# IOT Based Smart Boiler Monitoring System

**N Manikandaprapu[1], A Anandhan[2], P Dharani[3], K Manikandan[4]**
[1]Assistant professor, Dept of ECE
[2, 3, 4]Dept of ECE
[1, 2, 3, 4] Nandha Engineering College, Erode, Tamilnadu, India.

***Abstract-*** *The requirement for power generation in India increases step by step due to various factors. Nearly 70% of the power creation is from the thermal power plants in different areas of the nation. Observing and managing of these force plants at all times is a must, since these power plants are operated constantly. Boiler is incredible significance in thermal power plant. Hence observing the boiler parameters such as temperature is a great importance in power plant. It is not generally possible for constant observing in the plant premises because of an unpleasant industrial environment. In this task it is proposed to create far off observing and control of kettle boundaries utilizing remote correspondence. The proposed technique gives a total answer for these requirements in distant observing by utilizing different sensors for temperature, weight and stickiness estimation. This strategy utilizes Internet of Things (IoT) as the foundation of correspondence. The proposed strategy likewise gives a choice to checking and control even in distant area notwithstanding the control room. Web of Things (IoT) will assume a significant part later on idea of intensity plant reconciliation. The proposed method will suit and give a beginning-up initiation for this future concept.*

***Keywords***- PIC Programmable Logic Controller, Temperature sensor, LCD Display, Cooling system, IoT

## I. INTRODUCTION

### 1.1 INTRODUCTION TO INTERNET OF THINGS

The 'Thing' in IoT can be any device with any sort of inherent sensors with the capacity to gather and move data over a network without manual intercession. The embedded technology in the object helps to interface with inside states and the outside environment, which in turn helps in choices making measure. More or less, IoT is a idea that interfaces all the devices to the web and let them speak with one another over the web. IoT is a giant network of associated devices – all of which assemble and share information about how they are utilized and the conditions in which they are operated. A developer presents the application with a record containing the principles, logic, blunders and exceptions took care by him to the analyzer. Again, if there are any issues Tester conveys it back to the Developer. It takes different Iterations & in this manner a smart application is made. Similarly, a room temperature sensor accumulates the information and sends it over the network, which is then used by different device Sensors to alter their temperatures likewise. For example, Cooler's sensor can assemble the information with respect to the outside temperature and likewise alter the cooler's temperature. Similarly, your air conditioners can also change its temperature in like manner. This is how devices can interface, contribute & collaborate. IoT is a system wherein all physical objects are associated with the web through system devices or routers and exchange information. IoT permits objects to be controlled distantly across existing network foundation. IoT is an excellent also smart technique which reduces human effort as well as simple to access to physical devices. This technique also has independent control feature by which any device can control without any human cooperation.

### 1.2 INTRODUCTION TO EMBEDDED SYSTEM

Embedded C is one of the most famous and most normally utilized Programming Languages in the advancement of Embedded Systems. Thus, in this article, we will see a portion of the Basics of Embedded C Program and the Programming Structure of Embedded C Embedded C is perhaps the most famous dialects among Embedded Programmers for programming Embedded Systems. There are various standard programming vernaculars like Assembly, BASIC, C, etc that are habitually used for making Embedded Systems yet Embedded C remains acclaimed due to its proficiency, less improvement time and portability. Before diving in to the rudiments of Embedded C Program, we will initially investigate what an Embedded System is and the significance of Programming Language in Embedded Systems.

### 1.3 SMART MONITORING SYSTEM

A power station also referred to as a creating station, power plant, power house, or creating plant is an industrial facility for the creation of electric power, the term generally being restricted to those ready to be dispatched by a system administrator (i.e. the system administrator can, by some methods, arrange the planned output of the producing

facility).Most power stations contain at least one generators, a rotating machine that changes over mechanical force into electrical power. The different parameters in the boiler such have temperature, pressure moistness these boundaries can be controlled utilizing IoT. There is significant parameter that must to be controlled in the boiler for the security and to improve the unwavering quality of the boiler. In case if these boundaries are not controlled then there will be an occurrence of issue in the boiler. All together for the security of the boiler these parameter values must be controlled. So a smart method of control should be done by web of things. By making the website page and the control activity can be done through the internet of things.

## II. RELATED WORK

Most of the authors in this field framework done their related work to beat the existing method by step by step process. The thought enhanced by the creators are identified with our task is utilized to build up the savvy observing framework and it assists with achieving the temperature estimation of the boiler in thermal power plants.

- Design a Real-Time Conditioning and Control in a Server Room based on IoT
- Detection of heat stroke system based on IoT
- Monitoring temperature Smart Incubator based on IoT

2.1 Design a Real-Time Conditioning and Control in a Server Room based on IoT

Moses O. Onibonoje and Nnamdi I. Nwulu

Smooth business and organization's operations depend on the equipment and computer network infrastructures being housed in a server room. The major focus of administrators has been on ensuring security against network attacks and failure in connectivity, while neglecting the recurring dangers from environmental factors. The effect of environmental threats on computer hardware contributes 25% of downtime in world information processing. Downtime in business transactions contributes to organizational and personal image damage, loss of customers and lower revenue. The key contributing factor to the downtime by hardware failure is heat. Temperature and humidity are however the constituent parameters which determine heat index, and should therefore be well monitored and controlled.

2.2 Detection of heat stroke system based on IoT

Barzallo Boris and Basto Carolina

The temperature of the planet in the last150 years has increased by almost1.5 degrees, reaching in 2016 historical maximum indexes compared to previous years. It is inevitable that this climatic condition will follow its course, affecting the environment, nature and living beings. High temperatures in combination with high levels of humidity are conditions that facilitate the development of diseases present particularly in tropical and subtropical areas. According to the National Center for Epidemiological Surveillance and Disease Control of the Ministry of Health in Mexico, the most frequent health problems due to the high temperatures recorded in spring and summer are heat stroke, sunstroke and dehydration, which can be considered alarming, and may even be fatal. The condition known as heat stroke presents symptoms of rapid increase in the level of temperature in the body and affectation to the central nervous system.

2.3 Monitoring temperature Smart Incubator based on IoT

Ashish.B and H K AVisser

To recent study, every year more than 20million babies are born prematurely or with low birth weight - and an estimated 450 of them die each hour. This can be easily prevented by using neonatal incubators for these pre-mature babies. These life supporting machine provide adequate thermal regulation and environmental control for the baby while it uses all of the available resources to complete development to attain normal size. The main objective of this paper is to keep their temperature stable through-out. In addition, in the developing countries there is a large proportion of primary and intermediate health facilities than there are in the developed world. All these facilities could be connected to benefit people. This is made possible with the help of open resource like Internet of Things (IoT). The incubator has a certain temperature range to keep the babies warm. In some cases, if the temperature becomes more than normal then an alerts sent to doctor immediately so that the doctor can take the necessary precautions.

## III. PROPOSED SYSTEM

3.1 BLOCK DIAGRAM

In this project, used to monitor and control the boiler in thermal power plants. This figure3.1 shows the block diagram of the proposed system. A power station also referred to as a producing station, power plant, power house, or producing plant is an industrial facility for production of electric force, the term generally being restricted to those ready to be dispatched by a system administrator (i.e. the system operator can, by same methods, change the arranged

output of the generating facility). The various parameters in the boiler such has temperature, pressure, humidity these parameters can be controlled utilizing IoT. There are significant parameters of the boiler in thermal power plants. Most power stations contain at least one generator, a rotating machine that changes mechanical force into electrical force the temperature must be controlled in the boiler for the security and to improve the reliability of the boiler. In case if these parameters are not controlled then there will be an occurrence of issue in the boiler. All together for the wellbeing of the heater these boundary esteems must be controlled. IoT is good platform for communication so a smart way of control can be done by internet of things. The Figure 3.1 shows the block diagram of the proposed framework. It consists of a PIC microcontroller which is interfaced with GS and LCD to send and value of temperature. Here Temperature sensor senses the temperature of the boiler which is given to micro controller. Whenever the temperature value is exceeded to prescribed value it gives the alerts through Wi-Fi, LED and cooling is on. A set point esteems are saved for all the boundary esteems once in the event that the qualities are exits the high worth, at that point there will be an event of shortcoming in request to maintain a strategic distance from that deficiency internet checking has been done and the if the boundary esteems in the event that it exits over the cutoff it tends to be constrained by the online through a website page has been made and the all out control tasks should be possible through the site page.

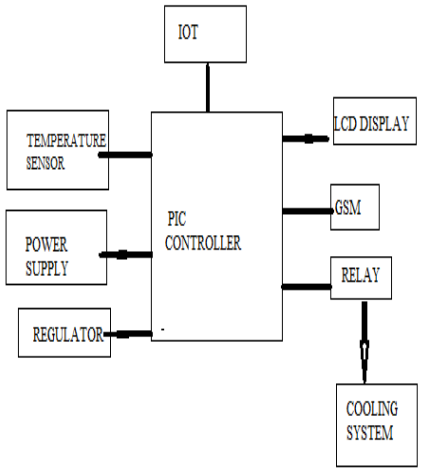


Figure 3.1 Block diagram

3.1 HARDWARE DESCRIPTION

3.1.1 PROGRAMMING LOGIC CONTROLLER

Core plc board was comprised of 16 digital inputs and 16 digital outputs. Inputs are optic isolated. Opto couplers are wont to protect the circuit/processor from heavy loads damage. At output side is employed 16 relays for switching heavy loads. Relays are rated as+12v. they're derived from Uln2803 Ic.Uln2803 is an 8- channel darling-ton array high output current. Uln2803 it can sink 500mA of current from a 50V power supply. it's inbuilt fly-back diodes for driving coils and prevents from back damage. Relay coils are directly connected to the ULN2803 output and doesn't need the fly back diodes, since they're build inside. Core plc board processor is pic16f877a performing at 20MHz. Whole board is powered employing a +12v dc supply. LM7805 regulator is employed to convert the +12v to +5v for power supply to microcontroller, opt couplers and uln2803 relay driver. For programming the board microcontroller pic16f877A picket 2 programmers is formed on the board.

3.1.2 ESP8266

The ESP8266 is set up to do either promising an application or offloading all Wi-Fi orchestrating limits from another application processor. Each ESP8266 module comes pre-tweaked with an AT request set firmware, which implies, you can basically interface this to your arduino device and get about as much Wi-Fi limit as a Wi-Fi Shield offers (and that is just out of the holder)! The ESP8266 module is an amazingly practical board with a gigantic, and ever developing, network. This module has a ground-breaking enough ready handling and capacity ability that permits it to be coordinated with the sensors and other application explicit gadgets through its GPIOs . Its serious extent of on-chip combination takes into account negligible outside hardware, including the front-end module, is intended to involve insignificant PCB territory. There is a practically boundless wellspring of data accessible for the ESP8266, all of which has been given by stunning network uphold. In the record segment underneath you will discover numerous assets to help you in utilizing the ESP8266, even guidelines on the most proficient method to changing this module into an IoT (Internet of Things) arrangement.

3.1.3 LM35 SENSOR

The LM35 gadget has a preferred position over straight temperature sensors adjusted in Kelvin, as the client isn't needed to deduct an enormous consistent voltage from the yield to get helpful Centigrade scaling. The LM35 gadget doesn't need any outer adjustment or tending to give ordinary correct nesses of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature extend. Lower cost is guaranteed by tending to and adjustment at the wafer level. The gadget is utilized with single force supplies, or with in addition to and less supplies. As the LM35 gadget draws just 60 μA from the gracefully, it has exceptionally low self-

warming of under 0.1°C in still air. The LM35-arrangement gadgets are accessible bundled in airtight TO semiconductor bundles, while the LM35C, LM35CA, and LM35D gadgets are accessible in the plastic TO-92 semiconductor bundle. The LM35D gadget is accessible in a 8-lead surface-mount little diagram bundle and a plastic TO-220 bundle.

3.1.4 Liquid Crystal Display

16×2 Character LCD is an essential LCD module which is regularly utilized in gadgets papers and items. It contains 2 columns that can show 16 appeared in the Figure 4.5. Each character is shown utilizing 5×8 or 5×10 dab network. It very well may be effectively interfaced with a microcontroller. Greetings Tech C has no implicit LCD libraries along these lines, the equipment information on LCD must be known. Normally utilized LCD Displays utilizes HD44780 consistent regulators. This is the pin outline of a 16×2 Character LCD display. As in all gadgets it additionally has two contributions to give power Vcc and GND. Voltage at VEE decides the Contrast of the presentation. A 10K potentiometer whose fixed finishes are associated with Vcc, GND and variable end is associated with VEE can be utilized to alter contrast. Microcontroller necessities to sends two data to work this LCD module, Data and Commands. Information speaks to the ASCII esteem (8 pieces) of the character to be shown and Command decides different activities of LCD, for example, position to be shown. Information and Commands are sent through similar information lines, which are multiplexed utilizing the RS (Register Select) contribution of LCD. At the point when it is HIGH, LCD accepts it as information to be shown and when it is LOW, LCD accepts it as a command. Data Strobe is given utilizing E (Enable) contribution of the LCD. At the point when the E (Enable) is HIGH, LCD accepts it as legitimate information or order. The information signal R/W (Read or Write) decides if information is composed to or perused from the LCD.The interface between this LCD and Microcontroller can be 8 piece or 4 piece and the contrast between them is in how the information or orders are send to LCD. In the 8bit mode, 8bit information and orders are sending through the information lines DB0–DB7 and information strobe is given through E contribution of the LCD.But 4bit mode utilizes just 4 information lines. In this 8bit information and orders are part into 2 sections (4 pieces each) and are sent consecutively through information lines DB4 – DB7 with its own information strobe through E input. The thought of 4bit correspondence is acquainted with spare pins of a microcontroller. As LCDs are moderate speed gadgets, the minuscule speed distinction between these modes isn't huge. Because of Persistence of Vision of our eyes speed distinction, can't be noted.

3.1.5 GSM

GSM (Global System for Mobile correspondence) is an advanced versatile organization that is generally utilized by cell phone clients in Europe and different pieces of the world. GSM utilizes a variety of Time Division Multiple Access (TDMA) and is the most broadly utilized of the three computerized remote communication advances: TDMA, GSM and Code-Division Multiple Access (CDMA). GSM digitizes and packs information, at that point sends it down a channel with two different floods of client information, each voluntarily opening. GSM, along with different advancements, is important for the development of remote portable broadcast communications that incorporates High-Speed Circuit-Switched Data (HSCSD), General Packet Radio Service (GPRS), Enhanced Data GSM Environment (EDGE) and Universal Mobile Telecommunications Service (UMTS) The GSM network has four separate parts that cooperate to work overall: the cell phone itself, the base station subsystem (BSS). The cell phone associates with the organization through equipment. The Subscriber Identity Module (SIM) card gives the organization recognizing data about the versatile user. The BSS handles traffic between the PDA and the NSS as appeared. It comprises of two principle segments: The Base Transceiver Station (BTS) and the Base Station Controller (BSC). The BTS contains the gear that speaks with the cell phones, generally the radio transmitter collectors and receiving wires, while the BSC, and is the insight behind it. The BSC speaks with and controls a gathering of base handset stations. The NSS part of the GSM network engineering, regularly called the center organization, tracks the area of guests to empower the conveyance of cell administrations. Portable transporters own the NSS. The NSS has an assortment of parts, including Mobile Switching Center (MSC) and Home Location Register (HLN). These segments perform various capacities, for example, directing calls and Short Message Service (SMS) and verifying and putting away guest account data through SIM cards. Since numerous GSM network administrators have wandering concurrences with unfamiliar administrators, clients can frequently keep on utilizing their telephones when they travel to different nations. SIM cards that hold home organization access arrangements might be changed to those with metered nearby access, essentially lessening meandering expenses, while encountering no decreases in administration.

3.1.6 Relay

A transfer is an electrically worked switch. It comprises of a gathering of info terminals for one or numerous control signals, and a gathering of working contact terminals. The switch may have quite a few contacts in different contact

structures, similar to make contacts, break contacts, or blends. Transfers are utilized where it's important to direct a circuit by a free low-power signal, or where a few circuits must be constrained by one sign. Transfers were first used in significant distance broadcast circuits as sign repeaters: they revive the sign rolling in from one circuit by sending it on another circuit. Transfers were utilized broadly in phone trades and early PCs to perform consistent operations. The customary kind of a hand-off utilizations an electromagnet to close or open the contacts, yet other working standards are designed, as in strong state transfers which use semiconductor properties for control without depending on moving parts. Transfers with adjusted working attributes and here and there different working loops are wont to shield electrical circuits from over-burden or blames; in current electrical force frameworks these capacities are performed by computerized instruments despite everything called defensive transfers.

## IV. RESULT AND ANALYS

The venture has temperature esteem made to me ceaselessly estimated and the deliberate qualities are made to be shown in the LCD. On the off chance that an outer unsettling influence is given to the boundary the qualities are changed and in the event that the qualities are exists up to the significant level, at that point there will be an event of flaw in the framework. So as to control an event of flaw the control activity are made through the page.

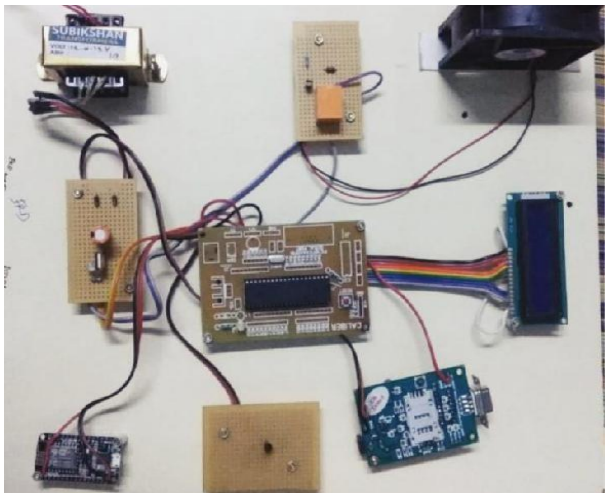


Figure 4.1 Hardware kit

## V. CONCLUSION AND FUTURE WORK

This undertaking is executed for a significant parameters such has temperature, pressure, dampness are persistently checked in the LCD screen. One of something critical is to keep up these boundary esteems at the set point level if not there will be an event of deficiency in the framework. So as to control the boundary esteems these qualities are made to be shown in the LCD and the site page is made and controlled. More number of boundaries can be utilized and this boundary are utilized to detect all the qualities in the kettle and these qualities can be made to be shown in the website page and the immediate control for every boundary should be possible through the site page.

## REFERENCES

[1] Paola.A,M.Ortolani, Lo Re Anastasi G. and Das S. K.,(2014),'Intelligent management systems for energy efficiency in buildings: A survey',ACM Computing Surveys, Vol. 47, No. 1, pp. 23-26.

[2] Nguyen.T.A and Aiello M.,(2013) 'Energy intelligent buildings based on user activity: A survey', Energy and buildings, Vol. 56, No. 2. pp. 244–257.

[3] Rajkumar "Boiler drum level control by using wide open control with three element control system" International Monthly Refereed Journal of Research in Management & Technology2013. Roopal Agrawal ,Umesh C.Pati "Internet Based Boiler Drum Level Control System Using LabVIEW" .

[4] Erickson.V.L. Carreira-Perpin M. and Cerpa A. E. (2014),'Occupancy modeling and prediction for building energy management', ACM Transactions on Sensor Networks (TOSN), Vol. 10, No. 3,pp. 42-65.

[5] Chintalapudi.K. Padmanabha Iyer A. and Padmanabhan V. N. (2010), "Indoor localization without the pain," in Proceedings of the Sixteenth Annual International Conference on Mobile Computing and Networking.

[6] Youssef. M and Agrawala A. (2005),'The Horus WLAN location determinationsystem', in Proceedings of the 3rd International Conference on Mobile Systems, Applications, and Services,NewYork, pp. 205–218.

[7] Nivedhitha S , Padmavathy A P , Susaritha U S Mentor: Dr. M. Ganesh Madhan "Development of Multipurpose Gas Leakage and Fire Detectorwith Alarm System".

[8] Stephen, B. ; Institute for Energy & Environment, Strathclyde University, Glasgow, U.K ; Galloway, S. ; Burt, G. " Self-Learning Load Characteristics Models for Smart Appliances" Smart Grid, IEEE Transactions on (Volume:5 , Issue: 5 2004.

[9] Bhargava, B; Dishaw, g. "Application of an energy source power system stabilizer on the 10 MW battery energy storage system at Chino substation," IEEE Trans. Power Syst. 13, pag 145–151 (1998).

[10] K. Sujatha and Dr. N. Pappa, Combustion Quality Estimation in Power Station Boilers using Median Threshold Clustering Algorithms, International Journal of Engineering Science and Technology Vol. 2(7), 2623-2631, 2010.

[11] M. R. Saravanan, "Incorporation of Phase Change Material ( PCM ) in Poultry Hatchery for Thermal Management & Energy Conversion Schemes of Slaughterhouse Waste in Broiler Farms for Energy Conservation – A Case Study," *2016 Int. Conf. Energy Effic. Technol. Sustain.*, pp. 291–299, 2016.

[12] L. A. Abdul-rahaim, A. Mohammed, and A. Ali, "Remote Wireless Automation and Monitoring of Large Farm using wireless sensors networks and Internet," vol. 6, no. 3, pp. 118– 137, 2015.

[13] Sung-Min Seo, Seung-Wan Kim, Jin-Woo Jeon, Jee-Hyun Kim, Hee- Soo Kim, Jung-Hwan Cho, Won-Ho Lee, Se-Hwan Paek, Food contamination monitoring via internet of things, exemplified by using pocket-sized immunosensor as terminal unit, Sensors and Actuators B: Chemical, Vol. 233, pp. 148-156, 2016.