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TREATMENT OF WASTE WATER USED IN GAS CLEANING PLANT (G.C.P) OF STEEL MELTING SHOP (S.M.S) IN A STEEL INDUSTRY

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Abstract: ***Treatment of Waste water from Steel melting shop (S.M.S) of steel industries is a challenging task. The waste water used in Gas cleaning plant(G.C.P) of S.M.S contains high amount of Suspended Solids. In present work, treatment of Total Suspended Solids (TSS), using the precipitation method was sought, by varying the pH and Temperature. The optimum value of each parameter was experimentally determined. The before treatment value of pH and TSS was found to be 11.5 and 53835 ppm. The raw waste water was collected at the temperature of 50 ℃. The experiments revealed that after the treatment with Ferric Chloride at pH equal to 5.1, 11.5 and 3.0 at temperature of 50 ℃ the percentage TSS removal were, 86.51 and 79.51 respectively. Thus, Maximum Removal efficiency was obtained at pH equal at 5.1 at the temperature of 50 ℃ i.e at the temperature of raw water. Consequently, the Ferric chloride Precipitation method can be considered as a reliable, safe and cost effective method for the treatment of Steel melting Shop wastewater.***
Keywords: S.M.S, G.C.P, TSS

I. INTRODUCTION

India is world's Third largest producer of steel. The growth is mainly because of easy availability of raw materials and cheap labour. It is expected that India will become a giant hub of Steel production, by the end of 2016. The Flagship programmes of Present Indian Government like SMART CITY MISSION, HOUSING FOR ALL BY 2020, MAKE IN INDIA campaign is going to boost the steel production in INDIA. It is expected that, India will become the third largest producer of steel in next ten years, by increasing the capacity to about 300 MT by 2025. Rapid urbanization and industrialization have led to the severe contamination of most of the fresh water resources with untreated industrial and municipal wastes .Treatment and reuse of wastewaters have become absolute necessity to avoid pollution of fresh water bodies. It has been estimated that 80% of all diseases are in some way, connected with contaminated water (WHO, 2007). Hence, purification of steel industry wastewater is a challenging task due to the stringent discharge standards for the protection of environment. Steel industry waste water in treated conventionally using physiochemical process, however the cost of chemicals and their low efficiency becomes a limitation. The total suspended solid in waste water makes the pipelines more prone to corrosion, mechanical failure and reduces the rate of heat transfer in heat exchangers. Therefore it becomes necessary to remove total suspended solid via a cheap, economically viable method. The Ferric Chloride Coagulation Method was to be effective in treatment of waste water having high amount of suspended solids. The present study was carried on waste water from GAS CLEANING PLANT(G.C.P) of Steel Melting Shop(S.M.S) in steel industry by varying the pH and Temperature.

II. MATERIALS AND METHODS

Ferric Chloride, used as a coagulating agent, UV Photometry for COD determination , Reagents A (4-aminoantipyrine) and B (Containing sulphuric acid and potassium dichromate), Hot Air Oven.

Total Suspended Solids Removal

- 5 grams of $FeCl_3$ was added to water samples, labelled 1, 2 and 3 at pH 3, 4 and 12 respectively.
- The samples were stirred for proper mixing at magnetic stirrer at 30 r.p.m.
- At various temperatures the rate of filtration was measured by filtering the sample using WattMan Filter Paper.
- At each pH, the percentage Removal of TSS was measured and Efficiency was calculated
- It was found that Maximum Removal efficiency was obtained at pH=4 at a temperature of 50 ℃ *i.e at the temperature of raw water.*

COD detection

- The Chemical Oxygen Demand(C.O.D) of the sample was determined using UV PHOTOMETRY.
- 30 ml of Solution was prepared with a dilution factor of 10, 6 and 4, by adding 0.3 ml of Reagent A and 2.3 ml of Reagent B.
- A blank solution with same Dilution factor, in each of the above case, was prepared using Distilled water.
- COD in each of the above samples was measured using UV Photometry.
- Absorbance is determined at 620 nm.
- COD is calculated using the formula:
- COD= Absorbance* Dilution Factor* 2248.

The COD content was tabulated and was found to be under permissible limit.

SAMPLE	pH	TSS on Dry filter paper Before treatment(mg/litre)	TSS on Dry filter Paper after Treatment(mg/litre	Percentage Removal
1	3.0	52657	11745	22.30%
2	5.1	52795	18740	35.49%
3	11.5	53835	13330	24.76%

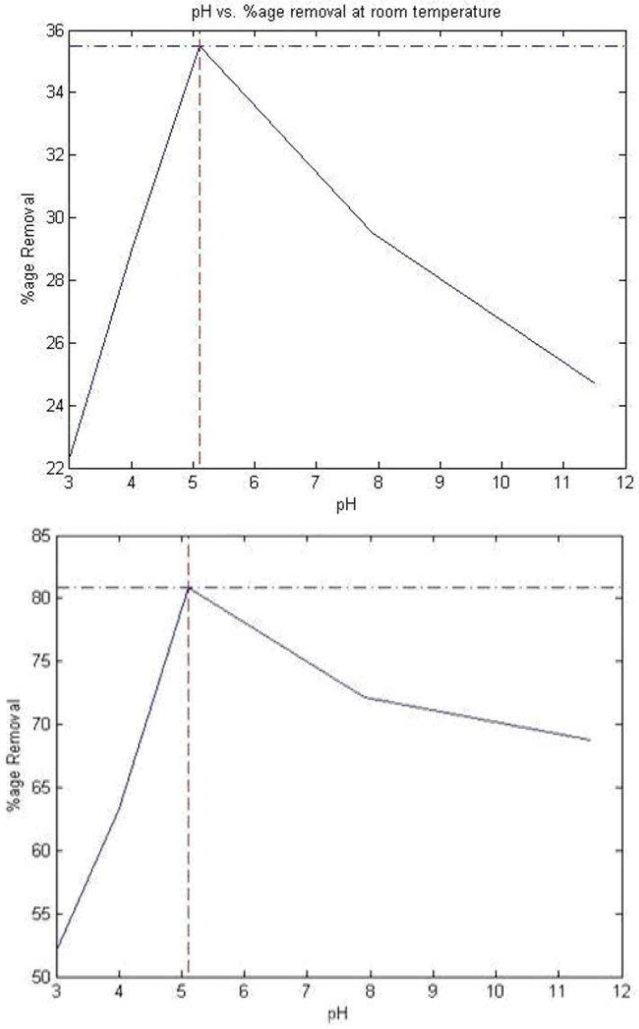
Table (a): Observation at room temperature

Sample	pH	TSS on Dry filter paper Before treatment(mg/litre)	TSS on Dry filter Paper after after Treatment(mg/litre)	Percentage Removal
1	3.0	53245	27690	52.00%
2	5.1	52748	42655	80.86%
3	11.5	51982	35735	68.74%

Table (b): Observation at temperature 50^{o}C

SAMPLE	COD Content (PPM)	Treatment Needed
1	336	NO
2	446	NO
3	532	NO

Table (c): Observation on COD Content at room temperature



pH vs % removal at 50 ^{o}C

III. RESULTS AND DISCUSSIONS

Ferric chloride reacts in water with hydroxide alkalinity to form various hydrolysis products that incorporate Fe(OH)3. These compounds possess high cationic charge which allows them to neutralize the electrostatic charges found on colloidal compounds and also to bind to negatively charged particles, including the ferric hydroxide itself. This ability to bind to itself is the mechanism for the formation of floc aggregates and the basis for ferric chloride's flocculation abilities.

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