. In aerobic absorption of sewage, the aerobic and facultative microorganisms oxidize the sulphur besides its mixtures existing in sewage to originally method sulphidies, which finally break down to custom sulphate ions, which is unchanging. The initial decomposition is associated with formation of H2S gas, which also ultimately get oxidized to form sulphate ions.

1.2.4 Total Dissolved Solids: Waste water usually contains very small amounts of dry matter compared with the huge amount of water. The solids contained in the wastewater can be in the form of suspended solids, dissolved solids, colloidal solids and solids sediments. Floating substances are solids dissolved in wastewater and salt in water. Colloidal solids are finely divided dust collected solution or suspension. Settable solids fraction which compensates when the waste water must remain unaffected for 2 hours.

1.2.5 Bio-chemical Oxygen Demand (B.O.D): If oxygen is available in the wastewater, the useful aerobic bacteria flourish and cause aerobic biodegradation of sewage which will continue until oxidation is complete. The amount of oxygen consumed in this process, BOD. Contaminated water continues to absorb oxygen for several months and it is impossible to determine the ultimate oxygen consumption. Therefore, BOD water is used for 5 days at 20 ° C, generally standard fabric, and approx. 68% of total demand. A 10-day BOD is approx. 90% of totals.

1.3 Wastewater Treatment Process

Wastewater treatment is the procedure for removing impurities from wastewater. Wastewater treatment contains local, industrial and organic processes to eliminate the impurities from the water and products naturally harmless treated waste water. The physical process of sewage treatment is done by removal of small and large, floating and solids particles by filtration and sedimentation process. In the filtration process, the suspended solids matters are separated from liquid. In Sedimentation process, the gravity is used to remove suspended solids from water. The biological Process of sewage treatment is also known as secondary treatment in which the particles which are left after primary treatment are removed from waste water. Biological treatment of sewage treatment includes aerobic and anaerobic wastewater treatment. The term aerobic refers to a process in which oxygen exists and the anaerobic process is defined as a procedure in which oxygen does not exist.

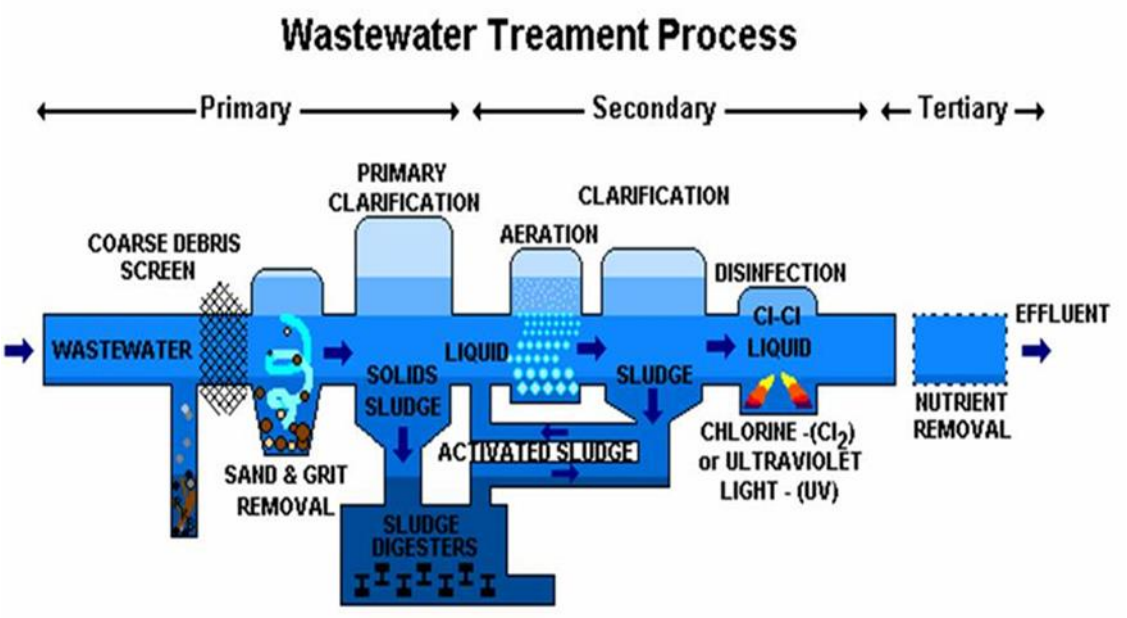


Fig 1: Wastewater treatment process.

1.3.1 Primary Treatment: Primary treatment temporarily save wastewater in a quiet pond where heavy solids settle, floating on the surface with oil, grease and lighter substances. Materials and finished liquids are removed and the residual liquid can be drained and further processed. Some sewage treatment that is connected to a sewer system, avoid arrangement after the primary treatment unit. This means that during strong

rainfalls, a secondary and a tertiary cleaning system for hydraulic overload protection and a mixture of sewage and rainwater that received primary treatment.

1.3.2 Secondary Treatment: Secondary treatment removes dissolved organic matter and suspended. Secondary processing is usually carried out by local water microorganisms in a controlled environment. Secondary treating may need a separation process to eliminate viruses from the treated water or tertiary treatment.

1.3.2.1 Aerobic Treatment Process: Aerobic purification system or ATS, often the (bad) Aerobic sewage system is a small sewage treatment plant, which corresponds to the clarification tank, but aerobic process aerobics by septic systems. These systems are often used in rural areas where there is no public sewage system and can be used for a home or a small residential complex. Unlike conventional septic aerobic treatment systems produce high quality secondary output that can be sterilized and used for surface irrigation. This allows for greater flexibility in the field's location backward and reducing the required size of the field leaches by at least half.

1.3.2.2 Anaerobic Treatment Process: Anaerobic fermentation is a process in which microorganisms' breakdown eco-friendly solid in the lack of oxygen. It can be used to treating a wide range of organic materials, food waste and old paper grass and debris of the animals. Anaerobic degradation of organic matter is a three-step process. In the conversion of the organic substance is formed between compounds known as metabolites.

1.3.3 Tertiary Treatment: Tertiary treatment at the end of cleaning in the facility that has improved the quality of waste water before it is reused, recycled or released into the environment. The treatment removes the inorganic compounds and other substances such as nitrogen and phosphorus. Bacteria, viruses and parasites that are harmful to human health are also removed at this stage.

1.4 Background and Need

Study of parameters of wastewater is very important as it can help in reducing the various problems produced directly or indirectly and also proper management of treatment of wastewater. Some of them are summarised as follows:

. The demand of water is increased, so there is a need to reuse the wastewater for irrigation.

. To reduce the adverse impact on environment and human health.

. To manage the water and to suggest the possible treatment for wastewater.

. There is a chance of outbreak of various diseases if wastewater is not managed.

. No treatment may be required if the wastewater is directly used for irrigation purposes.

1.5 Objectives of the Project

The main objective of this study is to determine the recycling potential of sewage Treatment plant Jagral and to check the extent of removal and to explore the recycling potential of treated water. However, it can achieve by considering following objectives:

1. To assess the characteristics of waste water generated from sewage treatment plant.

2. To analysis the treatment process employed.

3. To compare the wastewater and treated effluent of STP.

4. To find the efficiency of treatment plant.

5. To study recycling of wastewater.

1.6 Scope of the Project

The quality of waste water would be checked and measures to control it can be suggested. The treated water will reduce the demand of water for irrigation. Some of the points after taking into consideration can help in future development as discussed below:

1. Minimization of water pollution and wastewater.

2. Collection, Storage, transfer and transport of the wastewater without any calamities.

3. Reuse and Recycling of wastewater.

4. Study of wastewater treatment process.

5. Treatment of the wastewater mechanically, chemically, biologically, and thermally.

6. Suggestions/ Recommendation for recycling.

CHAPTER-2
LITERATURE REVIEW

Prior to starting up the analysis of the available data pertaining to the main premise of the work, it is very essential to know the conceptual and theoretical structure as also to review the perspective of other researchers briefly. It will make the attempt to review few of such efforts taken by various subject experts to make the problem easier and relate such ideas with the present study. After searching a series of studies related to the issue, the review of the parts of the study related to my research topic is as follows: -

RM Gersberg (1983) studied the demonstrate the exceptional utility of artificial water rich secondary nitrate discharges for nitrate removal at higher application rates. Reed fields (14 in number) are improved plastic excavations that included the growing plants that grew in the gravel. Without additional carbon additives, the low total nitrogen removal efficiency (~ 25%) in both beds planted. Once methanol was additional with carbon feed, bacterial denitrification completes and stimulates the elimination productivity very high (95% nitrogen elimination entire by waste water usage amount 16.8 cm day -1). Meanwhile methanol remains a comparatively affluent procedure of carbon, we verified the possibility of planting biomass then useful to the surface of the turf bedsteads as an alternative source of carbon.

Simon Judd et al. (1994) studied that the features of waste water after fabric treatments are controlled exhaustively. Categorization of wastewater continues to reflect the nature of the several manufacturing procedures used by manufacturing and elements related with these processes. Biochemical contamination due to together the raw material themself and a large number of spices used to make the ended product. The Natural Organic Material (NOM) is the term used to describe the complex matrix of organic substances from natural sources described in all waters. Efficient removal of turbidity and natural organic substances are water soluble can be obtained by coagulation and flocculation.

Rein Vaikmae et al. (2008) studied that the three samples of sewage after a pharmacological plant that had medicinal ointment remained exposed to a laboratory processing with a Fenton type in mixture with lime coagulation. All trials became plants that were pre-treated by adsorption procedure using betonies, but the value of the wastewater did not obey with the rules for sewage were evacuated.

Ramon Sala et al. (2009) studied that the purification plants wastewater consumes a lot of energy. Therefore, their carbon footprint reduction is particularly important, both economically and ecologically. Knowledge about efficient treatment plants Energy efficiency is the starting point of any energy saving initiative. In this article, we used a method of data conversion analysis (DEA) no radial to calculate the energy efficiency index for the tasting at the treatment facility in Spain. It was confirmed that the analysis of the energy efficiency of the treatment plant is very low, efficient with only 10% of them. He found out that the plant size, amount and type of organic substance removed ventilation bioreactor were important variables in explaining the differences in energy efficiency. However, the age of the plant has not been critical for energy.

Raquel Lebrero et al. (2009) studied that the bio filters, active sludge diffusion, bio trickling filtration, chemical scrubbing, activated carbon adsorption, regenerative combustion and hybrid technology are evaluated for environmental performance, the process of economic and social impact use IChemE sustainability indicators in the treatment of odors Sewerage sewage. This comparative analysis showed that physical impact / chemical technology presented highest environmental standards as their biological counterparts in energy consumption, materials, reagents and hazardous waste production.

Laila Mandi et. Al (2009) studied the performance of a sand filter for wastewater modern oil mill (UH) after dilution with waste water at home to operate at a rate of 0.59. The experimental pilot column consisted of PVC not transparent and the sand filter filled with sand 50 cm, gravel and 10 cm in the upper and lower part of the filter. Maintenance (4 cm / day) was performed on a dry cycle after one day of the wet / 3 day channel. The process was strongly acidic with a pH of 4.12 and had high concentrations of phenol compounds (7.2 g / l) and total chemical oxygen consumption (65 g / l). Reduction OMW diluted with sand filters, the pH is increased from 4.84 to 8.25 and 90% removal of the suspended substance. Treatment with sand filters also has significant reductions in the organic material (90% total COD, 83% of dissolved COD and 92% of phenolic compounds) and nutrients, 97% nitrogen in ammonia, 99% nitrate and gives phosphate 99%. The rate flow was determined after 10 weeks, resulting in a very low due to pores of sand clogging. HPLC analysis of OMW diluted before and after passage through the sand filters showed a significant reduction in the compounds of toxic monomers after treatment.

Simon Pollard et al. (2009) studied that the drying bio remains a deviation of aerobic degradation recycled in the automated and organic treatment plants to dehydrated and partially permanent remaining waste. MBT biological desiccation plants container yield high-quality solid recovered fuel (SRF), high content biomass. Now, the goal procedure, principles of operation, the device structures, settings controls and process control, and their impact on the quality of biodegradable results are critically investigated.

Robert Siegrist et al. (2010) studied that it is the latest per sulfate used oxidant for in situ chemical oxidation (ISCO) in soil and groundwater restoration. In this review, elementary reactions and relevant per sulfate governance factors discussed ISCO. The latest experiences with ISCO are presented with per sulfate, focusing on the various methods of activation, pollutants and expected reactions of per sulfate porous media, primarily based on a critical review of the scientific literature made by peers. The effect of estrogen trace in aquatic ecosystems is a serious environmental problem as their main source is the wastewater treatment plant. Increased elimination of17R-ethinyl estradiol (EE 2) reported for the treatment of active sludge with waiting time long enough for solid nitrification.

Amarnath Narayana et al. (2011) studied that Biodiesel fuel gaining ecological importance in recent years. This communication outlines the possibility of using existing mixed microalgae in ecological ecosystems to operate biodiesel. Cultures from five microalgae bodies of water bodies grown in domestic wastewater in open lagoons and seaweed harvested biomass were converted by transit reifications catalyzed by acid. The experiments showed the potential use of mixed-use microalgae biodiesel. The Properties of illness and organizational limits of a maze in drip irrigation emitter hydraulic act, internal Structural parameters. The trapezoidal labyrinth transmitter comprises the width of the road (W) and the span (S), the trapezoidal unit. The number (N), the height (H) and a distance (S). Research laboratory experiments were carried out by five various kinds of canal maze transmitters which are commonly used for drip irrigation systems in the subsoil.

Josep Ribes et al. (2011) studied to assess the effect of different variables on both operational and evaluation. The performance of organic and separation process anaerobically immersed membrane Pilot bioreactor treatment of urban waste water. It was used in mesophilic conditions (33 ° C), 70 days for the variable SRT and HRT in the range of 20 to 6 hours. Studied the smelly airs remain the main reason people record criticisms with the guilty organizations waste water collection and treatment systems. Some trainings have remained

directed for the avoidance and regulator of smelly vapors, not at all extensive investigation on current results in this part. The purpose of the study is to collect and classify new results in the prevention and control of smelly gas WCTS.

Nasser Mehrdadi et. al (2011) studied that the sludge effect of ultrasound on mud yield factor remained tested by pilot SBR reactors. From our outcomes, it was found that a decrease of spare mud is artificial by various issues, with the energy delivered to the mud mass, the force recycled for the generation of waves, the duration of the use of the wave, and the proportion of mud, Visible to the waves. The increase of the energy provided to the mass of sludge caused in a decrease of several mud products, then the energies greater than 35,000 kJ / kg of VSS displayed no important outcome on the reduction of sludge. In addition, less energy, and retaining period presented better performance reducing sludge. Use ultrasonic waves to reduce deterioration of the performance of the sludge in the value of the reactor outlet and also increase the amount of sludge that has been lifted by the waves through each reduction, reduced cleaning efficiency COD.

Marian Barbu et. al (2011) studied the strategy of a prophetic regulator for a wastewater treatment method. In the described procedure, the effluent is preserved to gain a solid substrate concentration, as the legislation (below 20 mg / l). This is attained through regulatory the dissolved oxygen attention at a certain value. The prophetic regulator uses a neural network as an interior model of procedure parameters and reduction course changes to achieve the goals regulator. This regulator approach provides more control options depending on the resulting limits: the forecast period, the horizon of regulator, the weight of the fault, and the understanding. The prophetic control organization is verified in three operating modes, which are considered crucial due to occurrence in present preparation.

Rory Coffey et al. (2011) studied of water quality. The study was conducted in five sampling websites of two different types the current points from September 1998 to September 2002. A total of 52 of invertebrate were registered. The upper part has a diverse society than the bottom supported. Low invertebrates the abundance was observed in the summer in the lower part, which would be the result of being strong values of the phosphate ions and nitrogen. Nevertheless, Behzat showed excellent water quality conditions. At the moment, he threatened human disturbance, especially in the lower part.

Mohammad Shakerkhatibi et al. (2012) studied that the Sequencing batch reactors have been developed to meet the true wastewater from the ethylene glycol / ethylene oxide manufacturing industry. Four identical reactors and effective total fluid volume up to 9 and 7 litres, respectively, were performed in similar. Laboratory tests were performed through various biological fillers 500, 1000, 1500 and 3000 g COD / m3. Period and reactor concert were investigated under different periods of mud 10, 20 and 30 days.

Lauren B Stadler et al. (2012) studied that the Raising duration of water management leads to a reassessment of household waste treatment practices. A key goal is to reduce energy demand and environmental impact while being restored. Anaerobic membrane bioreactors (AnMBRs) can produce a similar quality sulphate for aerobic treatment, while useful energy is growing up and significantly fewer residues produce. The population growth in developing countries will take place in small cities closely linked to agricultural areas where access to water and sanitation. Waste management priorities in these areas will differ from those in major cities and developed countries.

Sinan Demir et al. (2012) studied the thermo-economic analysis and assessment of a municipality Sewage system. Operation of an existing municipal sewer has been described in detail, and a thermo-economic method based on economic exergo Relationships and Energy Methods. The JRC (Speco) specific is planned to distribute the cost stream for plant subcomponents. Actuated carbon made after Phoenix dactylifera seeds were tested for the elimination of methylene blue dye (MB) after aqueous clarifications. Many readings have been conducted to assess the effects of the pH of the concentration of the starting solution (12.2) chemically activated carbon (CAC) (0.25 to 5 g / l), the concentration of Mo (50-400 mg / l) And interaction time (20-430 min) with methyl bromide adsorption CAC.

Justin T Jasper et al. (2013) Studied that the cell processing unit of wetlands and open water can be used to use solar photolysis to remove traces of organic pollutants in municipal wastewater. To evaluate the results of these new methods, photochemical model to assess photolysis, atenolol, carbamazepine, sulfamethoxazole and propranolol was measured in the areas of water under conditions representative contamination Hydroxyl processing contamination radical (OH •) and Carbonatradikal (CO3 •) predicts a steady state concentrations of the measured pH value of 8 to 10. The direct photolysis prices and light projection effects depending on the organic material resolved at photolysis rates were

estimated by the beam of recording data and light-filtering contaminant quantum exchanger factors.

Xiupeng Wei et. Al (2013) studied that the total number of suspended particles is a major polluter of affecting waterways worldwide. The prediction of TSS values is interesting for monitoring the quality of waste water. Frequent measurements of time series data TSS are built according to a flow rate affecting demand and carbon-containing biochemical oxygen consumption. He studied different circumstances of the daily average CBOD influential and powerful current stately at recesses of 15 minutes. Next, he used 5 statistics removal procedures, i.e., a multilayer perception saying next neighbour a spy adaptive multivariate regression, a Maintenance Vector Machine and Casual Forest, time towards build predictive models and time to build TSS. The old TSS values remained used as participation parameters to guess the current values besides future of TSS. A slide approach has been used to improve performance forecasts.

Lluis Corominas et al. (2013) Studied that Life Cycle Assessment (LCA) is a technique for quantifying the effects of a product, service, or cradle process at the grave. Wastewater (WWT) LCA was used in the 1990s in the search for more environmentally friendly WWT sustainable, it is clear that stroke is a valuable tool to illustrate the broader environmental impact of design and Operational decisions. The Improving water quality in wetlands systems built increasingly are used throughout the world. For this study, we studied two regimes consisting of an anaerobic reactor anaerobic sludge accumulation (UASB), followed by an underground flow (SSF), or pipe joints surface (FSF).

Amir Talebi et al. (2014) studied the influence of a coagulation procedure with ferro sulfate as a COD coagulant, as well as actual color clouds, was estimated using the Reaction Surface Methodology (RSM). A pot test method was used to treat adult discharges. Results of the reaction surface methodology (RSM) showed that ferro sulfate was more effective under alkaline conditions and with a coagulation dose of 10 g / l. The new membrane electrochemical reactor was developed with a membrane bioreactor (MBR) and microbial fuel cell (MFC) for sewage and energy recovery treatment. This system acts as a stainless steel mesh with the biofilm formed on the cathode material at the same time and is filtered. The oxygen fall reactions catalyzed by bacteria capably on the fixed side.

Daniel Lucas et al. (2014) studied that the Hospital discharges contribute to the prevention of new contaminants in the environment due to the heavy burden of pharmaceutically active

substances and certain endocrine disrupting compounds (EDC). Disassembled hospital waste water collected today; the dilution factor and the ineffectiveness of the wastewater treatment plant by removal inappropriate PhAc and EDC make both co-treated wastewater. For the treatment of wastewater and waste to treat odors that can cause inconvenience to neighboring people then add expressively to air contamination. Sulphur-containing composites are accountable for harsh rain. Several living mixtures of manufacturing source add to the strength of air in the air and ecological difficulties. Combustion smokes from manufacturing have always been preserved by physio-chemical procedures, such as washing, adsorption, reduction and corrosion.

Mohamed Ateia et al. (2014) studied the properties of illness and organizational parameters of a labyrinth in drip irrigation emitter hydraulic routine. The trapezoidal labyrinth transmitter comprises the width of the road (W) and the length (L), the trapezoidal unit. The numbers (N), the height (H) and a distance (S). Research laboratory experiments were carried out using five various types of channel maze transmitters (three pressure less compensation and two Pressure compensation transmitters) which are commonly used for drip irrigation systems in the subsoil.

Ivan Morales et al. (2015) Studied that Bacterial Removal Effects in a Water Purification System Conventional Soil Preparation is demonstrated near simplify the chance and transport of E. Bacteria in the surrounding environment and operating circumstances that expected beneath varying climatic circumstances. The treated water is treating to obtain a wastewater consuming a substrate absorption inside the parameters set by the standard (less than 20Mg / l). This is attained through regulatory the oxygen content toward a specific where analytical regulator via a neutral system as an interior typical of the procedure and Reduction to achieve changes in control objectives.

Rein Vaikmae et al. (2015) studied that the three samples of sewage after a pharmacological plant that had medicinal ointment remained exposed to a laboratory processing with a Fenton type in mixture through lime coagulation. All illustrations became plants that were pre-treated by adsorption procedure using betonies, Then the value of the wastewater did not observe through the rules for sewage were evacuated.

Amin Goli et. al (2016) studied that humic acids are the natural organic substances in the water. They show an significant role in the creation of harmful disinfectants. Human acid degradation using ultraviolet radiation and ultrasonic irradiation was investigated in a batch

photo reactor laboratory scale equipped with a 300 W mercury lamp immersed average and low pressure nonreactor frequency (42 kHz) to 170 w plate transducer acoustic effect to the effects of different parameters the effectiveness Of degradation. Experiments were performed in humic acids, initial concentrations of 2.5 to 10 mg / L. The oxidation of substances of human origin was followed by measurement of total organic carbon and the absorption UV at 254 nm and 436 nm.

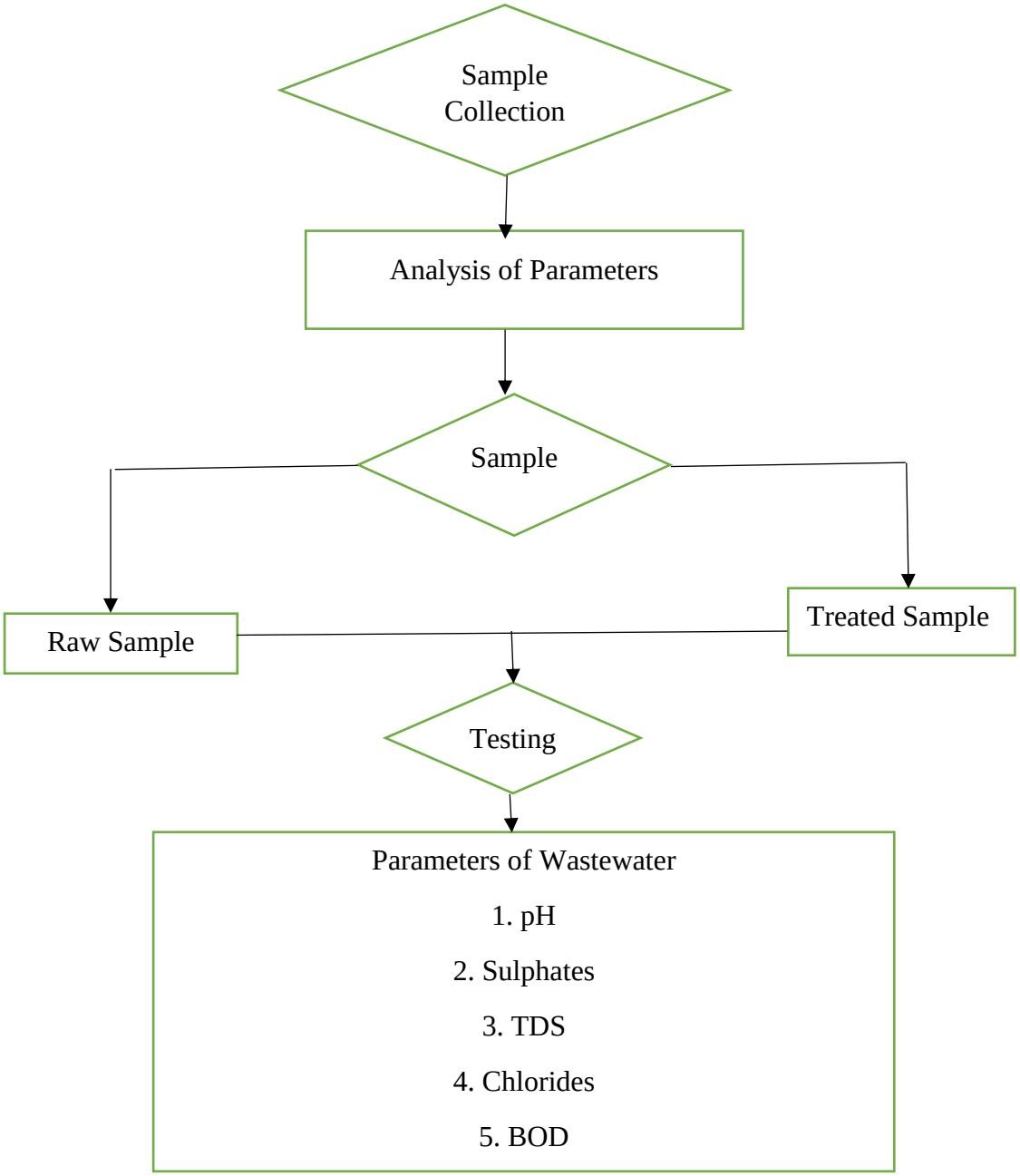
CHAPTER-3

MATERIALS AND METHODOLOGY

3.1 General

The samples were collected from the sewage treatment plant, Jagral. The raw and treated samples were collected for different analysis. Following is the methodology adopted to check the parameters of wastewater.

3.2 Flow chart of Methodology



3.3 Methods and Equipment's used for analysis

S.no	Parameters	Methods	Instruments Used
1	pH	Electrometric	pH meter
2	Turbidity	Turbid metric	Turbidity meter
3	Sulphate ions	Turbid metric	Turbidity meter
4	Chloride ions	Argentometric	Titrimetry

Table 3.3: Methods and Equipment's used.

3.3.1 pH

Method:

In this experiment, first we calibration the pH meter is done. It is done by immersing the electrodes in buffer solution 4 and 7 normally. Now we will read the reading on pH meter and calibrate it, till it shows the correct value. Now we will put the electrodes in the distilled water and then immersed in the samples of Raw water and Treated water. Now we will read the reading for pH.

3.3.2 Chloride

Method: Add 100 ml of sample in a conical flask. Add 1 ml of indicator known as potassium chromate. After that, titrate it with standard N/35.5 $AgNO_3$ solution. Now the color of solution is changed from yellow to brick red. Note the amount of titrant is used.

3.3.3 TDS

Method:

Total Dissolved Solids was examined by taking 20 ml of the sample, after filtering through a dry what man filter paper. The filtrate was taken in a pre-weighed porcelain crucible and evaporated to dryness in a hot air oven. The crucible was cooled in desiccators and weighed TDS was calculated with standard formula:

TDS (mg/l) = (Final wt.- Initial Wt.)/ Vol. of sample.

3.3.4 Sulphates

Method:

Take 1 ml of barium chloride 25 % solution in two different measuring cylinders. Add 1.5 ml Ethanolicsulphate standard solution 10 ppm each in both cylinders. mix and allow to stand for 2 minutes. Add 15 ml filtered water sample in one cylinder. Add 15 ml standard sulphate solution 10 ppm in one cylinder. Add 0.15 ml Acetic Acid 5M solution each in both cylinders and stir well with glass rod. make up the vol. of both the cylinders up to 50 ml with distilled with stirr well. Set aside both the cylinders for 10 minutes protected from light. Now switch on adjust NTU range button at 1000 NTU. Replace the blank with standard NTU solution and set the NTU reading with NTU calibrate Button to 100. Again, replace distilled water by standard turbid solution and set 0 and 100 respectively with corresponding knobs. Now, fill the Nessler cylinder tube with Standard solution and note down the display reading.

3.3.5 Turbidity

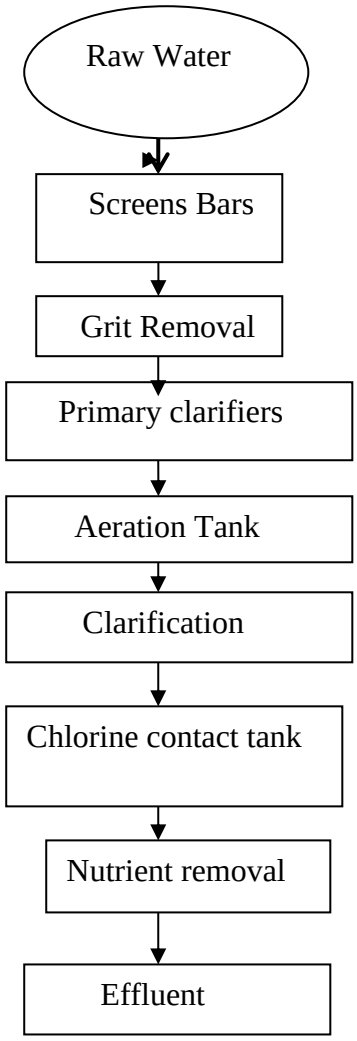
Method:

Prepare standard solution of coagulant say 1% solution, by dissolving 5 gm alum in sample water and making up to 500 ml. Take 1 litre beakers and fill with sample up to mark. Find the pH of the sample and adjust it to 5.5 to 9.0. fill the 1 to 6 ml of the alum solution into the test samples dosage is 10, 20, 30, 40, 50, 60 respectively. Run the paddle at 100 rpm for 1 minute. Reduce the speed to 30-40 rpm and run at this rate for 30 minutes. Stop the machine lift out the paddles and allow it to settle for 30 minutes. Find the residual turbidity of the supernatant using nephelometer. The dosage of alum which represents least turbidity, gives optimum coagulant dosage.

CHAPTER-4

RESULT AND DISCUSSIONS

4.1 Wastewater Treatment Process of Jagral



Raw water: The raw water is the wastewater of Jalandhar city, in which the impurities are present. The raw water contains chemicals, soaps, urine, minerals, bacteria, viruses etc.

Screens Bars: Screening is the leading process available at a sewage treatment plant. The screens removed the large floating objects from the sewage. Rags, wood, paper etc. are separated by Screens bars.

Grit Removal: Grit removal are sedimentation basins placed usually after the Screens bars and before the primary sedimentation tank. The Grit chamber eliminates the mineral grit, such as gravel, grit and other mineral material.

Primary Clarifiers: Primary clarifier removed the solid particulates or suspended solids from liquid for clarification. The Primary clarifiers are used to relax sludge although fat and oil rise to the exterior and are scanned off.

Clarification: In clarification, the suspended solids and organic matters is removed from the wastewater. The treated water is suitable for many agricultural and industrial uses by following the clarifications, but require further treatment to be used for municipal uses.

Chlorine Contact Tank: Chlorination is a disinfection process for public and private drinking water schemes. The disinfection technique is essential to kill the disease causing microorganisms in the water. To be assured that the additional chlorine is killing the microorganisms from water, the water is detained in vessel for at least 30 minutes.

Nutrients Removal: In this process, nitrogen and phosphorus are removed from the water.

Effluent: The treated water is used for agricultural activities.

4.2 Parameters of wastewater

1. pH

S. No	Samples	Parameters	Samples	Parameters
1	R1	9.5	T1	7.2
2	R2	9.3	T2	7.5
3	R3	9.8	T3	7.7

Table 1: pH values of samples.

The pH values of samples are varying between 7.2 to 9.8. The R1, R2, R3 are the samples of raw water and T1, T2, T3 are the samples of Treated water taken in January, February, March respectively. The pH in the month of January was 9.5 for raw water and reduces to 7.2 for treated water. The pH in the month of February was 9.3 for raw water and reduces to 7.5 for treated water. The pH in the month of March was 9.8 for raw water and reduces to 7.7 for treated water.

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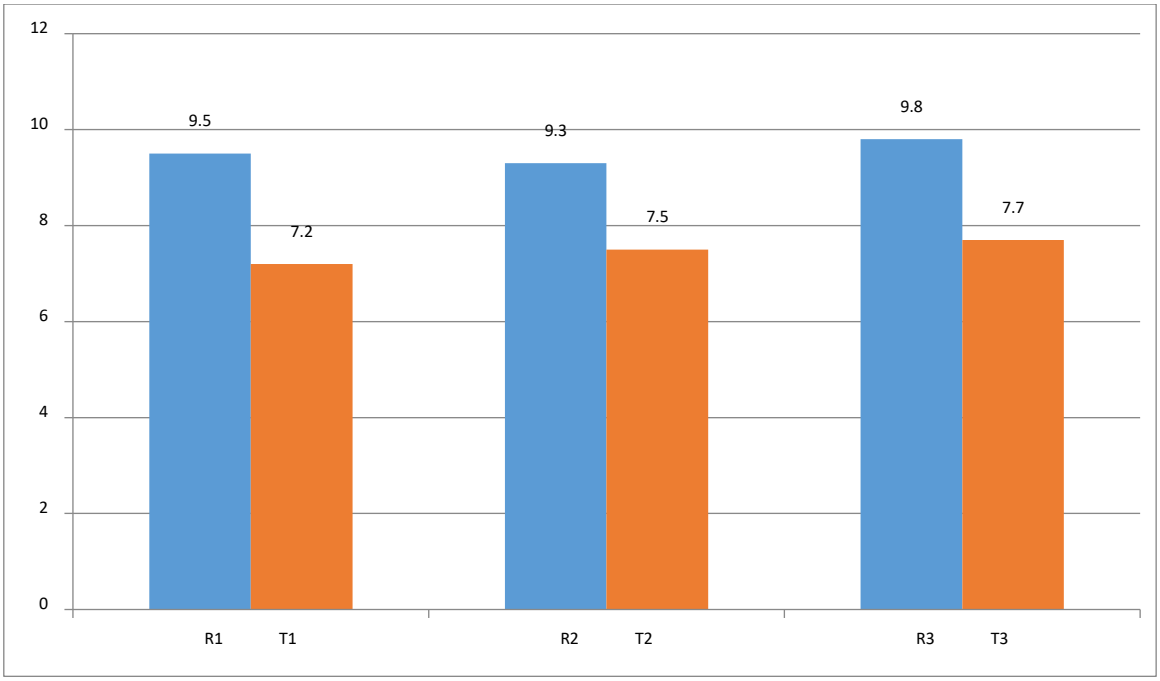


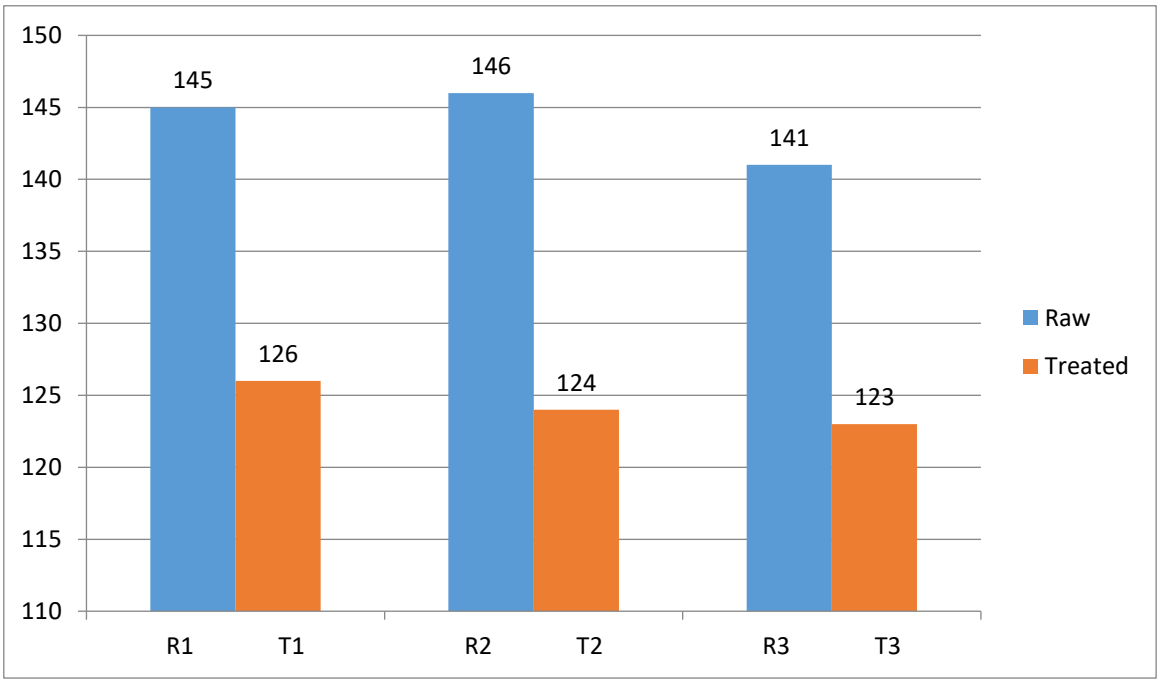
Graph 1: pH values of samples

2 Sulphates

S.no	Sample	Value of parameters	Sample	Values of parameters
1	R1	145	T1	126
2	R2	146	T2	124
3	R3	141	T3	123

Table 2: sulphate values of sample.

The sulphate values varying between 123 mg/l to 146 mg/l. The R1, R2, R3, are the samples of raw water and T1, T2, T3 are the samples of treated water taken in January, February, March. In the month of January sulphates in raw water 145 mg/l and sulphates in treated water is 126 mg/l. In the month of February the sulphates in the raw water is 146 mg/l and 124 mg/l in treated water. In the month of march the sulphates in the raw water is 141 mg/l and 123 mg/l in treated water.



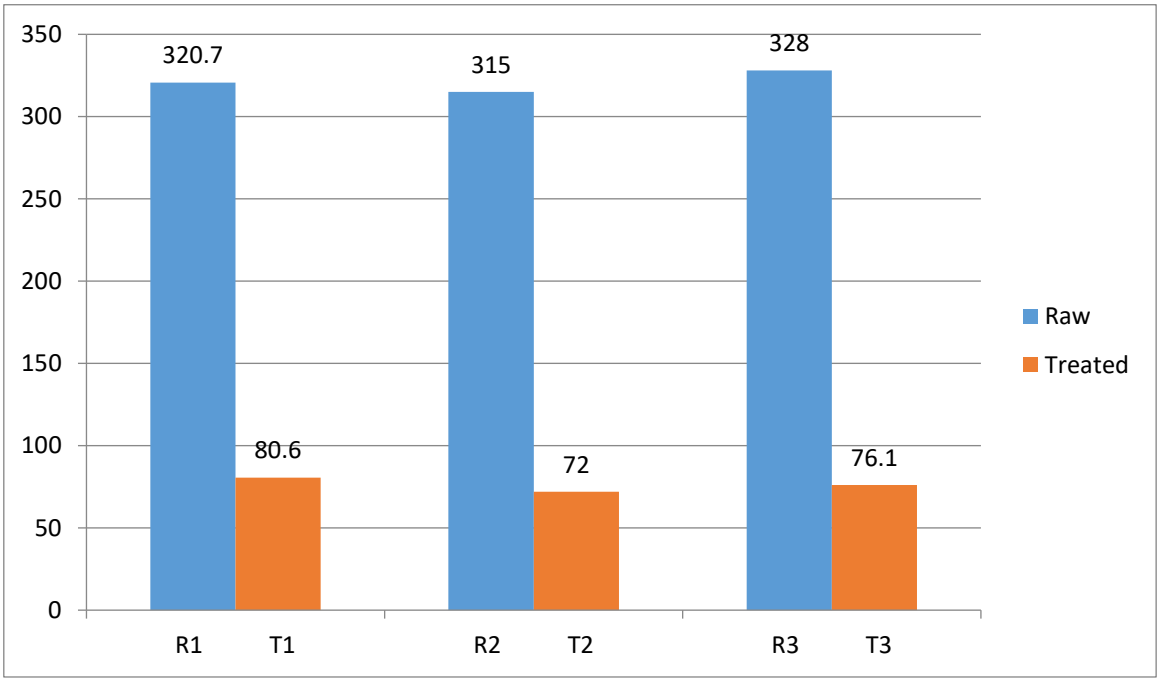
Graph 2: Sulphates values of samples

3. BOD

S.no	Sample	Parameters	Sample	Parameters
1	R1	320.7	T1	80.6
2	R2	315	T2	72
3	R3	328	T3	76.1

Table 3: BOD values of samples.

The BOD values of sample is varying between the 72 to 328 mg/l. The R1, R2, R3 are raw water sample and T1, T2, T3 are Treated water sample taken in January, February, March respectively. In the month of January efficiency of BOD removal is 74.8%. In the month of February efficiency of BOD removal is 77.14%. In the month of March efficiency of BOD removal is 76.80%.



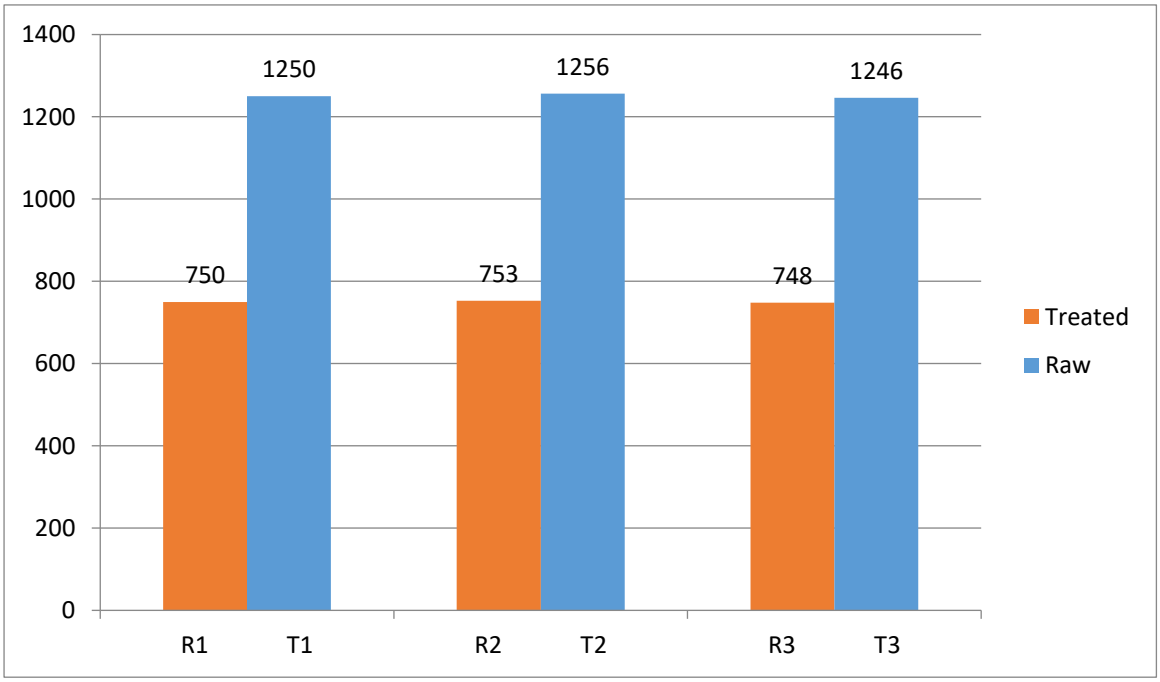
Graph 3: BOD values of samples**.**

4. TDS

S.no	Samples	Values of parameters(mg/l)	Sample	Values of parameters
1	R1	1250	T1	750
2	R2	1256	T2	753
3	R3	1246	T3	748

Table 4: TDS values of samples

The values of TDS varying between 748 to 1246 mg/l. The R1, R2, R3 are samples of raw water and T1, T2, T3 are samples of treated water taken in January, February, March respectively. TDS are inorganic salts like calcium, magnesium, potassium, sulphates and other small volumes of living material that are softened in water. In the month of January the TDS in raw water is 1250 mg/l and 750 mg/l in treated water. In the month of February the TDS in raw water is 1256 mg/l and 753 mg/l in treated water. In the month of march the TDS in raw water is 1246nmg/l and 748 mg/l in treated water.



Graph 4: TDS values of samples.

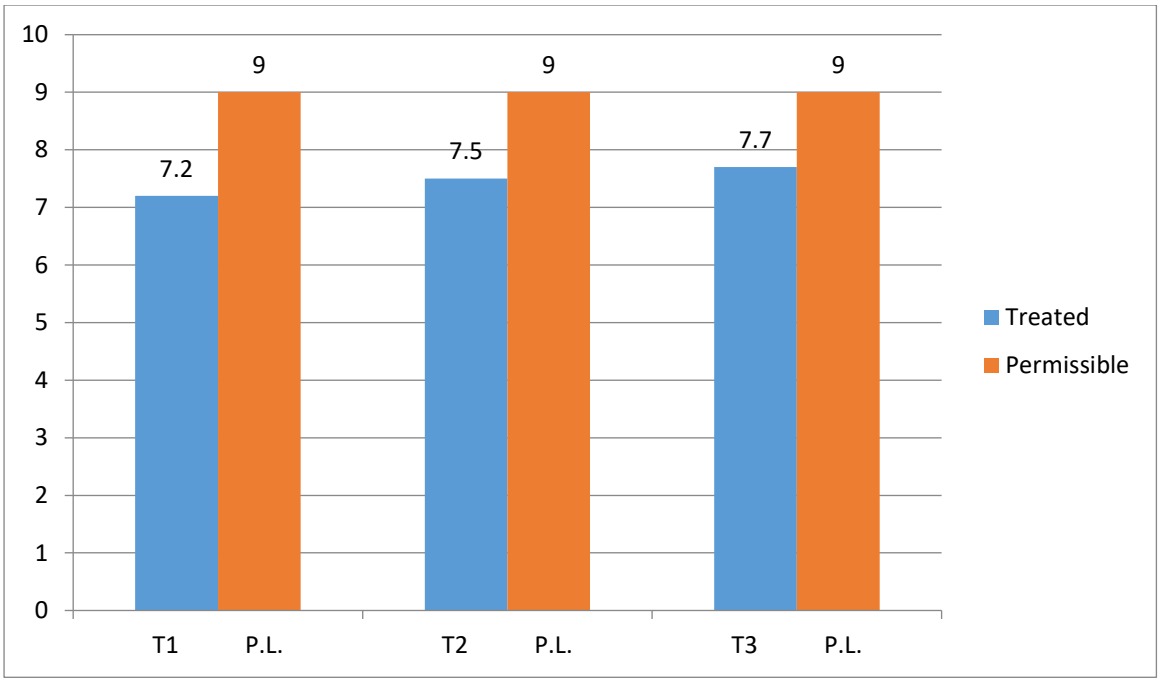
The Results for the parameters which includes pH, Sulphate ions, TDS, BOD chloride ions comes under the permissible limit. The values for pH are ranging between 7.2-8. The results for sulphates ranging between 123 mg/l to 146 mg/l. the TDS values are ranging between 728 mg/l to 1256 mg/l. the values of turbidity are varying between 185.7 to 205.6 mg/l.

5. pH

S.no	Treated Values of parameters	Permissible limit
1	7.2	9
2	7.5	9
3	7.7	9

Table 5: Treated values of pH.

For irrigation purposes the permissible limit of pH is 9. In the month of January the value of pH for treated water is 7.2. In the month of February the value of pH for treated water is 7.5. In the month of March the value of pH for treated water is 7.7. Therefore, All the values of pH comes under the permissible limit.



Graph 5: pH Treated values.

6. Sulphates

S.no	Treated values of parameters	Permissible limit
1	126	1000
2	124	1000
3	123	1000

Table 6: Sulphate treated values.

The permissible limit for sulphate ions in treated water is 1000 mg/l. In the month of January the value of sulphate in treated water is 126 mg/l. In the month of February the value of sulphate in treated water is 124 mg/l. In the month of March the value of sulphate in treated water is 123 mg/l. All the values of treated water come under the permissible limit.

Graph 6: Sulphates values of treated.

7. BOD

S.no	Treated values of parameters	Permissible limit
1	80.6	500
2	72	500
3	76.1	500

Table 7: BOD treated values.

The permissible limit of BOD in treated water is 500 mg/l. In the month of January the value of BOD in treated water is 80.6 mg/l. In the month of February the value of BOD in treated water is 72 mg/l. In the month of March the value of BOD in treated is 76.1 mg/l. All the values of treated water come under the permissible limit.

Graph 7: BOD values of treated

8. TDS

S.no	Treated Values of Parameters	Permissible Limit
1	750	2100
2	753	2100
3	748	2100

Table 8: TDS treated values.

The permissible limit for TDS in treated water is 2100 mg/l. In the month of January the value of TDS is 750 mg/l. In the month of February the TDS value of treated water is 753 mg/l. In the month of March the TDS value of treated water is 748 mg/l. Thus, all the values are come under the permissible limit.

Graph 8: TDS values of samples.

CHAPTER-5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The sampling of raw and treated water of sewage treatment plant, Jagral is done and different types of parameters were checked and these parameters were BOD, pH, Sulphates, and Total Dissolved Solids. From these results, it can be concluded that the treatment efficiency of this plant is 76.35%. At the same time pH reduction is quite efficient as it is near to the neutral value. Also the sulphates are reduced within the permissible limits. The plant shows significant change in Total dissolved solids (TDS).

As all the parameters after the treatment are coming within the range of permissible limits, thus, the effluent may be used for irrigation purposes.

This will help in solving the dual purpose of efficient disposal of effluent as well as increasing the soil fertility.

5.2 Recommendations

Groundwater is used as a source of water, but none of the wastewater generated is used to recharge groundwater sources after treatment. This leads to fact that the groundwater level is decreasing. The valuable nutrients present in wastewater are not used properly. On the other hand farmers have to buy artificial fertilisers that are imported from abroad, weakening the local economy.

Wastewater is being discharged into the open by industries without any legal consequences. The environment standards of the effluents are very low. Thus, the treatment of influent is very important as irrigating with untreated wastewater poses serious public health risks as sewage is major source of excreted pathogens the bacteria, viruses, protozoa that cause gastro intestinal infections in human beings.

The quality of treated effluent used in agriculture has a great influence on the operation and performance of the wastewater-soil-plant. In the case of irrigation, the required quality of effluent will depend on the crop or crops to be irrigated, the soil conditions and the system of effluent distribution adopted. Through crop restriction and selection of irrigation systems which minimize health risk, the degree of pre-application wastewater treatment can be reduced. The most appropriate wastewater treatment to be applied before effluent use in

agriculture is that which will produce an effluent meeting the recommended microbiological and chemical quality guidelines both at low cost and with minimal operational and maintenance requirements. All the parameters are within the range to be used on land for irrigation purposes. The plant can also be modified for further removal of various elements present in the wastewater so that the water may be used for various household purposes also.

The treated wastewater may also be used for other purposes apart from irrigation such as recreational purposes like artificial lakes, fountains etc. and car washing and other such activities.

The water may be used for drinking and in household activities after providing tertiary level treatment to it but that option has not been explored due to consumer reluctance.

5.3 Future Scope of the Project

It is expected that higher efficiencies and effectiveness of the systems will allow less waste and better recycling of the resources and less wastewater will be discharged to rivers. The treated water can also be used for the generation of electricity. Moreover, work for purification of water can be done. Various other parameters can be tested in the wastewater so that the water can use for other purposes. Further modifications can be studied so that a new and better design is provided for the treatment plant.

REFRENCES

Wastewater treatment management in the developing world with emphasis on India: challenges and opportunities.*Rev. Environ. Sci. Biotechnol.*2014. V. Srivastava, S. A. Ismail, P. Singh, R. P. Singh

Wastewater treatment in Jalandhar city and its impact on community health.

Wastewater treatmentt in Emerging Mega Cities : A case study of Pune City.*Indo Ital. Conf. Green Clean Environment.2008.*pp. 441–450. I. M. R. Gidde V. V. T. K. K. Kokate.

Wastewater treatment in Indian cities - A review. Wastewater management 2008. M. Sharholy, K. Ahmad, G. Mahmood,R. C. Trivedi.

Wastewater characteristics and treatment in Allahabad, India.Wastewater Management.2007.vol. 27, pp. 490–496. M. Sharholy, K. Ahmad, R. C. Vaishya, R. D. Gupta.

Assessment of Wastewater in Northeastern States of India. International Journal of Environmental Research and Development.2014.vol. 4, pp. 275–280. T. Chhabra, A. Paul, M. Gulati.

Wastewater treatment in Allahabad city and its impact on community health**.** International Journal of Pure and Applied Research in Engineering and Technology.2014. vol. 2,pp. 191–200. M. N. Rathod , K. B. Manwade.

A Case Study of Wastewater treatment in Mysore City.International journel of application or innovation in engineering and management.2013.vol. 2, pp. 290–294. J. Siddiqui, G. Pandey,S. Akhtar.

Systems approaches to integrated Wastewater treatment in developing countries.Waste Management.2013. vol. 33, pp. 988–1003. R. E. Marshall .K. Farahbakhsh.

.Processing of wastewater for Material Recovery.CRS Press.1990. G. M. Savage , L. F. Diaz

Wastewater treatment in Asian Developing Countries: Challenges and Opportunities. J. Appl. Environ. Biol. Sci. J. Appl. Environ. Biol. Science.*2012*.vol. 2, pp. 329–335. Y. Dhokhikah , Y. Trihadiningrum.

Advances in Water and Wastewater Treatment Technology :Tomonori Matsuo, Keisuke Hanaki, Satoshi Takizawa and Hiroyasu Satoh .

Environmental Engineering**.** H. S. Peavy, D. R. Rowe, and G. Tchobanoglous, McGraw-Hill, *1985.*

Applications of New Concepts of Physical–Chemical Wastewater Treatment Edited by:W.W. Eckenfelder and L.K. Cecil .

Basic Water and Wastewater Treatment A volume in Butterworths Basic Series.

Biological Phosphate Removal from Wastewaters .Proceedings of an IAWPRC Specialized Conference held in Rome, Italy, 28–30 September, 1987.

Biotechnology for Waste and Wastewater Treatment.Author(s):Nicholas P. Cheremisinoff, Ph.D.

Characterization and Treatment of Textile Wastewater.Author(s):Himanshu Patel and R. T. Vashi.

Handbook of Water and Wastewater Microbiology.Author(s):Duncan Mara and Nigel Horan.

Industrial Wastewater Treatment, Recycling and Reuse:Vivek V. Ranade and Vinay M Bhandari.

Instrumentation and Control of Water and Wastewater Treatment and Transport Systems .Proceedings of the 4th IAWPRC Workshop Held in Houston and Denver, U.S.A., 27 April – 4 May 1985.

Introduction to Wastewater Treatment Processes.*Author(s):R. Ramalho*.

Kinetics of Wastewater Treatment .Proceedings of a Post-Conference Seminar Held at the Technical University of Denmark, Copenhagen, 1978.

Membranes for Industrial Wastewater Recovery and Re-use.Edited by:Simon Judd and Bruce Jefferson.

Modelling in the Technology of Wastewater Treatment:Imre Horváth.

Municipal Wastewater in Agriculture.Edited by:Frank D'itri .

Nanomaterials for Wastewater Remediation:Ravindra Kumar Gautam and Mahesh Chandra Chattopadhyaya.