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Removal of Calcium and Magnesium of Underground Water in Veerapandi Village

Janaki.P[1], Balamurugan.P[2]
[1]P.G Scholar, M.E Environmental Engineering, Erode Sengunthar Engineering College (Autonomous), Perundurai, TamilNadu, India.
[2]Assistant Professor, Department Of Civil Engineering, Erode Sengunthar Engineering College (Autonomous), Perundurai, TamilNadu, India.
Corresponding author: Janaki.P

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ABSTRACT: Most of the river basins are closing or closed to severe water shortages, brought on by the simultaneous effects of agricultural growth, industrialization and urbanization. Performance of state-owned sewage treatment plants, for treating municipal waste water, and common effluent treatment plants, for treating effluent from small scale industries, is also not complying with prescribed standards. Thus, effluent from the treatment plants, often, not suitable for household purpose and reuse of the waste water is mostly restricted to agricultural and industrial purposes. The development of innovative technologies for treatment of wastewaters from various industries is a matter of alarming concern for us. Although many research papers have been reported on wastewater pollution control studies, but a very few research works are carried out for treatment of wastewater of steel industries, especially in reference to development of design of industrial effluent Treatment Plants (ETP) system. Another beneficial aspect of this research work will be recycling, reuse of water and sludge from steel industry The whole technologies for treating industrial wastewater can be divided into four categories: - Chemical, Physical, Biological and mathematical approaches. Keywords- Waste water, Effluent treatment plants (ETP), Environmental Impact assessment (EIA), and Physicaltreatment.

Keywords: Waste water, Effluent treatment plants (ETP),Groundwater, Coagulant, peanut and hybrid bermuda grass .

I. INTRODUCTION

Common Effluent Treatment Plants (CETPs) are considered as one of the viable solutions for small to medium enterprises for effective wastewater treatment. Wastewater generated by small and medium industries need to be transported to the Common Effluent Treatment Plant (CETP) by pumping of effluent from these industries. The effluent through pumping stations initially reaches a stilling/inlet chamber, after which it flows into the oil and grease (O&G) chamber for removing these from the wastewater, using a skimming mechanism. During this process, air and chlorine age injected into the chamber and separated oil and grease is then disposed. Wastewater moves from the O&G chamber to be collected in the screen chamber for removal of floating materials in the effluent. Apart from floating materials and O&G, the effluent also contains solid particles like grit and sand. The treatment process is a multifaceted task that needs to be planned and controlled in a sequential manner in order to meet the required discharge standards. Plant is designed to meet the specific demands of wastewater to be treated. The treatment processes for various effluents originating from different industrial sources are different. However, in India many of the operating CETPs are not performing optimally due to various technical and managerial reasons.

Physic-chemical treatment of wastewater was widely practiced until the late 19th century, until the advent of the trickling filter for biological treatment. The early 1970s saw a partial revival of interest that has continued to the present day, particularly for treatment plants that are overloaded during peak flow events. The addition of coagulant chemicals to primary clarifiers, or to other dedicated physical separation process, is an effective way of reducing the load to downstream biological process, orinsomecases for direct discharge.Thispracticeisgenerally. Referred to as chemically enhanced primary treatment, or CETP. Principle disadvantages that might preclude a wholly physic-chemical solution to wastewater treatment are the problems associated with the sludge produced, and the high operating costs of chemical addition. However, much of the current

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interests in physic-chemical treatment stem from its suitability for treatment under emergency measures; for seasonal applications, to avoid excess wastewater discharges during storm events; and for primary treatment before biological treatment, where the above disadvantages become lesserimpact.

CETP can also be an effective first step for pollution control in developing countries – particularly in large urban area that has evolved with sewerage system but without centralized waste water treatment, that have limited financial resources for complete, but capital-intensive biological treatments options such as activated sludge systems. Such urban development also may not have the areas available for appropriate technology options such as stabilization pond processes. The efficiency of CETP, in terms of BOD or COD removal, depends on waste water characteristics. With CETP, one can expect to remove particulate components, together with some portion of the colloidal components. Therefore, with such a waste water, it is feasible to achieve removals of more than: 95% TSS: 65% COD: 50% BOD: 20% Nitrogen and 90% phosphorus. In practice, removals may be lower or higher, for example: in warmer climates, with larger collection systems, and relatively flat sewers, one would expect a higher soluble fraction, and lower overall removals with CETP. On the other hand, if the collection system is relatively small, the climate is cold, and waste water is relatively fresh, there may be a higher proportion of particulate material and CETP enhance removals performance by higher. Staged coagulation- flocculation init.

II. MATERIALS

2.1.1 PEANUT

This study investigates the potential of peanut seeds as an environmentally friendly and natural coagulant for the treatment of high turbid water. The peanut seeds are used after oil extraction; and therefore, the active coagulation component was extracted by water and salt solution of various salt concentrations. The salts used were NaCl, KNO3, KCl, NH4Cl and NaNO3. Synthetic water with 200 NTU turbidity was used. Peanut extracted with NaCl (PC-NaCl) could effectively remove 92% of the 200 NTU turbidity using only 20 mg/l, while peanut seeds extracted with water (PC-DW) could remove only 31.5% of the same turbidity with the same dosage. The coagulant dosage didn't suffer from the concentration of the salt solution, however, residual turbidity decreased with increasing the concentration of the salt; and therefore, the relationship was found to be a second order polynomial curve with R2 of 0.9312. The other salts tested were also found to be good solvents to extract the active coagulation component with no much difference from NaCl solution in terms of efficiency.

Figure 2.1 Peanut Seeds

Commercial tamarind-based drinks are available from many countries. Vitamin B content is quite

2.1.2 HYBRID BERMUDA GRASS

Bermudagrass is presumably the toughest grass used for turf in areas of the desert southwest, the southern plains, and therefore the humid southeastern us . No other warm season grass has numerous attributes. These include:

· excellent resistance to heat and drought
· low water use rate
· dense sod formation
· tolerance of a wide range of soil pH ranges
· good tolerance to salty water and conditions
· good traffic tolerance
· relative ease of establishment
· grows on hard soil surfaces and shallow soils, better than most other grasses

Because bermudagrass has specialized growth stems and a comparatively rapid climb rate, it's usually excellent at crowding out weeds. Also, this is often the first reason why bermuda grows back so well when it's injured. Underground shoots (called rhizomes) help bermudagrass fill in void spots during a lawn.

Figure 2.2 Hybrid Bermuda Grass

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2.1.3 WHEAT

Wheat may be a grass widely cultivated for its seed, a cereal grain which may be a worldwide staple food. The many species of wheat together structure the genus Triticum; the foremost widely grown is Triticum aestivum (T. aestivum). The archaeological record suggests that wheat was first cultivated within the regions of the Fertile Crescent around 9600 BCE. Botanically, the wheat kernel may be a sort of fruit called a caryopsis.

There are five main categories of knowledge on physical properties of agro-food materials, which responds to physical treatments involving mechanical, thermal, electrical, optical and electromagnetic processes.

Broadly, the geometric properties like size and shape are one among most vital physical properties considered during the separation and cleaning of kernels. Study of physical properties in wheat kernels used are more complicated thanks to the inherent relationship among categories, that is, weight volume and density values are hooked in to the shape, size and degree of kernel damage. Besides, physical properties of cereal grains are intrinsically linked to its moisture content level.

Figure 2.3 Wheat

2.2 COAGULANTSPREPARATION

2.2.1 PREPARATION OF PEANUTPOWDER

Peanut seeds pods are allowed to mature and dry naturally to a brown color on the plantk. The seeds were faraway from the pods, kept for sun dry, and external shells were removed. Mature seeds showing no signs of discoloration, softening, or extreme desiccation were used. After sun dry, external shells were removed and seed kernel were obtained. Using grinder, fine powder achieved.

Figure.2.4 Powdered sample of Peanut

2.2.2 Preparation of Hybrid Bermuda Grass Powder

The hybrid bermuda grass was washed with water to remove dust and pulp and the clean grass were dried in the shade for 24 hours, and then removed the coat by treatment with the Hydrochloric acid. After that the seeds are powdered withthegrinderandtakesupto100gramsofthepowderednatural coagulant

Figure.2.5 Powdered sample of HBG

2.2.3 PREPARATION OF WHEAT POWDER

Wheat flour may be a powder made up of the grinding of wheat used for human consumption. Wheat varieties are called "soft" or "weak" if gluten content is low, and are called "hard" or "strong" if they need high gluten content. Hard flour, or bread flour, is high in gluten, with 12% to 14% gluten content, and its dough has elastic toughness that holds its shape well once baked. Soft flour is relatively low in gluten and thus leads to a loaf with a finer, crumbly texture.[1] Soft flour is typically divided into cake flour, which is that the lowest in gluten, and pastry flour, which has slightly more gluten than cake flour.

In terms of the parts of the grain (the grass fruit) utilized in flour—the endosperm or protein/starchy part, the germ or protein/fat/vitamin-rich part, and therefore the bran or fibre part—there are three general types of flour. White flour is made from the endosperm only. Brown flour includes a number of the grain's germ and bran, while whole grain or wholemeal flour is formed from the whole grain,

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including the bran, endosperm, and germ. Germ flour is formed from the endosperm and germ, excluding the bran.

Figure.2.6 Powdered sample of wheat

2.3 Sample Collection Andpreservation

The raw textile effluent waste water has been collected from the inlet of the common effluent treatment and its sample presentation precautions have been taken while collecting the effluent samples from industries. Five-liter polyethene cans were properly washed with mild detergent and then leached with 1:1 HCL overnight. Wastewater samples were immediately stored in ice box containing well frozen ice until they were to the laboratory where they were stored in refrigerator until analysis.

2.4 Preparation Of Natural Coagulant And Coagulation Studies

2.4.1 NATURAL COAGULANT:

In this study, peanut is used as natural coagulant, it is to be prepared for the treatment of textile wastewater. First the seed will be removed and dried in the oven in 60±2°c. The dried peanut is then powdered without any moisture content to neglect the contamination in it.

2.4.2 JARTest:

The jar test may be a common laboratory procedure want to determine the optimum operating conditions for water or wastewater treatment. This method allows adjustments in, variations in coagulant type, on a small scale in order to predict the optimum dosage of coagulant. There are six paddles which the operating conditions of six 1-liter containers. One container act as a control while the operating conditions can be varied among the remaining five containers. A rpm gage at the top-center of the device allows from the uniform control of the mixing speed in all of the containers. The jar test procedures involve the subsequent steps, fill the jar testing apparatus containers with sample water. One container is going to be used as an impact while the opposite 5 containers are often adjusted counting on what conditions are being tested. Add the coagulant to every container and stir at approximately 100 rpm for 1 minute. The rapid mix stage helps to disperse the coagulant throughout each container. Turn off the mixers and allow the containers to settle for 30 to 45 minutes. Then measure the final turbidity in each container.

III. EXPERIMENTAL PROCEDURE

The following are the flow chart representing various steps or methods used to achieve the project objective of the presentday

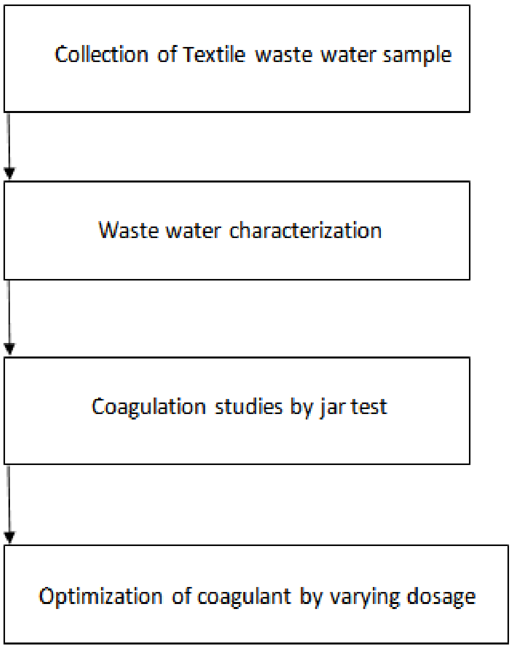

Figure 3.1 Flow chart for Methodology

3.1Physico- Chemical Parameters Analysing methods

3.1.1 DETERMINATION OFPH

The pH of the sample waste water was determined using determined using portable pen type pH meter at room temperature. The pH meter was calibrated as per the standard procedure. The meter is switched on and the pH electrode about 2-3 cm was dipped into the pH standard buffer solution. pH calibration mode was activated by pressing CAL/ MEAS key.The CAL iconappearedinthe LCD. Theupper display shows the default (uncalibrated) pH measurement of pH electrode while the lower display indicates the pH standard buffer solution which was automatically recognized by thematter.

The solution was swirled gently and the meter reading was allowed to stabilize. The upper display value is calibrated to the pH standard calibration points. The same procedure was repeated with other two standard buffers for better accuracy of the calibration. The electrode was rinsed in tap water before dipping into next standard buffer. Then the electrode was dipped about 2 to 3cm into the test solution. The test solution was stirred gently and the meter reading was allowed to stabilize till the display shows „ready". Then the reading on the display was noted as pH of the testsolution.

3.1.2 DETERMINATION OFTURBIDITY

The turbidity of the sample was found out using Nephelometric Turbidity meter. The principle involved in determination of turbidity is that when light is passed through a sample having suspended particles, some of proportional to the turbidity. The turbidity of the sample is thus measured from the amount of light scattered by the sample taking the references with standard turbidity suspension. First calibration of the instrument was done and then the sample was placed in the vial and the vial was placed in the turbidity meter. The reading displayed on the turbid meter was noted down as turbidity inNTU.

3.1.3 DETERMINATION OFCOD

The chemical oxygen demand of the sample was determined by closed reflux method. 2 ml of the sample was taken in COD digester bottles. 1ml of mercuric sulphate was added to avoid the interference of chlorine present in the sample and 3ml of COD acid was acid was also added to the sample. 1ml of potassium dichromate solution was added to the mixture and mixed well. The sample in the COD cuvettes along with the blank solution prepared with distilled water was refluxed in the COD digester for 2 hours at 150^{o}c. The refluxwas allowed to cool in the room temperature after the refluxing period. The blank and samples were titrated against Ferrous Ammonium Sulphate using Ferroin indicator. The volume of the titrate required for the samples and the blank to change color from the bluish green to wine red wasnoted.

3.1.4 DETERMINATION OF TOTALSOLIDS

The number of total solids in the sample was determined by separating the solids from the liquid present in the sample by heating at 103-105^{o}c. An evaporating dish of suitable size was taken and dried for 1 hour. The dish was stored in desiccators until it became cool.

The initial weight of the dried and cooled dish was noted. 10ml of the unfiltered well mixed sample were taken in the evaporating dish is placed in hot air oven at 103-105^{o}c for 2 hours till all water particles were evaporated. Then the dish was cooled in desiccators until it become cool and the weight of the cooled dish along with the solids was measured. The difference between the initial weight and the final weight of dish was calculated to determine the Total Solids in the sample. The total solid present in the wastewater sample was calculated as per the equation.

3.1.5 Determination Of Total Suspendedsolids

The amount of total suspended solids in the sample was determined by filtering the filterable suspended solids from the liquid present in the sample. Whatman filter paper was dried and weighed initially. 25 ml of the sample was filtered using the above prepared filter paper. The filter paper was dried in the oven at 103-105^{o}c to separate the liquid from the filterablesolids.
Suspended solid present in the wastewater sample was calculated as per theequation.

IV. RESULT AND DISCUSSION

The materials used and the methodology adopted in this study was presented in the previous chapter. The results obtained through this current study were discussed in this chapter.

4.1 EXPERIMENTALSTUDIES

Two experimental studies were carried out batch mode. First experimental study was carried out to determine the optimum dosage for the removal of sludge from textile waste water using natural

4.2 Determination Of Dissolvedsolids

The amount of total dissolved solids, the sample was determined by filtering the solids from the liquid present in the sample. An evaporating dish of suitable size was taken and dried for 1 hour. The dish was stored in the desiccator until it became cool. The initial weight of the dried and cooled dish was noted. 25ml of the sample was filtered using Whatman filter paper. 10 ml of the filtrate collected was taken in the evaporating dish. The sample taken in the dish was placed in hot plate until all water particles were evaporated. Then the dish was cooled in the desiccator until it become cool and the weight of the cooled dish along with the solids was measured.

Peanut and hybrid bermuda grass on the major pollutants of concerned in waste water treatment.

Table 4.1 Characterization of Textile WasteWater

S.No	Parameters	Concentration
1	pH	2.79
2	Turbidity	250 NTU
3	TDS	5750mg/l
4	TSS	1250mg/l
5	TS	7000mg/l
6	BOD	48060mg/l
7	COD	31558mg/l

4.3 Determination Of Optimum Dosage Of Natural Coagulants

This experimental study was carried out to determine the optimum dosage of natural coagulants (peanut, hybrid bermuda grass and wheat). 500 ml of sample was taken in the eight different beakers. The naturalcoagulantswereaddedin10ml,20ml,30ml,40ml,50ml,60ml,70ml,80mlto different beakers were subjected to flash mix rapidly for 1minute. After 1 min reduce the speed of the paddles and continueit for 10 minutes.Then switch off the motor and allow the solution to settle for 20 minutes. Measure the amount of floc produced at the bottom.This study was carried out format ural coagulants.

4.4 Determination Of Optimum Dosage Of Peanut

There adings were tabulated in the Table.4.2.

Table 4.2 Optimum Dosage of Peanut

S.No	Dose of Peanut (ml)	Amount of floc (mg)
1	10	2500
2	20	2700
3	30	2500
4	40	3000
5	50	3800
6	60	4200
7	70	2500
8	80	2800

The results were plottedina graph with coagulant dos ageonx-axis and floc produced on y- axis. This plotted graph was shown inFigure.4.1.

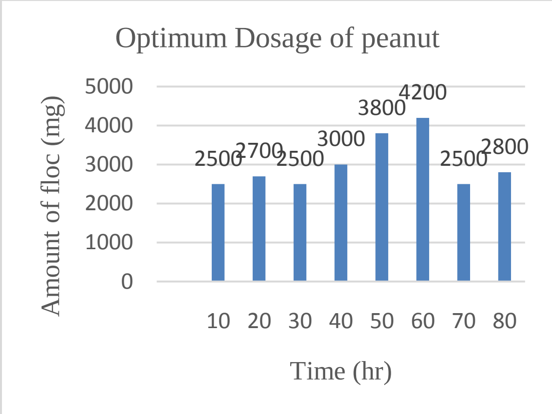

Figure.4.1 optimum dosage of Peanut

From graph,
Peanut coagulant vs floc produced the optimum dosage of Peanut is identified as 60 ml and amount of floc formed 4200mg.

Peanut coagulantvs floc produced the minimumdosage of Peanut isidentifiedas 10ml, 30ml, 70m land amount of floc formed 2500mg.

4.5 Determination Of Optimum Dosage Ofhybrid Bermuda Grass (Hbg)

ThereadingsweretabulatedintheTable.4.3 .The results were plotted in a graph with coagulant dosageonx-axis and floc produced ony-axis. This plotted graph was shown inFigure.4.2.

Table 4.3 Optimum dosage of HBG

S.No	Dose of HBG (ml)	Amount of floc (mg)
1	10	1450
2	20	2000
3	30	1800
4	40	2250
5	50	2900
6	60	3450
7	70	3300
8	80	2900

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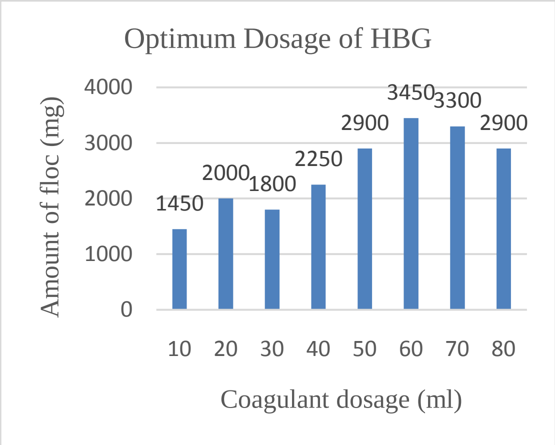

Figure.4.2 optimum dosage of hybrid bermuda grass

From graph,
Hybrid bermuda grass coagulant vs floc produced the optimum dosage of hybrid bermuda grass is identified as 60 ml and amount of floc formed3450mg.
HBG coagulant vs floc produced the minimum dosage of hybrid bermuda grass is identified as 10 ml and amount of floc formed1450mg.

4.6 DETERMINATION OF OPTIMUM DOSAGE OFWHEAT

The readings were tabulated in the Table. 4.4.The results were plotted in a graph with coagulant dosageonx-axis and flocproduced ony-axis.This plotted graph was shown inFigure.4.3.

Table 4.4 Optimum dosage of Wheat

S.No	Dose of Wheat (ml)	Amount of floc (mg)
1	10	1200
2	20	1750
3	30	2100
4	40	2850
5	50	3600
6	60	4700
7	70	4600
8	80	3600

Figure 4.3.Optimum dosage of Wheat

From graph,
AI coagulant vs floc produced the optimum dosage of neem is identified as 60 ml and amount of floc formed 4700mg.
AI coagulant vs floc produced the minimum dosage of neem is identified as 10 ml and amount of floc formed1200mg.

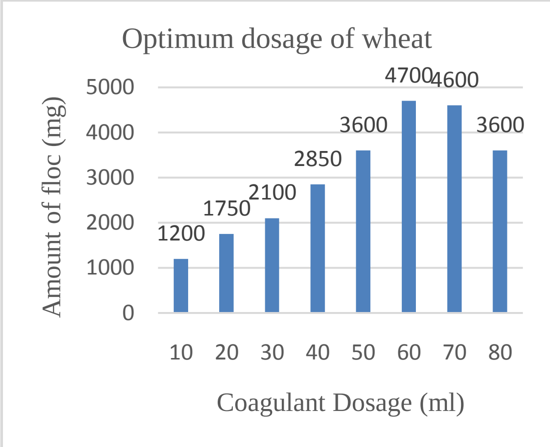

Figure 4.3.Optimum dosage of Wheat

4.8 SUMMARIZATION

From the experimental study 1, it may be concluded that the amount of sludge removal capacity of the naturalcoagulants

- For hybrid bermuda grass, it reaches its amount of sludge removal of 3450 mg at optimum dosage of 60ml.
- For Peanut, it reaches its amountof sludge removalof 4200
- mg at optimum dosage of 60 ml.
- For TRPY, it reaches its amount of sludge removal of 4500 mg at optimum dosage of 60ml.

V. CONCLUSION

In this work an attempt is made to study the uses of the natural coagulant Triticum on the reduction of the excess physico-chemical parameters present in the waste water collected from the CETP. The physico-chemical parameters are treatedwiththehelpofthenaturalcoagulant,werethe parameterslikecolor,pH, Turbidity, Total solids, Total suspended solids and Total Dissolved Solids (TDS) were graduallyreduced.
It may be concluded that the maximum removal efficiency in hybrid bermuda grass than other two natural coagulants such as Triticum, and Peanut on the major pollutants of concerned in waste water treatment.

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