SUSTAINABLE TREATMENT OF AUTOMOBILE SERVICE CENTRE WASTE WATER AND TO REUSE IT FOR AGRICULTURAL PURPOSES

A

MAJOR PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
CIVIL ENGINEERING

Under the supervision of

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May-2023

STUDENT'S DECLARATION

We hereby declare that the work presented in the Project report entitled **"Sustainable Treatment of Automobile Service Centre Waste Water and to Reuse it for Agricultural Purposes**" submitted for partial fulfillment of the requirements for the degree of Bachelor of Technology in Civil Engineering at the **Jaypee University of Information Technology, Waknaghat** is an authentic record of our work carried out under the supervision of **Mr. Akash Bhardwaj (Assistant Professor Grade II)** and **Prof. Dr. Ashok Kumar Gupta (Dean Academics and Research).** This work has not been submitted elsewhere for the reward of any other degree/diploma. We are fully responsible for the contents of our project report.

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CERTIFICATE

This is to certify that the work presented in the project report titled " **Sustainable Treatment of Automobile Service Center Waste Water and to Reuse it for Agricultural Purposes** " submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering is an authentic record of work carried out by Shubham Sharma(191601), Ayush Thakur(191602) and Naman Bhardwaj(191607) under the supervision of **Mr. Akash Bharadwaj (Assistant professor , Grade- II) and Prof. Dr. Ashok Kumar Gupta (Dean academics and research)** To the best of our knowledge, the preceding statement is correct.

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ABSTRACT

The results of a study on the sustainable treatment of vehicle service center wastewater for reuse in agricultural applications are presented in this project report. Four service stations in the Shimla-Solan belt provided samples, and a three-step treatment technique was used. Sedimentation, oil and grease removal, and dissolved particles removal. Sedimentation was accomplished with rice husk, oil and grease removal with sawdust, and dissolved particle removal with reverse osmosis.

The results demonstrated that the three-step treatment process was effective in cleaning the wastewater and creating high-quality effluent that could be reused in agriculture. Turbidity, TSS, TDS, chlorides, and oil and grease were reduced by 79.7%, 78.94%, 991.88%, 88.85%, and 89.34%, respectively.

The study's findings imply that a three-step treatment process can achieve sustainable treatment of vehicle service Centre wastewater and that the treated effluent can be safely reused for agricultural uses. This technique has the potential to lower the demand for fresh water resources while also promoting sustainable water management practices in the automotive repair sector.

Key Words: Sustainable Treatment, Rice Husk, Saw Dust, Reverse Osmosis, Agricultural Reuse.

CHAPTER 1

INTRODUCTION

According to US Geological Survey, 70% of worlds fresh water is used for agricultural purposes. This value goes up to 91.2% in South Asia (figure 1). With ever increasing pressure on water sources it is ideal to reuse treated waste water.

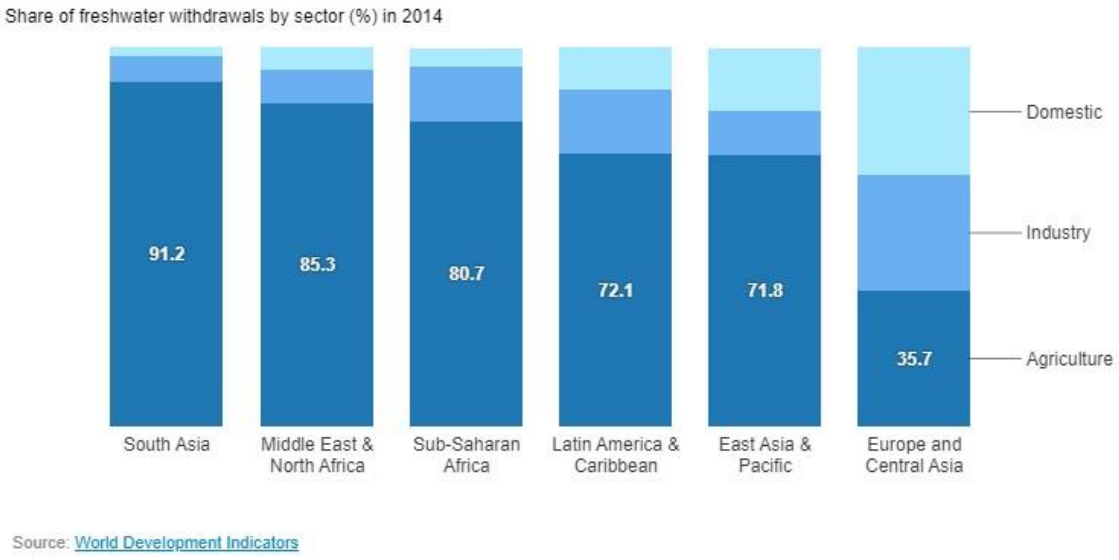

Figure 1.1: Share of Fresh water withdraw.
Source: World Development Indicators.

Industries produce large quantities of waste water. Hence, treating their waste water and reusing it for agricultural purposes creates an ideal scenario where we can free up a lot of fresh water for uses other than agricultural. But it is not enough to simply treat the waste water; we have to look at our ecological footing as well.

1.1 Some problems with conventional treatment system:

- The sedimentation tanks used for treatment requires high coagulation.

- Trickling filters generates sludge that needs to be disposed of.
- Rapid Sand filters produce large volume of sludge for disposal.
- In well-established cities where waste water treatment system was not adopted initially; it is extremely difficult to create it as it requires extensive amount of land, lot of digging will be required to connect sewer pipes with treatment chambers causing nuisance to people.

Because of the above-mentioned problems, it becomes necessary for us to adopt a treatment system which is easy to create and checks our eco-logical footing well.

The evaluation of the treated waste water is also done based on some parameters. These parameters give a correct information about the usability of treated water for the purpose of irrigation.

1.1.1 Chemical parameters:

Total salinity: Amount of dissolved salts present in water. In general, it refers to the concentration of the dissolved minerals and salt present in water. If the value of salinity is high, it can highly affect the aquatic life and the drinking water quality. There are various processes which can cause salinity such as mining. The salinity levels should be managed in order to ensure the good quality of water.

Acidity: The concept of acidity of water basically refers to the level of its pH. It basically tells us that how much acidic or basic our given water sample is. Water having pH less than 7 is considered as acidic. If the pH of given water sample comes out as it is considered neutral and if it comes out more than 7 it is considered as basic. For the purpose of agriculture, the level of pH should be between 6 to 8.

Hardness: Hardness occurs in water due to presence of bicarbonates, chlorides and sulfates of magnesium and calcium. Generally, it is measured in terms of parts per million i.e. ppm. In order to treat the hardness of water, water softeners can be used which can help in removing minerals through various processes.

Sodium Adsorption Ratio (SAR): It is basically a water quality parameter used for irrigation in case of sodium affected soils. In order to calculate the value of Sodium adsorption ratio, we have to divide the value of the sodium concentration by the square root of the half of the concentration of calcium and magnesium.

CHAPTER 2

LITERATURE SUMMARY

M.N. Asha et al. (2015) Whenever the waste water sample is collected from any of the automobile service station, it contains the oil and grease content in it as it is dealing with huge number of vehicles on a daily basis. So, in order to remove this oil and grease content from the waste water, we can make use of the low cost and easily available products such as sugarcane bagasse. For this very purpose, saw dust can also be used. Chemical treatment in order to reduce oil and grease content might include the dosages of alum but physically, saw dust and the sugarcane bagasse can be used.

Dr. M.M. Mujumdar et al. (2020) Various parameters to be tested for car washing waste water are pH, Oil and grease content in the collected sample of waste water, the value of BOD and COD, the value of the suspended matter that is present in the waste water sample, the value of dissolved solids in the waste water sample, the value of total solids in the waste water sample. If the water that is to be used for washing the cars in service centres can be reused to wash the cars, it will be directly reducing the consumption of fresh water and hence it will help in saving the fresh water.

Abhishek Shehra (2021) A cost estimation needs to be done to know about the fact if we go for the recycling process in case of agriculture, it will directly save money. Also, the various tests that are necessary to do for knowing about the effectiveness of waste water sample are pH, SAR, boron concentration etc.

Honoria de Fatima et al. (2017) In order to reduce the oil and grease content in the waste water collected from the automobile service stations, along with the use of saw dust, we can apply the sugarcane bagasse to reduce the oil and grease content. The sorption capacity of sugarcane bagasse as well as saw dust is enough to reduce the oil and grease content from collected waste water sample.

E. kowsalya et al. (2020): In order to manage the water supply and make it effective, it is imperative to treat the waste water so that the treated waste water can be used to mange the

water supply. Whenever there is a discharge of water from car washing stations, it has certain effects on the water pollutants. Basically, in order to proceed with the process of adsorption, carbon can be applied for this purpose.

Anjali K. Ullas (2018): The high values of turbidity can affect the driplines that are used in agriculture. In order to reduce the turbidity value, rice husk and the ash of rice husk are used. They are affective in reducing not only the turbidity, but also the suspended matter.

CHAPTER 3

METHODOLOGY

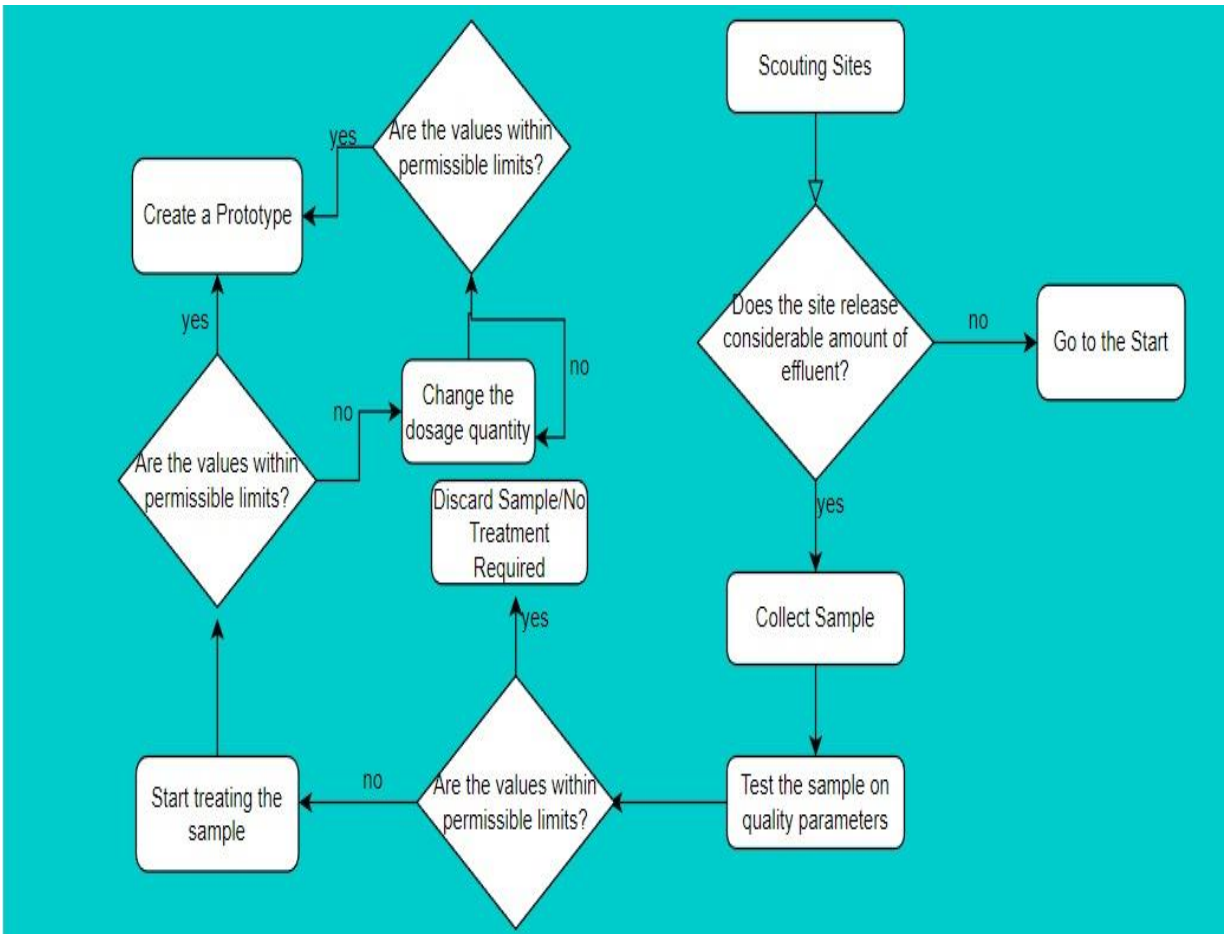

Figure 3.1: Methodology for waste water treatment.

3.1 To Identify a Suitable Site:

The site must produce a significant amount of waste water. It is desirable that the effluent sample may contain anomalies like high amount of TSS or some inorganic impurities. Mandi, Shimla and Solan these three sites are selected as they produce considerable amount of waste water in car washing Centres. Also when the waste water sample is collected from all these areas, it was observed that most of these service Centre were located nearby the agricultural fields and if the water from these service Centre would be used for agriculture, it will be beneficial as it can really save the fresh water that otherwise is used in case of irrigation/ agriculture.

3.2 Collection of Effluent Sample: Waste water sample is collected from Mandi, Shimla and Solan districts of Himachal Pradesh.

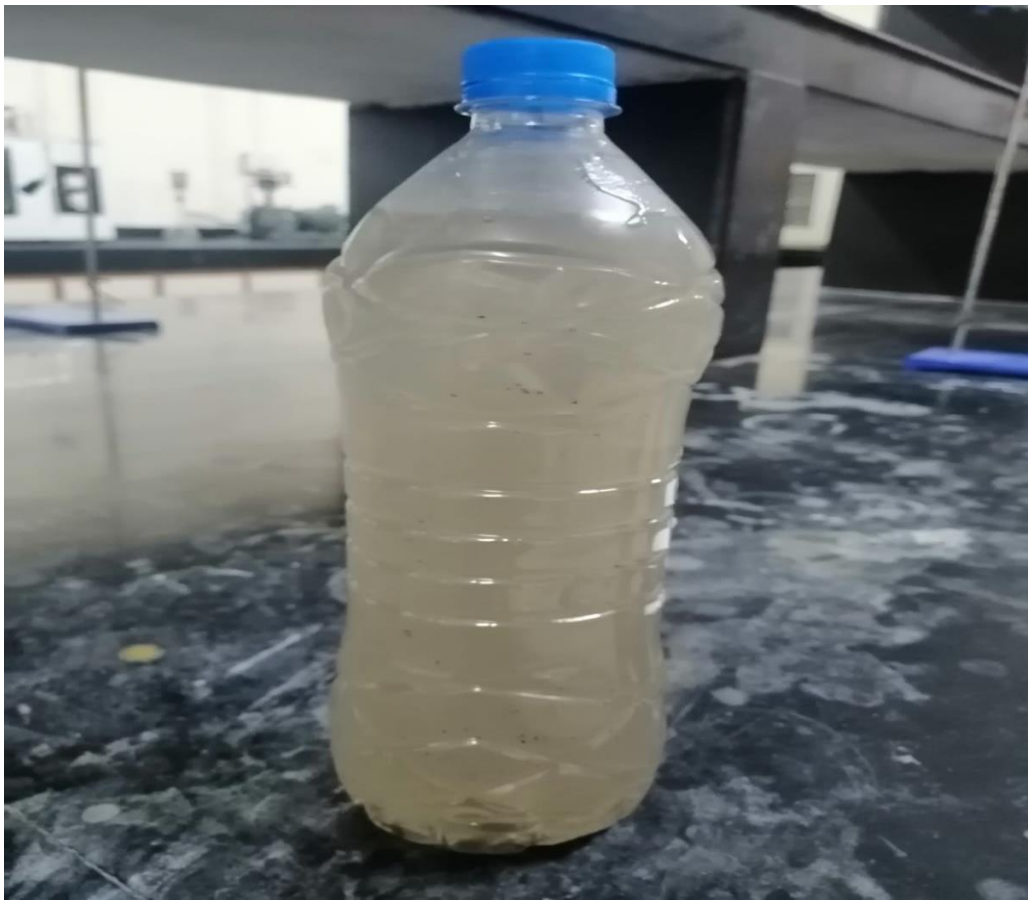

Figure 3.2: Waste water sample.

The waste water sample was collected from three districts of Himachal i.e. Mandi, Shimla and Solan. These service stations were chosen because it was observed that they release a considerable amount of the water that is wasted.

3.3 Testing of the Sample on Quality Parameters

To check if the water is suitable for irrigative purposes it has to tested to on the parameters mentioned above. After testing we will get a clear idea of what Quality Parameters are required to be treated for the water to be suitable for irrigation. The waste water sample is collected from all the four service stations. Each water sample to undergo around eight to nine tests which are required for any water to be used for agricultural purposes. Some of these tests include pH value of the collected effluent, the measure of turbidity of the collected effluent, the amount of chlorides which are present in all the four water samples, the amount in which total solids are present in water sample, the amount in which total dissolved solids are present in water sample,

to know about the oil and grease content.

Figure 3.3: Turbidity meter.

In order to measure the turbidity of water sample, we use turbidity meter to know about the level of turbidity in NTU.

3.4 To begin treatment

We have already discussed the drawbacks of conventional waste water treatment unit. So, to avoid those problems we will begin the treatment by passing the waste water sample through a three-step purification technique involving filtration, coagulation & flocculation and oil and grease removal. So, basically after testing the water on various parameters, we will be in a condition to know whether the water is suitable for irrigation purpose or not. If the tested values of parameters are within the permissible limits, then there is no need to treat the sample. But if the tested values are not in limits, the samples need to be treated for all those parameters.

3.4.1 How to treat waste water?

The waste water will mainly include suspended solids and oil & grease as the main pollutants due to the very nature of the vehicle service centers. Filtration will mainly reduce the larger

suspended particles. Coagulation and flocculation will bring down the turbidity and finally with oil and grease removal we will get the deaired water quality. Instead of using the conventional treatment strategies, we will be using the sustainable treatment strategies like the use of rice husk in order to remove the turbidity and the total suspended materials. Also, in order to reduce the value of oil and grease in the water sample, we will be using saw dust. Also, even if there will be some sort of dissolved solids present in the water sample, we will be using the process in which we will pass the water sample through a reverse osmosis membrane. So, instead of following the conventional type of treatment methods, we will be using the methods which are sustainable for the treatment such as sugarcane bagasse, saw dust etc. in order to lower down the values of various parameters that are not in the permissible limit for use in agriculture.

3.4.2 To check if the water is suitable for the required purpose

Test the treated sample on the quality parameters, if the values of the treated sample are within the permissible limits the project is successful and water can be used for agricultural purposes after the required treatment. But as the waste water sample that we have collected is coming out from the automobile service stations, there are high chances that the water that we are using will be having the parameters that will exceed the permissible limit of agriculture. So, we will be checking the waste water sample collected from each service station on the parameters. Also, we will be having the prescribed limits for agriculture use for all of those parameters. For example, the permissible limit for agriculture for pH is between 6.5 to 8.5 and if the pH of any of the waste water sample is not occurring within these limits, we might need to treat this sample for this very parameter. Similar is the case with another parameter called as turbidity. Standards are also prescribed for this such as if the value of turbidity of sample to be used for agricultural purpose is more than 25 NTU, it may affect the driplines to be used for that very purpose. So, if the value of turbidity is coming out to be more than 25 NTU, it should be treated to bring down the turbidity level. Similar is the case with total suspended solids. The prescribed limit for the parameter of total suspended solids in within 100mg/L and if the value of tested parameter falls more than this value, the samples need to be treated so that the value can be lowered down to have suspended matter value less than 10 mg/L. After that, the waste water sample will be able to be used for irrigation/agricultural purposes.

CHAPTER 4
TESTS AND ANALYSIS

4.1 Sample testing: Testing was done on various parameters such as pH, Turbidity, TDS, TSS, TS, electrical conductivity etc**.**

4.1.1 pH The concept of pH basically helps us in knowing the nature of our water sample that is whether the given waste water sample is acidic or basic or neutral. Out of the four waste water samples, two samples were a little unsafe as they were not in the permissible limits of pH for irrigation water. Permissible limit for pH for irrigation is between 6.5 to 8.5 according to WHO.

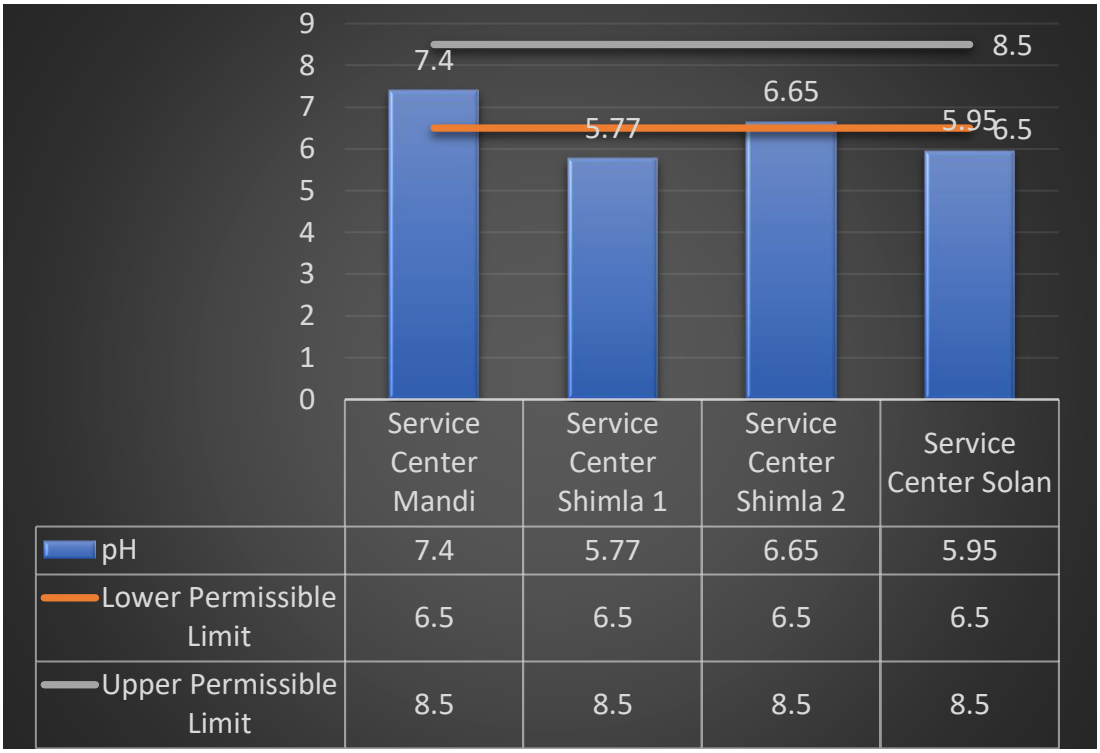

Figure 4.1: pH values of waste water sample.

4.1.2 Turbidity: In general words, turbidity is defined as the the quantity/ amount in which the given waste water sample is containing the suspended particles such as silt. The permissible limit for turbidity according to WHO is 25 NTU. Out of four samples, all were having turbidity more than 25 NTU. If turbidity is more than 25 NTU, it may destroy the driplines that are used in agriculture purposes.

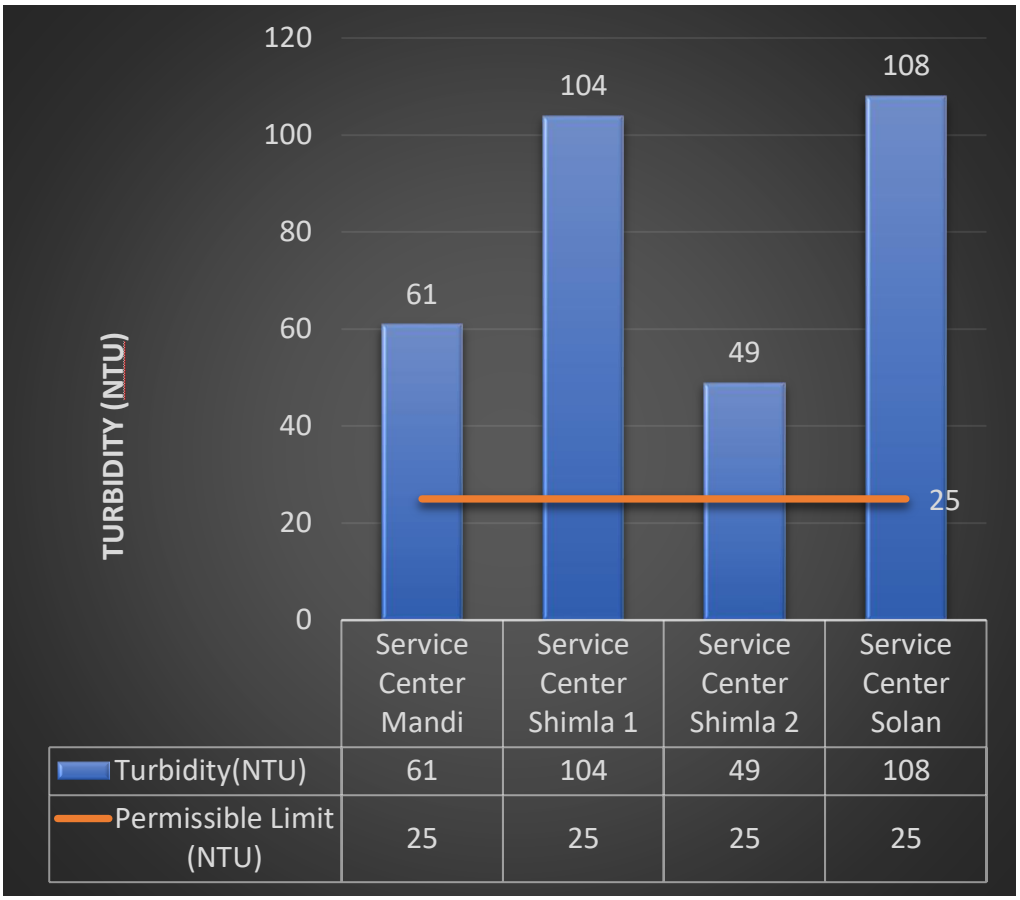

Figure 4.2: Turbidity values of waste water samples.

Determination of turbidity value: After collecting the waste water sample, it is poured into a tube which is also called as turbidity tube or nephelometer tube. It is filled up to a standard marked level. The sample is then allowed to settle for some minutes in order to allow the large particles to settle. After the sample is settled, the tube is inserted into the device known as turbidity meter and when the device is turned on, it gives the value of turbidity in NTU for given waste water sample.

4.1.3 Electrical Conductivity: It is basically the degree to which water conducts or

transmits electricity. It is the result of conductive ions present in water. The permissible limit for turbidity according to WHO is 2000 micro Siemen per cm. Out of the four samples, all were having electrical conductivity value less than 2000 micro Siemen per cm which is the permissible limit for irrigation water.

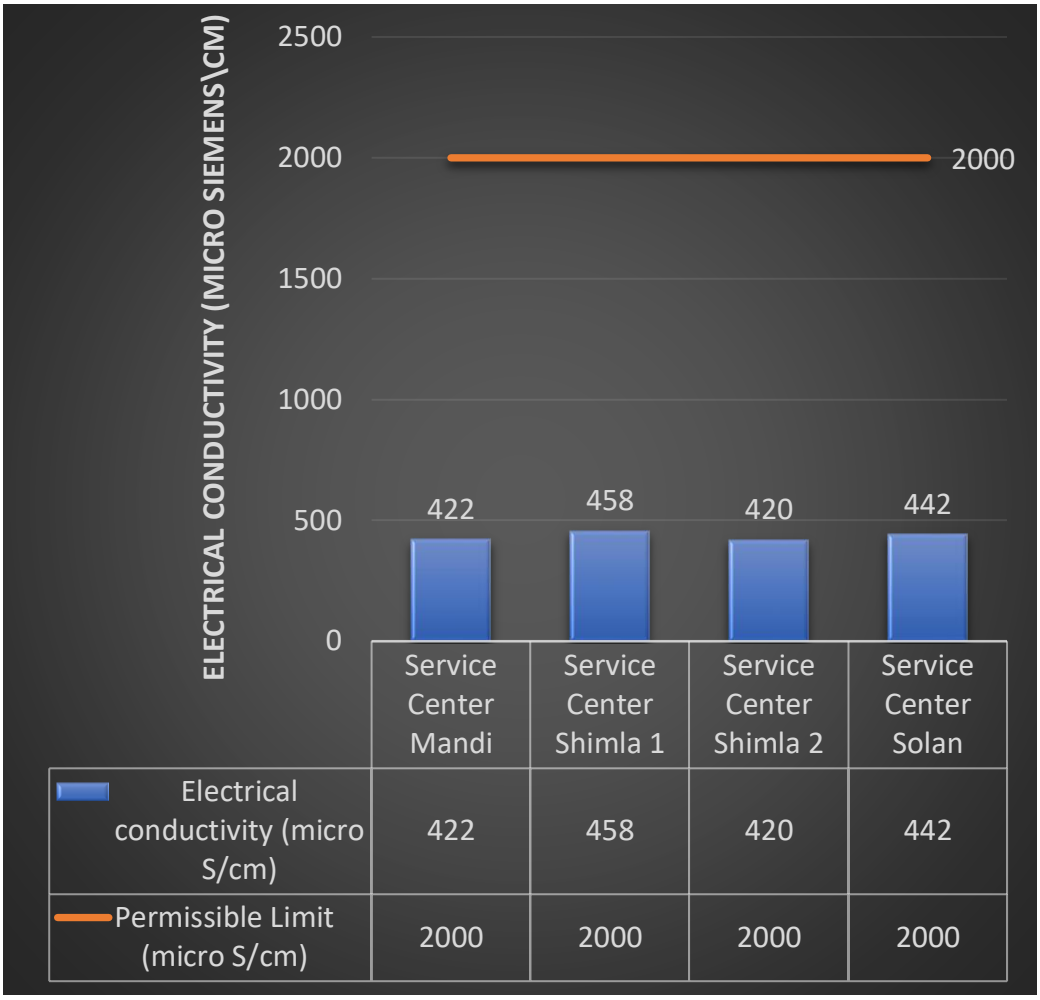

Figure 4.3: Electrical Conductivity values of waste water samples.

Determination of electrical conductivity: After collecting the waste water sample, the conductivity meter is turned on and it is then allowed to warm for some time. After this, the electrode which is also called as conductivity probe is put into the water sample. After sometime, the conductivity meter gives the reading in siemens per centimeter.

4.1.4 Chlorides: Chlorides are the naturally occurring elements that are commonly found in natural waters. It is generally found as a component of salt in some cases in combination with

potassium or calcium. According to United States department of agriculture the permissible limit for sensitive crops should be 70 mg/l.

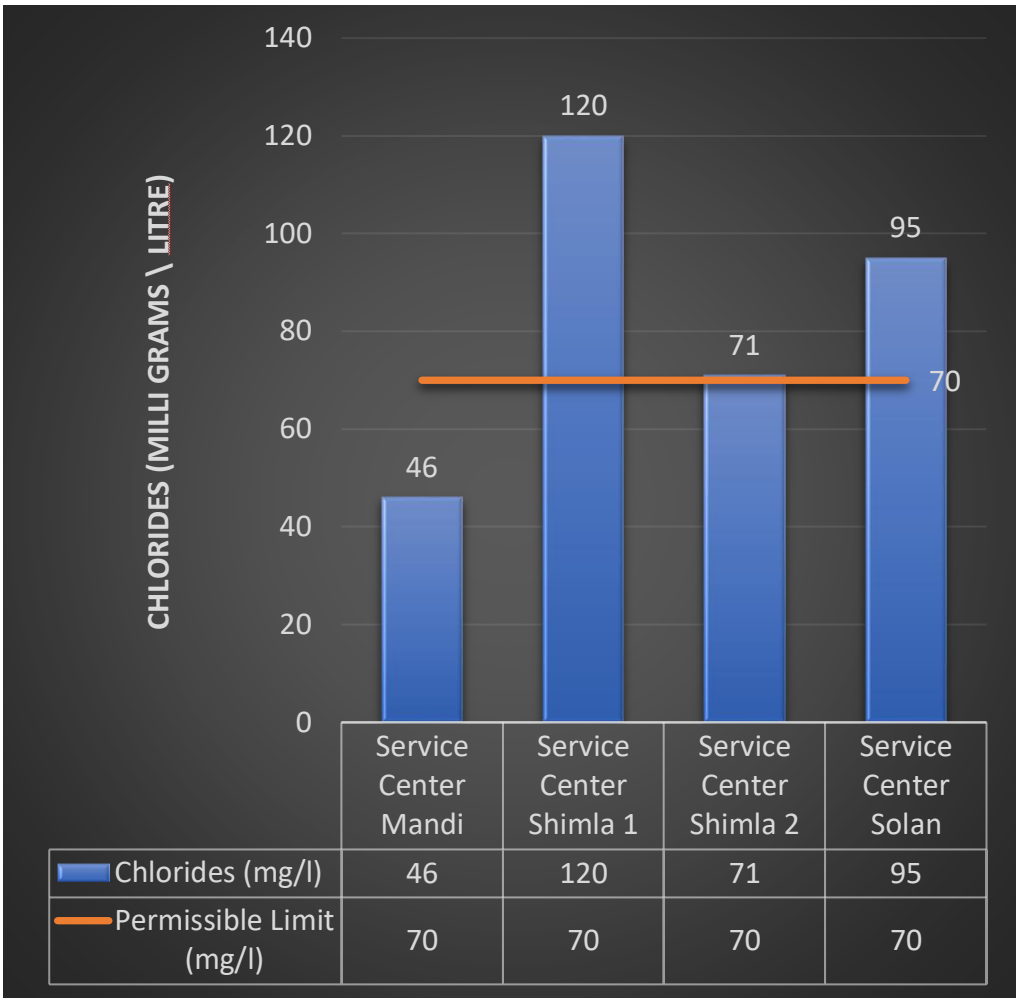

Figure 4.4: Chloride values of waste water samples.

Determination of chlorides value:

After collecting the waste water sample, there is an addition of indicator such as silver nitrate whose concentration is known. After this, titration is done with silver nitrate till the time there is a change in color which is permanent. When the color of sample is changed, there is an indication of end point. The volume in which silver nitrate is used is then observed and the value of chlorides can be found accordingly.

4.1.5 Total Solids: The concept of Total Solids basically tells us that what exactly is the amount of suspended as well as dissolved materials/ solids in a given waste water sample. The Total solids value are not having any independent limit for agriculture.

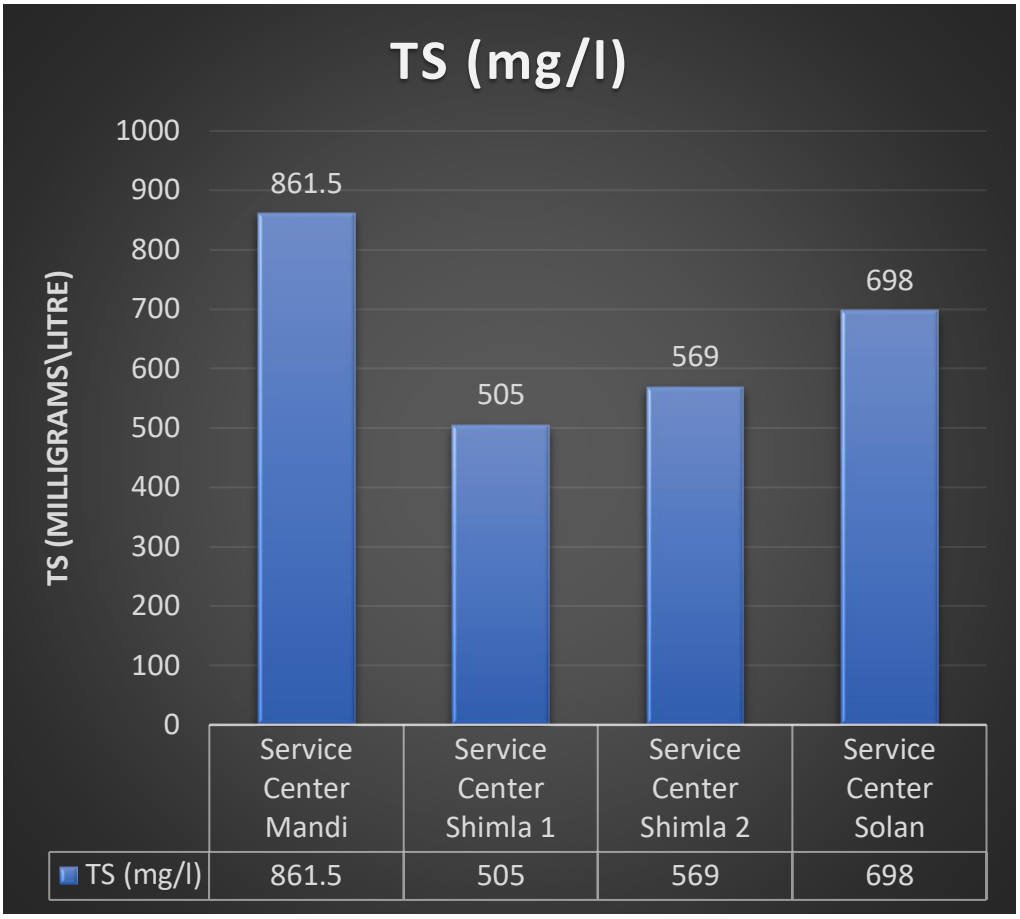

Figure 4.5: Total Solids values of waste water samples.

Determination of total solids value: After collecting the waste water sample, filter the water sample via filtration apparatus and then the water sample is placed in the crucible. After this, the sample needs to be dried in oven at around 103 – 105 degree Celsius for one to two hours. After this, the crucible is weighed with solids and the weight is recorded. Then the total solids can be determined by adding the evaporating dish weight and the solids and then when it is subtracted with the weight of evaporating dish , it gives the value of total solids.

4.1.6 Total Dissolved Solids: This parameter is basically useful for drinking water quality as it is nothing but the sum of organic as well as inorganic materials that are present in a particular water sample TDS value should be less than 2000mg/L and all four samples were in permissible limit for agriculture purpose.

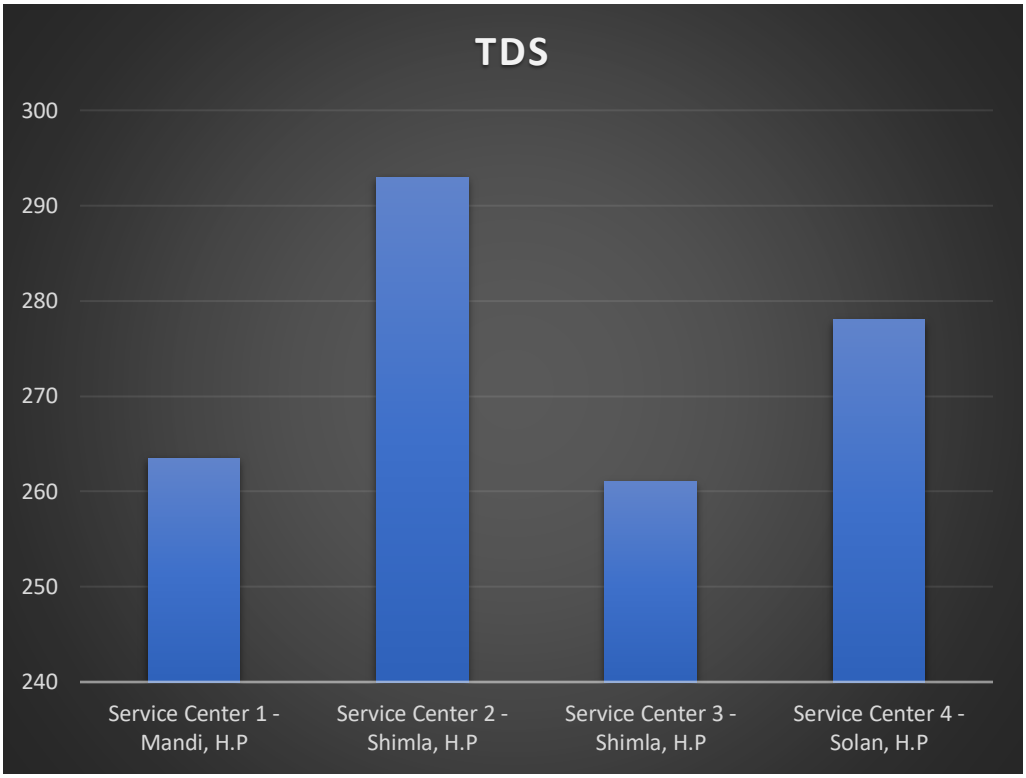

Figure 4.6: Total Dissolved Solids values of waste water samples.

Determination of TDS value: There are various methods to find the value pf TDS for a given waste water sample such as gravimetric method, conductivity method, titration method etc. We have used the conductivity method in which the electrical conductivity of waste water sample is measured and then a TDS meter can be used for the purpose of finding the total dissolved solids value.

4.1.7 TSS: The concept of TSS basically tells us that what exactly is the amount of suspended particles/materials that are present in a given waste water samples. For irrigation purposes, its value should be less than 200mg/L according to Central Pollution Control Board. Out of four samples, none of the sample was having TSS in permissible limit.

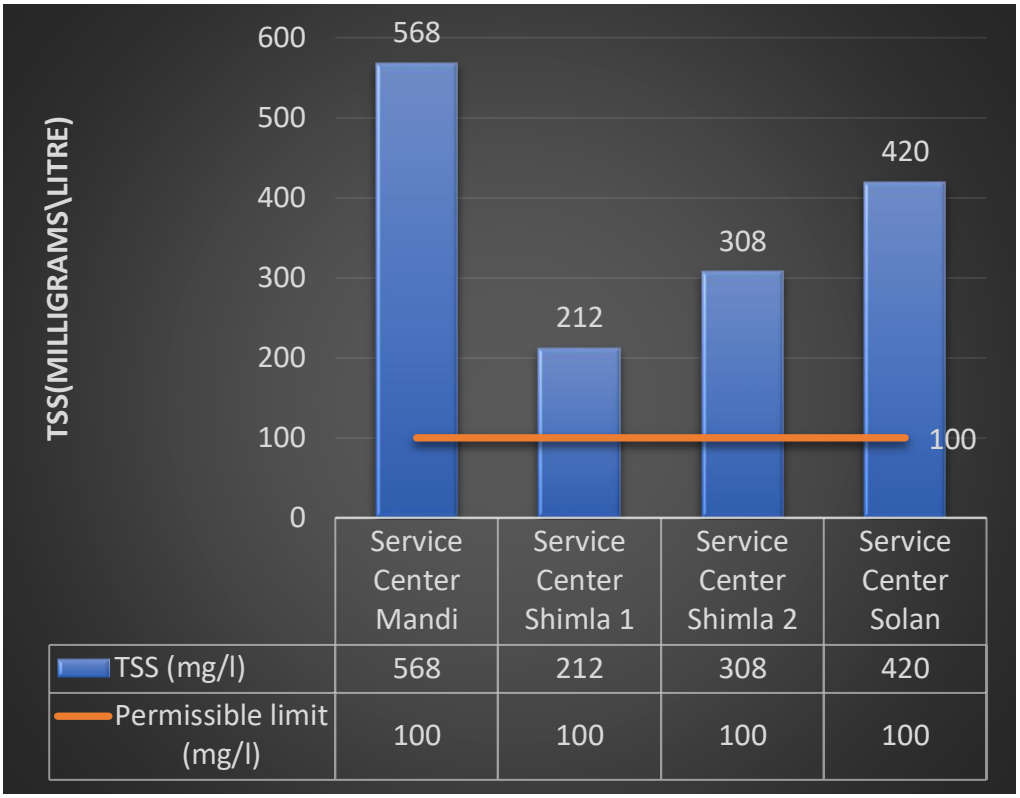

Figure 4.7: TSS values of waste water samples.

Determination of TSS value: There are various methods of finding the value of Total suspended solids such as gravimetric method, turbidity method, microscopic method etc. We have used the gravimetric method and this process includes the filtering of given waste water sample via filter paper. The suspended particles remained on the filter paper and after that, they are dried and then weighed. The value for TSS for given waste water sample can then be simply calculated.

4.1.8 Oil and Grease Content: The concept of oil and grease content in waste water basically tells us that what exactly is the hydrocarbon amount which is present in water sample as it can be harmful for humans as well as for the environment. The oil and grease can enter the water sample via variety of ways such as discharge from various industries. Also, if one consumes the water containing oil and grease content, then there are high chances that one may suffer various disease such as gastrointestinal problems and sometimes it can also lead to cancer. The Central Pollution Control Board has established a maximum permissible limit of 10 mg/l.

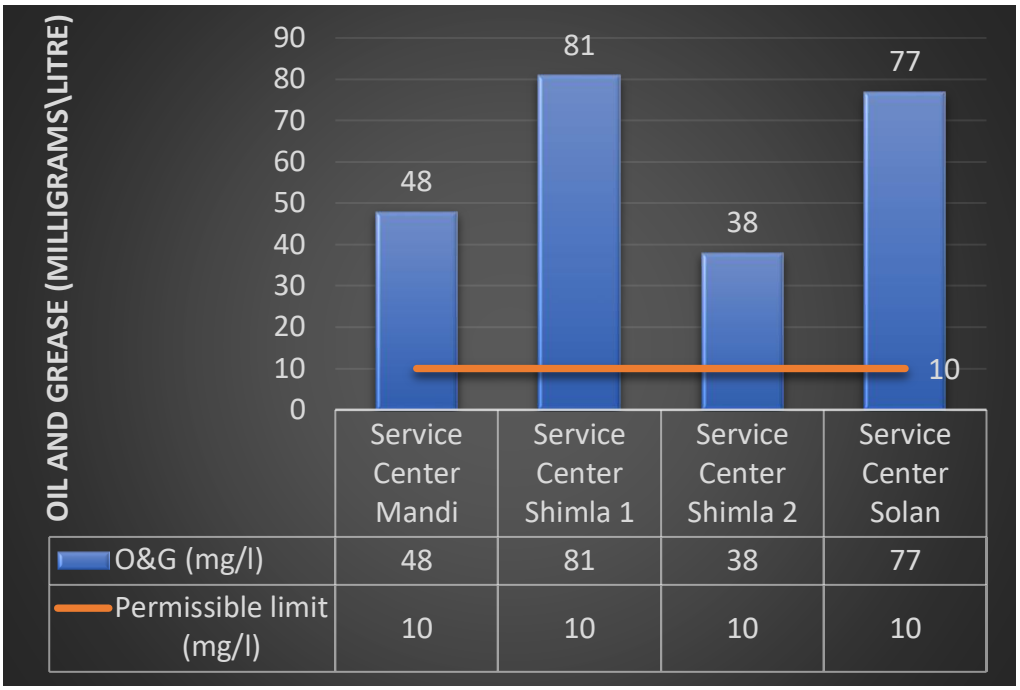

Figure 4.8 Oil and grease content values for water samples.

Determination of oil and grease content: The oil and grease content can be determined via simple procedure in which petroleum ether is used. After taking 25mL of sample of waste water, 1mL of dilute sulfuric acid is added in order to remove the suspended particles. After transferring the sample to the separating funnel, around 5mL of petroleum ether is added in order to make the layer of water and oil. After shaking the separating funnel and leaving the sample for 15-20 minutes, a layer is formed which clearly separates the aqueous water and the oil and grease. After taking out the aqueous part of water, only the oil and grease content is left in separating funnel and it can be measured accordingly.

Service Centre 1: This service Centre is located in district Mandi of Himachal Pradesh. Waste water sample is collected from here and then it is tested on various parameters such as turbidity, pH, total solids, total suspended solids, chlorides etc.

Table 4.1: Values of various tests for service Centre 1.

S.no	**Parameter**	**Value**
1.	Turbidity	61 NTU
2.	pH	7.4
3.	Electrical Conductivity	422 micro siemen/cm
4.	Chlorides	46 mg/L
5.	TDS	263.5mg/L
6.	TDS	861.5 mg/L

7.	Oil and grease content	48 mg/L
8.	TSS	598mg/L

Service Centre 2: This service Centre is located in district Shimla of Himachal Pradesh. The waste water sample is collected and then it is tested in the laboratory on various parameters such as chloride value, pH value, turbidity value etc.

Table 4.2: Values of various tests for service Centre 2.

S.no	**Test**	**Value**
1.	Turbidity	104 NTU
2.	Ph	5.77
3.	Electrical Conductivity	458 micro siemen/cm
4.	Chlorides	120 mg/L

5.	TDS	293 mg/L
6.	TS	505mg/L
7.	Oil and grease content	81 mg/L
8.	TSS	212 mg/L

Service Centre 3: This service Centre is also located in district Shimla. The waste water sample is collected and then it is tested on various water quality parameters such as TDS, TSS, pH

Table 4.3: Values of various tests for service Centre 3.

S.no	**Test**	**Value**
1.	Turbidity	49 NTU
2.	pH	6.65
3.	Electrical Conductivity	420 micro siemen/cm

4.	Chlorides	71mg/L
5.	TDS	261mg/L
6.	TS	569mg/L
7.	Oil and grease content	38 mg/L
8.	TSS	308 mg/L

Service Centre 4: This service Centre is located in district Solan of Himachal Pradesh. The waste water sample is collected from the Centre 4 and after collecting the sample it is tested on the mentioned quality parameters like pH, turbidity, TDS etc.

Table 4.4: Values of various Tests for service Centre4.

S.no	**Test**	**Value**

1.	Turbidity	108 NTU
2.	Ph	5.95
3.	Electrical Conductivity	442 micro siemen/cm
4.	Chlorides	95 mg/L
5.	TS	698 mg/L
6.	TDS	278 mg/L
7.	Oil and grease content	77 mg/L
8.	TSS	420 mg/L

After testing the given waste water samples on various parameters, it was observed that some values were in the limit permissible for agricultural use such as electrical conductivity values for all four samples but some parameters were not in permissible limits such as turbidity, total suspended solids etc. Hence the waste water samples were treated on those parameters to make it suitable for agricultural use.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Treatment Process

The treatment process that we have followed consists of three steps. In the first step, the use of rice husk and rice husk ash is there which can be used as coagulants. Their use in sediment filters is also done. The second step comprises of the use of saw dust. In this process we have considered that the saw dust can be used as adsorbent and as the waste water that we have taken is from the automobile service Centre, the amount of oil and grease in those waste water samples is in considerable amounts. And hence we can use the sawdust in order to reduce the oil and grease content from the waste water sample. Also, as the waste water is collected from various automobile service stations, there are high chances that some harmful particles must be present in the waste water sample. In order to remove those harmful substances, reverse osmosis can be applied which is basically the third step or stage in our treatment process.

5.1.1 Coagulation

It is basically defined as the process in which the suspended particles that are present in any given waste water sample are removed. In the process of coagulation, we generally use a substance which is called as coagulant. By using the coagulant, some of the suspended particles that are present in given waste water sample for example dirt etc. can be removed. Looking at the treatment of waste water, coagulation is one of the most important process as it ensures that the treated water after the process is safe to use and does not cause any harmful effects. In our treatment process, we have used rice husk and the rice husk ash as the coagulant. The apparatus that we have used for this purpose is the jar test apparatus. In order to convert the rice husk into its ash, we kept the rice husk in muffle furnace for some time. It was kept at around 500 degree Celsius for around 2 hours in order to convert it into ash.

Jar Test to reduce turbidity

In order to perform the process of coagulation, we have used the jar test apparatus for this purpose. In case of the apparatus for jar test, there are generally six cylinders in which the waste water sample is added. By performing this jar test, one can easily predict what actually is the

amount of coagulant one needs to use in order to treat the given sample of waste water with the required efficiency for particular cases. One can use varying doses in all six cylinders of the jar test apparatus which can help in knowing that at what dosage of a particular coagulant, the best possible treatment result is coming. In this case of the treatment of waste water sample from four service stations, we have used the rice husk and the ash of rice husk as coagulants. Also, we have used varying doses of rice husk and the ash of rice husk in all the six cylinders of the given jar test apparatus.

Determination of dosage of coagulant

As the apparatus that we are using consists of six cylinders, we have kept rice husk in three cylinders and in the remaining three cylinders we have kept the ash of this rice husk. The dosages that we have used for rice husk as well as the ash of rice husk are 0.1g, 0.2g,0.3g. The waste water sample is being put in all the six cylinders of the given apparatus. After that for a fixed period of time, the mixtures that are present in the given apparatus are then stirred at varying speeds. After that, the turbidity and the total suspended solids that are present in the given waste water sample are observed after the treatment process. The dosage which provided the best efficiency in removal of turbidity as well as total suspended solids is considered as the best dosage. The percentage reduction in turbidity as well as the reduction in percentage of the suspended materials/ particles are observed. In this case of treatment of the given waste water sample, the best reduction efficiency came out at the coagulant dosage of 0.2g in rice husk as well as in case of rice husk ash.

Coagulation for Service Centre 1

The waste water sample is collected from the first service station and its turbidity and the value of total suspended solids were measured. Its turbidity value came out to be 61 NTU using the turbidity meter and the value of total suspended solids for the same came out to be as 568 mg/L. Both of these parameters i.e. the turbidity and TSS values are not in permissible limit for agriculture and hence we need to treat the sample.

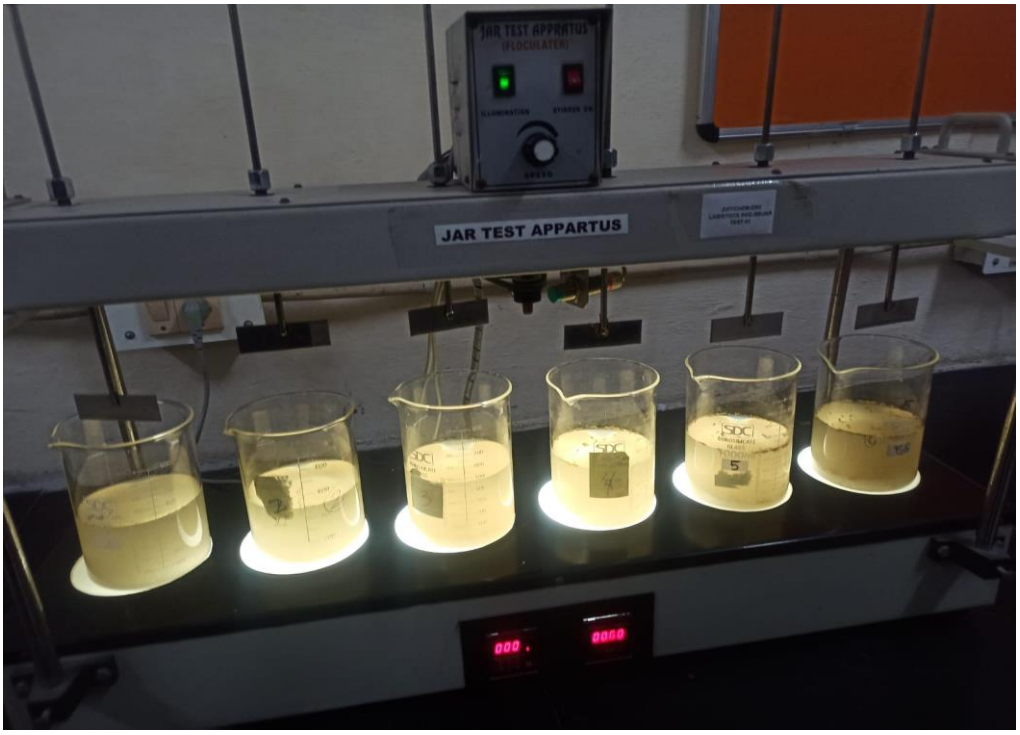

Figure 5.1 Jar test apparatus used for coagulation.

Turbidity reduction for service Centre 1

As the turbidity greater than 25 NTU may affect the driplines used in the irrigation purpose, it is necessary to treat the waste water sample for service station 1 as its turbidity value came out to be 61 NTU which is more than what is required for agricultural purposes. The waste water sample from service Centre 1 is treated with rice husk along with the ash of rice husk. The dosage for treating the waste water sample from service Centre 1 were 0.1g, 0.2g, 0.3g. The best reduction came to be at 0.2g dose of rice husk and the ash of rice husk.

Reduction with rice husk

The rice husk in varying dosages in the cylinders of the jar test can be used to reduce the turbidity value of the given waste water sample from service Centre 1. At 0.1 g dosage, 73.07 percentage of reduction is observed after performing the jar test. At 0.3g dosage, 74.61 percentage of reduction is observed after the jar test is performed.

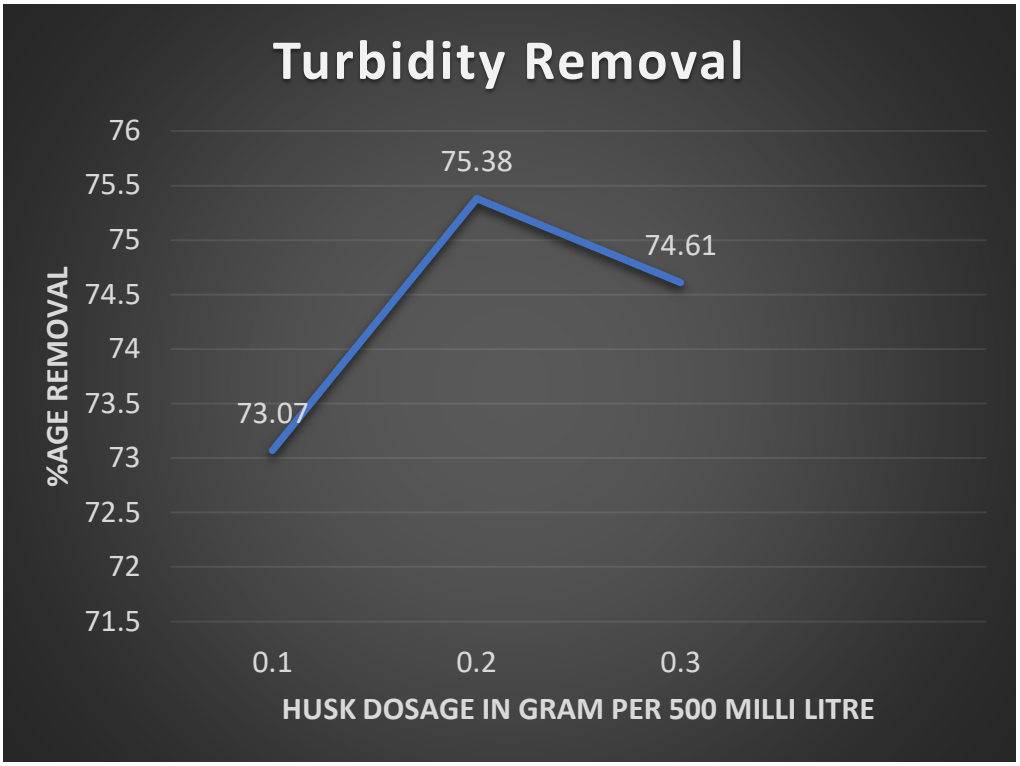

Figure 5.2. Reduction in Turbidity at varying dosages.

Also, at 0.2g dosage of rice husk, the percentage reduction came out to be as 75.38 % which is the highest reduction in waste water sample among the three dosages of rice husk. The amount of water sample taken in each cylinder is 500mL. And the initial turbidity was 61 NTU and after the best possible dosage i.e. at 0.2g of rice husk, it came out to be as 15.05 NTU which is within the permissible limit of irrigation or agricultural purpose. And hence the treated waste water sample is safe in terms of turbidity if it is to be used for agricultural purposes.

Reduction of turbidity with Rice Husk Ash

Rice husk is generally placed in a device known as muffle furnace. It is kept for 2 hours at 500 degree Celsius. After this, it is converted into the rice husk ash. It can also be applied to reduce turbidity of any given waste water sample. The dosages of the rice husk ash used were 0.1g, 0.2g,0.3g. At 0.1g dosage, the reduction in turbidity came out to be 75.38% and at 0.3g dosage the reduction in turbidity came out to be as 76.92 %.

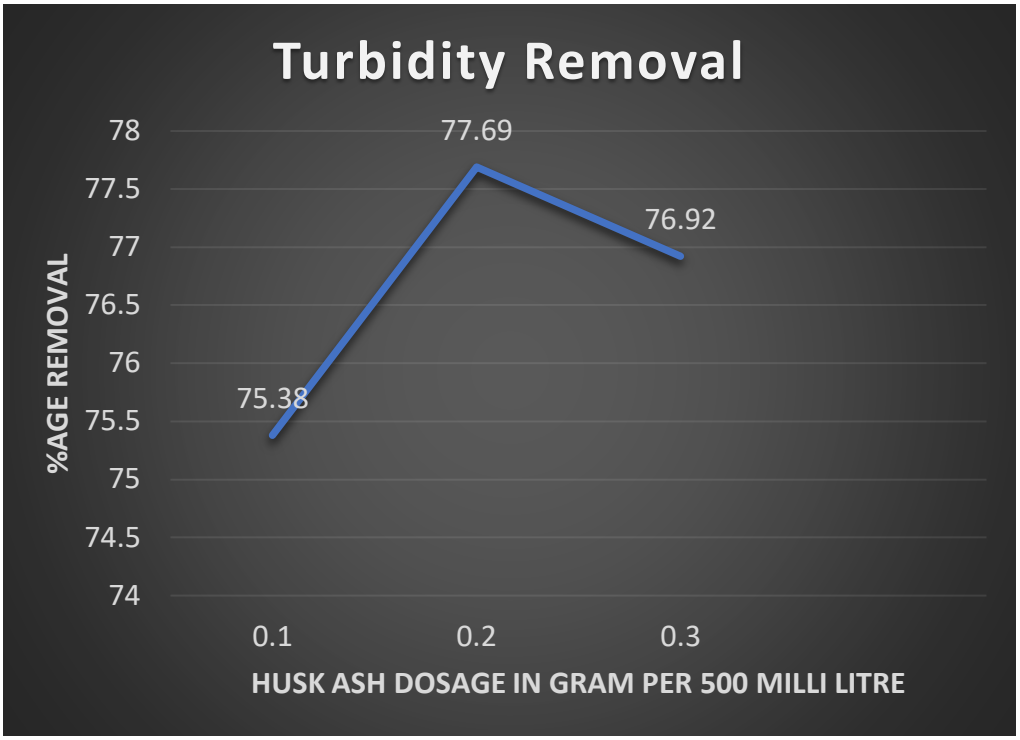

Figure 5.3 Reduction in Turbidity at varying dosages.

At 0.2g of dosage, the reduction in turbidity came out to be as 77.69 %. The initial value of turbidity recorded for this service Centre is 61 NTU and after using the 0.2g of rice husk ash dosage, the turbidity value became 13.61 NTU. It is the best possible dosage for given waste water sample as after the reduction, the turbidity value came out to be 13.61 NTU which is within the permissible limit for the irrigation or agricultural purposes. Hence the treated waste water at 0.2g dosage of rice husk ash is suitable for irrigation purposes.

Turbidity reduction for Service Centre 2

From service Centre 2, waste water sample is collected and then its turbidity value is measured which comes out to be as 104 NTU. As this value is more than the permissible limit for agricultural purposes, hence it becomes necessary to treat the waste water sample.

Reduction of turbidity using rice husk

The rice husk is put in the cylinders of the apparatus. The rice husk is used in varying dosages in all the cylinders such as 0.1g, 0.2g, 0.3 g. Water sample is taken as 500mL and reduction is observed at each dosage. At 0.1g dosage, the reduction in turbidity came out to be 72.78% and at 0.3g dosage, the reduction in turbidity came out to be as 74.74 %.

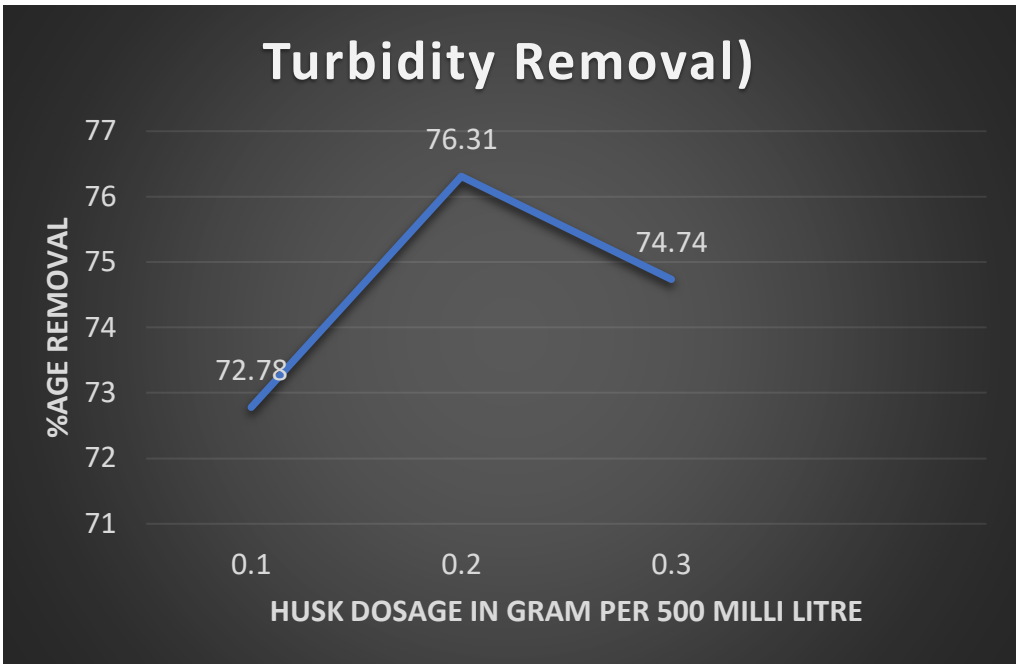

Figure 5.4 Reduction in Turbidity at varying dosages.

At 0.2g dosage, the reduction in turbidity value came out to be 76.31 %. It is hence the best possible reduction in the turbidity value. As the initial turbidity value of this water sample is 104 NTU, after reduction of 76.31%, the value becomes 24.64 NTU which is safe for agricultural purposes as it is below 25 NTU which is considered as the permissible limit for irrigation or agricultural purposes.

Reduction of turbidity using rice husk ash

Rice husk is generally placed in a device known as muffle furnace. It is kept for 2 hours at 500 degree Celsius. After this, it is converted into the rice husk ash. It can also be applied to reduce turbidity of any given waste water sample. The dosages of the rice husk ash used were 0.1g, 0.2g,0.3g. At 0.1g dosage, the reduction in turbidity came out to be 77.43% and at 0.3g dosage the reduction in turbidity came out to be as 78.34 %.

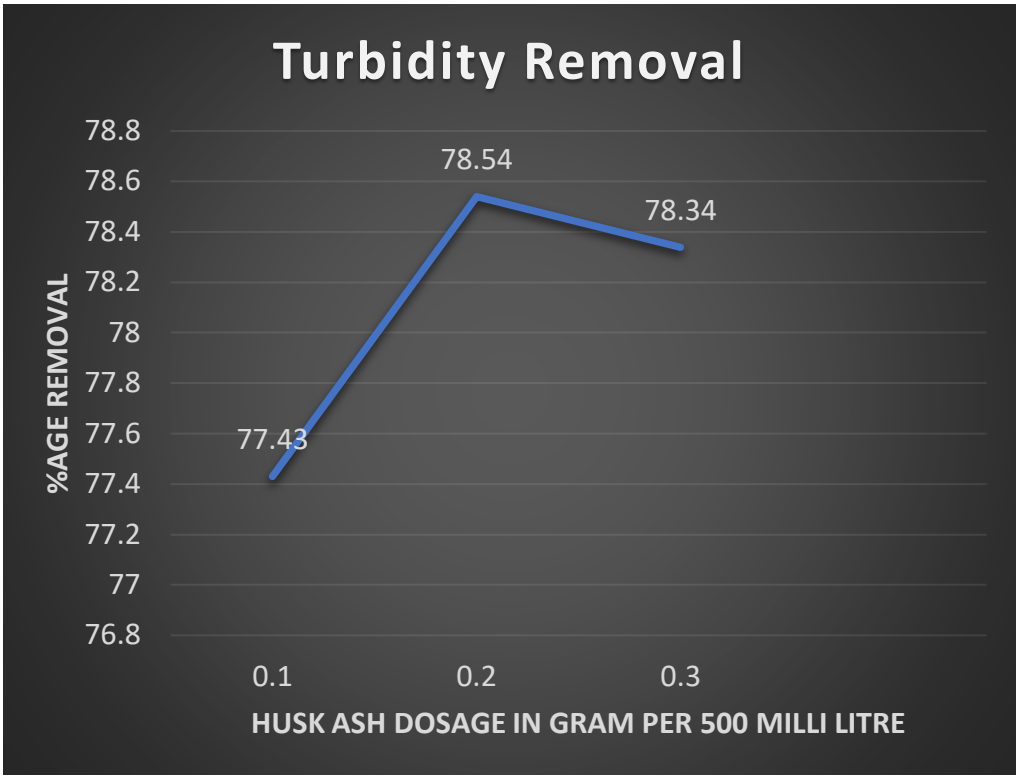

Figure 5.5 Reduction in Turbidity at varying dosages.

At the dosage of 0.2g, the reduction in turbidity came out as 78.54 % which is considered as the best possible dosage of rice husk ash in order to reduce the waste water sample's turbidity. The value of initial turbidity of the waste water sample from service Centre 2 came out to be as 104 NTU, which was not safe for irrigation/ agricultural purposes, after 78.54% reduction, the value comes out to be 22.32 NTU which is within the permissible limit for agriculture and hence this treated water can be used for irrigation purposes.

Turbidity reduction for service Centre 3

Waste water sample is collected from service Centre 3 and then the value of turbidity is checked for the water sample. The turbidity value for this water sample came out to be 49 NTU. As this value is not in the permissible limit for agriculture, it becomes necessary to treat this waste water in order to use it for irrigation or agricultural purposes.

Reduction of turbidity using Rice Husk

Turbidity can be reduced easily by using rice husk doses in various cylinders of jar test apparatus. The varying doses of rice husk are used in the cylinders such as 0.1g, 0.2g,0.3g etc.

and then after following the procedure for jar test, the turbidity of waste water sample can be reduced.

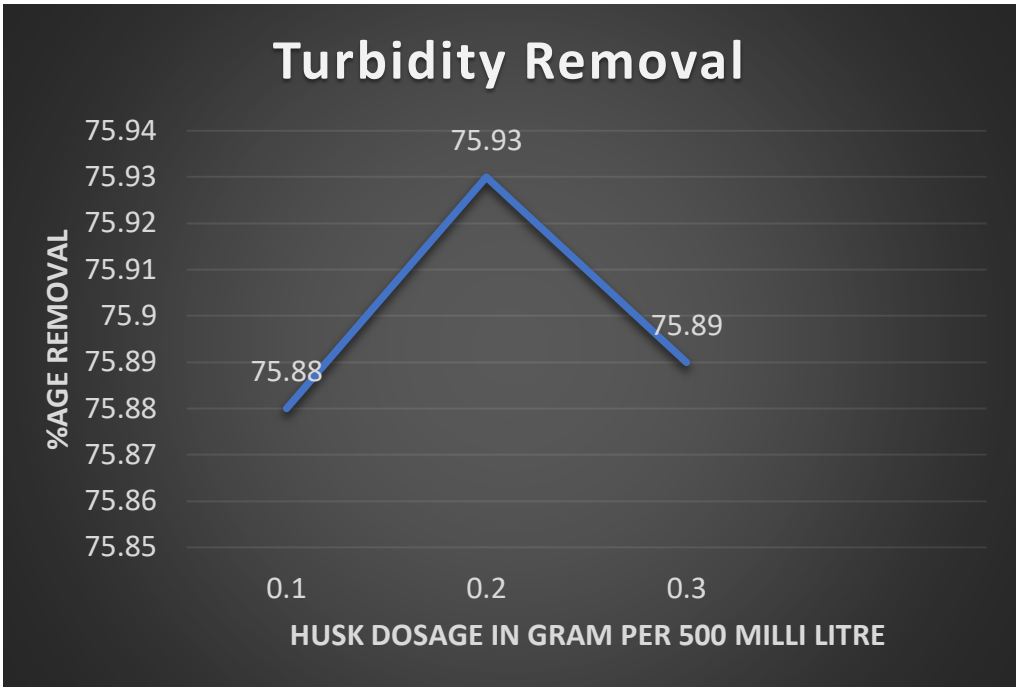

Figure 5.6 Reduction in Turbidity at varying dosages.

At 0.1g dosage of rice husk, the percentage reduction in turbidity value is 75.88 %. At 0.2g dosage, the percentage reduction in the value of turbidity is 75.93 %. At 0.3g dosage, the percentage reduction in turbidity is 75.89 %. At 0.2g dosage, best possible reduction can be seen i.e. 75.89%. Initially the turbidity value of the sample from service Centre 3 was 49 NTU and after the best possible reduction, the value came out to be 11.82 NTU. This value of turbidity is within the permissible limit for agricultural or irrigation use and hence the treated waste water sample can now be used for irrigation/ agricultural purposes.

Reduction of turbidity using rice husk Ash

When rice husk is placed in the equipment known as muffle furnace for around 2 hours at 500 degree Celsius, it gets converted into the rice husk ash. The rice husk ash dosages are also taken in cylinder as 0.1g, 0.2g,0.3g. Best possible reduction is observed at 0.3g dosage of rice husk ash.

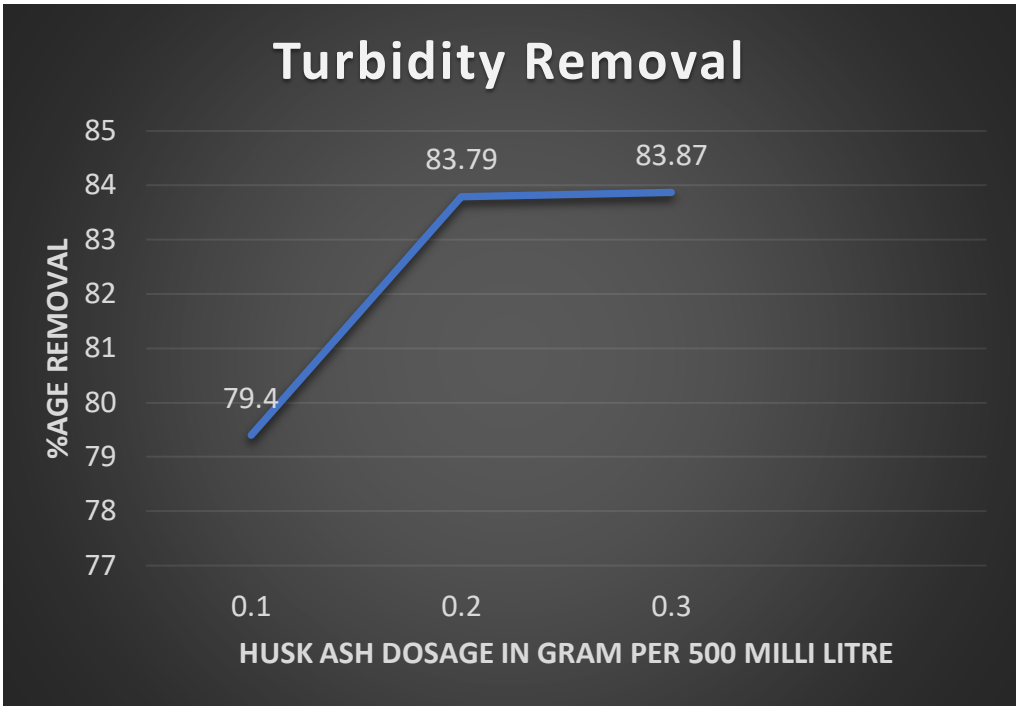

Figure 5.7 Reduction in Turbidity at varying dosages.

At 0.1g dosage of rice husk ash, the percentage reduction in turbidity is 79.4 %, at 0.2g dosage, the percentage reduction in turbidity is 83.79 % and at 0.3g dosage, the percentage reduction in dosage is 83.87 %. The initial turbidity value for this service Centre was 49 NTU and after best possible reduction, the turbidity value comes out to be 8 NTU which is considered to be safe for irrigation or agricultural purposes. Hence, the treated waste water is suitable for agricultural use as the values for its turbidity value are within permissible limits.

Turbidity reduction for service Centre 4

Service Centre 4 is located in district Solan and waste water sample is collected from this service Centre. The value of turbidity of this given waste water sample is then checked and it came out to be 108 NTU. As this value is not within the permissible limit for agriculture, the waste water sample is then treated with rice husk and the rice husk ash.

Reduction of turbidity using Rice Husk

Rice husk is used in varying doses in various cylinders such as 0.1g, 0.2g, 0.3g etc. At 0.1g dosage, the reduction in turbidity value came out to be as 76.98 % and at 0.2g dosage, the reduction came out to be as 77.43 % and at 0.3g dosage, the reduction came out to be as 77.38 %.

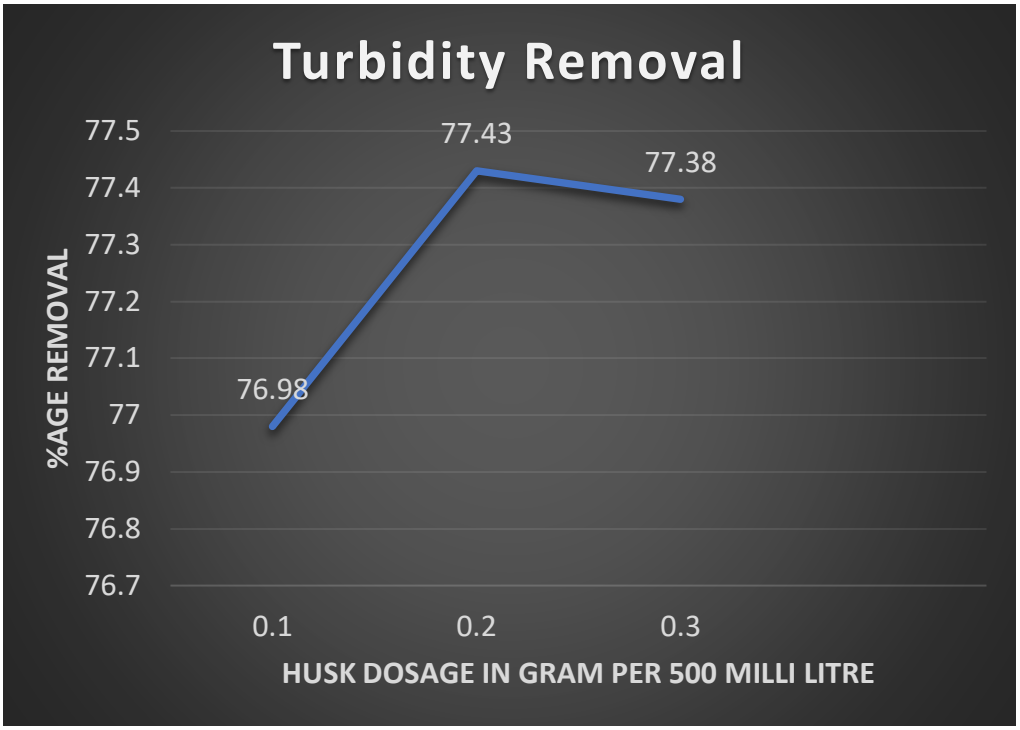

Figure 5.8 Reduction in Turbidity at varying dosages.

At 0.2g of dosage of rice husk, best possible reduction is observed i.e. 77.43 %. As the given water sample was having initial turbidity as 108 NTU, but after the best possible reduction at 0.2g of husk dosage, the reduced turbidity value comes out to be as 24.38 NTU which is within the permissible limit required for the purpose of irrigation/ agriculture.

Reduction of turbidity using Rice Husk Ash

As the waste water sample is collected from the service Centre 4, its initial value of turbidity was tested and it came out to be 104 NTU. But we have to make the waste water usable for irrigation purposes so in order to make it usable for agriculture, we need to treat the waste water sample using rice husk ash also at varying dosages such as 0.1g, 0.2g, 0.3g.

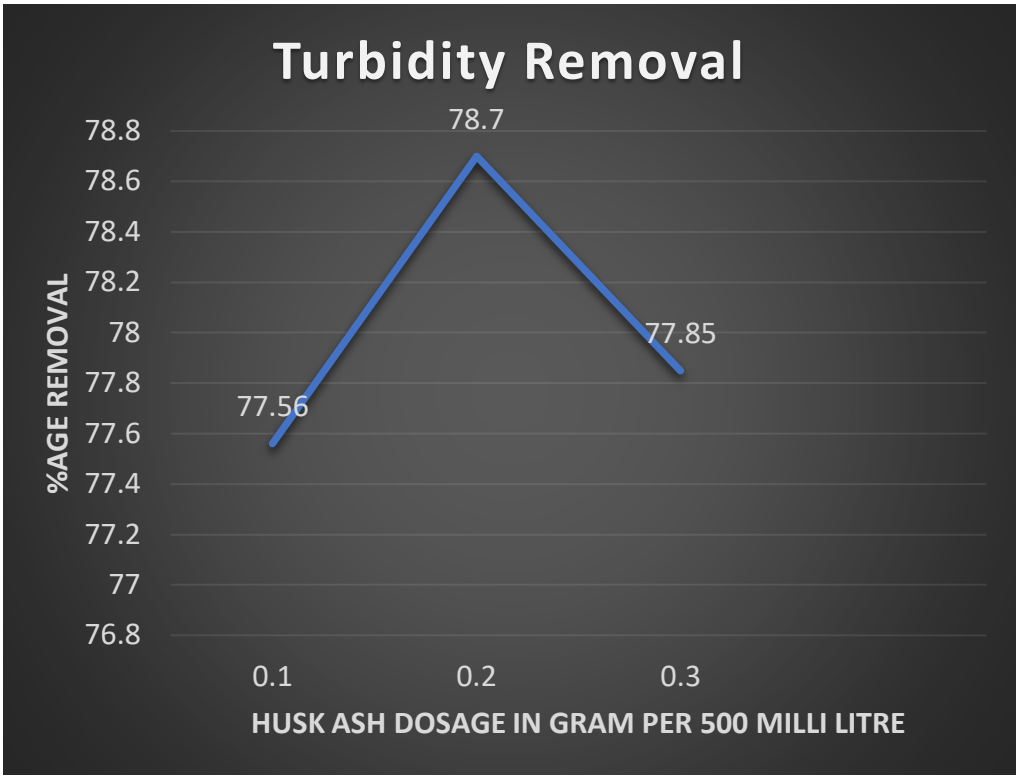

Figure 5.9 Reduction in Turbidity at varying dosages.

The best possible reduction in the turbidity value is observed when we use 0.2g dosage of the ash of rice husk and then keep the waste water sample for the process of coagulation. It is observed that on using 0.1g dosage of the rice husk ash, 77.56 % reduction in the value of turbidity is there and when we use 0.2g of rice husk ash, 78.7% of turbidity reduction is observed and on using 0.3g dosage of the ash of rice husk, we observed 77.85 % of reduction in turbidity value. Hence at 0.2g of dosage of rice husk ash, the best possible reduction in turbidity value is observed i.e. 78.7 %. After reduction the turbidity value came out to be 22.2 NTU which was initially 104 NTU.

Turbidity Requirement for agriculture

For using any type of water for irrigation or agricultural purposes, it is always advised that the value of turbidity of the water to be used for this purpose should be within 25 NTU. But in our all of the 4 samples, the turbidity values were exceeding the permissible limit of 25 NTU and hence it became necessary to treat the waste water sample to make it fit for agricultural or irrigation purposes. Rice Husk and along with it the rice husk ash both were used as coagulant in the process of treatment.

Figure 5.10 Before and after turbidity reduction.

For all the four samples that we have tested for turbidity, all were treated with rice husk and the ash of rice husk as coagulants. After the process of treating the turbidity is completed, it was observed that all of the four samples were having turbidity within permissible limit for agriculture i.e. below 25 NTU and all of these samples were fit for using for irrigation or agricultural purposes. Both, rice husk as well as its ash were found quite useful in reducing turbidity value and best reduction at 0.2g dosage, even then the best reduction was observed at 0.2g of rice husk ash.

TSS Reduction for service Centre 1

When the waste water sample was collected from the service Centre 1 which is located in district Mandi, it was observed that the value of suspended solids/ materials in that particular waste water sample came out to be 568mg/L. But as we have to use the water for irrigation or agricultural purposes, we have to treat the sample as the prescribed limit for suspended solids in water sample is upto 100mg/L.

Reduction of TSS using Rice Husk for service Centre 1

In order to reduce the value of the suspended materials/ solids for the given waste water sample from the service station 1, we have used rice husk in the same way as that for turbidity reduction.

0.1g, 0.2g, 0.3g of dosages of rice husk were used in order to reduce the total suspended materials / solids present in the waste water sample taken from service station 1.

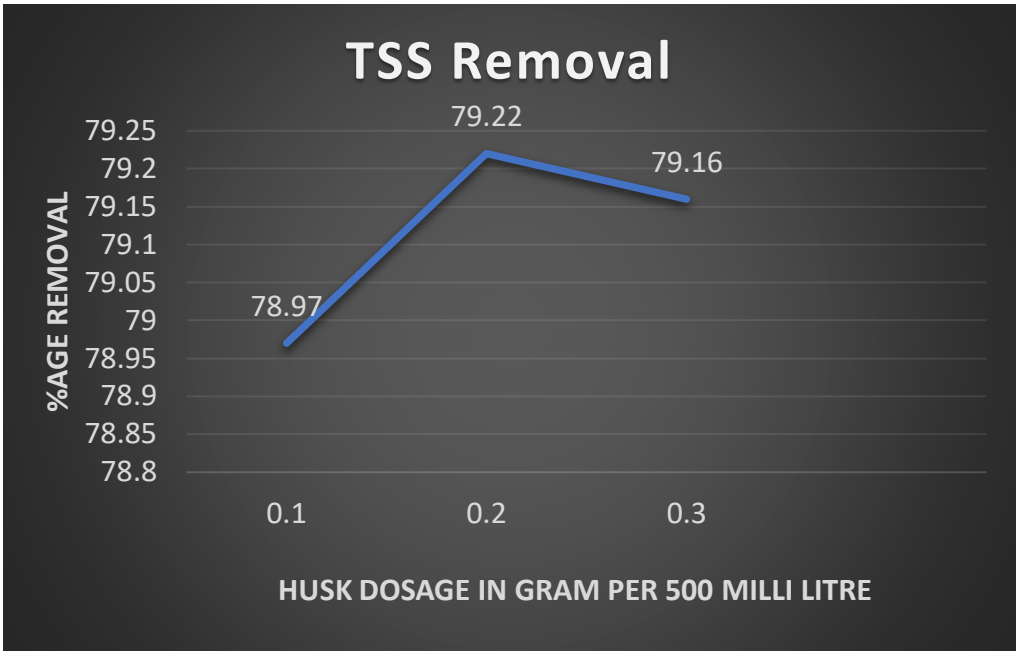

Figure 5.11 Reduction in TSS at varying dosages.

At 0.1g dosage of rice husk, it was observed that the percentage reduction in TSS value came out to be as 78.97 % and at 0.2g dosage of rice husk, the percentage reduction came out to be as 79.22 % and at 0.3g dosage the percentage reduction came out to be as 79.16 %. Best possible reduction was observed at 0.2g dosage of rice husk. The percentage reduction at this dosage was 79.22 % which means after treatment, the total suspended materials that were there in water sample were 118mg/L.

Reduction of TSS using Rice Husk Ash

For service Centre 1, the reduction in total suspended materials/ solids value was done with the ash of rice husk also. The rice husk, on placing in the muffle furnace in laboratory was converted into ash and its varying dosages such as 0.1g, 0.2g, 0.3g was used. The percentage reduction in total suspended materials value was observed at all the dosages.

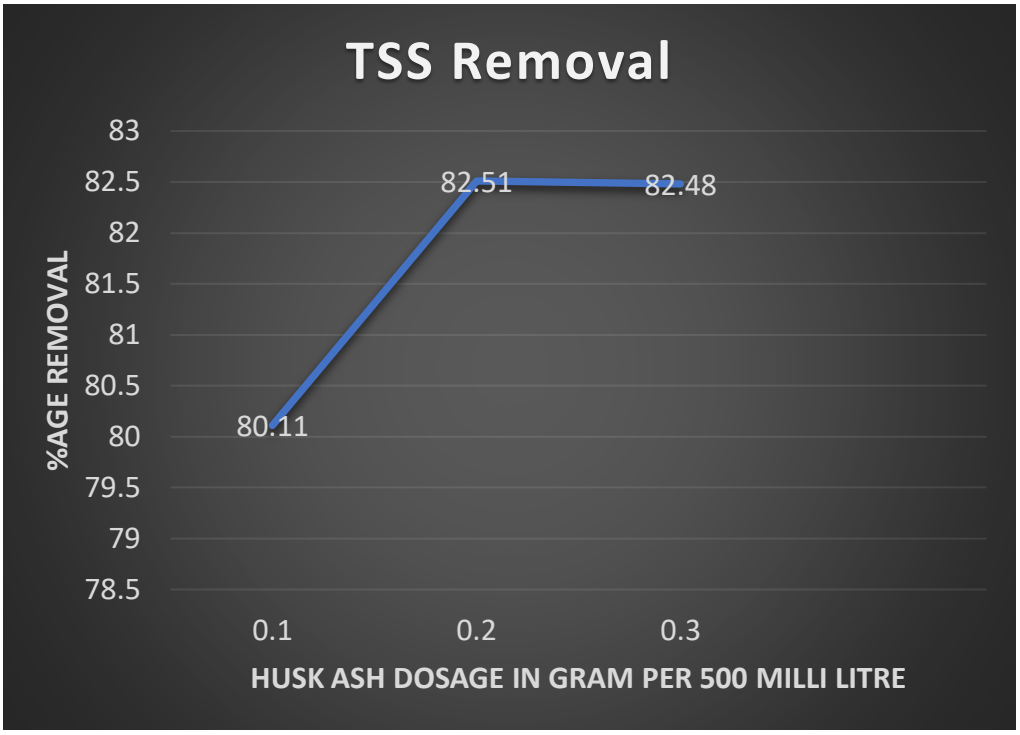

Figure 5.12. Reduction in TSS at varying dosages.

At 0.1g dosage of rice husk ash, the percentage reduction of Total suspended materials/ solids was 80.11 % and at 0.2g dosage, the percentage reduction in total suspended materials/ solids came out to be as 82.51 % but at 0.3g, the percentage reduction came out to be as 82.48 %. The best possible reduction using rice husk ash is observed at 0.2g dosage i.e. 82.51 %. The initial value of total suspended materials/ solids was 568mg/L but after reduction with 0.2g of rice husk ash, the value became 99.4mg/L which is within the permissible limit.

TSS reduction for Service Centre 2

The service Centre 2 that we have opted for testing is based in Shimla and it releases a considerable amount of water. The sample was collected from here and then the amount in which the suspended materials/ solids are present in it were tested. This amount came out to be 212mg/L which is not in the permissible limit for irrigation or agriculture use. Hence, its treatment was done in the same way.

Reduction OF TSS using rice husk

In order to make this water sample usable for agriculture, we have treated it with varying doses of rice husk like with 0.1g, 0.2g, 0.3g etc. And the percentage reduction is observed in each case.

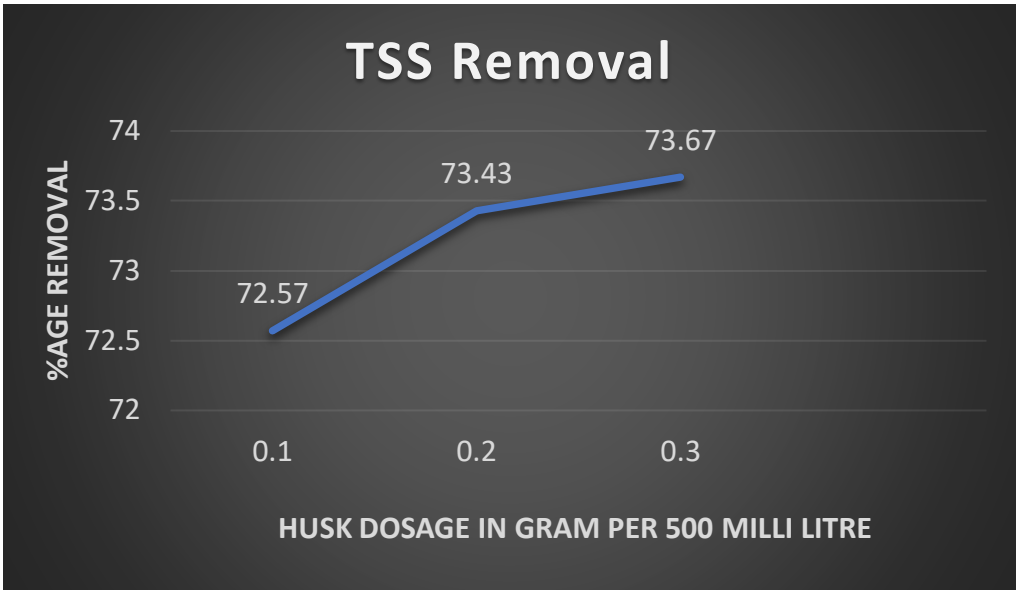

Figure 5.13. Reduction in TSS at varying dosages.

At the dosage of 0.1g per 500mL of the given waste water sample, the percentage reduction in total suspended materials came out to be 72.57 % and at 0.2g dosage per 500mL of the given waste water sample, the percentage reduction of total suspended materials came out to be 73.43 %. And at 0.3g dosage per 500 mL of solution, the percentage reduction was 73.67 %. The initial value of suspended materials present was 212mg/L and after reduction it became 56mg/L which is suitable for irrigation use.

Reduction of TSS using rice husk ash

Along with the rice husk, we have also referred the use of rice husk ash in order to reduce the overall suspended matter in the sample of waste water. These are also used in different dosages to know about the best possible dosage to reduce suspended materials. The dosages of 0.1g, 0.2g, 0.3g of rice husk ash are used.

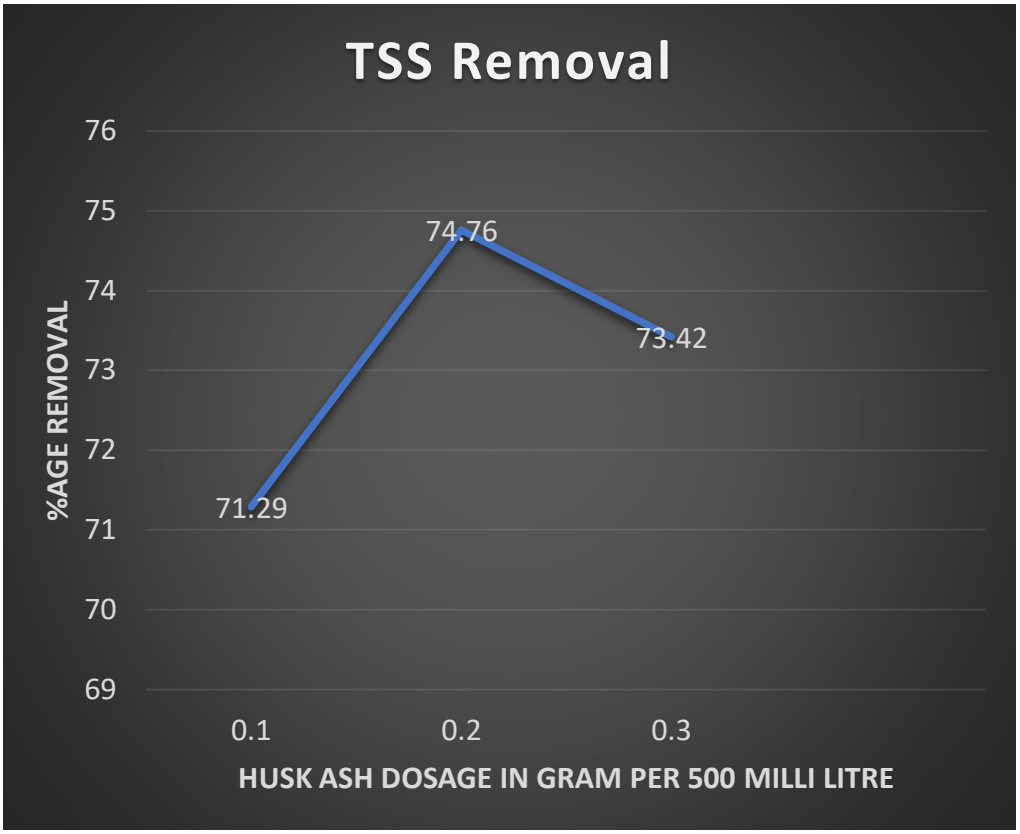

Figure 5.14. Reduction in TSS at varying dosages.

When the rice husk ash is used in the dosage of 0.1g, the percentage reduction of 71.29 % is observed. When this rice husk ash is used in the dosage of 0.2g, the percentage reduction of 74.76 % is observed. When the rice husk is used in the dosage of 0.3g, the percentage reduction of 73.42 % is observed. The best possible reduction using this rice husk ash can be seen when it is used in 0.2g dosage. 74.76 % reduction means the treated sample is having suspended matter in amount of 53.5mg/L which is considered suitable for agricultural or for irrigation purposes.

TSS Reduction for service Centre 3

When the waste water sample was collected from the service Centre 3, it was observed that the suspended matter that is present in the water sample was 308mg/L. But it was not suitable for using in the field of agriculture and hence its treatment is a must.

Treatment of TSS using rice husk

As the collected waste water sample from the service Centre 3 was not fit for irrigation purposes, therefore we needed to treat it to make it usable for agriculture. Hence, we applied the dosages of rice husk so that the suspended matter that is present in the waste water sample gets removed and the water become suitable for our desired purpose. In this case of service Centre 3 also, we have used 0.1g, 0.2g and 0.3g dosages of rice husk.

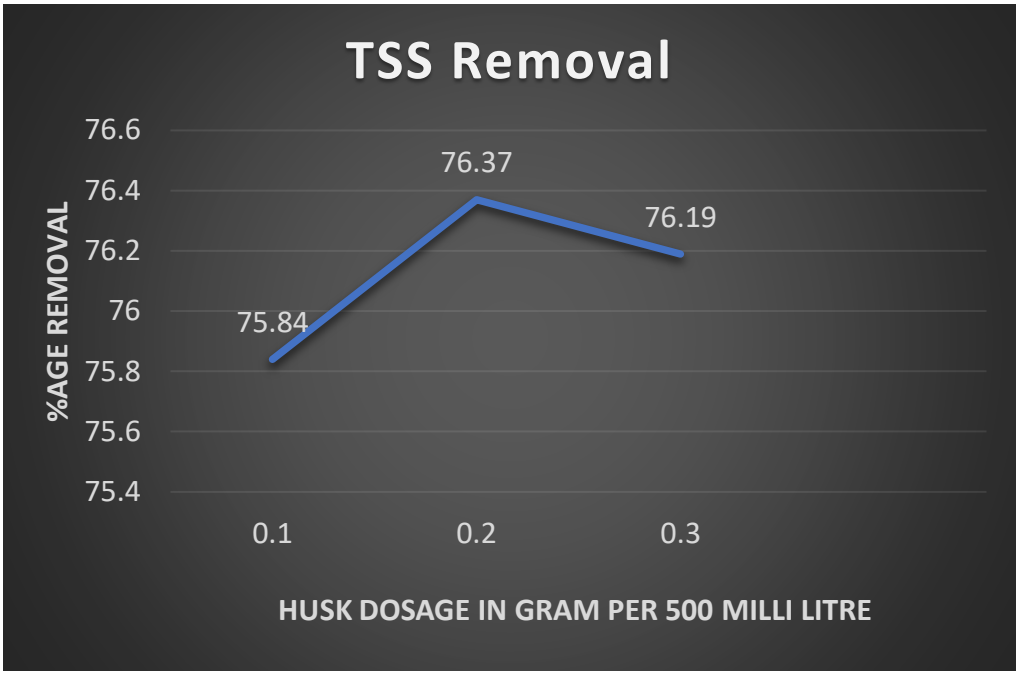

Figure 5.15 Reduction in TSS at varying dosages.

When we have used the dose of 0.1g of our coagulant known as rice husk, the suspended matter got reduced by 75.84 %. At 0.2g, best possible reduction is observed i.e.76.37 % which means that initially suspended matter was 308mg/L and after reduction it became 73mg/L which is all correct for irrigation use.

Treatment of TSS using rice husk ash

Along with the doses of rice husk, we have converted the rice husk into its ash and used it for coagulation purposes in different doses such as 0.1g of rice husk ash per 500mL of waste water, 0.2g of rice husk ash for 500mL of the waste water sample etc. At each dose, the reduction that it is making in suspended matter is observed in terms of percentage.

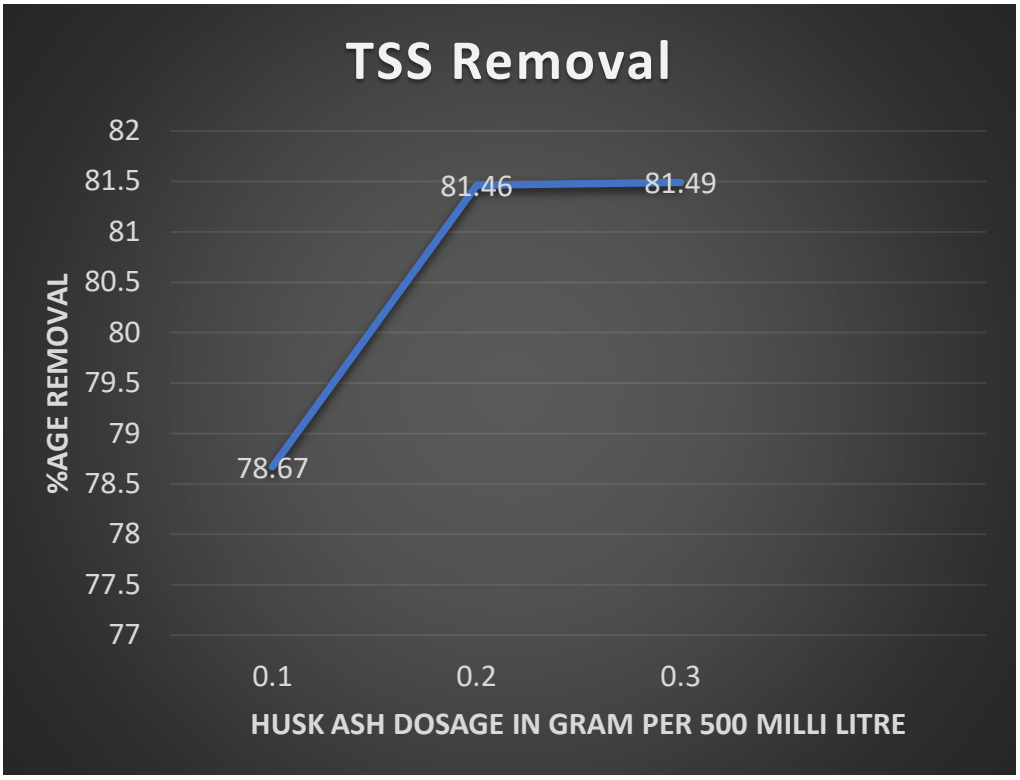

Figure 5.16. Reduction in TSS at varying dosages.

It can be seen using the TSS removal graph that when we have used the ash of rice husk in dose of 0.1g, our suspended matter got reduced by 78.67 % but when we used the 0.2g of the same rice husk ash, our suspended materials got reduced by 81.46 % and at 0.3g dose, suspended matter was reduced by 81.49 %. Clearly, the best possible reduction is occurring at the second dosage i.e. 0.3g of ash of rice husk. It is reducing the suspended matter by 81.49 %. It means that if initially the suspended materials were 308mg/L, then after reduction it remained 51mg/L which is less than 100 mg/L that is the permissible limit for this. Hence the treated waste water is now can be considered as safe for using in irrigation.

TSS Reduction for service Centre 4

The fourth service Centre is located in Solan and after getting the sample of waste water from there, the amount of suspended materials it was having were tested. The suspended matter in the given sample came out to be 420mL which was quite more than what is required for irrigation. Hence, the sample needed to be treated.

Treatment of TSS using rice husk

In order to use the given sample of water for agriculture/ irrigation purpose, the sample from service Centre 4 needed to be treated to lower down its suspended solids value. For fulfilling this very purpose, we have gone for the use of rice husk to act as a coagulant in doses of 0.1g, 0.2g, 0.3g etc.

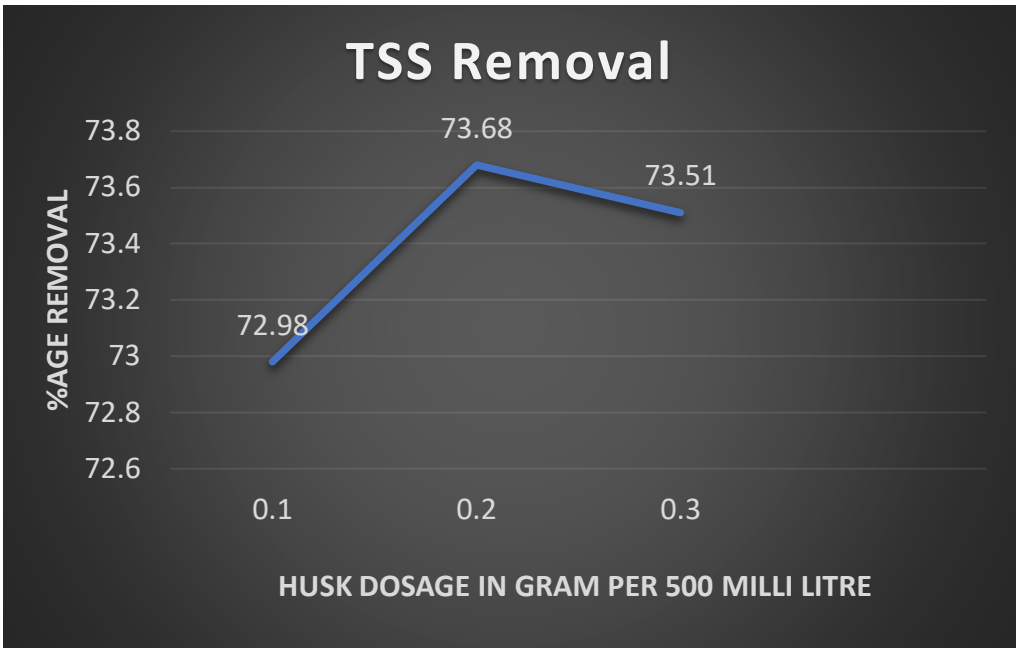

Figure 5.17 Reduction in TSS at varying dosages.

On using the rice husk in 0.1g dose per 500mL of the service Centre 4 waste water, 72.98% reduction in suspended matter was observed. On using the rice husk in 0.2g quantity, 73.68 % reduction is observed and again for 0.3g of dosage, the reduction observed was 73.51 %. The best possible reduction was seen when we have used the dose of rice husk as 0.2g. It reduced the suspended matter to 110.5mg/L.

Treatment of TSS using Rice husk ash

Again, for the service Centre 4 we have not only used the rice husk but we have also used the rice husk ash in varying doses such as 0.1g, 0.2g, 0.3g etc. corresponding to each dose, the reduction in suspended matter was observed in terms of percentage.

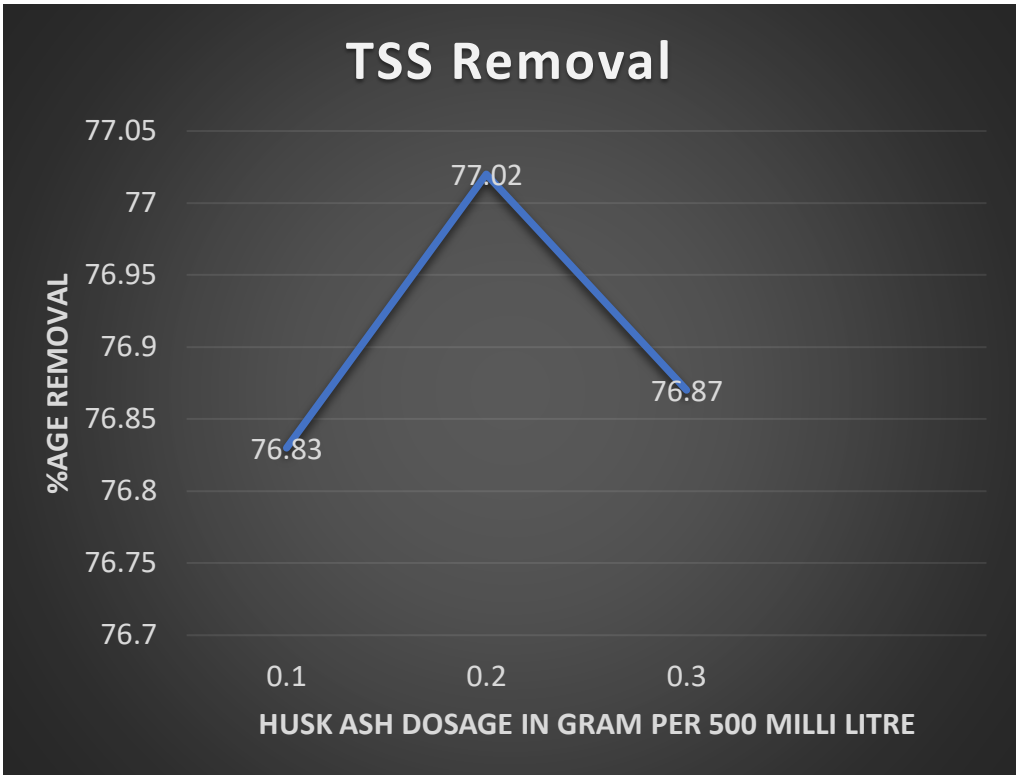

Fig 5.18. Reduction in TSS at varying dosages.

Looking at the graph of suspended materials removal versus the dosage of coagulant that we have used, it can be easily observed that at varying dosages of ash of rice husk, the percentage reduction is varying. At 0.1g dosage of ash of rice husk, we can see suspended matters are getting reduced by 76.83 % and when the same coagulant has been used with 0.2g dosage, the reduction in suspended materials came out to be 77.02 %. When we used the 0.3g dosage of the rice husk ash, the reduction percentage came out to be 76.87 %. The best possible reduction is observed at 0.2g dosage i.e. 77.02 %. The initial turbidity was 420mg/L and it got reduced to 96.6mg/L which is within the limit for the water to be used for agricultural purposes. Hence, the maximum reduction in suspended solids is given by the 0.2-gram dosage of the ash of rice husk.

Suspended solids requirement for agriculture

There are some guidelines from various Govt. agencies that there should be minimum amount of suspended materials/ solids in the water that is being used for the purpose of irrigation or agriculture. These guidelines have kept the suspended materials value to be 100 mg/L. In all our four samples, none of them were having the suspended solids in permissible limits and hence it became necessary to treat them.

Figure 5.19 suspended solids reduction.

On treating the water from all four service stations, it was observed that both, rice husk and the rice husk ash can reduce the amount of suspended matter/ material/ solid that are present in any given sample of water. That's why varying doses of rice husk ash have been used to know which dose of a particular coagulant can lead to what amount of reduction in percentage of the suspended materials. In our case, most of the time, 0.2g dose worked the best in reduction.

5.2 Sedimentation using Rice husk

While making the prototype for treatment, we have used one of the sediment filter cartridges for this process. In this treatment process also, we have made the use of rice husk as a filter media. The quantity of rice husk that we used for this purpose was 12g. As we have used the rice husk as a coagulant in jar test also, we know the fact that it can be used to treat the turbidity as well as reduce the total suspended materials in the water sample.

Figure 5.20. Rice husk used for sedimentation.

Although in this case we have not referred to the use of the ash of rice husk because it has already been tested that rice husk ash is being used to reduce the turbidity as well as the total suspended materials value. The average reduction is calculated in this case for both of the factors i.e. turbidity as well as the total suspended materials/ solids present in the sample of water. After noting the average reduction in both of the factors, it was seen that both the parameters were coming out to be in the allowed limit for their use in agriculture. Hence the treated waste water sample can be used for the required purpose after successful treatment with rice husk.

Turbidity Reduction

On using the sediment filter cartridges, average reduction in the values of turbidity for all four samples were considered. Initial value of turbidity for sample from service Centre 1 was 61 NTU, for service Centre 2 it was 104 NTU, for service Centre 3 it was 49 NTU and for service Centre 4 it was 108 NTU.

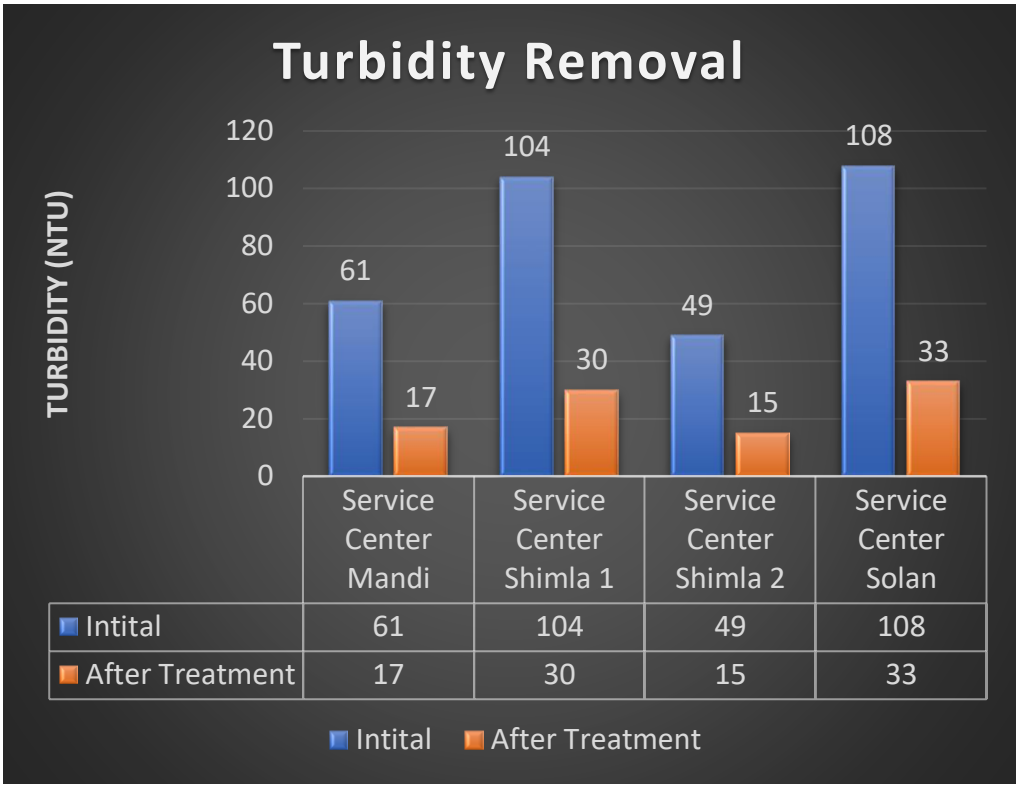

Figure 5.21 Reduction in turbidity for all service centres.

An average reduction in turbidity is considered and it came out to be 70.49 %. Upon this reduction, the turbidity value for water sample from service Centre 1 came out to be 17 NTU, and for second service Centre it came out to be 30 NTU, for third service Centre it came out to be 15 NTU and for the fourth service Centre it came out to be 33 NTU. Although the reduction in turbidity is considered more in case of the rice husk ash, yet the rice husk in the sediment cartridge is also able to reduce the turbidity to a considerable amount. The samples of water having turbidity value less than 25 NTU are generally considered safe for irrigation purpose.

TSS Reduction

Similar to the reduction in the values of turbidity for all the four samples that we have taken, the suspended materials/ solids can also be reduced by the same process. The samples that we have collected were taken from four service centres. The first sample was having suspended matter quantity as 568mg/L and the second sample was having the suspended matter quantity as 212mg/L. The third sample that we have collected was having the suspended matter quantity as 308 mg/L and the fourth sample had the suspended materials quantity as 420mg/L.

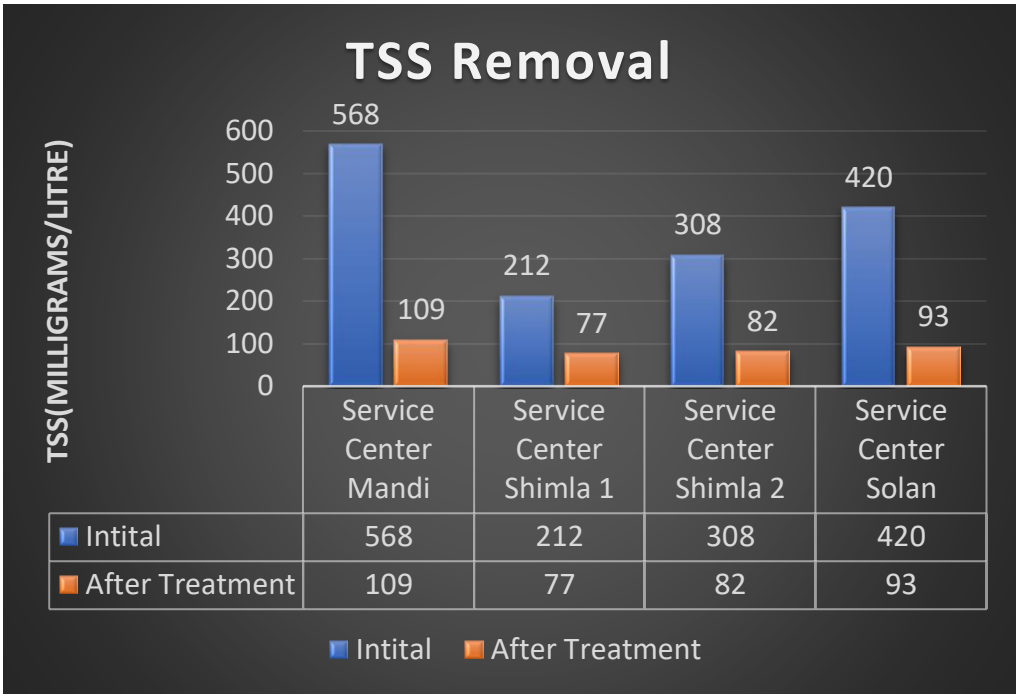

Figure 5.22. Reduction in TSS for all service Centres.

Similar to the average reduction concept followed in turbidity of waste water samples, average reduction in suspended matter is also considered. In case of suspended materials, average reduction is 76.06 %. Hence, using the rice husk in sediment filter, the suspended solids in sample one came out to be as 109mg/L , for sample two it came out to be as 77mg/L, for sample three it came out to be as 82 mg/L and for sample four it came out to be as 93mg/L. Hence after treating the sample for suspended materials, the water samples are fit to use for agricultural purposes.

5.3 Oil and Grease content testing

The samples of waste water were taken from four different areas and all of them were having huge amount of waste water discharge. As the samples were taken from automobile service Centre, the oil and grease content is in high quality in those water samples. But in order to discharge the water for agricultural purpose, the oil and grease content should be reduced and it should not be more than 10mg/L.

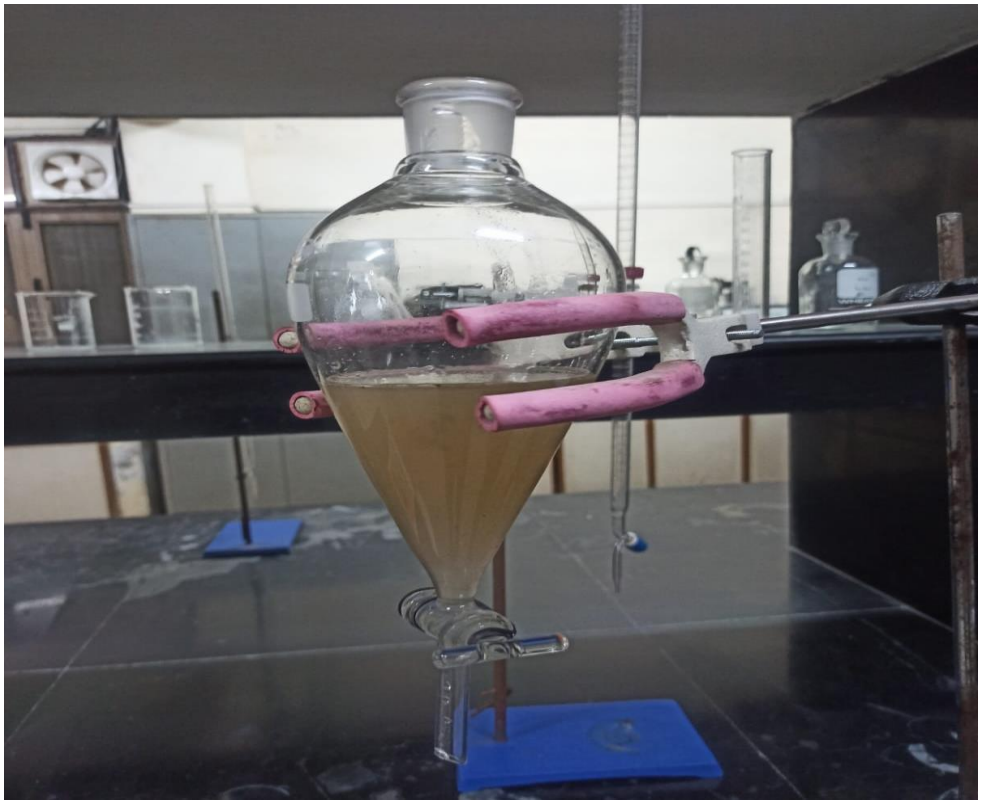

Figure 5.23 Oil and grease measurement using separating funnel.

The oil and grease content is measured for all the four samples. For the service Centre one, the Oil and grease content value came out to be 48mg/L and for the second waste water sample its value came out to be 81mg/L. For third service Centre, its value was 38mg/L and for the fourth sample, its value was 77mg/L. For all of the samples, none of the sample were having the oil and grease content value in the permissible limit and hence in order to use these samples for agriculture, we needed to reduce the oil and grease content of these water samples.

Oil and grease removal

In our treatment process we have used saw dust as the material to remove the oil and grease content which is present in all the four samples in huge amount. We have used a cartridge in which we have kept two plates which contains the saw dust. We have used around 15grams of saw dust in order to remove the oil and grease content. The cartridge took 9 minutes and 20 seconds to pass 1 Liter of water.

Figure 5.24 Cartridge filled with saw dust.

Whenever the water sample is passed through this cartridge containing saw dust, there is a reduction in the overall oil and grease content in waste water. For all the four samples, as the value of oil and grease content was not in permissible limits, all of these samples needed treatment to make them usable for agriculture. And hence, all the four samples were then treated with saw dust in the cartridge to reduce the oil and grease content value.

Reduction in O and G value

When all the four samples from different service stations were passed through the cartridge containing saw dust, a reduction in the oil and grease value is observed. In this case also, we have considered an average reduction in the oil and grease content. The average reduction came out to be 89.34 %.

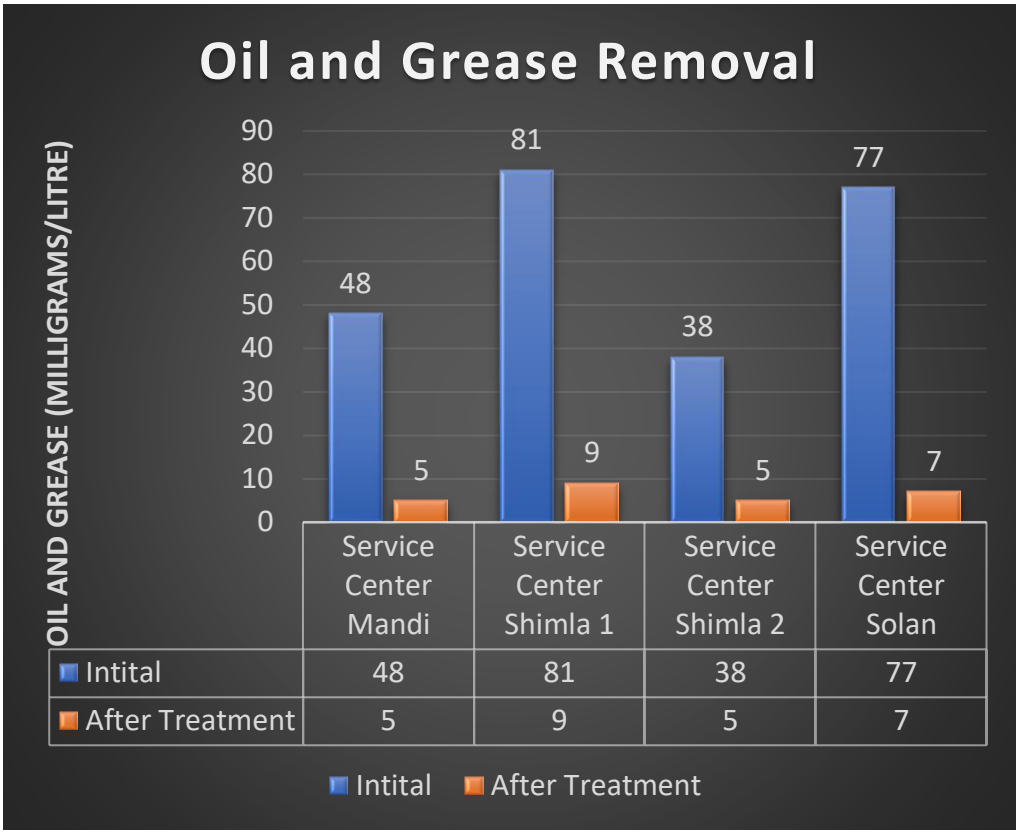

Figure 5.25. Reduction for oil and grease for all samples.

The initial oil and grease content in the waste water sample collected from the service station 1 was 48mg/L and after passing the sample through the cartridge containing saw dust it came out to be 5mg/L. Also, the initial oil and grease content for waste water sample collected from service station 2 was 81mg/L and after passing it through saw dust it came out to be 9mg/L. Again, when the waste water sample collected from service Centre 3 was passed through the cartridge containing saw dust, the oil and grease content became 5mg/L. And when the fourth sample collected from service station is passed through saw dust, the oil and grease content became 7mg/L.

O and G requirement for agriculture

When all the four samples collected from different service stations were passed through the cartridge containing saw dust, there was a reduction in the overall oil and grease content. After treating the four samples from saw dust, their oil and grease value came out to be less than 10 which is the prescribed limit for the water to be used for agriculture.

Figure 5.26 Treatment of waste water sample with saw dust.

If the oil and grease content in waste water sample is more than a considerable amount, it may cause many harmful effects as well as it will not be suitable for many types of crops. Hence, especially to make the reuse of water from the automobile service Centre, reducing the oil and grease content of water samples is a must. After reduction, if the value of oil and grease content came out to be less than 10mg/L, only then the water will be considered as safe to use for agricultural or irrigation purposes otherwise if its value is more than 10mg/L, we need to treat it further before using it for agricultural use.

5.4 Removal of Dissolved particles

In order to remove the dissolved particles, we have made the use of reverse osmosis process which is there in the prototype also. It can be implied to use in the removal of dissolved particles and the RO membrane that we have used is of 80 GPD which is able to treat 1 L of water in 5 minutes.

Fig 5.27 RO membrane used in prototype of waste water treatment.

As the other parameters such as turbidity and suspended materials, oil and grease values of all four samples were reduced by various processes such as jar test, sedimentation etc., it is also advisable to treat the dissolved matter that is present in the waste water sample. Hence the chlorides and the dissolved solids removal is being done by using a reverse osmosis membrane of 80 GPD. Before treatment, the values of dissolved solids as well as the values of chlorides are being tested for the sample and after treating it using RO, the value is noted and percentage reduction is observed.

Chlorides removal

On collecting the waste water samples from all the four service stations, the chlorides value was calculated for all the four samples and it was observed that service centre 1 was having the chlorides value within the permissible limit while the service centre 2,3, and 4 were not having the chloride values in permissible limit.

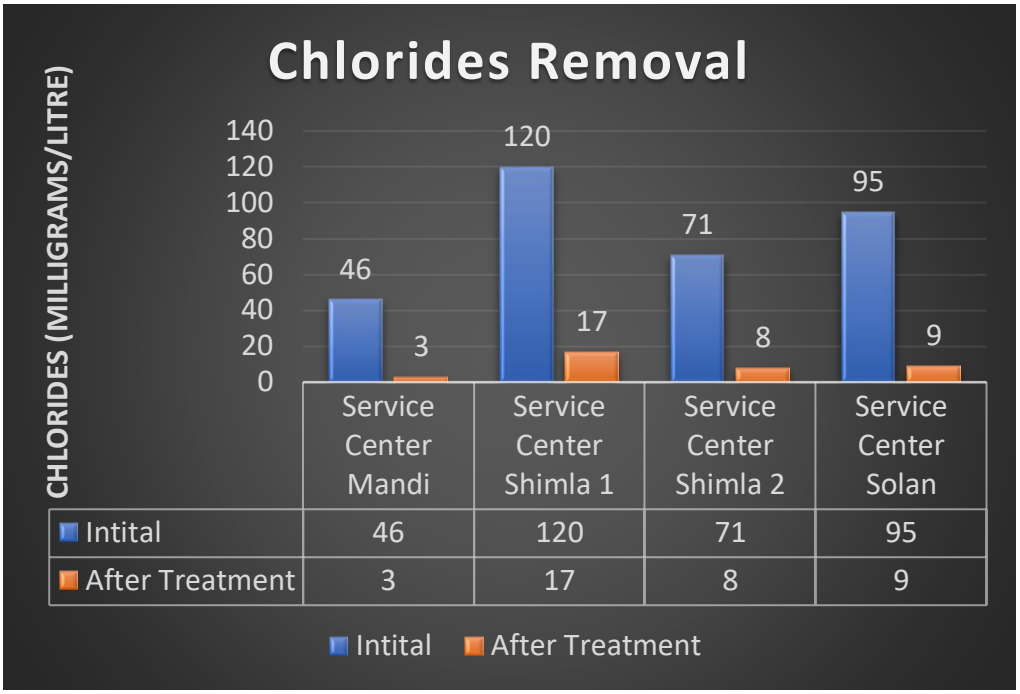

Figure 5.28 Chlorides removal for all service Centres.

But after treating the waste water sample via reverse osmosis membrane, the average reduction in chlorides value came out to be 88.85 %. So, after treatment, the chloride value of sample 2 came out to be 17mg/L, for sample 3, it came out to be 8mg/L and finally for sample 4, it came out to be 9mg/L. All of these treated samples were having the chlorides values within the limits specified for agriculture/ irrigation purposes. And hence, the treated waste water sample can be used for irrigation purposes. The prescribed limit for chlorides value is up-to 70mg/L and any sample having chloride value less than 70mg/L can be used for irrigation purposes.

Dissolved solids removal

The dissolved solids value was calculated for all the four samples that we have taken from different service stations. Although, the dissolved solids value is a major factor in determining the quality of drinking water and having not that much effect on irrigation water. Yet, we have treated all the four samples to reduce the dissolved solids value.

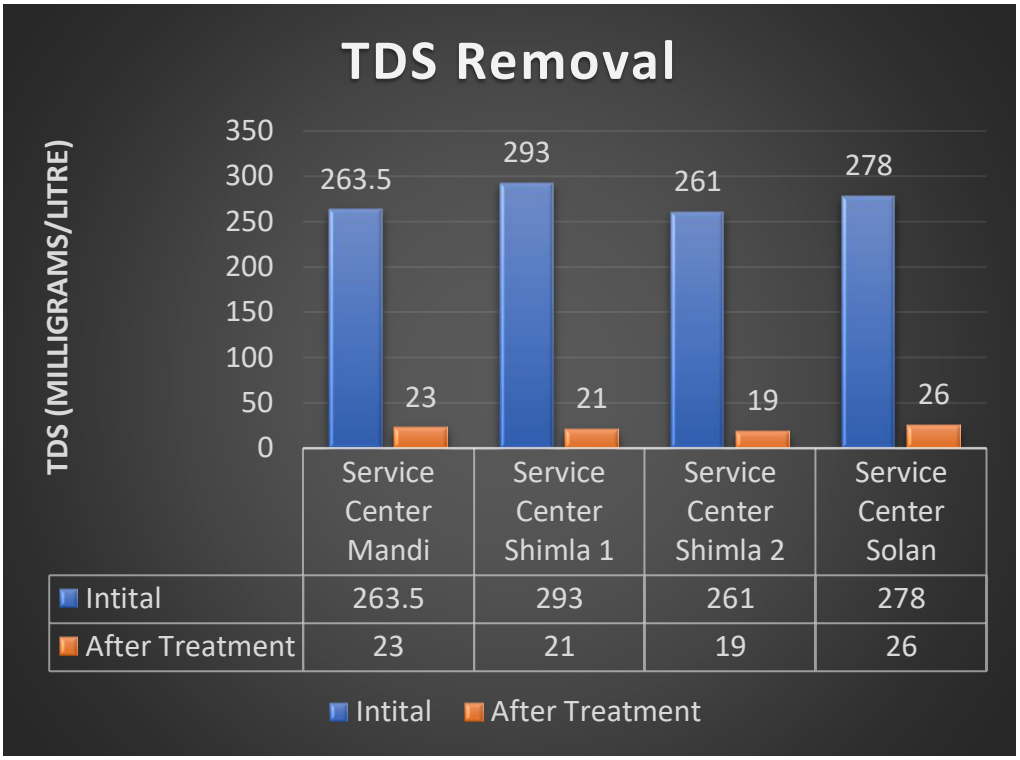

Figure 5.29 TDS removal for all service Centres.

Although it is not a very important parameter for irrigation water, yet we have treated the water in such a way that is reduction in dissolved solids value. Also, it is generally prescribed that the value of TDS should be less than 2000ppm if the given water sample is to be used for irrigation purpose. In all of our four sample, the TDS value was well within the limits but even then, treatment was done and after treatment it was observed that average reduction of 91.88 % in the dissolved solids was there which made the TDS value of sample 1 to be 23mg/L, for the second sample as 21mg/L, for the third sample as 19mg/L and for the fourth sample as 26mg/L.

5.5 Prototype for car service Centre waste water treatment:

The prototype that we have made for the reduction of waste water consists of many parts. In the first step, a specific amount of water is taken from a specific source and then the waste water enters the sediment filter. The sediment filter contains the rice husk as a filter media. This part helps in reducing the turbidity value. Also, along with the turbidity, the amount of total suspended materials is also reduced due to this. After this we have the oil and grease remove cartridge. This cartridge consists of saw dust. When some particular amount of waste water is

passed through the saw dust which is present in the given cartridge, it helps in reducing the value of oil and grease content. As removing or reducing the oil and grease content is necessary for agriculture purpose, the treatment for oil and grease content was a must for this case. Along with the the booster pump is also used with SMPS adapter in order to fasten the process of treatment. Also, in order to remove the dissolved matter present in the waste watrer sample and to reduce the chlorides value present in all the four samples, we have also used a reverse osmosis membrane in our prototype so that when the water sample passes through it, there will be a reduction in chlorides value and the dissolved solids value. The RO membrane is having two outlets, the first one is for the treated water and the other one is for the waste water. The water , when it comes out of the reverse osmosis membrane , is tested for various parameters such as chlorides and total dissolved solids. Hence the prototype is complete after reducing the turbidity of all the four samples, after reducing the total suspended matter in all the four water samples, after removing the oil and grease content of all the four samples and finally after reducing the chlorides value as well as the total dissolved solids present in all the four samples of waste water collected from service Centres.

Figure 5.30 Prototype for automobile service centre waste water treatment.

CHAPTER 6

CONCLUSION

This study describes a waste water treatment system which uses sustainable techniques instead of conventional treatment methods. Car washing waste water contains some of the contents like oil and grease which when discharged in open areas especially into crops may harm them. Also, to reuse the car washing waste water for agriculture and recirculation purposes it is necessary to treat the water up to the permissible limits. The treatment can be done by various sustainable techniques such as rice husk, saw dust and reverse osmosis etc.

Most of the automobile sectors discharge a lot of waste water. Although govt. has instructed these sectors to maximum reuse the waste water but it is not being followed everywhere. If the car washing waste water is treated well, it will definitely reduce the burden on fresh water resources.

According to our research the treatment method adopted worked with an efficiency of 70%-90%. The values of treated effluent were within permissible limit to be used for sensitive crops. Hence, the treatment method can be adopted for agricultural purposes.

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