

BOILER AUTOMATION USING EMBEDDED SYSTEM

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ABSTRACT

As the world is globalized day by day, so the demand of automated machines has increased rapidly. In industry or any power plant boiler hold a significant contribution. To control it industry, need uninterrupted monitoring at frequent interim. But there have number of restrictions to measure various stage of boiler by worker. In the early days this was done manually but this was dangerous and difficult for people in units like blast furnace boilers etc. The proposed method develops remote monitoring of boiler temperature and pressure levels using the Internet of Things. Constant monitoring of the industries is essential as these types of industries operate continuously. This method uses the Internet of Things (IoT) and LORA as a communication platform. The proposed method also offers an option for monitoring at a remote location in addition to the control room. In this project we will use a temperature sensor to detect the temperature of the boiler. The temperature and pressure sensor records the temperature and pressure of the boiler, which is transmitted to the microcontroller. The result of LCD shows Temperature & pressure sensor. The temperature sensor is connected in buzzer when the boiler is heated temperature are increasing the buzzer automatically gives the sound and the pressure sensor are increases then the buzzer gives sound.

Keywords: Peripheral Interface Controller, LoRa, Buzzer, IOT.

I. INTRODUCTION

The demand for automated machines that can effort much more efficiently to produce higher quality products has increased. In the case of a boiler system, proper monitoring of the sensors and proper monitoring of the temperature are required on a regular basis. Therefore, manual handling of the system becomes heavy work. The idea of boiler automation was introduced in order to achieve the goals associated with the automation control system: the development of operations, the improvement of the management level and the highly efficient process. As manual operation of the boiler becomes hard work, the industry is turning to automation. During this process, it is important to control the temperature, vapor pressure, water level, etc. for reliable operation and to avoid errors and damage. But with human workers, there are a number of possibilities for error in measuring at different stages. Boiler automation techniques are very important to avoid errors by human workers. Previously, several studies were conducted on the boiler automation system. In industrial sector automation was done using various techniques. In their proposed system there have a number of boilers supplied by a temperature sensor in every pipe of boiler which controlled the temperature of the system. The LoRa technology is used for give information to the consumer and the pressure sensor in every pipe of boiler which controlled the pressure of the system. Controller Arduino continuously reads the value of both sensors and display the values in the LCD display and uploads the values in Things speak website in particular login.

II. LITERATURE SURVEY

The paper [1] Boiler automation system using PLC for ensure efficient operation of boiler and digitalize the industries. To achieve the goal of this project a LOGO PLC was employed to control the operation of the boiler. In this project a heater jug was used as a prototype of boiler. A NTC (Negative Temperature Coefficient) thermistor along

with a temperature showing module is used to measure the temperature. Then the thermistor sends signal to the PLC through a regulator IC 7812.

The paper [2] Design and implementation of boiler automation system using PLC” Intelligence means the ability to comprehend reason and learn. Other aspects of intelligence that describe human intelligence are creativity, skills, consciousness, intuition, and emotion. Artificial Intelligence (AI) has tried to simulate such intelligent behavior in systems. AI is also defined as thinking humanly & rationally and acting as humanly & rationally. Intelligence means the ability to comprehend reason and learn. Other aspects of intelligence that describe human intelligence are creativity, skills, consciousness, intuition, and emotion. Artificial Intelligence (AI) has tried to simulate such intelligent behavior in systems. AI is also defined as thinking humanly & rationally and acting as humanly & rationally.

The paper [3] An intelligent dual-boiler monitoring and control system (DBMCS) through digital communication using protocol is proposed. It consists of a distributed system with LabVIEW graphical user interface running on PC as coordinating system for up to 2 embedded boiler control systems, implemented with microcontroller. In addition, a Gateway device based on microcontroller is implemented, to assist the communications between the PC and the boiler. It has also capabilities, which permit to connect up 2 boilers for monitoring and control purposes

The paper [4] V Boiler generates superheated vapor by heating saturated steam from steam pocket to do work. This superheater consists mainly of radiation convection and desuperheater. Superheat temperature from exit of boiler is the highest temperature in the system

The paper [5] Boiler drum water level is important parameters which affecting the safe operation of the boiler. In according to make the boiler operating safely and efficiently, the boiler drum water level would be maintained in the reasonable scope. Exorbitant water level will affect the separation of steam from water, increase the steam moisture, decrease the steam quality, increase boiler incrustation. Water level is too low, because the steam drum water less and load is very large as well as water vaporizing with faster speed, thus the steam drum water changes in speed, destroy the water cycle between the steam drum and water-wall. Local water-cooled wall is heated overweight, seriously it would cause steam drum destruction or explosion.

The paper [6] A boiler is an enclosed vessel that provides a means for combustion heat tube transferred into water until it becomes heated water or steam. The hot water or steam under pressure is then usable for transferring the heat to process. Water is a useful and cheap medium for transferring heat to a process.

The paper [7] The procedure of control over modern boiler steam temperature requires accuracy in keeping the present temperature. The temperature must be kept close to its value, prescribed by the boiler unit design, irrespective of the boiler operating mode and its load. When the temperature decreases, not only cost effectiveness of the whole boiler falls but the probability of emergency situations also increases, for instance boiler water flooding alongside steam may occur. The temperature rise causes metal deformation and premature wear in the boiler unit construction, which finally results in emergency shutdown of the boiler.

The paper [8] Many research studies have been carried out on the adjustment and optimization of combustion which has the characteristics of high efficiency and low pollution in the coal-fired boilers. It is difficult for mathematical algorithms to simulate the operation process of coal-fired boilers because of many coal-fired boiler devices and a complex nonlinear relationship among the boiler output parameters. This paper uses BP neural network algorithm which has the characteristic of solving intelligent nonlinear problems to model the coal-fired boiler parameters such as the amount of fuel, air supply and coal properties. To reduce the local convergence of BP neural network. In this paper also uses genetic algorithm to optimize the network structure. In the study of the optimization of operating mode, the outputs of coal-fired boilers just have two parameters which are combustion efficiency and NOx emissions.

The paper [9] Temperature control exists in every field of social life. Usually, the characteristics of nonlinear, great inertial, long-time delay, time varying and unidirectional rising, so it is difficult to obtain satisfactory control using conventional PID control. To solve this problem, researchers put forward the algorithm of adaptive control, robust control algorithm etc. but due to the complicity of the algorithm itself, it is relatively difficult to implemented in industry control. In this paper an incomplete differential PID controller was used to control the water temperature of an electrically heated boiler, parameters were tuned based on Yola Parameterized method and Control theory. Simulation results show that the robust PID controller has the advantage for parameter tuning, and the system has good robust and dynamic performance when parameters variation occur.

The paper [10] Boilers have huge volume, complicated structure and various of complicated faults. Steam and water pipe leakage is a major fault of boiler, which poses a serious threat to the boiler's safety and stable operation. Further studying diagnosis method of boiler steam and water pipe leakage is of great significance. At present, the diagnosis methods of steam and water pipe leakage include live acoustic wave analysis and artificial intelligence. By monitoring the inner of boiler, the method of acoustic analysis can determine whether pipe leak in somewhere. However, influenced by various physical factors, acoustic waves inside the boiler are complex, which has brought greater difficulties for leakage acoustic detection.

3. Proposed Methodology

The aim is to develop a boiler automation monitor and analyser in Sibi solvent extractor chemical industry to avoid the errors due to human workers. Our solution aims to monitor the temperature, pressure level of boilers and to upload the values in “Things speak” (graphical representation) website in a particular login. Display is also fixed into know the variations.

Temperature and Pressure Sensors:

Temperature and pressure sensors will be installed in the boiler to measure the temperature and pressure values of the boiler respectively. When the sensors increase the boiler automatically give the alertness.

PIC Controller:

The PIC controller will be used to control the temperature and pressure in the boiler. It will receive the input signals from the temperature and pressure sensors.

LoRa

The LoRa is wireless technology used to transmit the required data for long range in urban areas it transmits up to 5kms & rural areas up to 15kms.

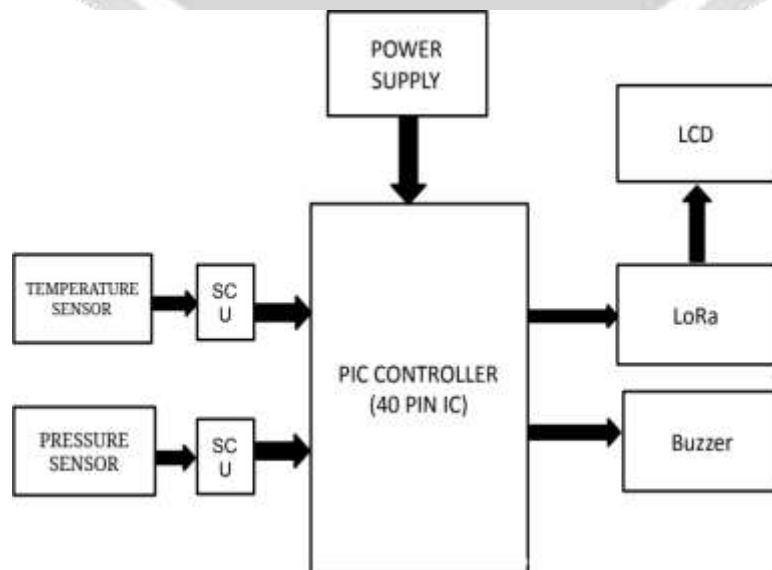
LCD:

LCD will be used to display the temperature and pressure readings received from the sensors.

Alarm:

An alarm will be installed in the system to alert the operator in case the temperature and pressure of the boiler exceed the pre-set threshold levels.

3.1 Block diagram



4. RESULT AND DISCUSSION

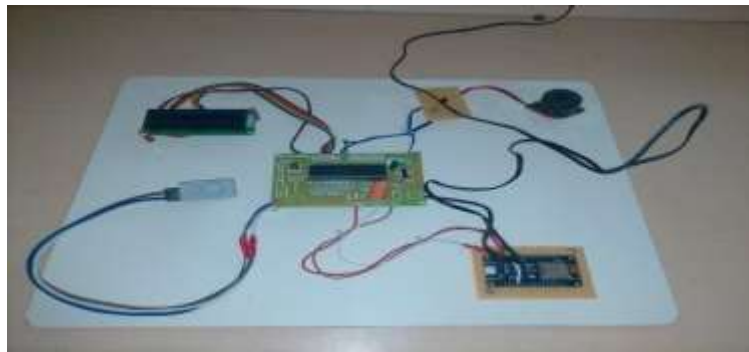


Figure-4.1 Full Hardware

This hardware is explaining full hardware kit of Temperature sensor, pressure sensor, Lora is done by Internet of things show fig 4.1

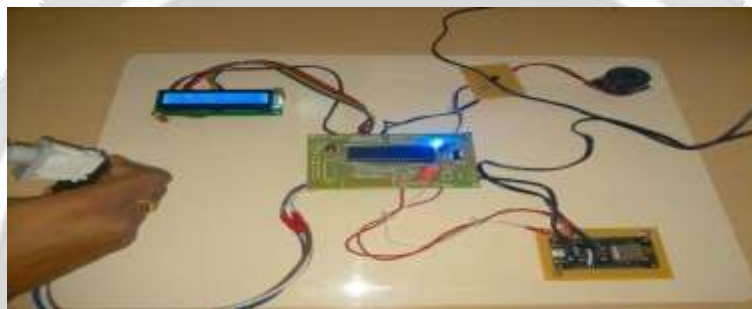


Figure-4.2 Temperature &pressure sensor

The result of LCD shows Temperature &pressure sensor. The temperature sensor is connected in buzzer when the boiler is heated temperature are increasing the buzzer automatically gives the sound and the pressure sensor are increases then the buzzer gives sound.



Figure 4.3 Things speak

This figure 4.3 results shows things speak website based up on thegraphical representation

5 Conclusion

We come to conclusion of which boiler switched off and in used and the analysis also to be done. Placed on Temperature, Pressure values. Controller Arduino continuously reads the value of both the sensors and display the value in the LCD display and uploads the value in **THINGS SPEAK** website in particular login.

6. FEATURE::

In this project automated only boiler in feature, we automated all the sensors in the industry.like conveyor automation, colling tower automation.

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