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Performance Evaluation of Treatment on Domestic Wastewater by using Oxidation Process. (Using Chlorine Dioxide)

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Abstract: **The advanced oxidation process (AOP's) is more effective technology for removal of degradable or non degradable waste present in wastewater. Oxidizing agent is more powerful for removal of waste present in wastewater. Now a days so many oxidation processes are used for removal of non easily removable waste present in wastewater, such most effective methods are Chlorine Dioxide (CLO2) ,Hydrogen peroxide (H2O2) ,Ozone (O3) ,Fenton reagent , Ultra-violet light (U/Light). In present paper highlighted the most effective method used for treatment of Domestic wastewater such as chlorine dioxide (CLO2). 10 PPM Dose of chlorine dioxide for 2 hours contact times got permissible values of chemical oxygen demand and biochemical oxygen demand are 51 mg/l and 18 mg/l respectively.**

Keywords: Advanced oxidation process, Chlorine dioxide, Hydrogen peroxide and ozone and Fenton reagent.

I. INTRODUCTION

In last 10 years the development of various techniques are came for the treatment of wastewater. Degradation of organic compounds can be removed by using biological treatment. The toxic compound cannot be remove from wastewater by using biological process, so advanced or best appropriate method is essential for the removing this kind of toxic compounds. The oxidation process is most powerful technique for removal of toxic compounds into biodegradable substances. This treatment is more beneficial for the removal of waste from wastewater, such various oxidation techniques are Chlorine Dioxide (CLO2), Hydrogen Peroxide (H2O2), Ozone (O3) and Ultraviolet light (U/V light). The main aim of chemical oxidation process is transformation of toxic substances into degradable substance. The toxic compounds are not easily removed in biological treatment; such case chemical oxidation process gives better result as compared to biological process. In chemical oxidation process powerful reagents are used for the decomposition of contaminants in wastewater. Advanced oxidation processes (AOPs) are used to oxidize complex organic components found in wastewater that are difficult to degrade biologically into simpler final products. When chemical oxidation is utilized for the treatment of wastewater, it may not be necessary to complete oxidation of compounds or group of compounds. In some cases, partial oxidation is sufficient for the conversion of toxic compounds into biodegradable substances. In advanced oxidation process degradation of substances into three step such primary degradation, intermediate degradation and final degradation of substance.

Advanced oxidation processes typically involve the generation and use of the hydroxyl radical (OH') as a strong oxidant to destroy compounds that cannot be oxidized by conventional oxidants such as oxygen, Ozone and chlorine. The main aim of advanced oxidation process is to reduce the economical cost as compared to biological process.

II. PARAMETRIC INVESTIGATION

A. Determination of COD

1. Chemical Required:

Potassium dichrornate, Conc.sulphuric acid, Ferroin indicator solution, Std. Ferrous ammonium sulphate solution, Mercuric Sulphate

2. Procedure:

a) Take 50m1 of sample in a flask and 1gm of HgSO4 and 5 ml of H2S04 add slowly to dissolve HgSO4 and cool the mixture.

b) Add 25 ml of 0.25N K2Cr2O7 solution. After that attach the condenser and start the cooling water. Apply the heat and reflux for 2hrs.

c) Dilute the mixture to about 300m1 and titrate excess dichromate with std. FAS using Ferro in indicator.

d) The color will change from yellow to green to blue and finally red.

e) Reflux on the same manner to a flask consisting of distilled water, equal to the volume of the sample and the reagents titrate as he sample and ml of titrant was deduced.

B. Determination of BOD.

1. Chemical Required:

Sodium Hydroxide, Manganese sulphate, Potassium iodide, Sodium thiosuiphate, Conc.H2SO4, Starch.

2. Procedure:

a) Take 300 ml BOD bottle, and filled with distilled water.

b) Filled BOD bottle with 2% and 5% volume of BOD bottle.

c) Keep BOD bottle in incubator at 27' C for 3 days.

d) In 500 ml conical flask take 200 ml sample.

d) Add to it one or two drops of starch indicator until the color becomes blue.

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c) Titrate against Standard Sodium thiosulphate solution until the disappearance of color.

C. Determination of residual chlorine.

a) Take 100 ml sample in conical flask.

b) Add 5ml acetic acid.

c) Add 1gm of KI potassium iodide.

d) Mix it 15 minutes and it keep away from direct sunlight.

e) Add few drop of starch indicator

f) Titrate it against 0.025 N sodium thiosulphate become colorless.

III. RESULTS.

Table no.1 characteristic of inlet wastewater.

Sr.no	Characteristic of wastewater	Range
1.	Chemical oxygen demand	220 -350 mg/l
2	Biological oxygen demand	105-200 mg/l
3	PH	6.0 - 7.5

Table no.2 for COD reduction for 2 hours contact time

Dose of CLO2	COD value(mg/l)	% COD reduction
1 PPM	198.4	35
2 PPM	179.2	41
3 PPM	176	42
4 PPM	140.6	41
5 PPM	67.2	67
6 PPM	75.2	68
7 PPM	51.2	75
8 PPM	106.4	68
9 PPM	83.6	75
10 PPM	64.6	80

Table no.3 BOD value after 2 hours contact time for CLO2.

Dose of CLO2	BOD value
1 PPM	55
2 PPM	40
3 PPM	40
4 PPM	32
5 PPM	35
6 PPM	45
7 PPM	15
8 PPM	18
9 PPM	55
10 PPM	15

Table no.4 residual chlorine after 2 hrs contact time for CLO2 dose.

Sr.no	Dose of CLO2	Residual chlorine (mg/l)
1	1 PPM	0.5
2	2 PPM	0.7
3	3 PPM	2.6
4	4 PPM	1.77
5	5 PPM	3.55
6	6 PPM	3.55
7	7 PPM	5.32
8	8 PPM	4.44
9	9 PPM	4.44
10	10 PPM	5.33

IV. CONCLUSIONS.

1. The chlorine dioxide is gave most accurate result at 5000 PPM solution, also longtime power of disinfection for wastewater treatment.

2. At 10 PPM dose of chlorine dioxide for 2 hours contact time achieved permissible limit of COD (chemical oxygen demand) and BOD (biochemical oxygen demand).

3. The chlorine dioxide is more soluble in water, so longer contact time for degradation of toxic compound in wastewater as compared to other oxidants.

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