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Evaluating the efficiency of removal of contaminants from the water treatment plant in Khartoum refinery

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Abstract: Khartoum refinery in Sudan giants company where this study aims to verify the efficiency of water treatment and pollution reduction factors and special attention to the biological treatment process . It was found that the biological process process superchargers in the removal of organic matter in the water. The study also howed the need to provide this stage mechanical mixer that is securing the ventilation of these pond and providing oxygen needed for operations oxidation through oxidation of organic material by microorganisms (bacteria) Which are converted to carbon dioxide and to be in the presence of microorganisms attached to the bottom of the stage settling pond . And data derived showing the amounts of COD , BOD5 , sulfide , ammonia , oils content it amounts 800 , 300, 10 , 800 , 50 mg / L respectively at a minimum . This study recommends hould be dealing with such water and to protect the environment and reduce pollution factors such as COD and BOD5 and .... etc to the standard amounts .

I. INTRODUCTION

water treatment unit in the Khartoum refinery designed by china petroleum and chemical corporation luoyang established in 1998 and started production in October 1999. Expanded this unit 300 m3 / h After the treatment process the movement of treated water to control pond where breeding fish and trees, as well as ertain types of birds are these basins index treatment efficiencies and know these pond oxidation pond and be outside the unit and the capacity (1260 * 650 * 0.5 m) and evaporation in this blessing 17.1mm / d And sources of ollution in these waters as follows, where steam is used extensively in oil refineries and in chapter devices and causing low pressure and towers distillation and others this vapor condenses then separated from petroleum products to the water authority and remain in these waters a certain percentage of hydrocarbons and sulfur also it used different types of water in very large quantities in oil refineries such as cooling water used in condensers and heat exchangers as well as process water which is about water salts that remain of crude oil

II. Material and Methods

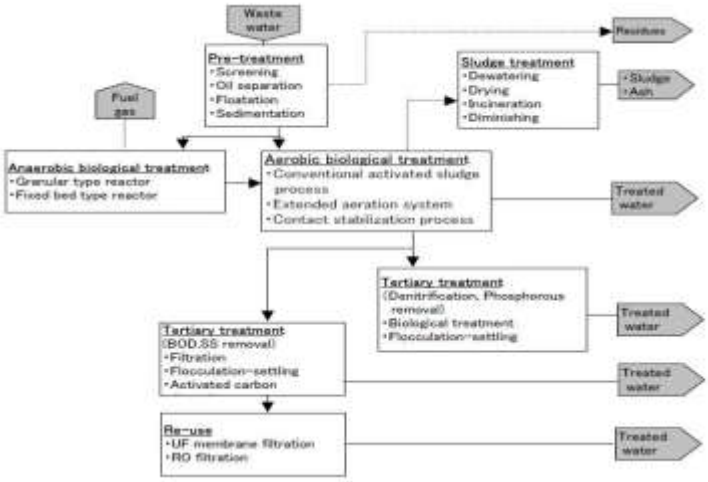

Figure (1.1) Industrial Water Treatment System

Stages of treatment :

1/Physical Treatment :

Where the separation of solids non-emulsified oils based on the principle of gravity, where use API separators with the design yield of the American Petroleum Institute, which depends on the design principle of the difference in density between water and oil

2/ Chemical treatment :

Emulsified oils can not be separated physically so it is necessary to resort to chemical treatment methods, which allows to remove the case of emulsification and stability emerging between oil and aqueous medium drops And supplemented by chemical processing so-called phase-floating stage which is very important and very crucial stage in the improvement of the final specifications for water treatment and symbolized short as (DAF) Dissolved Air Flotation by joining the air bubbles injected by private at the bottom of the tub network and thus reduce the its density .

3/ Biological treatment :

Water emerging from the flotation stage of the water entering the biological treatment tanks equipped with mechanical ventilation mixer the securing of these pond and providing oxygen needed for oxidation processes .

chemical consumption :

The addition of phosphate and alkaline soda into the process of biological system also injected PAC (poly aluminum chloride) with the use of Dissolved Air Flotation system for separating the sludge and oil. Depreciation is according to the following quantities :
PAC = 50 g/ton - PAM = 0.44 g/ton - Sodium phosphate = 28 g/ton

Temperature :

Temperature suitable for bacterial growth between 20 - 40 C ° and less than the temperature 10 C ° affect the treatment process and the growth of bacteria and thus the treatment process gets worse in the winter, and the optimum temperature between 25 - 32 C ° .

PH :

Microorganisms prefer to live in an environment acidic or neutral and the PH in the appropriate field between 6-9 and grade suitable for the growth of bacteria at (7) and increases or decreases in this area affect the treatmentprocess.

nutrimental substances :

Reduction clearly for the (chemical oxygen demand) COD leads to self-shattering for activated sludge for either higher increase of COD lead poisoning for activated sludge toxic as well as large of phosphorus quantities and nitrogen lead to contamination, as well as affect the growth of bacteria in general are nutrients the followingproportions : N : P = 100 : 5 :

toxic substances :

Mainly elements such as (Ta, Co, Mn, Cn) either lead decomposition of floccules or lead to the process control metabolism of bacteria and therefore it is necessary to prevent toxic materials from reaching into the tank.

dissolve oxygen (DO) :

Decrease or increase DO affect dissolved oxygen treatment process helps the decomposition of organic contaminants and in general should be between 2-4 mg/l

Flow :

Higher flow leads load shock and thus affect the sedimentation process and the decrease in the flow affects the nutrients and the House of Commons must be flow 200 m3 / h .

Methodology: The (APHA, 1998) Standard Methods are applied for the analyses. The effluent is analyzed for BOD5, and pH …etc values .

III. EXPERIMENTAL RESULTS AND DISCUSSION

Five samples were taken for analysis

Table (1.1) The quality of water entering the unit

No	Item	Unit	No	Item	Unit
1	COD	< 800 mg/L	6	Water temp.	< 40 C°
2	BOD5	< 300 mg/L	7	Phenol	< 50 mg/L
3	Sulfide	< 10 mg/L	8	SS	< 200 mg/L
4	Oil content	< 800 mg/L	9	PH	6 – 9
5	Ammonia nitrogen	< 50 mg/L			

Table (1.2) Quality of the water after treatment

No	Item	Unit	No	Item	Unit
1	COD	< 100 mg/L	5	Ammonia nitrogen	< 15 mg/L
2	BOD5	< 60 mg/L	6	Phenol	< 0.5 mg/L
3	Sulfide	< 1 mg/L	7	SS	< 60 mg/L
4	Oil content	< 10 mg/L	8	PH	6 – 9

Table (1.3) the results of the analysis of oil content

Hose 1	DAF 2	2F	2P
176.84	30.18	3.18	2.14
228.71	21.14	1.48	1.30
173.14	20.99	3.52	3.16
167.95	18.18	2.54	1.96
210.93	21.88	1.67	1.52

Table (1.4) the results of the analysis of PH

Hose 1	DAF 2	2F	2P
7.41	7.12	7.87	7.71
7.34	7.04	7.31	7.43
7.55	7.67	7.56	7.33
7.34	7.37	7.34	7.23
7.44	7.20	7.22	7.25

Table (1.5) the results of the analysis of Sulfide

Hose 1	2F	2P
8.96	0.00	0.00
7.52	0.45	0.00
8.00	0.88	0.56
7.92	0.48	0.01
8.40	0.32	0.00

Table (1.6) the results of the analysis of Biochemical oxygen demand (BOD 5)

OXI	2F	2P
26.4	16.7	21.5
25.3	25.1	26.3
27.7	23.7	25.1
26.8	20.1	22.3
30.6	27.1	28.4

Hose : Before water treatment **2F :** Filters
DAF : Dissolved Air Flatation **2P :** pumps

The use of microorganisms to remove contaminants from industrial water is considered an effective way is widespread, it is important when you make a biological water treatment industrial know the sources of pollution in the water, installed, and supplies discharged, the processes that take place inside the property and that affect the quantity and quality of these water, primary treatment results .
And that these factors are taken into account will allow you to increase the benefits derived by the plant through effective biological treatment. These benefits include the following :
- Capital and low operating costs compared with the chemical oxidation processes
- A real destruction of organic materials compared to only phase separation in the way the air of confusion or carbon adsorption .
- The oxidation of many types of organic materials .
- Remove inorganic compounds such as ammonia and sulfates, and the possibility of total removal of Nitrogen by nitrogen removal process .
- Flexibility in operations to deal with the broad areas of the properties of water and wastewater flows
- Reduce toxic substances in the water.

IV. CONCLUSION

The use of microorganisms in the stage of biological treatment to remove contaminants from industrial water is considered an effective way of widespread, so if the abundance of appropriate conditions for the treatment process .

V. RECOMMENDATIONS

Due to the small processing unit in the Khartoum refinery advised to increase the size of the processing unit to increase the efficiency of treatment, where he was in the case of the amount of water contaminated receiving great turning into large pond until processed after loading hide unity

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