Automation Of Industrial Boiler

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Abstract- *Instead of PC based servers, ARM processor based servers are becoming trend of today's market. As they are not using computer directly, it helps a lot in reduction of cost. Use of ARM processor along with Ethernet module (Embedded Web Server) can be done for monitoring and controlling maximum no. of either home appliances or industry devices. Without using a computer, Ethernet module has capability to communicate to the owner of the overall system, who is able to manage appliances from any location outside. This web server (HTTP server) provides a powerful networking solution, by enabling web access for automation and monitoring different systems. For the purpose of industry, instrumentation and home automation, this server is an optimized solution. Using web browser, system home page can be accessed. Operational status of the appliances can be monitored and observed or changed in case of necessity. This paper proposes a development of low cost electronic hardware for monitoring and controlling devices with web browser. Different sensors installed at working place help in sensing real time parameters like temperature, light, humidity.*

I. INTRODUCTION

All the values can be filled up by the introduction of the automation technique into the power plant. The automation technique involving the automatic control of all the processes which includes the monitoring and inspection needs provides for a very efficient system. The automation process helps the company having the power plant to reduce the amount of errors that occur , reduction in the human resources, increased efficiency, and most importantly very cost effective.

Over the years the demand for high quality, greater efficiency and automated machines has increased in this globalized world. The initial phase of the project focuses on passing the inputs to water in steel vessel at a required temperature, so as to constantly maintain a particular temperature in the vessel. The Air pre-heater and Economizer helps in this process. And the mainly focuses on level, temperature, %RH(Relative Humidity) and flow control at the various stages.

Thus the temperature in the steel vessel is constantly monitored and brought to a constant temperature as per requirement. The automation is further enhanced by constant monitoring using WEBPAGE which is stored in LPC2148 to the by means of ETHERNET. By means of threshold values set to various parameter in WEBPAGE the entire process is controlled as required. This project has proved to be very efficient practically as the need for automation grows day by day.

II. LITERATURE REVIEW

1. MANUAL CONTROL :-

In this, the control and automation are done by Manual Operation.

DRAWBACK:-

Human Errors subsequently affects the quality of end product.

2. HARD WIRED LOGIC CONTROL.

In this, Contractors and Relays together with timer and counters were used in achieving desired level of Automation.

DRAWBACK:-

Bulky and complex wiring,Involves lot of rework to implement changes in control logic,Work can be started only when it is fully defined which leads to longer project time.

3. ELECTRONICS CONTROL WITH LOGIC GATES:-

In this, Contractors and Relays together with timers and counters were replaced with logic gates and electronics timer in control circuit.

ADVANTAGE:-

Reduced space requirement, energy saving, less maintenance and hence greater reliability.

DRAWBACK:-

Implementation of changes in the control logic as well as reducing project lead-time was not possible.

4. PROGRAMMABLE LOGIC CONTROL :-

In this, instead of achieving desired control and automation through physical wiring of control devices, it is achieving through program say software.

DRAWBACK:-

The drawback of PLC is that we always need a skilled personnel to handle without which it can get side effects.

ADVANTAGE:-

Energy Saving, Reduced Space, Modular replacement, Easy troubleshooting, Error Diagnostics programmer

III. HARDWARE COMPONENTS

Below are the hardware components of the model which are connected inside the model. The specification and description is explained.

1. THERMOCOUPLE:

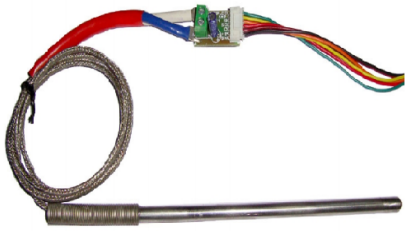

Figure 1. THERMOCOUPLE

This board include a 'K'typethermocouple probe with digital interface. Measures temperature from 0to +1024 degCelcius with 0.25 deg C resolution. Output is simple serial SPI interface to be used with any microcontroller. The board performs cold-junction compensation and digitizes the signal from atype-K thermocouple. The data is output in a 12-bit resolution, SPI™-compatible, read-only format. This converter resolvestemperatures to 0.25°C, allows readings as high as +1024°C.

2. CAPACITIVE LEVEL SENSOR:

Like ultrasonic sensors, capacitance sensors can handle point or continuous level measurement. They use a probe to monitor liquid level changes in the tank, electronically conditioning the output to capacitive and resistive values, which are converted to analog signals. The probe and the vessel wall equate to two plates of a capacitor, the liquid to thedielectric medium. Because the signal emanates from level changes alone, material buildup on the probe has no effect. Non-conductive fluid vessels may dictate dual probes or an external conducting strip.

Figure 2. LEVEL SENSOR

3. SYHS220:

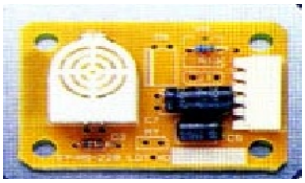

Figure 3. HUMIDITY SENSOR

SYHS-220 Module consist of SYH-2sensor and an integrated circuit to provide linear DC voltage output for 20-95%RH.

They are specifically designed for used in appliances and controllers.

4. RELAY:

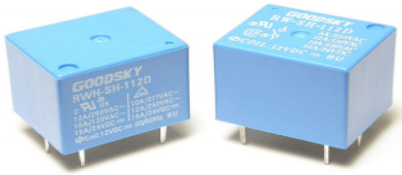

Figure 4. RELAY

A Relay is electrically operated Switch that enables one circuit to be switched to second circuit That is separate.It also controls one electrical circuit by Opening and Closing Contact in Other circuit.They are used to realize Logic and

Time delay function. They are also used as protective Relays by this function all the Faults during transmission and reception can be detected and isolated.

5. RELAY DRIVER:

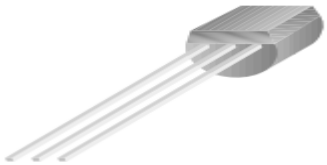

Figure 5. RELAY DRIVER

Transistors are used as Relay driver to provide high voltage and low noise.BC547 is of Semiconductor family with Package TO-220. It has three terminal Collector , Base , Emitter.

6. ENC28J60 :

The ENC28J60 is a stand-alone Ethernet controller with an industry standard Serial Peripheral Interface (SPI). It is designed to serve as an Ethernet network interface for any controller equipped with SPI. The ENC28J60 meets all of the IEEE 802.3 specifications. It incorporates a number of packet filtering schemes to limit incoming packets. It also provides an internal DMA module for fast data throughput and hardware assisted checksum calculation, which is used in various network protocols. Communication with the host controller is implemented via an interrupt pin and the SPI, with clock rates of up to 20 MHz. Two dedicated pins are used for LED link and network activityindication.

Figure 6. ETHERNET MODULE

7. MAX232:

The MAX232 device is a dual driver/receiver that includes a capacitive voltage generator to supply EIA-232 voltage levels from a single 5-V supply .Each receiver converts EIA-232 inputs to 5-VTTL/CMOS levels. These receivers have a typical threshold of 1.3 V and a typical hysteresis of 0.5 V, and can accept ±30-V inputs. Each driver converts TTL/CMOS input levels into EIA-232levels. The driver, receiver, and voltage-generator functions are available as cells in the Texas Instruments LinASIC library. The MAX232 is characterized for operation from0°C to 70°C. The MAX232I is characterized for operation from –40°C to 85°C.

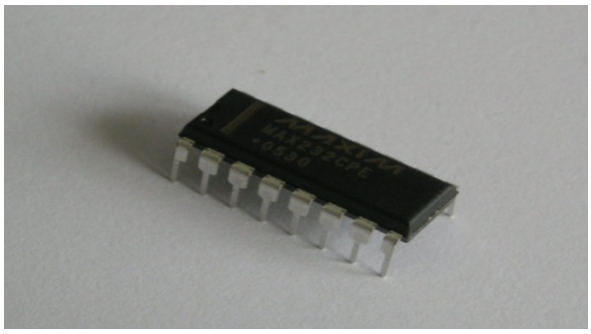

Figure 7. MAX232

IV. BASIC BLOCK DIAGRAM

The below mentioned block diagram shows the functionality of the project. In this as we can see the main control is through LPC2148 which is given a 3.3V power supply and it is connected to heater and pump through relay and relay driver .The sensors are also connected to it. The whole system is controlled through wifi which can be interfaced with a pc through a software and line drivers .

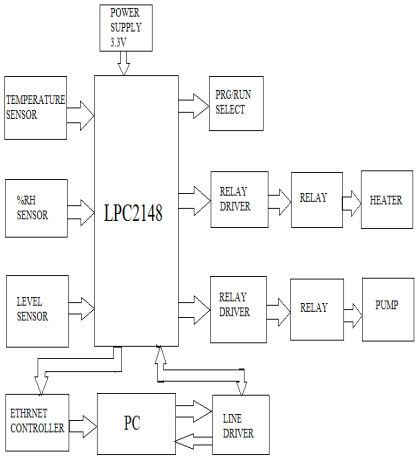

Figure 8. Basic block diagram

V. FLOWCHART

1. The first step is to start the program.
2. We fill the steel vessel with the required amount of water.
3. Then we will switch on the heater as mentioned in the diagram
4. Now the condition is that if the temp equals the set up temp we switch off the heater.
5. Now we have to check the water level in the steel vessel.

6. Now again if the level equals the setup level we stop thesupply of water through pump.
7. SYHS220 is being used as humidy sensor .
8. We measure the humidity through it.
9. Now what we do is design a web page and store it in LPC2148.
10. This will display status of all parameters in the page itself.
11. The process is executed.

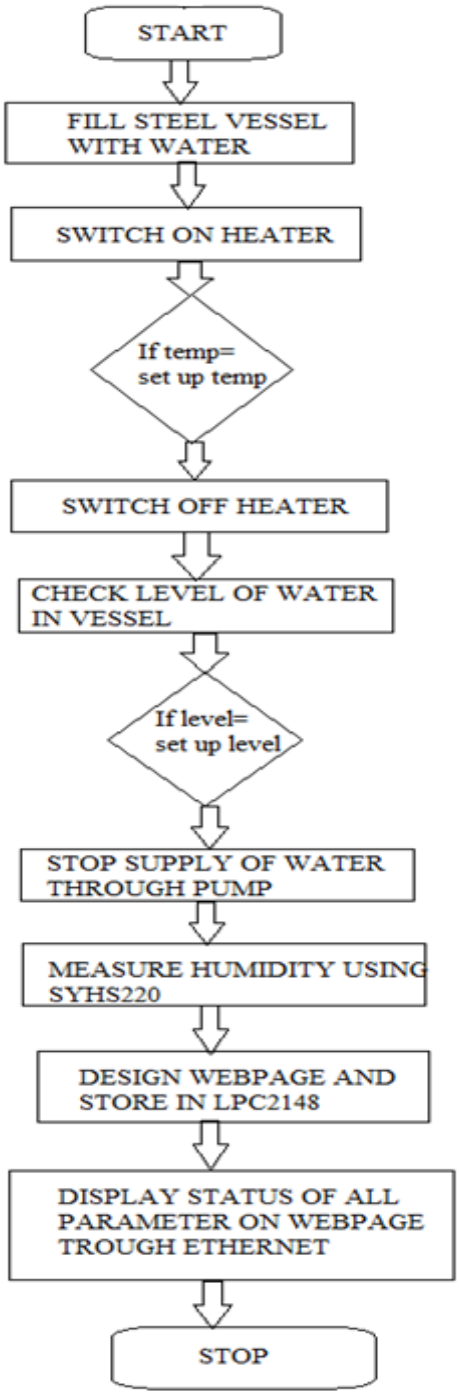

Figure 6 the material unloading response of the system

VI. ACKNOWLEDGEMENT

It is a pleasure in submitting here with the project on "AUTOMATION OF INDUSTRIAL BOILER" as the fulfillment of final year of Engineering course in ELECTRICAL.

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I conclude the acknowledgment by thanking those who directly or indirectly helped us in our project work.

VII. CONCLUSION

In this project I have made and performed the automatic industrial boiler by using various hardware sensors wiz. %RH, SYHS220, relay driver, capacity level sensor, thermocouple. In which the model is connected to the system via wifi module and can be controlled from a remote distance.

REFERENCES

[1] S.A.N.Sandeep, P.Malyadri ," Embedded Web Server Based on DAC System Using ARM‖" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 , Vol. 2, Issue 4, July-August 2012,

[2] Deepak C.Karia, VispiAdajania, ManishaAgrawal and SwapnilDandekar, "Embedded Web Server Application Based Automation and Monitoring System‖ "Proceedings of 2011 International Conference on Signal Processing, Communication, Computing and Networking Technologies (ICSCCN 2011)

[3] YanniZhai, XiaodongCheng ,"Design of Smart Home Remote Monitoring System Based on Embedded System"‖ 978-1-4244- 9600-6/11/ /$26.00 ©2011 IEEE

[4] V.BillyRakesh Roy1, Sanket Dessai1, S. G.Shiva Prasad

Yadav , ” Design and Development of ARM Processor Based Web Server”International Journal of Recent Trends in Engineering, Vol. 1, No. 4, May 2009

[5] A. R. Al-Ali, Member, IEEE & M. AL-Rousan “Java-Based Home Automation System” ‖ IEEE Transactions on Consumer Electronics, Vol. 50, No. 2, MAY 2004 .