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VALORIZATION OF SOLID WASTE FROM THE TANNERY INDUSTRY: PREPARATION OF ADSORBENT BY COST EFFECTIVE METHOD

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Abstract

Leather industry, one of the polluting industries because of generation of huge amount of liquid and solid wastes, also obnoxious smell because of degradation of proteinous material of skin Solid wastes are raw trimmings, fleshings, chrome shavings, buffing dusts and keratin wastes. Accumulation of these wastes lead to sludge problem and choking of treatment pipes and finally results in reduction in efficiency of treatment plant. Treatment of solid wastes also is not cost effective, posing economic burden to the tanners. Leather industry in the developing countries is facing lot of solid wastes problem and many tanneries closed for not meeting bio-chemical oxygen BOD) demand and total dissolved solids (TDS) norms. The objective of this paper is to review the kinds of solid wastes generated in leather industry and the useful technologies developed to overcome the solid wastes problem.In the commen effluent treatment plant Dual media filter is used to remove color, suspended solid, turbidity, BOD. In the dual media filter sand and pebbles and carbon are used for removing suspended solid and color. Instead these filter media we can use solid waste from tannery industries. In recent years, the need for safe and economical methods for the elimination of suspended solid and color and heavy metals from contaminated waters has necessitated research interest towards the production of low cost adsorbent. Therefore there is an urgent need that all possible sources of inexpensive adsorbents should be explored and their feasibility for the removal of suspended solid, color and heavy metals should be studied in detail. There is an availability of solid waste and possibility of use in tannery industries area. The main feature of this project is to increase the value creation process through the research i.e, utilization of solid waste with economical method and save the environment.

Introduction: Water is one of the essential enablers of life on earth. But pure water is not available to a large fraction of the population of the planet. While availability is an issue, contamination is another major concern which threatens the

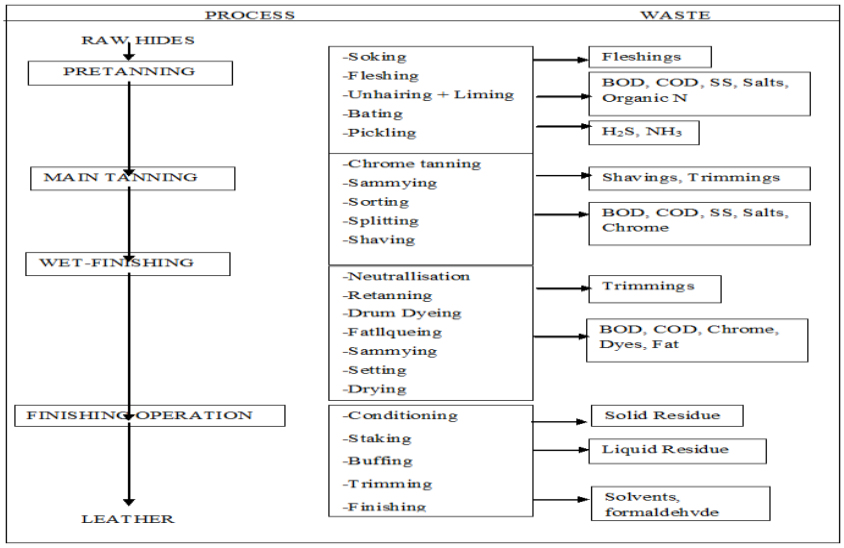
survival of many1. The Tannery Industry in India is one of the oldest and largest industries in the country. These require large volume of water of high purity and generate equally large volume of waste water which is highly complex and polluted. In the present study, it was aimed to carry out experiments using Fried Ground Granulated Leather Waste (FGGLW) for the removal of organic contaminants especially COD contributing components from the combined waste water of Tannery Industries. Due to the new directions imposed by the concept of Sustainable Development, the Integrated Management of Solid Wastes is an important key issue, mainly because of the potential negative effects against environment of wastes production and uncontrolled storage. The leather tanning industrial processing gives high and diverse quantities of solid wastes that can be valorized and/or recoveries of useful products. Assurance of the quality of water resources is representing a demand and a need of our days in conditions of reductions of the natural resources. In this context, there are important to be applied some efficient technologies and procedures for industrial effluent treatment in order to reuse the treated effluent in the technological process or to protect the tannery industries to survives.

Tannery Industries Process

- A tannery is the term for a place where the skins are processed.
- Tanning leather involves a process which permanently alters the protein structure of skin.

Making "rawhide" (untanned but worked hide) does not require the use of tannin. Rawhide is made by removing the flesh and fat and then the hairby use of an aqueous solution (this process is often called "liming" when using lime and water or "bucking" when using wood ash (lye) and water), then scraping over a beam with a somewhat dull knife, then drying.

1.1.1 Tannery Process and Waste Generation.



"Tanning is the process of treating skins of animals to produce leather, which is more durable and less susceptible to decomposition". in the tanning of leather lot of solid waste and liquid waste has generated these lead so much problem to environment.

The Figure 1.1.1 presents a flow diagram of the tanning-process. Hides are a by-product of slaughter activities and can be processed into a wide range of end products. For each end product, the tanning process is different and the kind and amount of waste produced may vary enormously. The chemicals traditionally used for tanning have been derived from plants, whereas the most common process nowadays is a combination of chrome salts (chrome tanning) and readily usable vegetable extracts (vegetable tanning). While chrome tanned shoe leather is the most widely produced leather, this kind of leather will receive most attention in the following. In most cases raw hides produced at slaughterhouses are preserved by pickling and drying for transport to tanneries and further treatment. In the very few cases that hides are instantly tanned there is no need for preservation. During the tanning process at least ±300 kg chemicals (lime, salt etc.) is added per ton of hides.

1.1.1 Pretanning (Beamhouse operations)

Soaking: The preserved raw hides regain their normal water contents. Dirt, manure, blood, preservatives (sodium chloride, bactericides) etc. are removed.

1.1.2 Fleshing and trimming:

Extraneous tissue is removed. Unhairing is done by chemical dissolution of the hair and epidermis with an alkaline medium of sulphide and lime. When after skinning at the slaughterhouse, the hide appears to contain excessive meat, fleshing usually precedes unhairing and liming.

1.5 Objectives

The purpose of this study is:

- To determine the effectiveness of CGLW in removing color and other pollutant from tannery industries wastewater.
- To investigate the potential use of CGLW.
- To find out the influence of pH, temperature, contact time, on adsorption process.
- To find out the possible utitization CGLW

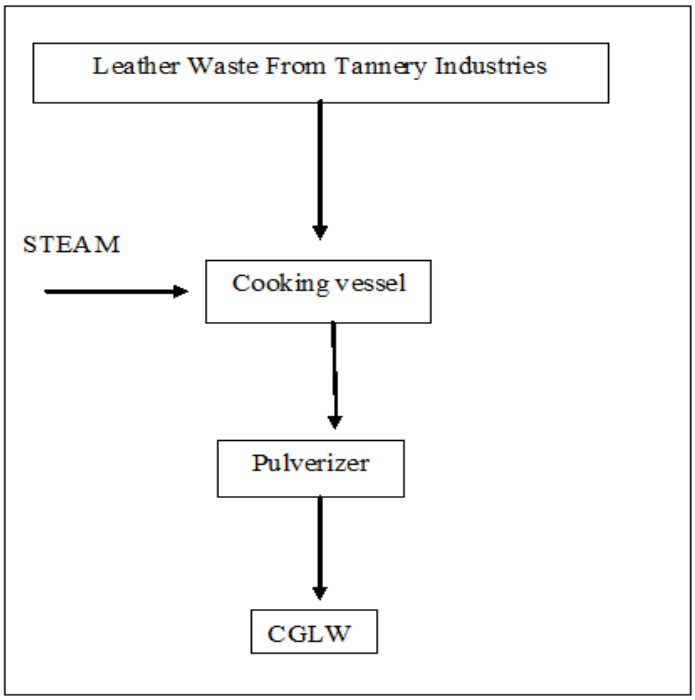
Methodology

- ✓ Examine the properties of Cooked Ground Leather Waste.
- pH
- Bulk density, g/cm3
- Surface area, m2/g
- Particle porosity
- Ash content
- Particle size, mm

- ✓ Design the adsorption column.
- ✓ Compare the experiment result of Cooked Ground Leather Waste (CGLW), carbon(C), 20%C+80%CGLW, 40%C+60%CGLW, 60%C+40%CGLW.
- ✓ Examine the effectiveness of adsorption with respect to pH, Temperature, contact time.

Making of CGLW

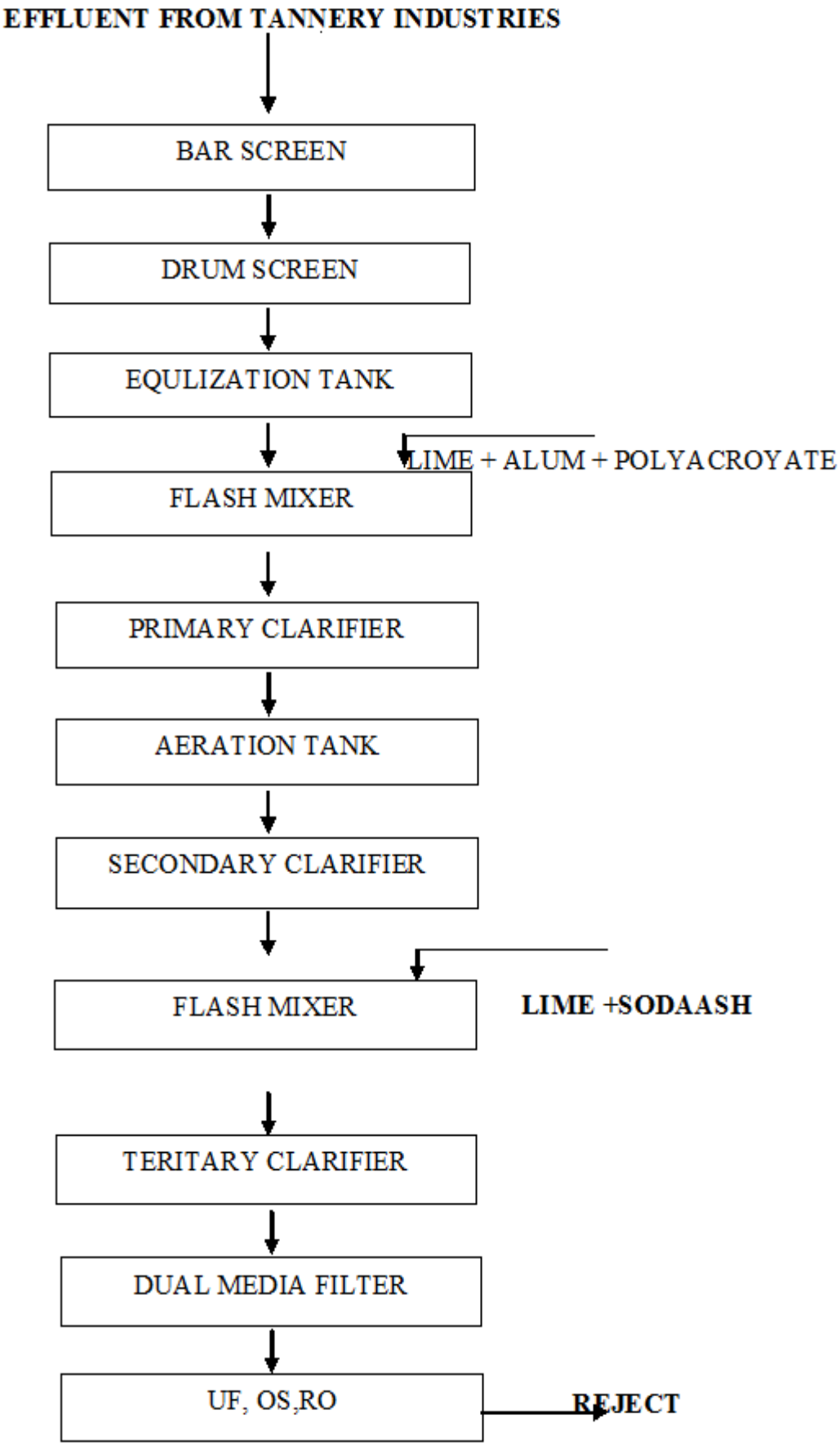
The following figures show the making of Cooked Ground Leather Waste.



Leather Wastes are getting from Tannery industries are cooked by the help of steam. Then these materials are get in to small pieces by using Pulverizer. The final materials we called as Cooked Ground Leather Waste (CGLW).

Cooked Ground Leather Waste (CGLW)

1.8 Treatment of Tannery Industrial Waste Water



Clean Water For Reuse

Generally the Waste Water from Tannery industries is treated in the common effluent treatment plant. The figure shows the flow sheet of treatment of waste water in CETP.

S.No.	UNIT OPERATIONS	ACTION
1	BAR SCREEN	4mm Solids are removed
2	DRUM SCREEN	2mm Solids are removed
3	EQULIZATION TANK	Homogeneous mixing , due to aeration reduce the sulphide
4	FLASH MIXER	Mixing the chemicals (LIME + ALUM + POLYACROYATE)
5	PRIMARY CLARIFIER	Reduction of TSS 90%, 40-50% COD, 30-40% BOD
6	AERATION TANK	Reduction of 70-80% COD, 90% BOD
7	SECONDARY CLARIFIER	Settling of Solid
8	FLASH MIXER	Mixing of chemicals (LIME +SODAASH**)**
9	REACTOR CLARIFIER	Reduction of Hardness
10	DUAL MEDIA FILTER	Filtration and reduction TSS,
11	UF, OS, RO	Reduction solid particle up to 0.01µ, ION EXCHNAGE, TDS

1.9 Experiment

The experiment has done in the laboratory, where the pipette filled with different kind of materials (60% materials and 40% free board) and the effluent from reactor clarifier was taken for testing. Then the out let water has tested and dates are analyzed.

Setp 1: The column filled with CFWL, then the RC sample (REACTOR CLARIFIER) OR TERITARY CLARIFIER are pour in to the column. The outlet has collected, and then tested.

Step 2: The Column has filled with full CARBON material, and then the RC sample is poured in to the column. The outlet has collected, and then tested.

Step 3: The Column has filled with full 40% of CARBON and 60% of CGLW materials, and then the RC sample is poured in to the column. The outlet has collected, and then tested.

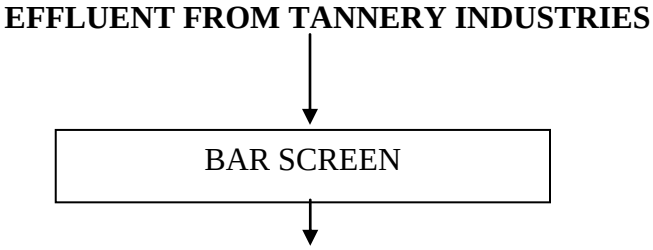
Step 4: The Column has filled with full 80% of CARBON and 20% of CGLW materials, and then the RC sample is poured in to the column. The outlet has collected, and then tested.

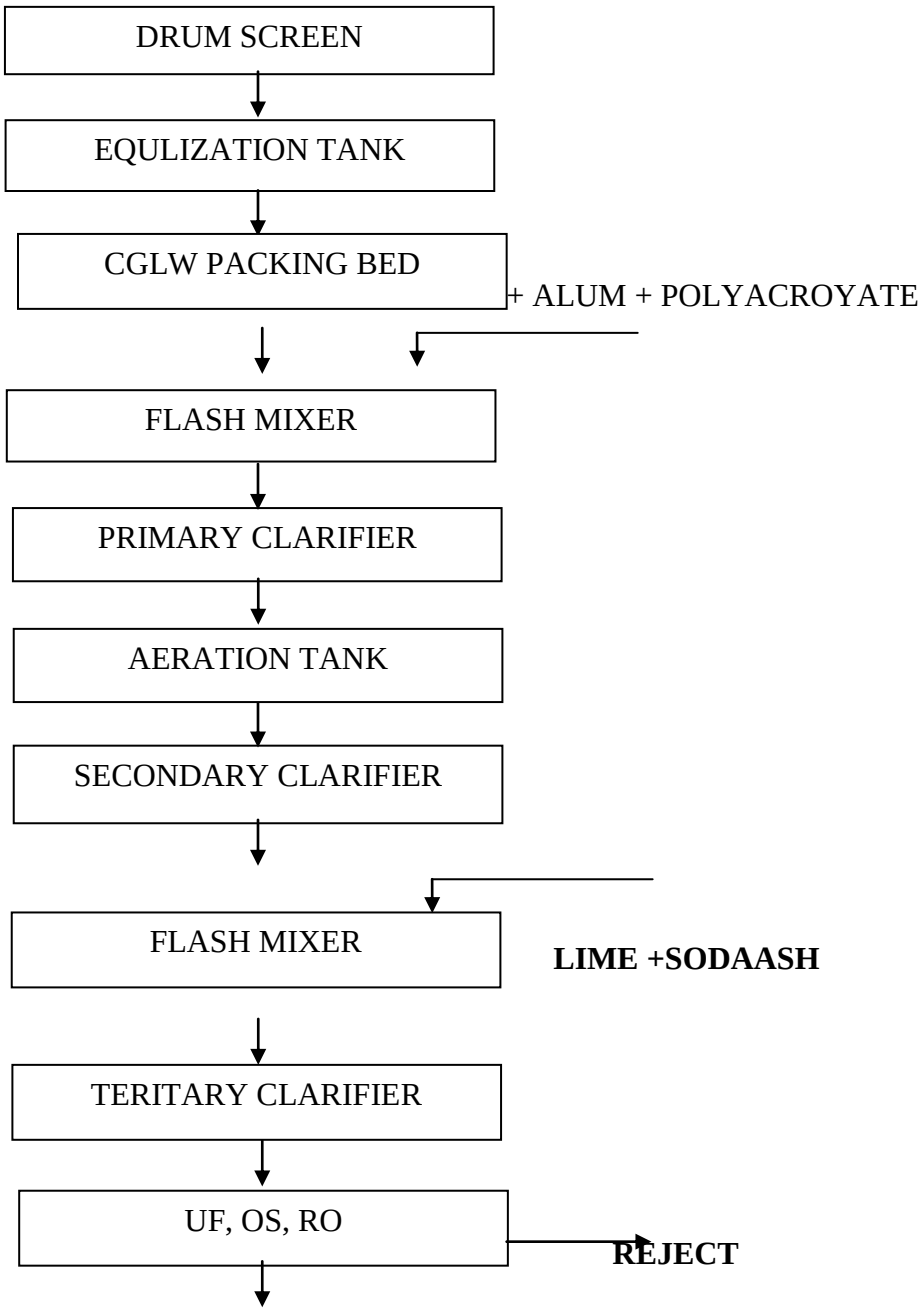
Step 5: The Column has filled with full 60% of CARBON and 40% of CGLW materials, and then the RC sample is poured in to the column. The outlet has collected, and then tested.

The comparative result from the experiment has showed in the tabulation:

S.No.	PARAMETERS	UNIT	RC SAMPLE	CGLW	CARBON	40% CARBON+ 60% CGLW	20% CARBON+ 80% CGLW	60% CARBON+ 40% CGLW
1	PH		7.6	7.1	7	6.9	7.8	8.2
2	C O D	mg/l	400	4320	280	1540	3200	800
3	CONDUCTIVITY		10160	11940	12600	10960	11520	10460
4	TDS	mg/l	6706	7880	8316	7243	7603	6904
5	TOTAL HARDNESS	mg/l	500	650	450	480	620	490
6	CL	mg/l	1732	1832	1966	2265	2032	1826
7	SULPHIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL
8	TUBIDITY	NTU	34	18	57	18	41	51
9	COLOR		LIGGHT BROWN	CLEAR	LIGHT BROWN	SOMEWHAT CLEAR	NOT CLEAR	NOT CLEAR

1.10.1 MODIFIED FLOW SHEET





Clean Water For Reuse

The permissible limits for out let of Treated water from CETP are:

S.No.	PARAMETERS	AVG. TOTAL POLL. LOAD TO CETP	PERMISSIBLE LIMITS
1	pH	6-9	7-7.5
2	COD	4000	250 mg/l
3	BOD	2000	30 mg/l
4	TSS	2000	100 mg/l
5	TDS	10000	2100 mg/l

6	Cl	5000	1000 mg/l
7	SULPHIDE H_2S	20	2 mg/l
8	SULPHATE $SO4^{2-}$	1400	1000mg/l
9	Cr	150	2
10	TOTAL HARDNESS	500	300

Conclusion

By using of CGLW (cooked granulated leather waste) in the treatment and judged the color was successfully removed. But the other parameter like COD, BOD getting higher in value. So, the above modification in the flowchart will remove BOD, COD. Here using leather waste in filter media for removing color and by this utilization the solid waste disposal problem reduced to certain extent.

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