



**Ecosafe Envirotech**

**Water testing laboratory & Environmental services**

1<sup>st</sup> floor, AVM Building, Kanakalaya Bank, Westhill, Kozhikode-673005

8129470770, 8547745170 ecosafe17@gmail.com

**Approved by kerala state pollution control board**

**Analytical study on purification efficiency of Enzyme  
(ENVOREIN™) in treatment process of oil refinery  
effluent**

**Project carried**

**By**

**Ecosafe Envirotech**

***(Approved by kerala state pollution control board)***

**This study conducted & report prepared**

**by**

**Mr. JASEEL O C**

**MSc Environmental eng (Cochin University), BSc Chemistry**





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## Introduction

Safe disposal of waste water is the one of the major environmental issue in the urban and industrial areas. Continuous disposal of bulk quantity of untreated waste water to the freshwater bodies (like rivers, ponds, lakes) , soak pits and even in to the sea will cause the serious adverse changes in the inherent ecosystem.

Risk of life span to the aquatic animals, accumulation of toxins in fishes and other sea foods , contamination of drinking water are the pollution effect of poor waste water management. This threat full effect to the discharging body is mainly contributed by excess organic and inorganic components, toxic substances, harmful microorganisms and very high or too low pH of discharged effluent. Decomposition of organic contaminants by the microbial organisms will cause the depletion of dissolved oxygen present in the water body, thereby it leads to the death of aquatic animals and reduces the quality of water by excess algal growth causes the phenomenon of eutrophication.

Scientists and technologists are inventing new technologies and conducting studies to improve the quality and efficiency of waste water treatment by last many decades , still continuing it and surly will go far in future also.

## Basic principles and terminologies of waste water treatment

Excess water disposed off after passing through a process in industries, residencies, and commercial uses or any type of human interventions is generally called waste water. Sewage, Sullage , and Effluent are the terms used to further classify the waste water.

Sewage is stands for general municipal waste water generating by household use, but free from hazardous chemicals and mainly composed of food contents, edible oil, and liquid from toilets. Whereas the sullage is the waste water free from urine, excreta and excess organic contaminants, it produces from house hold sinks showers and baths.





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The all type of industrial wastewater generally known as effluent water, it may contain hazardous chemicals and other production raw materials.

Organic and inorganic contaminants, like food waste, urine and excreta, oils and grees, pesticides, paints, solvents soap and detergents , solid particles like paper , plastic materials, sand and soil particles are the examples for constituents causing the contamination of water.

The contamination level of waste water and quality of treated water measures, by the parameters like COD, BOD pH, Total suspentable solids (TSS), Oil & grees.

COD & BOD are the very important waste water quality parameter, and both are expressing the contamination level of oxidisable organic and inorganic materials present in water. The difference between COD and BOD is, COD (Chemical oxygen demand) is the measure to quantify the organic and inorganic materials that is oxidized by a strong oxidizing agent (Pottasium dichromate). Whereas BOD (Biochemical oxygen demand) is the quantity of organic contaminants that is decomposed by microorganisms by consuming dissolved oxygen in the water. Both parameters are expressing in terms of milligram oxygen in one liter. In a same sample the COD value will be comparatively higher than the BOD.

The standard limit of BOD for the safe disposal of treated effluent will be variable depending on the mode of reuse or discharging body like public sewer, soak pit, river, and sea etc. For example, if the discharging body is inland surface water the BOD should be less than 30 mg/l, whereas for discharging into the sea the value should be less than 100 mg/l. Desirable COD value will be slightly higher accordingly. The pH value should comes in the range between 6.0 to 9.0 , the value of total suspendable solids and oil& grees is recommended below 10 mg/l.





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## About Ecosafe Envirotech.

We are a bunch of highly experienced professionals in the field of water analysis, water treatment technology, and designing of pollution control devices. Our employees are well qualified with academic degrees like MSc environmental engineering, MSc chemistry etc. Our scope covers the analysis of all type of water samples. Our main motto is customer satisfaction and we provide quality results with high accuracy following all the quality criteria as stated in ISO 17025:2017 manual. Our experienced personals visit the sites for the collection of samples in most accurate way following APHA 1060 B guidelines. We provide the results with solutions within minimum days so that the customer can find a solution without any further delays. Our team does conduct awareness camps in various parts of Kerala to make people aware the necessity of dealing with safe and healthy water.

We do analyze all type of effluents, influents and sewage water sticking on to the norms and guidelines of Kerala State Pollution Control Board and provide them technical advices on how to enhance the quality of outlet water from ETP/STP which is being discharged to municipal sewerages and environment.

We are also accredited for analyzing particulate matter and various gases which are hazardous to the environment from quarries and different industries.





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## About Envonix Hydrotech. LLP

Established in 2008 Envonix Hydrotech is a kerala-based company, which provides stat-of-the-art yet environment-friendly water, waste water treatment/filtering solutions as well as water purification product options across the country and overseas under its flagship brand, Maqpure.

Led by a dynamic team of innovative professionals including water treatment specialists and engineers/ plumbing designers, Envonix has a fully-fledged manufacturing facility and a brilliant sales and marketing team. Superb team work, an excellent range of products and solutions coupled with a focus of vision to be “better than the best,” led to Envonix Hydrotech establishing itself as a brand to reckon with, in a short span of time.

The Maqpure range of energy-saving turnkey projects both large and small, ensure effluents and sewage are safe for discharge into their surrounding natural environment. We integrate science and technology seamlessly to cleanse large volumes of water at high flow rates, which guarantees pure and safe portable water.

Also, our extensive range of household/commercial water purifiers deliver fresh, pure and healthy drinking water efficiently, round-the-clock. ENVOREIN and ENVOREIN PLUS are two of our standalone best-selling brands of 100% ecofriendly and non-toxic solutions for a clean and odorless environment as well as an easy-to-use solution for oxygenating and purifying contaminated water, respectively.

## Familiarizing the process mechanism of waste water treatment

The waste water treatment system achieves its final stage by passing through the different phases of treatment like physical, biological and chemical processes . There are many type of treatment methods, basically it is aerobic, anaerobic and membrane filtration technology.





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## Screening /Oil skimmer/ primary settling

It is the very initial stage of physical treatment, where the heavy solid materials and floating substances are easily removed by passing through a screen and baffled chamber system. Blocked waste materials from the screen and bottom of the chamber can manually remove and treated out systematically. The clear liquid free from oils and large particles passes to a collection tank.

## Aeration tank

Aeration is the hart process of waste water treatment because the 60 to 90 % of BOD reduction is carried in this stage. Aeration is applied with the support of a blower or mechanical agitator. For an efficient treatment the water has to hold in this tank for a time period of 16 to 24 hours.

## To Flocculation and settling tank

After aeration water passes to flocculation unit where with aid of chemicals like hydrated lime and caustic soda , the fine particles will aggregate into larger clogs which will easily settled out in settling tank.

## Filtration with sand filter activated carbon filter

Supernatant liquid comes out from the settling tank get filtered by passing through the pressure sand filter and activated carbon filter where the the fine particle get removed and color and odor creating substances get absorbed. The filtered water will clear and odor free , it can use for reuse by further advanced treatments like Ultra filtration or directly use for gardening and irrigation.





## Aim of study

- To study the efficiency of enzyme (ENVOREIN™) in purification of industrial waste water, especially the effluent from oil refineries.
- To estimate the minimum quantity of enzyme to be added in the waste water to get the maximum result of purification.
- To find out the minimum contact time to get most reliable result for the quality of treated water

## Scope of study

- To increase the efficiency of waste water treatment
- Reduce the use of excess chemicals as coagulants.
- To improve quality of treated waste water
- To reduce the risk to environment during the discharging of waste water to the surrounding water bodies.

## Brief description of the Enzyme

It is a commercial product with a trade name as 'ENVOREIN'. It is cellulose based derivative of a particular plant species with catalyst. The appearance is white colored small granules with mesh size of 1 mm.





## Methodology of study

The study is conducted by the analysis of waste water with parameters mainly COD, BOD, Sulphide and pH.

10 liter of untreated raw effluent water had collected from collection tank of ETP at BPCL Cochin refinery. Untreated raw effluent water analysed to find initial quality of waste water. Then one liter of waste water is taken out and 500 mg of enzyme is added and kept aside with providing aeration. Then after 24 hour the sample taken and undergoes chemical coagulation by adding caustic soda (500 ppm), and lime (1000ppm). The supernatant liquid after settling is filtered in activated carbon filter. Filtered sample is analyses and data is compared with raw effluent to find out the efficiency of purification.

By data comparison finally reaches into a conclusion and find out the criteria at which maximum treatment efficiency is occurred.







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## Interpretation of analysis report





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## Report no: - ES20/W016

Sample description: - Untreated waste water from ETP (Effluent treatment plant) at BPCL Cochin refinery.

COD of the sample is 1616 mg/L and BOD is 976 mg/L. pH is 7.95 and sulphide is 152.

This waste water is comparatively highly contaminated and visually dark colored with very intensive pungent smell.





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(No. PCB/LAB/C29/2019)

## WATER ANALYSIS REPORT

Name & Address of client	Mr. Abdul Rahman, Managing partner , Envonix Hydrotech LLP, Madeena tower, Calicut airport junction.	Sample I D	W200619-01
		Report No	ES20/W016
Sample description	Untreated effluent water from Oil refinery at BPCL Cochin.	Sampling by	Client
Date of collection	19-Jun-2020	Test completed on	25-Jun-2020

### Physical & Chemical analysis

Sl. NO	Parameters	Unit	Test method APHA	Result	Desirable limit
1	pH	-	4500H <sup>+</sup> B	7.95	5.5 – 9.0
2	COD	mg/L	5220 B	1616	--
3	BOD <sub>3</sub>	mg/L	5210 B	976	--
4	Sulphide	mg/L	4500 S <sup>2-</sup> D	152	--

Remarks: - Desirable limit will be considered based on the discharging body or mode of reuse.

Analyzed & reported by

Jaseel , Chief Analyst



*Jaseel*  
27/6/20



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**Report no: - ES20/W016**

**Sample description:** - 500 mg of enzyme powder is added to the one liters (500 mg/l) of untreated effluent, provided external aeration. **After 24 hours** added the coagulants, after settling clear water filtered through activated carbon filter and undergoes chemical analysis.

**COD and BOD reduction in percentage in comparing to the raw water**

COD reduction: - 80 %

BOD reduction: - 98 %.

Sulphide :- 98 %

pH value increased from 7.95 to 9.00





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## WATER ANALYSIS REPORT

Name & Address of client	Mr. Abdul Rahman, Managing partner , Envonix Hydrotech LLP, Madeena tower, Calicut airport junction.	Sample I D	W200620-01
		Report No	ES20/W017
Sample description	Effluent water after 24 hour enzyme (ENVOREIN™) treatment with aeration ( <b>500 mg enzyme to one liter</b> waste water, coagulated and filtered through activated carbon )	Sampling by	Laboratory
Date of collection	20-Jun-2020	Test completed on	26-Jun-2020

### Physical & Chemical analysis


Sl. NO	Parameters	Unit	Test method APHA	Result	Desirable limit
1	pH	-	4500H <sup>+</sup> B	9.00	5.5 – 9.0
2	COD	mg/L	5220 B	318	--
3	BOD <sub>3</sub>	mg/L	5210 B	18	--
4	Sulphide	mg/L	4500 S <sup>2-</sup> D	3.4	--

Remarks: - Desirable limit will be considered based on the discharging body or mode of reuse.

Analyzed & reported by

Jaseel , Chief Analyst



  
27/6/20



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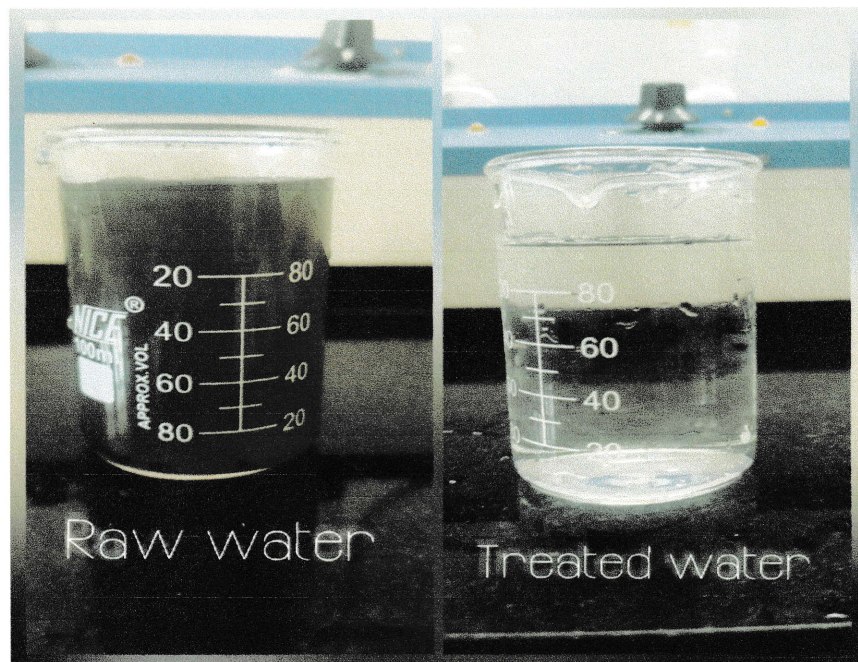
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## Data comparison table

	Parameters			
	pH	COD	BOD	Sulphide
Raw effluent	7.95	1616	976	152
Treated effluent	9.00	318	18	3.4

Figure of raw effluent & treated effluent





## Summary of the analysis and conclusion

1. The enzyme (Trade name –**Envorein**) is very effective in waste water treatment process oil refinery effluent
2. It is very effective to arrest the bad odor instantly on application of enzyme
3. A significant amount of BOD & COD reduction occurs by 24 hours of contact time with enzyme.
4. 50 kilogram of enzyme is sufficient to treat the one lakh liters of oil refinery effluent water with COD ranges from 1000 to 2000 mg/L.
5. The condition for most efficient result is while 500 mg/l enzyme added with aeration, then coagulated with lime and caustic soda and finally filtered through activated carbon.
6. 98 % BOD, 80 % COD and 98 % sulphide reduction happened in 24 hours of enzyme treatment (500 mg/l), coagulation and filtration process.
7. The final filtered water after enzyme treatment is free from foul odor and visually clear liquid.
8. COD of final treated water can be lowered little more by diluting with 25 % of fresh water and applying ozonation, to ensure the quality criteria for discharging safely.

