

Removal of High Density Particle in Pulp to Wet Lap Machine using Arduino

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Abstract:- Nowadays, Water Scarcity is the main problem facing in paper making industry. It can be reduced by reusing and recycling. In this project, the centrifugal cleaners have been used widely in the pulp and Paper Industry as a means of removing small contaminants. Initially they are used to remove only high dense particles but with the introduction of "Reverse Cleaners" low density particles can also be removed. Even though it had wide range real time application it is not fully implemented in automation. Manual labors are required to maintain the valves. Turbidity sensor is used to determine the suspended solid particles in water and identifies the purity level. Thus it helps to improve the efficiency and reduce the manual labours. Arduino is used to develop, design and test electronic prototypes and products as it is the open source electronic platform. Arduino makes the electronic circuits more accessible and helps in creating interactive objects and environments.

1. INTRODUCTION

Along with the increasing use of water in the paper making industry, the quality of water needs to be considered, especially for both human and industrial consumption. Water quality is determined based on the value of turbidity present in the water. Turbidity is one of the parameters in determining water quality. It is caused by organic and inorganic particles that are suspended in the water. This project develops an arduino UNO based turbidity detecting system which is aimed to measure water turbidity levels. The turbidity sensor consists of photodiode and infrared LED. This sensor detects the intensity of light passing through the scattering of particles and the result of analog signals voltage. Arduino motherboard Arduino is an open source electronics platform accompanied with a hardware and software to design, develop and test complex electronics prototypes and products. The microcontroller with other electronic components is used as a hardware and the software is used to program the codes. The Arduino program is very simple and easy for the compilation of the electronic programs in embedded C language. Relay is used as switch for opening and closing of the motors. The measurements results of the turbidity sensor is in the form of ADC values converted to units of NTU (Nephelometric Turbidity Units) and is shown on LCD display(16*2)

2. OBJECTIVE

To detect the suspended particles in water and outlet the suspended water in the paper making process

- ✓ If the suspended particles are pure, then the motor will function for the pure water to outlet it.
- ✓ To reuse the detected pure water for the next step process in the pulp wet lap industry.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

In our existing system, the particles such as pulp, wood, stones and sands, plastics, small contaminants of papers, sugarcane residues are combined and mixed together. It is then injected to the tank. It will separate the floating particles and plastics. And the remaining particles is sent to the destoner. It is the initial step of the separating process. In the destoner, the stones and high density particles such as sand, stones are separated by using centrifugal force. It is then sent to the primary stage. In the primary centrifugal cleaners, the high density particles are removed like, large stones, sand, metal particles. Then in secondary stage small stones are removed. At last in last stage territory stage small minute particles are removed. In all this process lot of water is wasted for each process.

3.1.1 DRAWBACKS

1. Time is considered more for the three step processes.
2. The cost requirement of this project will be more.
3. Water will be wasted and cannot be reused for any other purposes because of the cloudiness present in the water.

3.2 PROPOSED SYSTEM

Our proposed system uses the turbidity sensor and its concepts for the water purity detecting purpose. The turbidity level is fixed as 300 NTU for high purity and 700 NTU (Nephelometric Turbidity Unit) for low purity level. By using motor pump, the water will be supplied inside the primary process or it gets outlet. Here the two motors are used. If the level of turbidity is low, the first motor will get activated and water is sent to the primary process. If the turbidity is high, then the water will be outlet.

4. BLOCK DIAGRAM

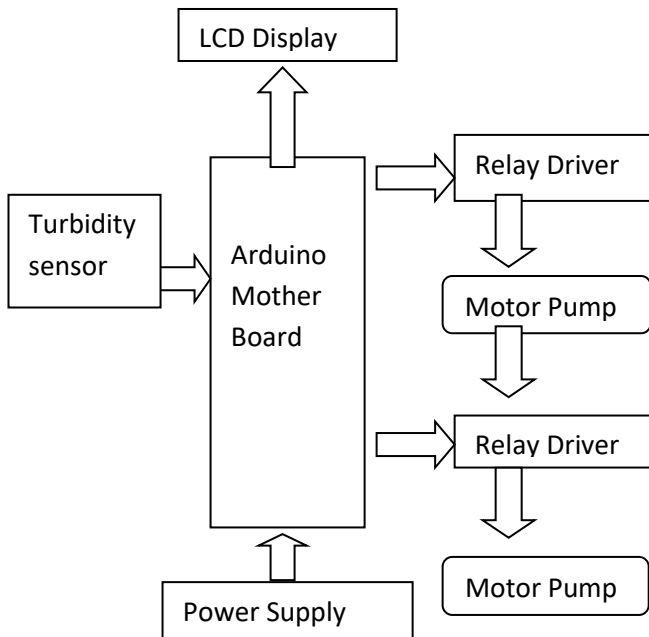


Fig 2. Block diagram

4.1 MERITS

1. By using turbidity sensor ,water can be reused.
2. Lot of time can be saved by using turbidity sensor.
3. Reduce of water wastage.

5. ELEMENTS USED

5.1 HARDWARE REQUIREMENTS

1. Arduino Board
2. Turbidity Sensor
3. Relay Driver
4. Motor Pump
5. LCD Display (16*2)
6. Power Supply
7. Embedded C(Software)

5.1.1 ARDUINO BOARD

Arduino make the application more accessible with its interactive objects and it is used as a single-board microcontroller. The hardware is an open source board designed with an 8-bit AVR microcontroller or a 32 bit ARM processor. Our Arduino model consists of a USB interface and pin description are as follows:

1. 6 analog input pins
2. 14 digital I/O pins

It allows the user to attach various boards and is an easy USB interface and is like a serial device. The chip is plugged straight into our USB port and supports the computer and works as a virtual serial port. The serial communication is an easy protocol because it is time tested and USB connections makes more comfortable as it is connected to all kinds of modern devices. Here, ATmega328 is the chip and acts as a microcontroller brain. The hardware features present in this

arduino board are timers, external and internal interrupts, PWM pins and multiple sleep modes.

5.1.2. TURBIDITY SENSOR

Turbidity sensors are used to detect the suspended particles and cloudiness present in the water. It consists of photo detector and LED light. The light scattered indicates the amount of turbidity in the water. Water turbidity level is increased by the increase in the total suspended solids present in the water. The measurement is done to check the quality of the water. It can be applied to detect the transparent glass and plastic particles. The turbidity measurement unit is NTU (Nephelometric Turbidity Units).

5.1.3. RELAY DRIVER

Relay is used as electromechanical devices in the application of industries particularly in the automation sectors. It is used as an interfacing from electronic to electrical which is used to switch or operate the electrical circuits at high Ac voltages. It has two parts which is coil and the switch. The coil is operated at the rated Dc voltage and switch is mechanically movable. The circuits are made isolated but magnetically connected at each other. So the fault do not occurs. If any of the side is faulty, it doesn't affect the either side of the circuit.

5.1.4. MOTOR PUMP

A pump is a mechanical device that moves liquids or gases. The hand pumps which are widely used to pump water from the wells are reciprocating. It is a machine that pressurizes or delivers a liquid. Mini water motor pump is mini type transfer water from lower place to higher place or to far place. The conversion takes place by the means of multiple whirls, which are excited by the impeller.

5.1.5. LCD DISPLAY(16*2)

An LCD is a display device module used to produce a visible image by using liquid crystals. The LCD used here is 16x2 and is a very basic display module commonly used in DIYs circuits. This display translates a display of 16 characters per line in 2 such lines. The characters are displayed in a 5x7 pixel matrix

5.1.6. POWER SUPPLY

The power supply is used to supply the electrical power. Here the transformer is used to supply the power to the entire circuit. The step up transformer is used to increase the alternating voltages a low current. It is also used for coupling the stages of digital processing circuits.

6.SOFTWARE REQUIREMENTS

1. Arduino IDE
2. Proteus 8

6.1 ARDUINO IDE

Arduino is based on hardware and software which is easy to use and it is an open source platform. Its circuit elements are programmable board and a software tool called arduino IDE. It is used to write the code and upload it into the microcontroller board. Arduino is able to read both analog

and digital signals from different sensors as an input. The output will results as motor activation, switching On the LED lights or connections to the cloud. The Arduino uses a USB cable instead using hardware tools such as programmer like other programmable circuit boards.

6.2 PROTEUS 8

The software Proteus is used for the simulation of programs and it was designed in Yorkshire, England by the Labcenter Electronics. It was designed to simulate the electrical and electronic circuit design. It can also possess 2D CAD drawing features. The product modules are schematic capture, microcontroller simulation, PCB design, 3D verification.

7.CONCLUSION

In this paper, monitoring the cloudiness of the water is proposed. By using turbidity sensor in the initial stage the quality of the water can be identified. The turbidity sensor was connected to the arduino board to reduce the circuit complexity. Turbidity sensor consist of a components such as photo detector and infrared LED as light source. The principle used in turbidity sensor is light scattering principle. This system can potentially help to monitoring purity in the water in destoner.

8. REFERENCE

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