JIMMA UNIVERSITY

JIMMA INSTITUTE OF TECHNOLOGY

FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING

ENVIRONMENTAL ENGINEERING CHAIR

REMOVAL OF POLLUTANTS FROM DOMESTIC WASTEWATER USING ELECTRO OXIDATION PROCESS: OPTIMIZATION THROUGH RESPONSE SURFACE METHODOLOGY

BY

KIDIST JEMAL BADI

A THESIS SUBMITTED TO THE FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING, JIMMA INSTITUTE OF TECHNOLOGY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL ENGINEERING

APRIL, 2019

JIMMA, ETHIOPIA

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MAIN ADVISOR: Prof., Dr.-Ing. ESAYAS ALEMAYEHU

CO-ADVISOR: Dr. P. ASAITHAMBI

APRIL, 2019

JIMMA, ETHIOPIA

DECLARATION

This Research study is my original work and has not been presented for a degree in any other University.

KIDIST JEMAL: ---------- ----------

Signature Date

This Research has been submitted for examination with my approval as University supervisor.

MAIN ADVISOR: Prof., Dr.-Ing. ESAYAS ALEMAYEHU

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Signature Date

CO-ADVISOR: Dr. P. ASAITHAMBI

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Signature Date

ABSTRACT

The electrochemical oxidation of domestic effluent was studied in a batch reactor in the presence of supporting electrolyte NaCl, $CaCl_2$ and Na_2CO_3 using stainless steel electrodes. The effect of operating parameters such as current ampere, pH, electrolysis time, inter-electrode distance and supporting electrolyte concentration on the percentage of color, COD, turbidity removal and power consumption were studied. The maximum percentage removal of color, COD and turbidity was 94.76%, 77.93% and 92.19% respectively at an initial pH of 8.99, current ampere of 0.18A, electrolysis time of 30 minutes, inter-electrode distance of 2cm and electrolyte concentration (i.e. NaCl) of 3gm/L for NaCl, the maximum percentage removal of color, COD and turbidity was 99.97%, 79.11% and 90.00% respectively at initial pH of 8.68, current ampere of 0.10A, electrolysis time of 30minute, inter-electrode distance of 2cm and electrolyte concentration (i.e. $CaCl_2$) of 1gm/L for $CaCl_2$ and the maximum percentage removal of color, COD and turbidity was 83.78%, 83.16% and 93.66% respectively at initial pH of 8.98, current ampere of 0.10A, electrolysis time of 30minute, inter-electrode distance of 1.99cm and electrolyte concentration (i.e. Na_2CO_3) of 2.40gm/L for Na_2CO_3. The operating parameters for the treatment of domestic effluent by electrochemical process were optimized using response surface methodology. The quadratic regression models with estimated coefficients were developed for the percentage removal of color, COD, turbidity and power consumption. It was observed that the model predictions matched with experimental values with an R^2 values of 0.5889, 0.8695, 0.6218 and 0.5428 for color, COD, turbidity and power consumption respectively for NaCl, R^2 values of color, COD, turbidity and power consumption for $CaCl_2$ were 0.5987, 0.8574, 0.6945 and 0.6215 respectively and R^2 values of color, COD, turbidity and power consumption for Na_2CO_3 were 0.6868, 0.8979, 0.6430 and 0.5771 respectively. The extent of color and turbidity removal were analysed using UV spectrophotometer and turbidity meter respectively. Besides, the operating costs investigated in the study were the energy cost of electro oxidation and the material cost because of consumption of stainless steel electrodes. Operating costs are 1.076\$/m^3 for NaCl, 1.077\$/m^3 for $CaCL_2$ and 1.072\$/m^3 for Na_2CO_3 wastewater treatment.

Key words: *Electro oxidation, Domestic wastewater, color, COD and turbidity removal, power consumption, Optimization, RSM*

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

BBD	Box-Behnken Design
BOD	Biological Oxygen Demand
CCD	Central Composite Design
COD	Chemical Oxygen Demand
DWW	Domestic Wastewater
DC	Direct current
EC	Electrical Conductivity
EO	Electro Oxidation
FAS	Ferrous Ammonium Sulphate
OC	Operating Cost
RSM	Response Surface Methodology
SS	Stainless Steel

CHAPTER ONE

1. INTRODUCTION

1.1 Background

Water is one of the abundantly available resources in nature and is essential for animal and plant life. Pollution of water bodies is increasing steadily due to industrial proliferation and urbanization [1].

Wastewater can create severe water pollution problems for aquatic life because of its various contents. Although wastewaters can be composed of various sources, it is most commonly composed of domestic wastewaters (DWWs) [2].

Wastewater generated from isolated communities and industries are complex mixture of organics, inorganic and microbial pollutants [3, 4]. Their exposure and accumulation in the aquatic environment lead to adverse effects towards human life and cause eutrophication of surface waters and transmission of waterborne diseases [4 - 6].

Virtually all types of water pollution are harmful to the health of humans, animals and the environment. The non-degradable pollutants created by human activity, generally become deposited on the bottom of the water system and their accumulation interferes with aquatic ecosystems. The conventional wastewater treatment widely used nowadays over the entire world includes physical/mechanical, chemical and biological treatment methods to remove suspended solids, biodegradable organic matters, inorganic matter and nutrients [7].

Physical/mechanical methods include processes where no noticeable chemical or biological changes are carried out and strictly physical phenomena are used to treat or improve the quality of the wastewater. These processes are sedimentation, screening, aeration, filtration, flotation and skimming, degasification and equalization. Chemical methods include the use of chemical processes to improve the water quality. These processes are chlorination, ozonation, neutralization, coagulation, adsorption and ion exchange. Chlorine, a strong oxidizing chemical, kills bacteria and slows down the rate of decomposition of the waste in the wastewater [8]. Neutralization is a commonly used chemical process in many industrial wastewater treatment operations. It consists

of the addition of acid or base to adjust pH levels back to neutrality. But it should be pointed out that certain processes may be physical and chemical in nature. For example coagulation consists of the addition of the chemicals that, through chemical reactions, form insoluble products that can be easily removed from wastewater by physical methods. Biological methods involve the use of microorganisms (some kind of bacteria) to degrade natural organic waste resulting in BOD and COD reduction [8].

Microbes play a key role in the loss of oxygen from surface waters. Microorganisms use organic matter as a food source through oxidation and consume oxygen in the process. They also use oxygen as electron acceptor in order to break down long-chained organic molecules into wastewater and to form more stable end products such as carbon dioxide and water. The basic reaction for biochemical oxidation may be written as [8]

Oxidizable material + bacteria + nutrient + $O_2 \rightarrow CO_2 + H_2O + E$ ……. (1)

Since all natural waterways contain bacteria and nutrients, almost any waste compounds introduced into such waterways will initiate a biochemical reaction. BOD (Biochemical Oxygen Demand) is a measure of the amount of total oxygen that is required by bacteria, fungi, and other biological organisms, to degrade/oxidize all organic compounds present in water/wastewater. Organic waste in wastewater treatment plants acts as a food source for water-borne bacteria. Bacteria decompose these organic materials using dissolved oxygen [8].

COD (Chemical Oxygen Demands) is a measure of the amount of total oxygen that is required to degrade/oxidize all organic (biodegradable) and inorganic (non-biodegradable) matter present in water and wastewater. Generally any oxidizable material present in a natural waterway or in an industrial wastewater will be oxidized by both, biochemical (bacterial) and chemical processes. The main focus of wastewater treatment plants is to reduce the BOD and COD in the effluent discharge to levels similar to natural waters [8].

Wastewater treatment plants are designed to function as bacteria farms, where bacteria are fed oxygen and organic waste. The excess bacteria grown in the system are removed as sludge and this solid waste is then deposed on land. The advantage of biological treatment is the great adaptability of microorganisms to a wide variety of wastewater content, but this is a long lasting treatment requiring a large physical area and very often leads to generation of non-biodegradable residues [6]. All of the mentioned treatment conventional wastewater technologies have some

disadvantages such as they are time consuming require extensive land area and demand determination of methods for further use or neutralization of disposed waste. Improper disposal of these liquid wastes may increase the probability for contamination of other water resources which will influence human health and environment pollution. Therefore, there is an urgent need to develop and design innovative, less expensive and more effective advanced technologies for wastewater treatment [9].

Advanced wastewater treatment technologies, which include the use of electricity, have been practiced in the second part of the 20thcentury [8, 9]. The first wastewater treatment using electricity was carried out in a plant built in 1889 in the UK where sewage treatment had been conducted by mixing the domestic wastewater with sea water and in USA the use of electricity in wastewater treatment was started in the late 1900. The capital investment and the electricity costs necessary for the application of this new technology were so high that they were not widely used in that period. Additionally, electrochemical techniques were difficult to control which made it difficult to obtain reliable results. However, later on, extensive research produced by more developed countries had accumulated useful amount of knowledge, and allowed the applications of electrochemical technologies to be restarted and practiced during the past four decades. Nowadays the costs of electrochemical treatments are comparable to other wastewater treatment technologies. It should be noted that in some cases electrochemical treatment is more efficient than other conventional technologies. The process does not require additional consumption of chemicals and electrolytes are added to the processes to stimulate reactions. The electrochemical treatment method may be considered as an economically alternative process [10]. The electrochemical oxidation is one of the advanced oxidation processes, potentially a powerful method of pollution control, offering high removal efficiencies in compact reactors with simple equipment's for control and operation. These processes generally operate at a low temperature and usually prefer adding electrolyte solutions to increase the conductivity of wastewater [11].

The electrochemical parameters chosen for the study were optimized statistically by adopting response surface methodology (RSM) [12]. RSM is a designed regression analysis to predict the value of a dependent variable based on the controlled values of the independent variables [11]. It leads to the need for an experimental design, which can generate a lot of samples for consumer evaluation in a short period of time, and thus laboratory level tests are more efficient. From the parameter estimates, it can be determined which variable contributes the most to the prediction

model, thereby allowing the product researcher to focus on the variables that are most important to the product acceptance. RSM was used to optimize the experimental parameter for a different process, which includes an advanced oxidation process, electrochemical oxidation and adsorption [11]. The two most common designs used in RSM are the Central Composite Desig (CCD) and the Box–Behnken Design (BBD) [11]. The CCD is ideal for sequential experimentation and allows a reasonable amount of information for testing lack of fit while not involving an unusually large number of design points [12]. In the present study, CCD with RSM was adopted to optimize the experimental parameters like various operation parameters such as current density, pH, distance in-between electrode, reaction time and effluent concentration on the COD, color and turbidity removal efficiency and power consumption [11]. The operating parameters were subjected to optimization for maximizing the efficiency of color, turbidity and COD removal and at the same time minimizing energy consumption, so that an economical and efficient technology for the treatment of domestic wastewater could be achieved [11]. The main objective of the present study was to assess the electrochemical oxidation treatment of domestic wastewater using stainless steel as both anode and cathode. Experiments were conducted in a batch electrochemical reactor with and without recirculation to investigate the effect of operating parameters such as current density, pH, distance in-between electrode, reaction time and effluent concentration on the percentage removal of COD, color and turbidity and energy consumption. An attempt has been made to employ CCD using RSM for optimizing the key influencing parameters (i.e. current density, pH, distance in-between electrode, reaction time and effluent concentration) on removal of COD, color and turbidity and power consumption in a batch recirculation system [11]. So this research work was focus on electro oxidation process for removal of pollutants from domestic wastewater.

1.2 Statement of the problem

One of the largest issues facing environmental pollution is a wastewater directly discharged to water bodies and its lack of appropriate treatment technology. The pollution of water has a serious impact on all living creatures and can negatively affect the use of water for drinking, household needs, fishing, transportation and commerce. Wastewater is one of the main cause for irreversible damages to the environment. It should be treated properly to remove pollutants to improve or purify the water by removing some of the pollutants, making it fit for discharge back to the environment. There is a need of more cost-effective methods to purify a wide range of polluted water on-site, and with minimal additives that are required for sustainable water management.

Electro oxidation treatment of wastewater presents an innovative technology in which a sacrificial metal anode and cathode produce electrically active coagulants and tiny bubbles of hydrogen and oxygen in water. One of the challenging tasks faced by scientists and engineers today is to provide safe water to support healthy human life. Highly developed countries, such as the USA and UK are also experiencing a critical need for wastewater cleaning because of an ever-increasing population, urbanization and climatic changes. Recently, there has been considerable interest in identifying new technologies that are capable of meeting more stringent treatment standards various electrochemical treatments are available for effluent treatment however; these processes were basically developed for the treatment of either organic impurities or desalination of waters for human consumption. Moreover, the cost of these electrochemical treatments was a major factor of concern due to degeneration. Many wastewater treatment technologies have been developed in last few decades for the removal of wastewater pollutants. During the last years, the electrochemical methods have been developed and used as alternative options for the remediation of wastewaters mainly due to their advantages, e.g., environmental compatibility and cost effectiveness.

1.3 Objectives

1.3.1 General objective

The general objective of the study was removal of pollutants from domestic wastewater using electro oxidation process and optimization through RSM

1.3.2 Specific objectives

1. To determine effect of operating parameters (i.e. pH, current ampere, electrolysis time, distance in-between electrodes and supporting electrolytes) on removal of pollutants such as color, COD and turbidity and power consumption
2. To estimate the operating cost
3. To optimize operating parameters by using RSM

1.4 Research questions

1. What percentage of color, COD and turbidity can be removed and how much power is consumed in kWh/m^3?
2. What are the operating cost of treating domestic wastewater in $\$/m^3$?

3. What are the optimum value of operating parameters?

1.5 Significance of the study

The significance of the study was to prevent water bodies from contamination due to improper discharge of liquid waste which contains different particles. So, if wastewater is discharged after treatment over the entire environment i.e. water bodies including aquatic lives are beneficiaries' from the study.

1.6 Scope of the study

The scope of the study was focused on removal of pollutants from domestic wastewater using Electro oxidation process from SOS children's village, discharged to Awetu River.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

Water is a very abundant natural resource and in many cases there is not enough supply of water of appropriate quality for industrial and domestic use. Many pollutants in water streams have been identified as harmful and toxic to the environment and human health. Strategies for ecological protection generally include the development of new or improved industrial processes that have no or minor effects on nature, and of processes for the treatment of inevitable waste. The tendency of the cost of water to increase, and the higher cost of effluent treatment due to the new restrictions on its discharge to the environment have induced industries to adopt programmers aiming at the minimization of water consumption and favoring the development of new methodologies for the optimization of these resources [13].

Wastewater is the main cause for irreversible damages to the environment, creating threats to the next generation. Many industries consume fresh water and exhaust as a wastewater. It should be treated properly to reduce the pollutants and achieve the permissible limit for its reutilization in the industrial/agriculture process to promote sustainability. There is a need of more cost-effective methods to purify a wide range of polluted water on-site, and with minimal additives that are required for sustainable water management [14].

As the rivers, lakes and other water bodies are being continuously polluted and the potable water supply is insufficient in many places, there is an urgent need to develop more effective, innovative and inexpensive techniques for the treatment of wastewater. Conventional treatments of wastewater containing organic and inorganic compounds by coagulation and flocculation have been used for decades to destabilize the colloidal substances. In these processes, aluminum sulfate, ferrous sulfate and ferric chloride have been used as coagulating agents and other additives (e.g. polyelectrolyte) are dosed to produce larger aggregates which can be separated physically. These are multi-stage processes that need repetitive supply of chemicals and extensive land area. There is a need of more cost-effective methods to purify a wide range of polluted water on-site, and with minimal additives that are required for sustainable water management. Electrolytic treatment of

wastewater presents an innovative technology in which a sacrificial metal anode and cathode produce electrically active coagulants and tiny bubbles of hydrogen and oxygen in water [13].

2.2 Electro oxidation process

Study on electro oxidation for wastewater treatment goes back to the 19th century, when electrochemical decomposition was investigated. Extensive investigation of this technology commenced since the late 1970s. During the last two decades, research works have been focused on the efficiency in oxidizing various pollutants on different electrodes, improvement of the electro catalytic activity and electrochemical stability of electrode materials, investigation of factors affecting the process performance, and exploration of the mechanisms and kinetics of pollutant degradation. Experimental investigations focus mostly on the behaviuors of anodic materials, the effect of cathodic materials was not investigated extensively although have found a considerable influence of the counter electrode material in the anodic destruction [15].

Electrochemical technology and its application on wastewater treatment have become increasingly interesting, because of its advantages especially for color removal [16].

Electrochemical treatment methods are more favorable since the low volume of sludge is produced compared with the conventional chemical treatment methods. Electrochemical processes are usually applied at room temperature and the produced sludge is easily recoverable [14]. Electrochemical techniques are one way for the treatment of wastewater containing organic pollutants. Two important features of the electrochemical process are converting non-biocompatible organics in to biocompatible compounds and oxidation of organics into carbon dioxide and water [13]. A typical electrochemical treatment process consists of electrolytic cell, which uses electrical energy to affect a chemical change [14].

Electrolytic treatment of wastewater presents an innovative technology in which a sacrificial metal anode and cathode produce electrically active coagulants and tiny bubbles of hydrogen and oxygen in water. One of the challenging tasks faced by scientists and engineers today is to provide safe water to support healthy human life. But human activities always generate wastewaters which contain various pollutants that create problems to aquatic life and contaminate water resources. Highly developed countries, such as the USA, are also experiencing a critical need for wastewater cleaning because of an ever-increasing population, urbanization and climatic changes. Recently, there has been considerable interest in identifying new technologies that are capable of meeting

more stringent treatment standards. Various electrochemical treatments are available for effluent treatment however; these processes were basically developed for the treatment of either organic impurities or desalination of waters for human consumption. Moreover the cost of these electrochemical treatments was a major factor of concern due to degeneration. Many water and wastewater treatment technologies have been developed in last few decades for the removal of diverse aquatic pollutants. During the last years, the electrochemical methods have been developed and used as alternative options for the remediation of water and wastewaters mainly due to their advantages, e.g., environmental compatibility, high energy efficiency and cost effectiveness [14]. Electrochemical processes are probably the most adequate tools in the aqueous effluent treatment, which are ideally suited to the present age. The process will not require chemical additions and indeed electrolytes are the only reactants added to the process to simulate reaction [17]. Electro-oxidation process is one of the most promising forefront electrochemical technologies to remove pollutants from wastewater [18].

Electro oxidation may offer an attractive alternative, for treating aqueous streams containing the organic compounds, through simultaneous evolution of oxygen at an anode surface, which is probably the most adequate tool in the aqueous effluent treatment, ideally suited to present age where environmental considerations are always to the fore.

Electro oxidation is a mediated reaction and occurs via oxygen atoms transfer from water in the solvent phase to the oxidation product. The overall process of anodic oxygen transfer may be represented by generic reaction [17] [Equation-1; where R is organic reactant and RO_X is oxidation product]. On the other hand, R may mineralize, according to Equation-2; known as combustion reaction.

$$R + XH_2O \rightarrow RO_X + 2XH^+ + 2Xe^- \quad \text{..... (2)}$$

$$R + XH_2O \rightarrow X/2\ CO_2 + 2XH + 2Xe^- \quad \text{..... (3)}$$

These processes were investigated for different organic compounds, in which, it is impossible to suppress the most side reaction, i.e. the anodic oxidation of water to give O_2, and the consequence is that only low current yields can be achieved. Further disadvantage of direct electrochemical oxidation is the low miscibility of most organics with water. As a result, mass transfer from the bulk solution to the anode is hindered and the achievable space – time yields are low. Also electrolysis often consumes much energy, especially in dilute wastewater treatment processes; for this reason the efficient electrochemical methods for water purification based on the indirect

electro oxidation of contaminants involving electro generation of strong oxidants is now in progress which is a more reliable technology for the degradation of toxic organic wastes and provides better results over the direct electro oxidation. In this process the waste is oxidized in the bulk solution by a mediator, mostly a transition metal in a higher oxidation state [17]. After waste oxidation in the bulk solution the reduced mediator is reoxidized at the anode, which is capable of oxidizing further organic molecules. The mechanism proposed for this process of organic compounds in aqueous solutions presents, as the first step the disadvantage of water which leads to the $^{\bullet}OH$ adsorbed on the electrode surface [Equation-4], then MO_{X+1} species can be formed from hydroxyl radicals in the active sites of the MO_X coating [Equation-5], finally this physiosorbed species oxidizes the organic molecules [Equation-6] [17].

$MO_X + H_2O \rightarrow MO_X (^{\bullet}OH) + H^+ + e^-$ ..... (4)

$MO_X (^{\bullet}OH) \rightarrow MOX_{+1} + H^+ + e^-$ ..... (5)

$MO_{X+1} + R \rightarrow MO_X + RO$ ..... (6)

2.3 Factors which influence Electro chemical treatment technology

There are factors which influence electrochemical treatment technology; which means the control, operation and chemical interactions of the electrolytic system affect the performance and reliability of electrolytic treatment technology. Adding to complexity and the suitable contaminant removal mechanisms and their interactions with the reactor design, current density, electrode type and operating time influence the electrolysis [19].

2.3.1 Reactor design

The reactor design affects operational parameters including bubble path, flotation effectiveness, floc-formation, fluid flow regime and mixing/settling characteristics. It is important to design the reactor for a specific process and the reactors for energy conversion and electrochemical synthesis will have different drivers to those used in the destruction of electrolyte-based contaminants. The form of the reactants and products; and the mode of operation (batch or continuous) are also the important design factors [19].

Desirable factors in reactor design and their implications include i) reasonable expenditure of low-cost components, a low cell voltage, and a small pressure drop over the reactor, ii) convenience and reliability in operation designed for facile installation, maintenance, and monitoring, iii) appropriate reaction manufacturing within the reactor (homogeneous and suitable values of current

density, electrode potential, mass transport, and flow), iv) simplicity and flexibility in an elegant design, which is attractive to end users [19].

2.3.2 Current ampere

Current ampere plays significant role in electrolytic treatment as it is the only operational parameter that can be controlled directly. In this system electrode spacing is fixed and current is a continuous supplied [19]. After destabilization of the colloidal suspension, effective aggregation requires adequate contact current and more coagulant (SS) available per unit of time. The residence time is decreased in the reactor, reducing the probability of collision and adhesion between pollutant and coagulant. Current ampere directly determines both coagulant dosage and bubble generation rate; and strongly influences both solution-mixing and mass transfer at the electrodes [19]. Electrode type and arrangement: - The wastewater to be treated is passed through the electrolytic reactor with electrodes and was subjected to coagulation and flotation by generating the ions forms the electrodes. These ions floating on the surface of wastewater after being captured by hydrogen gas bubbles are generated at cathode surfaces [19].

2.3.3 Electrolysis time

The organic concentration in wastewater reduces with the increase in electrolytic time [18]. The study of the effect of time at constant current density may be observed that the removal of COD and turbidity as a function of operating time changed from 10 to 50 minutes [18]. However, in the electrolysis time interval of 20 min to 65 min, the removal percentage of COD at a given electrolysis time was always higher at pH 5.0 than at pH 7.0. These findings suggested that at pH value around 7.0, and hence longer electrolysis times are necessary to obtain maximum efficiency of removal [19].

2.3.4 Operating cost

The process of evaluating and selecting appropriate wastewater treatment technology usually begins with a technical feasibility study that depends on the nature of the application [18]. The operating cost (OC) involves costs of chemicals, electrodes and energy consumptions as well as labor, maintenance, sludge dewatering and disposal, and fixed costs [19].

2.3.5 Electrode material

The electrode material used for this study was stainless steel electrode. Stainless steel is widely used in critical components of drinking water, wastewater, and water reuse treatment and conveyance systems, including well casings, reverse osmosis (RO) and other membrane treatment equipment, ultraviolet (UV) disinfection systems, and ozone generators. Stainless steels are corrosion-resistant [20]. Stainless steel was a metallic alloy of multiple elements, such as chromium, nickel, and molybdenum. Generally, a metallic alloy is considered "stainless" when its chromium content is greater than approximately 12% by weight, with iron as the majority of the balance. Higher alloyed stainless steels have more chromium, which provides corrosion resistance by forming a thin, adherent, and corrosion-resistant oxide film on a clean surface. When exposed to oxygen, whether in air or in water, this layer will naturally form to prevent corrosion. The protective layer is less effective when the original oxide surface layer becomes damaged or scratched, although when exposed to oxygen again, the protective film will rapidly re-form. An important part of stainless steel preparation is passivation i.e., removal of free iron compounds from the surface of the metal and the subsequent formation of a passive (inert) surface layer [20, 33]. Stainless steel is the ideal material for hygiene in domestic settings, because it is easy to clean and biologically neutral, in addition to being an eco-friendly product that is 100% recyclable. An eternal material, one that is charming and functional that ages slowly without losing any of its characteristics. These are some of the main technical characteristics which make stainless steel the undisputed star of domestic settings. The American Iron and Steel Institute indicates with the acronym AISI 304 a top quality austenitic stainless steel which contains 18% Chromium and 8% Nickel. This type of stainless steel proves extremely useful in the home, as it can withstand temperatures of up to 500°C [20, 36].

2.4 Response Surface Methodology

In order to optimize the experimental conditions, by electrochemical process was performed using response surface methodology (RSM) [19]. Response Surface Methodology: - RSM is a collection of mathematical and statistical techniques useful for developing, improving and optimizing processes and can be used to evaluate the relative significance of several affecting factors even in the presence of complex interactions [21]. Response surface methodology (RSM), a multivariate technique which mathematically fits the requirement of the experimental design, is proposed to solve these problems. Its application makes it possible to evaluate the impacts of potential

influencing factors on treatment efficiency and figure out their interactions with a limited number of experiments [21].

The main objective of RSM is to determine the optimum operational conditions for the system or to determine a region that satisfies the operating specifications. The application of statistical experimental design techniques in adsorption process development can result in improved product yields, reduced process variability, closer confirmation of the output response to nominal and target requirements and reduced development time and overall costs [22].

CHAPTER THREE

3 MATERIALS AND METHODS

3.1 Study area

The study area lies in the Jimma zone, south western part of Ethiopia, in Jimma town. The Town has a latitude and longitude of 7º41’6” and 36º49’53” respectively with an elevation of 1738 meters above sea level and 352 km from the center of the country, Addis Ababa, Ethiopia.

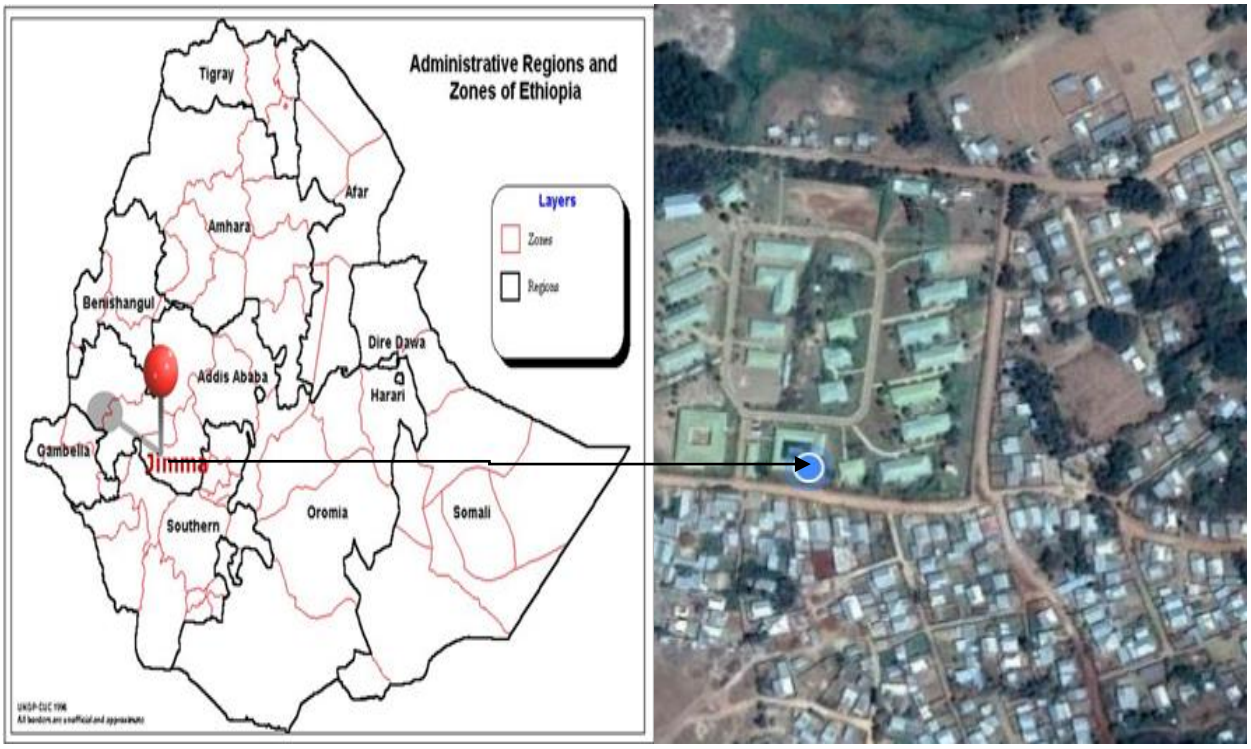


Figure 3.1: Location of Study Area

3.2 Study period

The study period is from July, 2018 G.C. to APRIL, 2019G.C.

3.3 Study design

The study design is laboratory based experimental design using quantitative data.

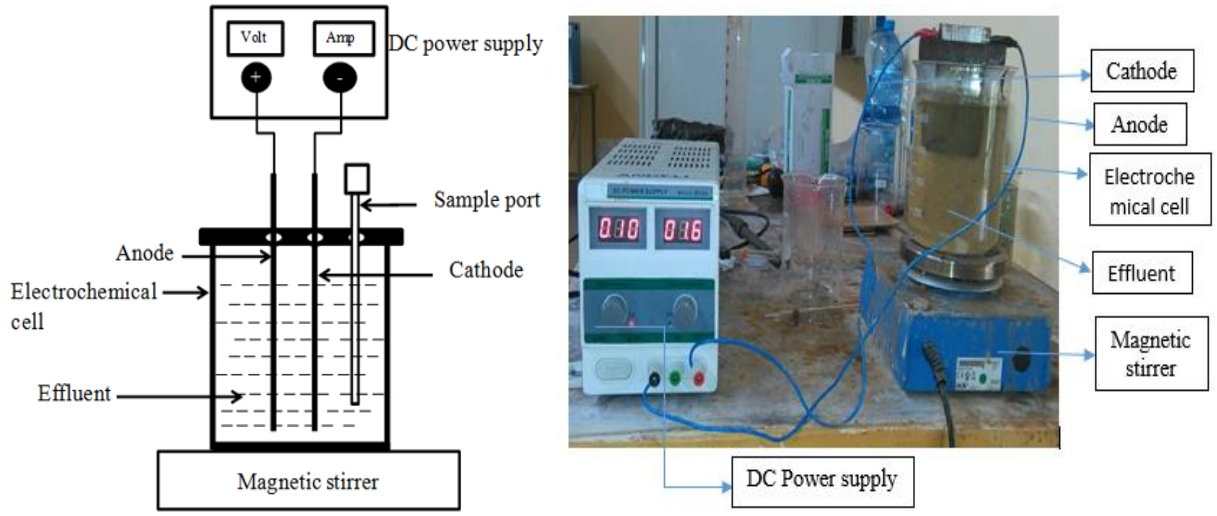


Figure 3.2.: Electrochemical reactor setup

3.4 Sampling procedures

At the time of sampling, the sampling bottles were thoroughly rinsed two or three times, using the wastewater to be sampled. The water quality parameters like: color, COD and Turbidity were measured, using digital instruments such as spectrophotometer model 6700, designed and manufactured in UK by Bibby scientific Ltd stone, staffs, UK, ST150SA have a serial number 41934 for color, turbidity meter model 93703, manufactured in Portugal for turbidity, COD reactor model 45600-02 manufactured in HACH COMPANY P.O.BOX 389, LOVELAND, COLO, USA, COD reactor have a serial number 980600006193 for COD, conductivity meter model Cond 3110, manufactured in USA have a serial number of 13341640 for electrical conductivity and pH meter model pH 3310, manufactured in Germany have a serial number of 13340201 for pH immediately after sampling.

3.5 Study variables

Dependent variable

- Pollutant removal efficiency

Independent variables

- Color, COD and Turbidity removal and power consumption
- Operating cost

- Operating parameters such as: pH, Current ampere, Electrolysis time, Inter-electrode distance and supporting electrolyte concentration (i.e. NaCl, $CaCl_2$ and Na_2CO_3)

3.6 Materials

Apparatus required for Power consumption and for removal of Color, COD and Turbidity. Mark (√) at the right place:

Table 3.1: Apparatus required for removal of pollutants from domestic wastewater

S.No	Apparatus	Color	COD	Turbidity	Power consumption
1.	COD digester		√		
2.	Burette & Burette stand		√		
3.	Spectrophotometer	√			
4.	Turbidity meter			√	
5.	Cell voltage				√
6.	COD vials with stand		√		
7.	DC Power supply	√	√	√	√
8.	Pipettes	√	√	√	
9.	Wash bottle	√	√	√	
10.	Beakers (500ml & 1000ml in volume)	√	√	√	
11.	Flasks & conical flasks (500ml & 1000ml in volume)		√		
12.	Pipette bulb	√	√	√	
13.	Electrode (stainless steel)	√	√	√	√

Chemicals required for removal of Color, COD and Turbidity. Mark (√) at the right place:

Table 3.2: Chemicals required for removal of pollutants from domestic wastewater

S.No	Chemicals	Color	COD	Turbidity
1.	Potassium dichromate		√	
2.	Sodium chloride	√	√	√
3.	Sulphuric acid		√	
4.	Calcium chloride	√	√	√
5.	Ferrous ammonium sulphate		√	
6.	Silver sulphate		√	
7.	Mercury sulphate		√	
8.	Sodium carbonate	√	√	√
9.	Ferroin Indicator		√	
10.	Organic free distilled water	√	√	√

3.7 Data collection Process

Wastewater samples were collected from SOS children's village in 4 rounds; 162 liters of wastewater samples were collected, from 162L volumes of wastewater samples 54liters samples analysed by NaCl, 54L samples are analysed by $CaCl_2$ and 54L samples are analysed by Na_2CO_3. On-site measurements was taken for wastewater temperature, electrical conductivity and pH. Wastewater samples for COD, Colour and Turbidity was collected in clean polyethylene bottles. The sample wastewater is kept in refrigerator below 4°C in order to arrest microbial action and transported to Jimma University for the analysis in Environmental Engineering laboratory.

3.8 Data Analysis

Data from the laboratory was analysed by some empirical formulas are used for analysis such as:

a) Percentage color removal

Percentage color removal were determined by taking samples at every 10 minutes during 30 minutes electrolysis time and read the absorbance for corresponding wavelength (i.e. 420nm), finally using equation 8 calculate the percentage color removal.

$$\text{Percentage colour removal} = \frac{\text{Absi}-\text{Abst}}{\text{Absi}} * 100 \quad \ldots\ldots (8)$$

Where, Abs_i and Abs_t are absorbance of initial and at any time t samples for corresponding wavelength (i.e. 420nm).

b) Percentage COD removal:

Percentage COD removal were determined by taking samples at every 10 minutes during 30 minutes electrolysis time and mix the samples of 2.5ml taken at every 10 minutes with 1.5ml potassium dichromate reagent and 3.5ml of sulphuric acid reagent and burn the samples including the blank sample for 2 hours in the COD reactor, cool at room temperature and put the samples in 25ml conical flask, add 2 – 4 drops of ferroin indicator shake until the color becomes blue-green and titrate with ferrous ammonium sulphate until the color changed from blue-green to reddish brown, then read the amount of FAS consumed ml from the burette, finally calculate the percentage COD removal using equation 9.

$$\text{Percentage COD removal} = \frac{CODO-CODt}{CODO} * 100 \quad \text{.......................................} \quad (9)$$

Where, COD_O and COD_t (in ppm) are the chemical oxygen demand at time t = 0 (initial) and at t (reaction time) respectively.

c) Percentage turbidity removal:

percentage turbidity removal were determined by taking samples at every 10 minutes during 30 minutes electrolysis and read the turbidity from turbidity meter, finally using equation 10 calculate the percentage turbidity removal.

$$\text{Percentage turbidity removal} = \frac{Turi-Turt}{Turi} * 100 \quad \text{.......................................} \quad (10)$$

Where, Tur_i and Tur_t are turbidity at time t = 0 (initial) and at t (reaction time) respectively.

d) Power consumption (kWh/m^3):

Power consumption were determined by reading the cell voltage at every 10 minutes of 30 minutes electrolysis time, reading the current ampere from the DC power supply and volume of the effluent, finally calculate the power consumption in kWh/m^3 using equation 11.

Power consumption is the quantity of energy consumed in the process for the removal of 1 kg of COD in the effluent and can be calculated by using the equation below;

$$\text{Power consumption } E = \frac{VIt}{3600 * 10^3} * \frac{1}{(CODo - CODt) * VR * 10\text{^}-6} \quad \text{...........................} \quad (11)$$

Where, V represents the observed cell voltage (V), I is the current ampere (A), t is electrolysis time (hr), V_R is the volume of the effluent (L).

3.9 Ethical considerations

Copying and quoting directly from source material without providing proper citations and quotation marks is a fundamental issue of ethical part of the researcher in the rule and regulation of Jimma University.

3.10 Plan for dissemination of findings

The result of this study was disseminated to Jimma University, Jimma Institute of Technology, Department of Water Supply and Environmental Engineering, Environmental Engineering chair and a copy of it will be kept in Jimma University, Jimma Institute of Technology library as a reference for all concerned individuals.

Besides, the result of the study was submitted to or published into national or international journal for the referenced topic of study.

CHAPTER FOUR

4 RESULTS AND DISCUSSION

This study is mainly aimed to determine basic operating parameters of treatment of domestic wastewaters. Therefore, color, COD, Turbidity and Power consumption were investigated in terms of selection of applied voltage, reaction time, pH, distance in-between electrode and chemical concentration (supporting electrolytes) in order to determine optimum operating conditions for maximum removal efficiency of color, COD and turbidity with minimum power consumption.

In electro-oxidation process, to achieve high removal efficiency, all affecting factors were optimized.

4.1 Effects of operating parameters on removal efficiency of Color, COD and Turbidity and power consumption

4.1.1 Effect of Initial pH

The effect of initial pH of solution on the removal of colour, COD, turbidity and power consumption was made by conducting studies in the pH range of 3 to 9 with the supporting electrolyte concentration as 1gm/L to 3gm/L at a current ampere of 0.1 to 0.2A. Figure 4.1.1a shows the effect of initial pH on the percentage removal of colour, COD, turbidity and power consumption during the electrochemical oxidation of the effluent. The initial pH strongly affects the electrochemical oxidation. The percentage removal of colour, COD and turbidity is found to increase with a decrease in the initial pH of the effluent. The acidic conditions are more favorable for the reduction of colour, COD and turbidity removal is due to the fact that more of the oxidant is produced under the acidic medium, while it decreases in the alkaline medium. This is due to the decreased production of chlorine and hypochlorite and also the formation of chlorate and perchlorate [10]. A maximum colour, COD and turbidity removal of 90.32%, 75% and 91.69% respectively was achieved at an initial pH of 3 for NaCl. Figure 4.1.1b shows the effect of initial pH on the percentage removal of colour, COD, turbidity and power consumption during the electro oxidation of the effluent for $CaCl_2$ as a supporting electrolyte. The percentage removal of colour increases with an increase in the initial pH of the effluent and that of COD and turbidity removal decreases with an increase in the initial pH of the effluent. The acidic conditions are more favorable

for the reduction of COD and turbidity removal is due to the fact that more of the oxidant is produced under the acidic medium, while it decreases in the alkaline medium. This is due to the decreased production of chlorine and hypochlorite and also the formation of chlorate and perchlorate [10]. A maximum colour removal of 90.63% was achieved at pH of 9 and that of COD and turbidity are 71.43% and 84.36% respectively for initial pH 3 for $CaCl_2$. Figure 4.1.1c shows the percentage removal of COD and turbidity increase with an increase in the initial pH of the effluent and that of colour increase when the initial pH of effluent increases from 3 to 6 and decreases from 6 to 9. A maximum colour removal of 78.26% was achieved at pH of 6 and that of COD and turbidity are 66.67% and 94.38% respectively at pH of 9 for Na_2CO_3.

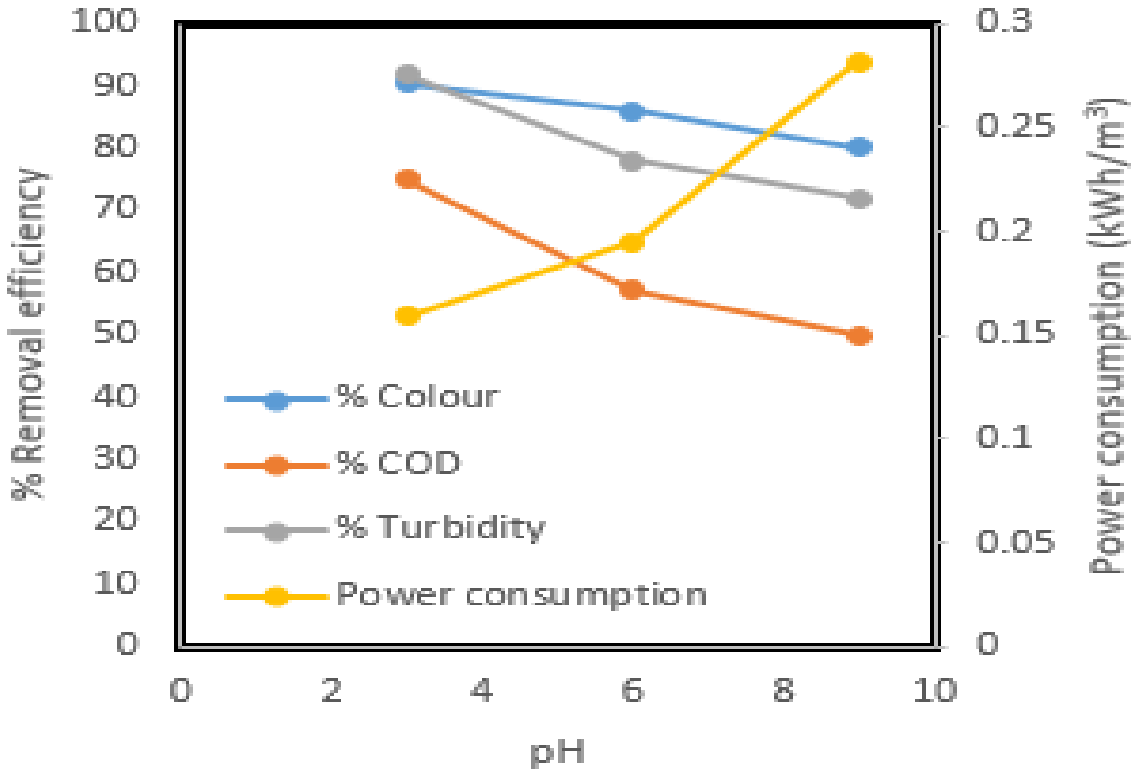


Figure 4.1.1a Effect of pH using NaCl

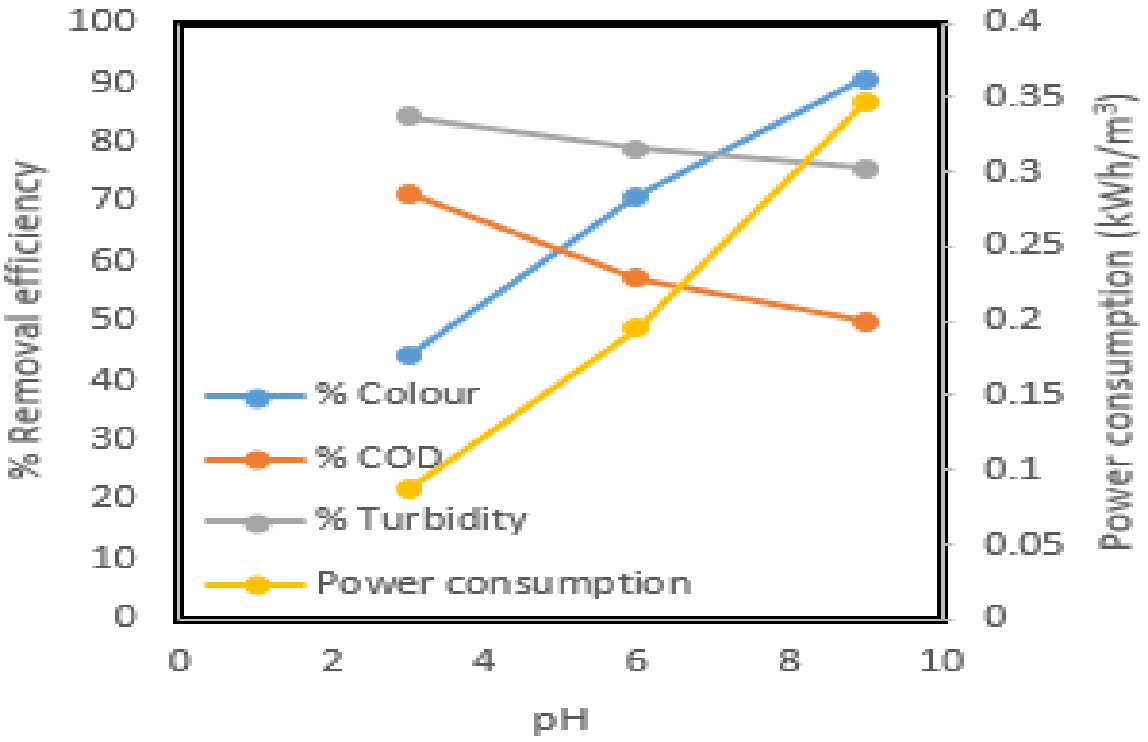


Figure 4.1.1b Effect of pH using $CaCl_2$

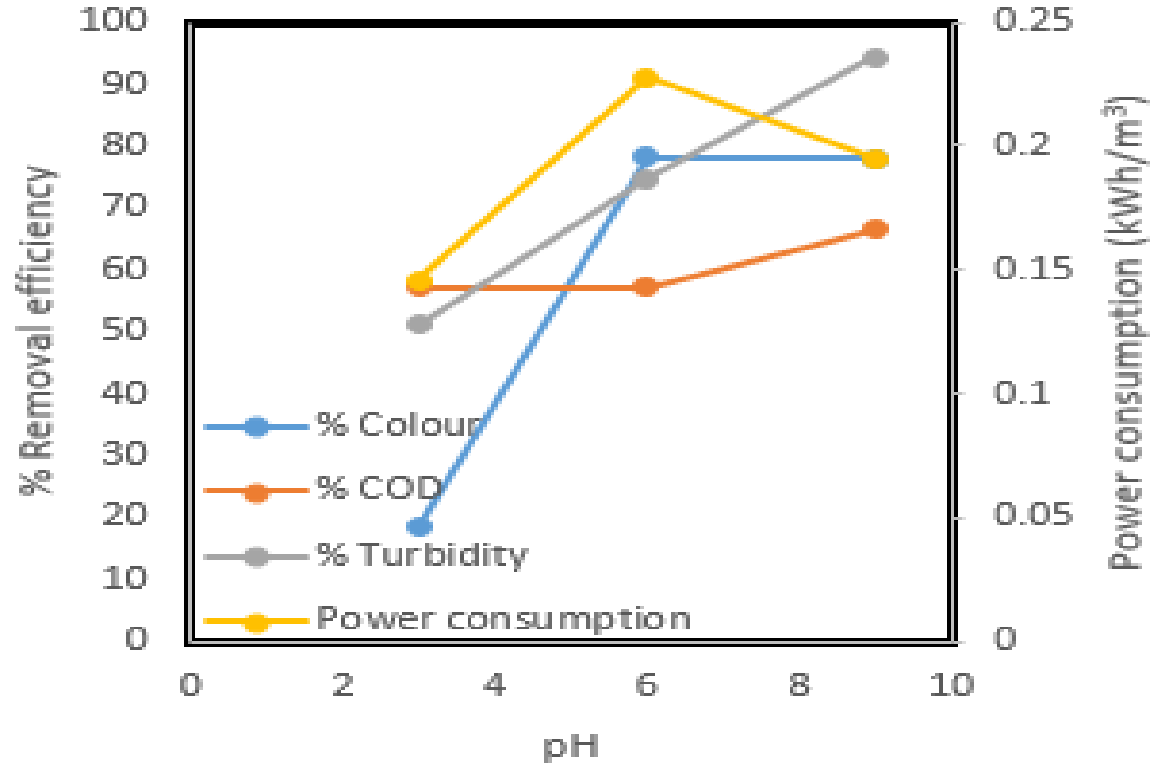


Figure 4.1.1c Effect of pH using Na_2CO_3

4.1.2 Effect of current ampere

The effect of current ampere on the removal of colour, COD and turbidity and power consumption in the treatment of the domestic effluent was studied using NaCl, $CaCl_2$ and Na_2CO_3 as supporting electrolyte at a concentration of 1gm/L to 3gm/L in the solution. Figure 4.1.2a shows that the percentage removal of colour, COD and turbidity increased with a decrease in the current ampere; this is due to the oxidation of the organic compound did occur directly on the electrode surface. A maximum colour, COD and turbidity removal of 90.32%, 75% and 91.69% respectively was achieved at a current ampere of 0.1A for NaCl. Figure 4.1.2b shows that the percentage removal of colour increased with an increase in the current ampere; this is due to the fact that the oxidation of the organic compound did not occur directly on the electrode surface but in the bulk of the solution due to electro-generated active chlorine [24] and that of COD and turbidity increased with a decrease in the current ampere; this is due to the oxidation of the organic compound did occur directly on the electrode surface. A maximum colour removal of 90.63% was achieved at a current ampere of 0.2A and that of COD and turbidity are 71.43% and 84.36% respectively was achieved at a current ampere of 0.1A for $CaCl_2$. Figure 4.1.2c shows that the percentage removal of COD and turbidity increased with an increase in the current ampere and the percentage removal of colour increased with an increase in the current ampere from 01A to 0.15A.

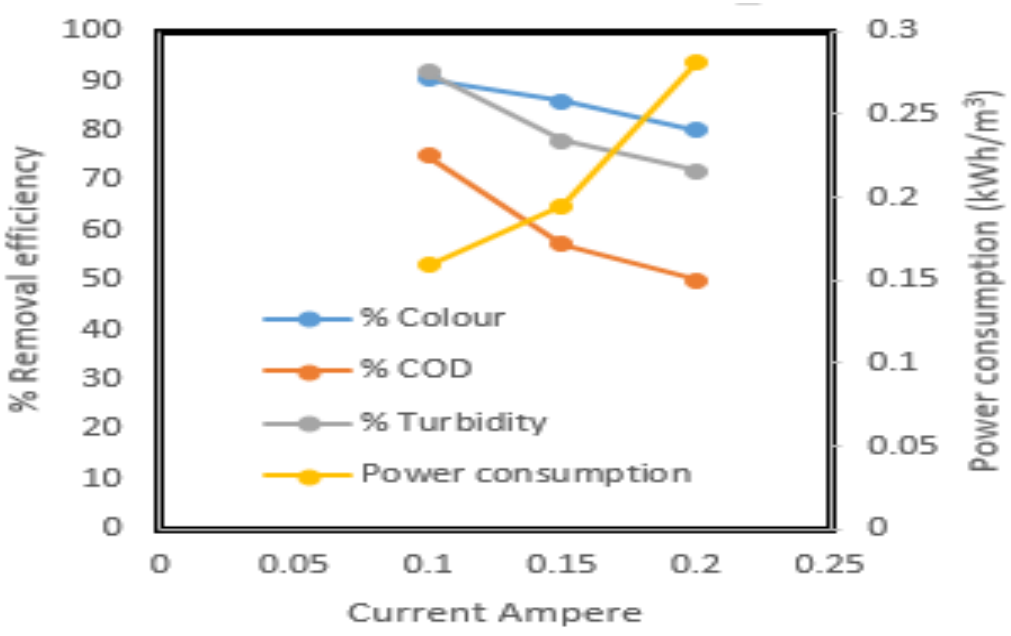


Figure 4.1.2a Effect of current ampere using NaCl

A maximum COD and turbidity removal of 66.67% and 94.38% respectively was achieved at a current ampere of 0.2A and that of colour is 78.26% was achieved at a current ampere of 0.15A for Na_2CO_3. This is due to the fact that the oxidation of the organic compound did not occur directly on the electrode surface but in the bulk of the solution due to electro-generated active chlorine [24].

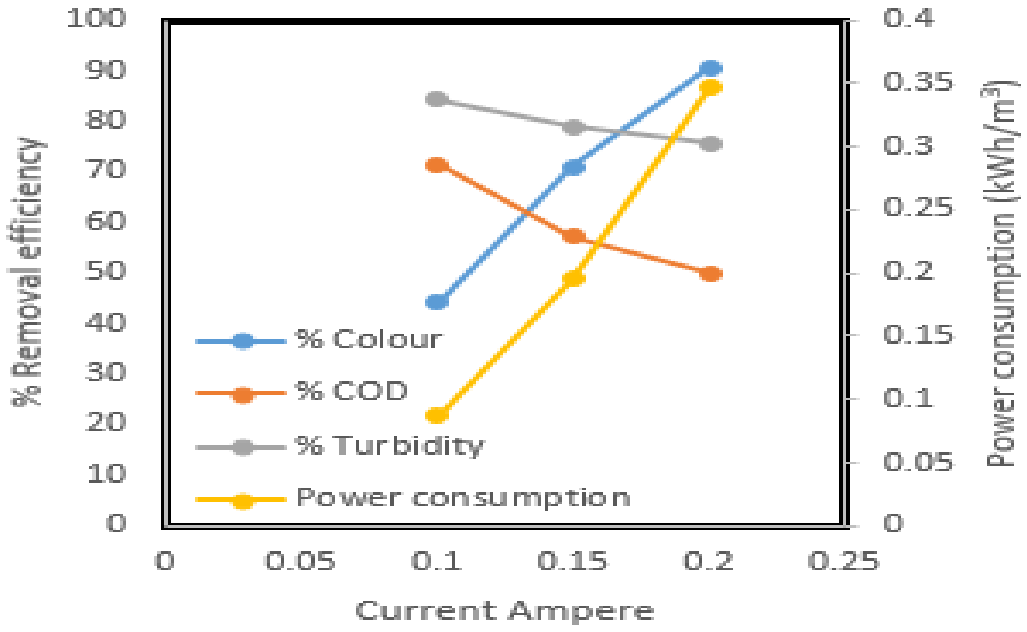


Figure 4.1.2b Effect of current ampere using $CaCl_2$

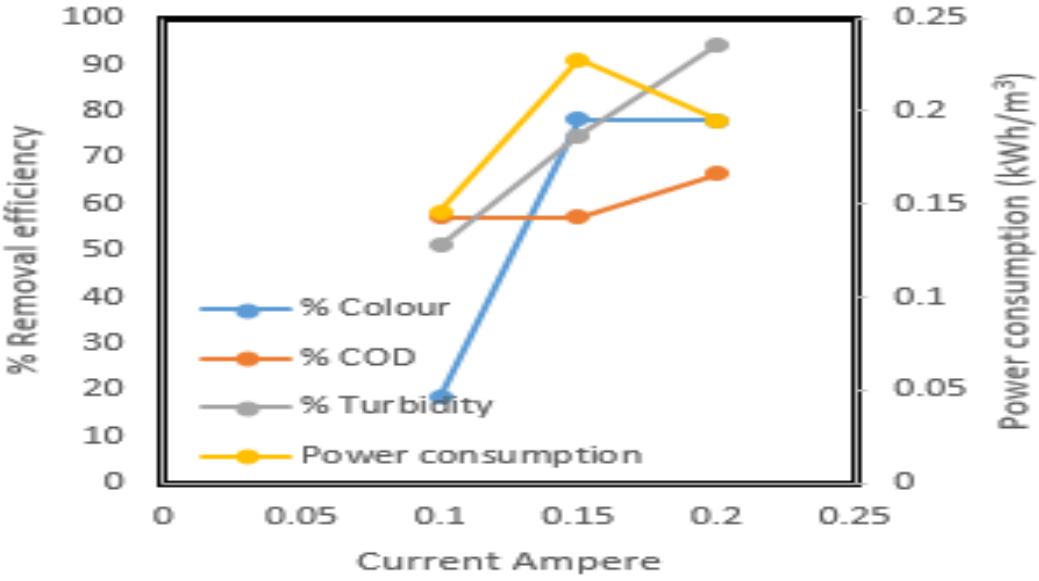


Figure 4.1.2c Effect of current ampere using Na_2CO_3

4.1.3 Effect of distance in-between electrodes

The effect of distance in-between electrodes on the removal of colour, COD and turbidity was made by conducting studies in the distance range of 1 to 2cm with the supporting electrolyte concentration 1gm/L to 3gm/L at a current ampere of 0.1 to 0.2A. Figure 4.1.3a shows that the effect of distance in-between electrodes on the percentage removal of colour, COD and turbidity during the electrochemical oxidation of the effluent. The percentage removal of colour, COD and turbidity is found to increase with a decrease in the distance in-between electrodes; this is due to the fact that with increasing inter-electrode distance between the anode and cathode, there is less interaction of ions and electrostatic attraction [27]. In order to achieve acceptable power consumption and the desired removal level of pollutants, the inter-electrode distance between the anode and cathode should be minimized [28]. A maximum colour, COD and turbidity removal of 90.32%, 75% and 91.69% respectively was achieved at a distance in-between electrodes of 1cm for NaCl. Figure 4.1.3b shows the effect of distance in-between electrodes on the percentage removal of colour, COD and turbidity during the electro oxidation of the effluent for $CaCl_2$ as a supporting electrolyte.

The percentage removal of colour increase with an increase in the distance in-between electrodes and that of COD and turbidity removal increases with a decrease in the distance in-between electrodes; this is due to the fact that with increasing inter-electrode distance between the anode and cathode, there is less interaction of ions and electrostatic attraction [27]. In order to achieve acceptable power consumption and the desired removal level of pollutants, the inter-electrode distance between the anode and cathode should be minimized [28]. A maximum colour removal of 90.63% was achieved at a distance of 2cm and that of COD and turbidity are 71.43% and 84.36% respectively at distance of 1cm for $CaCl_2$. Figure 4.1.3c shows the percentage removal of COD and turbidity increase with an increase in the distance in-between electrodes and that of colour increase when the distance increases from 1cm to 1.5cm and decreases from 1.5cm to 2cm; this is due to the fact that with increasing inter-electrode distance between the anode and cathode, there is less interaction of ions and electrostatic attraction [27]. In order to achieve acceptable power consumption and the desired removal level of pollutants, the inter-electrode distance between the anode and cathode should be minimized [28]. A maximum colour removal of 78.26% was achieved at a distance of 1.5cm and that of COD and turbidity are 66.67% and 94.38% respectively at a distance of 2cm for Na_2CO_3. With increasing inter-electrode distance between the

anode and cathode, there is less interaction of ions and electrostatic attraction. In order to achieve acceptable power consumption and the desired removal level of pollutants, the inter-electrode distance between the anode and cathode should be minimized [25, 28].

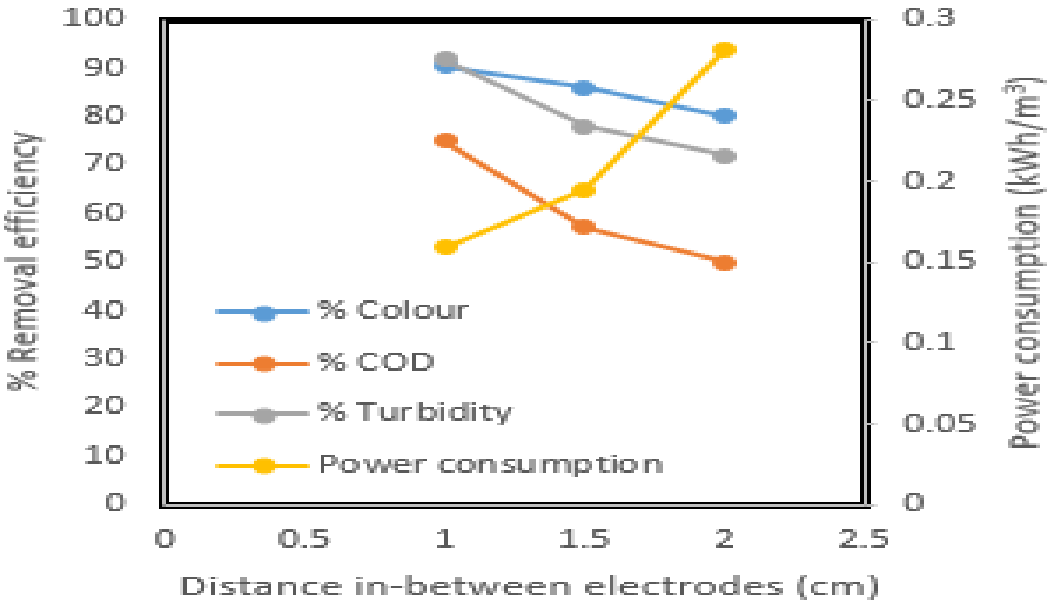


Figure 4.1.3a Effect of distance in-between electrodes using NaCl

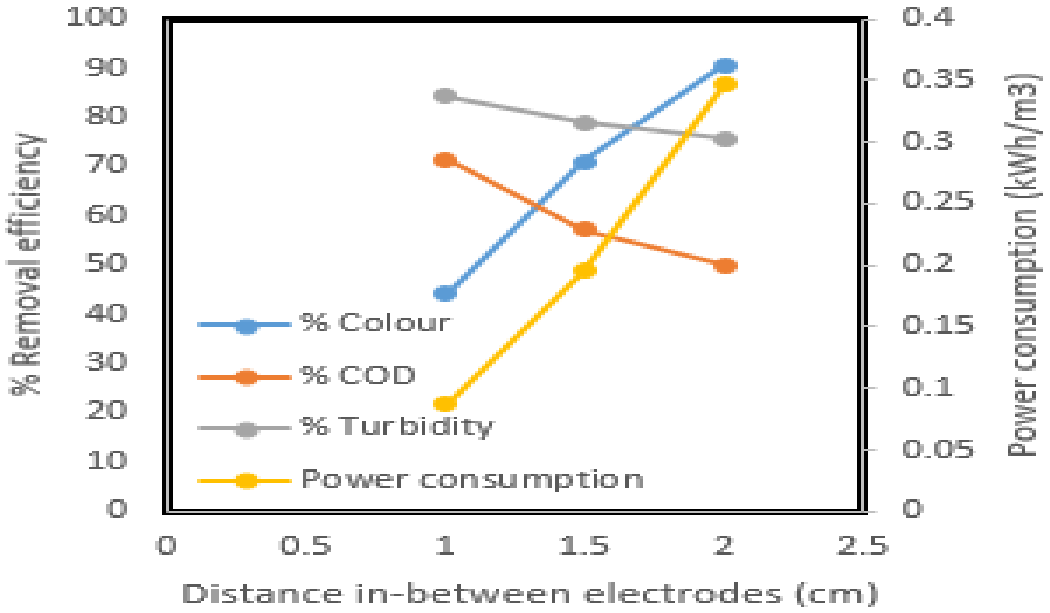


Figure 4.1.3b Effect of distance in-between electrodes using $CaCl_2$

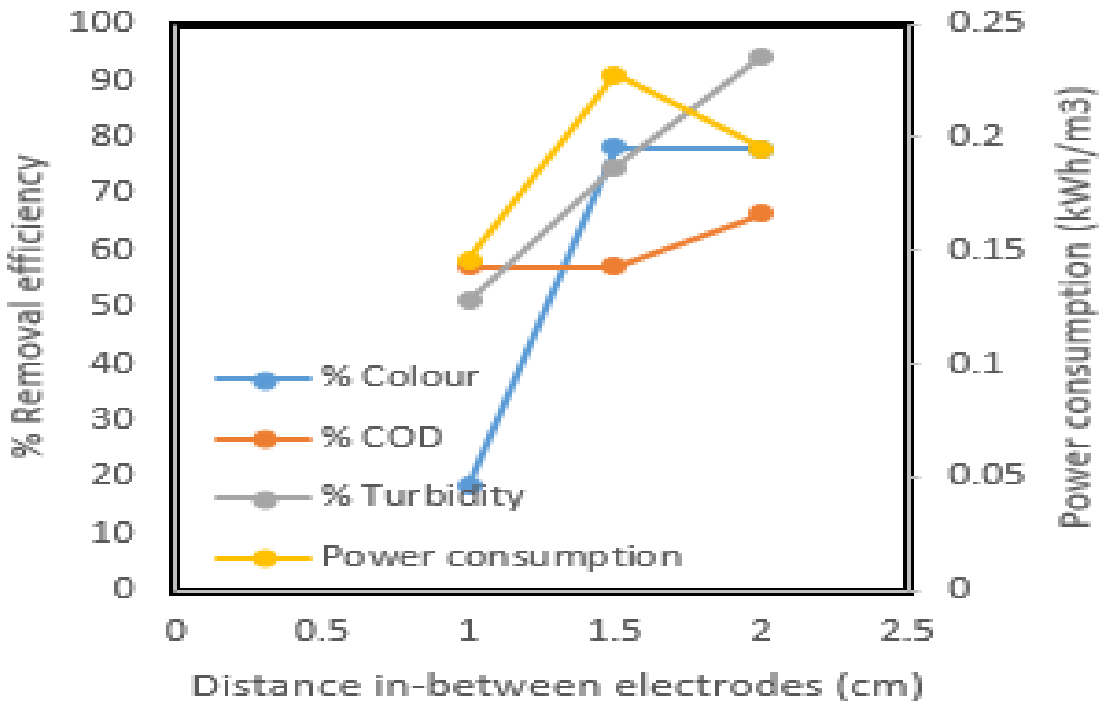


Figure 4.1.3c Effect of distance in-between electrodes using Na_2CO_3

4.1.4 Effect of Electrolysis time

The effect of electrolysis time on the removal of colour, COD and turbidity was made by conducting studies in the electrolysis time range of 10 to 30 minutes with the supporting electrolyte concentration 1 to 3 gm/L at a current ampere of 0.1A to 0.2A. Figure 4.1.4a shows the effect of electrolysis time on the percentage removal of colour, COD and turbidity during the electrochemical oxidation of the wastewater. The percentage removal of colour, COD and turbidity is found to increase with an increase in the electrolysis time. A maximum colour, COD and turbidity removal of 90.32%, 75% and 91.69% respectively was achieved at an electrolysis time of 30minute for NaCl. Figure 4.1.4b shows the effect of electrolysis time on the percentage removal of colour, COD and turbidity during the electro oxidation of the effluent for $CaCl_2$ as a supporting electrolyte. The percentage removal of colour, COD and turbidity increase with an increase in the electrolysis time of the effluent. A maximum colour, COD and turbidity removal of 44.21%, 71.43% and 84.36% respectively was achieved at an electrolysis time of 30 minutes for $CaCl_2$. Figure 4.1.4c shows the effect of electrolysis time on the percentage removal of colour, COD and turbidity during the electro oxidation of the effluent for Na_2CO_3 as a supporting electrolyte. The percentage removal of colour, COD and turbidity increase with an increase in the

electrolysis time. A maximum colour, COD and turbidity removal of 18.46%, 57.14% and 51.27% respectively was achieved at an electrolysis time of 30minute for Na_2CO_3. As the time of electrolysis increase comparable changes in the removal efficiency of COD, color and turbidity are observed. Also reaction time influence the treatment efficiency of electro oxidation process because the more time consume, the more production rate of hydroxyl and metal ion are produced on the electrodes [29].

Figure 4.1.4a Effect of electrolysis time using NaCl

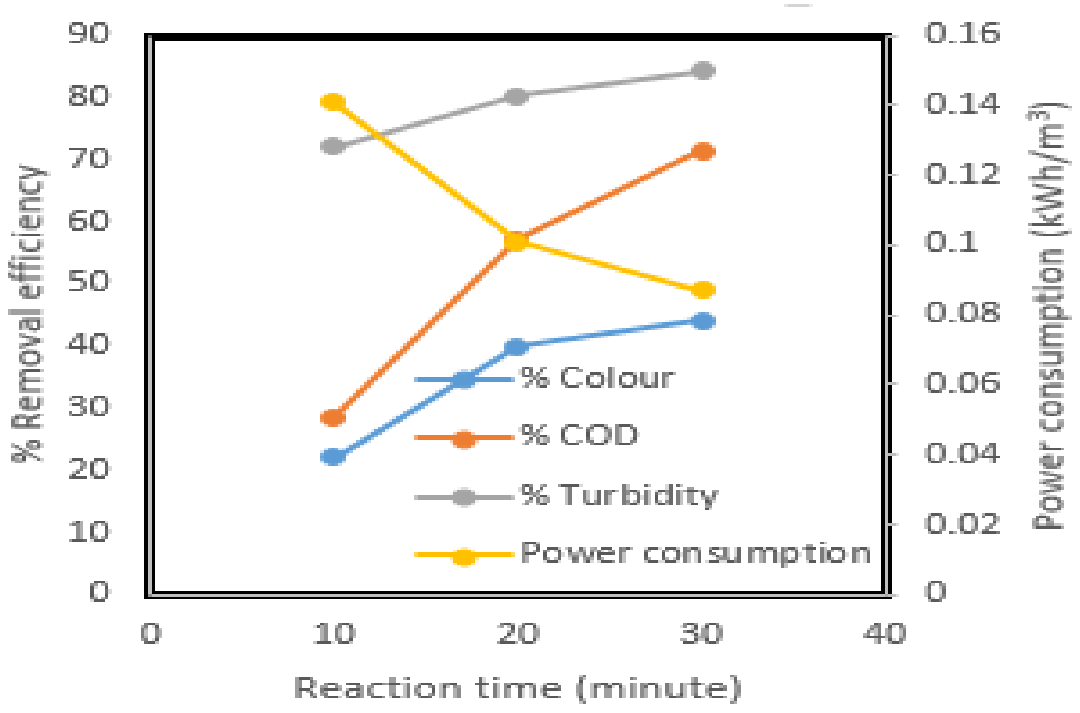


Figure 4.1.4b Effect of electrolysis time using $CaCl_2$

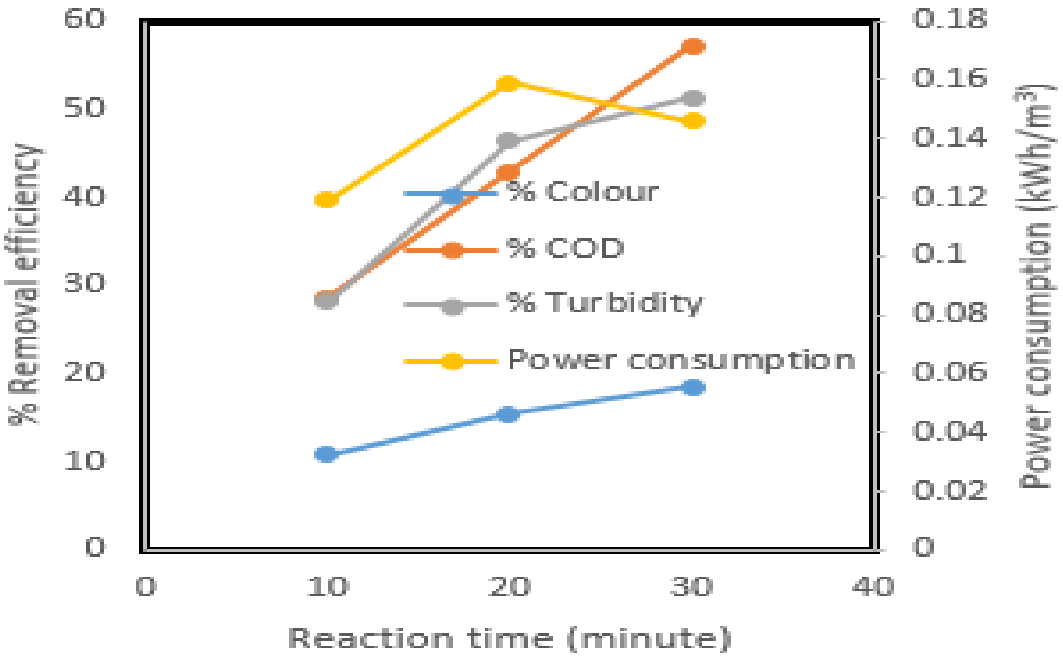


Figure 4.1.4c Effect of electrolysis time using Na_2CO_3

4.1.5 Effect of supporting electrolytes

The effect of supporting electrolyte on the removal of colour, COD and turbidity in the treatment of the domestic wastewater was studied using NaCl, $CaCl_2$ and Na_2CO_3 at a concentration of 1 to 3 gm/L in the solution. Figure 4.1.5a shows that the percentage removal of colour and turbidity increased with a decrease in the NaCl concentration and that of COD increased with an increase in the NaCl concentration; the percentage removal of COD increases due to the mediator of active chlorine electro-generated on the anode surface by chloride oxidation and also increasing the chloride concentration increases the color removal efficiency and this is due to the increased transfer of chloride ions to the anode surface [30]. A further increase in the NaCl concentration up to 4 g/L did not yield any significant improvements and hence, the optimum NaCl concentration used in the successive experiments was less than or equal to 4 g/L [28]. A maximum colour and turbidity removal of 90.32% and 91.69% respectively was achieved at a NaCl concentration of 1gm/L and that of COD removal of 91.67% was achieved at a NaCl concentration of 3 gm/L. Figure 4.1.5b shows that the percentage removal of COD increased with a decrease in the $CaCl_2$ concentration, the percentage removal of colour increased when the $CaCl_2$ concentration increases from 1 to 2 gm/L and decreases from 2 to 3 gm/L and the percentage removal of turbidity decreased when the $CaCl_2$ concentration increases from 1 to 2 gm/L and increased when the $CaCl_2$ concentration increases from 2 to 3 gm/L. A maximum COD removal of 71.43% was achieved at $CaCl_2$ concentration of 1gm/L, a maximum colour removal of 54.17% was achieved at $CaCl_2$ concentration of 2 gm/L and that of turbidity removal is 87.6% was achieved at $CaCl_2$ concentration of 3 gm/L. Figure 4.1.5c shows that the percentage removal of colour increased when the Na_2CO_3 concentration increase from 1 to 2 gm/L, the percentage removal of COD decreased when the Na_2CO_3 concentration increased from 1 to 2 gm/L and increased when the Na_2CO_3 concentration increases from 2 to 3 gm/L and the percentage removal of turbidity increased when the Na_2CO_3 concentration increased from 1 to 2 gm/L. A maximum colour removal of 82.17% was achieved at a Na_2CO_3 concentration of 2gm/l, a maximum COD removal of 75% was achieved at a Na_2CO_3 concentration of 3 gm/L and a maximum turbidity removal of 80.12% was achieved at a Na_2CO_3 concentration of 2 gm/L. This is observed that increasing the chloride concentration increases the color removal efficiency and this is due to the increased transfer of chloride ions to the anode surface [30].

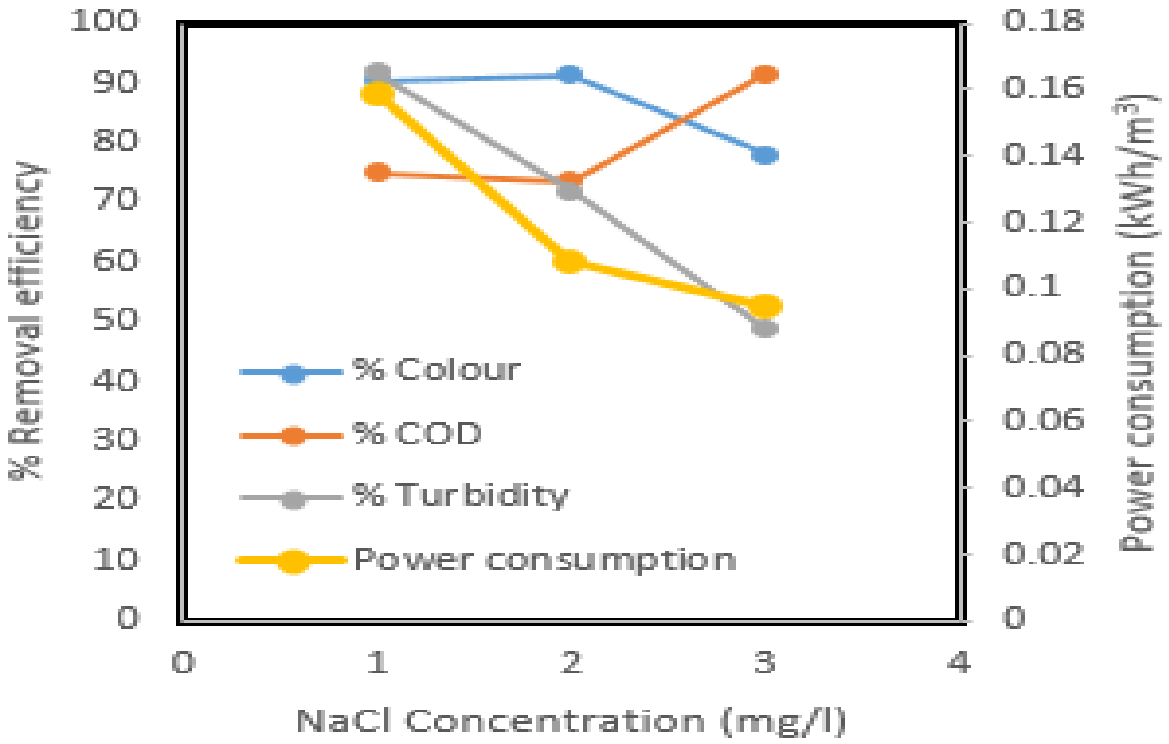


Figure 4.1.5a Effect of NaCl concentration

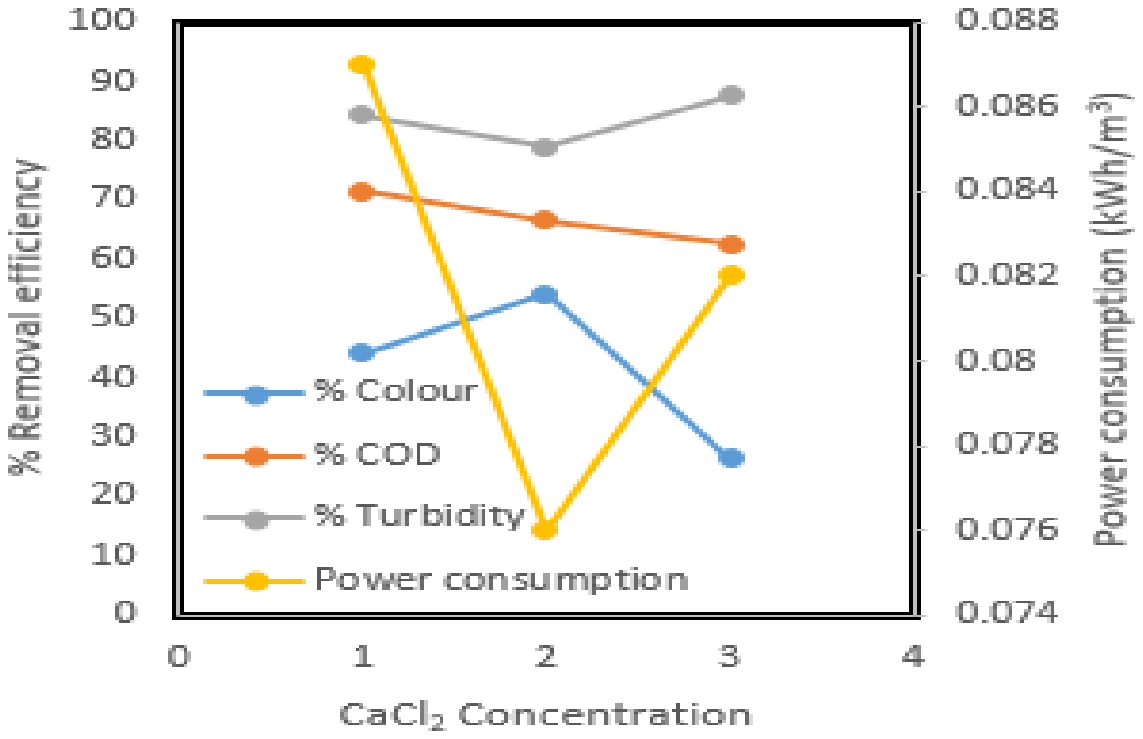


Figure 4.1.5b Effect of $CaCl_2$ concentration

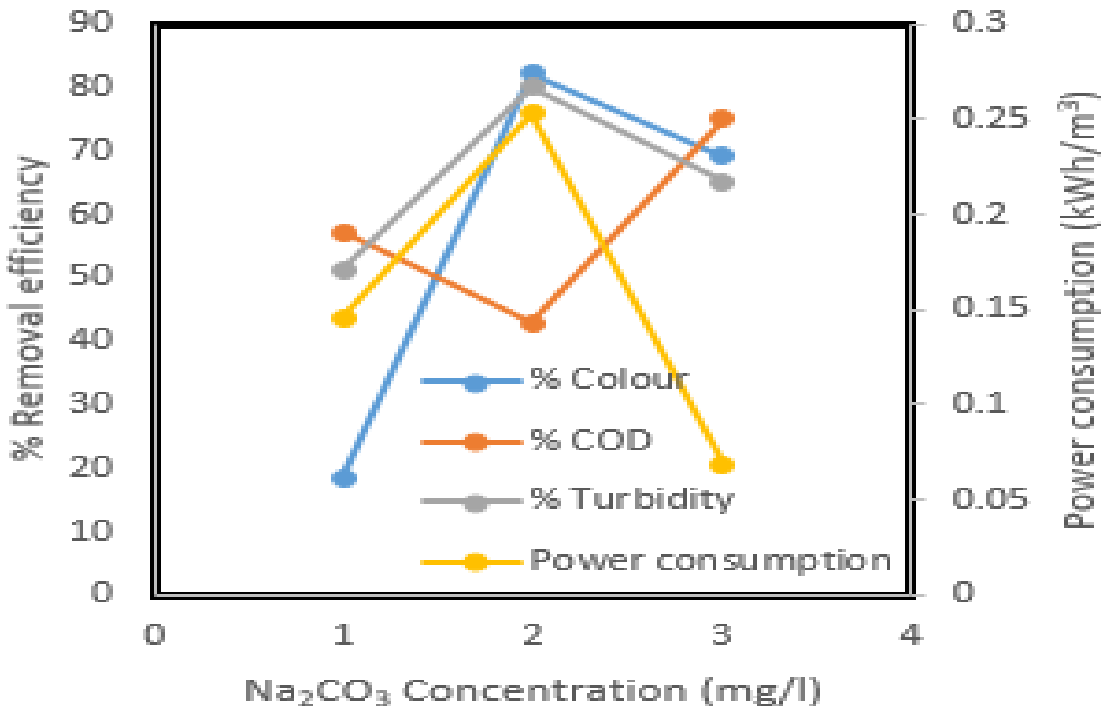


Figure 4.1.5c Effect of Na_2CO_3 concentration

4.1.6 Power consumption

Wastewater treatment techniques must be technically and economically feasible. Electrical energy consumption or power consumption is a very important economical parameters in electrochemical processes. The operating cost is mainly associated with electrical energy consumption [31, 32]. Electrical energy consumption for the electro oxidation process can be calculated by using equation-11.

Figure 4.1.1a and figure 4.1.1b shows the effect of pH on power consumption using NaCl and $CaCl_2$ respectively as a supporting electrolytes; the power consumption increases as the pH of the effluent increases. But, figure 4.1.1c shows the effect of pH on power consumption using Na_2CO_3 as a supporting electrolyte; in this case, the power consumption decreases as the pH goes from 6 to 9.

Figure 4.1.4a and figure 4.1.4c shows the effect of reaction time on power consumption using NaCl and Na_2CO_3 respectively as a supporting electrolyte; the power consumption decreases as the reaction time goes from 20 minutes to 30 minutes. But, figure 4.1.4b shows the effect of reaction time on power consumption using $CaCl_2$ as a supporting electrolyte; in this case, the power

power consumption decreases as the reaction time increases, because during electrolysis time as the electrolysis time increase the current ampere decreases this leads to the decrease in the power consumption.

Figure 4.1.5a shows the effect of NaCl concentration on power consumption; the power consumption decreases as the concentration of NaCl increases; due to the mediator of active chlorine electro-generated on the anode surface by chloride oxidation, increasing the chloride concentration increases the color, COD and turbidity removal efficiency and decreases the power consumption this is due to the increased transfer of chloride ions to the anode surface [30]. Figure 4.1.5b shows the effect of $CaCl_2$ concentration on power consumption; the power consumption increases as the concentration of $CaCl_2$ increases from 2 gm to 3 gm. Figure 4.1.5c shows the effect of Na_2CO_3 concentration on power consumption; the power consumption decreases as the concentration of Na_2CO_3 increases from 2 gm to 3 gm.

4.1.7 Evaluation of experimental results with RSM

The percentage removal of colour, COD, turbidity and power consumption are functions of variables such as current ampere, supporting electrolytes concentration, distance in-between electrodes, pH and electrolysis time.

Table 4.1.: Actual and coded values of the variables of the design of experiments

S.No	Actual values	Coded values	Values		
			-1	0	+1
1.	Current ampere	A	0.1	0.15	0.2
2.	pH	B	3	6	9
3.	Distance in-between electrode	C	1	1.5	2
4.	Electrolysis time	D	10	20	30
5.	Sodium chloride or calcium chloride or sodium carbonate	E	1	2	3

Table 4.1. Shows the actual and coded values of the variables of the design of experiments for all supporting electrolytes (i.e. NaCl, $CaCl_2$ and Na_2CO_3). But coded value of E, represents sodium chloride, calcium chloride and sodium carbonate since different supporting electrolytes were used.

The values -1, +1 and 0 indicates the minimum, maximum and average values of all operating parameters respectively.

Table 4.2. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage colour removal efficiency by electro oxidation process. Results of these tests are given for percentage colour removal efficiency. It can be seen from the Table 4.2., the cubic model was found to be aliased. For 2FI and linear models, P-value was lower than 0.02 and both of these model could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given in Table 4.2., the 2FI model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, 2FI model was chosen for further analysis.

For NaCl concentration:

For colour:

Table 4.2.: Sequential model sum of squares and Model summary statistics using NaCl for colour

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	6.461E+05	1	6.461E+05			
Linear vs Mean	35933.91	5	7186.78	28.38	< 0.0001	
2FI vs Linear	**7930.58**	**10**	**793.06**	**3.67**	**0.0002**	**Suggested**
Quadratic vs 2FI	560.08	5	112.02	0.5092	0.7689	
Cubic vs Quadratic	16324.32	30	544.14	4.11	< 0.0001	Aliased
Residual	14692.24	111	132.36			
Total	7.216E+05	162	4454.01			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	15.91	0.4763	0.4595	0.4362	42532.80	
2FI	**14.71**	**0.5814**	**0.5384**	**0.4894**	**38522.76**	**Suggested**
Quadratic	14.83	0.5889	0.5305	0.4606	40693.80	
Cubic	11.50	0.8052	0.7175	0.5799	31696.42	Aliased

The significant effects of the operating variables were determined using ANOVA and the results are given in Table 4.3. According to ANOVA, the Fisher F-values are large for colour, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface 2FI model shows that the current ampere, reaction time, pH and supporting electrolytes are the significant factors compared to the other

factors that affect the percentage removal of colour by electro oxidation. The coefficients in the 2FI term for current ampere and interaction of current ampere with pH are found to be more significant than the other interactive terms.

Table 4.4. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage COD removal efficiency by electro oxidation process. Results of these tests are given for percentage COD removal efficiency. It can be seen from the Table 4.4 the cubic model was found to be aliased. For quadratic, 2FI and linear models, P-value was lower than 0.02 and all of these three models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.4., the quadratic model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

The significant effects of the operating variables were determined using ANOVA and the results are given in Table 4.5. According to ANOVA, the Fisher F-values are large for COD, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the reaction time and distance in-between electrodes are the significant factors compared to the other factors that affect the percentage removal of COD by electro oxidation. The coefficients in the quadratic term for distance in-between electrodes and interaction of distance in-between electrodes with pH and electrolysis time are found to be more significant than the other interactive terms.

Table 4.6. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage turbidity removal efficiency by electro oxidation process. Results of these tests are given for percentage turbidity removal efficiency. It can be seen from the Table 4.6., the cubic model was found to be aliased. For 2FI and linear models, P-value was lower than 0.02 and both of these model could be used for further study as per sequential model sum of squares test.

Table 4.3.: ANOVA for Quadratic model using NaCl for colour

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	44424.58	20	2221.23	10.10	< 0.0001	significant
A	2458.89	1	2458.89	11.18	0.0011	significant
B	3320.43	1	3320.43	15.09	0.0002	significant
C	277.23	1	277.23	1.26	0.2635	
D	24660.50	1	24660.50	112.11	< 0.0001	significant
E	1663.42	1	1663.42	7.56	0.0067	significant
AB	2927.42	1	2927.42	13.31	0.0004	significant
AC	250.25	1	250.25	1.14	0.2880	
AD	327.35	1	327.35	1.49	0.2245	
AE	34.05	1	34.05	0.1548	0.6946	
BC	556.01	1	556.01	2.53	0.1141	
BD	783.46	1	783.46	3.56	0.0612	
BE	554.38	1	554.38	2.52	0.1146	
CD	166.27	1	166.27	0.7558	0.3861	
CE	109.22	1	109.22	0.4965	0.4822	
DE	89.27	1	89.27	0.4058	0.5251	
A^2	87.90	1	87.90	0.3996	0.5283	
B^2	195.94	1	195.94	0.8907	0.3469	
C^2	3.40	1	3.40	0.0155	0.9012	
D^2	105.43	1	105.43	0.4793	0.4899	
E^2	160.68	1	160.68	0.7305	0.3942	
Residual	31016.56	141	219.98			
Cor Total	75441.14	161				

The quadratic model regression equation for % colour were obtained by RSM and is given below:

$$\text{Colour (\%)} = 61.11 + 6.88A - 8.23B + 2.18C + 16.49D + 4.28E + 8.08AB + 2.32AC - 2.26AD + 0.7305AE + 3.38BC + 3.48BD + 2.92BE + 1.55CD + 1.26CE - 1.11DE - 1.65A^2 + 2.84B^2 + 0.3507C^2 - 1.71D^2 - 2.11E^2 \quad \text{..... (12)}$$

For COD

Table 4.4.: Sequential model sum of squares and Model summary statistics using NaCl for COD

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	3.495E+05	1	3.495E+05			
Linear vs Mean	71795.60	5	14359.12	134.60	< 0.0001	
2FI vs Linear	2388.17	10	238.82	2.45	0.0100	
Quadratic vs 2FI	**2712.04**	**5**	**542.41**	**6.63**	**< 0.0001**	**Suggested**
Cubic vs Quadratic	3811.76	30	127.06	1.82	0.0130	Aliased
Residual	7730.54	111	69.64			
Total	4.379E+05	162	2703.37			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	10.33	0.8118	0.8058	0.7970	17955.28	
2FI	9.88	0.8388	0.8223	0.7992	17762.49	
Quadratic	**9.05**	**0.8695**	**0.8510**	**0.8264**	**15353.90**	**Suggested**
Cubic	8.35	0.9126	0.8732	0.8111	16704.45	Aliased

As per model summary statistics results are given in Table 4.6., the 2FI model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, 2FI model was chosen for further analysis.

Table 4.5.: ANOVA for Quadratic model using NaCl for COD

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	76895.80	20	3844.79	46.97	< 0.0001	significant
A	15.99	1	15.99	0.1953	0.6592	
B	0.9998	1	0.9998	0.0122	0.9122	
C	540.79	1	540.79	6.61	0.0112	significant
D	61041.70	1	61041.70	745.68	< 0.0001	significant
E	1.23	1	1.23	0.0150	0.9026	
AB	9.47	1	9.47	0.1156	0.7343	
AC	54.62	1	54.62	0.6672	0.4154	
AD	73.48	1	73.48	0.8977	0.3450	
AE	65.84	1	65.84	0.8043	0.3713	
BC	370.72	1	370.72	4.53	0.0351	significant
BD	10.34	1	10.34	0.1263	0.7228	
BE	114.44	1	114.44	1.40	0.2391	
CD	1047.12	1	1047.12	12.79	0.0005	significant
CE	139.84	1	139.84	1.71	0.1933	
DE	75.93	1	75.93	0.9276	0.3371	
A^2	288.66	1	288.66	3.53	0.0625	
B^2	109.56	1	109.56	1.34	0.2493	
C^2	210.23	1	210.23	2.57	0.1113	
D^2	1748.17	1	1748.17	21.36	< 0.0001	significant
E^2	173.70	1	173.70	2.12	0.1474	
Residual	11542.30	141	81.86			
Cor Total	88438.10	161				

The quadratic model regression equations for % COD were obtained by RSM and is given below:

COD (%) = 34.72 + 0.5547A + 0.1428B – 3.04C + 25.94D – 0.1165E + 0.4594AB + 1.09AC – 1.07AD – 1.02AE + 2.76BC + 0.3993BD – 1.33BE + 3.90CD – 1.42CE + 1.03DE + 3.00A^2 + 2.12B^2 + 2.76C^2 + 6.97D^2 + 2.20E^2 ………………………………………………………….. (13)

For Turbidity

Table 4.6.: Sequential model sum of squares and Model summary statistics using NaCl for turbidity

Sequential model sum of squares

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Mean vs Total	5.917E+05	1	5.917E+05			
Linear vs Mean	27510.50	5	5502.10	25.89	< 0.0001	
2FI vs Linear	**9449.75**	**10**	**944.98**	**5.82**	**< 0.0001**	**Suggested**
Quadratic vs 2FI	755.09	5	151.02	0.9281	0.4648	
Cubic vs Quadratic	12680.34	30	422.68	4.57	< 0.0001	Aliased
Residual	10263.45	111	92.46			
Total	6.523E+05	162	4026.72			

Model summary statistics

Source	Std. Dev.	R^2	Adjusted R^2	Predicted R^2	PRESS	
Linear	14.58	0.4535	0.4360	0.4084	35888.18	
2FI	**12.74**	**0.6093**	**0.5692**	**0.5050**	**30029.29**	**Suggested**
Quadratic	12.76	0.6218	0.5681	0.4870	31117.22	
Cubic	9.62	0.8308	0.7546	0.6247	22762.39	Aliased

Table 4.7. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for turbidity, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting

factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface 2FI model shows that the reaction time and supporting electrolyte (i.e. NaCl) are the significant factors compared to the other factors that affect the percentage removal of turbidity by electro oxidation. The coefficients in the quadratic term for supporting electrolyte (i.e. NaCl) and interaction of supporting electrolyte (i.e. NaCl) with pH and current ampere are found to be more significant than the other interactive terms.

Table 4.8. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent power consumption by electro oxidation process. Results of these tests are given for power consumption. It can be seen from the Table 4.8 the cubic model was found to be aliased. For quadratic and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.8., the quadratic and linear models was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic and linear models was chosen for further analysis. But quadratic model was better for further analysis because, the value of R^2 for quadratic model ($R^2 – 0.5428$) was greater than that of linear model ($R^2 – 0.4472$).

Table 4.9. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for power consumption, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the current ampere, reaction time and supporting electrolyte (i.e. NaCl) are the significant factors compared to the other factors that affect the power consumption by electro oxidation. The coefficients in the quadratic term for supporting electrolyte (i.e. NaCl) and interaction of supporting electrolyte (i.e. NaCl) with current ampere and the quadratic term for reaction time and interactions of reaction time with distance in-between electrodes are found to be more significant than the other interactive terms.

Table 4.7.: ANOVA for Quadratic model using NaCl for turbidity

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	37715.34	20	1885.77	11.59	< 0.0001	significant
A	24.57	1	24.57	0.1510	0.6982	
B	295.97	1	295.97	1.82	0.1796	
C	99.99	1	99.99	0.6145	0.4344	
D	21098.68	1	21098.68	129.66	< 0.0001	significant
E	1023.09	1	1023.09	6.29	0.0133	significant
AB	900.80	1	900.80	5.54	0.0200	significant
AC	250.26	1	250.26	1.54	0.2170	
AD	181.01	1	181.01	1.11	0.2934	
AE	646.15	1	646.15	3.97	0.0482	significant
BC	3196.02	1	3196.02	19.64	< 0.0001	significant
BD	146.82	1	146.82	0.9023	0.3438	
BE	3094.74	1	3094.74	19.02	< 0.0001	significant
CD	14.90	1	14.90	0.0915	0.7627	
CE	64.10	1	64.10	0.3940	0.5312	
DE	134.78	1	134.78	0.8283	0.3643	
A^2	228.98	1	228.98	1.41	0.2375	
B^2	264.68	1	264.68	1.63	0.2043	
C^2	18.97	1	18.97	0.1166	0.7333	
D^2	223.40	1	223.40	1.37	0.2433	
E^2	3.04	1	3.04	0.0187	0.8915	
Residual	22943.80	141	162.72			
Cor Total	60659.14	161				

The quadratic model regression equations for % Turbidity were obtained by RSM and is given below:

Turbidity (%) = 66.71 + 0.6876A – 2.46B + 1.31C + 15.25D + 3.36E – 4.48AB – 2.32AC – 1.68AD + 3.18AE + 8.11BC + 1.50BD + 6.91BE + 0.4649CD + 0.9643CE – 1.37DE – $2.67A^2$ – $3.30B^2$ + $0.8284C^2$ – $2.49D^2$ – $0.2906E^2$…… (14)

For power consumption

Table 4.8.: Sequential model sum of squares and Model summary statistics using NaCl for power consumption

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	9.18	1	9.18			
Linear vs Mean	**1.35**	**5**	**0.2709**	**25.24**	**< 0.0001**	**Suggested**
2FI vs Linear	0.1683	10	0.0168	1.63	0.1033	
Quadratic vs 2FI	**0.1215**	**5**	**0.0243**	**2.47**	**0.0350**	**Suggested**
Cubic vs Quadratic	0.4919	30	0.0164	2.04	0.0041	Aliased
Residual	0.8932	111	0.0080			
Total	12.21	162	0.0754			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	**0.1036**	**0.4472**	**0.4294**	**0.4009**	**1.81**	**Suggested**
2FI	0.1016	0.5027	0.4516	0.3761	1.89	
Quadratic	**0.0991**	**0.5428**	**0.4780**	**0.3901**	**1.85**	**Suggested**
Cubic	0.0897	0.7052	0.5724	0.3588	1.94	Aliased

Table 4.9.: ANOVA for Quadratic model using NaCl for power consumption

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	1.64	20	0.0822	8.37	< 0.0001	significant
A	0.4391	1	0.4391	44.70	< 0.0001	significant
B	0.0336	1	0.0336	3.42	0.0664	
C	0.0023	1	0.0023	0.2323	0.6306	
D	0.1921	1	0.1921	19.55	< 0.0001	significant
E	0.0696	1	0.0696	7.08	0.0087	significant
AB	0.0115	1	0.0115	1.17	0.2812	
AC	0.0008	1	0.0008	0.0845	0.7717	
AD	0.0008	1	0.0008	0.0819	0.7752	
AE	0.0404	1	0.0404	4.11	0.0446	significant
BC	0.0001	1	0.0001	0.0074	0.9316	
BD	0.0030	1	0.0030	0.3041	0.5822	
BE	0.0272	1	0.0272	2.76	0.0986	
CD	0.0505	1	0.0505	5.14	0.0249	significant
CE	0.0142	1	0.0142	1.44	0.2314	
DE	0.0000	1	0.0000	0.0030	0.9565	
A^2	0.0261	1	0.0261	2.66	0.1052	
B^2	0.0522	1	0.0522	5.31	0.0226	significant
C^2	0.0178	1	0.0178	1.82	0.1799	
D^2	0.0132	1	0.0132	1.35	0.2481	
E^2	0.0208	1	0.0208	2.12	0.1477	
Residual	1.39	141	0.0098			
Cor Total	3.03	161				

The quadratic model regression equations for power consumption were obtained by RSM and is given below:

Power consumption (kWh/m^3) = 0.2842 + 0.0919A – 0.0262B + 0.0063C – 0.0460D – 0.0277E – 0.0160AB + 0.0042AC + 0.0036AD – 0.0251AE + 0.0012BC + 0.0068BD + 0.0205BE – 0.0271CD + 0.0143CE + 0.0006DE – $0.0285A^2$ – $0.0464B^2$ + $0.0254C^2$ – $0.0192D^2$ – $0.0240E^2$ …… (15)

For $CaCl_2$ concentration:

For color

Table 4.10: Sequential model sum of squares and Model summary statistics using $CaCl_2$ for colour

Sequential model sum of squares

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Mean vs Total	5.254E+05	1	5.254E+05			
Linear vs Mean	32553.90	5	6510.78	21.02	< 0.0001	
2FI vs Linear	**13263.77**	**10**	**1326.38**	**5.53**	**< 0.0001**	**Suggested**
Quadratic vs 2FI	**2599.04**	**5**	**519.81**	**2.26**	**0.0518**	**Suggested**
Cubic vs Quadratic	13574.25	30	452.47	2.66	0.0001	Aliased
Residual	18872.75	111	170.02			
Total	6.062E+05	162	3742.22			

Model summary statistics

Source	Std. Dev.	R^2	Adjusted R^2	Predicted R^2	PRESS	
Linear	17.60	0.4026	0.3834	0.3553	52130.81	
2FI	**15.49**	**0.5666**	**0.5221**	**0.4591**	**43735.43**	**Suggested**
Quadratic	**15.17**	**0.5987**	**0.5418**	**0.4615**	**43548.07**	**Suggested**
Cubic	13.04	0.7666	0.6615	0.4705	42816.97	Aliased

Table 4.10. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage colour removal efficiency by electro oxidation process. Results of these tests are given for percentage colour removal efficiency. It can be seen from the Table 4.10 the cubic model was found to be aliased. For 2FI and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.10., the quadratic and 2FI models was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic and 2FI models was chosen for further analysis. But quadratic model was better for further analysis because, the value of R^2 for quadratic model (R^2 – 0.5987) was greater than that of 2FI model (R^2 – 0.5666).

Table 4.11. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for colour, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the reaction time and distance in-between electrodes are the significant factors compared to the other factors that affect the percentage colour removal by electro oxidation. The coefficients in the quadratic term for distance in-between electrodes and interaction of distance in-between electrodes with current ampere and pH are found to be more significant than the other interactive terms.

Table 4.12. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage COD removal efficiency by electro oxidation process. Results of these tests are given for percentage COD removal efficiency. It can be seen from the Table 4.12 the cubic model was found to be aliased. For quadratic and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.12., the quadratic and linear models was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased.

Table 4.11.: ANOVA for Quadratic model using $CaCl_2$ for colour

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	48416.71	20	2420.84	10.52	< 0.0001	significant
A	688.35	1	688.35	2.99	0.0859	
B	3.30	1	3.30	0.0143	0.9049	
C	1684.18	1	1684.18	7.32	0.0077	significant
D	21979.18	1	21979.18	95.51	< 0.0001	significant
E	56.10	1	56.10	0.2438	0.6223	
AB	190.17	1	190.17	0.8264	0.3649	
AC	7178.65	1	7178.65	31.20	< 0.0001	significant
AD	235.57	1	235.57	1.02	0.3134	
AE	499.00	1	499.00	2.17	0.1431	
BC	2872.17	1	2872.17	12.48	0.0006	significant
BD	138.38	1	138.38	0.6013	0.4394	
BE	822.02	1	822.02	3.57	0.0608	
CD	552.84	1	552.84	2.40	0.1234	
CE	393.56	1	393.56	1.71	0.1931	
DE	0.6272	1	0.6272	0.0027	0.9584	
A^2	827.01	1	827.01	3.59	0.0600	
B^2	15.93	1	15.93	0.0692	0.7929	
C^2	58.84	1	58.84	0.2557	0.6139	
D^2	244.21	1	244.21	1.06	0.3047	
E^2	1474.39	1	1474.39	6.41	0.0125	significant
Residual	32446.99	141	230.12			
Cor Total	80863.71	161				

The quadratic model regression equations for % colour were obtained by RSM and is given below:

Colour (%) = 59.17 + 3.64A + 0.2594B + 5.37C + 15.57D + 0.7865E – 2.06AB – 12.45AC – 1.92AD – 2.80AE + 7.69BC + 1.46BD + 3.56BE + 2.83CD – 2.39CE + 0.0933DE – $5.07A^2$ + $0.8100B^2$ + $1.46C^2$ – $2.60D^2$ + $6.40E^2$ …….. (16)

For COD

Table 4.12.: Sequential model sum of squares and Model summary statistics using $CaCl_2$ for COD

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	3.444E+05	1	3.444E+05			
Linear vs Mean	**73710.70**	**5**	**14742.14**	**151.46**	**< 0.0001**	**Suggested**
2FI vs Linear	317.35	10	31.73	0.3117	0.9772	
Quadratic vs 2FI	**2189.92**	**5**	**437.98**	**4.87**	**0.0004**	**Suggested**
Cubic vs Quadratic	3811.47	30	127.05	1.59	0.0434	Aliased
Residual	8864.89	111	79.86			
Total	4.332E+05	162	2674.37			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	**9.87**	**0.8292**	**0.8237**	**0.8160**	**16353.89**	**Suggested**
2FI	10.09	0.8328	0.8156	0.7924	18457.84	
Quadratic	**9.48**	**0.8574**	**0.8372**	**0.8092**	**16960.95**	**Suggested**
Cubic	8.94	0.9003	0.8554	0.7874	18894.83	Aliased

Therefore, quadratic and linear models was chosen for further analysis. But quadratic model was better for further analysis because, the value of R^2 for quadratic model (R^2 – 0.8574) was greater than that of linear model (R^2 – 0.8292).

Table 4.13.: ANOVA for Quadratic model using $CaCl_2$ for COD

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	76217.97	20	3810.90	42.39	< 0.0001	significant
A	12.55	1	12.55	0.1396	0.7092	
B	1.33	1	1.33	0.0148	0.9033	
C	32.17	1	32.17	0.3579	0.5506	
D	62387.87	1	62387.87	693.94	< 0.0001	significant
E	228.54	1	228.54	2.54	0.1131	
AB	6.32	1	6.32	0.0703	0.7913	
AC	1.30	1	1.30	0.0144	0.9046	
AD	38.32	1	38.32	0.4262	0.5149	
AE	26.38	1	26.38	0.2934	0.5889	
BC	0.7374	1	0.7374	0.0082	0.9280	
BD	37.36	1	37.36	0.4155	0.5202	
BE	9.64	1	9.64	0.1072	0.7438	
CD	56.64	1	56.64	0.6300	0.4287	
CE	41.93	1	41.93	0.4664	0.4958	
DE	74.44	1	74.44	0.8280	0.3644	
A^2	477.20	1	477.20	5.31	0.0227	significant
B^2	0.9464	1	0.9464	0.0105	0.9184	
C^2	17.53	1	17.53	0.1950	0.6595	
D^2	1684.46	1	1684.46	18.74	< 0.0001	significant
E^2	18.84	1	18.84	0.2096	0.6478	
Residual	12676.35	141	89.90			
Cor Total	88894.32	161				

Table 4.13. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for COD, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the reaction time was the significant factor compared to the other factors that affect the percentage COD removal by electro oxidation. The coefficients in the quadratic term for reaction time are found to be more significant than the other interactive terms.

The quadratic model regression equations for % COD were obtained by RSM and is given below:

$$COD\ (\%) = 39.30 - 0.4915A - 0.1649B + 0.7425C + 26.23D - 1.59E - 0.3754AB - 0.1673AC + 0.7749AD - 0.6429AE - 0.1233BC + 0.7589BD + 0.3855BE + 0.9064CD + 0.7799CE - 1.02DE + 3.85A^2 - 0.1975B^2 - 0.7963C^2 + 6.84D^2 + 0.7234E^2 \quad \ldots\ldots (17)$$

Table 4.14. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage turbidity removal efficiency by electro oxidation process. Results of these tests are given for percentage turbidity removal efficiency. It can be seen from the Table 4.14 the cubic model was found to be aliased. For quadratic, 2FI and linear models, P-value was lower than 0.02 and all of these three models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.14., the quadratic model was found to have maximum “Adjusted R^2” and “Predicted R^2” values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

Table 4.15. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for turbidity, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the pH, distance in-between electrode and reaction time are the significant factor compared to the other factors that affect the percentage

turbidity removal by electro oxidation. The coefficients in the quadratic term for reaction time and interaction of reaction time with current ampere and pH are found to be more significant than the other interactive terms.

For Turbidity

Table 4.14.: Sequential model sum of squares and Model summary statistics using $CaCl_2$ for turbidity

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	5.953E+05	1	5.953E+05			
Linear vs Mean	27894.07	5	5578.81	25.89	< 0.0001	
2FI vs Linear	11604.35	10	1160.43	7.70	< 0.0001	
Quadratic vs 2FI	**3220.04**	**5**	**644.01**	**4.83**	**0.0004**	**Suggested**
Cubic vs Quadratic	8119.34	30	270.64	2.82	< 0.0001	Aliased
Residual	10670.91	111	96.13			
Total	6.568E+05	162	4054.18			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	14.68	0.4535	0.4360	0.4118	36179.71	
2FI	12.28	0.6422	0.6054	0.5677	26589.55	
Quadratic	**11.54**	**0.6945**	**0.6512**	**0.6055**	**24266.50**	**Suggested**
Cubic	9.80	0.8265	0.7484	0.6553	21201.23	Aliased

Table 4.15.: ANOVA for Quadratic model using $CaCl_2$ for turbidity

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	42718.45	20	2135.92	16.03	< 0.0001	significant
A	508.72	1	508.72	3.82	0.0527	
B	1175.43	1	1175.43	8.82	0.0035	
C	919.91	1	919.91	6.90	0.0096	
D	22338.64	1	22338.64	167.63	< 0.0001	
E	2.73	1	2.73	0.0205	0.8864	
AB	107.31	1	107.31	0.8053	0.3710	
AC	131.07	1	131.07	0.9836	0.3230	
AD	896.14	1	896.14	6.72	0.0105	
AE	44.04	1	44.04	0.3305	0.5663	
BC	5489.60	1	5489.60	41.19	< 0.0001	
BD	1196.24	1	1196.24	8.98	0.0032	
BE	60.57	1	60.57	0.4545	0.5013	
CD	359.51	1	359.51	2.70	0.1027	
CE	235.58	1	235.58	1.77	0.1858	
DE	66.32	1	66.32	0.4976	0.4817	
A^2	64.35	1	64.35	0.4829	0.4883	
B^2	373.74	1	373.74	2.80	0.0962	
C^2	2048.75	1	2048.75	15.37	0.0001	
D^2	171.73	1	171.73	1.29	0.2582	
E^2	842.39	1	842.39	6.32	0.0131	
Residual	18790.25	141	133.26			
Cor Total	61508.71	161				

The quadratic model regression equations for % Turbidity were obtained by RSM and is given below:

Turbidity (%) = 53.97 + 3.13A – 4.90B – 3.97C + 15.69D + 0.1735E + 1.55AB – 1.67AC – 3.75AD + 0.8308AE + 10.64BC + 4.29BD + 0.9664BE + 2.28CD – 1.85CE – 0.9597DE + $1.41A^2$ – $3.92B^2$ + $8.61C^2$ – $2.18D^2$ + $4.84E^2$…… (18)

For power consumption

Table 4.16.: Sequential model sum of squares and Model summary statistics using $CaCl_2$ for power consumption

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	8.04	1	8.04			
Linear vs Mean	1.44	5	0.2875	33.13	< 0.0001	
2FI vs Linear	0.1359	10	0.0136	1.63	0.1035	
Quadratic vs 2FI	**0.1614**	**5**	**0.0323**	**4.31**	**0.0011**	**Suggested**
Cubic vs Quadratic	0.3163	30	0.0105	1.58	0.0454	Aliased
Residual	0.7400	111	0.0067			
Total	10.83	162	0.0669			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	0.0932	0.5150	0.4995	0.4763	1.46	
2FI	0.0913	0.5637	0.5189	0.4605	1.51	
Quadratic	**0.0866**	**0.6215**	**0.5679**	**0.4959**	**1.41**	**Suggested**
Cubic	0.0817	0.7349	0.6155	0.4114	1.64	Aliased

Table 4.17: ANOVA for Quadratic model using $CaCl_2$ for power consumption

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	1.73	20	0.0867	11.58	< 0.0001	significant
A	0.7107	1	0.7107	94.86	< 0.0001	significant
B	0.0057	1	0.0057	0.7575	0.3856	
C	0.0202	1	0.0202	2.70	0.1025	
D	0.2193	1	0.2193	29.27	< 0.0001	significant
E	0.0745	1	0.0745	9.94	0.0020	significant
AB	0.0087	1	0.0087	1.16	0.2843	
AC	0.0038	1	0.0038	0.5082	0.4771	
AD	0.0520	1	0.0520	6.94	0.0094	significant
AE	0.0100	1	0.0100	1.34	0.2494	
BC	0.0549	1	0.0549	7.32	0.0076	significant
BD	0.0014	1	0.0014	0.1869	0.6662	
BE	0.0049	1	0.0049	0.6486	0.4220	
CD	0.0131	1	0.0131	1.75	0.1885	
CE	0.0064	1	0.0064	0.8524	0.3575	
DE	0.0020	1	0.0020	0.2635	0.6085	
A^2	0.1305	1	0.1305	17.42	< 0.0001	significant
B^2	0.0018	1	0.0018	0.2358	0.6280	
C^2	0.0117	1	0.0117	1.57	0.2125	
D^2	0.0156	1	0.0156	2.08	0.1518	
E^2	0.0054	1	0.0054	0.7265	0.3955	
Residual	1.06	141	0.0075			
Cor Total	2.79	161				

Table 4.16. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent power consumption by electro oxidation process. Results of these tests are given for power consumption. It can be seen from the Table 4.16 the cubic model was found to be aliased. For quadratic and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.16., the quadratic model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

Table 4.17. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for power consumption, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the current ampere, reaction time and supporting electrolyte (i.e. $CaCl_2$) are the significant factor compared to the other factors that affect the power consumption by electro oxidation. The coefficients in the quadratic term for current ampere and interaction of current ampere with reaction time are found to be more significant than the other interactive terms.

The quadratic model regression equations for power consumption were obtained by RSM and is given below:

Power consumption (kWh/m^3) = 0.2392 + 0.1169A – 0.0108B – 0.0186C – 0.0492D – 0.0287E + 0.0139AB + 0091AC – 0.0285AD – 0.0125AE – 0.0336BC + 0.0046BD – 0.0087BE + 0.0138CD + 0.0096CE + 0.0052DE – $0.0637A^2$ – $0.0085B^2$ + $0.0206C^2$ – $0.0208D^2$ + $0.0123E^2$ …… (19)

For Na_2CO_3 concentration:

For colour

Table 4.18.: Sequential model sum of squares and Model summary statistics using Na_2CO_3 for colour

Sequential model sum of squares

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Mean vs Total	6.229E+05	1	6.229E+05			
Linear vs Mean	23187.16	5	4637.43	30.23	< 0.0001	
2FI vs Linear	6417.51	10	641.75	5.35	< 0.0001	
Quadratic vs 2FI	**2758.28**	**5**	**551.66**	**5.27**	**0.0002**	**Suggested**
Cubic vs Quadratic	6912.69	30	230.42	3.26	< 0.0001	Aliased
Residual	7845.08	111	70.68			
Total	6.701E+05	162	4136.17			

Model summary statistics

Source	Std. Dev.	R^2	Adjusted R^2	Predicted R^2	PRESS	
Linear	12.39	0.4921	0.4758	0.4499	25920.00	
2FI	10.95	0.6283	0.5901	0.5317	22066.80	
Quadratic	**10.23**	**0.6868**	**0.6424**	**0.5760**	**19977.07**	**Suggested**
Cubic	8.41	0.8335	0.7585	0.6477	16602.19	Aliased

Table 4.18. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage colour removal by electro oxidation process. Results of these tests are given for percentage colour removal. It can be seen from the Table 4.18 the cubic model was found to be aliased. For quadratic, 2FI and linear models, P-value was lower than 0.02 and all of these three models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.18., the quadratic model was found to have maximum "Adjusted R^2" and

"Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

Table 4.19. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for colour, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the reaction time and supporting electrolyte (i.e. Na_2CO_3) are the significant factor compared to the other factors that affect the percentage colour removal by electro oxidation. The coefficients in the quadratic term for supporting electrolyte (i.e. Na_2CO_3) and interaction of supporting electrolyte (i.e. Na_2CO_3) with pH are found to be more significant than the other interactive terms.

Table 4.20. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage COD removal by electro oxidation process. Results of these tests are given for percentage COD removal. It can be seen from the Table 4.20 the cubic model was found to be aliased. For quadratic and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.20., the quadratic model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

Table 4.21. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for COD, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the reaction time was the significant factor compared to the other factors that affect the percentage COD removal by electro oxidation.

Table 4.19.: ANOVA for Quadratic model using Na_2CO_3 for colour

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	32362.96	20	1618.15	15.46	< 0.0001	significant
A	7.12	1	7.12	0.0680	0.7947	
B	93.46	1	93.46	0.8930	0.3463	
C	56.95	1	56.95	0.5441	0.4619	
D	18492.27	1	18492.27	176.68	< 0.0001	significant
E	1370.85	1	1370.85	13.10	0.0004	significant
AB	1671.15	1	1671.15	15.97	0.0001	significant
AC	359.80	1	359.80	3.44	0.0658	
AD	32.48	1	32.48	0.3104	0.5783	
AE	38.11	1	38.11	0.3641	0.5472	
BC	934.24	1	934.24	8.93	0.0033	significant
BD	112.05	1	112.05	1.07	0.3026	
BE	581.38	1	581.38	5.55	0.0198	significant
CD	31.22	1	31.22	0.2983	0.5858	
CE	136.40	1	136.40	1.30	0.2556	
DE	134.75	1	134.75	1.29	0.2584	
A^2	0.3317	1	0.3317	0.0032	0.9552	
B^2	141.93	1	141.93	1.36	0.2462	
C^2	299.21	1	299.21	2.86	0.0931	
D^2	437.32	1	437.32	4.18	0.0428	significant
E^2	1962.83	1	1962.83	18.75	< 0.0001	significant
Residual	14757.77	141	104.67			
Cor Total	47120.72	161				

The quadratic model regression equations for % colour were obtained by RSM and is given below:

Colour (%) = 68.61 – 0.3701A – 1.38B – 0.9878C + 14.28D + 3.89E – 6.10AB – 2.79AC – 0.7135AD – 0.7728AE – 4.39BC + 1.31BD – 2.99BE + 0.6730CD – 1.41CE – 1.37DE – $0.1015A^2$ – $2.42B^2$ + $3.29C^2$ – $3.49D^2$ – $7.38E^2$ …….... (20)

For COD

Table 4.20.: Sequential model sum of squares and Model summary statistics using Na_2CO_3 for COD

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	3.290E+05	1	3.290E+05			
Linear vs Mean	84843.42	5	16968.68	164.84	< 0.0001	
2FI vs Linear	1259.86	10	125.99	1.24	0.2686	
Quadratic vs 2FI	**4494.04**	**5**	**898.81**	**12.30**	**< 0.0001**	**Suggested**
Cubic vs Quadratic	4346.69	30	144.89	2.70	< 0.0001	Aliased
Residual	5957.88	111	53.67			
Total	4.299E+05	162	2654.01			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	10.15	0.8409	0.8357	0.8282	17331.94	
2FI	10.07	0.8533	0.8383	0.8178	18380.47	
Quadratic	**8.55**	**0.8979**	**0.8834**	**0.8640**	**13725.10**	**Suggested**
Cubic	7.33	0.9410	0.9144	0.8761	12504.18	Aliased

The coefficients in the quadratic term for reaction time was found to be more significant than the other interactive terms.

Table 4.21.: ANOVA for Quadratic model using Na_2CO_3 for COD

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	90597.32	20	4529.87	61.98	< 0.0001	significant
A	12.90	1	12.90	0.1765	0.6750	
B	98.31	1	98.31	1.35	0.2481	
C	8.54	1	8.54	0.1168	0.7330	
D	72191.44	1	72191.44	987.81	< 0.0001	significant
E	52.17	1	52.17	0.7139	0.3996	
AB	13.69	1	13.69	0.1874	0.6658	
AC	59.71	1	59.71	0.8170	0.3676	
AD	79.43	1	79.43	1.09	0.2989	
AE	9.19	1	9.19	0.1257	0.7234	
BC	502.24	1	502.24	6.87	0.0097	significant
BD	5.80	1	5.80	0.0794	0.7786	
BE	74.89	1	74.89	1.02	0.3131	
CD	1.25	1	1.25	0.0171	0.8963	
CE	43.27	1	43.27	0.5920	0.4429	
DE	13.50	1	13.50	0.1848	0.6680	
A^2	147.46	1	147.46	2.02	0.1577	
B^2	12.58	1	12.58	0.1721	0.6789	
C^2	251.57	1	251.57	3.44	0.0656	significant
D^2	3754.63	1	3754.63	51.38	< 0.0001	significant
E^2	237.37	1	237.37	3.25	0.0736	
Residual	10304.57	141	73.08			
Cor Total	1.009E+05	161				

The quadratic model regression equations for % COD were obtained by RSM and is given below:

COD (%) = 33.09 – 0.4982A + 1.42B + 0.3824C + 28.21D – 0.7585E – 0.5525AB + 1.14AC – 1.12AD – 0.3794AE + 3.22BC + 0.2990BD – 1.07BE + 0.1345CD – 0.7922CE – 0.4331DE + 2.14A^2 + 0.7198B^2 + 3.02C^2 + 10.21D^2 + 2.57E^2 ………………………………………… (21)

For Turbidity

Table 4.22.: Sequential model sum of squares and Model summary statistics using Na_2CO_3 for turbidity

Sequential model sum of squares

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Mean vs Total	6.796E+05	1	6.796E+05			
Linear vs Mean	21067.06	5	4213.41	31.37	< 0.0001	
2FI vs Linear	**4813.89**	**10**	**481.39**	**4.35**	**< 0.0001**	**Suggested**
Quadratic vs 2FI	1135.96	5	227.19	2.14	0.0647	
Cubic vs Quadratic	7896.28	30	263.21	4.11	< 0.0001	Aliased
Residual	7106.62	111	64.02			
Total	7.216E+05	162	4454.52			

Model summary statistics

Source	Std. Dev.	R^2	Adjusted R^2	Predicted R^2	PRESS	
Linear	11.59	0.5014	0.4854	0.4578	22783.10	
2FI	**10.51**	**0.6159**	**0.5765**	**0.5084**	**20658.90**	**Suggested**
Quadratic	10.32	0.6430	0.5923	0.5089	20634.30	
Cubic	8.00	0.8309	0.7547	0.6084	16454.36	Aliased

Table 4.22. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent percentage turbidity removal by electro oxidation process. Results of these tests are given for percentage turbidity removal. It can be seen from the Table 4.22 the cubic model was found to be aliased. For

2FI and linear models, P-value was lower than 0.02 and both of these models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.22., the 2FI model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, 2FI model was chosen for further analysis.

Table 4.23. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for turbidity, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface 2FI model shows that the pH, reaction time and supporting electrolyte (i.e. Na_2CO_3) are the significant factor compared to the other factors that affect the percentage turbidity removal by electro oxidation. The coefficients in the 2FI term for supporting electrolyte (i.e. Na_2CO_3) and interaction of supporting electrolyte (i.e. Na_2CO_3) with current ampere and pH are found to be more significant than the other interactive terms.

Table 4.24. Shows two different tests namely sequential model sum of squares and model summary statistics were employed to decide about the adequacy of various models to represent power consumption by electro oxidation process. Results of these tests are given for power consumption. It can be seen from the Table 4.24 the cubic model was found to be aliased. For quadratic, 2FI and linear models, P-value was lower than 0.02 and all of these three models could be used for further study as per sequential model sum of squares test. As per model summary statistics results are given Table 4.24., the quadratic model was found to have maximum "Adjusted R^2" and "Predicted R^2" values excluding cubic model which was aliased. Therefore, quadratic model was chosen for further analysis.

Table 4.23.: ANOVA for Quadratic model using Na_2CO_3 for turbidity

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	27016.90	20	1350.85	12.70	< 0.0001	significant
A	5.04	1	5.04	0.0474	0.8280	
B	720.31	1	720.31	6.77	0.0103	
C	153.68	1	153.68	1.44	0.2315	
D	16092.94	1	16092.94	151.24	< 0.0001	
E	1165.42	1	1165.42	10.95	0.0012	
AB	31.83	1	31.83	0.2991	0.5853	
AC	280.28	1	280.28	2.63	0.1068	
AD	21.74	1	21.74	0.2043	0.6520	
AE	800.56	1	800.56	7.52	0.0069	
BC	1598.44	1	1598.44	15.02	0.0002	
BD	36.98	1	36.98	0.3476	0.5564	
BE	867.79	1	867.79	8.16	0.0049	
CD	141.83	1	141.83	1.33	0.2502	
CE	27.43	1	27.43	0.2577	0.6125	
DE	177.16	1	177.16	1.66	0.1990	
A^2	267.15	1	267.15	2.51	0.1153	
B^2	436.36	1	436.36	4.10	0.0447	
C^2	437.24	1	437.24	4.11	0.0445	
D^2	165.88	1	165.88	1.56	0.2139	
E^2	0.9195	1	0.9195	0.0086	0.9261	
Residual	15002.90	141	106.40			
Cor Total	42019.80	161				

The quadratic model regression equations for % Turbidity were obtained by RSM and is given below:

Turbidity (%) = 70.22 – 0.3114A + 3.83B – 1.62C + 13.32D + 3.58E + 0.8424AB – 2.46AC + 0.5837AD – 3.54AE + 5.74BC + 0.7552BD + 3.66BE + 1.43CD + 0.6308CE – 1.57DE – $2.88A^2$ – $4.24B^2$ + $3.98C^2$ – $2.15D^2$ + $0.1598E^2$ …….. (22)

Table 4.24.: Sequential model sum of squares and Model summary statistics using Na_2CO_3 for power consumption

Sequential model sum of squares

Source	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**	
Mean vs Total	11.48	1	11.48			
Linear vs Mean	1.25	5	0.2504	23.79	< 0.0001	
2FI vs Linear	0.3141	10	0.0314	3.45	0.0004	
Quadratic vs 2FI	**0.1039**	**5**	**0.0208**	**2.39**	**0.0406**	**Suggested**
Cubic vs Quadratic	0.7596	30	0.0253	6.06	< 0.0001	Aliased
Residual	0.4641	111	0.0042			
Total	14.37	162	0.0887			

Model summary statistics

Source	**Std. Dev.**	**R^2**	**Adjusted R^2**	**Predicted R^2**	**PRESS**	
Linear	0.1026	0.4327	0.4145	0.3854	1.78	
2FI	0.0954	0.5412	0.4941	0.4288	1.65	
Quadratic	**0.0932**	**0.5771**	**0.5171**	**0.4388**	**1.62**	**Suggested**
Cubic	0.0647	0.8396	0.7674	0.6378	1.05	Aliased

Table 4.25.: ANOVA for Quadratic model using Na_2CO_3 for power consumption

ANOVA for response surface quadratic model

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	1.67	20	0.0835	9.62	< 0.0001	significant
A	0.5329	1	0.5329	61.40	< 0.0001	significant
B	0.0077	1	0.0077	0.8872	0.3479	
C	0.0269	1	0.0269	3.10	0.0807	
D	0.4124	1	0.4124	47.52	< 0.0001	significant
E	0.0107	1	0.0107	1.23	0.2691	
AB	0.0156	1	0.0156	1.79	0.1828	
AC	6.535E-06	1	6.535E-06	0.0008	0.9781	
AD	0.0339	1	0.0339	3.91	0.0500	significant
AE	0.0116	1	0.0116	1.33	0.2501	
BC	0.1709	1	0.1709	19.69	< 0.0001	significant
BD	0.0001	1	0.0001	0.0148	0.9035	
BE	0.0211	1	0.0211	2.44	0.1208	
CD	0.0015	1	0.0015	0.1695	0.6812	
CE	0.0290	1	0.0290	3.34	0.0698	
DE	0.0032	1	0.0032	0.3718	0.5430	
A^2	0.0406	1	0.0406	4.68	0.0322	significant
B^2	0.0007	1	0.0007	0.0779	0.7806	
C^2	0.0063	1	0.0063	0.7209	0.3973	
D^2	0.0409	1	0.0409	4.71	0.0316	significant
E^2	0.0100	1	0.0100	1.16	0.2839	
Residual	1.22	141	0.0087			
Cor Total	2.89	161				

The quadratic model regression equations for power consumption were obtained by RSM and is given below:

Power consumption (kWh/m^3) = 0.3147 + 0.1013A – 0.0125B – 0.0215C – 0.0674D + 0.0109E + 0.0186AB – 0.0004AC – 0.0231AD – 0.0135AE – 0.0593BC + 0.0014BD + 0.0181BE + 0.0046CD + 0.0205CE + 0.0067DE – $0.0355A^2$ – $0.0053B^2$ + $0.0150C^2$ – $0.0337D^2$ – $0.0167E^2$ …… (23)

Where; A is current ampere, B is pH, C is distance in-between electrode, D is Electrolysis time and E is Supporting electrolyte (i.e. either NaCl or $CaCl_2$ or Na_2CO_3)

Table 4.25. Shows the significant effect of the operating variables using ANOVA. According to ANOVA, the Fisher F-values are large for power consumption, indicating that the variation in the response can be explained by this model equation. The associated P-value is used to estimate where F is large enough to indicate whether the model is statistically significant. Any factor or interacting factors with $P < 0.05$ is considered to be statistically significant. The ANOVA table obtained from the response surface quadratic model shows that the current ampere and reaction time are the significant factors compared to the other factors that affect the power consumption by electro oxidation. The coefficients in the quadratic term for current ampere and interaction of current ampere with reaction time are found to be more significant than the other interactive terms.
Experimental design matrix and response based on the experimental (actual) values and predicted values on the colour, COD, turbidity and power consumption for sodium chloride, calcium chloride and sodium carbonate was shown on Appendix D, Appendix E and Appendix F respectively.

The performance of model equation was analyzed based on the adequacy, significance, the effects of the interacting operating parameters and optimization from maximum efficiency. The predicted values from the model were compared with the experimental values for COD was shown on figure 4.1.7a, 4.1.7b and 4.1.7c for NaCl, $CaCl_2$ and Na_2CO_3 respectively. It was observed that the model predictions match with the experimental values and the data points lay close to the diagonal line. But, the predicted values from the model were compared with the experimental values for colour, turbidity and power consumption was shown on Appendix G, Appendix H and Appendix I for all supporting electrolytes.

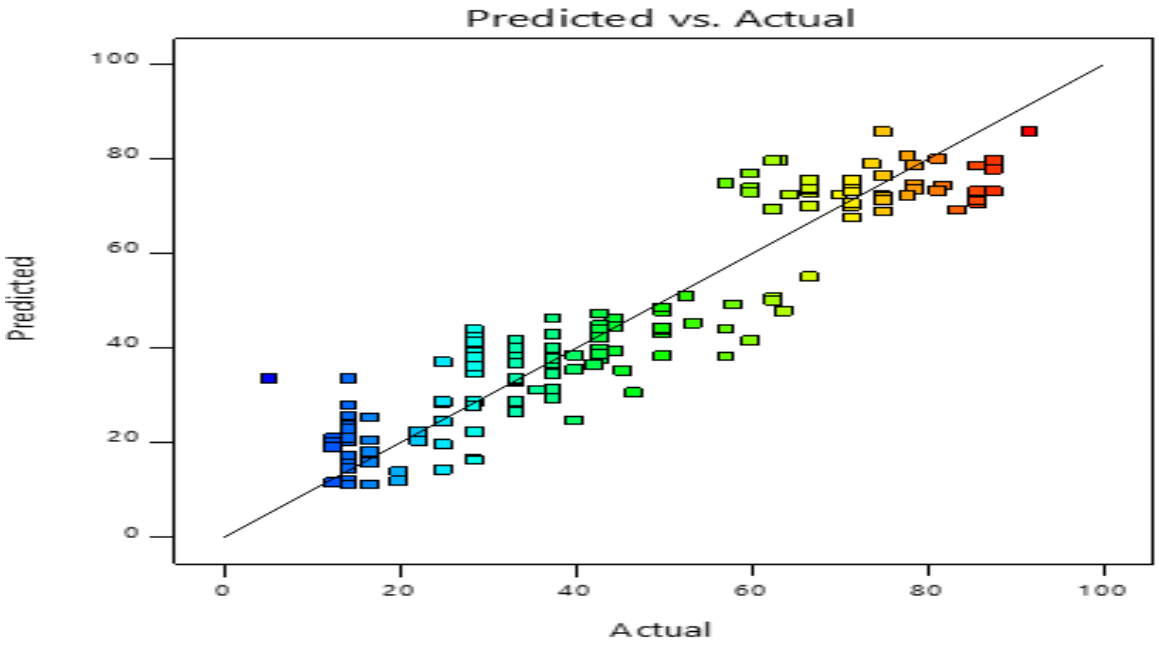


Figure 4.1.7a Plot for relationship between experimental and predicted value for percentage COD removal using NaCl.

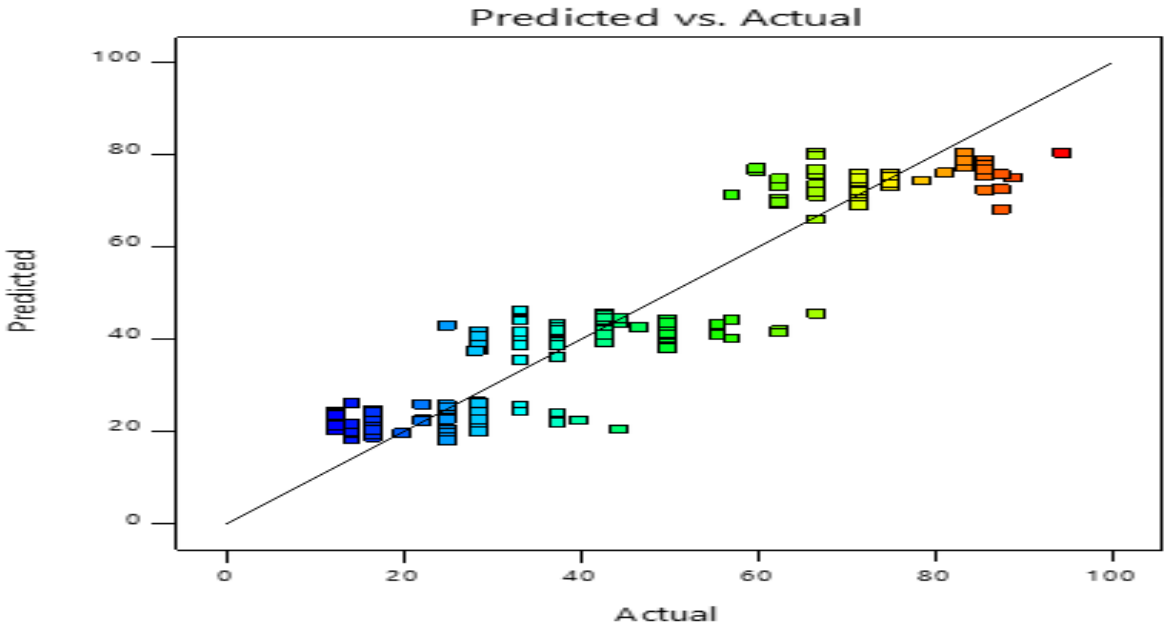


Figure 4.1.7b Plot for relationship between experimental and predicted value for percentage COD removal using $CaCl_2$.

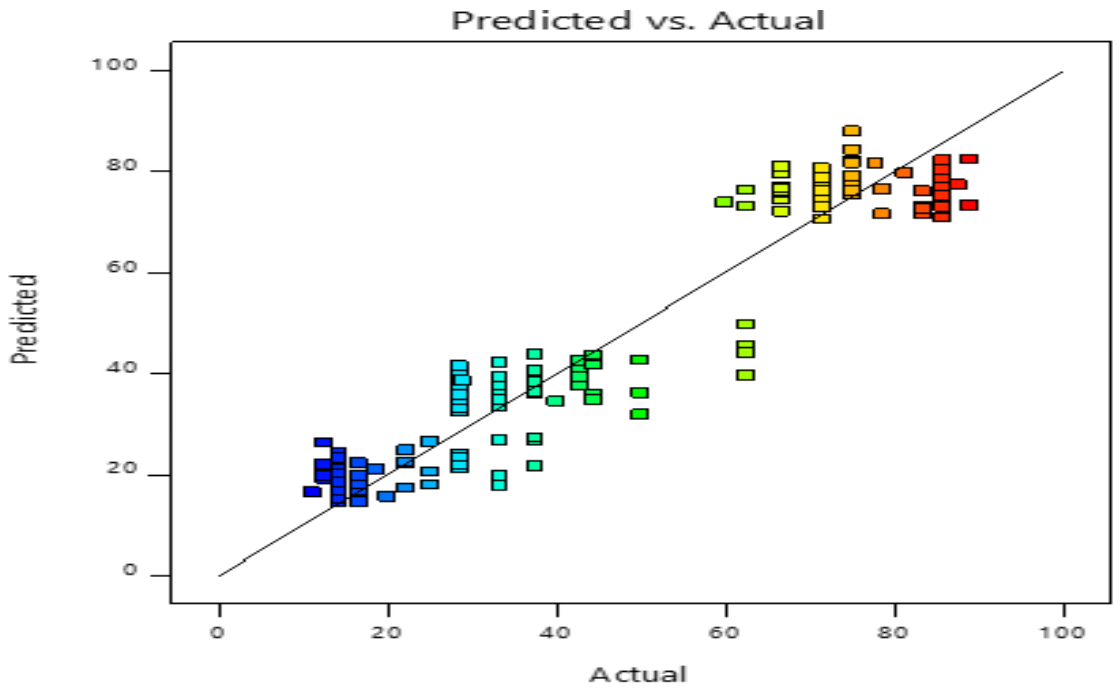


Figure 4.1.7c Plot for relationship between experimental and predicted value for percentage COD removal using Na_2CO_3.

4.2 Operating cost

Cost estimation analysis during the wastewater treatment process includes cost of electricity, chemical reagent, labor and equipment. The most important parameters that affect operating cost are cost of electrode material and consumed electrical energy. Thus, the operating cost based on electrode material, electrical energy and chemical consumed was calculated using the following equation [27, 29 & 30].

Operating cost $= aC_{energy} + bC_{electrode} + D$ …….. (24)

Where a = energy cost 0.056 kWhr, b = cost of stainless steel, C_{energy} = energy consumed in kWhr/m^3, $C_{electrode}$ = Electrode consumed in kg/m^3 of stainless steel and D = cost of chemicals consumed in kg/m^3 (D = cost of salt + cost of acid = 1.065$/$m^3$).

Cost of electrical energy (kWhr/m^3) was calculated by using equation-11 (page 18).

Cost of electrode (kg/m^3) is calculated by the following equation according to Faradays law:

$C_{electrodes}$ (kg/m^3) $= \frac{I*t*M}{n*F*V}$ …… (25)

Where I = is the current ampere (A), t = is the time of electrolysis (s), M = molecular mass of stainless steel (55.845g/mol), n = number of electrons transferred (z = 2), Faradays constant (96,487C/mol) and V = volume of effluent (m^3)

Under optimum condition the operating cost was 1.076\$/m^3 for NaCl, 1.077\$/m^3 for $CaCl_2$ and 1.072\$/m^3 for Na_2CO_3 at a pH of 8.99, current ampere of 0.18A, reaction time 30 minutes, distance in-between electrode 2 cm and NaCl concentration 3 gm/L, $CaCl_2$ concentration 1 gm/L and Na_2CO_3 concentration 2.40 gm/L.

4.3 Optimization of operating parameters by using Response Surface Methodology

During removal efficiencies of colour, COD and turbidity and power consumption different parameters were under considerations. These are:

4.3.1 Effects of supporting electrolytes

Effects of supporting electrolyte type on the turbidity, color and COD removal by electro oxidation was investigated at wastewater pH, current ampere, supporting electrolyte concentration, electrolysis time and distance in-between electrode. Supporting electrolyte types were selected different salt types such as NaCl, $CaCl_2$ and Na_2CO_3 which have a solubility in aqueous media. As can be seen from the results, the presence of the supporting electrolyte in wastewater medium increased removal efficiency significantly. Turbidity, color and COD removal efficiency was found to be 92.19%, 94.76% and 77.93% respectively for NaCl, 90. 00%, 99.97% and 79.11% respectively for $CaCl_2$ and 94.20%, 83.41% and 83.11% respectively for Na_2CO_3. This is observed that increasing the chloride concentration increases the color removal efficiency and this is due to the increased transfer of chloride ions to the anode surface [29, 30].

In experiments, NaCl, $CaCl_2$ and Na_2CO_3 were chosen as a supporting electrolytes to enhance the degradation efficiency and shorten the treatment time according to the findings of other authors. Their results showed that the presence of chloride ions played an important role. Almost total decolorization was obtained with $CaCl_2$ and when a low removal was obtained with Na_2CO_3.

4.3.1.1 Effect of sodium chloride

Figure 4.3.1.1 shows the effect of sodium chloride and electrolysis time on color, COD, turbidity removal and power consumption. Various amounts of concentration of sodium chloride were taken in 1000 ml of beaker, the sample from 1gm to 3 gm and kept on magnetic stirrer to have enough

contact time for 30 minutes. These samples were analyzed and optimized. It was observed from the figure that color, COD and turbidity removal increases as the dose of NaCl increases from 1gm to 3 gm. This is observed that increasing the chloride concentration increases the color removal efficiency and this is due to the increased transfer of chloride ions to the anode surface [29, 30]. But, on figure 4.3.1.1d (power consumption) doesn't observed that much effect like that of color, COD and turbidity.

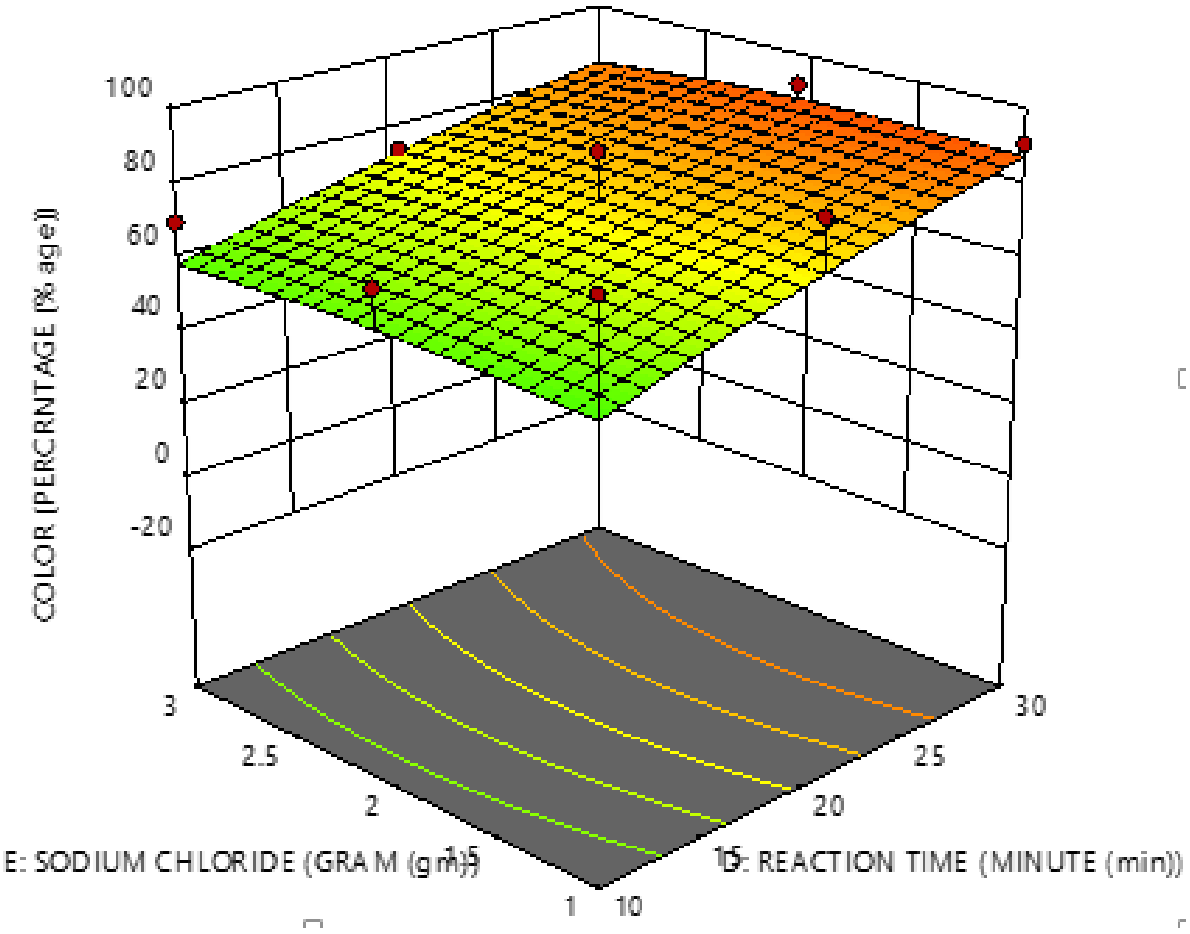


Figure 4.3.1.1a Combined effect of NaCl and electrolysis time on color.

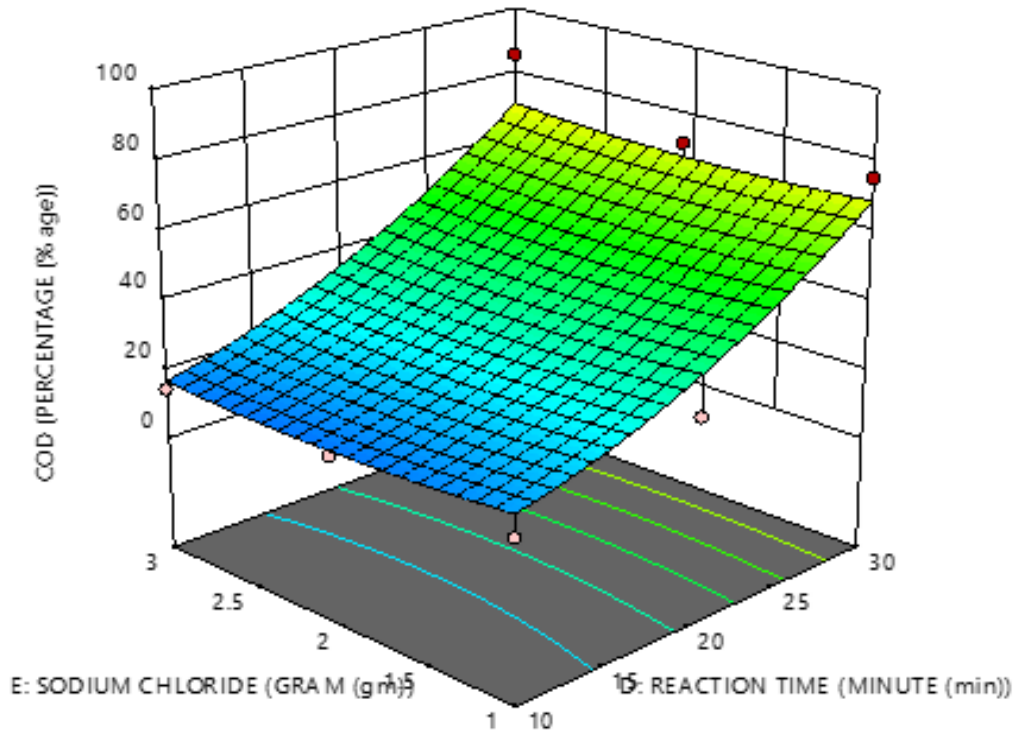


Figure 4.3.1.1b Combined effect of NaCl and electrolysis time on COD.

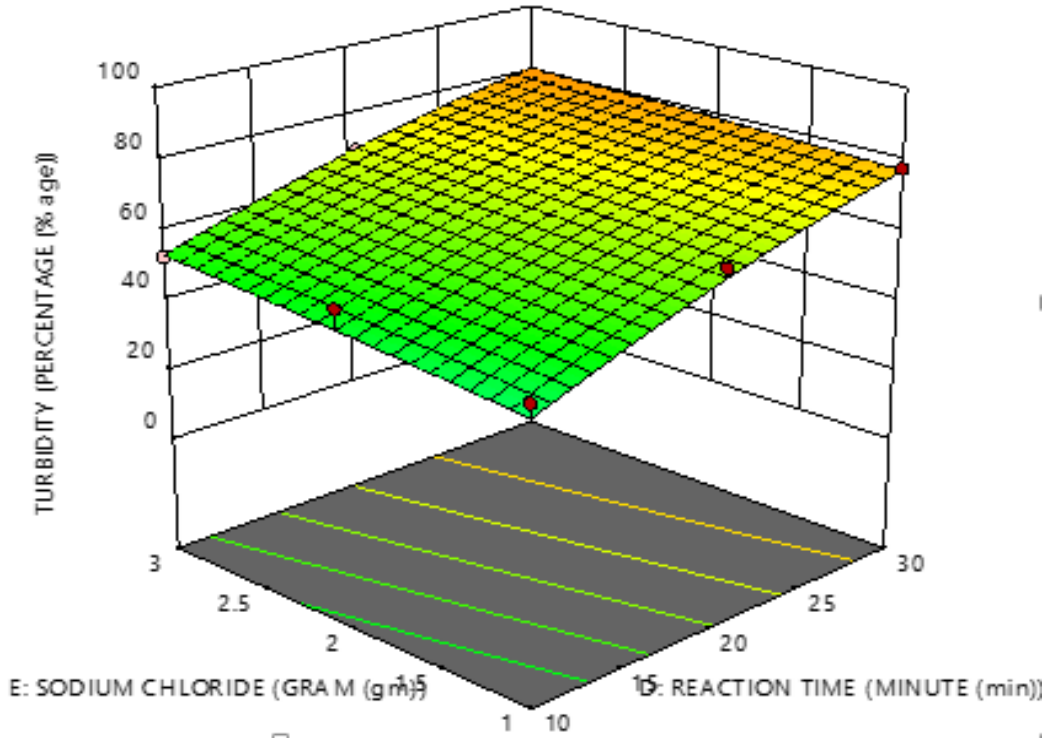


Figure 4.3.1.1c Combined effect of NaCl and electrolysis time on turbidity.

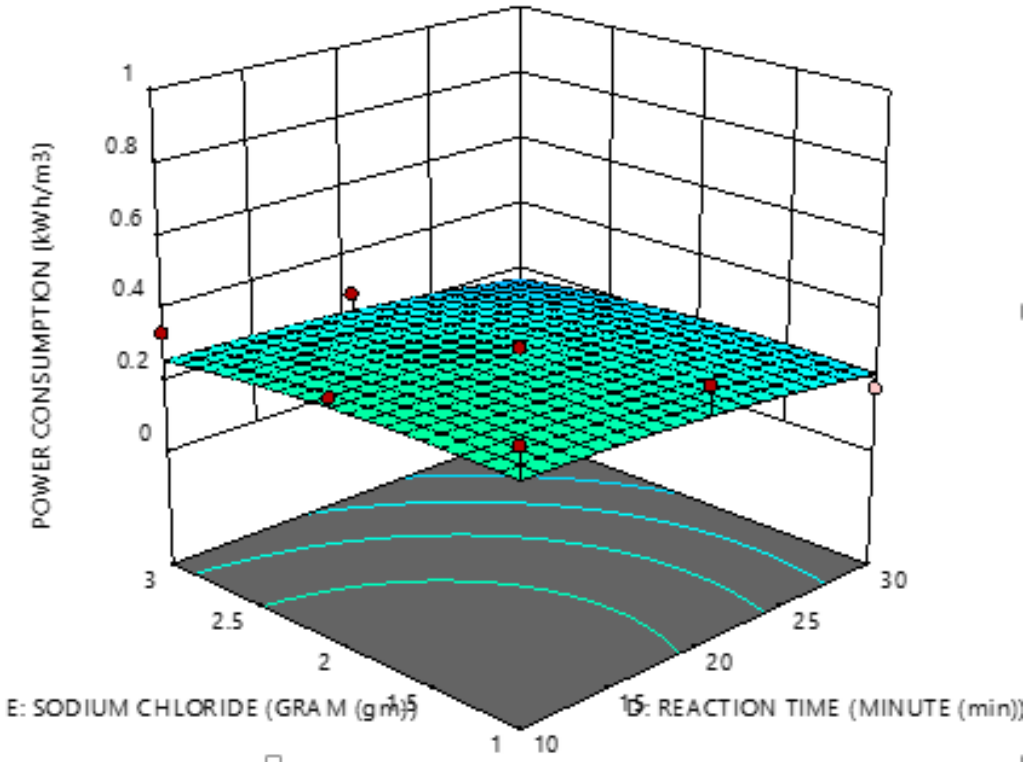


Figure 4.3.1.1d Combined effect of NaCl and electrolysis time on power consumption.

4.3.1.2 Effect of calcium chloride

Figure 4.3.1.2 effect of calcium chloride and electrolysis time on color, COD, turbidity and power consumption. As various amounts of calcium chloride in gram increases in a sample of 1000 ml from 1 gm to 3 gm the removal efficiency of color, COD and turbidity increases. This is observed that increasing the chloride concentration increases the color, COD and turbidity removal efficiency and this is due to the increased transfer of chloride ions to the anode surface [30, 32]. But, figure 4.3.1.2d: on power consumption, effect of calcium chloride doesn't observed that much effect.

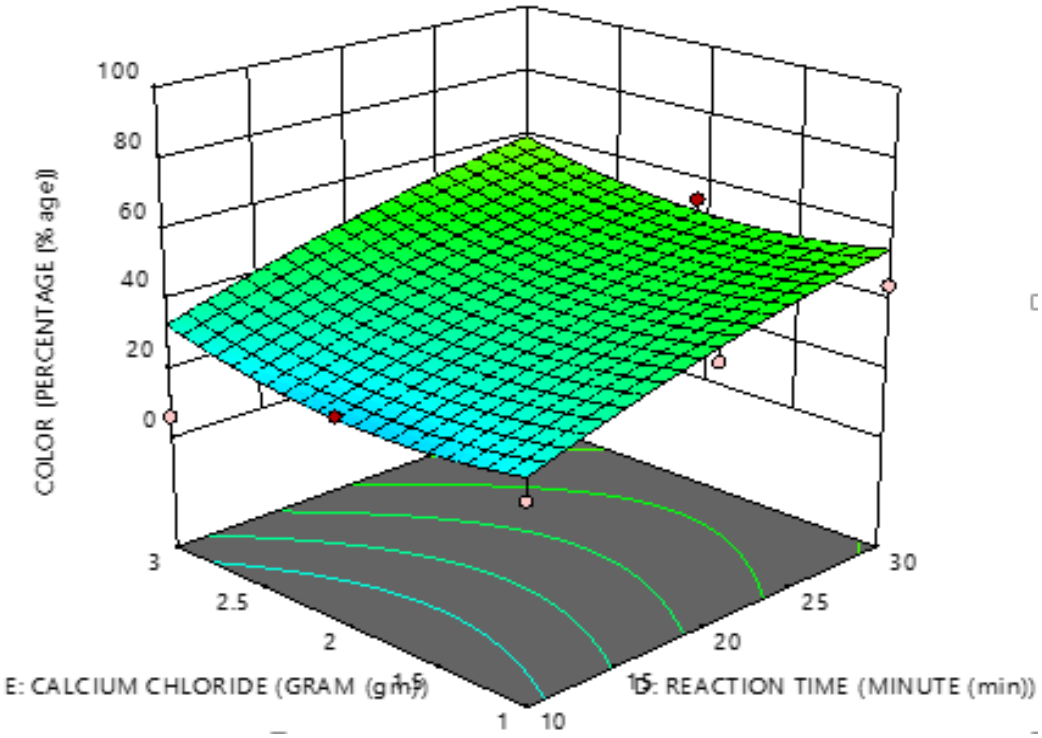


Figure 4.3.1.2a Combined effect of $CaCl_2$ and electrolysis time on color.

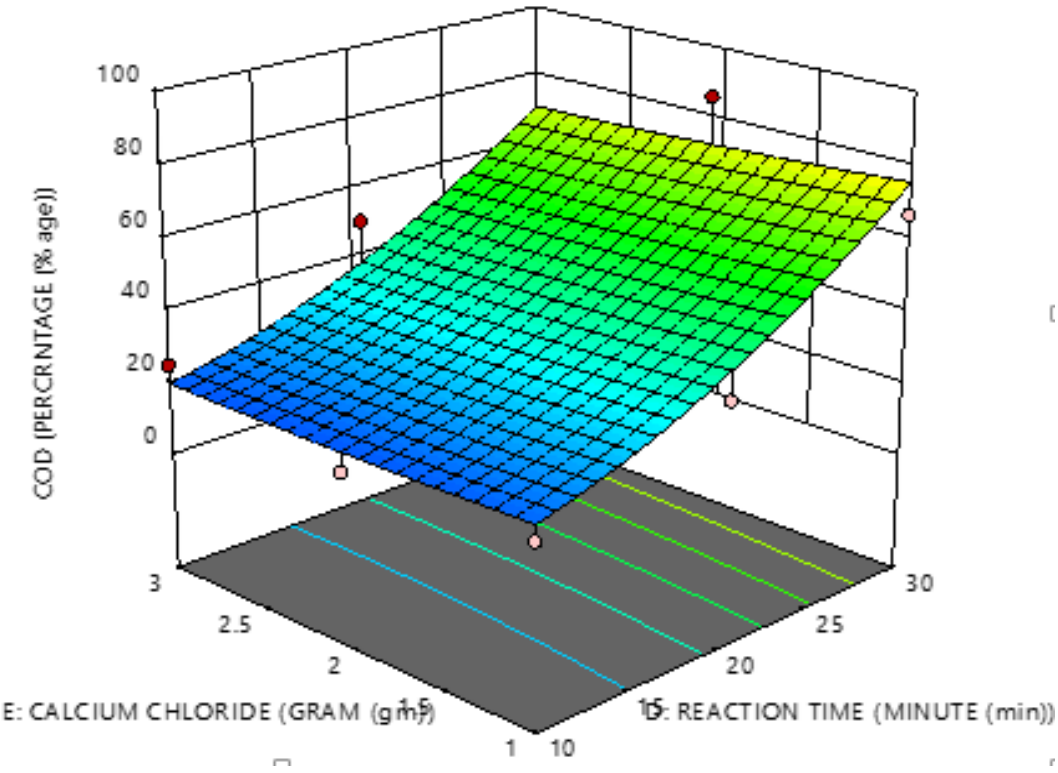


Figure 4.3.1.2b Combined effect of $CaCl_2$ and electrolysis time on COD.

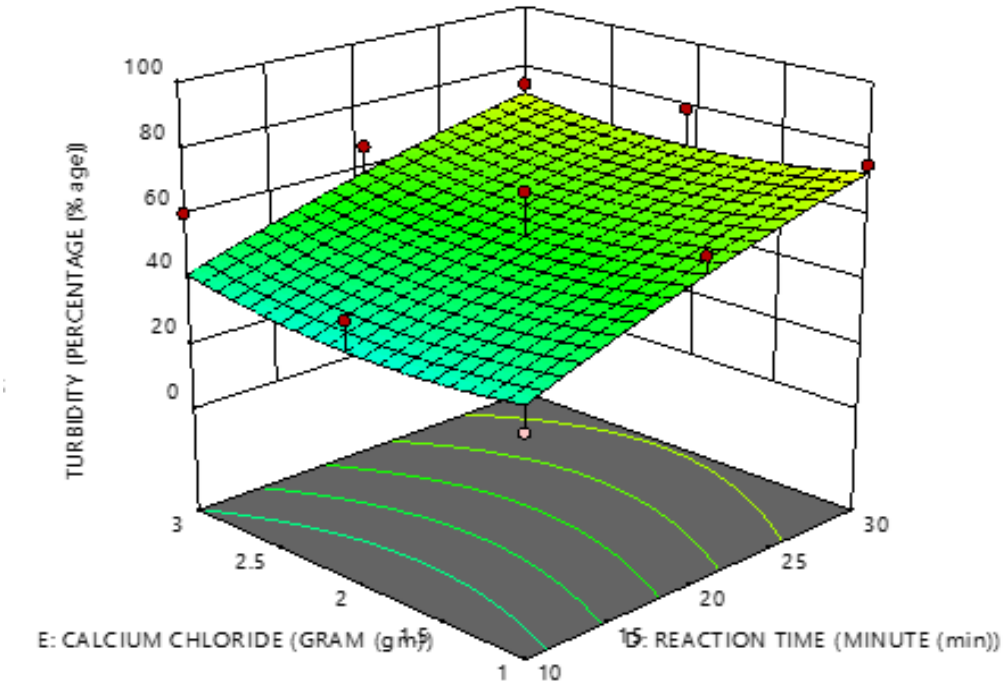


Figure 4.3.1.2c Combined effect of $CaCl_2$ and electrolysis time on turbidity.

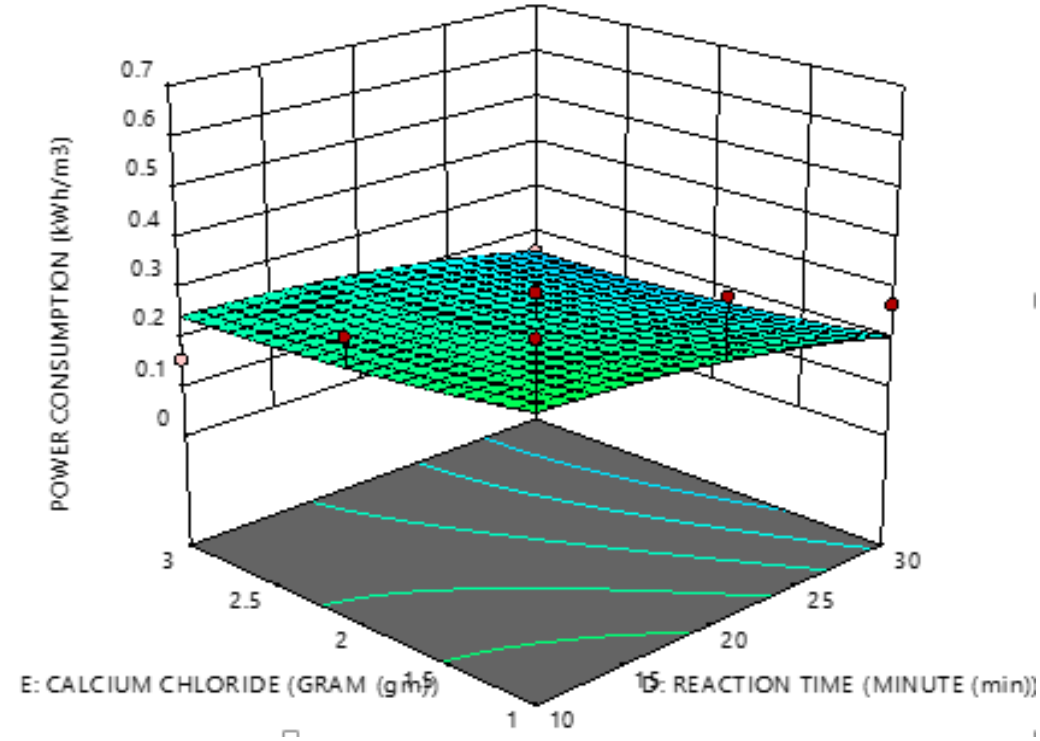


Figure 4.3.1.2 Combined effect of $CaCl_2$ and electrolysis time on power consumption.

4.3.1.3 Effect of Sodium carbonate

Figure 4.3.1.3 effect of sodium carbonate and electrolysis time on color, COD, turbidity and power consumption.

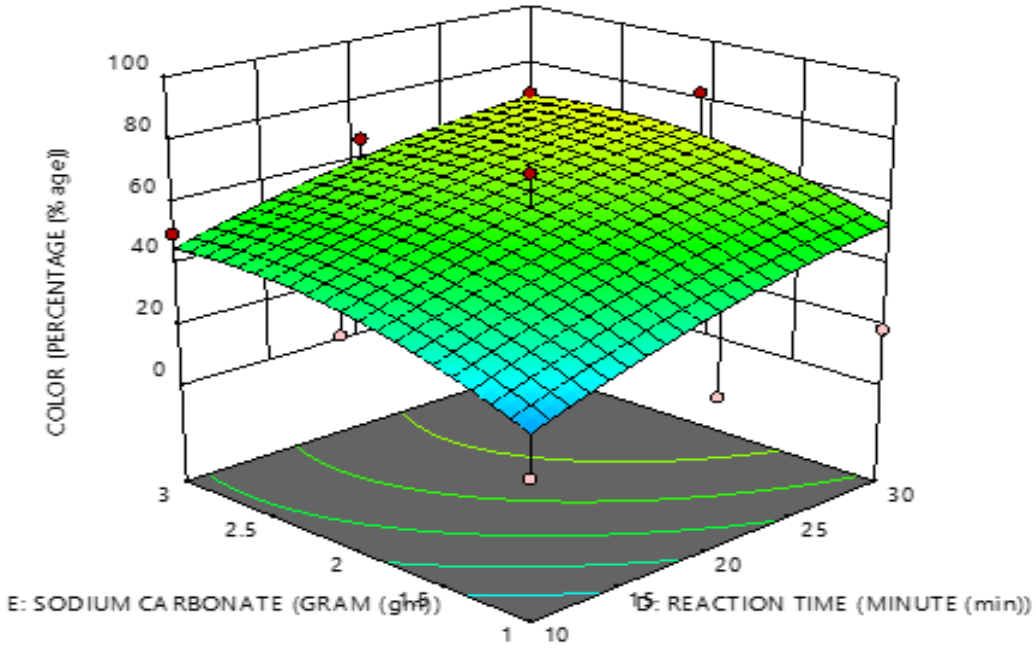


Figure 4.3.1.3a Combined effect of Na_2CO_3 and electrolysis time on color.

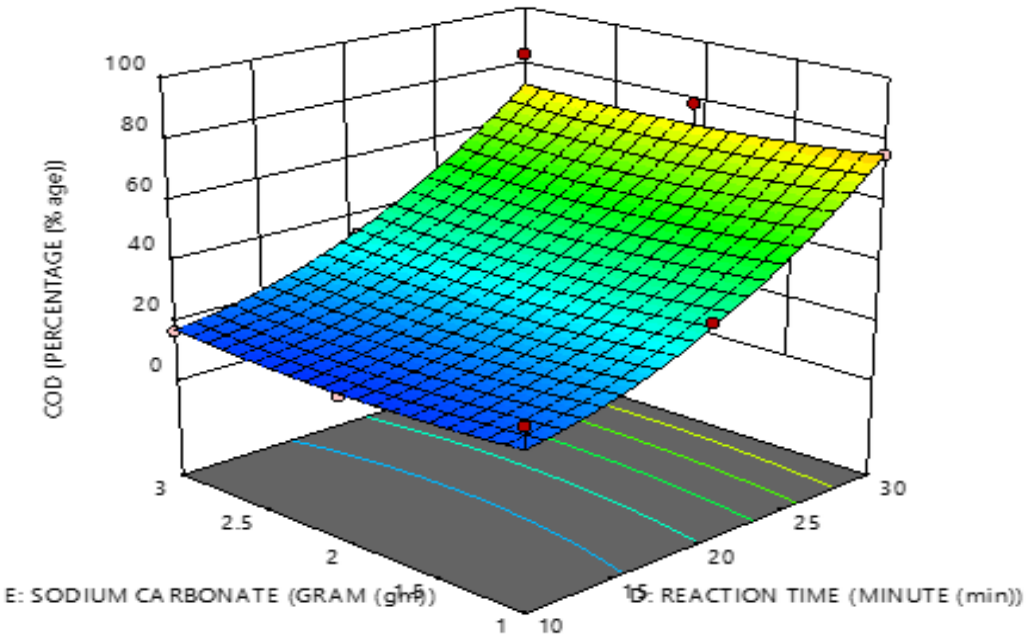


Figure 4.3.1.3b Combined effect of Na_2CO_3 and electrolysis time on COD.

As various amounts of sodium carbonate in gram increases in a sample of 1000 ml from 1 gm to 3 gm the removal efficiency of color, COD and turbidity increases as well as the power consumption also increases.

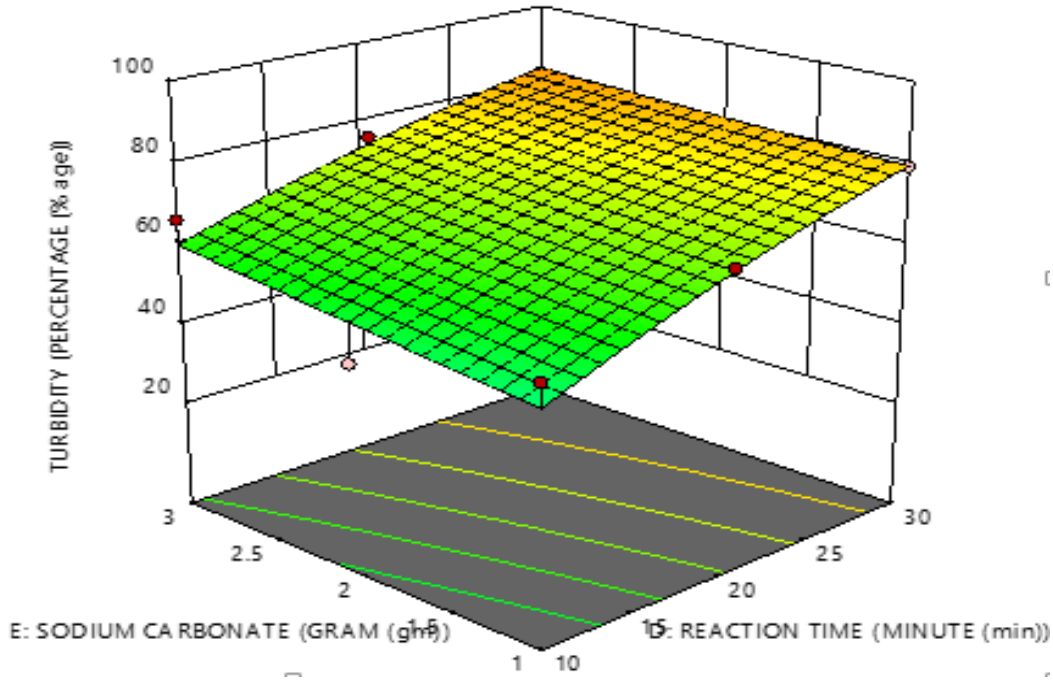


Figure 4.3.1.3c Combined effect of Na_2CO_3 and electrolysis time on turbidity.

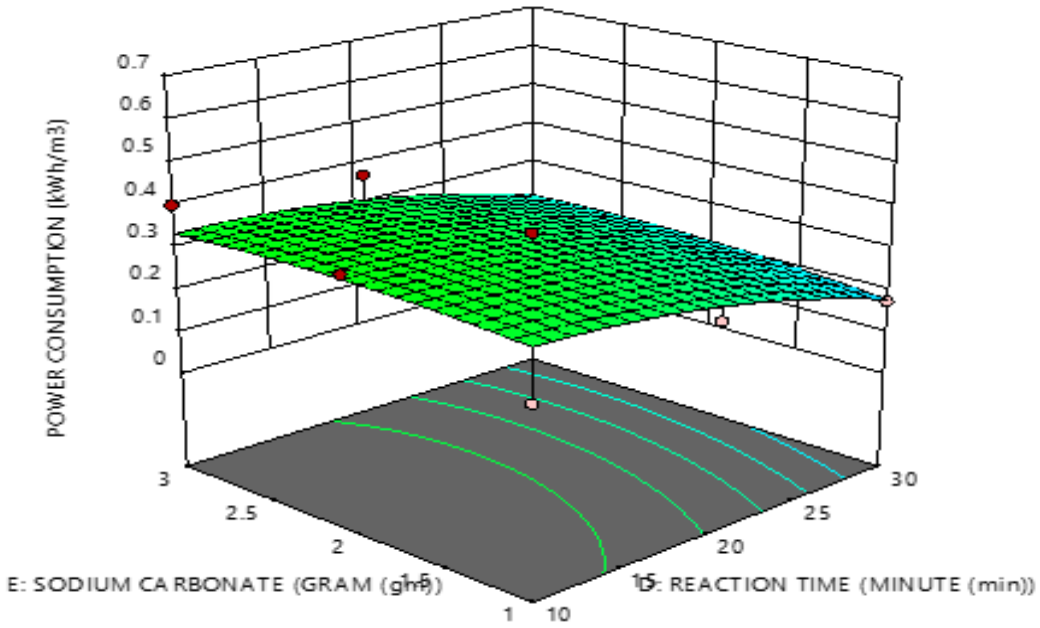


Figure 4.3.1.3d Combined effect of Na_2CO_3 and electrolysis time on power consumption.

4.3.2 Effect of pH

It has been established that the influence pH is of vital important in the performance of many electrochemical processes. Also, that the initial pH of the electrolyte is one of the important factors affecting the performance of electrochemical process particularly on the performance of electro oxidation process. In this study, turbidity, color and COD removal efficiency was determined in the pH ranges from 3 to 9, figure 4.3.2 shows the influence of solution pH on turbidity, color and COD removal as well as the power consumption. It shows that the turbidity, color and COD removal efficiency increased with pH until it reached to 8.99 and after this point, further increase of pH, the removal efficiency decreased. Maximum removal efficiency occurred at pH 8.99 value, thus pH = 8.99 was the optimum pH. This is due to the decreased production of chlorine and hypochlorite and also the formation of chlorate and perchlorate [23, 29]. But, the combined effect of pH and current ampere on color, COD, turbidity and power consumption using $CaCl_2$ and Na_2CO_3 was shown on Appendix J and Appendix K respectively.

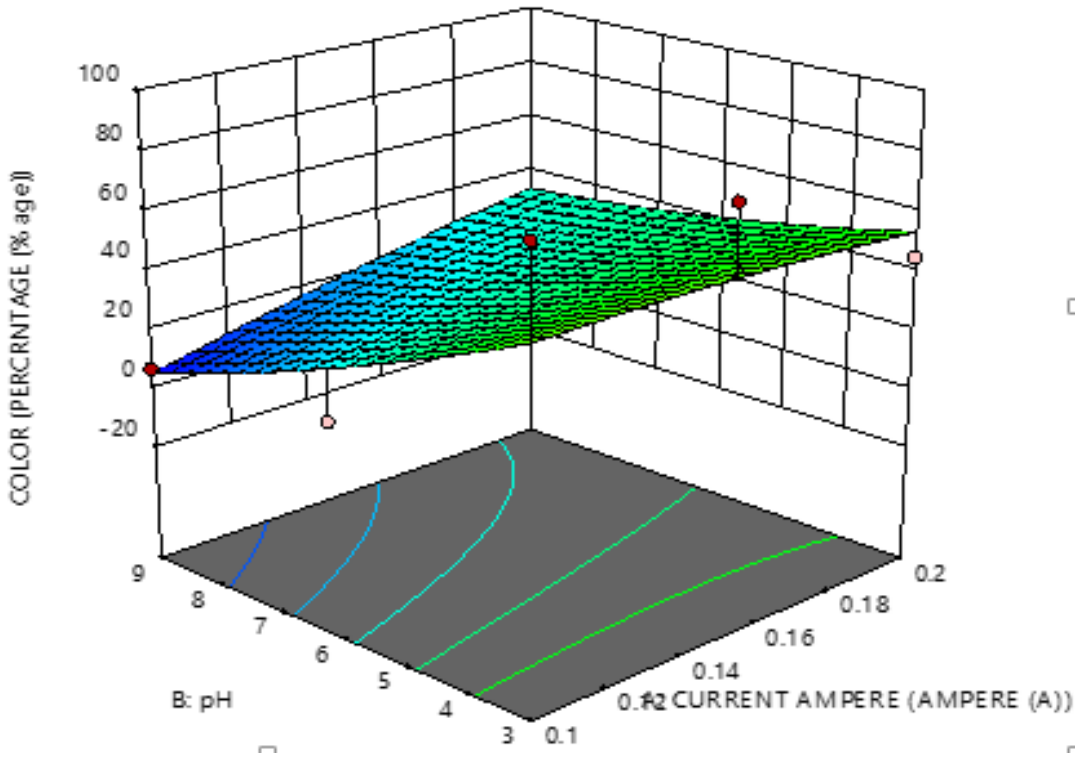


Figure 4.3.2a- Combined effect of pH and current ampere on color using NaCl

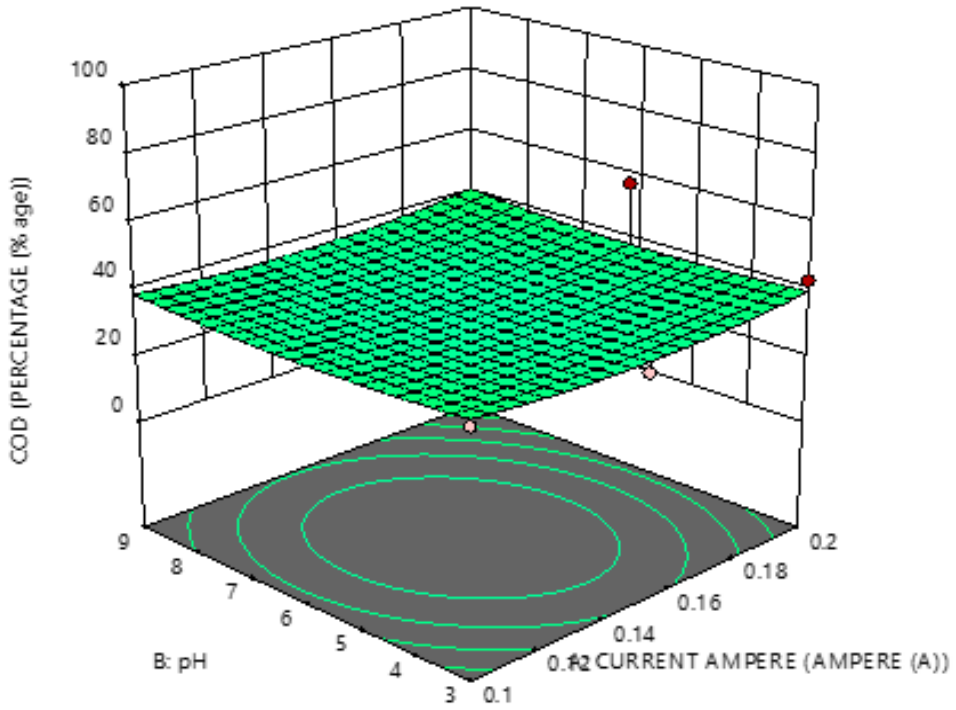


Figure 4.3.2b- Combined effect of pH and current ampere on COD using NaCl

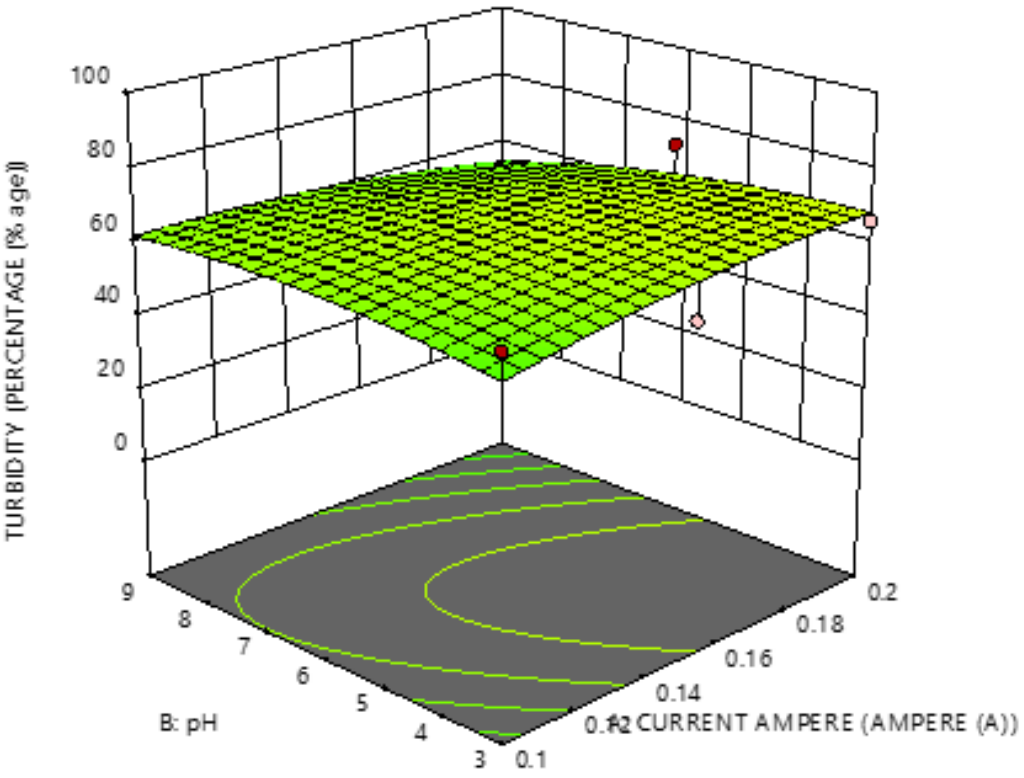


Figure 4.3.2c- Combined effect of pH and current ampere on turbidity using NaCl

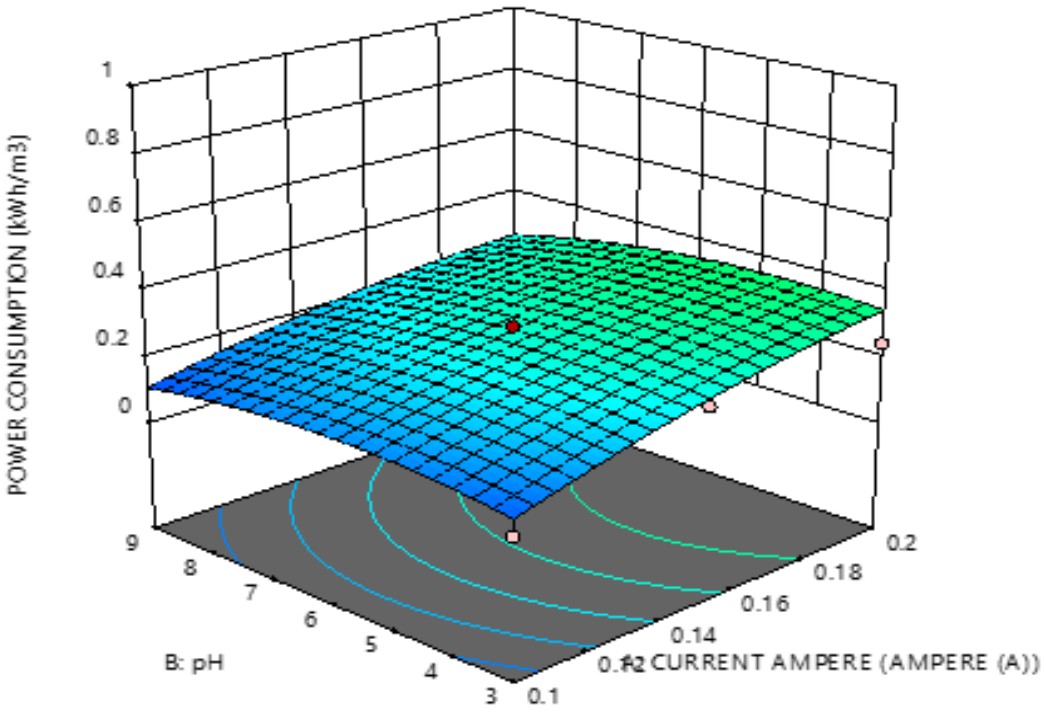


Figure 4.3.2d- Combined effect of pH and current ampere on power consumption using NaCl

4.3.3 Effect of current ampere

The effect of current ampere is another important parameter for pollutant removal in the electro oxidation process that effects the metal hydroxide concentration forming during the process. High current ampere especially causes both decomposition of the electrode material and an increase in pollutant removal. The effect of current ampere on the treatment of domestic wastewater shown in figure 4.3.3 was investigated by varying the applied current to the wastewater in the same conditions, electro oxidation time 10 minute. The current ampere was applied between the range of 0.1A to 0.2A in order to assess the effect of current ampere on turbidity, color and COD. So, the optimum current ampere occurred for removal efficiency of turbidity, color and COD was 0.18A for NaCl, 0.10A for $CaCl_2$ and 0.10A for Na_2CO_3. The performance of the process at higher current ampere is marginal. Further, it was also observed that an increase in the current ampere also results in the loss electrical energy in the form of heat and more unwanted reactions [24, 35-37]. But, the combined effect of current ampere and electrolysis time on color, COD, turbidity and power consumption using $CaCl_2$ and Na_2CO_3 was shown on Appendix L and Appendix M respectively.

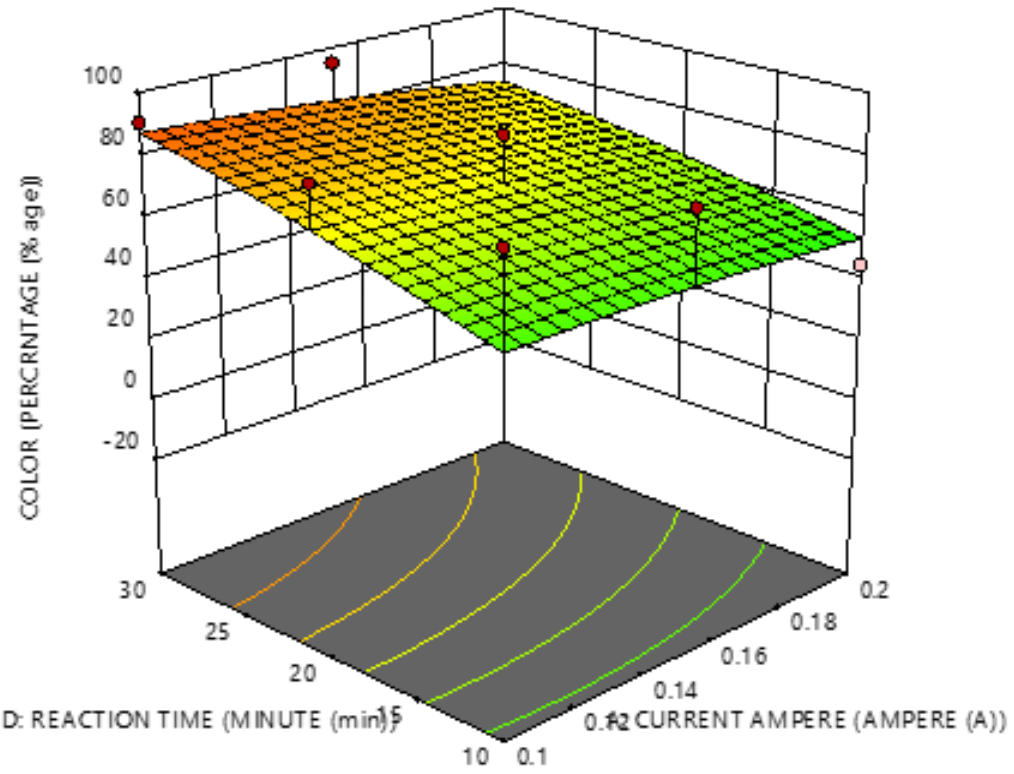


Figure 4.3.3a- Combined effect of current ampere and electrolysis time on color using NaCl.

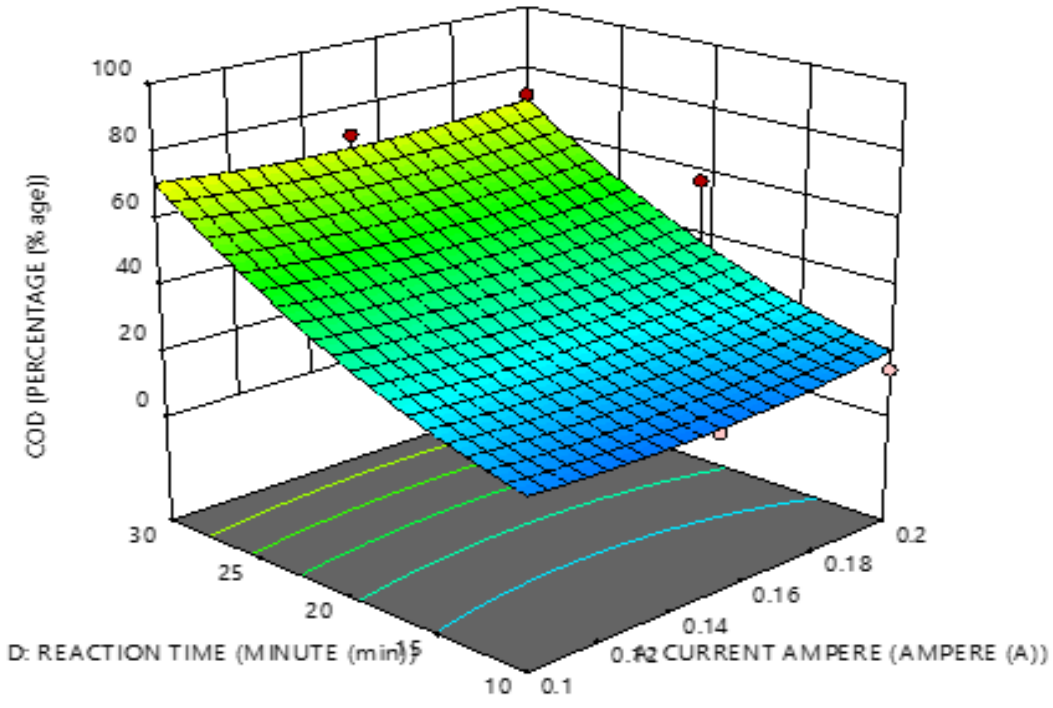


Figure 4.3.3b- Combined effect of current ampere and electrolysis time on COD using NaCl.

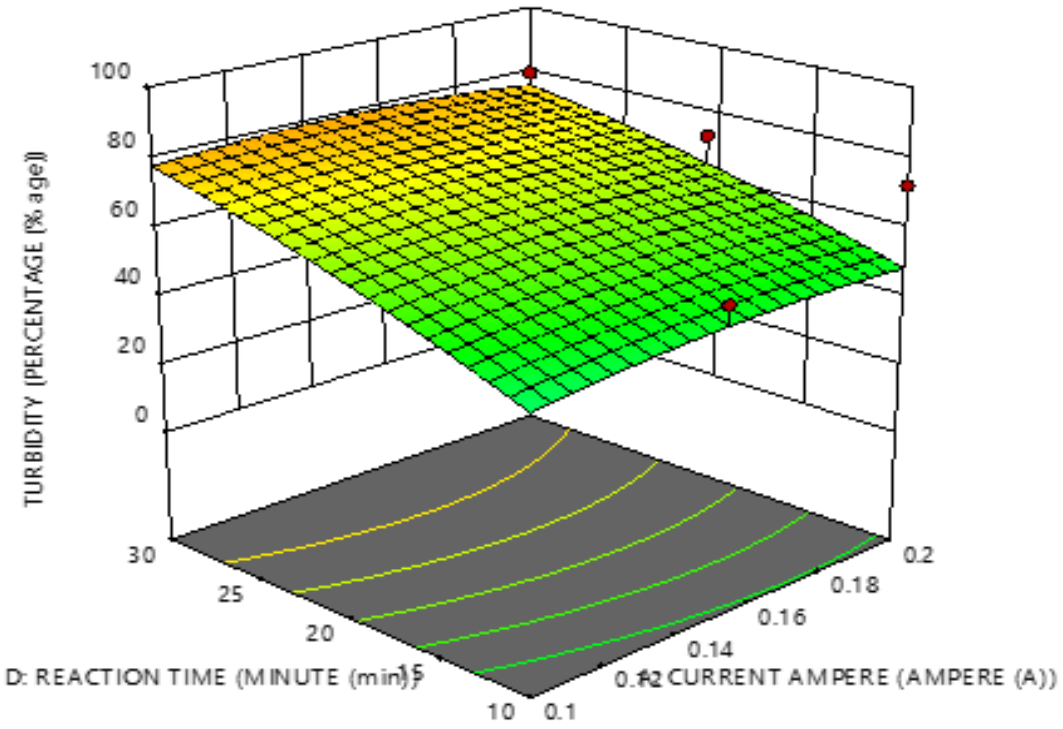


Figure 4.3.3c- Combined effect of current ampere and electrolysis time on turbidity using NaCl.

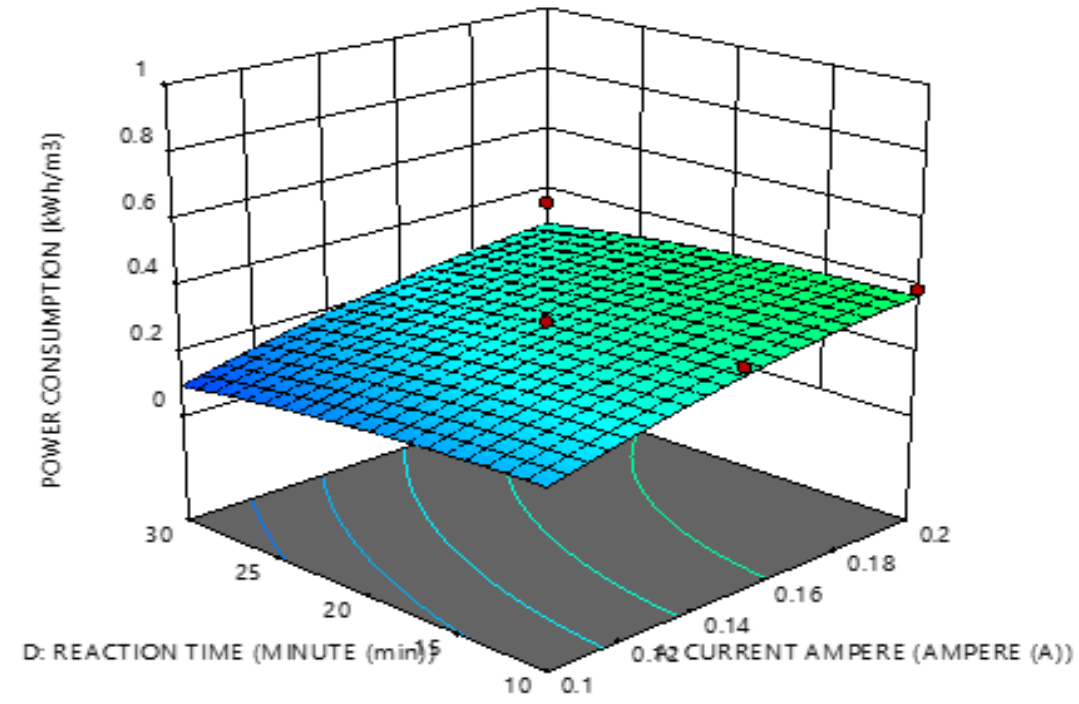


Figure 4.3.3d- Combined effect of current ampere and electrolysis time on power consumption using NaCl.

4.3.4 Effect of electrolysis time

The effect of electrolysis time is another significant parameter that is influential on the electro oxidation process. Because the formation and concentrations of metal hydroxides play an important role on pollutant (i.e. turbidity, color and COD) removal, this depends on operation time. In electro oxidation process, anode produces metal ions during electrochemical reaction. Metal ions are a destabilization agent. If the electrolysis time were low, the metal ion dosage was not sufficient to destabilize all colloidal and suspended particles, so pollutant removal efficiency was not high. Figure 4.3.4 Shows that the electrolysis time has an important effect on pollutant removal efficiency. When the reaction time changed from 10 to 30 minute the removal efficiencies of turbidity, color and COD increases with electrolysis time. So the optimum electrolysis time for removal of pollutants from domestic wastewater is 30 minute for all supporting electrolytes. But, the combined effect of electrolysis time and distance in-between electrode on color, COD, turbidity and power consumption using $CaCl_2$ and Na_2CO_3 was shown on Appendix N and Appendix O respectively.

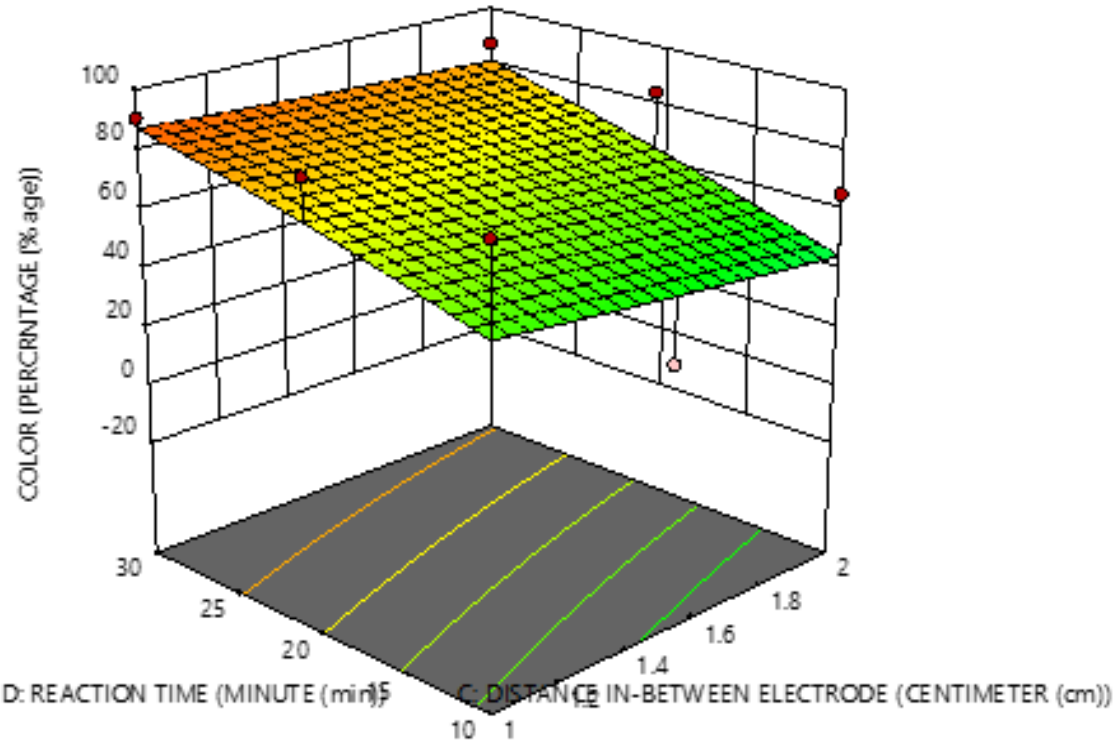


Figure 4.3.4a: Combined effect of electrolysis time and distance in-between electrode on color using NaCl.

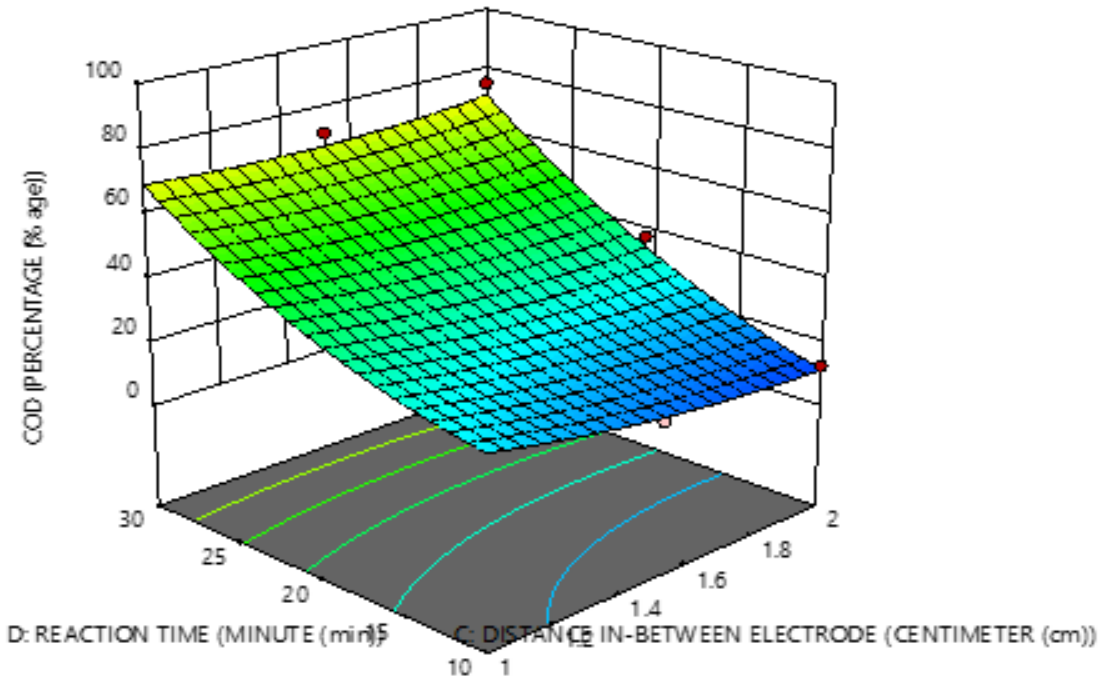


Figure 4.3.4b: Combined effect of electrolysis time and distance in-between electrode on COD using NaCl.

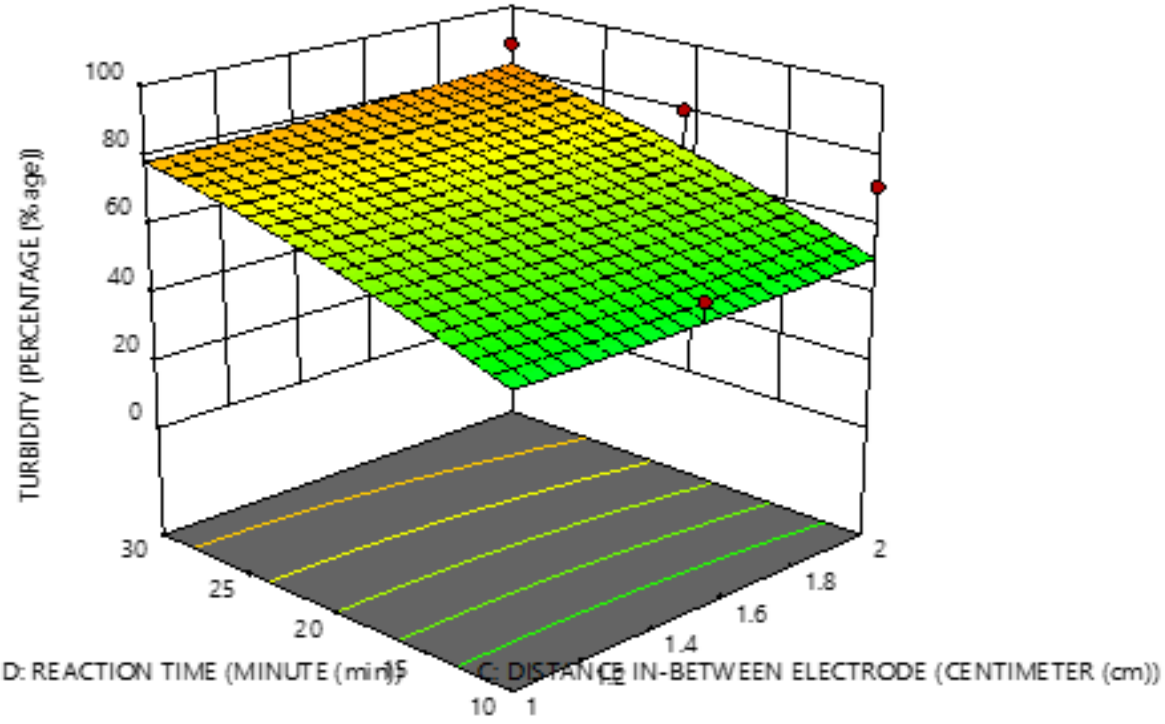


Figure 4.3.4c: Combined effect of electrolysis time and distance in-between electrode on turbidity using NaCl.

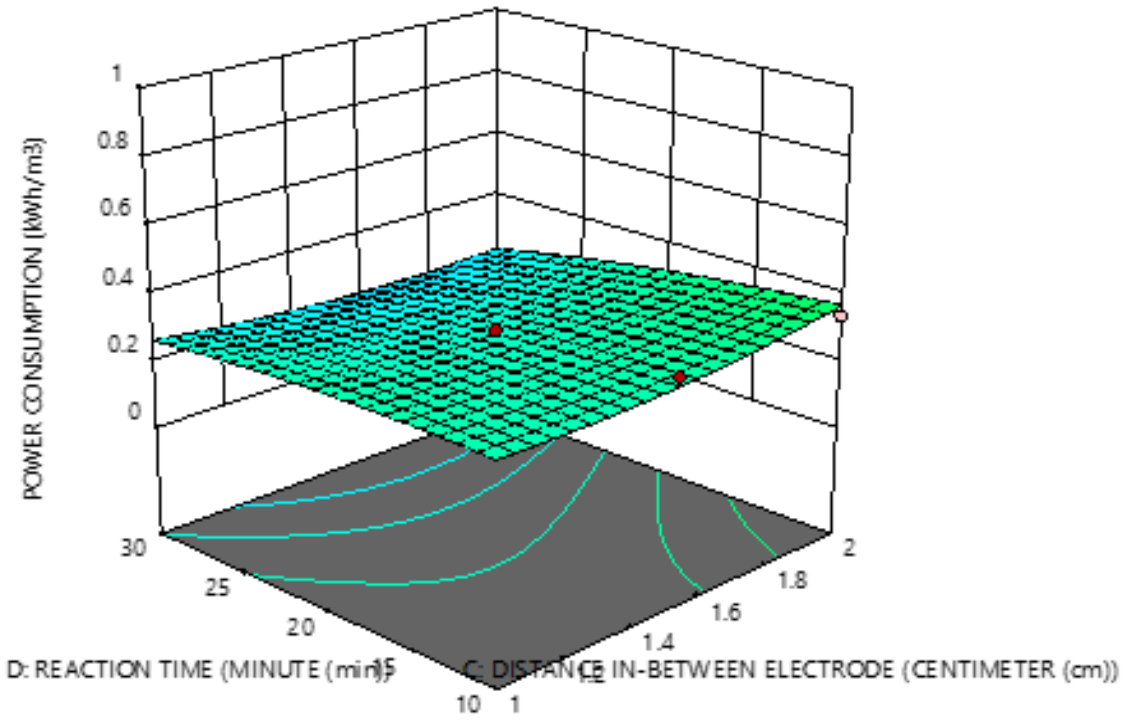


Figure 4.3.4d: Combined effect of electrolysis time and distance in-between electrode on power consumption using NaCl.

4.3.5 Effect of distance in-between electrode

Several scholars have investigated the impact of electrode distance on pollutant removal efficiency. In-between electrode distance depends on the nature of pollutants and structure of electrodes. In this study, the impact of in-between electrode distance was studied at three different distances; 1cm, 1.5cm and 2cm. The turbidity, color and COD removal efficiencies were increased as the distance in-between electrodes increased. Figure 4.3.5 shows that the distance in-between electrode has an important effect on the pollutant removal efficiency. When the dose of supporting electrolytes changed from 1 gm to 3 gm the removal efficiencies of color, COD and turbidity increases with distance in-between electrode. So, the optimum distance in-between electrode for removal of pollutants from domestic wastewater is 2 cm for all supporting electrolytes. With increasing inter-electrode distance between the anode and cathode, there is less interaction of ions and electrostatic attraction. In order to achieve acceptable power consumption and the desired removal level of pollutants, the inter-electrode distance between the anode and cathode should be minimized [25, 28-31]. But, the combined effect of calcium chloride and distance in-between

electrode on color, COD, turbidity and power consumption using $CaCl_2$ and Na_2CO_3 was shown on Appendix P and Appendix Q respectively.

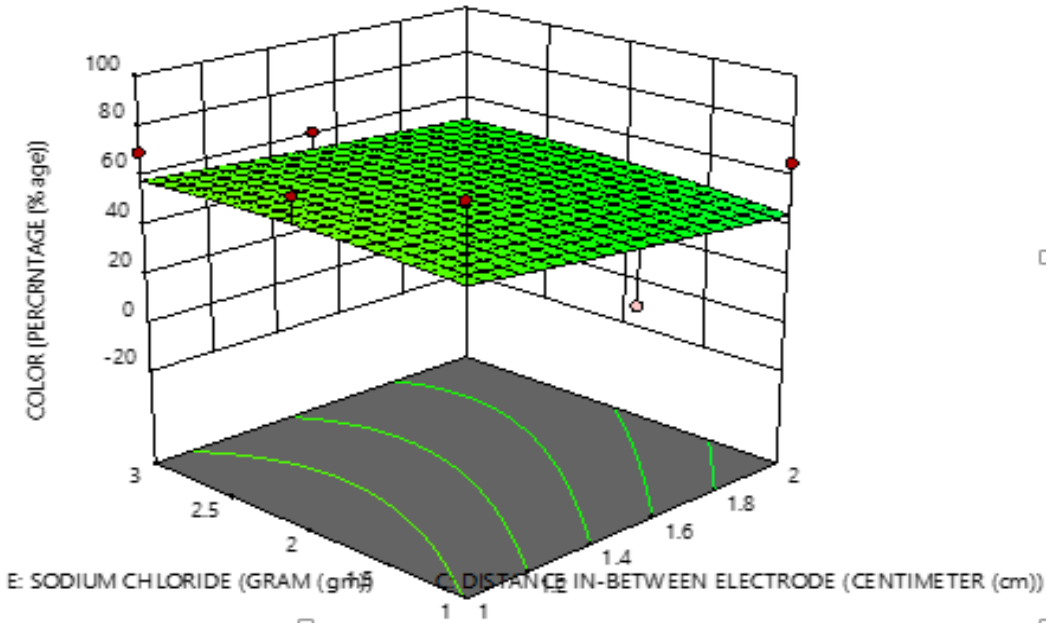


Figure 4.3.5a: Combined effect of sodium chloride and distance in-between electrode on color using NaCl.

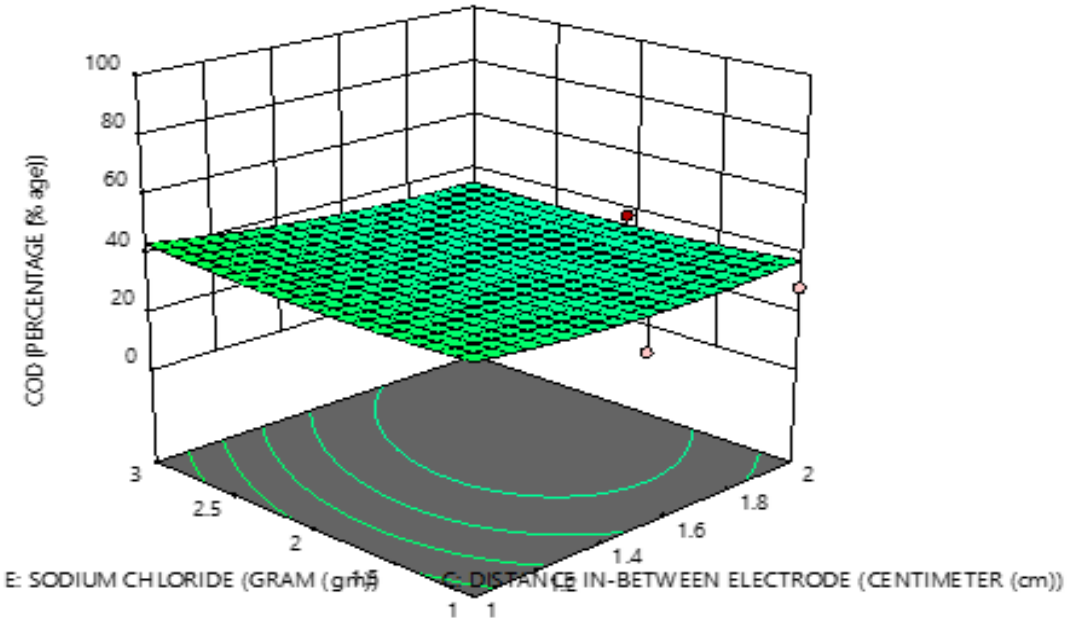


Figure 4.3.5b: Combined effect of sodium chloride and distance in-between electrode on COD using NaCl.

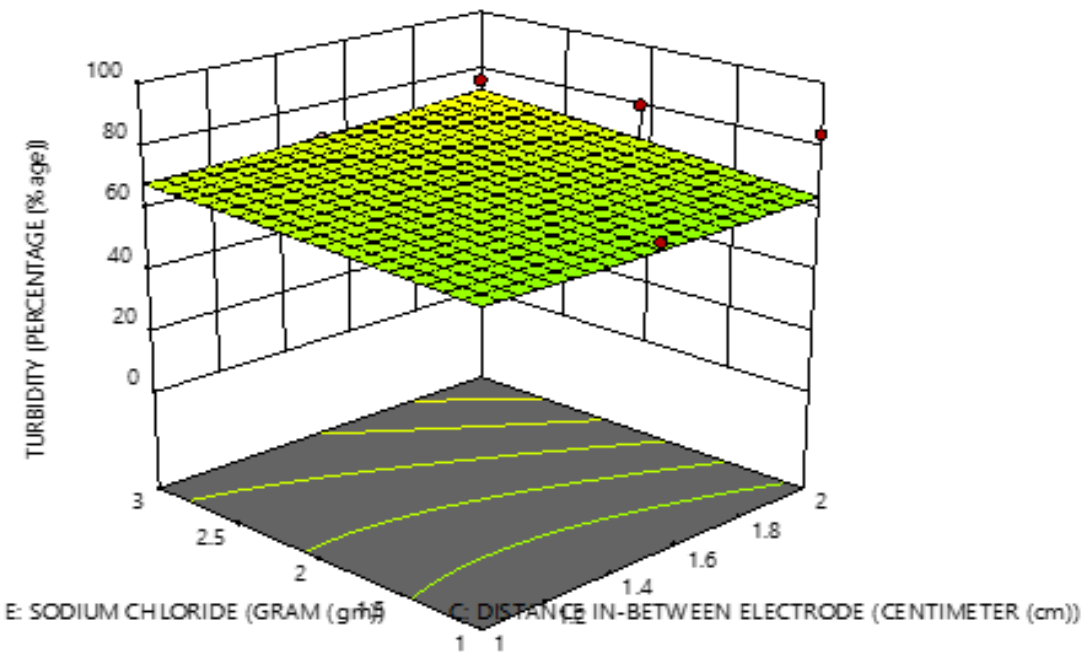


Figure 4.3.5c: Combined effect of sodium chloride and distance in-between electrode on turbidity using NaCl.

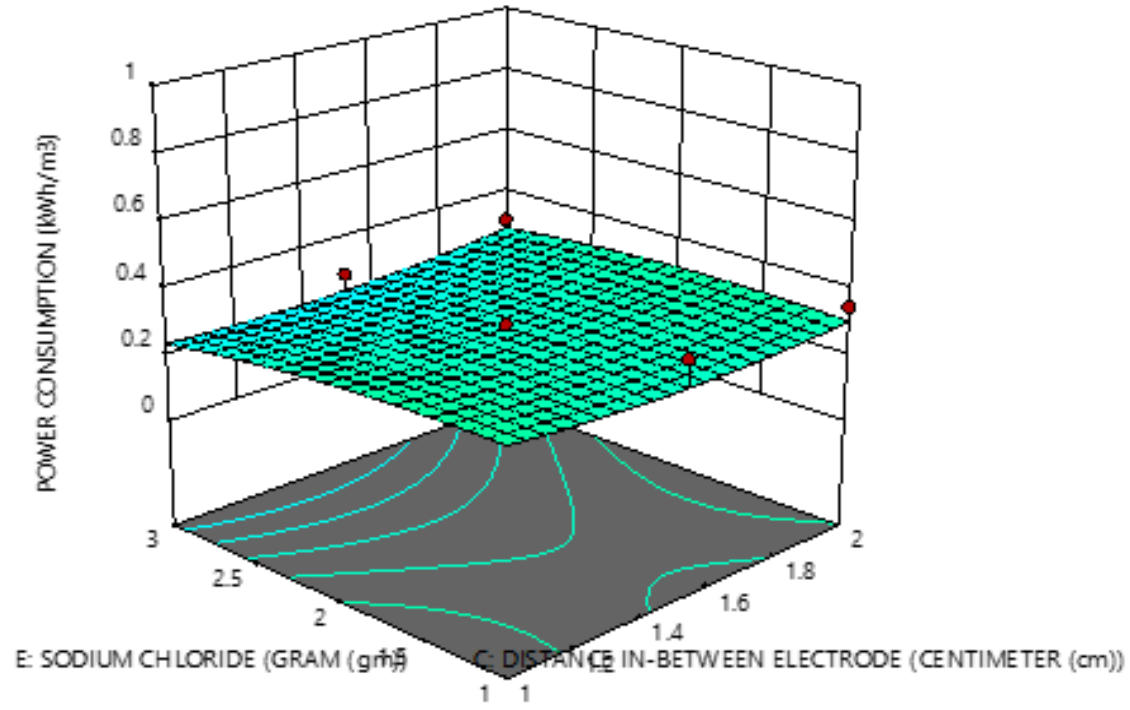


Figure 4.3.5d: Combined effect of sodium chloride and distance in-between electrode on power consumption using NaCl.

CHAPTER FIVE

5 CONCLUSIONS AND RECCOMENDATIONS

5.1 Conclusions

The electrochemical oxidation process was used to treat the domestic wastewater using batch reactor. The influences of operating parameters such as current ampere, pH, electrolysis time, distance in-between electrodes and supporting electrolytes on the percentage colour, COD, turbidity removal and power consumption were investigated. Besides, operating cost of the electro oxidation process was evaluated. DWW was successfully treated by electro oxidation process in 30 minutes. The removal efficiencies of turbidity, colour and COD were 92.19%, 94.76% and 77.93% respectively, 90.00%, 99.97% and 79.11% respectively for $CaCl_2$ and 94.20%, 83.41% and 83.11% respectively for Na_2CO_3. The optimum operating conditions were pH 8.99, current ampere 0.18A, reaction time 30 minutes, distance in-between electrode 2 cm and NaCl concentration 3 gm/L, the optimum operating conditions for $CaCl_2$ were pH 8.68, current ampere 0.1A, reaction time 30 minutes, distance in-between electrode 2 cm and $CaCl_2$ concentration 1gm/L and that of Na_2CO_3 optimum operating conditions were pH 8.98, current ampere 0.1A, reaction time 30 minutes, distance in-between electrode 1.99 cm and Na_2CO_3 concentration 2.40 gm/L. The power requirement and electrode consumption were 0.196 kWh/m^3 and $4.82*10^{-6}$ kg SS/m^3 respectively for NaCl, 0.212 kWh/m^3 and $4.82*10^{-6}$ kg SS/m^3 respectively for $CaCl_2$ and 0.116 kWh/m^3 and $4.82*10^{-6}$ kg SS/m^3 respectively for Na_2CO_3 at a current ampere of 0.2A wastewater treated under the optimum operating conditions. In addition, operating costs were determined with respect to all the supporting electrolytes. Operating cost as 1.076\$/m^3 for NaCl, 1.077\$/m^3 for $CaCl_2$ and 1.072\$/m^3 for Na_2CO_3 at a current ampere of 0.2A under the optimum operating conditions was evaluated. According to the results, the electro oxidation process in the optimum conditions was shown to be economical treatment of DWW.

5.2 Recommendations

- In this study, specific parameters like color, COD and turbidity are the only parameters analyzed. But, also other parameters found in domestic wastewater are need to be studied by other researchers for the future.
- During analytical technique of electro oxidation process there is a phenomenon called electrode fouling which involves in the passivation of an electrode surface by a fouling agent that forms an increasingly impermeable layer on the electrode. So, there are various antifouling strategies have been used to reduce or eliminate electrode fouling by a protective layer or a barrier on an electrode substrate to prevent the fouling agent from reaching the electrode surface.
- Since electro oxidation process produce a low amount of sludge due to the floc and some suspended materials formation per each experiment there should be further study on the sludge produced to take part in the best sludge management system in order to prevent environmental pollution either by selecting suitable disposal site or by analyzing it for land application.
- Since stainless steel was an alloy of iron which contains about 18% chromium there may be a carcinogenic characteristics in the effluent after the treatment process. So there should be a further study on the carcinogenic characteristics of the effluent using stainless steel electrode.
- In order to reduce the operating cost during electro oxidation analysis process use alternative power sources that means use solar energy power source instead of electrical energy power source.

REFERENCES

[1] Kavitha, E. Electrochemical Oxidation of Textile Industry Wastewater Using DSA ® In Tubular Reactor. International Journal of Engineering Research and Applications. 2012; 2(6): 444 - 451

[2] Owa, F.D. Water pollution: Sources, Effects, Control and Management. Mediterranean Journal of Social Sciences. 2013; 4(8): 65 – 68

[3] Vlyssides, A.G., Karlis, P.K., Rori, N., Zorpas, A.A. Electrochemical treatment in relation to pH of domestic wastewater using Ti/Pt electrodes. Journal of Hazardous Materials. 2002; 95: 215 – 226.

[4] Daghrira, R., Drogui, P., Tshibangu, J. Efficient treatment of domestic wastewater by electrochemical oxidation process using bored doped diamond anode. Separation and Purification Technology. 2014; 131: 79 – 83

[5] Konnerup, D., Thammarat, K., Brix, H. Treatment of domestic wastewater in tropical, subsurface flow constructed wetlands planted with Canna and Heliconia. Journal of Ecological Engineering. 2009; 35: 248 – 257

[6] Denny, P. Implementation of constructed wetlands in developing countries. Water Sciences and Technology. 1997; 35: 27 – 34

[7] Kurt, U., Gonullu, M.T., Ilhan, F., Varinca, K. Treatment of domestic waste water by Electro coagulation in cell with Fe-Fe Electrodes. Environmental Engineering Science. 2008; 57(2): 153 - 162

[8] Mickova, I. Advanced Electrochemical technologies in waste water treatment part I: Electro coagulation. American scientific Research Journal for Engineering, Technology and Sciences. 2015; 14(2): 233-257

[9] Hughes, R. "An introduction to colloids in colloidal science: Principles, methods and applications, 2nd edition, Cosgrove, T.; Edition. Wiley-Black well, London, 2005; 394

[10] Asaithambi, P., Garlanka, L., Anantharaman, N., Matheswaran, M. Influence of Experimental Parameters in the Treatment of Distillery Effluent by Electrochemical Oxidation. Separation Science and Technology. 2012; 47(3): 470-481

[11] Asaithambi, P., Matheswaran, M. Electrochemical treatment of simulated sugar industrial effluent: Optimization and modeling using a response surface methodology. Arabian Journal of Chemistry. 2011; 9: 981 – 987

[12] Somayajula, A., Asaithambi, P., Susree, M., Matheswaran, M. Sono electrochemical oxidation for decolorization of Reactive Red 195. Ultrasonics Sonochemistry. 2012; 19: 803 – 811

[13] Chopra, A.K., Sharma, A.K., Kumar, V. Overview of Electrolytic treatment: An alternative technology for purification of waste water. Archives of Applied Science Research. 2011; 3(5): 191 - 206

[14] Impa, J.A., Nagarajappa, D.P., Krishne, K.G., Manjunath, N.T. Domestic waste water treatment by Electro coagulation using Copper and Aluminum Electrodes. International Journal of Innovative Research in science, Engineering and Technology. 2015; 4(6): 3844 - 3850

[15] Chen, G. Electrochemical technologies in wastewater treatment. Separation and purification technology. 2004; 38: 11 - 41

[16] Miled, W., Hajisaid, A., Roudesli, S. Decolorization of High polluted Textile wastewater by Indirect Electrochemical oxidation process. Journal of Textile and Apparel, Technology and Management. 2010; 6(3): 1 - 6

[17] Mickova, I. Advanced Electrochemical Technologies in Waste water Treatment. Part II: Electro flocculation and Electro flotation. American Scientific Research Journal for Engineering Technology and sciences. 2015; 14(2): 273 - 294

[18] Dominguez-Ramos, A., Irabien, A. Analysis and Modeling of the continuous Electro oxidation process for organic matter removal in urban wastewater treatment. Industrial and Engineering chemistry research. 2013; 52(22): 7534 - 7540

[19] Vik, E.A. Treatment of potable water containing humus by Electro coagulation followed by filtration. Water Supply. 1983; 1(23): 2 – 3

[20] Mameri, N., Yeddou, A.R., Lounici, H., Belhocine, D., Grib, H., Bariou. Deflouridation of septentrional Sahara water of North Africa by Electro coagulation process using bipolar aluminum electrodes. Water Resources. 1998; 32(5): 1604

[21] Yue, L., Wang, L., Shi, F., Guo, J., Yand, J., Lian, J.L., Luo, X. Application of Response Surface Methodology to the Decolorization by the Electrochemical process using $FePMO_{12}O_{40}$ catalyst. Journal of Industrial and Engineering chemistry. 2015; 21: 971 - 979

[22] Ravikumar, K., Ramalingam, S., Krishnan, S., Balu, K. Application of Response Surface Methodology to optimize the process variables for Reactive Red and Acid Brown dye removal using a novel adsorbent. Dyes and Pigments. 2006; 70: 18 - 26

[23] Shete, B.S., Shinkar, N.P. Dairy Industry waste water sources, characteristics and its Effects on Environment. International Journal of Current Engineering and Technology. 2013; 3(5): 1611 – 1615

[24] Krishna, B.M., Murthy Usha, N., Manoj Kumar, B., Lokesh, K.S. Electrochemical pretreatment of distillery wastewater using aluminum electrode. Journal of Applied Electrochemistry. 2010; 40 (3): 663.

[25] Ahmed Basha, C., Soloman, P.A., Velan, M., Miranda, L.R., Balasubramanian, N., Siva, R. Electrochemical degradation of specialty chemical industry effluent. Journal of Hazardous Materials. 2010; 176 (1–3): 154.

[26] Asaithambi, P., Susree, M., Saravanathamizhan, R., Matheswaran, M. Ozone assisted electrocoagulation for the treatment of distillery effluent. Desalination. 2012; 1–7: 297

[27] Dalvand A, Gholami M, Joneidi A, Mohammad Mahmoodi N (2011) Dye removal, energy consumption and operating cost of electrocoagulation of textile wastewater as a clean process. Clean Soil Air Water 39(7):665–672

[28] Asaithambi, P., Abdul Aziz A.R., Sajjadi, B., Wan Mohd Ashri Bin Wan Daud. Sono assisted electrocoagulation process for the removal of pollutant from pulp and paper industry effluent. Environmental Science and Pollution Research. 2017; 24(6): 5168–5178.

[29] Nasrullah, M., Singh, L., Wahind, Z.A. Treatment of sewage by electrocoagulationand the effect of high current density. Energy and environmental engineering journal. 2012; 1(1): 27 – 31.

[30] Krishna Prasad, R., Srivastava, S.N. Electrochemical degradation of distillery spent wash using catalytic anode: Factorial design of experiments. Chemical Engineering Journal. 2009; 146 (1): 22.

[31] Koseoglu, P. An analysis of University Students perceptions of the concepts of "water" and "water pollution" through Metaphors. EURASIA Journal of Mathematics Science and Technology Education. 2017; 13(8): 4343 - 4350

[32] Chaturvedi, S.I. Electrocoagulation: A novel waste water Treatment method. International Journal of Modern Engineering Research. 2013; 3(1): 93 - 100

[33] Jian-Guang, Y., Jie, L., Si-yao, P., Yuan-lu, L., Wie-qiang, Sh. A new membrane Electro deposition based process for tin recovery from waste printed circuit boards. Journal of hazardous materials. 2016; 304: 409 - 416

[34] Cano, A., Barrera, C., Cotillas, S., Llanos, J., Canizares, P., Rodrigo, M.A. Use of Dia cell modules for the electro disinfection of Secondary treated waste water with diamond Anodes. Chemical Engineering Journal. 2016; 306: 433 - 440

[35] Linares-Hernandez, I., Barrer-Diaz, C., Bilyeu, B., Juarez-Gracia, P.R., Campos-Medina, E. A combined Electro coagulation - Electro oxidation treatment for industrial waste water. Journal of Hazardous Materials. 2009; 175: 688 - 694

[36] Ramirez, E.R. Physicochemical treatment of rendering waste water by Electro coagulation. Thirty sixth purdue Indian waste conference, Lafayette, Indian. 1981.

[37] Tsai, C.t., Lin, S.T., Shue, Y.C., Su, P.L. Electrolysis of soluble organic matter in leachate from landfills. Water Resources. 1997; 31(12): 3073

APPENDIXES

Appendix A: Optimization through RSM using sodium chloride as a supporting electrolyte and other supporting electrolytes.

Number	Current ampere	pH	Distance in-between electrod	Reaction time	Sodium chloride	Color	COD	Turbidity	Power consumption	Desirability	
1	**0.177**	**8.999**	**2.000**	**30.000**	**3.000**	**94.760**	**77.925**	**92.194**	**0.166**	**0.917**	**Selected**
2	0.196	9.000	2.000	29.966	3.000	99.658	79.399	88.997	0.173	0.911	
3	0.188	9.000	2.000	30.000	2.929	97.359	78.635	89.662	0.175	0.909	
4	0.191	8.832	1.993	30.000	3.000	97.524	78.557	89.568	0.177	0.908	
5	0.165	9.000	2.000	29.764	2.996	91.000	76.261	93.533	0.161	0.906	
6	0.200	8.922	2.000	29.859	2.999	100.169	79.246	87.998	0.177	0.906	
7	0.180	9.000	2.000	29.594	2.959	94.760	76.252	90.898	0.174	0.906	
8	0.170	8.979	1.976	30.000	2.905	91.731	76.886	91.695	0.165	0.905	
9	0.184	9.000	1.922	29.835	3.000	94.711	76.451	89.291	0.164	0.905	
10	0.196	9.000	1.915	30.000	3.000	97.852	78.171	87.278	0.165	0.904	
11	0.200	9.000	1.978	29.742	3.000	99.805	78.483	87.591	0.173	0.904	
12	0.149	9.000	2.000	30.000	2.963	86.399	76.943	95.211	0.144	0.901	
13	0.157	9.000	1.935	30.000	2.964	87.493	76.032	92.909	0.146	0.900	
14	0.143	8.993	1.999	29.928	3.000	84.412	76.726	95.936	0.135	0.897	
15	0.200	8.999	1.835	30.000	2.997	97.009	77.417	84.925	0.159	0.897	
16	0.138	8.999	2.000	29.999	3.000	82.689	77.206	96.475	0.127	0.896	
17	0.149	9.000	2.000	30.000	2.787	85.496	76.587	93.658	0.148	0.896	
18	0.150	8.691	1.980	30.000	3.000	85.686	76.125	94.219	0.150	0.894	
19	0.123	8.991	2.000	30.000	2.994	77.600	77.876	97.148	0.103	0.890	

20	0.138	8.643	1.999	30.000	3.000	82.211	76.495	95.376	0.137	0.890
21	0.200	9.000	1.823	29.999	2.897	96.404	77.079	83.460	0.165	0.890
22	0.200	9.000	2.000	29.987	2.639	99.083	79.711	83.657	0.193	0.889
23	0.196	8.999	1.802	29.998	2.855	94.760	76.241	83.358	0.166	0.886
24	0.200	8.998	1.710	29.992	3.000	94.230	75.817	82.594	0.153	0.886
25	0.100	3.005	1.019	30.000	1.000	87.061	76.186	84.321	0.113	0.886
26	0.101	3.000	1.000	29.988	1.001	87.185	76.300	84.698	0.120	0.885
27	0.107	9.000	2.000	30.000	2.999	71.747	79.285	97.498	0.070	0.885
28	0.191	9.000	2.000	29.738	2.595	96.322	77.619	84.709	0.195	0.885
29	0.131	9.000	1.868	30.000	3.000	78.339	75.724	93.391	0.107	0.885
30	0.199	8.546	1.796	30.000	3.000	93.971	76.030	84.295	0.172	0.885
31	0.142	9.000	2.000	30.000	2.534	82.385	76.317	91.980	0.145	0.884
32	0.135	8.371	2.000	29.999	3.000	80.830	76.121	94.661	0.138	0.884
33	0.188	8.788	1.997	28.745	2.997	94.759	72.802	88.841	0.190	0.883
34	0.200	9.000	1.893	29.996	2.683	97.003	77.910	82.162	0.183	0.882
35	0.100	3.001	1.010	30.000	1.227	87.631	76.494	82.521	0.116	0.882
36	0.121	8.439	2.000	30.000	2.998	76.494	77.012	95.276	0.112	0.881
37	0.133	9.000	2.000	29.582	2.847	79.806	75.108	95.027	0.128	0.881
38	0.100	3.000	1.061	29.996	1.147	87.115	75.686	82.544	0.107	0.881
39	0.100	3.010	1.000	30.000	1.359	87.792	76.829	81.495	0.118	0.880
40	0.100	3.176	1.000	30.000	1.003	85.788	76.081	84.320	0.122	0.879
41	0.118	9.000	2.000	29.997	2.532	74.207	77.222	93.907	0.100	0.878
42	0.141	7.889	1.997	29.958	3.000	81.870	74.921	92.632	0.157	0.876
43	0.189	9.000	2.000	30.000	2.292	94.217	78.693	81.855	0.201	0.876
44	0.108	3.000	1.024	29.985	1.000	86.510	75.033	85.429	0.142	0.875
45	0.137	8.985	2.000	29.992	2.303	79.308	76.272	90.483	0.138	0.873
46	0.115	9.000	2.000	30.000	2.331	72.069	77.312	92.594	0.092	0.873

47	0.100	3.000	1.000	29.650	1.391	87.515	75.659	80.845	0.120	0.873
48	0.100	3.000	1.290	29.985	1.000	85.073	73.226	80.998	0.072	0.873
49	0.100	3.000	1.000	29.982	1.946	87.692	78.632	76.280	0.106	0.872
50	0.195	8.984	2.000	30.000	2.248	95.395	79.432	79.909	0.207	0.872
51	0.101	9.000	2.000	30.000	2.394	67.460	78.545	93.617	0.059	0.871
52	0.102	9.000	2.000	30.000	2.340	67.429	78.438	93.247	0.060	0.870
53	0.108	3.000	1.000	30.000	1.386	87.366	75.751	82.718	0.146	0.870
54	0.102	3.044	1.000	29.905	1.675	87.400	76.851	79.106	0.123	0.870
55	0.100	3.252	1.056	30.000	1.315	85.478	75.498	81.005	0.114	0.869
56	0.101	3.022	1.000	30.000	2.345	86.568	80.583	72.952	0.092	0.867
57	0.100	3.005	1.003	30.000	2.553	85.965	82.128	70.690	0.076	0.867
58	0.100	3.001	1.034	30.000	2.354	86.584	80.269	72.209	0.083	0.867
59	0.110	3.003	1.000	29.913	1.433	87.205	75.359	82.456	0.151	0.866
60	0.102	3.000	1.000	30.000	2.531	85.997	81.652	71.517	0.085	0.866
61	0.106	3.000	1.000	29.271	1.000	86.045	73.152	84.621	0.142	0.865
62	0.102	3.000	1.222	30.000	1.476	86.477	73.950	78.187	0.090	0.865
63	0.100	3.061	1.017	30.000	2.522	85.652	81.507	70.988	0.078	0.865
64	0.200	8.618	2.000	30.000	2.298	95.383	79.106	79.509	0.222	0.865
65	0.101	3.000	1.001	29.999	2.985	83.825	85.531	66.785	0.046	0.865
66	0.100	3.000	1.000	29.867	2.651	85.467	82.428	69.669	0.071	0.864
67	0.100	3.038	1.000	29.956	2.833	84.412	84.104	68.117	0.058	0.864
68	0.100	3.168	1.000	29.986	2.384	85.476	80.608	72.523	0.091	0.863
69	0.100	3.000	1.060	29.998	2.627	85.467	81.611	69.461	0.064	0.863
70	0.100	3.000	1.005	29.684	2.284	86.620	79.204	72.866	0.093	0.863
71	0.100	3.205	1.000	29.999	2.254	85.594	79.711	73.838	0.100	0.863
72	0.100	3.000	1.160	30.000	2.015	86.781	76.565	73.952	0.081	0.863
73	0.100	3.000	1.250	30.000	1.706	86.519	74.407	75.683	0.078	0.862

74	0.100	3.139	1.030	30.000	2.873	83.516	83.768	67.778	0.054	0.860
75	0.100	3.006	1.592	29.988	1.000	83.022	71.829	77.933	0.046	0.860
76	0.174	9.000	1.583	30.000	3.000	85.563	72.778	83.767	0.142	0.860
77	0.113	3.012	1.000	30.000	2.689	84.707	81.078	72.774	0.104	0.860
78	0.114	3.001	1.000	29.999	2.754	84.424	81.468	72.424	0.101	0.860
79	0.108	9.000	1.725	30.000	2.999	68.427	76.244	89.783	0.058	0.860
80	0.185	9.000	2.000	30.000	1.993	91.128	78.899	79.027	0.204	0.860
81	0.100	3.000	1.110	30.000	2.792	84.565	82.051	67.414	0.046	0.859
82	0.100	9.000	1.980	30.000	2.047	64.855	78.292	90.812	0.047	0.859
83	0.100	3.053	1.580	30.000	1.082	83.102	71.813	77.479	0.048	0.859
84	0.200	8.999	1.997	30.000	1.977	94.556	80.707	75.109	0.215	0.857
85	0.122	3.026	1.000	30.000	3.000	82.548	82.349	72.292	0.099	0.857
86	0.118	3.000	1.037	30.000	2.919	83.328	81.596	71.511	0.092	0.857
87	0.122	3.000	1.000	30.000	2.629	84.488	79.532	75.233	0.131	0.855
88	0.100	3.416	1.005	30.000	3.000	81.179	84.613	67.601	0.057	0.855
89	0.100	9.000	2.000	29.649	2.136	64.985	76.975	91.472	0.055	0.855
90	0.130	3.000	1.000	30.000	2.965	82.347	81.217	74.259	0.119	0.854
91	0.145	7.442	2.000	30.000	2.645	81.763	73.510	88.974	0.185	0.853
92	0.100	3.790	1.000	29.958	1.139	81.264	74.951	82.159	0.135	0.853
93	0.139	9.000	2.000	30.000	1.735	75.966	77.181	85.088	0.134	0.852
94	0.136	3.000	1.000	29.981	3.000	81.642	80.784	75.356	0.128	0.852
95	0.103	3.000	1.786	29.958	1.000	81.889	71.700	76.357	0.046	0.852
96	0.100	3.788	1.000	30.000	1.335	81.779	75.365	80.802	0.134	0.852
97	0.100	3.069	1.777	30.000	1.057	81.788	71.977	76.058	0.039	0.851
98	0.101	9.000	2.000	29.807	1.874	63.830	77.834	89.890	0.047	0.851
99	0.100	3.003	1.000	28.109	1.000	84.998	69.947	82.372	0.129	0.849
100	0.100	3.112	1.985	30.000	1.000	80.185	73.205	75.130	0.037	0.848

Appendix B: Optimization through RSM using calcium chloride as a supporting electrolyte and other supporting electrolytes.

Number	Current ampere	pH	Distance in-between electrode	Reaction time	Calcium chloride	Color	COD	Turbidity	Power consumption	Desirability	
1	**0.100**	**8.676**	**2.000**	**30.000**	**1.000**	**99.968**	**79.111**	**90.004**	**-0.009**	**0.936**	**Selected**
2	0.100	8.078	2.000	29.998	1.000	98.429	79.075	89.738	0.002	0.935	
3	0.100	8.999	1.999	29.971	1.011	101.057	78.980	89.737	-0.016	0.934	
4	0.100	9.000	1.996	29.960	1.000	100.939	78.946	89.669	-0.015	0.934	
5	0.102	8.911	2.000	30.000	1.010	100.907	78.868	89.741	-0.007	0.934	
6	0.100	8.853	1.987	29.999	1.000	99.979	79.132	89.287	-0.013	0.934	
7	0.100	8.995	1.999	30.000	1.046	100.872	79.013	89.421	-0.017	0.934	
8	0.100	8.766	2.000	29.891	1.015	100.253	78.630	89.598	-0.011	0.933	
9	0.100	7.399	2.000	30.000	1.041	96.034	78.931	88.556	0.013	0.931	
10	0.100	7.076	2.000	29.974	1.011	95.356	78.864	88.421	0.020	0.930	
11	0.100	8.800	2.000	29.632	1.000	100.047	77.590	89.192	-0.010	0.928	
12	0.100	9.000	2.000	29.824	1.169	99.833	77.980	87.670	-0.019	0.925	
13	0.100	7.686	1.933	30.000	1.002	93.226	79.121	86.189	0.010	0.924	
14	0.112	9.000	2.000	30.000	1.108	100.169	77.331	87.793	0.037	0.923	
15	0.100	9.000	1.924	29.986	1.000	96.175	79.150	85.663	-0.013	0.923	
16	0.100	9.000	1.990	30.000	1.307	98.768	78.511	86.136	-0.025	0.922	
17	0.100	7.446	2.000	29.401	1.000	95.624	76.541	87.878	0.018	0.920	
18	0.100	7.804	2.000	30.000	1.348	95.131	78.319	85.740	-0.002	0.920	
19	0.100	7.507	2.000	30.000	1.376	93.991	78.225	85.128	0.003	0.918	
20	0.103	6.710	1.941	29.985	1.000	91.416	78.510	85.196	0.041	0.917	

21	0.100	6.760	1.999	29.726	1.196	92.325	77.379	85.175	0.022	0.915
22	0.100	8.895	2.000	29.979	3.000	110.367	77.418	84.914	-0.033	0.914
23	0.100	9.000	2.000	29.961	2.998	110.865	77.375	84.905	-0.036	0.914
24	0.117	9.000	1.991	29.939	1.000	100.100	76.806	87.999	0.064	0.913
25	0.102	8.995	2.000	30.000	2.991	110.562	77.162	84.837	-0.026	0.913
26	0.100	8.728	2.000	29.971	2.992	109.260	77.275	84.706	-0.027	0.913
27	0.101	9.000	2.000	30.000	2.934	109.740	77.336	84.511	-0.033	0.913
28	0.100	5.561	1.985	29.931	1.000	90.561	78.520	84.583	0.043	0.912
29	0.100	6.619	1.986	30.000	1.302	90.809	78.251	83.761	0.020	0.910
30	0.100	5.232	2.000	30.000	1.000	90.577	78.728	84.226	0.048	0.910
31	0.106	9.000	2.000	30.000	2.952	109.396	76.481	84.352	-0.009	0.909
32	0.100	7.782	2.000	29.867	1.628	93.962	77.298	83.248	-0.006	0.909
33	0.110	9.000	1.998	29.998	3.000	109.605	75.990	84.412	0.006	0.908
34	0.100	8.807	2.000	29.969	2.643	104.456	77.221	82.910	-0.035	0.907
35	0.100	5.294	2.000	29.817	1.000	90.482	77.996	84.118	0.048	0.907
36	0.100	8.971	2.000	30.000	2.135	100.372	77.493	82.418	-0.038	0.907
37	0.100	8.425	1.991	30.000	1.933	96.494	77.570	82.176	-0.024	0.906
38	0.100	5.022	2.000	29.998	1.002	90.047	78.675	83.525	0.051	0.906
39	0.101	8.988	2.000	29.547	3.000	110.051	75.570	84.020	-0.030	0.905
40	0.115	8.949	2.000	30.000	3.000	108.651	75.313	84.289	0.027	0.905
41	0.100	5.068	2.000	30.000	1.025	89.875	78.629	83.373	0.050	0.905
42	0.118	8.954	1.994	30.000	3.000	107.837	74.901	83.895	0.039	0.902
43	0.100	7.234	2.000	30.000	2.803	98.641	76.914	81.597	0.004	0.902
44	0.100	8.802	2.000	29.688	2.604	103.480	76.097	82.188	-0.034	0.901
45	0.110	8.379	1.871	29.999	1.118	90.818	77.662	81.319	0.041	0.901
46	0.100	7.350	2.000	30.000	2.175	93.479	77.117	80.746	-0.002	0.900
47	0.122	9.000	2.000	29.996	3.000	107.683	74.521	84.086	0.050	0.898

48	0.100	9.000	1.915	30.000	2.818	103.021	77.287	79.626	-0.038	0.897
49	0.120	8.223	2.000	29.560	1.002	97.653	75.008	87.248	0.090	0.895
50	0.100	7.109	1.916	29.995	2.998	96.749	76.720	79.410	0.007	0.894
51	0.118	6.688	2.000	30.000	1.000	94.399	76.947	86.127	0.104	0.893
52	0.118	8.874	1.979	30.000	1.978	96.484	75.283	80.496	0.041	0.893
53	0.100	5.928	2.000	29.990	2.943	93.993	76.414	78.910	0.035	0.892
54	0.100	6.053	2.000	30.000	2.810	92.942	76.492	78.644	0.030	0.891
55	0.101	9.000	2.000	28.709	2.991	108.580	72.409	82.223	-0.029	0.888
56	0.132	8.868	2.000	30.000	1.000	98.894	76.003	87.712	0.122	0.887
57	0.100	5.943	2.000	29.657	2.994	94.253	75.140	78.711	0.037	0.887
58	0.101	6.402	1.897	30.000	2.973	92.236	76.275	77.351	0.024	0.886
59	0.100	4.393	1.990	29.988	1.060	87.341	78.348	80.190	0.057	0.884
60	0.110	8.951	1.795	29.751	1.001	88.052	76.991	78.152	0.041	0.881
61	0.137	9.000	2.000	30.000	1.000	98.552	75.801	87.503	0.136	0.880
62	0.100	5.619	1.933	30.000	3.000	90.548	76.184	76.493	0.037	0.879
63	0.100	4.056	2.000	29.636	1.017	87.029	76.960	79.094	0.065	0.873
64	0.101	3.697	2.000	30.000	1.000	87.056	78.239	78.174	0.072	0.871
65	0.200	3.000	1.000	29.999	1.001	92.785	78.812	89.901	0.210	0.866
66	0.100	8.547	2.000	27.651	2.959	103.745	68.357	79.548	-0.015	0.864
67	0.200	3.086	1.000	29.974	1.001	92.408	78.721	89.830	0.212	0.864
68	0.100	5.687	1.952	30.000	2.430	85.775	76.411	75.164	0.028	0.863
69	0.101	5.099	1.870	30.000	1.268	81.530	77.963	77.073	0.041	0.862
70	0.147	8.999	2.000	30.000	1.373	93.920	74.686	83.546	0.148	0.860
71	0.198	3.000	1.000	29.809	1.000	92.407	77.737	89.837	0.214	0.860
72	0.100	8.840	2.000	27.671	1.866	94.551	68.547	77.925	-0.024	0.860
73	0.100	3.134	2.000	30.000	1.000	85.748	78.239	75.655	0.073	0.859
74	0.148	9.000	1.967	30.000	2.984	99.839	72.778	81.978	0.121	0.859

75	0.200	3.000	1.000	30.000	3.000	86.637	69.995	91.785	0.136	0.857
76	0.122	7.455	1.794	30.000	3.000	92.004	73.647	75.201	0.078	0.856
77	0.200	3.000	1.000	29.839	1.168	90.250	77.213	88.565	0.202	0.856
78	0.193	3.000	1.000	30.000	1.058	90.599	77.283	89.252	0.212	0.854
79	0.200	3.362	1.000	29.772	1.005	91.048	77.918	89.432	0.220	0.854
80	0.199	3.000	1.000	29.867	3.000	86.493	69.295	91.703	0.139	0.853
81	0.100	4.863	1.891	30.000	3.000	85.652	75.735	73.284	0.047	0.852
82	0.200	3.108	1.000	29.987	1.293	88.268	77.133	87.687	0.195	0.851
83	0.200	3.688	1.000	29.965	1.000	89.807	78.749	89.069	0.225	0.850
84	0.200	3.000	1.092	30.000	1.001	90.554	79.234	84.810	0.208	0.850
85	0.200	3.000	1.002	29.986	1.401	87.414	76.542	87.084	0.187	0.849
86	0.200	3.000	1.000	29.941	2.816	85.036	70.334	89.991	0.139	0.848
87	0.200	3.445	1.054	30.000	1.017	89.417	79.021	86.405	0.217	0.847
88	0.198	3.000	1.000	29.999	1.398	87.223	76.290	87.153	0.189	0.847
89	0.187	3.031	1.018	30.000	1.000	89.803	76.850	88.596	0.218	0.846
90	0.200	4.001	1.000	29.999	2.997	84.661	70.336	91.020	0.152	0.845
91	0.191	3.001	1.000	30.000	2.995	85.837	68.727	91.207	0.147	0.845
92	0.200	3.796	1.017	29.959	1.008	88.872	78.764	87.950	0.226	0.844
93	0.200	3.839	1.033	30.000	1.000	88.478	79.021	87.133	0.226	0.842
94	0.101	4.209	2.000	29.998	3.000	86.389	75.466	72.303	0.075	0.840
95	0.178	3.002	1.000	29.972	1.000	87.935	75.435	89.523	0.219	0.839
96	0.200	3.000	1.144	29.976	1.017	89.057	79.261	82.024	0.207	0.838
97	0.200	4.360	1.015	30.000	3.000	83.628	70.581	89.739	0.156	0.838
98	0.200	3.044	1.027	29.970	2.679	83.191	71.118	87.162	0.142	0.837
99	0.200	3.595	1.067	29.995	2.993	83.315	70.725	87.403	0.146	0.835
100	0.185	3.000	1.000	29.897	3.000	85.085	67.537	90.925	0.154	0.835

Appendix C: Optimization through RSM using sodium carbonate as a supporting electrolyte and other supporting electrolytes.

Number	Current ampere	pH	Distance in-between electrode	Reaction time	Sodium carbonate	Color	COD	Turbidity	Power consumption	Desirability	
1	**0.100**	**8.983**	**1.999**	**30.000**	**2.401**	**83.767**	**83.161**	**93.662**	**-0.000**	**0.952**	**Selected**
2	0.100	9.000	2.000	29.957	2.365	83.956	83.026	93.299	-0.002	0.951	
3	0.100	9.000	1.982	29.999	2.525	82.628	82.874	94.346	0.009	0.950	
4	0.100	8.885	1.998	29.997	2.583	82.397	82.901	95.329	0.013	0.949	
5	0.100	8.281	2.000	30.000	2.504	83.940	81.689	93.802	0.026	0.948	
6	0.100	8.999	1.983	29.943	2.431	83.352	82.640	93.408	0.005	0.948	
7	0.100	8.990	1.986	29.839	2.530	82.482	82.128	94.380	0.011	0.947	
8	0.107	8.949	2.000	30.000	2.437	82.076	82.321	94.379	0.026	0.946	
9	0.100	8.055	2.000	29.978	2.614	83.204	81.165	94.380	0.039	0.946	
10	0.101	8.036	2.000	30.000	2.465	84.342	81.096	93.080	0.034	0.945	
11	0.100	7.900	2.000	30.000	2.583	83.712	80.975	93.803	0.041	0.945	
12	0.100	8.761	2.000	29.999	1.972	85.622	83.390	89.359	-0.020	0.945	
13	0.100	7.793	2.000	30.000	2.677	82.932	80.848	94.379	0.048	0.944	
14	0.100	8.029	2.000	30.000	2.261	85.624	81.277	91.229	0.021	0.944	
15	0.100	8.981	1.953	30.000	2.177	84.592	82.674	90.009	-0.004	0.941	
16	0.100	8.653	1.999	30.000	2.837	79.900	82.734	97.533	0.030	0.940	
17	0.100	8.999	2.000	29.994	2.865	78.898	83.447	98.357	0.022	0.939	
18	0.108	9.000	2.000	29.999	2.647	79.871	82.344	96.428	0.037	0.939	
19	0.100	9.000	1.960	30.000	1.993	85.037	83.221	88.409	-0.018	0.939	
20	0.100	8.114	1.951	30.000	2.758	81.242	80.904	94.383	0.049	0.939	

21	0.101	7.810	2.000	30.000	2.087	86.111	80.993	89.445	0.020	0.938
22	0.100	8.732	1.930	30.000	2.382	83.683	81.582	91.138	0.019	0.938
23	0.100	7.775	2.000	29.918	2.826	81.265	80.661	95.549	0.055	0.938
24	0.106	9.000	2.000	29.760	2.005	83.999	82.077	89.991	-0.004	0.937
25	0.100	7.180	2.000	29.997	2.621	84.018	79.657	92.353	0.062	0.937
26	0.100	8.813	1.970	30.000	1.867	85.273	83.345	87.468	-0.023	0.937
27	0.119	8.982	2.000	30.000	2.396	80.056	81.441	94.362	0.055	0.936
28	0.100	7.384	2.000	30.000	2.218	86.158	80.019	89.679	0.038	0.936
29	0.100	8.806	2.000	30.000	1.636	84.935	84.721	86.172	-0.047	0.936
30	0.119	8.479	2.000	30.000	2.369	81.194	80.393	93.560	0.069	0.934
31	0.111	8.875	2.000	30.000	1.771	83.298	83.290	88.465	-0.003	0.934
32	0.100	9.000	1.876	30.000	2.773	79.431	81.536	93.601	0.039	0.932
33	0.100	7.075	1.999	30.000	2.924	80.864	80.070	94.378	0.075	0.932
34	0.100	8.001	1.998	29.997	1.706	85.539	82.505	86.338	-0.013	0.931
35	0.100	6.746	2.000	29.999	2.694	83.643	79.015	91.588	0.077	0.928
36	0.100	8.562	2.000	30.000	1.432	83.795	85.142	84.254	-0.055	0.926
37	0.120	8.999	2.000	30.000	1.620	80.938	83.537	87.858	0.008	0.925
38	0.100	9.000	1.957	30.000	1.496	83.614	85.111	83.480	-0.055	0.923
39	0.100	9.000	1.928	29.185	2.453	82.076	78.055	91.156	0.024	0.921
40	0.100	7.972	1.856	30.000	2.999	77.637	80.151	93.746	0.072	0.921
41	0.100	8.807	1.816	30.000	3.000	76.349	80.939	93.993	0.061	0.921
42	0.117	9.000	2.000	30.000	1.406	80.301	84.907	85.801	-0.018	0.920
43	0.100	6.404	2.000	30.000	2.696	83.742	78.403	90.422	0.087	0.918
44	0.106	9.000	2.000	29.954	1.238	80.754	86.584	83.107	-0.067	0.917
45	0.136	8.999	1.984	29.981	1.834	78.299	81.334	89.743	0.069	0.915
46	0.100	9.000	1.741	29.999	2.413	82.434	79.704	86.474	0.046	0.912
47	0.100	6.535	2.000	29.357	2.196	85.779	75.255	86.752	0.069	0.908

48	0.101	9.000	1.731	29.923	3.000	75.862	79.929	91.945	0.072	0.908
49	0.139	8.993	2.000	30.000	2.205	76.976	80.493	92.861	0.096	0.907
50	0.100	6.718	1.999	29.999	1.481	83.803	80.673	82.876	0.013	0.907
51	0.100	9.000	1.808	29.998	1.736	83.709	81.796	81.651	-0.005	0.906
52	0.139	9.000	2.000	30.000	2.402	75.908	80.272	94.312	0.103	0.904
53	0.101	9.000	1.624	30.000	2.580	81.134	78.681	85.517	0.073	0.900
54	0.133	7.413	2.000	30.000	1.279	78.268	81.086	85.419	0.067	0.900
55	0.105	9.000	1.711	30.000	3.000	75.290	79.680	91.664	0.085	0.899
56	0.129	9.000	2.000	30.000	2.824	73.356	80.859	97.846	0.099	0.899
57	0.138	9.000	2.000	30.000	1.112	73.548	85.724	85.192	0.015	0.897
58	0.114	6.779	1.986	30.000	3.000	78.243	78.327	93.480	0.123	0.895
59	0.124	7.273	2.000	29.999	2.874	77.901	78.196	94.357	0.131	0.892
60	0.100	6.317	1.000	30.000	3.000	79.281	81.233	85.166	0.100	0.890
61	0.100	8.669	1.820	29.899	1.371	81.419	82.477	78.718	-0.025	0.890
62	0.100	6.095	1.000	30.000	2.986	78.900	81.268	85.041	0.098	0.889
63	0.100	6.404	1.000	29.964	3.000	79.460	81.021	85.156	0.102	0.889
64	0.101	6.119	1.000	30.000	3.000	78.838	81.204	85.200	0.100	0.889
65	0.100	5.707	1.004	30.000	3.000	77.730	81.592	84.777	0.091	0.889
66	0.100	6.363	1.010	29.992	2.997	79.289	81.031	85.065	0.101	0.889
67	0.100	6.187	1.018	29.984	3.000	78.767	80.933	84.980	0.100	0.887
68	0.151	9.000	1.997	29.557	1.331	72.856	81.660	86.514	0.069	0.887
69	0.100	8.702	1.538	30.000	2.893	78.320	78.494	86.830	0.094	0.886
70	0.104	6.212	1.000	30.000	3.000	79.093	80.717	85.519	0.109	0.885
71	0.104	5.490	1.000	30.000	2.994	77.412	81.238	84.953	0.097	0.884
72	0.100	4.752	1.000	30.000	3.000	75.034	82.385	83.626	0.075	0.884
73	0.100	4.637	1.000	29.996	2.997	74.670	82.488	83.386	0.072	0.883
74	0.130	6.580	2.000	30.000	1.024	75.545	81.026	82.894	0.069	0.881

75	0.101	4.514	1.003	29.967	3.000	74.269	82.317	83.159	0.073	0.881
76	0.100	6.431	1.000	29.596	3.000	79.287	79.206	84.953	0.106	0.880
77	0.100	5.039	1.002	30.000	2.593	78.367	80.347	82.398	0.088	0.879
78	0.100	9.000	1.438	30.000	2.597	81.949	77.833	82.324	0.096	0.879
79	0.100	4.558	1.022	30.000	3.000	74.253	82.204	82.914	0.074	0.879
80	0.100	5.998	1.000	30.000	2.352	81.942	79.220	81.699	0.103	0.879
81	0.100	4.304	1.000	30.000	2.828	74.790	81.892	82.214	0.072	0.878
82	0.100	6.747	1.016	30.000	2.359	83.937	78.746	81.174	0.112	0.878
83	0.100	8.008	1.086	30.000	3.000	81.059	79.605	84.154	0.123	0.877
84	0.104	6.285	2.000	29.964	1.008	77.135	81.909	79.514	0.003	0.877
85	0.100	7.921	1.000	30.000	2.447	86.661	78.792	80.208	0.125	0.877
86	0.100	6.563	1.696	30.000	2.934	78.187	77.183	86.912	0.106	0.877
87	0.100	6.929	1.002	30.000	2.232	84.658	78.703	80.327	0.113	0.876
88	0.110	4.571	1.000	30.000	3.000	75.199	81.302	84.034	0.094	0.875
89	0.166	8.999	1.989	29.994	1.025	67.363	85.870	85.380	0.069	0.875
90	0.141	6.794	2.000	30.000	1.043	74.781	81.033	83.975	0.089	0.875
91	0.101	5.206	1.000	30.000	2.349	79.361	79.481	81.707	0.096	0.874
92	0.100	5.967	1.000	30.000	2.155	81.650	78.978	80.725	0.102	0.874
93	0.100	4.236	1.000	30.000	2.593	75.475	80.981	81.350	0.076	0.873
94	0.170	9.000	2.000	30.000	1.403	70.243	83.461	87.415	0.102	0.873
95	0.100	7.838	1.201	30.000	2.912	80.442	78.427	83.803	0.119	0.872
96	0.109	4.661	1.029	30.000	3.000	75.173	80.828	83.701	0.097	0.871
97	0.100	8.674	1.287	30.000	2.882	80.399	78.190	83.445	0.117	0.871
98	0.102	4.288	1.000	30.000	2.460	76.097	80.177	81.334	0.085	0.869
99	0.100	8.048	1.202	30.000	2.455	84.290	77.333	80.068	0.116	0.868
100	0.100	5.748	1.000	30.000	1.967	80.146	78.993	79.928	0.098	0.868

Appendix D: Run order for Sodium chloride concentration

	Color		COD		Turbidity		Power consumption	
Run Order	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**
1	87.45	57.57	33.33	33.08	70.22	51.91	0.1520	0.1763
2	88.10	74.13	50.00	47.80	89.87	70.74	0.1790	0.1655
3	90.32	87.25	75.00	76.46	91.69	84.58	0.1590	0.1164
4	70.43	60.17	5.26	33.51	51.86	45.88	0.6300	0.1623
5	88.48	75.61	57.89	49.26	71.58	63.33	0.1030	0.1522
6	91.30	87.62	73.68	78.95	71.89	75.81	0.1080	0.1037
7	69.65	58.54	50.00	38.33	43.01	39.26	0.0790	0.1003
8	73.04	72.87	66.67	55.11	48.76	55.35	0.1010	0.0908
9	78.09	83.77	91.67	85.82	48.89	66.46	0.0950	0.0430
10	50.00	35.40	12.50	19.09	47.66	43.94	0.4010	0.3153
11	61.82	54.71	25.00	37.04	65.42	63.06	0.3690	0.2878
12	80.91	70.61	75.00	68.92	77.42	77.19	0.1790	0.2220
13	63.95	42.91	14.29	15.75	54.47	48.96	0.3360	0.3111
14	84.30	61.11	28.57	34.72	64.75	66.71	0.2930	0.2842
15	86.05	75.89	71.43	67.64	77.95	79.47	0.1560	0.2190
16	50.55	46.19	14.29	16.80	52.63	53.40	0.3360	0.2587
17	67.03	63.28	28.57	36.81	68.93	69.77	0.2820	0.2325
18	83.52	76.95	85.71	70.74	77.24	81.17	0.1300	0.1679
19	35.78	43.88	37.50	29.47	9.53	28.31	0.1930	0.3344
20	55.69	65.95	62.50	50.65	20.99	47.71	0.2140	0.2902
21	87.75	84.61	75.00	85.76	41.38	62.12	0.2460	0.2076
22	70.29	56.30	22.22	22.37	63.36	44.38	0.2890	0.3398
23	75.71	77.26	44.44	44.56	75.57	62.41	0.2680	0.2962

24	78.57	94.81	77.78	80.70	82.87	75.46	0.2230	0.2143
25	54.38	64.49	25.00	19.65	49.24	59.87	0.2170	0.2970
26	79.34	84.35	37.50	42.88	70.59	76.53	0.2800	0.2541
27	80.17	100.78	81.25	80.04	71.89	88.21	0.1740	0.1728
28	41.33	52.87	12.50	20.14	37.97	51.51	0.4450	0.3224
29	60.00	68.71	37.50	37.69	52.42	69.12	0.2460	0.2881
30	70.00	81.13	62.50	69.18	76.86	81.74	0.1950	0.2155
31	18.75	57.46	16.67	18.13	32.32	49.62	0.2500	0.2977
32	50.00	72.18	33.33	36.71	55.61	65.86	0.2390	0.2640
33	68.75	83.49	83.33	69.22	75.91	77.12	0.1300	0.1921
34	42.00	57.82	16.67	20.51	41.99	47.15	0.3690	0.2248
35	55.00	71.43	33.33	40.11	59.71	62.02	0.3260	0.1918
36	77.00	81.62	66.67	73.66	69.76	71.91	0.2280	0.1205
37	49.47	44.20	14.29	23.05	41.10	38.85	0.5930	0.4490
38	71.10	62.80	28.57	43.83	56.00	56.74	0.5350	0.3980
39	77.89	77.99	85.71	78.54	70.82	69.65	0.2460	0.3086
40	49.75	53.70	14.29	17.27	48.85	48.01	0.6080	0.4339
41	71.81	71.19	28.57	39.07	62.98	64.54	0.5790	0.3835
42	82.23	85.26	71.43	74.81	76.78	76.08	0.3300	0.2948
43	59.05	58.97	16.67	15.89	47.48	56.60	0.4630	0.3707
44	70.48	75.35	33.33	38.71	66.12	71.75	0.4200	0.3210
45	79.52	88.30	66.67	75.48	77.67	81.93	0.2820	0.2329
46	6.67	5.39	33.33	28.77	28.32	22.91	0.1700	0.0990
47	15.56	28.89	50.00	44.30	47.86	44.74	0.1690	0.1018
48	65.56	48.97	66.67	73.76	61.93	61.60	0.1370	0.0662
49	21.05	13.83	33.33	26.55	31.89	30.68	0.1200	0.1260
50	34.21	36.22	50.00	43.10	58.98	51.15	0.1400	0.1294

51	62.28	55.19	66.67	73.59	70.11	66.64	0.1520	0.0945
52	40.63	18.05	25.00	28.71	62.10	37.88	0.1050	0.1048
53	49.10	39.32	37.50	46.29	78.35	56.98	0.1300	0.1089
54	65.63	57.18	87.50	77.80	86.27	71.10	0.0810	0.0747
55	80.95	57.24	35.71	31.18	81.10	60.57	0.1780	0.3301
56	86.67	71.52	42.86	44.83	86.41	77.72	0.2680	0.3229
57	94.76	82.39	64.29	72.42	86.83	89.88	0.2390	0.2773
58	85.79	60.56	46.67	30.59	82.89	57.72	0.1490	0.2910
59	88.95	73.74	53.33	45.27	83.71	73.50	0.2330	0.2844
60	92.53	83.49	60.00	73.89	89.10	84.29	0.2820	0.2395
61	69.45	59.67	37.50	34.40	72.17	54.28	0.0940	0.2038
62	78.85	71.73	62.50	50.10	75.41	68.69	0.1130	0.1978
63	85.91	80.36	87.50	79.75	77.94	78.12	0.1070	0.1536
64	34.78	42.16	40.00	24.73	25.85	40.47	0.2960	0.4004
65	37.39	59.21	60.00	41.60	47.28	57.89	0.3670	0.3764
66	59.13	72.84	70.00	72.42	67.10	70.34	0.4210	0.3142
67	71.71	50.40	14.29	20.37	72.10	48.66	0.3910	0.3709
68	82.89	66.34	57.14	38.28	72.86	64.72	0.2240	0.3476
69	86.18	78.85	71.43	70.12	79.39	75.80	0.3560	0.2860
70	76.36	54.41	22.22	20.41	75.93	56.28	0.2240	0.2934
71	77.73	69.24	44.44	39.34	79.56	70.98	0.2030	0.2707
72	80.91	80.64	77.78	72.21	86.55	80.68	0.1550	0.2097
73	44.71	53.60	45.45	35.27	61.50	63.90	0.2840	0.4269
74	51.76	65.62	63.64	47.85	63.13	79.36	0.3880	0.4232
75	57.65	74.22	81.82	74.37	92.91	89.84	0.4240	0.3812
76	33.44	57.65	14.29	33.67	34.81	64.23	0.8410	0.3627
77	35.94	68.56	42.86	47.28	72.77	78.32	0.5010	0.3596

78	65.63	76.05	57.14	74.82	81.88	87.43	0.5640	0.3183
79	68.70	57.48	42.11	36.46	76.47	63.98	0.0900	0.2503
80	77.74	67.28	52.63	51.09	79.71	76.70	0.1390	0.2479
81	77.83	73.65	63.16	79.66	81.16	84.44	0.1660	0.2072
82	11.11	28.64	33.33	28.80	17.98	40.71	0.1020	0.1840
83	33.33	48.67	50.00	43.93	36.33	61.04	0.1100	0.1800
84	40.00	65.27	66.67	72.99	50.63	76.39	0.1140	0.1377
85	10.00	34.16	14.29	27.90	14.25	41.58	0.1810	0.1905
86	55.00	53.07	57.14	44.05	52.69	60.55	0.0650	0.1872
87	62.90	68.56	71.43	74.14	75.31	74.53	0.0780	0.1455
88	16.67	35.45	37.50	31.39	12.59	41.87	0.0570	0.1489
89	24.17	53.25	50.00	48.57	57.75	59.47	0.0690	0.1462
90	25.00	67.63	62.50	79.69	69.69	72.08	0.0690	0.1052
91	16.36	21.21	28.50	27.80	18.10	22.61	0.2120	0.2208
92	25.00	42.45	42.86	42.25	51.56	42.76	0.2600	0.2271
93	70.82	60.26	71.43	70.63	59.38	57.93	0.2080	0.1951
94	21.43	30.38	25.00	24.55	19.40	33.57	0.1900	0.2226
95	65.43	50.51	37.50	40.03	33.43	52.35	0.2240	0.2296
96	74.00	67.21	62.50	69.44	52.66	66.15	0.1690	0.1982
97	17.50	35.33	14.29	25.70	18.22	43.95	0.2970	0.1763
98	48.80	54.34	42.86	42.21	51.57	61.36	0.1520	0.1839
99	78.50	69.93	85.71	72.65	68.60	73.80	0.1030	0.1532
100	30.62	33.72	33.33	32.81	27.28	16.97	0.2270	0.2855
101	68.46	52.70	44.44	46.19	52.21	35.44	0.3330	0.2954
102	83.69	68.25	66.67	73.50	72.10	48.92	0.2820	0.2670
103	36.25	43.63	25.00	28.55	34.92	31.11	0.2020	0.2622
104	54.17	61.49	37.50	42.95	48.97	48.21	0.2400	0.2728

105	66.25	75.92	75.00	71.30	63.57	60.33	0.1590	0.2450
106	50.00	49.31	28.57	28.68	44.53	44.67	0.2380	0.1908
107	71.86	66.05	42.86	44.11	60.05	60.41	0.2890	0.2020
108	80.00	79.38	78.57	73.48	72.61	71.16	0.2210	0.1748
109	28.50	50.88	12.50	20.95	62.54	45.17	0.1950	0.1644
110	58.50	68.99	37.50	39.58	79.18	64.46	0.1010	0.1266
111	78.50	83.67	75.00	72.14	84.59	78.77	0.0690	0.0504
112	51.82	54.74	12.50	19.96	26.27	40.10	0.1300	0.1648
113	80.91	71.73	37.50	39.61	65.22	58.02	0.0770	0.1276
114	90.73	85.30	87.50	73.19	75.84	70.97	0.0460	0.0521
115	61.25	54.37	14.29	23.35	45.35	34.45	0.1020	0.1171
116	73.75	70.24	42.86	44.03	61.10	51.00	0.0680	0.0805
117	89.75	82.70	78.57	78.64	80.36	62.58	0.0550	0.0057
118	65.38	44.89	25.00	14.34	39.01	40.09	0.0940	0.2033
119	83.85	64.55	37.50	36.86	53.67	59.85	0.1060	0.1384
120	86.92	80.78	81.25	73.32	77.00	74.62	0.0630	0.0352
121	41.38	50.01	20.00	11.92	22.96	35.98	0.1380	0.2181
122	70.34	68.55	40.00	35.47	46.79	54.37	0.1090	0.1538
123	87.59	83.67	60.00	72.96	61.29	67.78	0.1010	0.0512
124	39.00	50.89	20.00	13.90	26.46	31.29	0.1300	0.1847
125	77.00	68.32	40.00	38.47	37.57	48.31	0.1080	0.1211
126	91.00	82.33	60.00	76.98	57.38	60.35	0.1080	0.0191
127	29.41	49.20	14.29	14.62	26.51	44.10	0.4450	0.3656
128	41.18	66.60	28.57	36.07	40.62	62.18	0.3910	0.3042
129	64.18	80.57	85.71	71.45	66.98	75.27	0.1790	0.2046
130	33.85	55.05	16.67	11.18	40.48	43.18	0.4020	0.3552
131	38.46	71.33	33.33	33.66	56.36	59.88	0.3910	0.2945

132	66.15	84.18	66.67	70.07	66.02	71.61	0.2610	0.1954
133	69.14	56.67	14.29	12.14	41.62	41.67	0.2940	0.2967
134	75.31	71.83	28.57	35.64	57.23	57.01	0.2600	0.2366
135	85.80	83.58	71.43	73.08	74.13	67.36	0.1370	0.1382
136	68.24	51.55	16.67	25.32	44.44	52.51	0.4480	0.4235
137	79.41	65.13	33.33	41.80	63.71	68.44	0.4050	0.3927
138	87.65	75.28	75.00	72.21	74.46	79.38	0.2410	0.3237
139	47.27	56.87	28.57	22.29	40.93	53.81	0.1950	0.3736
140	65.45	69.33	42.86	39.80	65.93	68.36	0.2410	0.3435
141	80.00	78.37	85.71	71.24	74.84	77.93	0.1660	0.2751
142	38.89	57.96	14.29	23.66	51.35	54.52	0.3610	0.2756
143	65.56	69.31	28.57	42.19	64.61	67.70	0.3620	0.2461
144	87.22	77.23	78.57	74.66	73.28	75.91	0.1970	0.1783
145	56.25	50.21	14.29	20.88	52.69	42.78	0.5200	0.4708
146	83.75	65.34	28.57	41.26	77.63	59.17	0.4630	0.4131
147	90.00	77.04	71.43	75.57	86.48	70.58	0.2600	0.3169
148	71.88	56.78	28.57	16.43	53.31	45.04	0.2600	0.4353
149	84.38	70.80	42.86	37.83	64.73	60.06	0.3090	0.3781
150	93.75	81.39	85.71	73.17	81.21	70.10	0.2240	0.2827
151	54.00	59.13	28.57	16.37	39.88	46.71	0.2100	0.3516
152	71.60	72.03	42.86	38.80	59.11	60.37	0.2500	0.2951
153	88.00	81.51	71.43	75.17	73.83	69.04	0.1200	0.2003
154	34.55	35.12	14.29	16.33	73.99	44.65	0.3800	0.3597
155	57.27	55.99	28.57	38.18	83.76	64.23	0.3470	0.3052
156	68.09	73.43	78.57	73.96	91.85	78.82	0.1720	0.2123
157	67.91	43.89	12.50	11.57	71.15	50.63	0.3360	0.3698
158	70.15	63.64	37.50	34.44	80.06	68.84	0.2030	0.3159

159	87.91	79.97	75.00	71.25	88.07	82.07	0.1300	0.2236
160	43.64	48.43	14.29	11.19	65.97	56.03	0.3470	0.3317
161	80.10	67.07	28.57	35.09	75.95	72.88	0.3040	0.2785
162	89.10	82.29	85.71	72.93	85.85	84.73	0.1300	0.1869

Appendix E: Run order for Calcium chloride concentration

	Color		COD		Turbidity		Power consumption	
Run Order	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**
1	22.10	28.56	28.57	26.27	72.15	64.91	0.1410	0.1422
2	40.00	44.27	57.14	44.24	80.40	80.92	0.1010	0.1187
3	44.21	54.77	71.43	75.88	84.36	92.56	0.0870	0.0536
4	25.00	24.48	16.67	24.45	73.60	61.26	0.1290	0.1076
5	30.00	40.28	33.33	41.40	76.10	76.31	0.1160	0.0893
6	54.17	50.88	66.67	72.03	79.00	86.99	0.0760	0.0295
7	5.88	33.20	37.50	24.09	80.90	67.28	0.0460	0.0975
8	17.65	49.10	50.00	40.02	85.10	81.37	0.0690	0.0845
9	26.47	59.78	62.50	69.63	87.60	91.09	0.0820	0.0299
10	60.67	46.70	16.67	21.20	31.89	39.79	0.4450	0.3137
11	82.02	64.78	33.33	41.61	63.86	58.63	0.4020	0.2801
12	87.64	77.65	66.67	75.69	75.22	73.10	0.2690	0.2049
13	50.00	41.00	14.29	19.91	45.15	36.09	0.3250	0.2675
14	55.56	59.17	28.57	39.30	67.22	53.97	0.2930	0.2392
15	71.11	72.13	85.71	72.37	79.04	67.48	0.1300	0.1692
16	55.43	48.09	25.00	20.06	60.65	42.06	0.1570	0.2459
17	76.63	66.36	50.00	38.43	67.02	58.98	0.1460	0.2228
18	84.78	79.41	62.50	70.49	74.35	71.53	0.1560	0.1581
19	35.65	45.61	44.44	20.52	50.00	47.88	0.1590	0.3607
20	60.43	66.06	55.56	43.36	68.91	69.55	0.2260	0.3170
21	70.00	81.31	66.67	79.89	75.39	86.85	0.2460	0.2316
22	31.58	38.28	20.00	19.75	31.95	44.12	0.3040	0.3029
23	52.63	58.83	50.00	41.58	67.57	64.83	0.2260	0.2644

24	70.32	74.16	60.00	77.08	68.37	81.17	0.2240	0.1844
25	82.22	43.75	12.50	20.42	62.13	50.04	0.4340	0.2698
26	86.74	64.39	37.50	41.23	72.50	69.79	0.3090	0.2365
27	90.63	79.81	87.50	75.73	75.56	85.17	0.1980	0.1617
28	48.24	52.27	12.50	22.31	48.97	46.03	0.4890	0.3120
29	64.71	68.89	37.50	41.96	63.83	60.57	0.3110	0.2737
30	79.41	80.30	75.00	75.29	75.35	70.75	0.2220	0.1938
31	50.00	43.01	28.57	20.64	55.64	41.36	0.1950	0.2744
32	61.82	59.72	42.86	39.26	69.24	54.94	0.2460	0.2414
33	77.27	71.22	71.43	71.58	77.01	64.16	0.2080	0.1668
34	48.08	46.54	25.00	20.40	18.48	46.36	0.2060	0.2615
35	59.62	63.35	50.00	38.02	26.51	58.99	0.1570	0.2337
36	70.77	74.94	62.50	69.31	57.89	67.24	0.1690	0.1643
37	61.30	43.93	22.22	22.52	51.16	49.78	0.3040	0.3957
38	79.57	62.92	44.44	44.61	77.04	67.15	0.2460	0.3473
39	84.35	76.70	66.67	80.38	86.03	80.16	0.2170	0.2574
40	51.72	33.04	14.29	21.37	55.41	45.05	0.4480	0.3466
41	70.34	52.12	42.86	42.44	58.73	61.47	0.2700	0.3035
42	81.38	66.00	85.71	77.19	71.89	73.52	0.1810	0.2187
43	11.83	34.95	14.29	21.66	42.48	50.01	0.3910	0.3221
44	30.11	54.12	28.57	41.71	56.48	65.46	0.3470	0.2842
45	48.39	68.09	85.71	75.44	73.04	76.55	0.1520	0.2047
46	16.44	7.77	16.67	24.65	14.60	20.23	0.1810	0.1682
47	37.67	26.40	33.33	44.13	51.25	44.83	0.1730	0.1540
48	58.33	39.82	83.33	77.30	77.13	65.06	0.0830	0.0982
49	8.76	10.81	28.57	23.60	23.20	18.51	0.0690	0.1162
50	16.67	29.53	42.86	42.07	51.10	42.15	0.0720	0.1073

51	23.33	43.05	71.43	74.22	69.85	61.42	0.0570	0.0567
52	8.33	26.65	12.50	24.01	11.14	26.47	0.1300	0.0889
53	16.33	45.47	37.50	41.46	42.13	49.14	0.0680	0.0851
54	49.67	59.07	87.50	72.59	63.58	67.45	0.0410	0.0398
55	54.55	56.50	22.22	22.34	53.79	69.68	0.1950	0.3410
56	68.18	70.28	55.56	41.08	66.77	81.94	0.1170	0.2889
57	75.45	78.86	66.67	73.50	74.03	89.83	0.0980	0.1953
58	77.92	49.62	14.29	19.88	86.23	66.86	0.4020	0.2938
59	82.12	63.50	28.57	37.60	92.23	78.16	0.3040	0.2470
60	83.18	72.17	71.43	69.01	92.41	85.09	0.0780	0.1586
61	66.87	55.54	16.67	18.87	77.30	73.71	0.4020	0.2712
62	71.66	69.52	33.33	35.57	79.44	84.05	0.2390	0.2297
63	86.26	78.28	66.67	65.96	83.37	90.02	0.1060	0.1465
64	70.43	49.99	33.33	24.43	49.12	47.25	0.3180	0.4080
65	71.74	66.15	66.67	45.61	51.06	62.35	0.2890	0.3459
66	75.65	77.10	83.33	80.47	59.91	73.07	0.3130	0.2422
67	30.40	41.49	40.00	22.49	28.74	44.38	0.1400	0.3493
68	36.36	57.74	46.67	42.66	30.07	58.51	0.2400	0.2924
69	41.76	68.78	60.00	76.50	33.56	68.28	0.2900	0.1939
70	27.84	45.78	37.50	22.00	77.73	51.18	0.1160	0.3152
71	39.46	62.13	50.00	41.15	79.54	64.35	0.1740	0.2635
72	45.95	73.26	75.00	73.98	82.53	73.16	0.1880	0.1702
73	65.63	74.29	14.29	26.11	81.50	77.27	0.4920	0.4123
74	73.75	86.16	42.86	45.62	88.57	85.79	0.2990	0.3317
75	76.25	92.81	85.71	78.82	89.13	89.93	0.1950	0.2096
76	86.86	64.62	37.50	23.01	82.73	75.28	0.2220	0.3526
77	88.00	76.57	62.50	41.51	93.68	82.84	0.1970	0.2773

78	90.23	83.32	75.00	73.68	94.76	86.02	0.1950	0.1604
79	76.19	67.74	12.50	21.35	85.44	82.97	0.4780	0.3175
80	78.00	79.79	37.50	38.83	87.61	89.56	0.2220	0.2474
81	79.81	86.64	62.50	69.99	88.52	91.78	0.1390	0.1357
82	20.00	17.36	33.33	25.66	39.67	46.50	0.1270	0.1637
83	33.33	34.53	50.00	44.38	51.41	66.80	0.1300	0.1449
84	40.00	46.49	66.67	76.79	73.32	82.73	0.1300	0.0844
85	23.64	16.84	12.50	24.23	26.85	43.81	0.1520	0.1204
86	26.91	34.10	62.50	41.93	52.03	63.15	0.0550	0.1068
87	49.10	46.15	75.00	73.32	70.76	78.13	0.0650	0.0516
88	48.89	29.12	28.57	24.24	59.17	50.80	0.1200	0.1017
89	72.66	46.47	42.86	40.93	70.38	69.18	0.1350	0.0934
90	88.28	58.62	57.14	71.30	80.43	83.20	0.1360	0.0434
91	19.23	31.59	28.57	19.97	17.71	28.09	0.2340	0.3947
92	41.54	48.30	57.14	40.22	49.79	48.94	0.2100	0.3520
93	53.56	59.80	71.43	74.16	70.67	65.42	0.1950	0.2676
94	36.76	31.83	14.29	18.28	25.24	27.20	0.4840	0.3302
95	64.71	48.63	28.29	37.52	51.86	47.09	0.4130	0.2927
96	76.18	60.23	71.43	70.44	67.83	62.61	0.1890	0.2136
97	42.98	44.87	25.00	18.04	15.12	35.99	0.2010	0.2904
98	73.51	61.77	37.50	36.26	55.24	54.92	0.2240	0.2581
99	83.68	73.45	87.50	68.17	75.41	69.48	0.1260	0.1842
100	22.73	45.26	16.67	22.99	54.97	38.78	0.6800	0.4938
101	59.10	60.05	33.33	44.02	66.04	55.88	0.6370	0.4226
102	70.36	69.63	83.33	78.73	76.15	68.62	0.3560	0.3097
103	42.50	42.71	14.29	20.66	33.33	38.72	0.3910	0.4168
104	62.50	57.59	28.57	40.67	45.10	54.86	0.3760	0.3508

105	74.50	67.26	78.57	74.37	65.32	66.64	0.1890	0.2432
106	43.63	52.96	14.29	19.77	51.33	48.34	0.3610	0.3644
107	71.88	67.93	28.57	38.77	66.54	63.52	0.3470	0.3036
108	87.25	77.69	71.43	71.45	80.10	74.34	0.1200	0.2012
109	50.10	36.79	28.57	26.41	66.60	42.95	0.1020	0.1041
110	52.73	55.33	42.86	45.29	76.33	61.24	0.0820	0.0944
111	61.82	68.66	85.71	77.84	81.81	75.16	0.0510	0.0431
112	10.00	30.32	25.00	25.38	37.87	37.44	0.0580	0.0791
113	45.00	48.95	37.50	43.23	56.01	54.78	0.0720	0.0746
114	79.00	62.38	62.50	74.77	69.42	67.74	0.0650	0.0286
115	60.10	36.65	25.00	25.79	45.82	41.62	0.0540	0.0787
116	78.18	55.37	37.50	42.63	70.73	57.99	0.0720	0.0795
117	88.18	68.89	62.50	73.14	76.39	69.99	0.0650	0.0386
118	42.78	47.93	28.57	24.96	25.84	38.20	0.1020	0.1073
119	77.22	69.30	42.86	44.74	46.55	58.77	0.1060	0.1113
120	90.56	85.47	85.71	78.20	68.10	74.98	0.0760	0.0738
121	47.50	39.07	25.00	24.71	25.63	30.85	0.0690	0.0919
122	73.75	60.54	50.00	43.47	51.05	50.46	0.0690	0.1012
123	82.25	76.79	75.00	75.91	65.60	65.71	0.0650	0.0689
124	44.85	43.01	22.22	25.90	26.72	33.17	0.0650	0.1011
125	63.83	64.57	44.44	43.64	52.76	51.83	0.0650	0.1156
126	82.82	80.92	88.89	75.07	70.77	66.11	0.0490	0.0886
127	24.29	50.97	14.29	20.70	26.72	39.60	0.3470	0.3242
128	53.57	70.42	42.86	41.25	57.51	56.43	0.2030	0.2997
129	82.14	84.66	85.71	75.48	71.59	68.89	0.1300	0.2336
130	33.33	39.31	25.00	19.80	32.84	33.08	0.2320	0.2963
131	44.00	58.86	37.50	39.33	41.20	48.95	0.2820	0.2770

132	69.33	73.19	87.50	72.55	53.87	60.45	0.1630	0.2162
133	29.41	40.46	16.67	20.35	22.92	36.23	0.4670	0.2929
134	50.59	60.09	33.33	38.86	28.91	51.14	0.3580	0.2789
135	60.00	74.52	66.67	71.06	55.58	61.68	0.2200	0.2233
136	67.69	57.62	22.22	25.92	39.60	51.94	0.2750	0.3924
137	81.54	72.32	33.33	46.34	62.47	62.74	0.3380	0.3256
138	92.00	81.81	94.44	80.44	76.24	69.17	0.1580	0.2172
139	25.00	45.56	12.50	23.60	27.12	48.10	0.5060	0.3423
140	50.00	60.35	25.00	43.00	49.21	57.94	0.4910	0.2807
141	75.00	69.93	81.25	76.09	63.24	63.41	0.2200	0.1776
142	31.25	46.29	25.00	22.72	31.27	53.94	0.2390	0.3168
143	50.00	61.18	50.00	41.11	51.42	62.81	0.2240	0.2605
144	66.25	70.85	62.50	73.18	69.74	67.32	0.2340	0.1626
145	38.24	43.87	16.67	24.13	49.64	43.83	0.5640	0.4137
146	75.29	61.40	33.33	45.46	64.37	56.91	0.5210	0.3606
147	83.54	73.72	83.33	80.47	77.55	65.62	0.2780	0.2660
148	10.87	29.42	28.57	22.59	34.76	38.14	0.2600	0.3732
149	41.30	47.04	42.86	42.90	50.36	50.26	0.2990	0.3254
150	56.52	59.45	85.71	76.89	63.75	58.01	0.2030	0.2360
151	44.54	27.76	28.57	22.50	55.87	42.13	0.2600	0.3574
152	84.55	45.48	42.86	41.79	74.28	53.29	0.3180	0.3148
153	90.00	57.99	71.43	74.76	79.26	60.08	0.2600	0.2307
154	63.64	53.09	16.67	19.46	55.43	44.00	0.4450	0.2923
155	70.45	74.00	33.33	40.77	64.88	65.12	0.4020	0.2725
156	79.10	89.70	66.67	75.77	82.64	81.88	0.2770	0.2111
157	27.78	45.00	25.00	18.95	47.24	38.45	0.1890	0.2558
158	54.44	66.00	37.50	39.24	63.27	58.61	0.2310	0.2411

159	64.44	81.80	75.00	73.22	73.97	74.40	0.1630	0.1850
160	47.91	49.70	14.29	19.88	52.91	42.57	0.2920	0.2438
161	68.60	70.80	28.57	39.16	68.32	61.77	0.2600	0.2344
162	74.42	86.69	71.43	72.12	79.42	76.61	0.1360	0.1835

Appendix F: Run order for Sodium carbonate concentration

	Color		COD		Turbidity		Power consumption	
Run Order	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**	**Actual Value**	**Predicted Value**
1	10.77	24.54	28.57	23.43	28.11	52.35	0.1190	0.1714
2	15.38	42.40	42.86	42.55	46.32	66.61	0.1590	0.1480
3	18.46	53.29	85.71	82.09	51.27	76.58	0.0980	0.0572
4	34.78	42.35	14.29	22.78	72.28	56.60	0.2670	0.1672
5	69.57	58.84	28.57	41.47	74.83	69.29	0.2600	0.1505
6	82.17	68.37	71.43	80.58	80.12	77.69	0.1520	0.0664
7	50.00	45.40	37.50	27.27	59.71	61.16	0.0720	0.1295
8	66.67	60.52	62.50	45.52	61.88	72.29	0.0720	0.1195
9	69.22	68.67	75.00	84.20	65.26	79.12	0.0690	0.0421
10	44.74	38.21	25.00	17.98	55.54	49.75	0.2060	0.3276
11	65.79	57.34	37.50	36.42	67.29	66.79	0.2530	0.2871
12	82.24	69.50	75.00	75.28	79.21	79.53	0.1740	0.1793
13	48.91	50.85	14.29	15.09	44.74	54.75	0.3580	0.3484
14	70.11	68.61	28.57	33.09	62.53	70.22	0.3370	0.3147
15	78.26	79.41	78.57	71.52	74.85	81.39	0.1660	0.2136
16	40.98	48.72	16.67	17.33	66.12	60.06	0.4020	0.3359
17	63.11	65.12	33.33	34.90	75.48	73.96	0.3690	0.3088
18	76.23	74.54	83.33	72.89	81.98	83.57	0.2020	0.2144
19	15.38	26.86	50.00	31.89	20.55	49.11	0.1340	0.2898
20	30.77	47.27	62.50	49.64	57.88	68.92	0.2030	0.2324
21	49.23	60.71	75.00	87.82	75.55	84.44	0.2320	0.1075
22	52.27	34.33	37.50	26.75	80.44	54.85	0.1830	0.3358
23	67.45	53.37	62.50	44.07	85.47	73.09	0.2030	0.2850

24	67.73	65.44	75.00	81.81	85.79	87.04	0.2320	0.1668
25	38.10	27.03	33.34	26.74	80.92	60.91	0.1640	0.3483
26	59.10	44.70	44.45	43.63	91.12	77.58	0.2240	0.3043
27	78.10	55.40	66.67	80.94	94.38	89.96	0.1950	0.1928
28	23.46	35.49	14.29	16.51	58.94	46.09	0.4130	0.3543
29	62.35	53.31	28.57	34.65	68.58	62.37	0.3690	0.3125
30	78.40	64.16	71.43	73.21	77.53	74.36	0.1950	0.2032
31	50.70	51.13	14.29	14.69	50.37	47.43	0.3580	0.3571
32	68.31	67.58	28.57	32.39	63.62	62.14	0.3260	0.3220
33	82.39	77.06	71.43	70.52	73.67	72.56	0.1820	0.2194
34	45.31	51.99	14.29	18.01	43.31	49.08	0.4020	0.3265
35	66.41	67.07	28.57	35.28	70.85	62.23	0.3690	0.2980
36	78.91	75.19	85.71	72.97	83.97	71.08	0.1570	0.2022
37	35.11	39.47	12.50	26.31	63.32	47.35	0.6360	0.3678
38	61.17	58.56	37.50	43.77	79.10	66.40	0.3760	0.3090
39	68.10	70.69	75.00	81.65	87.36	81.16	0.2530	0.1827
40	48.00	49.93	16.67	22.25	46.86	49.43	0.5360	0.3957
41	64.00	67.66	33.33	39.27	64.97	66.92	0.4770	0.3436
42	68.00	78.41	66.67	76.71	76.64	80.11	0.3140	0.2240
43	11.83	45.63	14.29	23.32	49.46	51.83	0.5500	0.3902
44	41.94	61.98	28.57	39.91	62.24	67.75	0.5060	0.3447
45	51.61	71.37	71.43	76.92	75.56	79.37	0.2780	0.2318
46	48.35	46.12	22.22	22.49	38.39	38.03	0.1840	0.1888
47	74.18	66.61	33.33	42.20	53.82	53.80	0.2140	0.1683
48	88.46	80.13	88.89	82.34	74.97	65.28	0.1030	0.0803
49	51.10	57.95	14.29	19.69	49.10	49.59	0.2610	0.2207
50	72.73	77.07	28.57	38.97	67.29	63.80	0.2420	0.2068

51	83.92	89.21	71.43	78.68	80.92	73.71	0.1300	0.1255
52	50.91	55.00	28.57	22.03	59.71	61.48	0.1340	0.2192
53	61.82	72.75	42.86	40.88	73.82	74.11	0.1640	0.2120
54	76.36	83.54	85.71	80.15	80.15	82.45	0.1120	0.1374
55	33.33	34.65	37.50	21.70	59.53	59.50	0.1560	0.3265
56	40.00	51.79	62.50	39.71	70.47	74.34	0.1740	0.2800
57	76.67	61.97	75.00	78.13	81.28	84.90	0.1890	0.1662
58	69.23	51.69	12.50	20.68	83.93	60.20	0.3470	0.3088
59	73.08	67.47	37.50	38.25	88.65	73.48	0.2170	0.2690
60	76.46	76.27	62.50	76.24	90.79	82.47	0.1890	0.1619
61	65.71	53.96	22.22	24.79	83.29	61.23	0.2060	0.2577
62	68.57	68.37	44.44	41.92	84.56	72.94	0.1950	0.2246
63	71.31	75.81	66.67	79.48	88.46	80.35	0.1840	0.1241
64	34.52	39.22	18.75	21.12	54.84	49.52	0.2820	0.4298
65	44.10	57.64	37.50	38.44	61.67	67.14	0.2530	0.3663
66	64.29	69.09	75.00	76.18	76.57	80.47	0.1680	0.2354
67	66.67	51.09	33.34	17.85	58.57	50.97	0.1270	0.4372
68	72.73	68.14	44.45	34.73	74.21	67.02	0.1790	0.3804
69	84.85	78.22	66.67	72.05	79.60	78.78	0.1740	0.2562
70	40.00	48.19	33.33	19.71	66.17	52.74	0.2120	0.4112
71	67.78	63.87	50.00	36.16	69.23	67.23	0.2750	0.3611
72	76.67	72.59	83.33	73.04	80.26	77.41	0.2410	0.2436
73	48.18	44.55	14.29	24.26	82.38	60.88	0.5940	0.4105
74	62.27	60.99	42.86	41.14	86.94	76.31	0.3100	0.3410
75	75.00	70.45	85.71	78.46	92.39	87.45	0.1800	0.2041
76	61.96	60.82	28.57	22.85	41.85	58.04	0.2530	0.3793
77	73.62	75.89	42.86	39.31	65.05	71.90	0.2600	0.3165

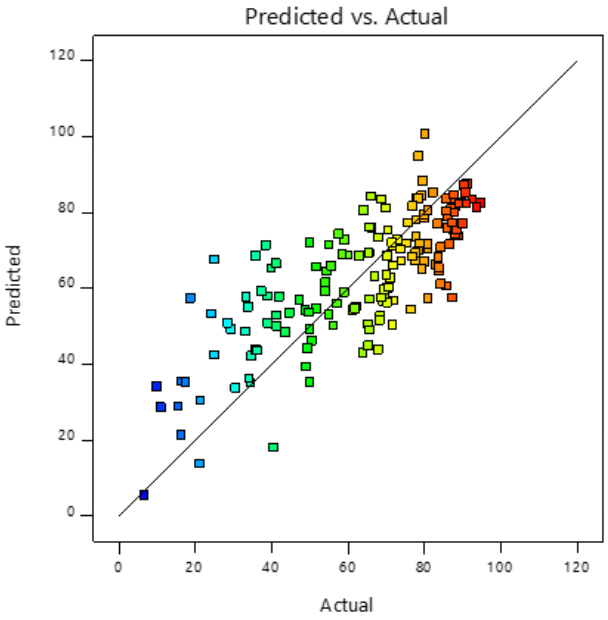
78	78.53	83.98	71.43	76.18	77.53	81.47	0.2000	0.1863
79	47.62	62.32	25.00	26.58	31.77	55.53	0.2460	0.3148
80	73.81	76.02	50.00	42.60	54.96	67.82	0.2170	0.2586
81	79.52	82.74	75.00	79.05	75.32	75.82	0.1880	0.1351
82	63.50	37.75	22.22	22.24	60.37	49.43	0.1270	0.1854
83	68.61	56.92	44.44	41.65	75.85	64.45	0.1210	0.1634
84	78.83	69.12	77.78	81.50	85.17	75.17	0.0900	0.0740
85	58.00	52.57	25.00	20.52	65.65	57.34	0.1130	0.1992
86	71.33	70.37	62.50	39.50	75.61	70.79	0.0810	0.1839
87	82.67	81.21	75.00	78.91	83.00	79.94	0.0870	0.1012
88	54.29	52.62	28.57	23.93	63.71	65.56	0.1300	0.1797
89	78.57	69.06	42.86	42.48	76.81	77.44	0.1540	0.1711
90	87.62	78.52	85.71	81.46	82.58	85.03	0.1010	0.0950
91	35.26	44.02	12.50	19.65	41.21	46.86	0.4340	0.3812
92	62.11	63.79	37.50	38.25	60.96	63.22	0.2680	0.3375
93	81.58	76.60	87.50	77.28	74.82	75.28	0.1540	0.2265
94	52.30	55.07	11.11	16.48	35.96	54.88	0.5310	0.3996
95	64.37	73.48	33.33	34.64	60.10	69.67	0.3260	0.3626
96	74.14	84.92	88.89	73.24	79.66	80.17	0.1630	0.2583
97	50.59	51.36	14.29	18.44	61.80	63.22	0.5090	0.3846
98	63.53	68.40	28.57	36.17	80.94	76.44	0.4770	0.3543
99	70.47	78.46	71.43	74.33	88.55	85.37	0.2670	0.2567
100	35.45	41.72	14.29	21.10	47.80	49.93	0.6080	0.5024
101	68.18	60.78	28.86	38.59	71.95	66.87	0.5500	0.4357
102	76.18	72.87	78.57	76.50	83.13	79.52	0.2760	0.3016
103	57.22	52.00	16.67	17.55	60.39	54.41	0.5500	0.5074
104	68.04	69.69	33.33	34.60	69.51	69.78	0.5060	0.4474

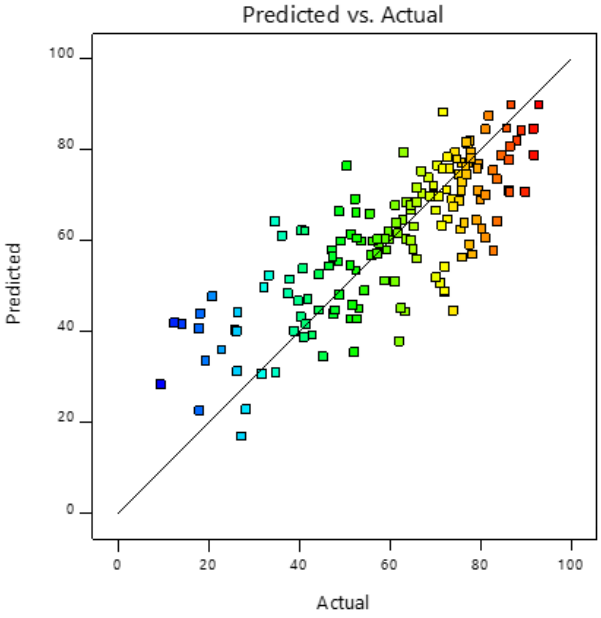
105	77.32	80.41	83.33	72.08	77.12	80.86	0.2780	0.3199
106	52.27	47.51	14.29	19.13	52.53	59.20	0.5360	0.4789
107	69.32	63.83	28.57	35.75	64.80	73.01	0.4910	0.4256
108	77.27	73.19	71.43	72.79	77.87	82.52	0.2690	0.3049
109	16.90	28.17	16.67	17.10	29.87	41.41	0.2310	0.1996
110	28.17	46.70	33.33	36.35	53.12	57.10	0.2100	0.1808
111	50.56	58.26	66.67	76.03	68.94	68.51	0.1460	0.0946
112	52.22	44.58	20.00	15.66	28.10	46.28	0.2530	0.2159
113	55.56	61.74	40.00	34.48	43.43	60.41	0.2380	0.2038
114	74.44	71.93	60.00	73.73	57.85	70.25	0.2240	0.1243
115	54.82	46.22	16.67	19.36	61.55	51.48	0.2250	0.1987
116	63.86	62.01	33.33	37.74	68.83	64.04	0.2020	0.1933
117	72.89	70.84	66.67	76.56	78.92	72.31	0.1360	0.1205
118	50.00	38.38	16.67	16.81	45.24	38.42	0.2310	0.1977
119	73.46	57.58	33.33	36.19	60.93	55.55	0.2170	0.1835
120	83.33	69.82	83.33	76.00	74.07	68.39	0.1170	0.1020
121	44.55	53.38	16.67	14.58	55.17	43.93	0.2090	0.2345
122	59.10	71.22	33.33	33.53	67.96	59.49	0.1730	0.2270
123	71.82	82.08	83.33	72.91	76.34	70.76	0.0910	0.1521
124	50.00	53.61	14.29	17.48	53.99	49.75	0.2250	0.2378
125	76.37	70.08	28.57	36.00	66.63	63.75	0.2020	0.2371
126	80.77	79.58	85.71	74.94	76.77	73.45	0.0900	0.1689
127	47.95	42.91	22.22	17.35	50.91	40.64	0.2120	0.3520
128	69.18	61.41	44.44	35.62	67.23	58.36	0.1900	0.3148
129	72.60	72.93	66.67	74.32	78.56	71.78	0.1680	0.2102
130	42.62	57.14	14.29	14.74	30.34	42.61	0.3910	0.3753
131	71.31	74.27	28.57	32.58	56.99	58.76	0.3470	0.3448

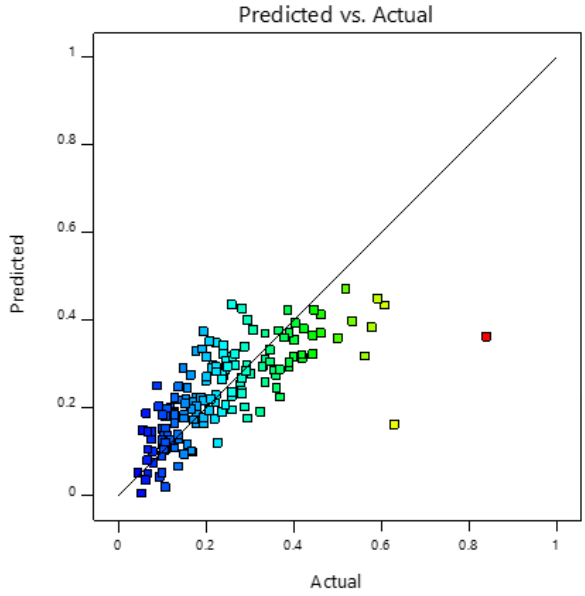
132	81.15	84.42	85.71	70.84	68.39	70.61	0.1630	0.2469
133	52.56	56.60	16.67	17.26	37.52	44.90	0.3470	0.3652
134	72.44	72.36	33.33	34.67	52.75	59.48	0.3150	0.3414
135	74.36	81.14	83.33	72.50	68.90	69.76	0.1630	0.2502
136	43.84	42.61	14.29	20.20	27.56	45.02	0.6400	0.4379
137	70.55	59.72	28.57	37.22	53.37	61.88	0.5460	0.3730
138	72.60	69.85	71.43	74.67	71.86	74.45	0.2950	0.2407
139	54.41	57.47	16.67	18.00	45.75	42.81	0.5060	0.4273
140	61.76	73.21	33.33	34.59	55.60	58.11	0.4630	0.3691
141	70.59	81.98	83.33	71.60	70.43	69.11	0.2430	0.2435
142	56.82	57.56	14.29	20.94	37.23	40.92	0.4630	0.3832
143	68.94	71.93	28.57	37.09	57.10	54.65	0.4190	0.3317
144	80.30	79.33	71.43	73.67	72.29	64.09	0.2080	0.2128
145	54.17	47.25	28.57	22.18	28.37	37.11	0.2240	0.4353
146	61.67	65.02	42.86	39.33	47.71	55.41	0.2600	0.3750
147	70.83	75.83	85.71	76.91	66.81	69.41	0.1740	0.2473
148	75.56	60.70	12.50	19.19	38.34	35.53	0.5920	0.4451
149	90.00	77.11	37.50	35.91	51.52	52.26	0.3570	0.3915
150	92.22	86.55	62.50	73.05	63.27	64.70	0.3040	0.2705
151	67.65	59.39	28.57	21.33	32.94	34.28	0.3110	0.4215
152	86.47	74.43	42.86	37.62	50.22	49.44	0.3280	0.3746
153	89.41	82.50	85.71	74.33	65.92	60.31	0.2320	0.2604
154	39.19	41.24	12.50	22.04	50.77	50.04	0.4020	0.2659
155	62.84	61.05	37.50	40.61	76.04	68.51	0.2390	0.2301
156	72.97	73.89	81.25	79.60	82.46	82.69	0.1450	0.1269
157	51.95	52.48	14.29	18.35	35.66	55.67	0.3690	0.3073
158	68.18	70.92	28.57	36.49	66.59	72.57	0.3370	0.2782

159	74.03	82.38	85.71	75.05	78.42	85.18	0.1520	0.1817
160	58.72	48.94	16.67	19.80	42.78	61.61	0.4130	0.3153
161	63.30	66.01	33.33	37.51	59.47	76.95	0.3690	0.2928
162	78.89	76.11	66.67	75.64	72.68	87.99	0.2610	0.2030

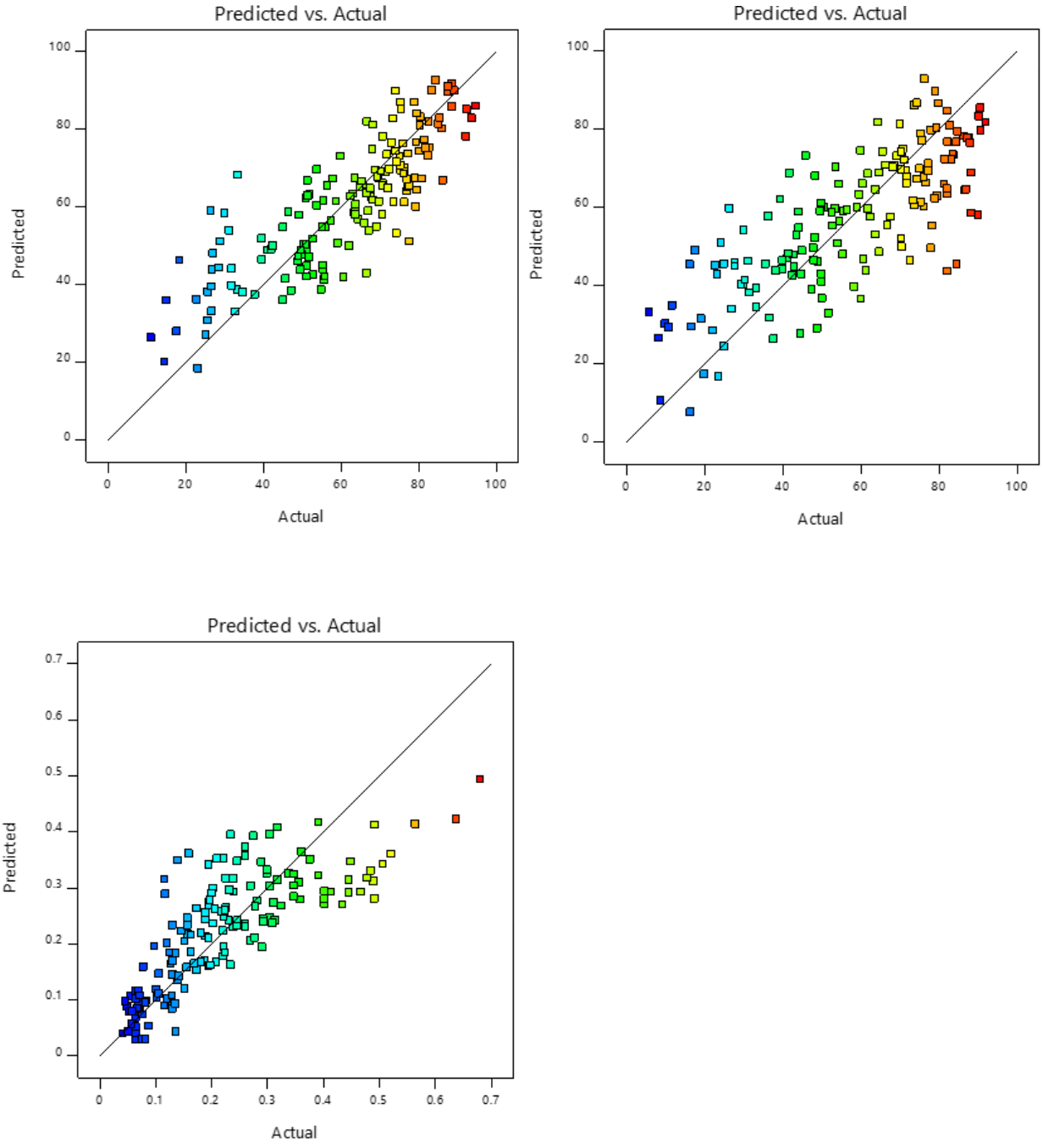
Appendix G: Plot for relationship between experimental and predicted value for percentage colour, turbidity and power consumption using NaCl.



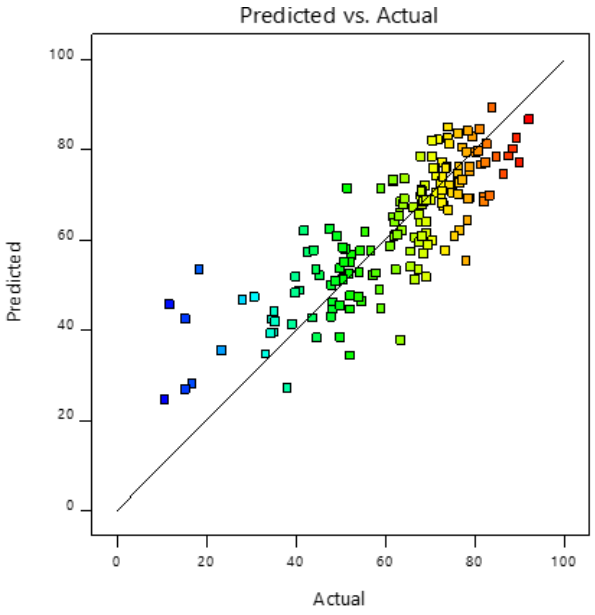


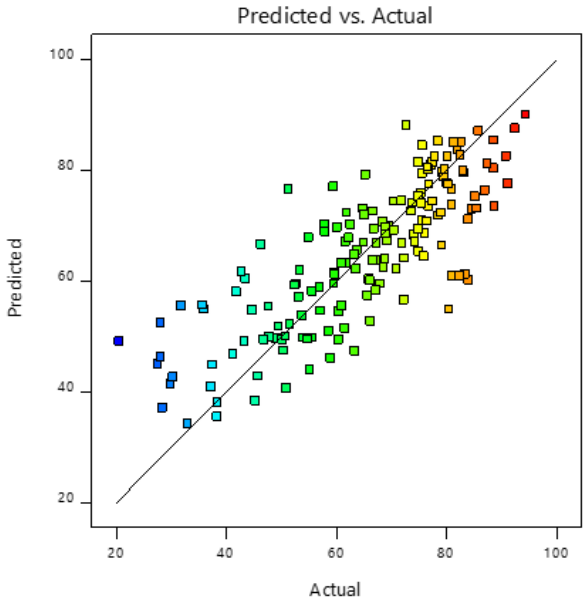


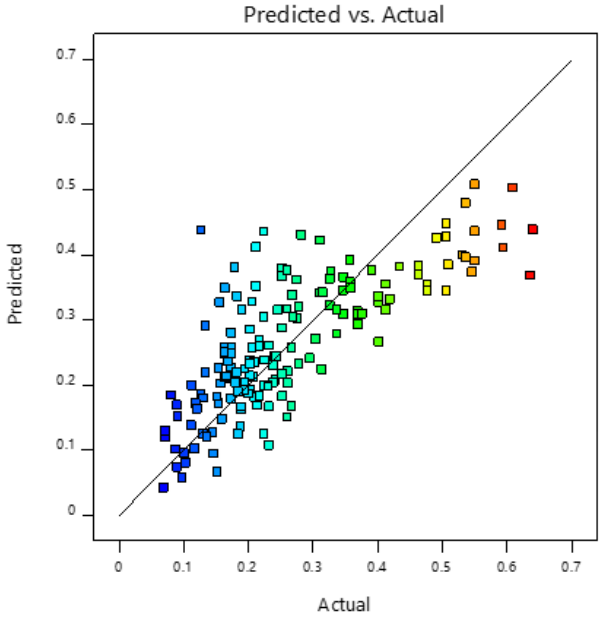
Appendix H: Plot for relationship between experimental and predicted value for percentage colour, turbidity and power consumption using $CaCl_2$.



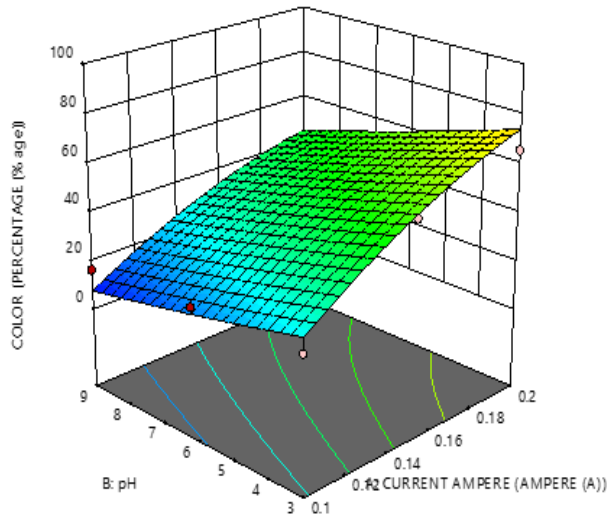
Appendix I: Plot for relationship between experimental and predicted value for percentage colour, turbidity and power consumption using Na_2CO_3.

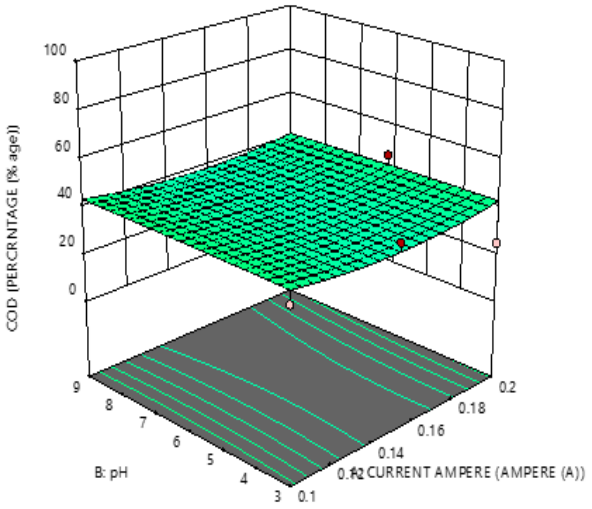


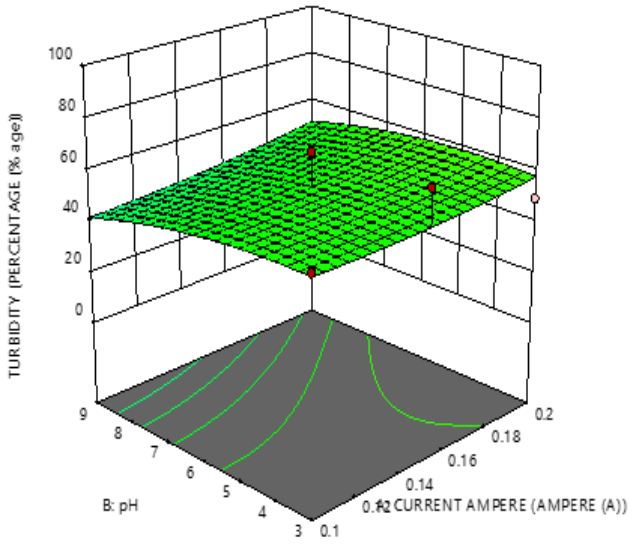


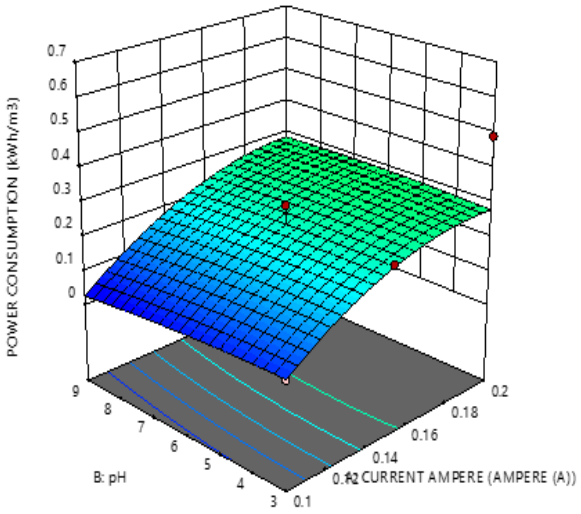


Appendix J: Combined effect of pH and current ampere on color, COD, turbidity and power consumption using $CaCl_2$.

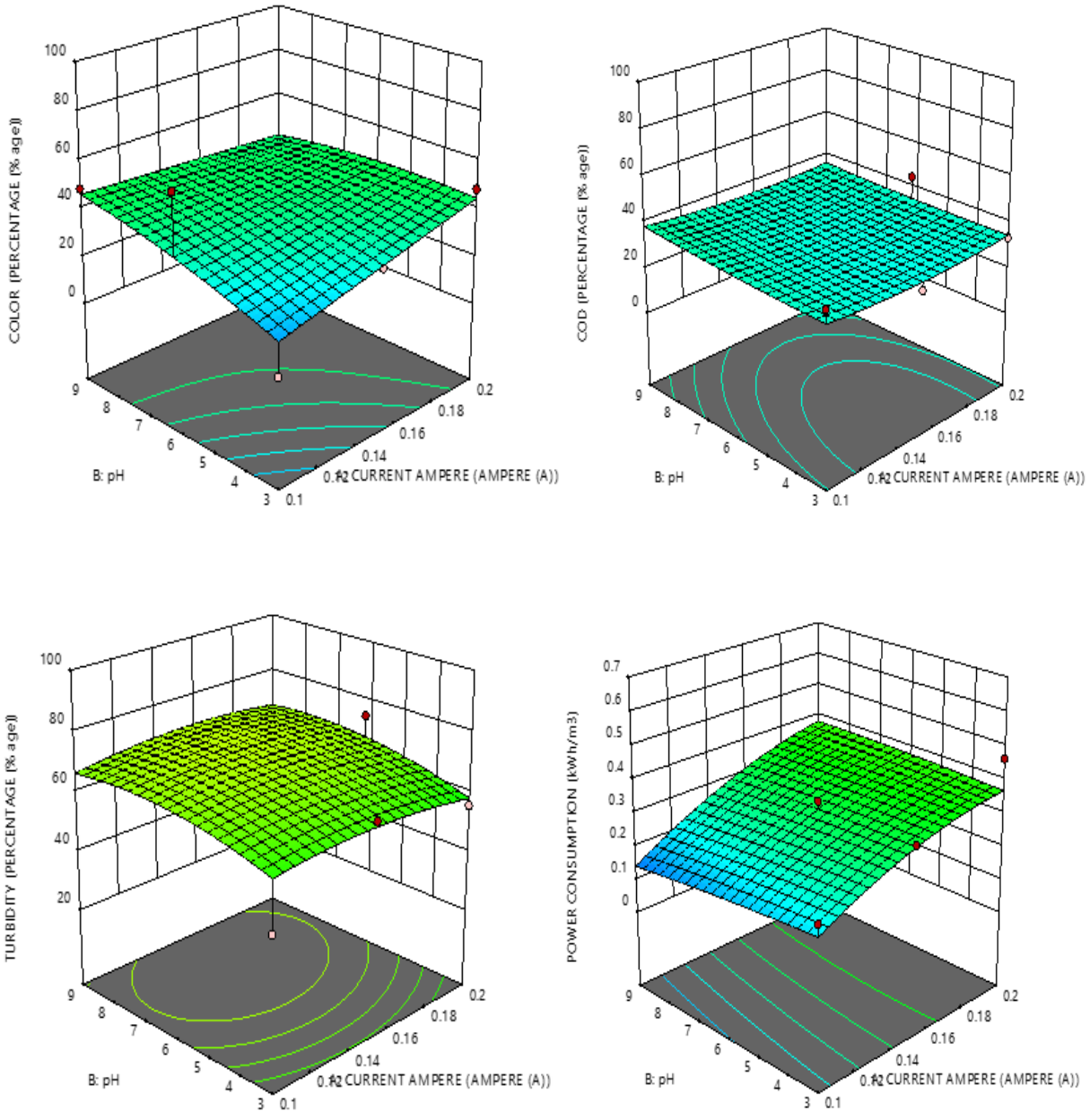




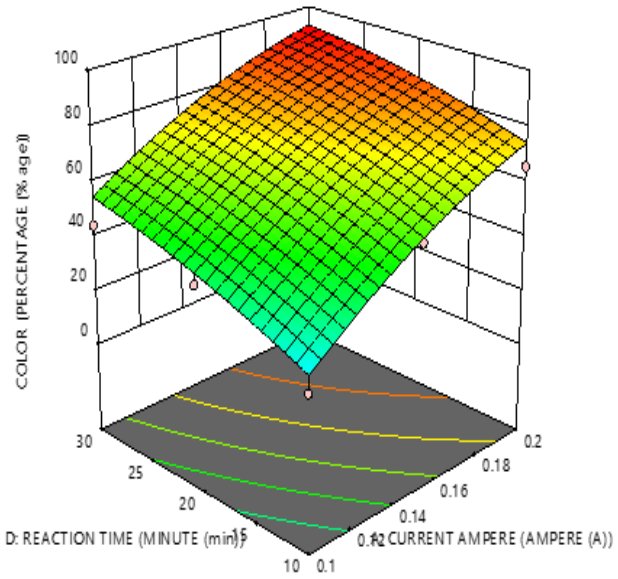


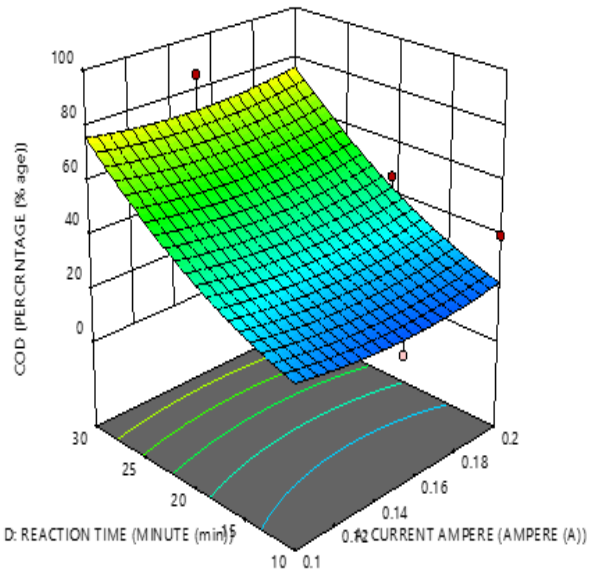


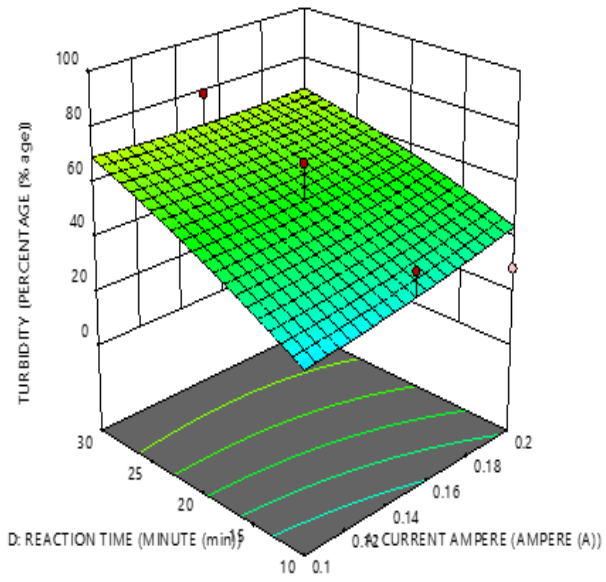
Appendix K: Combined effect of pH and current ampere on color, COD, turbidity and power consumption using Na_2CO_3.

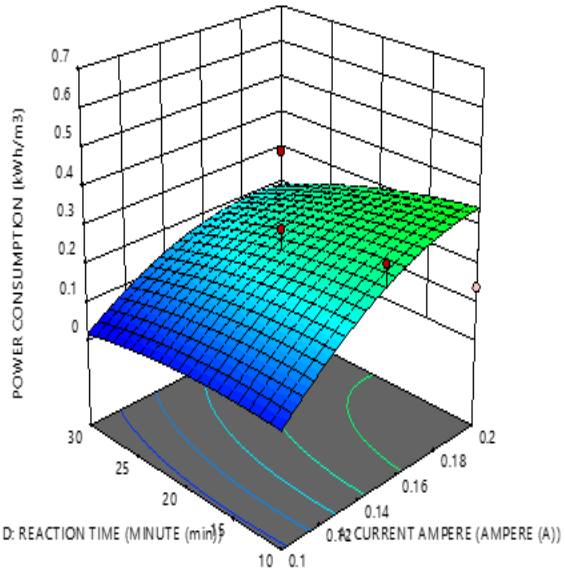


Appendix L: Combined effect of current ampere and electrolysis time on color, COD, turbidity and power consumption using $CaCl_2$.

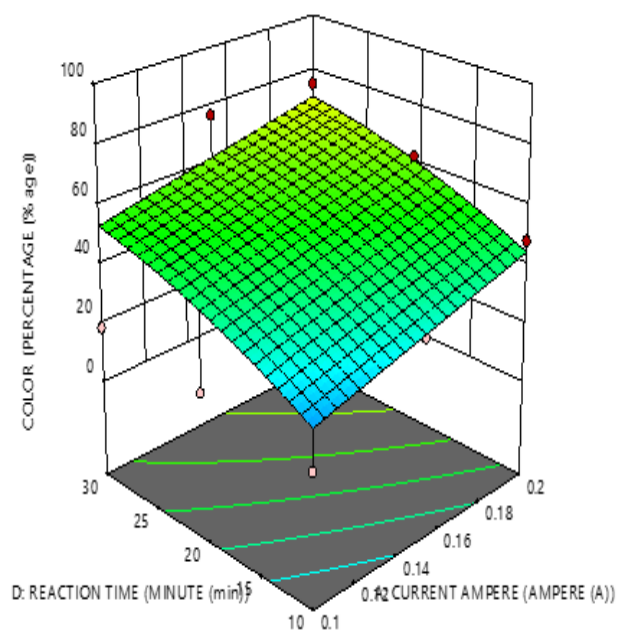


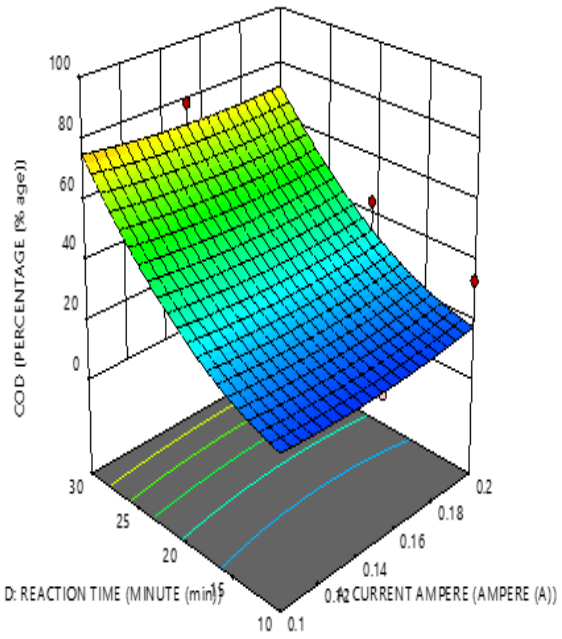


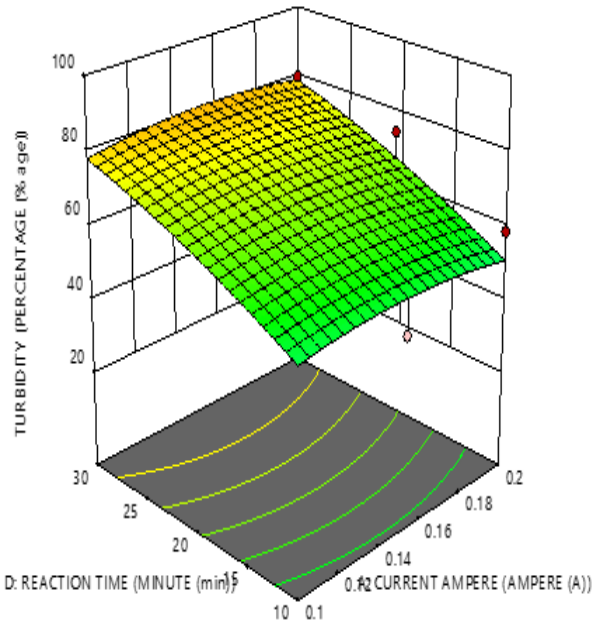


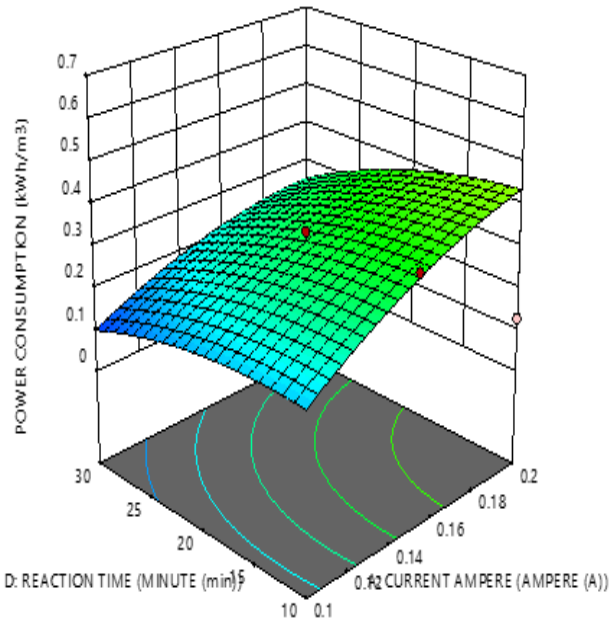


Appendix M: Combined effect of current ampere and electrolysis time on color, COD, turbidity and power consumption using Na_2CO_3.

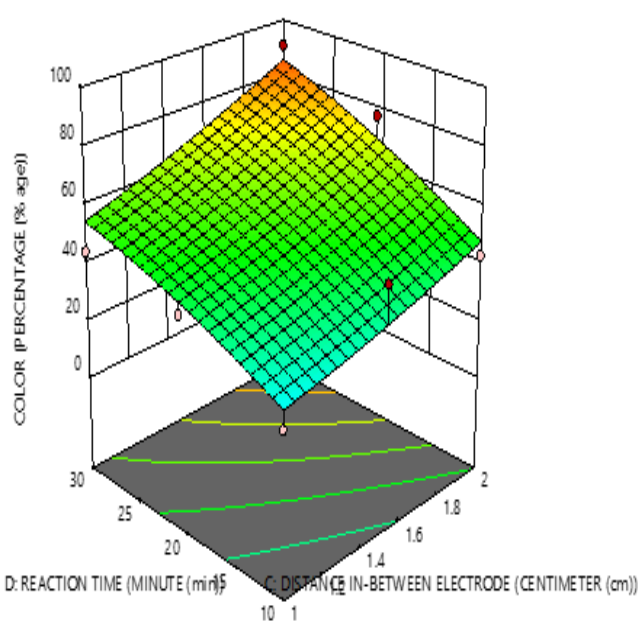


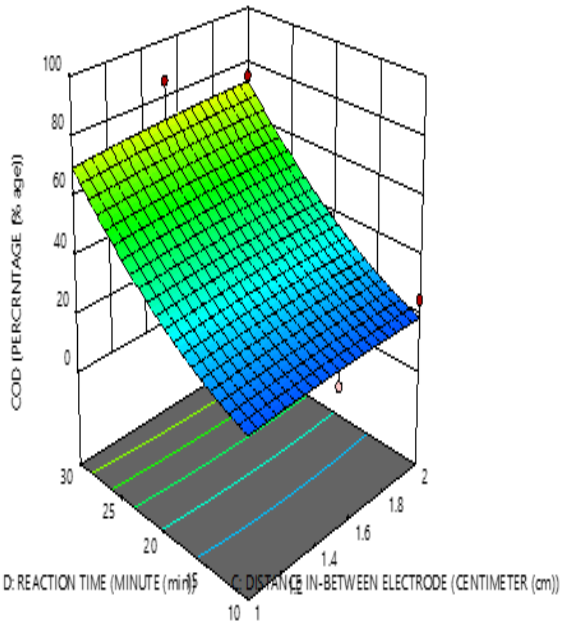


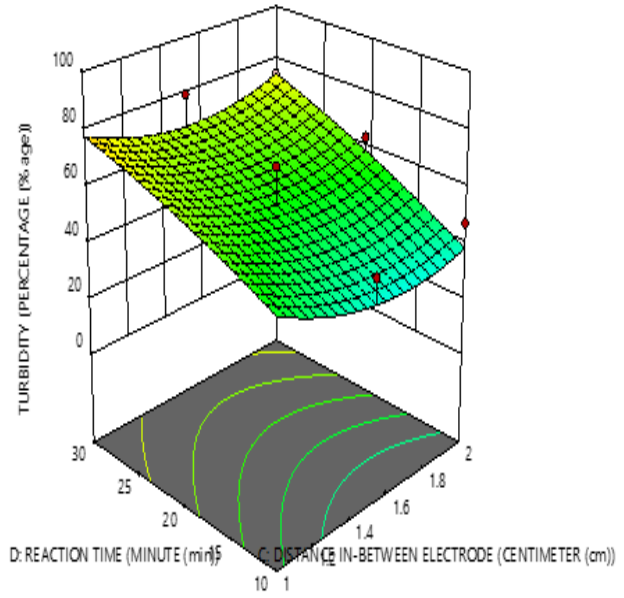


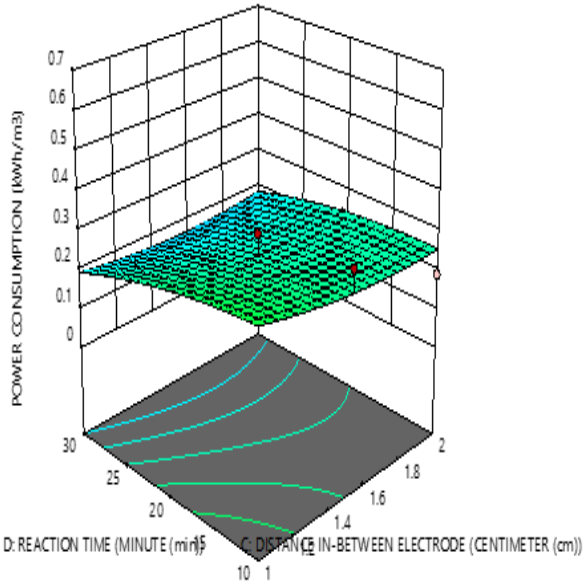


Appendix N: Combined effect of electrolysis time and distance in-between electrode on color, COD, turbidity and power consumption using $CaCl_2$.

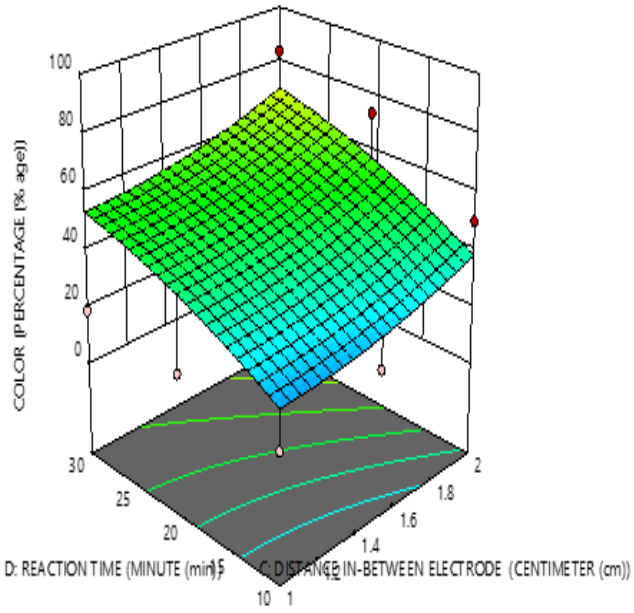


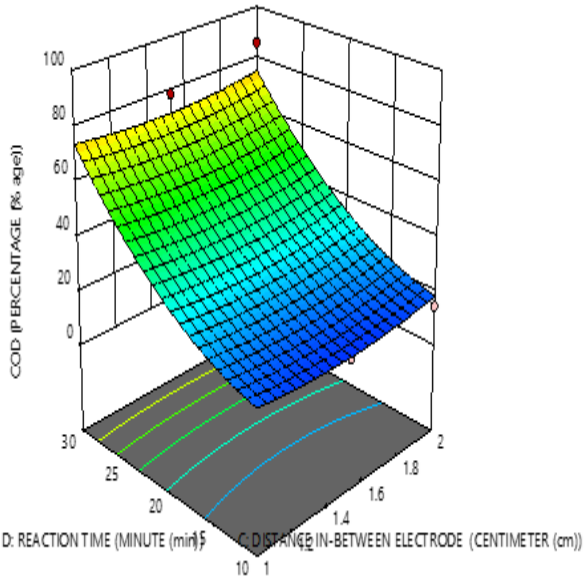


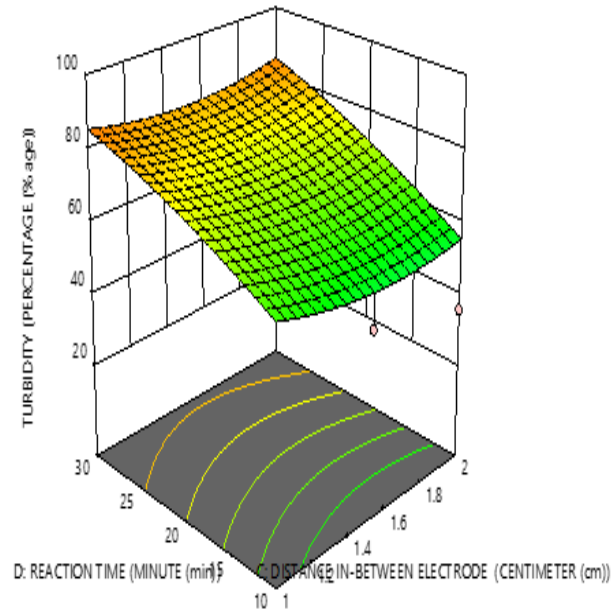


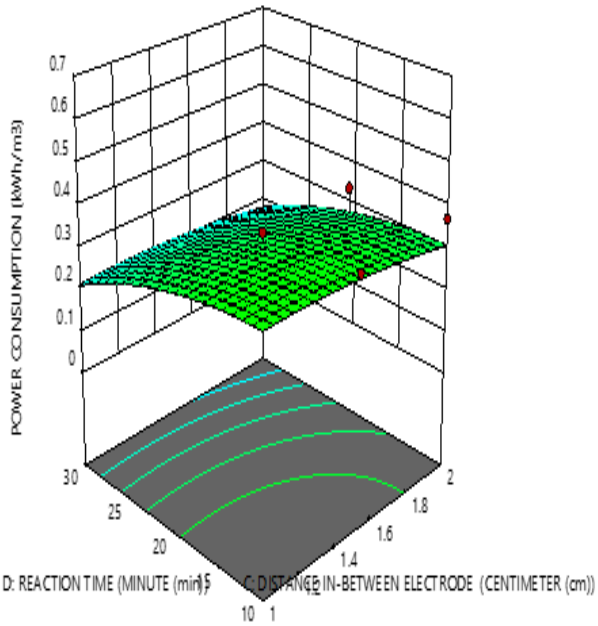


Appendix O: Combined effect of electrolysis time and distance in-between electrode on color, COD, turbidity and power consumption using Na_2CO_3.

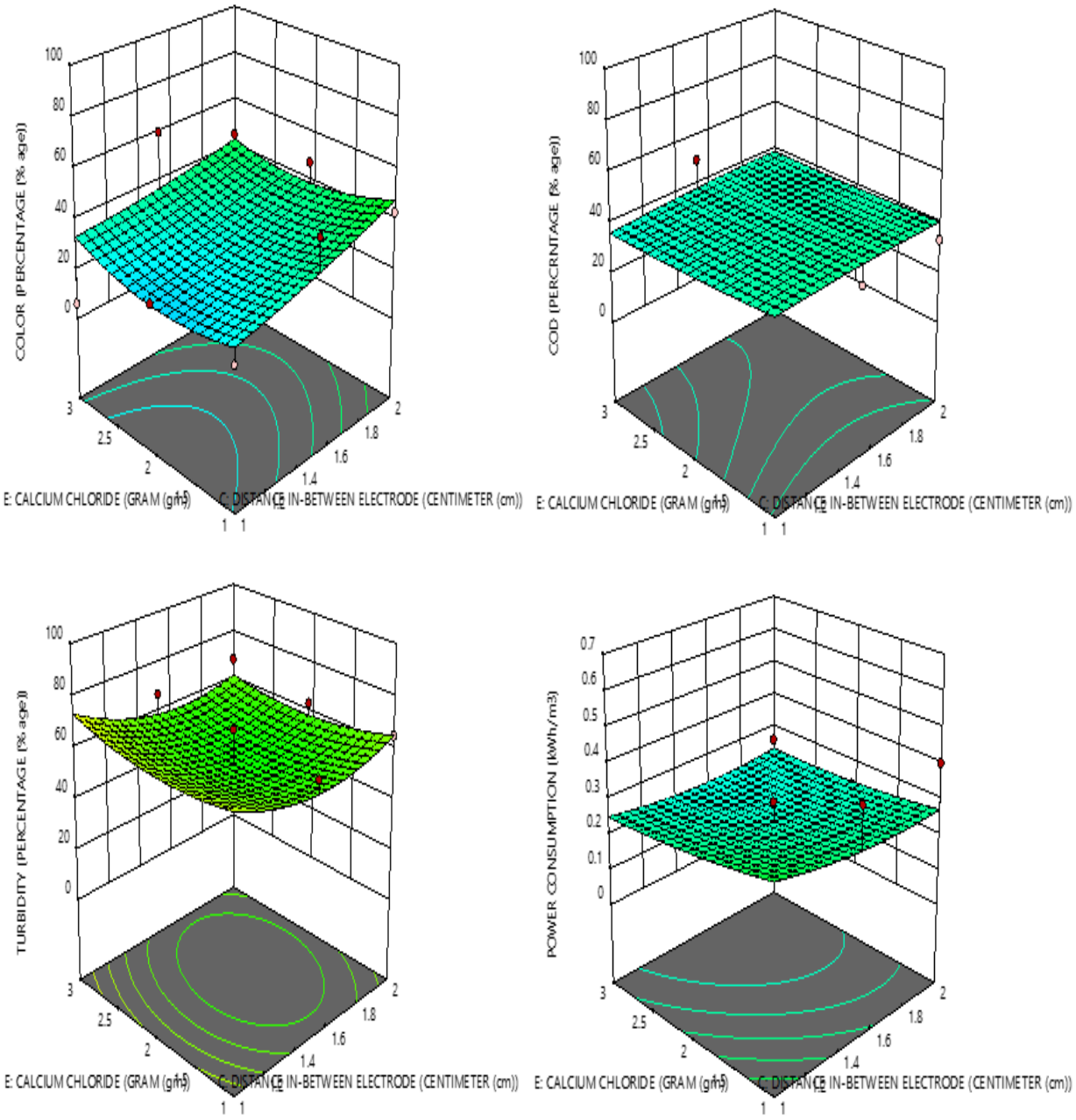




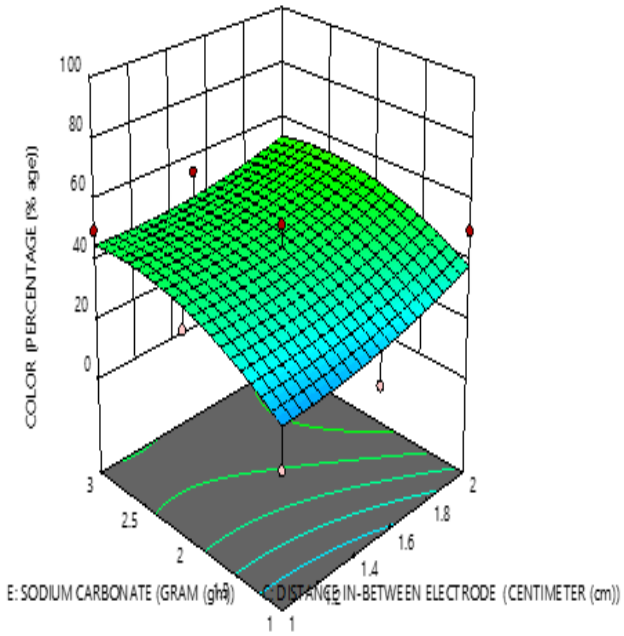


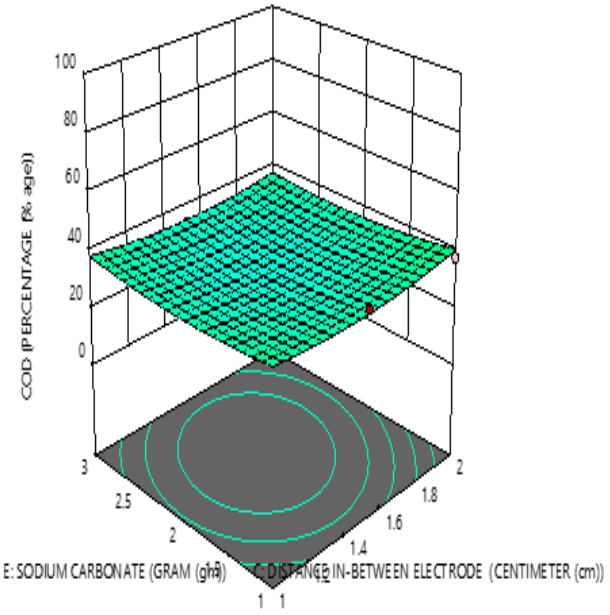


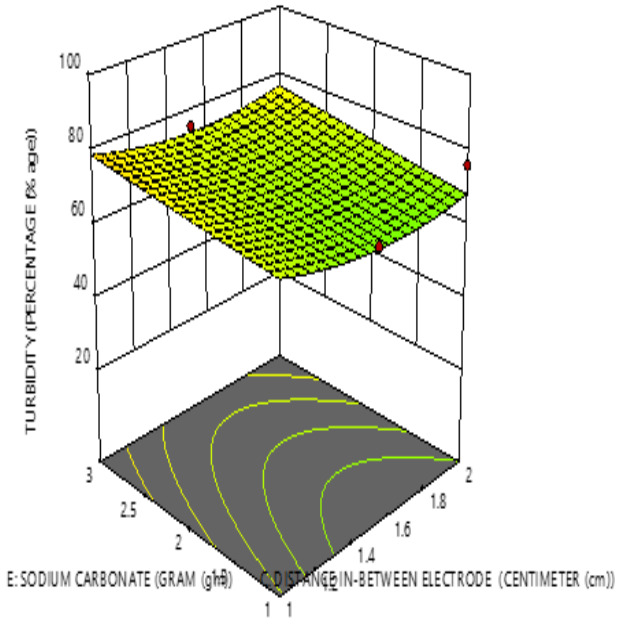
Appendix P: Combined effect of calcium chloride and distance in-between electrode on color, COD, turbidity and power consumption using $CaCl_2$.

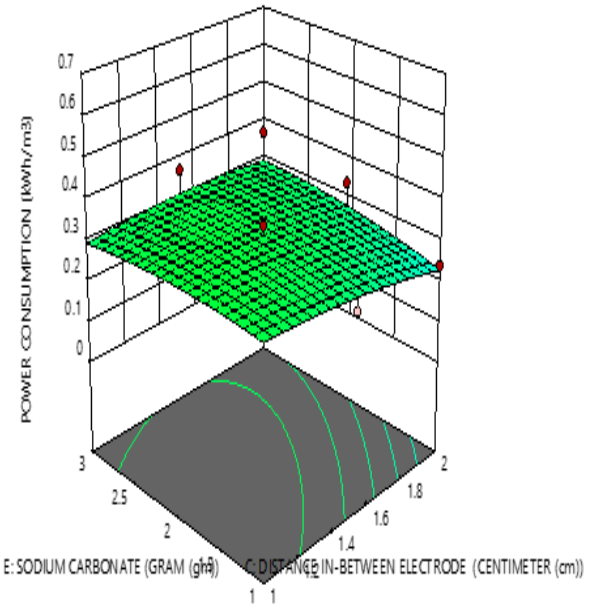


Appendix Q: Combined effect of Sodium carbonate and distance in-between electrode on color, COD, turbidity and power consumption using Na_2CO_3.









Appendix R: Experimental data from laboratory

Experimental No: 1

Date: 14/08/18 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 1 Mode of Electrode connection: Parallel In Between Electrode distance: 1cm System: Batch Current Ampere: 0.1A Current density: 33.1 A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	9.7	5900		420	0.94		1.2	384			230	
10 min		47.4	4700	4.2		0.118	87.45	0.8	256	33.33	0.152	68.5	70.22
20 min		70.8	4380	3.7		0.112	88.1	0.6	192	50	0.179	23.3	89.87
30 min		83.2	4290	3.3		0.091	90.32	0.3	96	75	0.159	19.1	91.69

Experimental No: 2

Date: 14/18/08and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2g/l. pH: 3 Reaction time: 30minute Depth: 4.8 cm and	Experimental No: 2 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 38.6A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	65.4	9510		420	1.15		1.9	608			64.4	
10 min		83.7	9300	4.3		0.34	70.43	1.8	576	5.26	0.630	31.0	51.86
20 min		87.1	9600	3.9		0.19	88.48	0.8	256	57.89	0.103	18.3	71.58
30 min		93.8	9720	3.5		0.10	91.3	0.5	160	73.68	0.108	18.1	71.89

Experimental No: 3

Date: 14/08/18 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3gm/l pH: 3. Reaction time: 30minute Depth: 4.2cm and	Experimental No: 3 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 44.1A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	63.7	20100		420	1.15		1.2	384			45.1	
10 min		85	19250	3.3		0.349	69.65	0.8	256	50	0.079	25.7	43.01
20 min		90.5	20200	2.8		0.310	73.04	0.6	192	66.67	0.101	23.11	48.76
30 min		89.4	20800	2.4		0.252	78.09	0.5	160	91.67	0.095	22.6	48.89

Experimental No: 4

Date: 15/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1gm/l pH: 3 Reaction time: 30minute Depth: 5.3cm and	Experimental No: 4 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 52.41A/m2 Width:5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	8.2	4800		420	1.05		1.4	448			192	
10 min		43	4080	4.1		0.20	80.95	0.9	288	35.71	0.178	36.3	81.1
20 min		73	3560	3.7		0.14	86.67	0.8	256	42.86	0.268	26.1	86.41
30 min		92.6	3600	3.3		0.055	94.76	0.5	160	64.29	0.239	25.3	86.83

Experimental No: 5

Date: 15/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2gm/l PH. 3 Reaction time: 30minute Depth: 5.1cm and	Experimental No: 5 System: Batch In Between Electrode distance:1cm Mode of Electrode connection: Parallel Current Ampere:0.15A Current density: 54.47A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	78	8570		420	0.950		1.5	480			120.9	
10 min		93.6	8040	4.8		0.135	85.79	0.8	256	46.67	0.149	20.7	82.89
20 min		93.8	8350	4.3		0.105	88.95	0.7	224	53.33	0.233	19.7	83.71
30 min		94	8750	3.9		0.071	92.53	0.6	192	60.00	0.282	13.21	89.1

Experimental No: 6

Date: 15/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3gm/l pH: 3 Reaction time: 30minute Depth: 4.9cm and	Experimental No: 6 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 56.69A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	77.2	17700		420	0.851		1.6	512			98.8	
10 min		91.5	16940	2.6		0.26	69.45	1.0	320	37.5	0.094	27.5	72.17
20 min		94.5	15690	2.6		0.18	78.85	0.8	256	62.5	0.113	24.3	75.41
30 min		90.7	18300	2.3		0.12	85.91	0.7	224	87.5	0.107	21.8	77.94

Experimental No: 7

Date:15/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium chloride Effluent concentration 1gm/l. pH: 3. Reaction time: 30minute Depth: 5.6cm and	Experimental No: 7 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 66.14A/m2 Width:5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	10.7	5930		420	0.85		1.1	352			147	
10 min		37.2	4720	4.9		0.47	44.71	0.9	288	45.45	0.284	56.6	61.5
20 min		48.5	4020	4.7		0.41	51.76	0.7	224	63.64	0.388	54.2	63.13
30 min		64.7	3510	4.4		0.36	57.65	0.5	160	81.82	0.424	10.42	92.91

Experimental No: 8

Date 15/08/18: and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium chloride Effluent concentration 2gm/l pH: 3 Reaction time: 30minute Depth: 5.4cm and	Experimental No: 8 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 68.59A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	57.5	8120		420	0.320		0.7	224			113.11	
10 min		66.3	7820	2.9		0.213	33.44	0.6	192	14.29	0.841	73.74	34.81
20 min		83.1	7180	2.6		0.205	35.94	0.4	128	42.86	0.501	30.8	72.77
30 min		93.3	7610	2.6		0.110	65.63	0.3	96	57.14	0.564	20.5	81.88

Experimental No: 9

Date:15/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium chloride Effluent concentration: 3gm/l pH: 3 Reaction time: 30minute Depth: 5.4cm and	Experimental No: 9 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 72.62A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	75.7	14370		420	1.150		1.9	608			117.3	
10 min		87.4	13410	2.5		0.360	68.7	1.1	352	42.11	0.09	27.6	76.47
20 min		88.7	13570	2.4		0.256	77.74	0.9	288	52.63	0.139	23.8	79.71
30 min		93.2	13800	2.3		0.255	77.83	0.7	224	63.16	0.166	22.1	81.16

Experimental No: 10

Date: 16/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1gm/l pH: 6. Reaction time: 30minute Depth: 5.7cm and	Experimental No: 10 System: Batch In Between Electrode distance:1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 64.98A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	7.7	2200		420	1.15		1.2	384			113.0	
10 min		37.2	2370	4.4		0.34	70.43	1.0	320	33.33	0.318	57.5	49.12
20 min		60.7	2350	4.0		0.325	71..74	0.8	256	66.67	0.289	55.3	51.06
30 min		79.8	2250	3.6		0.28	75.65	0.7	224	83.33	0.313	45.3	59.91

Experimental No: 11

Date:16/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: calcium chloride Effluent concentration: 2gm/l pH: 6 Reaction time: 30minute Depth: 5.5cm and	Experimental No:11 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 67.37Am2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	80.1	5000		420	0.352		1.5	480			60.2	
10 min		84.3	4780	2.9		0.245	30.4	0.9	288	40	0.14	42.9	28.74
20 min		91.5	4650	2.9		0.224	36.36	0.8	256	46.67	0.24	42.1	30.07
30 min		93.5	4810	3.0		0.205	41.76	0.6	192	60	0.29	40.0	33.56

Experimental No: 12

Date: 16/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3gm/l pH: 6. Reaction time: 30minute Depth: 5.2cm and	Experimental No:12 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.23A/m2 Width: 5.4cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	81.3	93.40		420	0.370		1.6	512			143.7	
10 min		83.1	91.20	2.4		0.267	27.84	1.0	320	37.5	0.116	32.0	77.73
20 min		93.5	90.80	2.4		0.224	39.46	0.8	256	50	0.174	29.4	79.54
30 min		93.3	93.50	2.6		0.200	45.95	0.7	224	56.25	0.251	25.1	82.53

Experimental No: 13

Date: 16/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1gm/l pH: 6 Reaction time: 30minute Depth: 5.6cm and	Experimental No: 13 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 50.54 A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	10.5	2810		420	0.84		1.6	512			199.3	
10 min		31.5	2950	3.9		0.55	34.52	1.3	416	18.75	0.282	90.0	54.84
20 min		54.2	2880	3.5		0.47	44.1	1.0	320	37.5	0.253	76.4	61.67
30 min		73.1	2930	3.1		0.30	64.29	0.8	256	50.0	0.252	46.7	76.57

Experimental No: 14

Date16/08/18: and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2gm/l pH: 6 Reaction time: 30minute Depth: 5.4cm and	Experimental No: 14 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 52.41A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	65.5	65.70		420	0.825		1.8	576			126	
10 min		78.5	6400	3.5		0.275	66.67	1.2	384	33.34	0.127	52.2	58.57
20 min		91.6	62.90	3.3		0.225	72.73	1.0	320	44.45	0.179	32.5	74.21
30 min		87.7	65.00	3.2		0.125	84.85	0.6	192	66.67	0.174	25.7	79.60

Experimental No: 15

Date: 16/08/18and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3gm/l pH: 6. Reaction time: 30minute Depth: 5.3cm and	Experimental No:15 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 53.40A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	67.1	12700		420	0.450		1.2	384			146.9	
10 min		77.5	12500	3.9		0.270	40	0.8	256	33.33	0.212	49.7	66.17
20 min		93.5	12000	3.8		0.145	67.78	0.6	192	50.0	0.275	45.2	67.78
30 min		90.2	12920	3.7		0.105	76.67	0.5	160	58.33	0.344	29.0	76.67

Experimental No: 16

Date:17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1gm/l pH: 6 Reaction time: 30minute Depth: 5.7cm and	Experimental No:16 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 66.2A/m2 Width:5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	7	3330		420	1.15		1.0	320			147	
10 min		36.9	3420	4.1		0.75	34.78	0.6	192	40	0.296	109	25.85
20 min		58.1	3300	3.8		0.72	37.39	0.4	128	60	0.367	77.5	47.28
30 min		84.4	3200	3.4		0.47	59.13	0.3	96	70	0.421	48.4	67.1

Experimental No: 17

Date:17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2gm/l pH: 6. Reaction time: 30minute Depth: 5.6cm and	Experimental No: 17 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 67.39A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	81.8	7450		420	0.760		1.4	448			116.45	
10 min		90.9	7200	2.7		0.215	71.71	1.2	384	14.29	0.391	32.5	72.1
20 min		91.4	6980	3.1		0.130	82.89	0.6	192	57.14	0.224	31.6	72.86
30 min		92.8	7610	4.1		0.105	86.18	0.4	128	71.43	0.356	24.0	79.39

Experimental No: 18

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3gm/l pH: 6 Reaction time: 30minute Depth: 5.5cm and	Experimental No:18 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 68.61A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	57.3	5860		420	1.1		1.8	576			113.0	
10 min		80.4	5100	3.1		0.26	76.36	1.4	448	22.22	0.224	27.2	75.93
20 min		94.6	13400	2.8		0.245	77.73	1.0	320	44.44	0.203	23.1	79.56
30 min		93.5	15500	2.5		0.210	80.91	0.8	256	55.56	0.217	15.2	86.55

Experimental No: 19

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1gm/l pH: 9 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 19 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 66.2 A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	10.2	2750	-	420	1.15	-	1.8	576	-	-	230.0	-
10 min		33.3	2730	4.4		0.74	35.65	1.0	320	44.44	0.159	115.0	50.0
20 min		52.4	2720	3.9		0.455	60.43	0.8	256	55.56	0.226	71.5	68.91
30 min		78.3	2610	3.4		0.345	70.0	0.6	192	66.67	0.246	56.6	75.39

Experimental No: 20

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5cm and	Experimental No: 20 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 68.61 A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	70.2	5580	-	420	0.475	-	2.0	640	-	-	124.9	-
10 min		81.1	5440	4.2		0.325	31.58	1.6	512	20.0	0.304	85.0	31.95
20 min		89.3	5120	3.9		0.225	52.63	1.0	320	50.0	0.226	40.5	67.57
30 min		93.3	5100	3.1		0.141	70.32	0.8	256	60.0	0.224	39.5	68.37

Experimental No: 21

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.2cm and	Experimental No: 21 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 72.57A/m2 Width: 5.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	75.3	10,000	-	420	2.7	-	1.6	512	-	-	108.0	-
10 min		78.9	9700	3.0		0.48	82.22	1.4	448	12.5	0.434	40.9	62.13
20 min		93.5	9350	3.2		0.358	86.74	1.0	320	37.5	0.309	29.7	72.5
30 min		93.5	9520	3.2		0.253	90.63	0.8	256	50.0	0.347	26.4	75.56

Experimental No: 22

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium carbonate Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 22 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 66.2 A/m2 Width: 5.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	12.3	3380	-	420	1.3	-	1.6	512	-	-	146	-
10 min		33.1	3500	3.7		1.1	15.38	0.8	256	50.0	0.134	116	20.55
20 min		55.4	3440	3.5		0.9	30.77	0.6	192	62.5	0.203	61.5	57.88
30 min		82.5	3340	3.2		0.66	49.23	0.4	128	75.0	0.232	35.7	75.55

Experimental No: 23

Date: 17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 23 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 68.61 A/m2 Width: 5.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	47.8	7350	-	420	1.1	-	1.6	512	-	-	159	-
10 min		71.3	7330	3.8		0.525	52.27	1.0	320	37.5	0.183	31.1	80.44
20 min		85.5	7220	3.5		0.358	67.45	0.6	192	62.5	0.203	23.1	85.47
30 min		88.6	7210	3.2		0.355	67.73	0.4	128	75.0	0.232	22.6	85.79

Experimental No: 24

Date:17/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 24 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.2A/m2 Width: 5.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	15.7	14,600	-	420	1.05	-	1.8	576	-	-	251	-
10 min		53.3	14,130	3.4		0.65	38.1	1.2	384	33.34	0.164	47.9	80.92
20 min		86.8	13,750	3.1		0.43	59.1	1.0	320	44.45	0.224	22.3	91.12
30 min		93.7	13,600	2.7		0.23	78.1	0.6	192	66.67	0.195	14.1	94.38

Experimental No: 25

Date: 18/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 25 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 67.39A/m2 Width: 5.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	8.8	3810	-	420	1.02	-	1.6	512	-	-	82.9	-
10 min		29.0	3700	4.0		0.655	35.78	1.0	320	37.5	0.193	75.0	9.53
20 min		51.8	3510	3.7		0.452	55.69	0.6	192	62.5	0.214	65.5	20.99
30 min		61.9	3440	3.4.		0.125	87.75	0.4	128	75	0.246	48.6	41.38

Experimental No: 26

Date: 18/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 26 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 69.88 A/m2 Width: 2.3cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	50.2	7890	-	420	1.75	-	1.8	576	-	-	122	-
10 min		59.6	7810	4.0		0.525	70.29	1.4	448	22.22	0.289	44.7	63.36
20 min		71.5	7650	3.7		0.425	75.71	1.0	320	44.44	0.268	29.8	75.57
30 min		89.6	7500	3.6		0.375	78.57	0.8	256	55.56	0.313	20.9	82.87

Experimental No: 27

Date: 18/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 27 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 72.57 A/m2 Width: 5.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	69.4	14,670	-	420	1.21	-	1.6	512	-	-	91.8	-
10 min		75.3	14,200	3.0		0.552	54.38	1.2	384	25	0.217	46.6	49.24
20 min		91.0	14,050	2.9		0.25	79.34	1.0	320	37.5	0.280	27.0	70.59
30 min		93.6	14,040	2.6		0.24	80.17	0.8	256	50	0.282	25.8	71.89

Experimental No: 28

Date: 22/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 28 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.8 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	5.1	3200	-	420	0.95	-	1.4	448	-	-	353	-
10 min		29.9	3190	3.9		0.74	22.1	1.0	320	28.57	0.141	98.3	72.15
20 min		54.2	3000	2.8		0.57	40	0.6	192	57.14	0.101	69.2	80.4
30 min		71.1	2850	2.0		0.53	44.21	0.4	128	71.43	0.087	55.2	84.36

Experimental No: 29

Date: 22/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 29 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere:0.1 A Current density: 37.12 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	76.2	6140	-	420	0.6	-	1.2	384	-	-	100	-
10 min		83.7	5600	1.8		0.45	25	1.0	320	16.67	0.129	26.4	73.6
20 min		93.3	5540	1.6		0.42	30	0.8	256	33.33	0.116	23.9	76.1
30 min		93.7	5340	1.4		0.275	54.17	0.4	128	66.67	0.076	21.0	79.0

Experimental No: 30

Date: 22/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3cm and	Experimental No: 30 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 38.51A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	73.6	11,710	-	420	0.17	-	1.6	512	-	-	119.4	-
10 min		85.8	10,790	1.9		0.16	5.88	1.0	320	37.5	0.046	22.8	80.9
20 min		93.6	10,430	1.9		0.14	17.65	0.8	256	50	0.069	17.78	85.1
30 min		92.5	10,400	1.9		0.125	26.47	0.6	192	62.5	0.082	14.8	87.6

Experimental No: 31

Date: 22/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 31 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.8 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	12.1	6070	-	420	0.65	-	1.4	448	-	-	82.90	-
10 min		43.3	5610	3.3		0.58	10.77	1.0	320	28.57	0.119	59.6	28.11
20 min		56.2	5430	3.3		0.55	15.38	0.8	256	42.86	0.159	44.5	46.32
30 min		69.8	5180	2.7		0.53	18.46	0.6	192	57.14	0.146	40.4	51.27

Experimental No: 32

Date: 22/08/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 32 System: Batch In Between Electrode distance:1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 37.1 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	19.4	9730	-	420	0.23	-	1.4	448	-	-	42.9	-
10 min		49.3	9440	3.7		0.15	34.78	1.2	384	14.29	0.267	11.89	72.28
20 min		60.8	9100	3.6		0.07	69.57	1.0	320	28.57	0.260	10.8	74.83
30 min		71.3	8950	3.5		0.041	82.17	0.8	256	42.86	0.253	8.53	80.12

Experimental No: 33

Date: 23/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 33 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 38.51 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	66.9	13400	-	420	0.9	-	1.6	512	-	-	82.9	-
10 min		76.5	13380	3.0		0.45	50	1.0	320	37.5	0.072	33.4	59.71
20 min		88.6	13360	2.5		0.3	66.67	0.6	192	62.5	0.072	31.6	61.88
30 min		92.5	13320	1.9		0.277	69.22	0.4	128	75	0.069	28.8	65.26

Experimental No: 34

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 34 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.71A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	5.1	3240	-	420	1.1	-	1.8	576	-	-	124	-
10 min		26.5	3110	3.6		0.5	54.55	1.4	448	22.22	0.195	57.3	53.79
20 min		48.6	2930	2.7		0.35	68.18	0.8	256	55.56	0.117	41.2	66.77
30 min		61.7	2510	1.8		0.27	75.45	0.6	192	66.67	0.098	32.2	74.03

Experimental No: 35

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 35 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 55.66A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	88.2	6440	-	420	0.951	-	1.4	448	-	-	220	-
10 min		89.2	5960	3.7		0.21	77.92	1.2	384	14.29	0.402	30.3	86.23
20 min		91.1	5690	2.8		0.17	82.12	1.0	320	28.57	0.304	17.1	92.23
30 min		92.8	5240	1.2		0.16	83.18	0.4	128	71.43	0.078	16.7	92.41

Experimental No: 36

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 36 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 57.76A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	70.4	9680	-	420	0.815	-	1.2	384	-	-	89.0	-
10 min		89.8	9410	3.7		0.27	66.87	1.0	320	16.67	0.402	20.2	77.3
20 min		92.2	8770	2.2		0.231	71.66	0.8	256	33.33	0.239	18.3	79.44
30 min		93.1	8420	1.3		0.112	86.26	0.4	128	66.67	0.106	14.8	83.37

Experimental No: 37

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 37 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.71 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	8.1	3910	-	420	0.75	-	1.6	512	-	-	148	-
10 min		51.2	3740	4.3		0.50	33.33	1.0	320	37.5	0.156	59.9	59.53
20 min		80.2	3420	4.0		0.45	40	0.6	192	62.5	0.174	43.7	70.47
30 min		85.3	3130	3.5		0.175	76.67	0.4	128	75.0	0.189	27.7	81.28

Experimental No: 38

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 38 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 55.66A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	63.5	9690	-	420	0.65	-	1.6	512	-	-	112	-
10 min		74.2	9130	3.2		0.2	69.23	1.4	448	12.5	0.347	18.0	83.93
20 min		90.1	8810	3.0		0.175	73.08	1.0	320	37.5	0.217	12.71	88.65
30 min		90.4	8690	2.9		0.153	76.46	0.6	192	62.5	0.189	10.32	90.79

Experimental No: 39

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 39 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 57.76A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	69.6	13660	-	420	0.875	-	1.8	576	-	-	149	-
10 min		88.6	13490	3.8		0.30	65.71	1.4	448	22.22	0.206	24.9	83.29
20 min		88.7	13280	3.6		0.275	68.57	1.0	320	44.44	0.195	23.0	84.56
30 min		91.4	13170	3.4		0.251	71.31	0.6	192	66.67	0.184	17.2	88.46

Experimental No: 40

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 40 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.61A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	11.1	3310	-	420	0.8	-	1.4	448	-	-	113.0	-
10 min		40.4	3280	3.4		0.275	65.63	1.2	384	14.29	0.492	20.9	81.5
20 min		62.1	3210	3.1		0.21	73.75	0.8	256	42.86	0.299	12.92	88.57
30 min		68.3	3190	2.7		0.19	76.25	0.6	192	57.14	0.293	12.28	89.13

Experimental No: 41

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 41 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.21A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	83.4	6280	-	420	1.75	-	1.6	512	-	-	102.0	-
10 min		88.3	6140	4.6		0.23	86.86	1.0	320	37.5	0.222	17.62	82.73
20 min		92.0	6070	3.4		0.21	88	0.6	192	62.5	0.197	6.45	93.68
30 min		92.1	5930	2.6		0.171	90.23	0.4	128	75	0.195	5.34	94.76

Experimental No: 42

Date: 24/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 42 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 78.49 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	77.7	12130	-	420	1.05	-	1.6	512	-	-	84.0	-
10 min		83.4	11810	3.3		0.25	76.19	1.4	448	12.5	0.478	12.23	85.44
20 min		85.0	11480	2.3		0.231	78.0	1.0	320	37.5	0.222	10.41	87.61
30 min		88.3	11140	1.6		0.212	79.81	0.6	192	62.5	0.139	9.64	88.52

Experimental No: 43

Date: 25/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 43 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.61 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	6.7	5910	-	420	1.1	-	1.4	448	-	-	132.8	-
10 min		36.4	5120	4.1		0.57	48.18	1.2	384	14.29	0.594	23.4	82.38
20 min		57.4	4870	3.2		0.415	62.27	0.8	256	42.86	0.310	17.34	86.94
30 min		70.0	4080	2.6		0.275	75.0	0.6	192	57.14	0.282	10.11	92.39

Experimental No: 44

Date: 25/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 44 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.21A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	61.6	9670	-	420	0.815	-	1.4	448	-	-	84.11	-
10 min		71.3	9320	3.5		0.310	61.96	1.0	320	28.57	0.253	48.91	41.85
20 min		80.4	9010	2.7		0.215	73.62	0.8	256	42.86	0.260	29.4	65.05
30 min		88.2	8730	2.3		0.175	78.53	0.4	128	71.43	0.200	18.9	77.53

Experimental No: 45

Date: 25/08/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 45 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 78.5 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	67.4	14460	-	420	1.05	-	1.6	512	-	-	110.8	-
10 min		76.8	13890	3.4		0.55	47.62	1.2	384	25	0.246	75.6	31.77
20 min		87.2	13310	3.0		0.275	73.81	0.8	256	50	0.217	49.9	54.96
30 min		90.8	13090	2.6		0.215	79.52	0.4	128	75	0.188	27.34	75.32

Experimental No: 46

Date:25/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1gm/l pH: 6 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 46 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.8A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	7.1	2820	-	420	0.9		1.2	384	-	-	84.5	-
10 min		31.8	2770	2.8		0.8	11.11	0.8	256	33.33	0.102	69.3	17.98
20 min		58.5	24010	2.3		0.6	33.33	0.6	192	50	0.110	53.8	3633
30 min		76.5	2200	2.1		0.54	40	0.4	128	66.67	0.114	41.72	50.63

Experimental No: 47

Date:22/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 2gm/l pH: 6 Reaction time: 30 minute Depth: 5.5cm and	Experimental No: 47 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere:0.1A Current density: 37.1 A/m2 Width:4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	72.9	7300	-	420	1.0	-	1.4	448	-	-	83.5	-
10 min		78.5	7190	2.5		0.9	10	1.2	385	14.29	0,181	71.6	14.25
20 min		91.1	6870	1.8		0..45	55	0.6	192	57.14	0.065	39.5	52.69
30 min		91.8	6410	1.8		0.371	62.9	0.4	128	71.43	0.078	20.62	75.31

Experimental No: 48

Date:25/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 3gm/l pH: 6 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 48 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 37.1 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	70.1	6100	-	4200	0.12	-	1.6	512	-	-	71.32	-
10 min		83.5	5970	2.3		0.20	10	1.00	320	14.29	0,057	62.34	14.25
20 min		91.3	5660	1.9		0.182	55	0.8	2256	57.14	0.069	30.13	52.69
30 min		92.4	5370	1.6		0.18	62.9	0.6	192	71.43	0.069	21.62	75.31

Experimental No: 49

Date: 25/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 1gm/l pH: 6 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 49 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.8 A/m2 Width:4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	10.1	3310	-	420	0.75	-	1.2	384	-	-	120	-
10 min		34.3	3230	3.5		0.6	20	0.8	256	33.33	0.127	27.4	39.67
20 min		66.3	3120	2.7		0.5	33.33	0.6	192	50.0	0.130	58.31	51.41
30 min		77.1	2890	2.4		0.45	40	0.4	128	66.67	0.130	32.01	73.32

Experimental No: 50

Date:25/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.5cm and	Experimental No: 50 System: Batch In Between Electrode distance:1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 37.11 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	70.6	6520	-	420	0.275		1.6	512	-	-	93.4	-
10 min		86.4	6370	2.1		0.21	23,64	1.4	448	12.5	0.152	68.32	26.85
20 min		90.3	6190	1.9		0.201	26.91	0.6	192	62.5	0.055	44.8	58.03
30 min		91.1	5870	1.8		0.14	49.1	0.4	128	75	0.065	27.31	70.76

Experimental No: 51

Date:25/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 3gm/l pH: 6 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 51 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 38.51A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	59.5	9830	-	420	1.280	-	1.4	448	-	-	108.51	--
10 min		78.3	9610	3.3		0.40	48.89	1.0	320	28.57	0.120	44.3	59.17
20 min		86.6	9340	2.8		0.35	72.66	0.8	256	42.86	0.135	32.14	70.38
30 min		89.9	9190	2.5		0.15	88.28	0.6	192	77.14	0.136	21.23	80.43

Experimental No: 52

Date:26/08/2018 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 52 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 35.8 A/m2 Width:4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	5.7	4080	-	420	0.685	-	1.8	576	-	-	123.4	-
10 min		36.8	3890	3.5		0.250	63.5	1.4	448	22.22	0.127	48.9	60.37
20 min		59.4	3630	3.3		0.215	68.61	1.0	320	44.44	0.121	29.8	75.85
30 min		72.2	3270	2.9		0145	78.83	0.8	256	55.56	0.126	18.3	85.17

Experimental No: 53

Date:26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 2gm/l pH: 6 Reaction time: 30 minute Depth: 5.4cm and	Experimental No: 53 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 37.79 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	67.1	8970	-	420	0.750	-	1.6	512	-	-	98.8	-
10 min		87.4	8860	3.1		0.315	58	1.2	384	25	0.113	36.9	62.65
20 min		88.6	8190	2.8		0.215	71.33	0.6	192	62.5	0.081	24.1	75.61
30 min		90.8	8110	2.4		0.130	82.67	0.4	128	75	0.087	16.8	83

Experimental No: 54

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 3gm/l pH: 6 Reaction time: 30 minute Depth: 5.2cm and	Experimental No: 54 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 39.25 A/m2 Width:4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	70.4	13720	-	420	1.050	-	1.4	448	-	-	132.0	-
10 min		86.8	13510	3.6		0.480	54.29	1.0	320	28.57	0.130	47.9	63.71
20 min		90.4	13260	3.2		0.225	78.57	0.8	256	42.86	0.154	30.61	76.81
30 min		91.2	13180	2.8		0.130	87.62	0.6	192	57.14	0.152	23.0	82.58

Experimental No: 55

Date:26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 1g/l pH: 9 Reaction time: 30 minute Depth: 5.8cm and	Experimental No: 55 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.19A/m2 Width:4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	8.7	3420	-	420	0.9	-	1.2	384	-	-	84.42	-
10 min		34.0	3270	4.7		0.84	6.67	0.8	256	33.33	0.170	60.51	28.32
20 min		64.4	3110	3.5		0.76	15.56	0.6	192	50	0.169	44.02	47.86
30 min		84.9	2960	3.2		0.31	65.56	0.4	128	66.67	0.137	32.14	61.93

Experimental No: 56

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2mg/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 56 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 3.1 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	79.5	7900	-	420	0.570		1.2	384	-	-	78.03	-
10 min		83.6	7840	3.3		0.45	21.05	0.8	256	33.33	0.120	53.15	31.89
20 min		90.4	7630	2.9		0.375	34,21	0.6	192	50	0.140	32.01	58.98
30 min		91.2	7220	2.8		0.215	62.28	0.4	128	66.67	0.152	32.01	70.11

Experimental No: 57

Date:26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3gm/l pH: 9 Reaction time: 30 minute Depth: 5.3cm and	Experimental No:57 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 38.5 A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	82.5	14460	-	420	1.6	-	1.6	512	-	-	153	-
10 min		86.6	14380	2.9		0.95	40.63	1.2	384	325	0.105	58.02	62.4
20 min		89.5	14140	2.7		0.815	49.1	1.0	320	37.5	0.130	33.13	7835
30 min		90.1	13820	2.6		0.55	65.63	0.8	256	50	0.141	21.0	68.27

Experimental No: 58

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 1 mg/l pH: 9 Reaction time: 30 minute Depth: 5.7cm and	Experimental No: 58 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 35.8A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	10.1	3320	-	420	0.90	-	1.2	384	-	-	83.41	-
10 min		43.4	3210	2.5		0.752	16.44	1.0	320	16.67	0.181	71.23	14.6
20 min		60.3	3050	2.4		0.561	37.67	0.8	256	33.33	0.173	40.67	51.25
30 min		80.6	2870	1.9		0.375	58.33	0.6	192	50	0.138	19.08	77.13

Experimental No: 59

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2gm/l pH: 9 Reaction time: 30 minute Depth: 5.5cm and	Experimental No: 59 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 37.11A/m2 Width: 4.9cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	44.3	6210	-	420	0.15	-	1.4	448	-	-	58.1	-
10 min		76.1	6170	1.9		0.137	8.76	1.0	320	28.57	0.069	44.62	23.2
20 min		86.6	6040	1.5		0.125	16.67	0.8	256	42.86	0.072	28.43	51.1
30 min		89.3	5930	1.5		0.115	23.33	0.4	128	71.43	0.057	17.52	69.85

Experimental No: 60

Date: 26/08/2018and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 60 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 38.51A/m^2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	72.8	11800	-	420	0.3		1.6	512	-	-	74.51	-
10 min		87.2	11740	1.8		0.275	8.33	1.4	448	12.5	0.130	66.21	11.14
20 min		92.2	11530	1.4		0.251	16.33	1.0	320	37.5	0.068	43.12	42.13
30 min		92.4	11290	1.3		0.151	49.67	0.8	256	50	0.071	27.14	63.58

Experimental No: 61

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: sodium Carbonate Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 61 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 35.8 A/m^2 Width:4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	6.1	2950	-	420	0.910	-	1.8	576	-	-	143.8	-
10 min		33.4	2840	5.1		0.470	48.35	1.4	448	22.22	0.184	88.6	38.39
20 min		56.4	2670	4.4		0.235	74.18	1.2	384	33.33	0.214	66.4	53.82
30 min		69.4	2540	3.8		0.105	88.46	0.8	256	55.56	0.165	36.0	74.97

Experimental No: 62

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 62 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 37.1 A/m^2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	66.6	6970	-	420	0.715	-	1.4	448	-	-	117.4	-
10 min		79.4	6820	3.6		0.350	51.1	1.2	384	14.29	0.261	59.8	49.1
20 min		86.8	6760	3.3		0.195	72.73	1.0	320	28.57	0.242	38.4	67.29
30 min		89.8	6680	3.0		0.115	83.92	0.6	192	57.14	0.163	22.8	80.92

Experimental No: 63

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 63 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 38.51 A/m^2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	68.2	12880	-	420	0.550	-	1.4	448	-	-	97.8	-
10 min		76.4	12790	3.7		0.270	50.91	1.0	320	28.57	0.134	39.4	59.71
20 min		86.6	12460	3.4		0.210	61.82	0.8	256	42.86	0.164	25.6	73.82
30 min		90.4	12310	3.1		0.130	76.36	0.6	192	57.14	0.168	19.41	80.15

Experimental No: 64

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 64 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 54.82 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	6.0	3380	-	420	1.1	-	1.4	448	-	-	71.35	--
10 min		29.8	3270	3.9		0.92	16.36	1.0	320	28.5	0.212	58.44	18.1
20 min		52.9	3200	3.6		0.825	25	0.8	256	42.86	0.260	34.56	51.56
30 min		80.1	3110	3.2		0.326	70.82	0.4	128	71.43	0.208	28.98	59.38

Experimental No: 65

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 65 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 56.82 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	70.2	7860	-	420	0.35	-	1.6	512	-	-	63.45	-
10 min		79.2	7770	3.5		0.275	21.43	1.2	384	25	0.190	51.14	19.4
20 min		88.9	7710	3.1		0.121	65.43	1.0	320	37.5	0.224	42.24	33.43
30 min		90.2	7420	2.6		0.091	74.0	0.6	192	62.5	0.169	30.04	21.13

Experimental No: 66

Date: 26/08/2018 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 66 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 58.96A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	80.0	14500	-	420	1.0	-	1.4	448	-	-	78.48	-
10 min		85.0	14490	2.7		0.825	17.5	1.2	384	14.29	0.297	64.18	18.22
20 min		91.9	14400	2.1		0.512	48.8	0.8	256	42.86	0.152	38.01	51.57
30 min		92.2	14270	1.9		0.215	78.5	0.6	192	57.14	0.155	24.64	68.6

Experimental No: 67

Date: 27/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7cm and							Experimental No: 67 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 54.82A/m2 Width: 4.8cm						
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	10.7	3480	-	420	0.26	-	1.4	448	-	-	75.51	-
10 min		43.5	3340	4.3		0.21	19.23	1.0	320	28.57	0.234	62.14	17.71
20 min		75.1	3190	3.8		0.152	41.54	0.6	192	57.14	0.210	37.91	49.79
30 min		80.5	3110	3.0		0.121	53.56	0.4	128	71.43	0.195	22.15	70.67

Experimental No: 68

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and							Experimental No: 68 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 56.82 A/m^2 Width:4.8 cm						
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	59.9	6190	-	420	0.34	-	1.4	448	-	-	68.82	-
10 min		70.1	6100	4.4		0.215	36.76	1.2	384	14.29	0.484	51.45	25.24
20 min		88.9	5970	3.8		0.121	64.71	1.0	320	28.29	0.413	33.13	51.86
30 min		90.1	5830	2.9		0.081	76.18	0.8	256	42.86	0.315	22.14	67.83

Experimental No: 69

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and								Experimental No: 69 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 58.96 A/m^2 Width: 4.8cm					
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	49.3	11830	–	420	0.57	–	1.6	512	–	–	81.34	–
10 min		55.7	11780	3.7		0.325	42.98	1.2	384	25.0	0.201	59.04	15.12
20 min		79.4	11670	3.1		0.151	73.51	1.0	320	37.5	0.224	36.41	55.24
30 min		86.8	11500	2.7		0.093	83.68	0.8	256	50	0.220	20.0	75.41

Experimental No: 70

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7 cm and								Experimental No:70 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 54.82 A/m^2 Width: 4.8 cm					
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	10.1	3400	–	420	0.950	–	1.6	512	–	–	110.4	–
10 min		34.6	3380	4.0		0.615	35.26	1.4	448	12.5	0.434	644.9	41.21
20 min		62/8	3270	3.7		0.360	62.11	1.0	320	37.5	0.268	43.1	60.96
30 min		78.8	3190	3.3		0.175	81.58	0.8	256	50	0.269	27.8	74.82

Experimental No: 71

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 71 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 56.82 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	51.4	7420	-	420	0.870	-	1.8	576	-	-	99.0	-
10 min		72.6	7370	4.9		0.415	52.3	1.6	512	11.11	0.531	63.4	35.96
20 min		80.4	7240	4.5		0.310	64.37	1.2	384	33.33	0.326	39.51	60.1
30 min		88.2	7100	4.0		0.225	74.14	0.8	256	55.56	0.260	20.14	79.66

Experimental No: 72

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 72 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 58.96A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	54.4	14510	-	420	0.850	-	1.4	448	-	-	130.1	-
10 min		66.8	14430	4.7		0.420	50.59	1.2	384	14.29	0.509	49.7	61.8
20 min		78.8	14340	4.4		0310	63.53	1.0	320	28.57	0.477	24.8	80.94
30 min		86.8	14220	4.1		0.251	70.47	0.8	256	42.86	0.445	14.9	88.55

Experimental No: 73

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30minute Depth: 5.7 cm and	Experimental No: 73 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 73.1 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	13.1	3440	-	420	0.65	-	1.8	570	-	-	79.91	-
10 min		35.6	3370	4.7		0.451	30.62	1.2	385	33.33	0.227	58.11	27.28
20 min		61.6	3230	4.6		0.205	68.46	1.0	320	44.44	0.333	38.19	52.21
30 min		79.4	3190	3.9		0.106	83.69	0.6	192	66.67	0.282	22.31	72.1

Experimental No: 74

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 74 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 75.76 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	69.6	7540	-	420	0.24	-	1.6	512	-	-	48.91	-
10 min		80.4	7470	2.8		0.153	36.25	1.2	384	25	0.202	31.83	34.92
20 min		88.3	7400	2.5		0.110	54.17	1.0	320	37.5	0.24	24.96	48.97
30 min		90.4	7320	2.2		0.081	66.25	0.8	256	50	0.239	17.82	63.57

Experimental No: 75

Date: 28/08/2018 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 75 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 78.62 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	18.8	5720	-	420	0.43	-	1.4	448		-	68.43	-
10 min		47.1	5580	3.3		0.215	50	1.0	320	28.57	0.238	37.96	44.53
20 min		63.4	5460	3.0		0.121	71.86	0.8	256	42.86	0.289	27.34	60.05
30 min		27.9	5290	2.8		0.086	80	0.6	192	57.14	0.304	18.74	72.61

Experimental No: 76

Date: 29/08/20018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 76 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 73.1 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	6.9	2810	-	420	0.55	-	1.2	384	-	-	97.74	-
10 min		30.8	2780	4.7		0.425	22.73	1.0	320	16.67	0.680	44.01	54.97
20 min		59.6	2540	4.4		0.225	59.1	0.8	256	33.33	0.637	33.01	66.04
30 min		72.6	2400	4.1		0.163	70.36	0.6	192	50	0.593	23.19	76.15

Experimental No: 77

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 77 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 75.76 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	65.4	5640	-	420	0.2	-	1.4	448	-	-	48.21	-
10 min		72.7	5540	2.7		0.115	42.5	1.2	384	14.29	0.391	32.14	33.33
20 min		87.3	5380	2.6		0.075	62.5	1.0	320	28.57	0.376	26.49	45.1
30 min		89.1	5130	2.4		0.051	74.5	0.6	192	57.14	0.261	16.72	65.32

Experimental No: 78

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 78 System: Batch In Between Electrode distance:1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 78.62 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	64.8	10340	-	420	0.8	-	1.4	448	-		89.39	
10 min		77.2	10190	2.5		0.451	43.63	1.2	384	14.29	0.361	43.51	51.33
20 min		87.6	10100	2.4		0.225	71.88	1.0	320	28.57	0.347	29.91	66.54
30 min		90.2	9870	2.3		0.102	87.25	0.8	256	42.86	0.333	17.82	80.1

Experimental No: 79

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 79 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 73.1 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	6.1	3540	-	420	1.10	-	1.4	448		-	138.7	-
10 min		30.6	3320	4.2		0.710	35.45	1.2	384	14.29	0.608	72.4	47.8
20 min		51.4	3270	3.8		0.350	68.18	1.0	320	28.86	0.550	38.2	71.95
30 min		66.7	3110	3.5		0.260	76.18	0.8	256	42.86	0.506	23.4	83.13

Experimental No: 80

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 9 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 80 System: Batch In Between Electrode distance: 1 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 75.76 A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	51.6	7420	-	420	0.970	-	1.2	384	-	-	119.4	-
10 min		70.4	7340	3.8		0.415	57.22	1.0	320	16.67	0.550	47.3	60.39
20 min		79.8	7190	3.5		0.310	68.04	0.8	256	33.33	0.506	36.4	69.51
30 min		86.8	7030	3.2		0.220	77.32	0.6	192	50	0.463	27.32	77.12

Experimental No: 81

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 3 gm/l pH: 9 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No:81 System: Batch In Between Electrode distance: 1cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 78.62A/m^2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	52.6	14570	-	420	0.880	-	1.4	448	-	-	112.5	-
10 min		64.8	14310	3.7		0.420	52.27	1.2	384	14.29	0.536	53.4	52.53
20 min		78.6	14190	3.4		0.270	69.32	1.0	320	28.57	0.491	39.6	64.8
30 min		87.6	13720	3.1		0.20	77.27	0.8	256	42.86	0.448	24.9	77.87

Experimental No: 82

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chlorine Effluent concentration: 1 gm/l pH: 9 Reaction time: 30 minute Depth: 6.4 cm and	Experimental No: 82 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 33.24 A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	9	12.4	5600	-	420	1.0	-	1.6	512		-	153	-
10 min		37.4	5480	2.7		0.715	28.5	1.4	448	12.5	0.195	57.31	2.54
20 min		51.8	5320	2.1		0.415	58.5	1.0	320	37.5	0.101	31.85	79.18
30 min		68.9	5270	1.9		0.215	78.5	0.8	256	50	0.103	23.58	84.59

Experimental No: 83

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 6.2 cm and	Experimental No: 83 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 34.32A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	50.6	9570	–	420	0.55	–	1.6	512	–	–	84.05	–
10 min		69.7	9480	1.8		0.265	51.82	1.4	448	12.5	0.130	61.97	26.0
20 min		83.8	9340	1.6		0.105	80.91	1.0	320	37.5	0.077	29.23	65.22
30 min		89.1	9210	1.5		0.051	90.73	0.8	256	50	0.081	20.31	75.84

Experimental No: 84

Date: 29/08/2018 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 6.0 cm and	Experimental No: 84 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 35.46 A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	71.6	19320	–	420	0.4	–	1.4	448	–	–	72.24	–
10 min		88.6	18710	1.4		0.155	61.25	1.2	384	14.29	0.102	39.48	45.35
20 min		89.9	18130	1.4		0.105	73.75	0.8	256	42.86	0.068	28.12	61.1
30 min		90.2	17600	1.4		0.041	89.75	0.6	192	57.14	0.076	14.19	80.36

Experimental No: 85

Date: 20/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 6.4 cm and	Experimental No: 85 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 333.24 A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	5.7	3240	-	420	1.1	-	1.4	448	-	-	220	-
10 min		31.2	3170	2.8		0.54	50.1	1.0	320	28.57	0.102	73.48	66.6
20 min		55.2	7080	1.7		0.52	52.73	0.8	256	42.86	0.082	52.08	76.33
30 min		75.3	2910	1.4		0.42	61.82	0.6	192	57.14	0.076	40.08	81.81

Experimental No: 86

Date: 30/08/2018 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 2 gm/l. pH: 3 Reaction time: 30 minute Depth: 6.2 cm and	Experimental No:86 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 34.32 A/m^2 Width: 4 .7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	64.3	6230	-	420	0.5	-	1.6	512		-	68.94	-
10 min		75.1	6180	1.6		0.45	10	1.2	384	25	0.058	42.83	37.87
20 min		88.1	6100	1.5		0.275	45	1.0	320	37.5	0.072	30.33	56.01
30 min		90.3	5910	1.5		0.105	79	0.6	192	62.5	0.065	21.08	69.42

Experimental No: 87

Date: 30/08/2018 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium Chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 6.0 cm and	Experimental No: 87 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 35.46 A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	80.3	11690	-	420	0.55	-	1.6	512	-	-	73.35	-
10 min		86.9	11540	1.5		0.215	60.1	1.2	384	25	0.054	39.74	45.82
20 min		90.1	11430	1.5		0.120	78.18	1.0	320	37.5	0.072	21.47	70.73
30 min		90.8	11270	1.5		0.065	88.18	0.6	192	62.5	0.065	17.32	76.39

Experimental No: 88

Date: 30/08/2018 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 1 mg/l pH: 3 Reaction time: 30 minute Depth: 6.4 cm and	Experimental No: 88 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 33.24 A/m^2 Width:4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	10.6	5980	-	420	0.710	-	1.2	1.2	-	-	92.4	-
10 min		36.8	5820	3.2		0.590	16.9	1.0	1.0	16.67	0.231	64.8	29.87
20 min		54.5	5690	2.9		0.510	28.17	0.8	0.8	33.33	0.210	43.32	53.12
30 min		66.6	5710	2.7		0.351	50.56	0.4	0.4	66.67	0.146	28.7	68.94

Experimental No: 89

Date: 30/08/2018 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 6.2 cm and	Experimental No: 89 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 34.32 A/m^2 Width:4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	51.2	9680	-	420	0.450	-	1.0	320	-	-	54.8	-
10 min		60.4	9570	3.5		0.215	52.22	0.8	256	20	0.253	39.8	28.1
20 min		76.6	9410	3.3		0.20	55.56	0.6	192	40	0.238	31.0	43.43
30 min		88.9	9330	3.1		0.115	74.44	0.4	128	60	0.224	23.1	57.85

Experimental No: 90

Date: 30/08/2018 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium Carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 6.0 cm and	Experimental No: 90 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 35.46 A/m^2 Width: 4.7 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	58.8	13390	-	420	0.830	-	1.2	384	-	-	89.2	-
10 min		69.9	13270	3.1		0.375	54.82	1.0	320	16.67	0.225	43.3	61.55
20 min		80.4	13140	2.8		0.30	63.86	0.8	256	33.33	0.202	27.8	68.83
30 min		88.6	13090	2.5		0.225	72.89	0.6	192	50	0.181	18.8	78.92

Experimental No: 91

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.1 cm and	Experimental No: 91 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 42.63 A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	9.1	6010	-	420	0.65	-	1.6	512	-	-	84.0	-
10 min		34.3	5890	2.6		0.225	65.38	1.2	384	25	0.094	51.23	39.01
20 min		57.2	5710	2.2		0.105	83.85	1.0	320	37.5	0.106	38.92	53.67
30 min		76.2	5540	1.9		0.085	86.92	0.8	256	50	0.103	19.32	77

Experimental No: 92

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 4.9 cm and	Experimental No: 92 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 44.37 A/m2 Width: 4.6cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.8	9490	-	420	0.725	-	1.0	320	-	-	77.21	-
10 min		81.6	9400	1.9		0.425	41.38	0.8	256	20	0.138	59.48	22.96
20 min		87.3	9270	1.5		0.215	70.34	0.6	192	40	0.109	41.08	46.79
30 min		89.6	9140	1.4		0.09	87.59	0.4	128	60	0.101	29.89	61.29

Experimental No: 93

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 4.7 cm and	Experimental No: 93 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 46.25A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	72.9	19170	-	420	0.5	-	1.0	320	-	-	69.74	-
10 min		78.4	19080	1.8		0.305	39	0.8	256	20	0.130	51.29	26.46
20 min		87.6	18740	1.5		0.115	77	0.6	192	40	0.108	43.54	37.57
30 min		89.4	18530	1.5		0.045	91	0.4	128	60	0.108	29.72	57.38

Experimental No: 94

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.1 cm and	Experimental No: 94 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 42.63A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	11.9	3450	-	420	0.9	-	1.4	448	-	-	92.31	-
10 min		38.7	3290	2.8		0.515	42.78	1.0	320	28.57	0.102	68.46	25.84
20 min		65.0	3200	2.2		0.205	77.22	0.8	256	42.86	0.106	49.34	46.55
30 min		78.6	3110	2.1		0.085	90.56	0.6	192	57.14	0.114	29.48	68.1

Experimental No: 95

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 4.9 cm and	Experimental No: 95 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1 A Current density: 44.37A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	55.5	6510	–	420	0.40	–	1.6	512	–	–	53.03	–
10 min		62.3	6430	1.9		0.21	47.5	1.2	384	25	0.069	39.44	25.63
20 min		81.2	6270	1.9		0.105	73.75	0.8	256	50	0.069	25.96	51.05
30 min		87.4	6140	1.8		0.071	82.25	0.4	128	75	0.065	18.24	65.6

Experimental No: 96

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 4.7 cm and	Experimental No: 96 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 46.25A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.1	9720	–	420	0.553	–	1.8	576	–	–	67.97	–
10 min		79.1	9640	1.8		0.305	44.85	1.4	448	22.22	0.065	49.81	26.72
20 min		84.2	9430	1.8		0.20	63.83	1.0	320	44.44	0.065	32.11	52.76
30 min		88.6	9220	1.8		0.095	82.82	0.8	256	55.56	0.078	19.87	70.77

Experimental No: 97

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.1 cm and	Experimental No: 97 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 42.63A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	7.8	3870	-	420	0.81	-	1.2	384	-	-	113.4	-
10 min		36.7	3690	3.2		0.405	50	1.0	320	16.67	0.231	62.1	45.24
20 min		58.8	3400	3.0		0.215	73.46	0.8	256	33.33	0.217	44.3	60.93
30 min		70.4	3210	2.7		0.135	83.33	0.6	192	50	0.195	29.4	74.07

Experimental No: 98

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 4.9 cm and	Experimental No: 98 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 44.37 A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	60.8	9540	-	420	1.1	-	1.2	384	-	-	96.8	-
10 min		72.4	9370	2.9		0.61	44.55	1.0	320	16.67	0.209	43.4	55.17
20 min		86.8	9190	2.4		0.45	59.1	0.8	256	33.33	0.173	31.01	67.96
30 min		90.2	9060	2.1		0.31	71.82	0.6	192	50	0.152	22.9	76.34

Experimental No: 99

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 4.7 cm and	Experimental No: 99 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.1A Current density: 46.25 A/m2 Width: 4.6 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	66.8	13580	-	420	0.91	-	1.4	448	-	-	87.8	-
10 min		78.9	13390	3.1		0.455	50	1.2	384	14.29	0.225	40.4	53.99
20 min		86.8	13210	2.8		0.215	76.37	1.0	320	28.57	0.202	29.3	66.63
30 min		90.1	13140	2.5		0.175	80.77	0.8	256	42.86	0.181	20.4	76.77

Experimental No: 100

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 100 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.42A/m2 Width: 5.2cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	5.8	5870	-	420	0.75	-	1.6	512	-	-	97.0	-
10 min		27.8	5430	4.1		0.44	41.33	1.4	448	12.5	0.445	60.17	37.97
20 min		64.9	5340	3.4		0.3	60	1.0	320	37.5	0.246	46.15	52.42
30 min		72.9	5210	3.0		0.225	70	0.6	192	62.5	0.195	22.45	76.86

Experimental No: 101

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 101 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 55.47 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.9	9620	-	420	0.4	-	1.2	384	-	-	57.24	-
10 min		81.9	9440	2.3		0.325	18.75	1.0	320	16.67	0.25	38.74	32.32
20 min		87.7	9300	2.2		0.2	50	0.8	256	33.33	0.239	25.41	55.61
30 min		89.2	9210	2.0		0.125	68.75	0.6	192	50	0.217	13.79	75.91

Experimental No: 102

Date: 30/08/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 102 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 57.69 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	84.2	19310	-	420	0.50	-	1.2	384	-	-	65.21	-
10 min		88.5	19120	3.4		0.29	42	1.0	320	16.67	0.369	34.83	41.99
20 min		90.2	18840	3.0		0.225	55	0.8	256	33.33	0.326	26.27	59.71
30 min		90.8	18600	2.8		0.115	77	0.4	128	66.67	0.228	19.72	69.76

Experimental No: 103

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 103 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.42 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	8.3	3280	-	420	0.85	-	1.6	512	-	-	82.14	-
10 min		43.7	3110	4.5		0.44	48.24	1.2	448	12.5	0.489	41.92	48.97
20 min		66.3	2820	4.3		0.30	64.71	1.0	320	37.5	0.311	29.71	63.83
30 min		88.0	2770	4.1		0.175	79.41	0.8	256	50	0.334	20.25	75.35

Experimental No: 104

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 104 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 55.47 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	77.7	6130	-	420	0.55	-	1.4	448	-	-	88.40	-
10 min		88.6	5860	3.6		0.275	50	1.0	320	28.57	0.195	39.21	55.64
20 min		92.7	5590	3.4		0.21	61.82	0.8	256	42.86	0.246	27.19	69.24
30 min		93.1	5460	3.2		0.125	77.27	0.4	128	71.43	0.208	20.32	77.01

Experimental No: 105

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 105 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 57.69 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	53.4	13000	-	420	0.260	-	1.6	512	-	-	49.18	-
10 min		72.2	12400	3.8		0.135	48.08	1.2	384	25	0.206	40.09	18.48
20 min		92.6	11390	2.9		0.105	59.62	0.8	256	50	0.157	36.14	26.51
30 min		93.1	11100	2.6		0.076	70.77	0.6	192	62.5	0.169	20.71	57.89

Experimental No: 106

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 106 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.42 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	5.1	3580	-	420	0.810	-	1.4	448	-	-	128.6	-
10 min		33.4	3340	3.8		0.62	23.46	1.2	384	14.29	0.413	52.8	58.94
20 min		58.6	3120	3.4		0.305	62.35	1.0	320	28.57	0.369	40.4	68.58
30 min		70.4	3100	3.0		0.175	78.4	0.8	256	42.86	0.326	28.9	77.53

Experimental No: 107

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 107 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 55.47 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	54.8	9580	-	420	0.71	-	1.4	448	-	-	109.4	-
10 min		66.6	9390	3.3		0.35	50.7	1.2	384	14.29	0.358	54.3	50.37
20 min		78.5	9300	3.0		0.225	68.31	1.0	320	28.57	0.326	39.8	63.62
30 min		86.8	9190	2.8		0.125	82.39	0.8	256	42.86	0.304	28.8	73.67

Experimental No: 108

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 108 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 57.69 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	72.4	13570	-	420	0.64	-	1.4	448	-	-	124.9	-
10 min		78.6	13440	3.7		0.35	45.31	1.2	384	14.29	0.402	70.8	43.31
20 min		86.6	13300	3.4		0.215	66.41	1.0	320	28.57	0.369	36.41	70.85
30 min		90.8	13210	2.9		0.135	78.91	0.8	256	42.86	0.315	20.02	83.97

Experimental No: 109

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 109 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 64.6 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	12.0	5200	-	420	0.85	-	1.4	448	-	-	83.01	-
10 min		40.4	4190	4.1		0.60	29.41	1.2	384	14.29	0.445	61.0	26.51
20 min		69.7	3720	3.6		0.50	41.18	1.0	320	28.57	0.391	49.29	40.62
30 min		87.4	3680	3.3		0.305	64.18	0.8	256	42.86	0.358	27.41	66.98

Experimental No: 110

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 110 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 67.1 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	71.9	8240	-	420	0.325	-	1.2	384	-	-	52.5	-
10 min		84.9	7770	3.7		0.215	33.85	1.0	320	16.67	0.402	31.25	40.48
20 min		93.5	7570	3.5		0.20	38.46	0.8	256	33.33	0.391	22.91	56.36
30 min		93.8	7230	3.2		0.11	66.15	0.4	128	66.67	0.261	17.84	66.02

Experimental No: 111

Date: 31/08/18 and Day: Friday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 111 System: Batch In Between Electrode distance: 2cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 69.78 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	73.2	14720	-	420	0.81	-	1.4	448	-	-	93.07	-
10 min		88.8	14360	2.7		0.25	69.14	1.2	384	14.29	0.294	54.33	41.62
20 min		92.4	14210	2.4		0.2	75.31	1.0	320	28.57	0.260	39.81	57.23
30 min		92.8	13900	2.1		0.115	85.8	0.6	192	57.14	0.171	24.08	74.13

Experimental No: 112

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 112 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 64.6 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	9.1	5270	-	420	0.7	-	1.4	448	-	-	81.34	-
10 min		33.5	4110	3.2		0.53	24.29	1.2	384	14.29	0.347	59.61	26.72
20 min		65.4	3300	2.8		0.325	53.57	0.8	256	42.86	0.203	34.56	57.51
30 min		88.5	2890	2.4		0.125	82.14	0.6	192	57.14	0.195	23.11	71.59

Experimental No: 113

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 113 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 67.1A /m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	79.1	5850	-	420	0.375	-	1.6	512	-	-	63.45	-
10 min		89.7	5390	4.3		0.25	33.33	1.2	384	25	0.232	42.61	32.84
20 min		92.1	4840	3.9		0.21	44	1.0	320	37.5	0.282	37.31	41.2
30 min		93.0	4710	3.5		0.115	69.33	0.8	256	50	0.285	29.27	53.87

Experimental No: 114

Date: 01/09/18and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 114 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 69.77 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	80.4	10290	-	420	0.425	-	1.2	384	-	-	52.09	-
10 min		89.9	10080	4.3		0.3	29.41	1.0	320	16.67	0.467	40.15	22.92
20 min		91.8	8770	3.3		0.21	50.59	0.8	256	33.33	0.358	37.03	28.91
30 min		92.4	8610	2.7		0.17	60	0.6	192	50	0.293	23.14	55.58

Experimental No: 115

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 115 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 64.6 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	10.1	4120	-	420	0.73	-	1.8	576	-	-	86.49	-
10 min		27.9	4030	3.9		0.38	47.95	1.4	448	22.22	0.212	42.46	50.91
20 min		51.4	3790	3.5		0.225	69.18	1.0	320	44.44	0.19	28.34	67.23
30 min		72.5	3610	3.1		0.2	72.6	0.6	192	66.67	0.168	18.54	78.56

Experimental No: 116

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 116 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 67.1 A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	54.4	9560	-	420	0.61	-	1.4	448	-	-	71.49	-
10 min		68.6	9320	3.6		0.35	42.62	1.2	384	14.29	0.391	49.8	30.34
20 min		78.8	9070	3.2		0.175	71.31	1.0	320	28.57	0.347	30.75	56.99
30 min		86.7	8730	3.0		0.115	81.15	0.8	256	42.86	0.326	22.6	68.39

Experimental No: 117

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.0 cm and	Experimental No: 117 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 69.77A/m2 Width: 4.3 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	54.4	12380	-	420	0.78	-	1.2	384	-	-	78.67	-
10 min		76.8	12190	3.2		0.37	52.56	1.0	320	16.67	0.347	49.15	37.52
20 min		84.9	11840	2.9		0.215	72.44	0.8	256	33.33	0.315	37.17	52.75
30 min		89.8	11570	2.5		0.2	74.36	0.6	192	50	0.271	24.47	68.9

Experimental No: 118

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1gm/l pH: 3 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 118 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.4A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	11.8	5120	-	420	0.85	-	1.2	384	-	-	86.61	-
10 min		36.7	4610	3.1		0.27	68.24	1.0	320	16.67	0.448	48.12	44.44
20 min		68.0	4320	2.8		0.175	79.41	0.8	256	33.33	0.405	31.43	63.71
30 min		82.8	4190	2.5		0.105	87.65	0.6	192	50	0.361	22.12	74.46

Experimental No: 119

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 119 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 77.16A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	72.9	8580	-	420	0.55	-	1.4	448	-	-	67.92	-
10 min		84.8	7860	2.7		0.29	47.27	1.0	320	28.57	0.195	40.12	40.93
20 min		89.4	7690	2.5		0.19	65.45	0.8	256	42.86	0.241	23.14	65.93
30 min		91.2	7420	2.3		0.11	80	0.6	192	57.14	0.249	17.09	74.84

Experimental No: 120

Date: 01/09/18 and Day: Saturday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 120 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 80.13 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	78.6	15010	-	420	0.90	-	1.4	448	-	-	88.0	-
10 min		90.4	14270	2.5		0.55	38.89	1.2	384	14.29	0.361	42.81	51.35
20 min		91.8	13840	2.5		0.31	65.56	1.0	320	28.57	0.362	31.14	64.61
30 min		92.6	13320	2.5		0.115	87.22	0.8	256	42.86	0.361	23.51	73.28

Experimental No: 121

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 121 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.4 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	6.6	3730	-	420	0.65	-	1.8	576	-	-	79.16	-
10 min		33.2	3120	3.8		0.21	67.69	1.4	448	22.22	0.275	47.81	39.6
20 min		56.3	2840	3.5		0.12	81.54	1.2	384	33.33	0.338	29.71	62.47
30 min		77.5	2750	3.1		0.052	92.0	0.8	256	55.56	0.269	18.81	76.24

Experimental No: 122

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 122 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 77.16 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	78.9	5980	-	420	0.24	-	1.6	512	-	-	61.10	-
10 min		87.5	5510	3.5		0.18	25	1.4	448	12.5	0.506	44.53	27.12
20 min		90.1	5130	3.4		0.12	50	1.2	384	25	0.491	31.03	49.21
30 min		92.8	5040	3.3		0.06	75	0.8	256	50	0.358	22.46	63.24

Experimental No: 123

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 123 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 80.13 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	78.7	10020	-	420	0.40	-	1.6	512	-	-	57.41	-
10 min		86.9	9350	3.3		0.275	31.25	1.2	384	25	0.239	39.46	31.27
20 min		90.3	7450	3.1		0.20	50	0.8	256	50	0.224	27.89	51.42
30 min		91.4	7100	2.7		0.135	66.25	0.6	192	62.5	0.234	17.37	69.74

Experimental No: 124

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 124 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.4 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	7.1	4540	-	420	0.73	-	1.4	448	-	-	77.94	-
10 min		34.9	4420	4.4		0.41	43.84	1.2	384	14.29	0.640	56.46	27.56
20 min		58.4	4370	3.8		0.215	70.55	1.0	320	28.57	0.546	36.34	53.37
30 min		72.5	4210	3.4		0.20	72.6	0.8	256	42.86	0.492	21.93	71.86

Experimental No: 125

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 125 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 77.16 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	56.4	9640	-	420	0.68	-	1.2	384	-	-	64.35	-
10 min		75.6	9450	3.5		0.31	54.41	1.0	320	16.67	0.506	34.91	45.75
20 min		80.3	9370	3.2		0.26	61.76	0.8	256	33.33	0.463	28.57	55.6
30 min		86.7	9210	2.8		0.20	70.59	0.6	192	50	0.405	19.03	70.43

Experimental No: 126

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.2 cm and	Experimental No: 126 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 80.13 A/m2 Width: 4.8 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	54.4	12100	-	420	0.66	-	1.4	448	-	-	77.22	-
10 min		68.6	12010	3.2		0.285	56.82	1.2	384	14.29	0.463	48.47	37.23
20 min		77.6	11840	2.9		0.205	68.94	1.0	320	28.57	0.419	33.14	57.1
30 min		84.8	11430	2.4		0.130	80.3	0.8	256	42.86	0.347	21.4	72.29

Experimental No: 127

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 127 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 70.18 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	7.9	4990	-	420	0.80	-	1.4	448	-	-	84.61	-
10 min		34.9	4330	3.6		0.35	56.25	1.2	384	14.29	0.520	40.03	52.69
20 min		62.1	3610	3.2		0.13	83.75	1.0	320	28.57	0.463	26.71	68.43
30 min		84.5	3450	3.0		0.115	85.6	0.8	256	42.86	0.434	18.93	77.63

Experimental No: 128

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 128 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 72.73 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.3	7870	-	420	0.16	-	1.4	448	-	-	49.56	-
10 min		79.8	7730	3.6		0.07	56.25	1.0	320	28.57	0.260	34.13	31.13
20 min		86.9	7420	3.2		0.045	71.88	0.8	256	42.86	0.309	23.14	53.31
30 min		90.2	7310	3.1		0.025	84.38	0.6	192	57.14	0.336	17.48	64.73

Experimental No: 129

Date: 02/09/18 and Day: Sunday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 129 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 75.47 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.0	13730	-	420	0.25	-	1.4	448	-	-	91.71	-
10 min		84.7	13060	2.9		0.19	24	1.0	320	28.57	0.210	55.14	39.88
20 min		89.6	12810	2.6		0.115	54	0.8	256	42.86	0.250	37.50	59.11
30 min		90.8	12470	2.3		0.071	71.6	0.6	192	57.14	0.250	24.0	73.83

Experimental No: 130

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 130 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 70.18 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	7.8	2250	-	420	0.85	-	1.2	384	-	-	94.0	-
10 min		33.4	2170	3.9		0.525	38.24	1.0	320	16.67	0.564	47.34	49.64
20 min		65.1	2100	3.6		0.21	75.29	0.8	256	33.33	0.521	33.49	64.37
30 min		72.6	1920	3.2		0.14	83.54	0.6	192	50	0.463	21.1	77.55

Experimental No: 131

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 131 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 72.73 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	74.1	5950	-	420	0.23	-	1.4	448	-	-	68.41	-
10 min		79.8	5420	3.6		0.205	10.87	1.0	320	28.57	0.260	44.63	34.76
20 min		84.5	4910	3.1		0.135	41.3	0.8	256	42.86	0.299	33.96	50.36
30 min		89.8	4320	2.8		0.1	56.52	0.6	192	57.14	0.310	24.8	63.75

Experimental No: 132

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 132 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 75.47 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	66.2	10010	-	420	1.10	-	1.4	448	-	-	89.46	-
10 min		86.9	9490	3.6		0.61	44.54	1.0	320	28.57	0.260	39.48	55.87
20 min		90.2	9460	3.3		0.17	84.55	0.8	256	42.86	0.318	23.01	74.28
30 min		91.4	9280	3.0		0.11	90	0.6	192	57.14	0.325	18.55	79.26

Experimental No: 133

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 3 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 133 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 70.18 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	16.1	4610	-	420	0.60	-	1.4	448	-	-	73.49	-
10 min		37.9	4580	3.1		0.275	54.17	1.0	320	28.57	0.224	52.64	28.37
20 min		61.4	4470	2.7		0.23	61.67	0.8	256	42.86	0.260	38.43	47.71
30 min		75.5	4420	2.4		0.175	70.83	0.6	192	57.14	0.261	24.39	66.81

Experimental No: 134

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 3 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 134 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 72.73 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	59.4	9460	-	420	0.90	-	1.6	512	-	-	61.94	-
10 min		78.6	7690	4.1		0.22	75.56	1.2	448	12.5	0.592	38.19	38.34
20 min		83.2	7430	3.7		0.09	90	1.0	320	37.5	0.357	30.03	51.52
30 min		86.7	7210	3.5		0.07	92.22	0.6	192	62.5	0.304	22.75	63.27

Experimental No: 135

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 3 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 135 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 75.47 A/m2 Width: 5.0 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	3	52.4	12180	-	420	0.85	-	1.4	448	-	-	76.78	-
10 min		77.6	12020	4.3		0.275	67.65	1.0	320	28.57	0.311	51.49	32.94
20 min		84.9	11720	3.4		0.115	86.47	0.8	256	42.86	0.328	38.22	50.22
30 min		89.8	11330	3.2		0.09	89.41	0.6	192	57.14	0.347	26.17	65.92

Experimental No: 136

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 136 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 49.73 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	6.1	3460	-	420	1.10	-	1.6	512	-	-	139.1	-
10 min		34.8	3330	3.7		0.55	50	1.4	448	12.5	0.401	72.8	47.66
20 min		58.1	3290	3.4		0.42	61.82	1.2	384	25	0.369	48.1	65.42
30 min		74.9	3200	3.3		0.21	80.91	1.0	320	37.5	0.358	31.4	77.42

Experimental No: 137

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 137 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 51.51 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	66.8	8100	-	420	0.860	-	1.4	448	-	-	112.9	-
10 min		76.9	7650	3.1		0.31	63.95	1.2	384	14.29	0.336	51.4	54.47
20 min		88.6	7450	2.7		0.135	84.3	1.0	320	28.57	0.293	39.8	64.75
30 min		90.4	7320	2.4		0.12	86.05	0.6	192	57.14	0.195	24.9	77.95

Experimental No: 138

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 138 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.42 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	68.9	13400	-	420	0.910	-	1.4	448	-	-	91.4	-
10 min		74.6	13340	3.1		0.45	50.55	1.2	384	14.29	0.336	43.3	52.63
20 min		86.8	13290	2.6		0.30	67.03	1.0	320	28.57	0.282	28.4	68.93
30 min		90.2	13170	2.4		0.15	83.52	0.8	256	42.86	0.260	20.8	77.24

Experimental No: 139

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 139 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 49.73A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	5.1	2410	-	420	0.890	-	1.2	384	-	-	115.4	-
10 min		34.3	2350	4.1		0.35	60.67	1.0	320	16.67	0.445	78.6	31.89
20 min		56.4	2210	3.7		0.16	82.02	0.8	256	33.33	0.402	41.7	63.86
30 min		72.8	2140	3.3		0.11	87.64	0.4	128	66.67	0.269	28.6	75.22

Experimental No: 140

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 140 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 51.51 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	66.8	6130	-	420	0.450	-	1.4	448	-	-	89.7	-
10 min		72.4	5940	3.0		0.225	50	1.2	384	14.29	0.325	49.2	45.15
20 min		78.8	5860	2.7		0.20	55.56	1.0	320	28.57	0.293	29.4	67.22
30 min		87.1	5630	2.4		0.13	71.11	0.6	192	57.14	0.195	18.8	79.04

Experimental No: 141

Date: 03/09/18 and Day: Monday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 141 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 53.42 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	72.4	9550	-	420	0.920	-	1.6	512	-	-	114.6	-
10 min		78.9	9410	2.9		0.41	55.43	1.2	384	25	0.157	45.1	60.65
20 min		84.8	9330	2.7		0.215	76.63	0.8	256	50	0.146	37.8	67.02
30 min		90.1	9240	2.4		0.14	84.78	0.6	192	62.5	0.156	29.4	74.35

Experimental No: 142

Date: 04/09/18 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 142 System: Batch In Between Electrode distance: 1.5cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 49.73 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	6.1	3970	-	420	0.760	-	1.6	512	-	-	118.3	-
10 min		37.6	3800	3.8		0.42	44.74	1.2	384	25	0.206	52.6	55.54
20 min		60.4	3620	3.5		0.26	65.79	1.0	320	37.5	0.253	38.7	67.29
30 min		73.4	3510	3.2		0.135	82.24	0.8	256	50	0.261	24.6	79.21

Experimental No: 143

Date: 04/09/18 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 143 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 51.51 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	57.1	8910	-	420	0.920	-	1.4	448	-	-	116.9	-
10 min		68.4	8830	3.3		0.47	48.91	1.2	384	14.29	0.358	64.6	44.74
20 min		78.6	8670	3.1		0.275	70.11	1.0	320	28.57	0.337	43.8	62.53
30 min		80.8	8320	2.8		0.20	78.26	0.6	192	57.14	0.228	29.4	74.85

Experimental No: 144

Date: 04/09/18 and Day: Tuesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 144 System: Batch In Between Electrode distance: 1.5 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 54.42 A/m2 Width: 5.2 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	68.4	13610	-	420	0.610	-	1.2	384	-	-	115.4	-
10 min		84.8	13500	3.7		0.36	40.98	1.0	320	16.67	0.402	39.1	66.12
20 min		89.6	13340	3.4		0.225	63.11	0.8	256	33.33	0.369	28.3	75.48
30 min		90.8	13230	3.1		0.145	76.23	0.6	192	50	0.336	20.8	81.98

Experimental No: 145

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 145 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 50.71 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	6.1	3440	-	420	1.10	-	1.4	448	-	-	148.4	-
10 min		34.9	3320	3.5		0.72	34.55	1.2	384	14.29	0.380	67.5	54.51
20 min		56.1	3270	3.2		0.47	57.27	1.0	320	28.57	0.347	38.6	73.99
30 min		82.4	3190	2.9		0.351	68.09	0.8	256	42.86	0.315	24.1	83.76

Experimental No: 146

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 146 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 52.52 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	61.8	7310	-	420	0.670	-	1.6	512	-	-	132.4	-
10 min		70.9	7170	3.1		0.215	67.91	1.4	448	12.5	0.336	66.1	50.08
20 min		86.8	7100	2.8		0.20	70.15	1.0	320	37.5	0.203	38.2	71.15
30 min		89.1	7030	2.4		0.13	80.6	0.8	256	50	0.195	26.4	80.06

Experimental No: 147

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 147 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 54.47 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	66.3	13400	-	420	1.10	-	1.4	448	-	-	115.2	-
10 min		76.4	13310	3.2		0.62	43.64	1.2	384	14.29	0.347	57.8	49.83
20 min		86.8	13220	2.8		0.45	59.1	1.0	320	28.57	0.304	39.2	65.97
30 min		90.2	13110	2.4		0.21	80.1	0.6	192	57.14	0.195	27.7	75.95

Experimental No: 148

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 148 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 50.71 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	6.1	2410	-	420	1.10	-	1.2	384	-	-	129.0	-
10 min		36.2	2370	4.1		0.44	63.64	1.0	320	16.67	0.445	57.5	55.43
20 min		58.7	2250	3.7		0.325	70.45	0.8	256	33.33	0.402	45.3	64.88
30 min		79.8	2200	3.4		0.23	79.1	0.6	192	50	0.368	22.4	82.64

Experimental No: 149

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l PH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 149 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 52.52 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	62.4	5140	-	420	0.450	-	1.6	512	-	-	81.9	-
10 min		77.8	4910	3.5		0.325	27.78	1.2	384	25	0.189	43.21	47.24
20 min		86.9	4750	3.2		0.205	54.44	1.0	320	37.5	0.231	30.08	63.27
30 min		90.4	4560	3.0		0.16	64.44	0.8	256	50	0.244	21.32	73.97

Experimental No: 150

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 150 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 54.45 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	68.3	9610	-	420	0.430	-	1.4	448	-	-	92.8	-
10 min		76.8	9440	2.7		0.224	47.91	1.2	384	14.29	0.292	43.7	52.91
20 min		81.2	9270	2.4		0.135	68.6	1.0	320	28.57	0.260	29.4	68.32
30 min		88.9	9180	2.1		0.110	74.42	0.8	256	42.86	0.227	19.1	79.42

Experimental No: 151

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.8 cm and	Experimental No: 151 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 50.71 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	7.8	2960	-	420	0.740	-	1.6	512	-	-	136.9	-
10 min		31.5	2820	3.7		0.45	39.19	1.4	448	12.5	0.402	67.4	50.77
20 min		54.2	2600	3.3		0.275	62.84	1.0	320	37.5	0.239	32.8	76.04
30 min		66.8	2440	2.9		0.20	72.97	0.8	256	50	0.235	24.01	82.46

Experimental No: 152

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.6 cm and	Experimental No: 152 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15A Current density: 52.52A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	58.4	6940	-	420	0.770	-	1.4	448	-	-	97.3	-
10 min		67.5	6780	3.4		0.37	51.95	1.2	384	14.29	0.369	62.6	35.66
20 min		78.5	6620	3.1		0.245	68.18	1.0	320	28.57	0.337	32.5	66.59
30 min		87.7	6370	2.8		0.20	74.03	0.6	192	57.14	0.228	21.0	78.42

Experimental No: 153

Date: 05/09/18 and Day: Wednesday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.4 cm and	Experimental No: 153 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.15 A Current density: 54.47 A/m2 Width: 5.1 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	62.1	12960	-	420	0.545	-	1.2	384	-	-	84.19	-
10 min		75.7	12840	3.8		0.225	58.72	1.0	320	16.67	0.413	48.17	42.78
20 min		86.8	12620	3.4		0.20	63.3	0.8	256	33.33	0.369	34.12	63.3
30 min		90.2	12430	3.2		0.115	78.89	0.6	192	50	0.347	23.0	78.89

Experimental No: 154

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 154 System: Batch In Between Electrode distance:2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.61 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	6	3470	-	420	0.950	-	1.4	448	-	-	110.0	-
10 min		35.9	3210	4.1		0.48	49.47	1.2	384	14.29	0.593	64.8	41.1
20 min		57.1	3140	3.7		0.275	71.1	1.0	320	28.57	0.535	48.4	56
30 min		78.8	3100	3.4		0.21	77.89	0.6	192	57.14	0.369	32.1	70.82

Experimental No: 155

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 155 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.21 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	58.8	7720	-	420	0.816	-	1.4	448	-	-	91.3	-
10 min		66.4	7530	4.2		0.41	49.75	1.2	384	14.29	0.608	46.7	48.85
20 min		72.8	7350	4.0		0.23	71.81	1.0	320	28.57	0.579	33.8	62.98
30 min		86.9	7200	3.8		0.145	82.23	0.8	256	42.86	0.549	21.2	76.78

Experimental No: 156

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 156 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 77 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	64.4	13400	-	420	1.05	-	1.2	384	-	-	127.2	-
10 min		77.8	13270	3.2		0.43	59.05	1.0	320	16.67	0.463	66.8	47.48
20 min		86.8	13080	2.9		0.31	70.48	0.8	256	33.33	0.420	43.1	66.12
30 min		90.8	12810	2.6		0.215	79.52	0.6	192	50	0.376	28.4	77.67

Experimental No: 157

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 157 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.61 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	5.1	2390	-	420	1.15	-	1.8	576	-	-	154.6	-
10 min		33.6	2210	4.2		0.445	61.3	1.4	448	22.22	0.304	75.5	51.16
20 min		52.4	2140	3.4		0.235	79.57	1.0	320	44.44	0.246	35.5	77.04
30 min		68.9	2090	3.0		0.18	84.35	0.6	192	66.67	0.217	21.6	86.03

Experimental No: 158

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.5 cm and	Experimental No: 158 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.21 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	52.8	5210	-	420	0.725	-	1.4	448	-	-	96.2	-
10 min		64.6	5130	3.1		0.35	51.72	1.2	384	14.29	0.448	42.9	55.41
20 min		78.4	4870	2.8		0.215	70.34	0.8	256	42.86	0.27	39.70	58.73
30 min		86.6	4640	2.5		0.135	81.38	0.6	192	57.14	0.271	27.04	71.89

Experimental No: 159

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Calcium chloride Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.3 cm and	Experimental No: 159 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 77 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	54.6	9460	-	420	0.465	-	1.4	448	-	-	89.4	-
10 min		66.8	9310	2.7		0.41	11.83	1.2	384	14.29	0.391	51.42	42.48
20 min		80.1	9170	2.4		0.325	30.11	1.0	320	28.57	0.347	38.91	56.48
30 min		88.9	9080	2.1		0.24	48.39	0.6	192	57.14	0.228	24.1	73.04

Experimental No: 160

Date: 06/09/18/ and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 1 gm/l pH: 6 Reaction time: 30 minute Depth: 5.7 cm and	Experimental No: 160 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 71.61 A/m2 Width: 4.9 cm

Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	10.7	2980	-	420	0.940	-	1.6	512	-	-	176.4	-
10 min		34.6	2710	4.4		0.61	35.11	1.4	448	12.5	0.636	64.7	63.32
20 min		52.8	2570	3.9		0.365	61.17	1.0	320	37.5	0.376	36.92	79.1
30 min		64.6	2420	3.5		0.30	68.10	0.8	256	50	0.380	22.3	87.36

Experimental No: 161

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 2 gm/l pH: 6 Reaction time: 30 minute Depth: 5.5 cm and								Experimental No: 161 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2A Current density: 74.21 A/m2 Width: 4.9 cm					
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	54.8	6980	–	420	0.625	–	1.2	384	–	–	93.34	–
10 min		68.9	6710	3.7		0.325	48	1.0	320	16.67	0.536	49.6	46.86
20 min		78.6	6500	3.3		0.255	64	0.8	256	33.33	0.477	32.7	64.97
30 min		86.9	6340	2.9		0.20	68	0.4	128	66.67	0.314	21.8	76.64

Experimental No: 162

Date: 06/09/18 and Day: Thursday Electrode material: Anode and Cathode: Stainless steel Effect of operating parameter: Sodium carbonate Effluent concentration: 3 gm/l pH: 6 Reaction time: 30 minute Depth: 5.3 cm and								Experimental No: 162 System: Batch In Between Electrode distance: 2 cm Mode of Electrode connection: Parallel Current Ampere: 0.2 A Current density: 77 A/m2 Width: 4.9 cm					
Treatment interval	pH	Temp. (°C)	Electrical conductivity	Cell voltage	Color removal			COD removal			Power consumption	Turbidity (NTU)	
Time				Volts	Wave L(nm)	Absorbance	% color	FAS (ml)	COD (PPm)	% COD	kW hr/m^3	Turbidity	% tur.
0 min	6	62.8	12960	–	420	0.465	–	1.4	448	–	–	78.59	–
10 min		74.9	12830	3.8		0.410	11.83	1.2	384	14.29	0.550	39.72	49.46
20 min		86.8	12610	3.5		0.27	41.94	1.0	320	28.57	0.506	27.32	62.24
30 min		90.8	12410	3.2		0.225	51.61	0.8	256	42.86	0.463	19.21	75.56

Appendix S: Some of the pictures taken in laboratory during the activity in the laboratory


WTW
6.563
42.7 °C
F1
F2
CAL
AR
STO
RCL
ENTER


SPectrophotometer


HOT
DO NOT TOUCH
CALIENTE
NO TOCAR
CHAUD
HACH
COD REACTOR
HEATING
POWER
TIMER
MIN
150°C
ADJ


ANDELI