Recycling of Waste Water in Dying Industry Using Solar Energy


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Received: 15/01/2017, Revised: 18/02/2017 and Accepted: 28/03/2017

Abstract

Wastewater management is a process used to convert waste water into an effluent that can be either returned to the water cycle with minimal environmental issues or reused. Treatment means removing impurities from water being treated and some methods of treatment are applicable to both water and wastewater. Textile is a major source of income and of great importance for India's economy. At the same time textile processing has major environmental impact. A large proportion of the environmental issues are related to the use and discharge of the Water. Textile manufacturing is among the major industrial water users. To produce one kg of textile fabrication about 200 litres of water is used. In this project separate tanks are placed to improve water quality. Acid and Alkali is added based on the pH sensor reading in the given wastewater. Main pollution in waste water comes from dyeing and finishing process. Today 70% of available water in India is polluted and two by third of illness related to water bond diseases. Dyeing is performed by soft flow reactor process. Coloring of hosiery fabric takes place in the presence of high concentration of sodium chloride in dye solution. Wash water and dye bath waste water are the process effluents of dyeing industry which are collected separately and follow the advanced treatment for maximum recycling of recovered waters. Here motor is fixed to mix the water and added Acid or Alkali. Color sensor is used to identify the color of the mixed waste water with Alkali or Acid. Based on the PH sensor reading relay is activated through microcontroller. Finally, Sedimentation process will takes place for converting Impure water to the pure water. In this project microcontroller is used to activate the pumps and motor connected with it. This water management process gives better result in the impurity less water. To reduce cost and increase efficiency in this project we are using solar energy.

1. Introduction

At the beginning of the 21st century, the world faces a water quality crisis resulting from continuous population growth, urbanization, land use change, industrialization, food production practices, increased living standards and poor water use practices and wastewater management strategies. Wastewater management (or the lack thereof) has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of our life support systems, on which a wide range of sectors, from urban an integrated, full life cycle, eco-system-based management system that operates across all three dimensions of sustainable development to food production
and industry, depend. It is essential that wastewater management be considered as part of Development (social, economic and environmental), geographical borders, and includes both freshwater and marine waters (Corcoran et al. 2010). The World Water Forum meeting in March 2012 echoed the problems and the need to bring waste-water to the fore in world water politics. Worldwide waste-water treatment is failing as a result, the majority of wastewaters are dis-charged without any form of treatment into the environment. Spreading disease to humans and dam-aging key ecosystems such as coral reefs and fisheries. Dirty water is a key factor in the rise of de-oxygenated dead zones that have been emerging in the seas and oceans across the globe. This is becoming increasingly a global problem as urban populations are projected to nearly double in 40 years, from current 3.4 billion to over six billion people – but already most cities lack adequate wastewater management due to aging, absent or inadequate sewage infrastructure” (World Water Council, 2012).

2. Objectives

1. To design a real time wastewater management that is used to reduce the impurities in the wastewater and also gives good mixture of Acid and Alkali.
2. To reduce cost and increase life time we are going to design solar based wastewater management system.
3. To increase efficiency and speed microcontroller is used.

3. Properties of Dyeing Waste Water

Sample Collections: The effluent samples were collected from the Dying industry situated in Noyyal river, Tirupur, Tamil Nadu. The sample have been taken carefully in sampling bottles were previously cleaned by non-ionic detergent and kept at 4oC. Some of the physico-chemical parameters were determined at the sampling site while the other analysis which was carryout in laboratory had done within 24 hours after the collection of effluent. Following characteristics has been identified for the dyeing factory effluent. Wastewater generated: 200 to 600 cum/d, Colour: Pale white, pH: 9.29, Total dissolved solids: 10829 mg/l, Calcium: 42 mg/l, Sulphate: 291 mg/l, Chloride: 4760mg/l. The above characteristics of dyeing waste water are determined by physical and chemical laboratory tests. Thus, the pollution loads of the effluent vary depending on the nature of raw materials, chemicals used, at the time of rinsing cloths in dyes.

A sample of raw effluent from a Dyeing factory, in the Tirupur District of Tamil Nadu, was collected and analysed. The raw effluent was collected in a 10litre sterilized plastic can from the effluent disposal system of the sago unit. And the sample has been analysed for physical and chemical parameters using the standard methods lab.
4. Experimental Procedure

Treatment of Dyeing waste water

Figure shows the Flocculation Initially dyeing waste water treated by using fly ash. Fly Ash has been recognized as a highly effective Coagulant for the treatment of heavy metals in waste water. Fly Ash is a particularly good absorbent medium due to its absorbent in nature. This high absorbing capacity permits the accumulation of a large number of contaminant molecules. 50% of Fly ash added with Dyeing waste water by the weight of water. In this sample flocculate by using flocculator. After this process, the water sample was tested in laboratory. It gives a result of reducing of chlorides and sulphate contents. The properties of Sample water after treated with fly ash is,

Appearance: Clear
Colour: Colourless
Odour: None
Turbidity: 0
Total dissolve solids (mg/l): 848
Electrical Conductivity
Micro (mho/cm): 1211
pH: 7.62
pH, Alkalinity as CaCO3 mg/l: 0
Total Alkalinity as CaCO3 mg/l: 280
Total Hardness as CaCO3 mg/l: 380

5. Hardware Implementation

![Hardware Implementation Diagram]
Figure V consist of four tanks. Tank 1 contains the acid whereas tank 2 contains the alkali. The waste water of dyeing industry is fed to the tank 3. The acid and alkali level of waste water is checked in this tank and if the acid content of dyeing water is lower than the alkali content, particular quantity of acid solution from tank 1 is fed to tank 3. Thus, when the dyeing water leaves the tank 3 it becomes neutralized and is fed to tank 4. In tank 4, sedimentation process takes place. The suspended impurity present in the dyeing water is removed and recycling process takes place. The outlet water from the tank 4 is pure and free from impurities.

6. Processor Block Diagram
Figure IV shows the processor diagram of microcontroller which consist of 4 Relay, 3 pumps and DC motor. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The 3 Relays are connected to 3 pumps and the 4th relay is connected to the DC motor. The relay used to maintain the constant voltage.

The microcontroller is used for the control of the pumps and DC motor. PIC16F877A belongs to a class of 8-bit microcontrollers of RISC architecture. It has 8kb flash memory for storing a written program. Since memory made in FLASH technology can be programmed and cleared more than once, it makes this microcontroller suitable for device development.

The power supply given to the microcontroller from the solar panel. A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. LCD (Liquid Crystal Display) screen is an electronic display module. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. It is connected to the microcontroller for the purpose to display the values. An electric battery is a collection of one or more electrochemical cells in which stored chemical energy is converted into electrical energy. The principles of operation haven’t changed much since the time of Volta. Each cell consists of two half cells connected in series through an electrolytic solution.

7. Hardware Setup

Figure VII shows the hardware setup

Connection Description

1. 5vdc is connected to the controller unit and 12v dc is conned to the relay unit.
2. Temperature sensor is interfaced with the AN7 analog pin
3. PH sensor is interfaced with the AN6 analog pin
4. Conductivity sensor is interfaced with the AN5 analog pin
5. LCD is interfaced with port B
6. 4 relays are connected with RC0, RC1, RC2, RC3

**Hard wares interfaced with microcontroller are**
1. Sensor *Durability *Conductivity *pH level
2. Relay
3. AD620 IC
4. Regulator
5. LCD unit

**Design Setup To Achieve The Objectives**
Step1: Design and develop the 5V DC AND 12V DC power supply unit
Step2: Interface the LCD to the controller for monitoring purpose
Step3: Interface the analog sensors to in analog ports
Step4: Validating the analog values
Step5: Trigger the corresponding relay units

**Design Steps**
Step 1: The Regulator is fed with the solar power.
Step 2: The output DC voltage of 5v and 12v are obtained from Regulators L7905 & KA7812
Step 3: The PIC unit is fed with 5v and 12v supply is given to the mechanical unit
Step 4: Four relays are connected to the PIC
Step 5: Three relays are connected to the Pump1,2,3 respectively
Step 6: Fourth relay is connected to the stirrer
Step 7: Sensors for monitoring the Durability, pH level, conductivity are connected to the microcontroller
Step 8: Based on the readings of the above sensors signals from microcontroller is send to the relay
Step 9: If -5<pH<0, relay 1 closes the pump1 If 0<pH<5, relay 2 closes the pump2
Step 10: The above operation continues till the water in the tank3 is neutralized.

**8. Conclusion**

Today 70 % of available water in india is polluted and two by third of illness related to water bond diseases. A large proportion of the environmental issues are related to the use and discharge of the water from dying industry. The waters which came out from the dying industries are so harmful. Our water resources are limited and hence the recycling method is one of the alternative for getting the fresh water. Now-a-days various types of water purification process is present but here we use is the sedimentation process, colouring, salinity and the organic chemicals are removed. The primary focus of this project is to establish the waste water treatment in dying industry using solar energy. The renewable energy sources are used in this project to reduce the power consumption and increase the efficiency. At first it deals with the, pH level & conductivity & durability of the water is checked. By using the color sensor, the water color is displayed. After that, project deals with the sedimentation process & salinity of the water is removed & the water is reused in future. By using the solar panel power consumption is reduced.

**9. Future Scope**

The water scarcity is felt by all, industries are the first to be impacted as state governments/local bodies give priority to agricultural and residential usages. In many areas, it is easy for dying industries to get necessary approvals for power but this method reduces the power consumption. “Water availability is a huge challenge for everyone today in industry”. The energy will become more expensive in the future because
the nuclear plants must disappear before 2025. The government will probably rise the waste water treatment costs for the citizens. In dying industry, the waste water is recycled by this methodology needs only low cost from citizens so it is useful in future.

References