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Effect of the chemical dosing in primary treatment study of the textile based industrial waste water

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ABSTRACT

Waste water from textile industries has a high PH, high temperature and a high concentration of organic materials. Removing Colour and organics from waste water is more important because the presence of small amounts of dyes is clearly visible and detrimentally affects into the water quality. In primary treatment process of textile based effluent, simple chemicals such as lime (10% sol.), iron salts (5% sol.), polyelectrolyte (0.1% sol.) gave good result and removed Colour,COD,BOD,TSS faster than physical processes. The analysis results according to Jar-test were depicted in the stage-wise performance of inlet and outlet effluent quality in ETP. In primary treatment the Colour of these effluents mostly Red-Black or Dark green to change into Yellow or Light Green. The Chemical Oxygen Demand are 60% decrease, Total Suspended Solids 50% decrease, Hardness 20% decrease but Total Dissolve Solids ˜ 32% increase due to addition of Lime solution. The flock Produced by iron salt with lime at pH 10 to 11is heavier and can remove more percentage of Suspended Solids than Alum in a very short time period. Iron salt (ferrous sulphate and ferric sulphate) makes 90% treated water and 10% sludge. The Sedimentation of Sludge is very fast by Iron salt than Alum. Being good oxidizing agents, the Iron salts can remove Hydrogen sulphide, hydrogen sulphate and its corresponding Odour and tastes from water.

KEYWORDS

Treatment;
Dosing;
Hardness;
Alum;
Flock;
Suspended solids;
Effluent;
Waste;
Sludge.

INTRODUCTION

At Pali there are about one thousand Textile based industries. These industries discharge industrial effluent without any prior treatment but these discharge effluent enter into CETPs for proper Treatment.

These CETPs established basically to treat for cotton based industrial effluent. At present time Synthetic cloths are dyeing and printed here. These changing of process of that area and using of synthetic dyes, large quantity of effluents cause failure of CETPs.

By the using of proper dosing and new Technology we can treat this industrial waste water properly. Hydrad Lime, Ferrous Sulphate and Polyelectrolyte mostly using by CETPs but their dosing process, poor quality of chemicals and oldest technology failed to proper treat

these effluent.

MATERIAL AND METHOD

Water samples of industrial effluents were collected from dyeing and printing units of different textile industries and inlet of CETPs unit (I,II,III,IV) during the case of study. The water samples were collected in BOD bottles of 300 ml capacities. All the bottles were carried in laboratory in ice box for analysis.

We used *"Jar test"* for proper Dosing, Coagulation, and Sedimentation of Sludge.

Dosing of Chemicals is the main process of effluent cleaning. In textile based effluent Lime, Caustic, Ferrous Sulphate, Copperas (Ferric Sulphate),

Poly-Aluminum Chloride (PAC), Alum, Hypo chloride, Polyelectrolyte mostly used for Primary effluent cleaning.

In Jar-Test by the ppm dosing of these chemicals we will observing maximum settling of suspended solids, organic matter, and flocks.

We try to get results maximum sludge settle down in sort time period with using of very low amount of dosing chemicals.

EXPERIMENT

1. Lime 10% sol., Ferrous 5% sol., Poly 0.1% sol. Used in one lit of effluent in Jar Test for one minute.
2. Lime 10%, Poly Aluminum Chloride (PAC) 5%, Poly 0.1% sol., used in one lit of effluent in Jar Test for one minute.
3. Caustic 10%, Ferrous 5% sol., Poly 0.1% sol. Used in one lit of effluent in Jar Test for one minute.
4. Lime 10% sol., Alum 5% sol., Poly 0.1% sol. Used in one lit of effluent in Jar Test for one minute.

PROCESS

1. One lit of water sample with dosing chemical is running in Jar Test for one minute.
2. The maximum sludge settle down is recorded with in 3 to 5 minutes.

When Lime 10 % solutions add into effluent, first of all it increase effluents pH between 10.0 to 11.0 then flocks appeared. Ferrous Sulphate 5% solutions add in above solution as a Coagulant.

It also makes flocks and tries to settle down suspended solids. Ferrous also control the pH of effluents by its acidic nature and change the effluent Colour into blacky solution.

Being a good oxidizing agent, the iron salts can remove hydrogen sulphide, hydrogen sulphate and its corresponding Odour from waste water.

Lime ferric sulphate or ferrous sulphate react with effluents organic matter, Metal compounds and makes ferric hydroxide and calcium sulphate which is called 'flock'. This flocks specific gravity higher, so sedimentation done fastly.

Using the Polyelectrolyte 0.1% solution (highly viscose fluid) in above solution, poly connects the flocks and increases both the flock size and specific gravity, so maximum sludge settle down in primary treatment.

If flow of inlet effluent is 25000 to 30000 lit/hr then-

a. Lime-85% purity and 10% solution at 450 ppm (mg/lit/hr), 450 kg/12 hr gave better result.
b. Ferrous Sulphate-90% purity, 5% solution at 100 ppm (mg/lit/hr), 100 kg/12 hr gave better result.
c. Polyelectrolyte-viscosity 0.25 poise, 0.1% solution at 1 ppm (1 mg/lit/hr), 1 kg/12 hr gave better result.

RESULT AND DISCUSSION

By the Jar test for the proper Dosing of Chemicals Lime 10% to 15% solution, Ferric sulphate 5% solution, and Polyelectrolyte 0.1% solution gave very good result.

PH between 10.0 to11.0 after lime-ferrous dosing makes large size maximum flocks, which settled own fastly by polyelectrolyte dosing.

We observed that when pH below 10.0, quantity of flocks decreased and sludge did not settle properly.

The removal of Colour from Red-Black or Dark green into Yellow or Light Green by proper dosing of chemicals and Chemical Oxygen Demand are 60% decrease, Total Suspended Solids 50% decrease, Hardness 20% decrease but Total Dissolve Solids 32% increase due to addition of Lime solution in primary treatment.

TABLE 1 : Effect of the chemical dosing on textile effluents (Jar test result)

Parameter	Lime 10% sol. Ferrous 5% sol. Poly 1% sol.	Lime 10% PAC 5% Poly 1%	Caustic 10% Ferrous 5% Poly 1%	Lime 10% Alum 5% Poly 1%
COD	60% Decrease	50 % Decrease	40% Decrease	50% Decrease
TSS	50% Decrease	40% Decrease	40% Decrease	40% decrease
HARDNESS	20% Decrease	12% Decrease	10% Decrease	15% Decrease
TDS	32% Increase	28% Increase	10% Increase	35% Increase
COLOUR	Green-Light green Black-Yellow	Green-Yellow Black-Yellow	Green-Yellow Black-Yellow	Black-Light Pink
WATER : SLUDGE	90% : 10%	70% : 30%	75% : 25%	60% :40%

TABLE 2 : Lime, ferrous and poly dosing result

Parameter	Min. Effluent value (mg/lit)	Max. Effluent value (mg/lit)	Jar-Test Result (mg/lit)	Jar-Test Result (mg/lit)	Percentage Result
COD	2430	3340	972	1336	60 % Decrease
TSS	1640	1940	820	970	50 % Decrease
Hardness	720	920	576	736	20 % Decrease
TDS	7140	9400	9424	12408	32 %Increase
Colour	Red Green	Black Dark Green	Yellow Light Brown	Yellow Light Green / Light Brown	

***TABLE 1 and 2: Lime, ferrous and poly dosing results depending on pH of effluents after dosing of these chemical the pH should be maintain between 10.0 to11.0 gave better result.**

Several research scholars find out that Total dissolve Solids reduce in Primary Treatment but it is false because the addition of lime, Total Dissolve Solids absolutely increases ≈ 32% in outlet of Primary Treatment.

PH of inlet effluent if high, then Iron salt used, if inlet PH is low, then using Alum. Mostly Textile and Dyeing based industrial effluents PH founds 8.0 to 9.0.

Lime and alum makes light weight floating flocks, their specific gravity is very low so it floating at water surface and not settle properly.

Alum makes 60% treated water and 40% sludge of Textile based industrial effluent. This treated effluent Colour is Off-white to light Pink.

The flock Produced by iron salt with lime is heavier and can remove more percentage of Suspended Solids than Alum.

Iron salt (ferrous sulphate and ferric sulphate) makes 92% treated water and 8% sludge. The Sedimentation of Sludge is very fast by Iron salt than Alum.

Being good oxidizing agents, the Iron salts can remove Hydrogen sulphide, hydrogen sulphate and its corresponding Odour and tastes from water.

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