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TITLE: WATER TREATMENT BY ELECTROCOAGULATION

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We are worry so much about the pure water which is present in limited quantity now a days in India. The sewage treatment is a process that excludes the contaminants from the wastewater effectively and make it clean. Electrocoagulation is commonly used in water and wastewater treatment plants for the destabilisation of pollutants so that they can be removed in the sub- sequent separation processes.The electrocoagulation process is use for water treatment plant but it can also be use for sewage treatment. In this electrocoagulation process aluminium and iron electrodes has been used to treat wastewaters. Thus it become imperative to think about solid or water purification using effective and inexpensive technique. A wide range of treatment are currently known to the people With the recent technology development in electrochemical field. A new technique has been introduced in the industries, named as electrocoagulation. The main objective of this study is focusing on electrocoagulation process methodology and its application.

Index Terms: *Electrocoagulation, Aluminium electrode, Iron electrode., etc.*

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1 INTRODUCTION.

India has the infrastructure to delicacy only 30 %of the sewage generated, as per the most recent figures. Also, given the underutilized capacity of these plants, only 24 %of the sewage actually undergoes treatment.One of the basic requirements of a human being is Water. Globalization, un-controlled population and other factors are creating shortage of pure water and the issue is a concern for many countries. Thus, it becomes essential to think about water sanitization using effective and cheap techniques and its reusability. A wide scope of wastewater treatments are now known to people. With the topical technology growth in electrochemical field, a new technique has been introduced in the industry, named as electro-coagulation. The main objective of this article is focus on electro-coagulation method**.** Electro-coagulation (EC) is a broad-range treatment technology that removes total suspended solids (TSS), heavy metals, emulsified oils, bacteria and other contaminants from water

Electro-coagulation (EC) is a technique used for wash water treatment, wastewater treatment, industrial processed water, and medical treatment. Electro-coagulation has become a rapidly growing area of wastewater treatment due to its ability to remove contaminants that are generally more difficult to remove by filtration or chemical treatment systems, such as suspended solids, and heavy metals. . There are many brands of electro-coagulation devices available and they can range in complication from a simple anode and cathode to much more complex devices with control over electrode potentials. Coagulation is one of the most important reactions used in water treatment and waste water treatment. Ions (heavy metals) and colloids (organic and inorganic) are mostly held in solution by electrical charges. The addition of ions with reverse charges destabilizes the colloids, allowing them to coagulate. Coagulation can be achieved by a chemical coagulant or by electrical methods.

The traditional physiochemical treatment process that are used for the wastewater treatment is filtration, air stripping, ion-exchange, chemical precipitation, chemical oxidation, carbon adsorption. One of the advanced electrochemical expertise based system is the electro-coagulation method.

Electro-coagulation (EC), the transient of electric current through water, has proven very useful in the exclusion of contaminants from water. Electro-coagulation systems have been in existence for many years using a range of anode and cathode geometries, including plates, balls, fluidized bed spheres, wire mesh, rods and tubes.

In the past few decades it has been used for the action for the water containing waste foodstuff, oil wastes, dyes, suspended

matters, chemical and mechanical polishing waste, organic matter from landfill leachates, defluorination of water, synthetic detergent effluents, mine wastes and heavy metal-contain solution.

EC has become one of the affordable wastewater treatment process around the world by reducing electricity utilization and efficiency of the needed power supplies. where it is applied at the latter stages of water treatment.

1.1 THEORY OF ELECTROCOAGULATION

the first plant of EC was built in London in 1889 for the treatment of sewage. Despite some capable results, the achievement of this technology has been limited. However, there has been renewed scientific, economic and environmental interest in this technology in recent years due to demand of alternative water treatment technologies. EC understandably has several similarities with the chemical coagulation but also significant differences, such as side reactions, Which are discussed in this section. In the EC system there are multiple electrochemical reactions occurring simultaneously at the anodes and cathodes

1.3 Aim and Scope

Electrocoagulation (EC) may be a potential answer to environmental troubles dealing with water reuse and rational waste management. The aim of this research was to assess the feasibility of EC-process for industrial contaminated effluents and for sewage from taking into reflection technical and inexpensive factors. EC-technology claim to offer resourceful removal rates for most types of wastewater impurities at low power consumption and without adding any precipitating agents.

2 PROCESS

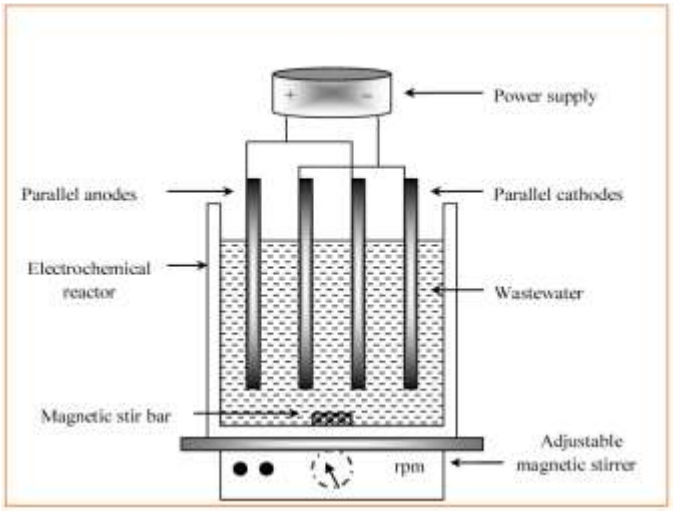

Fig-1: Process

1) In its simplest form, an electro coagulation reactor is made up of an electrolytic cell with one anode and one cathode. When coupled to an external power source, the anode material will electrochemically corrode by oxidation.

2) through electrolysis, the positive side undergoes anodic reactions, while on the negative side, cathodic reactions are encounter. fresh metal plates, such as iron or aluminum, are regularly used as sacrificial electrodes to incessantly produce ions in the water.

3) In this process at first the water is pass from inlet pipe to the EC cell where the arrangement of cathode and anode is present and multiple reaction take places.

4) The sacrificial anodes and cathodes can be of the same or of dissimilar materials. through electrolysis, the positive side undergo anodic reactions, while on the negative side, cathodic reactions are encounter.

5) At the time of this process, First, a metal ion is drive into the water. On the surface of the cathode, water is hydrolyzed into hydrogen gas and hydroxyl groups. temporarily, electrons flow freely to undermine surface charges on suspended solids and emulsified oils. As the reaction continues, large flocks form that entrain overhanging solids, heavy metals, emulsified oils and other contaminants.

6) Magnetic bar agitator is provided at the bottom of the EC CELL so as to mix the water properly at proper RPM

7) This process is run on DC current.

2.1 APPLICATIONS

- Ground Water Cleanup
- Surface Water Cleanup
- Sewage treatment
- Water Pre-treatment

1) **Ground Water Cleanup**

EC is extremely successful in the deduction of naturally occurring salts in well water, as well as the separation of iron, magnesium, calcium, metals, nitrates and sulfur. EC is also well suited for the recovery of ground water that has been impure with heavy metals, high molecular weight hydrocarbons and Halogenated hydrocarbons.

2) **Surface Water Cleanup**

EC is used to eradicate bacteria, viruses and cysts from surface water, thereby rendering impure waste streams into potable water. EC is predominantly effective in the removal of life aggressive contaminants such as Guardia and cryptosporidium.

3) **Sewage Treatment**

EC has proven effectual in treat sewage water, sewage sludge concentration, and sewage sludge metal complex sufficiently to enable land application.

4) **Water Pretreatment**

Water pretreatment with EC has proven useful in removing bacteria, silica and TSS.

2.2 ADVANTAGES

- Wastewater treated by EC gives potable, clear, colorless and odorless and useable water
- The electrolytic processes in the EC cell are inhibited electrically and with no moving parts, thus require less maintenance
- The EC process has the advantage of remove the smallest colloidal particles, because the applied electric field neutralises any residual charge,
- EC requires simple equipment and is easy to operate with sufficient operational latitude to handle most problems encountered on running
- Sludge formed by EC tends to be readily settable and easy to de-water

2.3 DISADVANTAGES

- The 'sacrificial electrodes' are dissolve into wastewater stream as a result of oxidation, and need to be habitually replaced.
- The use of electricity may be costly in many places.
- A resistant oxide film may be twisted on the cathode leading to loss of effectiveness of the EC unit.

2.4 DEPENDENCY

The routine of the EC process depends on many effective parameters such as pH of the solution, applied current to the reactor, conductivity of the solution, electrolysis time as well as electrode specifications such as understanding of electrode, electrode shape, distance between the electrodes, etc. The effects of each parameter in details can be found away in the

Fig-1: Electrode Coagulation

literature. However, in this study, effects of six of the parameters such as pH of the winery waste water by adjusting the pH with acid or base, arrangement of the sacrificial electrodes ,electrolysis time (duration of applying voltage to the wastewater), current density (applied current to the unit area of active electrode surface) and particularly power supply type (by changing the polarity of the anodes and cathodes) were investigate.

3.1 BENEFITS OF ELECTROCOAGULATION

- **Low operating cost**
- **Low power requirement**
- **Low maintenance**
- **Sludge minimization**

1) Low operating cost :

As there is no moving parts is comprise in apparatus and no expensive parts is required to run the process, so the cost for running this operation is very less.

2) Low power requirement:

Does not required huge amount of electricity for this process. So we can say that its essential low power requirement.

3) Low maintenance:

Maintenance cost is very low as it does not necessary daily washing or it does not essential to repair or change the parts of apparatus immediately.

CONCLUSION

Electro coagulation has a wide diversity of wastewater treatment capabilities. It is the process of destabilize suspended, emulsified or dissolved contaminants in aqueous medium by introducing a minimum amount of electrical current. It thus reduces additional costs concerned for the process. It even replaces traditional treatment process such as filtration, chemical treatment, which have proved to be less effective and costly processes. Considering the benefits, EC process helps removal of TSS by 95-98 %; BOD by 50-98 % and Bacteria by 95-97% . This suggest that the technique is effective and reliable for a wide range of future application, which in turn will give hope for purify water for all.

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