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EFFICIENT MONITORING AND AUTOMATIC CONTROL OF EFFLUENTS IN THE DYEING INDUSTRIES

S.Ranjitham[1], T.Sathya[2] , G.Boopathi Raja[3]

[1]Final Year ECE, Department of ECE,
Velalar College of Engineering and Technology, Erode, TN, (India)
[2,3] Assistant Professor, Department of ECE,
Velalar College of Engineering and Technology, Erode, TN, (India)

ABSTRACT

The textile and dyeing industries are providing opportunities for sustained economic development in a country and also they play a major role in Indian economy. Textile products are the basic human requirements next to food. Manufacture and use of synthetic dyes for fabric dyeing has therefore becomes a massive industry today. However their toxic nature has become a grave concern to environmentalists. People in the surrounding area of an industry are directly affected by the odor smell of chemical discharge. In this paper, we monitor and control the industrial effluents by connecting a solenoid valve to water outlet of the industry. The solenoid valve will open only if the TDS and pH value are matched with the standard value.

***Keywords* : dye , potential of Hydrogen, Total Dissolved Solids.**

I. INTRODUCTION

The ever increasing urbanization has severely impacted water quality in stream ecosystems globally, where the developing countries face a more serious threat, often due to lack of water resource proper management [1].Currently, in many different countries, surface water is monitored by permanent monitoring stations of public agencies which monitor the standard physio-chemical water quality parameters [2]. According to United Nations, in the developing countries, 90% of all sewage water goes into water untreated and 70% of industrial discharge is dumped untreated [3], [4].Color is the main attraction of any fabric. No matter how excellent its constitution, if unsuitably colored it is bound to be a failure as a commercial product. Fabric was earlier being dyed with natural dyes. Historical records of the use of natural dyes extracted from vegetables, fruits, flowers, certain insects and fish dating back to 3500BC have been found. These however gave a limited and dull range of colors. Therefore synthetic dyes were discovered by W. H. Perkins in 1856 has provided a wide range of dyes that are color fast and come in a wider range and brighter shades. However, it is toxic to nature [5].

II. PROBLEM IDENTIFICATION:

The textile industry consumes a substantial amount of water in its manufacturing processes used mainly in the dyeing and finishing operations of the plants. The waste water from textile plants is classified as the most polluting of all the industrial sectors.

The greatest environmental concern with dyes is their absorption and reflection of sunlight entering the water. Light absorption diminishes photosynthetic activity and seriously influences the food chain. Textile dyes can cause allergies such as contact dermatitis and respiratory diseases, allergic reaction in eyes and skin irritation. The presence of very small amounts of dyes in the water, which are nevertheless highly visible, seriously affects the quality and transparency of water bodies such as lakes, rivers, which damages the aquatic environment. This improperly treated industrial water also polluted groundwater quality.

The parameters of water to be checked for pollution:

1) pH
2) Total dissolved solids(TDS)
3) Dissolved oxygen(DO)

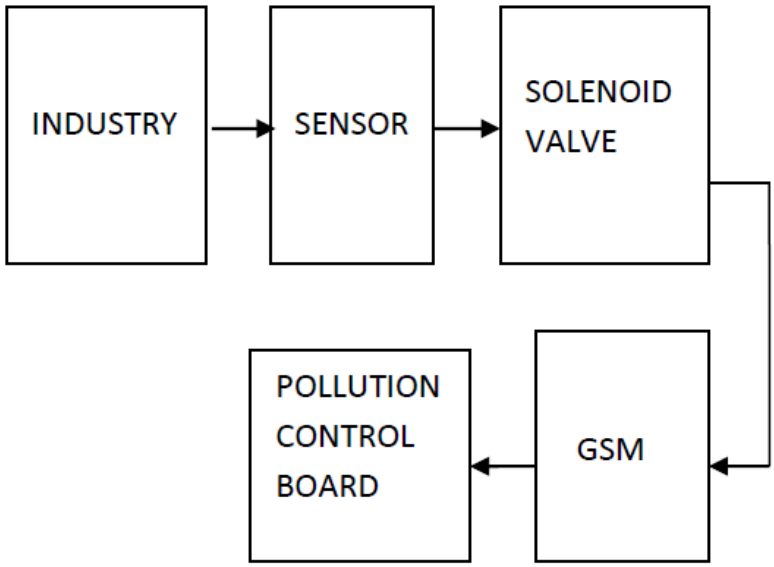

Figure 1. An overview of monitoring and control of effluents

III. PROPOSED METHOD

In this paper, pH sensor, TDS sensor, gas sensor is connected with Arduino UNO R3 and a solenoid valve is connected with water outlet of the industry. Standard acceptable pH and TDS values are announced by the government.

If it exceeds, then the solenoid valve connected with the water outlet will stop the water flow. In this paper, three parameters were measured to check water quality. They are,

(a) pH value
(b) TDS value

(c) Gas leakage

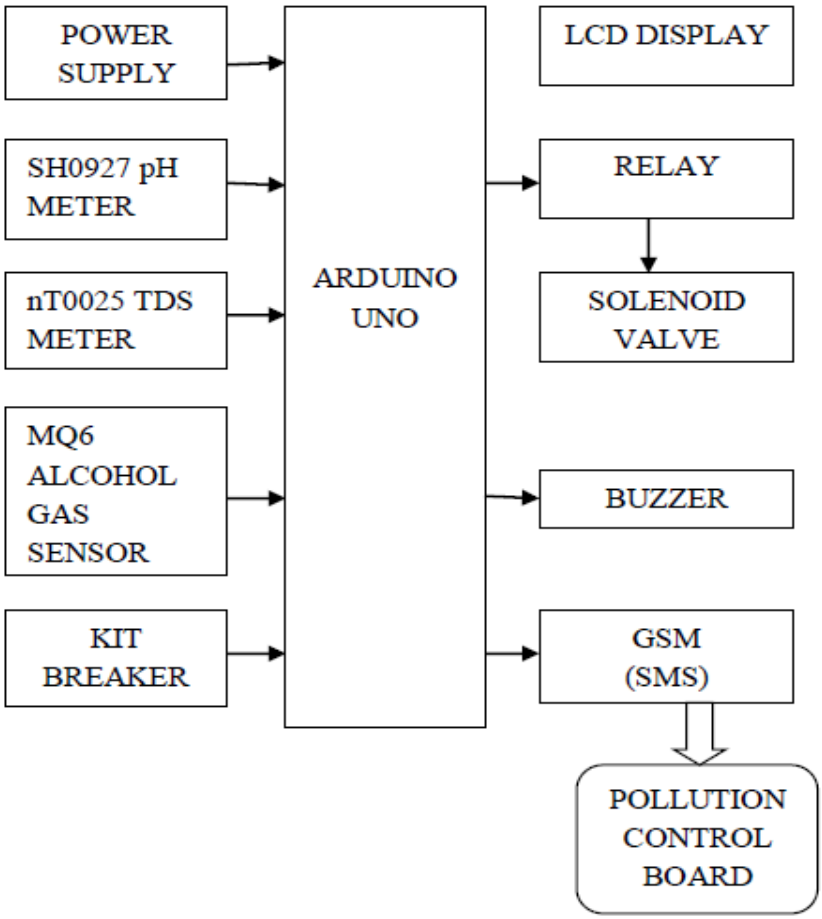

Figure 2. Block diagram

IV. HARDWARE DESCRIPTION

1. MEASURING pH VALUE:

pH is the measure of H+ ions concentration; its value indicates the nature of water, neutral, acidic or alkaline. The maximum permissible limit of pH is 6.5-9.2. If the pH of water is too high or too low, the aquatic organisms living within it will die. Here we use SH-0927 pH meter.

2. MEASURING TDS VALUE:

All natural water contains minerals and dissolved substances. These minerals in water can be generally measured as total dissolved solids. TDS comprises naturally minerals mostly inorganic salts like (Calcium, Magnesium, Chlorides, Potassium, Sodium, Sulphate etc.).

TDS also include contaminants such as heavy metals, but usually at low concentration. The range is between 300 – 500 is acceptable but more than that is not fair. Measurement range: 0-9990 ppm .here we use nT-0025 TDS meter.

Cadmium	0.003
Chromium	0.05
Fluoride	1.5
Mercury	0.001
Chloride	600
Sulphate	400
Hardness as CaCO3	500
Aluminum	0.2
Copper	1.5
Iron	1.0
Zinc	15.0
Arsenic	0.01
Nickel	0.02
Sodium	200

Table1. Maximum permissible limit in ppm

3 .MEASURING GAS SENSOR*:*

There is an extensive use of bleaching chemicals, in the production of textiles from raw materials. Toxic bleaching chemicals create a risk to personal and the environment. Hence it is need to fix gas sensor to mitigate risks. Here we use MQ6 alcohol gas sensor.

Figure 3. a) pH meter b) TDS meter c) Gas sensor

V. CASE STUDY

pH levels can fluctuate daily due to photosynthesis and respiration in the water. Figure4.shows the analysis of RO water, distilled water and tap water.

It shows RO water is slightly alkaline, distilled water nearly alkaline and tap water has highest pH value of 8.23. So it is considered as basic and it has high TDS value which is harmful to drink.

Figure4. Analysis of water quality

Figure5.shows the analysis of industrial water. We took untreated industrial water of two dyeing industries and a weaving industry. The increase in TDS value increases its harmful effect. We used TDS meter which measures TDS value up to 2000ppm .As TDS value of dyeing industry 1 crossed the measurement limitation of the TDS meter, it shows value '1' in the display.

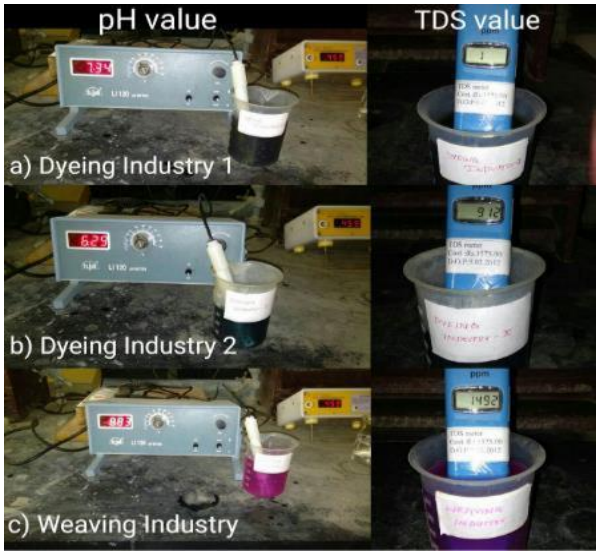

Figure5. Analysis of industrial water quality

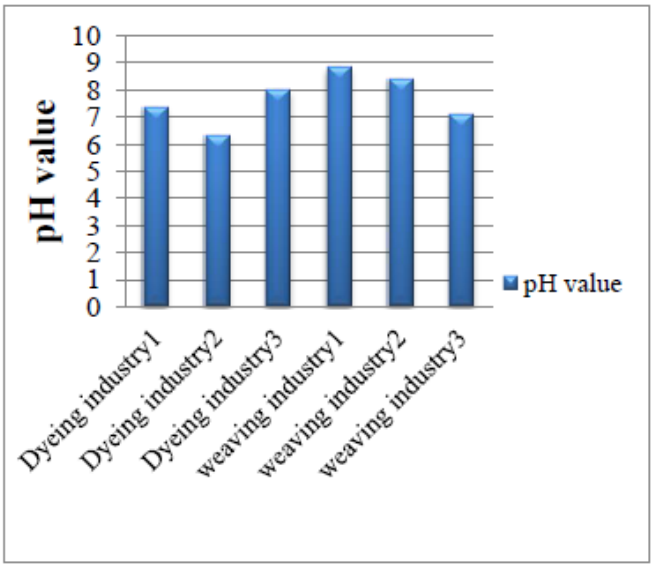

Figure6. Analysis of industrial water with pH value

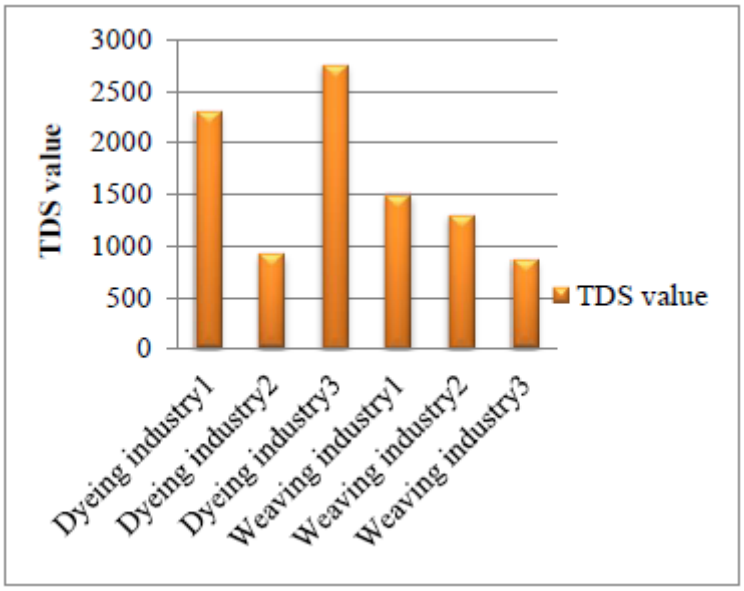

Figure7.Analysis of industrial water with TDS value

VI.CONCLUSION

With newer varieties of modern textiles, clothes are entered into market after polluting water and air. The problem of undesirable effects of a large number of chemicals and dye stuffs used in textile industry is indeed grave as their effects in the environment and on public do not show immediately. So in this paper, we pretented an approach to control effluents from dyeing industry after monitoring its nature based on pH value and TDS value. In future, solenoid valve will be controlled based on other quality parameters like COD (Chemical oxygen Demand) and BOD (Biochemical Oxygen Demand) also.

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