DESIGN OF TREATMENT PLANT FOR POULTRY WASTE WATER, ASSESSMENT AND ESTIMATION

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Abstract

The discharge of water wastes into a stream may impart turbidity, reduce dissolved oxygen, form sludge deposits, alter salinity, pH, and temperature, produce nutrients that result in undesirable growths, and impart toxicity to that stream. The increased level of any one of these factors in a natural body of water may adversely affect the flora and reduce the value of that water to subsequent users. Wastewater-treatment systems in the poultry-processing industry usually provide primary and secondary treatment and may or may not include tertiary treatment. The PWW treatment plant is to be designed and constructed to treat the waste water, generated from various farms or slaughter houses. My project deals with the design of PWW treatment plant at farm house, Munnaracode .Presently the population of poultries are 50,000 in the farm house from that one lakhs liters of waste water is generated per month. But still now there is a increasing in the population. When considering the population inflation and future developments in the farm, the capacity of the PWW would be large. So, there is a need for design the PWW plant which would be sufficed to handle the future waste water treatment requirements of the area. Treated water is discharged into land for irrigation purposes and balance to public drain. Also prepare the detailed estimation and abstract of estimated cost for the PWW treatment plant, and to develop a model for the values so as to check whether the method is preferable or not.

Index Term-*PPW[1],biological treatment[2], coagulation[3],Reuse[4],reclamation[5]*

1. INTRODUCTION

Poultry farming is the process of raising domesticated birds such as chickens, ducks, turkeys and geese for the purpose of farming meat or eggs for food. Poultry are farmed in great numbers with chickens being the most numerous. According to the researchers and scientists, 74 percent of the world's poultry meat, and 68 percent of eggs are produced in ways that are described as intensive. One alternative to intensive poultry farming is free-range farming using lower stocking densities. Poultry processing is drawing more interest in Sudan for many reason such as amelioration in living standards, prosperity, relatively easy profit and revenue from this sort of investment, increased prices of meat together with relevant environmental, socioeconomic and cultural factors and local impacts. Therefore, old poultry processing centers are expanding and new sectors are emanating to existence. The net result is an augmentation in waste generated creating problems with their handling, treatment and final disposal.This aggravated inconveniences such as occurrence of obnoxious odors, fly nuisance especially the common fly, breeding place for mosquitoes, accumulation of large volumes of wastes annually and presence of unwanted, harmful wild life in the vicinity of the poultry farm. An increase in poultry processing has generated a steady rise in wastewater pollutant concentrations. Despite mechanical improvements in wastewater treatment, many poultry processors continue to pay unnecessarily high fees for municipal water Poultry processing plants, as in many other food processing activities typically are high water users. For broilers, 5 to 10 gallons of water are used to process one 5 pound, average-sized chicken. When processing turkey the volume of water is even higher with average weight of slaughtered turkeys exceeding 4 times that

of a chicken. It is not unusual for a typical poultry processor to generate 1,000,000 to 1,500,000 gallons of wastewater daily.

II.MATERIALS AND METHODS

1. Poultry effluent

The effluent is collected from the farm houses and nearby stalls.It is a mixed colour of red and brown,red indicate the blood of the poultries and bown indicated the waste .The effluent also have flesh,feathers ,waste particles etc.

Fig.1 Poultry effluent

2. Sand

Sand is a loose granular substance typically pale yellowish brown, resulting from the erosion of siliceous and other rocks and forming a major constituent of beaches, river bed, etc. The sand is collected from the Bharathpuzha river. Sand passes through IS 2.36 mm is used. The filter medium should be of uniform grain size to make sure that the pores between grains are the same size, so that the filters efficiency should be equal over the bed.

3. Activated carbon

Activated carbon can be considered as a material of phenomenal surface area made up of millions of pores - rather like "molecular sponge. The activated carbon was collected from house itself. Activated charcoal or activated carbon is a typical form of carbon which is prepared by burning of coal or organic matter like animal bones or coconut shells in controlled conditions.

4. Gravels

Gravels are mostly seen in the river.It is spherical in shape.This is used in the filter media for the support of fine aggregates.gravels strains the water completely.To accomplish the above process gravels are sieve through 2mm IS sieve is used.

5. Fine aggregate

Fine aggregates are very fine particals which helps to strength the filter media and also for support the gravels.To accomplish the above purposes, aggregates must be graded. The aggregate which passes through 2.5mm IS sieve and retain on 4mm IS sieve is used.

6. Coarse aggregate

Coarse aggregate is provided to support the sand bed and to permit uniform drainage of the overlaying sand. This layer allows water to drain freely from the sand bed while preventing sand from escaping to the outlet tank. To accomplish the above purposes, aggregates must be graded. The aggregate which passes through 10 mm IS sieve and retain on 20 mm IS sieve is used.

7. lablab purpureus (hyacinth bean)

Lablab purpureus is a scientific name of peanut plant. The seeds were removed 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. The seed kernels were ground to fine powder using a kitchen blender to make it of approximate size of 600 μm to achieve solubilization of active ingredients in the seed. Distilled water was added to the powder to make 1% suspension of it. The suspension was vigorously shaken for 45 minutes using a magnetic stirrer to promote water extraction of the coagulant proteins, and this was then passed through filter paper (Whatman no. 42, 125mmdia.). The filtrate portions were used for required dose of natural coagulants. Fresh solutions were prepared daily and kept refrigerated to prevent any ageing effects (such as change in pH, viscosity, and coagulationactivity). Solutions were shaken vigorously before use.

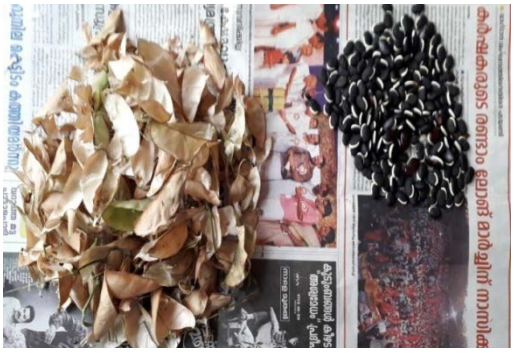

Fig.2 Dried peanut seeds

8. Chlorine

Chlorination is the process of adding chlorine to drinking water to disinfect it and kill germs. Different processes can be used to achieve safe levels of chlorine in drinking water. Chlorine is available as compressed elemental gas, sodium hypochlorite solution (NaOCl) or solid calcium hypochlorite (Ca(OCl)2 . While the chemicals could be harmful in high doses, when they are added to water, they all mix in and spread out, resulting in low levels that kill germs but are still safe to drink.

9. EXPERIMENTAL SET UP FOR PWW MODEL

Model for PWW s were developed using glass and plastic containers as per obtained designed value. About 5L sewage waste water was collected from farm houses and near slaughter houses, munnaracode.Sewage water diluted and to made as 10L. Checked the parameters of diluted sewage water. A plastic container of 10 L capacity is used as an inlet chamber. From inlet chamber, the sewage was passed through the screens having an opening of 6mm,4mm and 2mm respectively. Large PVC half rounded pipe 160mm size of length90cm used as screen chamber. The screens were placed at 45 degree to the chamber. After screening, the effluent was collected in the coagulation aided with sedimentation tank.It contains the motor for paddles to rotate in a fixed velocity for flocculation.Pea nut powder solution is added to the tank coagulation.The continue mixing the the effluent is allow for the sedimention for 4hr.After the sedimentation using the submersible pump the effluent is pumped to the trickling filter.

Fig.37 Experimental set up for small scale model for PWWs

10. Trickling filter

A plastic container of 50L capacity with 43cm dia and 56cm depth.Springler with three arms having 4 nozzels in each arms. This get rotated according to the force of water pumped.The effluent is pumped from sedimentation tank using submersible pump.The water is perculated through the filter bed consist total six layer.First layer is coarse aggregate of 4 to 5 mm sieve having 5cm thick,second layer is fine aggregate of sieve 2.5mm having 5cm thick,third layer is gravel of sieve mm having 8cm thick,fourth layer is sand having 12cm thick,fifth layer is activated carbon having 11cm thick and the last layer is again sand of 5cm thick.Total length of bed cover is 46cm and depth of under drainage is 5cm which follow to tap.

11. METHODOLOGY

Model for PWW were developed using glass and plastic containers as per obtained designed value. The method behind the small scale PWW model is based on extended aeration trickling process. About 5 L sewage waste water was collected from farm house, Munnaracode. Sewage water diluted and to made as 10L. Checked the parameters of diluted sewage water. A plastic container of 10 L capacity is used as an inlet chamber. The main process carried out in the treatment plant is, wastewater generated from various sections is first passed through screen chamber for removing large particles. After screening, the effluent is collected in a sedimentation tank where air is bubbled by means of mini motor and it is also for rotating paddles for flocculation.Jar test is conducted for determine the dosage of coagulant. It was carried out as a batch test, accommodating a series of six beakers together with six spindle steel paddles.Coagulant of varying concentrations were added in the beakers. The whole procedures in the jar test were conducted in different rotating speed. From the coagulation cum sedimentation tank, the wastewater is pumped at a suitable rate to the trickling tank. After the filtration of effluent from trickling tank flow to the disinfection tank.Chlorine is added disinfectant for safe. The treated water is discharged in to land for irrigation purposes and balance to public drain. Checked parameters are given below.

12. PWW TREATMENT PLANT

The farm house at munnaracode covers total 1 acres.. All the aspects of farm house, climate, topography, and population of hens growth rates and future extensions should be considered while designing the project. The design of PWW in farm house includes the integral parts such as inlet chamber, screen chamber, coagulation cum sedimentation tank,trickling filter and disinfection tank.the waste water are from the slaughter houses by cleaning of house utensils etc. When

considering the population of hens inflation and future developments to farm house , the wastw water generated now is 100000L/month.The farm house started in the year 2000 having 6000 numbers of hens only having two units.but by increasing the year the farm house also become extended with more poultries,so which can be replaced by the PWW having 1MLD for 20 years of design period. In 2019,the num of stuff are 50000 having 10 units . The new PWW designed for 200000 lakhs of hens. For 200000 population, the average flow is 1MLD. The STP is designed based on aeration activated sludge process. Degree of treatment, design period, population should be considered at the time of design.

13. ABSTRACT OF ESTIMATE

Abstract of estimated cost the cost of each item worked out from the quantities already computed in the detailed measurement from at workable rate. But the total cost is worked out in the prescribed form called abstract of estimated cost form. For other expenses such as transportation, contingencies, petty supervisions 7 % of estimated cost is added to the total cost. At various stages in project management, need to know how much is cost of executing unit amount of work, and how many equipments are required to execute unit amount of an item of work. For getting the all datas abstract of estimate should be done as per current rate available in PWD.

III.RESULT AND DISCUSSIONS

1. SIZE OF DESIGNED PPW

The poultry waste water treatment plants for munnarakode area was designed as per advanced activated sludge process. The size of the screen chamber obtained as 2.5m×1m×1m. Screen chamber is used to prevent the entry of solid particles particles above a certain size; such as plastic cups, paper fats flesh,bnes,feathers,others into the pww plant . Size of the sedimentation tank ,flocculation chamber, diameter and depth of trickling filter , size of disinfection were tabulated in 1.Flocculation chamber and sedimentation tank is designed in one tank,the floccution chamber is for mixing the the coagulant into the effluent.The mixed effluent is allow to settle intented heavier organic materials in the sedimentation tank.The disinfection tank is a small tank used for adding and mixing the disinfectant into the effluent and to produce clear supernatant water.

Table.1Size of components of designed PWWs

COMPONETS	SIZE
Inlet chamber	1.3mx1mx1m
Screen chamber	2.5mx1mx1m
Flocculation chamber	2mx6mx2m
Sedimentation tank	25mx6mx2m
Trickling filter	Diameter 70m, 2m
Disinfection tank	1.3mx1mx1m

2. ESTIMATION AND COST OF DESIGNED PWW PLANT

Estimation of the designed poultry treatment plant is done by long wall short wall method. The abstract of estimated cost is followed as per P.W.D rates 2017. The total cost for work is approximate eight crores twenty lakhs ninty four thousand seven hundred sixty six.

Table.2 Cost for construction

SL.NO	DESCRIPTION	AMOUNT
1	Inlet chamber	197175.4
2	Screen chamber	40254
3	Flocculation chamber	18267836.3
4	Sedimentation tank	3910135.2
5	Trickling filter	61144650.2
6	Disinfection tank	197175.4
	Other expense **Total**	 **82094766**

1V CONCLUSION

The project is intended to design a treatment plant to treat poultry waste water from the farm house, murracode, palakkad district based on biological sludge process . When considering the population inflation and future developments in the farm houses and near by stalls the capacity of PWW plant should be large. So the PWW plant which can handle the future sewage requirement is designed for 30 years. Presently there is no treatment plant is exist. The designed PWW plant is of 1ML capacity . For this purpose, designed the integral part of PWW, i.e inlet chamber, screen chamber, sedimentation chamber, coagulation camber, trickling filter, disinfection tank. Enough space is available for the construction, hence it is constructed

in one storie . Detailed estimation of designed treatment plant is done as per long wall short wall method. The abstract of estimated cost is followed as per P.W.D rates 2017. The total cost for work is approximately 8-9 crores. A model for PWW was also developed as per the designed values to check its working and it was satisfactory. The effluent was treated by this model. The treated water is tested and found that it is with in the limit of CPCB for irrigation purposes. By considering the cost and efficiency of treatment, the designed PWW Plant is satisfactory and very useful.

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