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USE OF OZONE TO REMOVE REACTIVE COLORS

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ABSTRACT

Colored wastewaters are the main problem of industrial wastewater which contains a complex structure and properties of substances are toxic, carcinogenic, mutagenic and non-biodegradability. Ozone and ozone combined with UV oxidation processes in new ways that are used to treat industrial wastewater. In this process, and one of the many factors influencing them, is PH. In the textile coloring process, the volume of water consumed. Since the consolidation of paint on fabric is not never completed, the industrial wastewater contains a lot of color. The presence of suspended solids, COD and pH swing is also the other characteristics of this type of wastewaters (1). Discharge wastewater into the environment that leads to visual pollution, Eutrophication and loss of balance aquatic life. In addition to the chemical structure of the colors, chemical and biological treatment methods usually are not able to purify them. Increasing concerns about wastewater and international environmental standards, led to the development of new methods for the treatment of colors and convert them into harmless substances found. As a result, the aim of this study is the use of ozone in the removal of reactive colors.

Keywords: Reactive colors, ozone, remove reactive colors.

INTRODUCTION

Reactive colors with azo structure that has the color of nitrogen double bond, such as colors are widely used in the textile industry

(1). Due to the low toxicity and degradation of these colors are, in hazardous materials before discharge to the environment are to be

treated azo colors are resistant to biological degradation under aerobic and anaerobic conditions led their treatment to produce cyclic compounds, which may be more toxic than color molecules (2). The physico-chemical treatment methods, such as coagulation and flocculation, adsorption and membrane filtration has some disadvantages such as sludge production, are required to reproduce and shock absorbent membrane and the other hand, research shows that organic pollutants such as colors, after using a chemical oxidation method suitable, are biodegradable. Ozone is able to produce phenolic compounds and other compounds destroy taste in drinking water. Odor and taste in water resources from pollution naturally occurring human organic material. The bacteria with drug use, especially in surface waters are causing taste and odor. Use chlorine for disinfection creates chlorophenol compounds with odor and taste is very high. Most odor-causing compounds by ozone treatment of sulfur compounds such as hydrogen sulfide lost some, mercaptans or organic sulfides to sulfates can by ozone, oxidized. Advanced oxidation processes in aqueous and non-aqueous chemical processes for the treatment and elimination of compounds and pollutants in industrial wastewater are used. The process uses a large

amount of oxidizing agent is used, for this reason, these methods are costly method (6-3).

Biochemical properties of ozone

The role of ozone in water purification and wastewater treatment as an oxidizing agent and a combination microbicide is important and in the aquatic environment has similar characteristics with chlorine. So the two complement each other as rivals and in some cases are considered. Ozone has two properties are very important in relation to its surroundings (7).

High disinfection power

Germicidal properties of ozone is revealed the high potential oxidation. Research shows that ozone disinfection is achieved by a direct effect on bacteria and break down the cell wall of bacteria. In this respect, the mechanism of action that is different from chlorine disinfection process. Due to the high power of ozone disinfection compared with chlorine (25 times) and other disinfectants, less time is needed to complete the disinfection process. Evaluation is also the ability to destroy viruses more ozone than chlorine (8).

Ozone as a powerful oxidizing

Ozone has many uses in the treatment of drinking water, such as taste and odor control, color control and removal of iron

and manganese in addition to disinfection. Clarify the oxidizing power of poor quality water sources such as recycled water is important. Ozone mineral products completely oxidize and cause sedimentation and delete them. The major importance of breaking down organic compounds and ozone in the iron and manganese. Removing organic compounds, ozone generator, color, shows strong and effective as well as a polishing agent for wastewater and drinking water paint removal work is a great range of applications. Ozone can also destroy the phenolic compounds and other taste-generating substances in drinking water. Research has shown that pesticides malathion and parathion ozone can turn that dangerous substances are carcinogenic and phosphoric acid (safe). Recently, the use of ozone to control and remove turbidity and organic matter in the guidelines proposed EPA regulations (9,10). The aim of advanced oxidation processes, the conversion of waste to mineral or semi-oxidized into products which are nontoxic and removed by other methods such as biological methods can easily be treated. Advanced oxidation processes other than a strong oxidizing agent, an additional factor is used and based on advanced oxidation processes can be divided into several categories (11).

A- Advanced oxidation processes for these chemicals can be noted in the ozonation process, the combination of ozone and hydrogen peroxide.

B- Advanced oxidation processes of Fenton photocatalytic process of this group can be named and the combination of UV with titanium dioxide catalyst.

Advanced oxidation processes, photochemical processes such as ozonation combined with ultraviolet combination of hydrogen peroxide with ultraviolet rays is placed in this group. This is one of the most effective methods of oxidation. Ozone is a powerful oxidizing agent which is both molecular and radical oxidation process of the company. Ozone reduction potential compared to sieve hydrogen has activity against 70 volts (12). UV energy is proportional to its frequency and impact of pollutants and UV ozone molecules, causing direct disruption of the target molecule and break through the ozone accelerates the formation of hydroxyl radicals in the process thus becomes oxidation of the companies (13). Several factors have affected the oxidation process using the oxidation conditions can be increased and adjusted operating efficiency and oxidation efficiency. One of these factors, is PH. Tests and what

they have done in previous studies in this area, show that the regulation of PH in optimum conditions decreased by 40 oxidation and the oxidation process which is one of the major problems is its high cost, it is very important and is a great help to the economic justification process (16,17). In this study, PH effect on oxidation with ozone and ozone combined with ultraviolet radiation is used and by changing the PH solution using buffered solutions while other oxidation conditions are kept constant, the effect of PH in the color and COD removal solution is studied.

Use of ozone in the industry

Ozone is a highly flexible disinfectants and disinfection many applications in air, water, environment (cleaning of walls, floors and surfaces with water containing active oxygen), work clothes and various accessories. Active oxygen or ozone, unlike traditional disinfectants such as chlorine, formaldehyde, methyl bromide and other chemicals, no toxins or harmful oxidation during the procedure does not standing. Air disinfection with active oxygen continuously during work done without emptying position and thus regularly reduce the amount of pollution in the environment (21). In the last century the number of applications increased ozone so that ozone initial applications in

areas such as drinking water treatment, wastewater treatment, purification of bottled water, odor control and medical applications, now called the classical applications of ozone. However, many applications today that can be named for ozone raised them as non-classical applications, especially those applications were considered by the beginning of the new century (22). Ozone applications in various aspects of agriculture and food industry is one of the very new and very active ozone. The project will study the applications of ozone in the fields of agriculture and food industry, especially in terms of the feasibility of using some of the new applications that can be used in the above mentioned sectors in the country were studied. Studies show that ozone as an alternative to pesticides and disinfectants commonly used in the fields of maintenance and storage of agricultural products, irrigation of crops, the destruction of pests and diseases of field, disinfection of food products, disinfection of food, water disinfection process equipment and processes food processing, packaging and storage of cold meat, fish preservation, disinfection of water used in the poultry industry. In each of the above areas, many other side benefits of ozone either as a gas or in solution were discussed (19-23). Water treatment system

using ozone has been welcomed hundreds of years ago in France, but in the United States after years of transmission of diseases by water (chlorine is ineffective on viruses) approved FDA has been and still is used as the most powerful disinfectant. The ozone applications in water treatment can be cited in 4 sections (28-25)

1. The water treatment that makes full sterile water to remove taste and odor and also items such as iron and manganese from water.
2. Disinfection and removal of organic matter in the water.
3. Details of ozone concluded that the removal of colloidal particles in a sand filter.
4. Remove the color and taste of the water. In this regard it can be pointed out to the private villas, apartment complexes and factories, mineral water and food and industrial plants.
5. Disinfection of treated wastewater
6. The use of ozone in the aeration tank for the conversion of COD to BOD and biodegradability of waste water, the better the sedimentation basin secondary sedimentation
7. Eliminate filamentous bacteria (filaments) that causes the disruption of sedimentation and Bulking

8. The elimination of Nocardia Which makes the Nocardia foam
9. Capacity by increasing the efficiency of the biological treatment plant
10. Reduce sludge production by half and less
11. Ability to remove all microorganisms without taking resistance to ozone
12. The water treatment cooling towers (without anti-fouling and anti-corrosion following reduction of water).

MATERIALS AND METHODS

For studies of the ozone production device "Ozomatic Lab802" laboratory is used. Ozone production rate of the device can be changed from 1 to 4 grams per hour. Supply pure oxygen and the ozone produced by passing an ozone analyzer) to measure the amount of ozone in the gas (and flow meter and Throttle Valve is ready to enter the wastewater treatment system. One problem with the use of ozone in wastewater treatment systems, how the ozone treatment system, is the low efficiency and researchers to improve the efficiency and effectiveness of the injection of different methods have been used [12,13]. In this study of a system to inject ozone into the liquid flow venturi are used, this method produced ozone enters into the liquid flow out of circulation pump.

The ultraviolet radiation from a steel cylinder with a length of 80 cm and a diameter of 7 cm was used. UV lamps were used inside the steel cylinder. Pressure mercury lamp of the type of light bulbs smell of the wavelength of the light, the lamp 254, and it is 30 watts, which is the color used in this study belongs to a species that textile paint means reactive colors. Reactive colors are widely used in the textile industry, and in 1993 about 32% of the cellulose fibers are dyed with these colors (14). Color used in this study is Reactive Brilliant Red is the color that is produced in China and its scientific name Reactive Red 120, Color Index. The colors for the dyeing of cellulosic fibers, wool, silk and nylon used in this study, three parameter consistency, color, COD and ozone concentration in the exhaust gas phase at PH 6, 8, 11 and 3 were used. Measurement of color in the wastewater during the process of oxidation of the solution, at defined intervals sampled and the concentration is measured by a spectrophotometer. For measuring COD, the volumetric method is used to digest the return package. Iodometry method for measuring the amount of ozone discharged from the reactor is used. This method is based on the interaction of potassium iodide and ozone.

FINDINGS

PH impact on colorless color Reactive red 120 using the process of oxidation with ozone concentration given color. From the figure it is seen that during the process of oxidation dye concentration decreases slowly and gradually. In addition, it is clear that in the first 10 minutes, independent of PH value and color reduction is the same for all solutions. Since the first minutes of oxidation, to react with the ozone molecules in color only in the present and competing for their reaction with ozone there is, regardless of the pH of the solution, the dye molecules easily with ozone and other factors such as hydroxyl radicals available to react and decompose into simpler substances. The impact of acid PH oxidation can be said that in response to its molecular shape and color molecule reacts with ozone molecules and the ozone concentration in the reaction rate has an important role to play in PH oxidation mechanism and radical hydroxyl radical follows is the main factor in determining the rate of reaction. Since the groups in the molecule main factor determining the direction and the type of reaction (radical and molecular) (15). And molecular structure of color Reactive red 120 is not available, so do not be commented with certainty in this case, however, according to the results we can say that the groups in the building of color are

more likely to participate in reactions within the bases and more radical reactions involved and quickly removed at pH ranges of more bases, but nevertheless, the color of the molecular reactions involved. The process of oxidation with ozone and UV radiation obtained the same results.

CONCLUSION

The optimum amount for any quantitative or qualitative response was entered in the software, at this stage, to color number 75 pt co for COD removal costs and maximum and minimum sludge index was chosen. For this purpose, the current density A / m² 110-33 / 311 Time min, 94-22 pH of 5 and low levels of ozone as the most optimal in terms of efficiency of removal of COD, delete 0, respectively. It is worth mentioning / color, sludge index and the cost was determined. The highest desirability of about 55 to increase the current density and time, the color and COD removal increased but costs also increased accordingly. Increased removal rate and current density decreased with increasing time, the costs per kg of pollutants removed increases, but to achieve the desirable level eliminates the need for the increase in these two variables. The optimal pH were obtained for color removal and sludge index, pH of 5. Increase the amount of ozone, a significant influence on color and

COD removal, but since it is expensive to produce ozone, a huge impact on economic aspects involved. In this study, the lowest level was considered as optimum. In this study, the final pH, electrode consumption and the amount of ozone output was determined experimentally and theoretically. It was observed that the pH during the process of change. The change in pH in the acidic environment more alkaline environment, and in fact the system at alkaline pH is somewhat buffered. Initial pH and the final pH reactions that occur on the surface of the cathode and anode; because increased density and time, the reaction at the cathode and the anode increases, the amount of hydroxyl ion production and increasing pH is also more intuitive. According to Faraday's law with increasing current density and time according to the material has a certain amount of iron ions is produced. The experimental results with the theory, but it did not match correlation coefficient between the two was 0.7422. The ozone output was relatively high and increasing ozone dose increased input. Reduce pollutants under different conditions, ozone output also increased, but the rate decreased with increasing pH and this is due to the increasing rate of ozone to hydroxyl radicals. According to the study, current density, time

and initial pH may have a significant effect on the process. It should be noted that when the metal ions and flukes are limited production, the impact is more significant parameters and flukes when enough is present in the environment, so it does not matter what the environmental conditions prevailing reaction

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