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# TREATMENT OF PAPER AND PULP INDUSTRY WASTEWATER BY BIPOLAR ELECTRODE SYSTEM.

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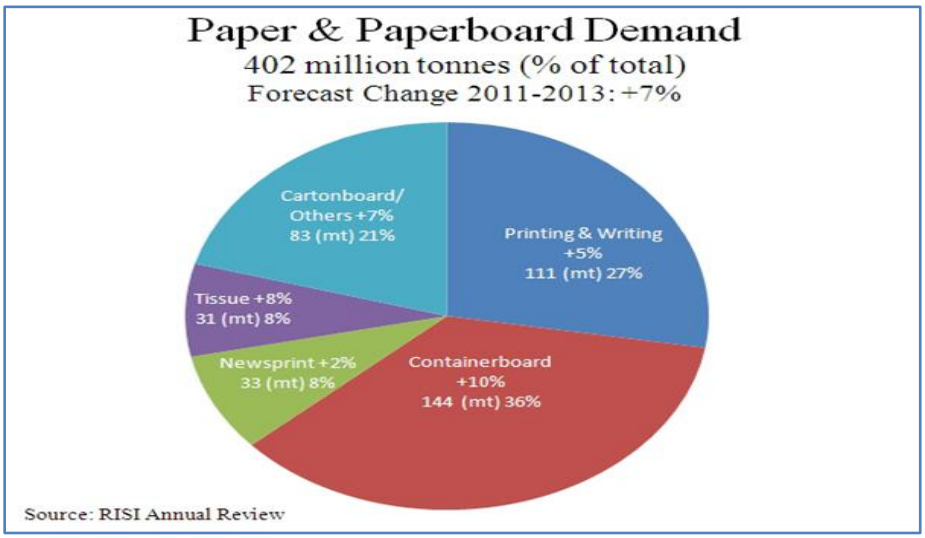
**ABSTRACT**

*Electro coagulation is an effective technique for treatment of Paper and Pulp industrial effluent. The effective performance of Electro-coagulation (EC) technique in the treatment of paper and pulp mill wastewater has been investigated using different combination of aluminum (Al) and iron (Fe) electrodes. The influence of electrolysis time, applied current density, rotational speed, electrolyte pH, electrode distance and supporting electrolyte on Electro coagulation efficiency for the treatment of Pulp and Paper industrial effluent has been attempted in the present investigation it has been observed from the present experimental results that the effluent can be effectively treated using Electro coagulation.*

***keywords****: Aluminum Electrodes, iron Electrodes, BOD, COD, Electro coagulation, color Paper &Pulp effluent.*

## INTRODUCTION

The Indian paper industries is the one of the largest industry and more than 100 year old. Among its 20$^{th}$ ranks paper producing country in the world. These industries disturbing the ecological balance of the environment by discharging a wide variety of wastewater. Also India is the first country in the world to use bamboo as the basis raw material for making paper due the limited forest resources other raw material like bagasse, straw, were identify and now extensively used waste paper is also being used for the paper making. Almost all variety of paper is produces using this material Waste generated by the pulp and paper industries carries very high BOD, COD, phenol, toxic substances recalcitrant organics, pH, turbidity, high temperature and intense color. The coloring body present in the wastewater from pulp and paper industries is organic in nature and is comprised of wood extractives, synthetic dyes, lignin and its degradation of products formed by the action of chlorine on lignin. The paper-making process is requires large amount of water for the production processes (about 250-300 $m^3$ per tones of paper) hence it is a water-intensive process [1].



**Waste Water characteristics:**

The volume depends mainly on the manufacturing procedure, and the water economy adopted in the plant. It has been observed that a well operated and well managed integrated pulp and paper mill employing Kraft process for pulping , produces a waste volume in the range of 225 to 320 $m^3$ per tone of paper manufactured. The mills manufacturing special quality of paper produce larger amount of water for washing and bleaching. Like the volume of waste, the chemical composition of the waste will also depend on the size of the plant, manufacturing process. In most of the small paper mills in India, the chemical recovery is not practiced due to economical reasons. The pulp and paper mill wastes are characterized by very strong color, high BOD, high suspended solids and high COD/BOD ratio[2 ].

**1.5 Characteristics of physical property of wastewater.**

| Parameters | Small Mill - (<20 t of paper/day) | Large Mill - (2000 t of paper/day) |
|---|---|---|
| pH | 8.2 - 8.5 | 8.5 - 9.5 |
| Total solids, mg/l | ---- | 4410 |
| Suspended solids , mg/l | 900-2000 | 3300 |
| COD , mg/l | 3400-5780 | 716 |
| BOD, mg/l | 680-1250 | 155 |
| Color | Dark Brown | Dark Brown |
| COD/BOD | 3.9-5 | 4.6 |

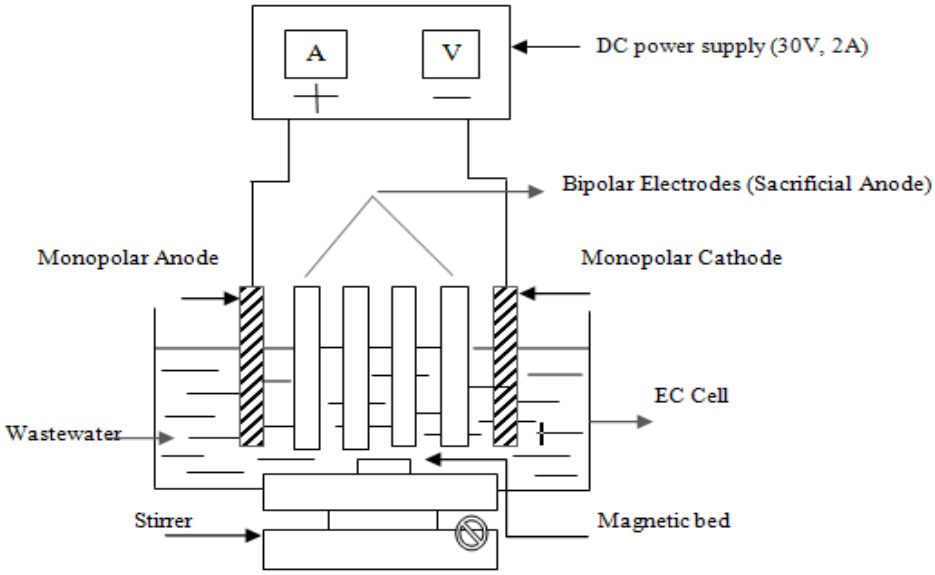
## MATERIALS AND METHODS

**4.1 Technical Specification of the Experimental Setup.**

The reactor will be made up of acrylic material with a total working volume of 1.5L and with the dimensions of l5cmx10cmx10cm. The electro coagulation unit consists of six electrodes and DC power supply and the electrodes were connected as bipolar electrode system. The DC source of 0-30 V and 0-2 A is used as power supply to the system. Electrodes were made up of Aluminum and Iron with dimensions of 5cmx10cmx1mm with 1cm spacing. The Schematic and experimental set up as shown in the below figures.

**4.2 Brief methodology.**

The batch experimental studies were conducted to optimize various parameters such as pH, electrolysis duration and voltage. The experiments were performed with four electrodes connected to the DC power supply. The space between all the




**Schematic representation of experimental setup**

## CONCLUSION

- Suitability of Electrocoagulation unit for high strength streams.
- The organic and nutrient material in the wastewater can be skimmed off as it is likely to precipitate as floating sludge.
- The sludge may can contain high levels of aluminum and iron in such a levels that it may not create a problem when mixed with other sludge streams.
- What are the mechanism that involve, how it is being treated mechanism, what are the factor that is infusing the efficiency of the treatment and then what is the main or significant parameter that contribute to the treatment.
- The EC unit might turn out be to be a success in treating the wastewater.

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