Monitoring of Boiler via Android Application with GUI Interface

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ABSTRACT

The whole idea of this project was designed to utilize the newly enhancements of android applications in smart phones and their attraction and fast utilization in the present and coming era of the world. In industries boiler have been used for so many purpose`s so by looking at its use in the field their enhancements in monitoring tools is taking place day by day so that the better performance with efficient result with minimum efforts and hazards can achieve. So now looking all the features and advantages of smart phones we have took our thoughts to next level of precision in monitoring the boiler parameter through Android App. The idea of indulging Android app or smart phone is that it will give us mobility and fast reaction time to the ongoing situation without using the so much man power which includes more error chances in controlling the parameter of boiler. By adding its information to an Android app, workers of the same industry can monitor it while doing some other tasks simultaneously hence it will help to save time, cut manpower and improve the overall efficiency of the system.

Keywords: Boilers, Android application, boilers in industries.

INTRODUCTION

The basic aim behind this idea is that to design and utilize the automated system control for boiler by using android application implemented as a Graphical User Interface (GUI) with a Programmable Logic Controller (PLC).

BOILER COMPOSITION

The boiler is composed of some important materials. Like vessels. Boilers composed of very strong wrought iron which is also feasible with its construction. The boilers are made up of hot fireboxes

which are build by using copper due to its greater thermal conductivity and better formability but is now being replaced by another material called steel due to great increase in it price.

MATERIALS AND METHOD

HARDWARE

The hardware apparatus and their synchronization with the application work plays a vital role for the stability, performance and utilization to the max extent of the boiler can achieve. The boiler is categorized in to two main objects "Hardware and Software". The hardware involves all the electronic and controlling components required to obtain the maintained and extract the desired controlled results successfully.

COMPONENTS

Components which is require to use for boilers are as follows.

Heater, Water pump ,Pressure switch, Pressure gauge, Mechanical Safety Valve, Glass Gauge Set, Pressure transmitter, Solenoid valves, Circuit Breaker, Ball Valve, Non Return Valve, Relays, Level Electrodes,
A non-return valve allows a medium to flow in only one direction. A non-return valve is fitted to ensure that a medium flows through a pipe in the right direction, where pressure conditions may otherwise cause reversed flow [1]. Pressure Transmitter in the project our System`s hardware is to be designed. The system involves all the features of hardware and software which use to produce the hot steam in boiler by holding its pressure, level and temperature. The controlling element like pressure valve will maintain the stability and overall performance of the designed system. By automating the system and continuously monitoring through a GUI as an interface on android application.

The basic structure of boiler has two portions called chamber, one holds water while other keep steam. In this water is heated to produce steam of it through heater this process is done by the tube which is directly connected to heaters, when water passed in these hot tubes it gets boiled and convert in to steam. The temperature is continuously monitored by putting thermocouples in it provides accurate temperature and by using these readings on PLC boiler`s temperature control can vary according to requirements.
A Programmable Logic Controller, or PLC, is more or less a small computer with a built-in operating system (OS). This OS is highly specialized to handle incoming events in real time, i.e. at the time of their occurrence [2].Temperature reading can be easily be read continuously through using the Schneider's PLC, Temperature Module TMD 200.These analog reading obtain from Temperature and Pressure sensor are fed in to this module to scale the readings according to the program stored in PLC. Schneider`s PLC is perfect for this kind of simple application due to its ease in programming structure.

METHODOLOGY

The boiler should work in the following sequence if reliable results are desired.

1.   The boiler should be start manually.
2.   The pump gets activated.

3.   The level sensor will maintained the level of water.
4.   4Temperature sensor will maintain the temperature of boiler.
5.   To maintain the desired pressure there should be a pressure sensor which keeps the pressure of boiler inside the defined pre-set limit.
6   A valve will be used for pressure control for the security purpose.
7   The steam is then utilized for different useful purpose.
8   This whole process can be monitored on a android application work as an GUI for this system.

SYSTEM SOFTWARE
 OPC SERVER

The word "OPC" comes from "OLE (Object Linking and Embedding) for Process Control" is the original name for a standard specification developed in 1996 by an industrial automation industry task force.
The OPC Server is a powerful, easy-to-use server software package providing access to real-time process information in Protection and Control devices throughout any Sub-station Automation System, SCADA system, Process Automation system (Distribution Control System), or other system with OPC Client support [3]. OPC is a software interface standard that allows Windows programs to communicate with industrial hardware devices. After the initial release in 1996, the task force, established a year earlier, releases version 1.0 of a simplified OPC specification for Data Access (DA) in August. Within the first year, several other software and hardware vendors began using OPC as their mechanism for interoperability .It soon becomes clear that a more formalized organization of compliance, interoperability, certification and validation is necessary. The OPC Foundation is established at the Chicago ISA Show in September.

ORIGIN AND USES

OPC Data-Access (OPC DA). It means how the data can be transferred among data sink and data source in real time.

Figure 1: OPC Cloud Computing

DESIGN

OPC was aimed to offer a common link for process control hardware and Windows based software applications. From plant floor device, standards state stable approaches of retrieving field information however steps carry on similar nevertheless data source and its type. Server of OPC

offers similar approach for one hardware device as for client of OPC to get its information and it remains similar for any extra hardware device and for every other OPC server .As to interface two, the main purposes were to decrease the struggle necessary from software companions, SCADA, their hardware producers & further producers of HMI. For fresh hardware devices, hardware producers established servers of OPC so their efforts were completed that they can access their devices fully, efforts of SCADA manufacturer were completed to access to hardware and with the present compliant server of OPC when they established their client of OPC **.** SCADA systems range from simple configurations to large, complex projects. Most SCADA systems utilize HMI(human-machine interface) software that allows users to interact with and control the machines and devices [4]
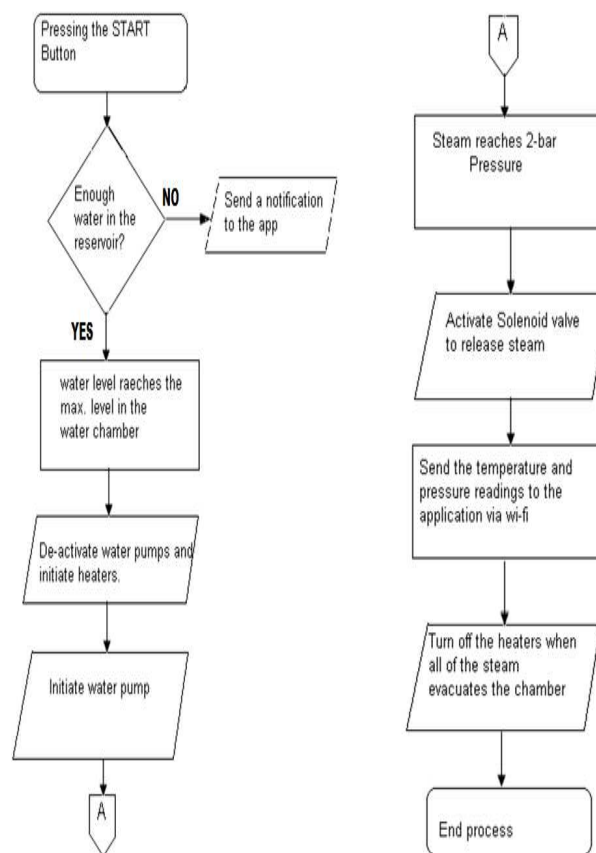
SYSTEM FLOWCHART:

Figure 2: Overall System Working Flow

SOFTWARE PROGRAMMING

 ECLIPSE

Eclipse is a Java-based open source platform that allows a software developer to create a customized development environment (IDE) from plug-in components built by Eclipse members. Eclipse is managed and directed by the Eclipse.org Consortium [5]

Eclipse is open for persons and administrations who hope to cooperate on commercially-welcoming open source software. Its schemes are dedicated on constructing an open improvement platform

consist of extensible structure, apparatuses and runtimes for constructing, organizing and dealing software through the lifespan. Eclipse Foundation is a nonprofit, participant supported organization that hosts the Eclipse projects and supports, encourage together open source community and environment of yields and facilities.

ANDROID

In the last 15 years OS established very much. Android was built from the ground-up to enable developers to create compelling mobile applications that take full advantage of all a handset has to offer. It was built to be truly open [6]. Android is common with expertise corporations which need a handy, little price and customizable operating system for big technology devices. Android's open nature has a huge community of inventers and fanatics to practice the open-source encryption as a foundation for community-driven plans, which enhance new-fangled structures for innovative operators or else take Android to devices which were legitimately released running further operating systems.

For software development of the application we have used Eclipse software and saved the application in android JAVA then mounted it in an Android supported handset. The look of the HMI/ application appears similar this:
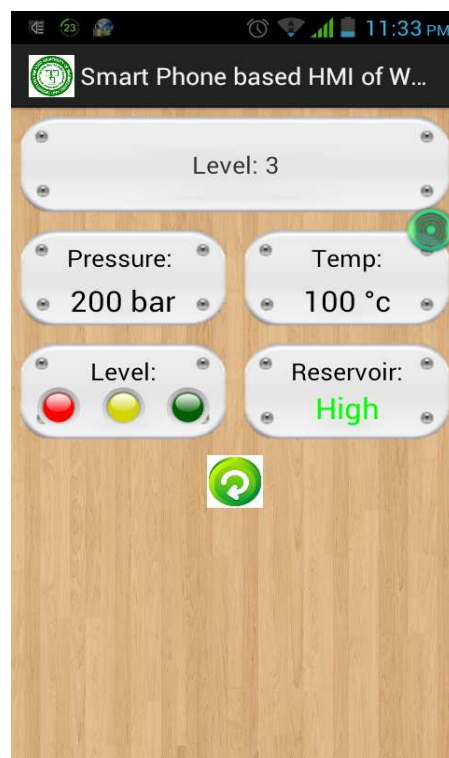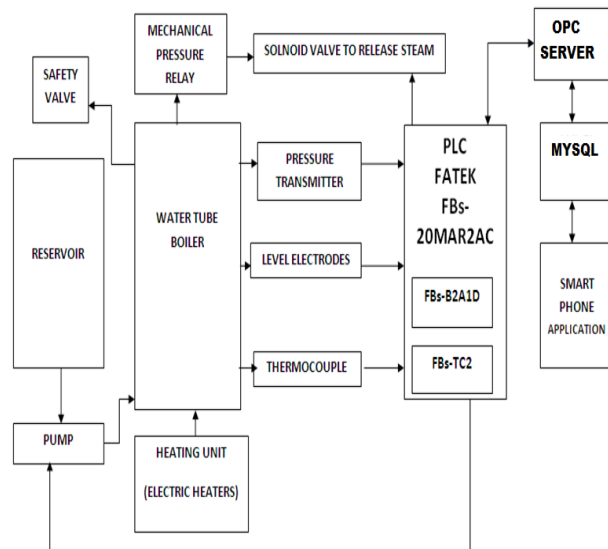

Figure 3: Smart Phone Based HMI Display

BLOCK DIAGRAM OF SYSTEM:

Figure 4: Block Diagram of Design

CONCLUSION

The main goal of our project was to automate the overall system (boiler) and control the parameters like temperature, pressure etc. we are controlling the parameters digitally and analogously and try to reduce the human interaction. Using different sensors and valves to make the system efficient safe and secure. All the parameters are monitored and controlled through GUI (Graphical User Interface) display as it is the perfect replacement of manual work.

FUTURE ENHANCEMENT

For future work, more data can be integrated into the application and more parameters can be monitored. Also, many other industrial instruments can be monitored and controlled with the help of application from a smart phone.

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