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A Multi Sensor Intelligent Device For Real Time Multi Phase Flow Controlling In Thermal Power Plant

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ABSTRACT-This paper presents the development of a multi-sensor intelligent device for real-time multiphase flow controlling in thermal power plants. The device integrates several sensors, including a current sensor, a temperature sensor to accurately measure the flow of temperature and current of the multiphase in the power plant. The device uses an intelligent algorithm that takes input from the sensors and dynamically adjusts the control valves to regulate the flow rate, thus maintaining the desired flow rate while ensuring efficient and safe operation. The proposed device has been tested and validated in a laboratory environment and shows promising results for real-time flow control in thermal power plants. This device has potential for improving the safety, efficiency, and reliability of thermal power plants.
KEYWORDS: Current sensor, Tempearture sensor, Multiphase flow

I. INTRODUCTION

A multi-sensor intelligent device for real-time multiphase flow controlling in thermal power plants is a cutting-edge technology designed to enhance the efficiency and safety of power plant operations. This device is equipped with advanced sensors that can monitor multiple parameters such as temperature, pressure, flow rate, and composition of fluids in real-time. It provides valuable insights into the complex multiphase flows occurring in thermal power plants, which are critical for optimizing the performance and minimizing the environmental impact of these facilities.This device has the ability to intelligently control the multiphase flow in thermal power plants, which is crucial for ensuring safe and efficient operation. It utilizes advanced algorithms and machine learning techniques to analyze the data from various sensors and make real-time decisions to adjust the flow rates of different fluids as needed. Also it provide the real time solution to the falut occurred in the plant. This ensures that the power plant is running at optimal efficiency while minimizing the risk of accidents and reducing emissions.

II. MOTIVATION TOWARDS THEWORK

Themainmotiveisto improve the efficiency and reliability of the power plant by developing a system that can accurately measure and control the flow of multi phases in real-time. The device should be able to monitor the temperatures, current, and other relevant parameters of each phase and use this information to optimize the operation of the power plant. The device should also be designed to be robust and durable, able to operate in harsh industrial environments and withstand high temperatures and pressures. It should be able to integrate with existing control systems and provide accurate and reliable data for decision-making processes. Ultimately, the objective is to increase the efficiency and profitability of the power plant by reducing downtime, minimizing waste, and improving the overall performance of the plant. This can be achieved through the development of an intelligent multiphase flow controlling device that provides real-time data and control of the

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different phases in the system.

III. OBJECTIVE OF THEPROJECT

- To monitor the flow rates of each phase in real-time, allowing the plant to optimize the flow rates to maximize energy production while minimizing energy waste.
- To monitor the pressure and temperature of the flow system to ensure that the system is operating within safe parameters and to prevent damage to the system.

By showing an alarm message to the assistant engineer on the other side, it is used to control the phase fault. The goalof the research has always been to prevent phase flows and enhance the efficiency and safety of the plant.

IV. EXISTING SYSTEM

The existing system isabout IOT Based remote monitoring for HT motor. HT motor were normally used widely in the industrial field in which it works on 3.3kv,6.6kv and in11kv. If any fault occurs, that causes HT motor to be failure. Which it leads to an shut down of generating station or in industrial field and there will be an chance of occurrence of heavy loss. To avoid such a failure, an continuous monitor had to be done. The motto is to continuous monitoring of various parameters of motor like speed, vibration, temperature, current and voltage of HT motor and controls it by using an IOT [1].The continuous monitoring of HT motor will leads to be an avoidance of such a failure in motor, which were used in the industrial field.vibration which can exit beyond its limits may lead to critical situation and motor cannot be handle over it [2]. When the temperature of the motor rise, there is an occurrence of stator and rotor winding to be damage and also an possible of getting explore of motor. The health of HT motor can be viewed by continues monitoring. So that we can avoid the fault and can maintain issue of the motor [3]. In which this also provide an avoidance of insulation failure and reduce the maintenance cost [4].

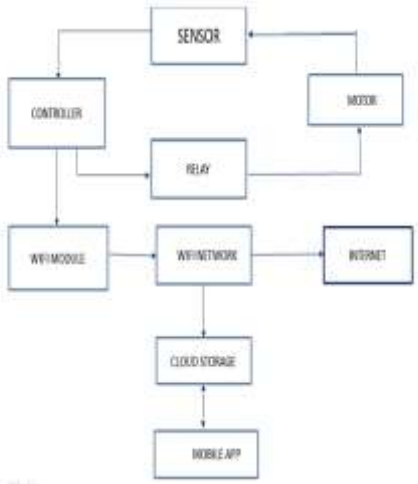

Fig.1 Block diagram of existing system

V. PROPOSEDSYSTEM

The concept of a multi sensor intelligent device for real time multiphase flow controlling in thermal power plants using a PIC controller, three transformers, six PT100 and CT100 sensors, an LCD, and IoT has the potential torevolutionize the way these power plants operate. The device would allow for real-time monitoring of the multiphase flow in the thermal power plant, providing precise and accurate readings for accurate and efficient control of the process. The transformer conduct the power from generation system. The current transferred to the power plant through this transformers. On the period of transferring if the current or voltage is going high or less will make an huge impact on the plant. So to prevent from those issues the flow control method was proposed. The PT100 & CT100 sensors are used to control the level of current & temperature in the plant. If the phase mismatch or phase fault has been occurred during the power transmission, the sensor sense the problem and send the real time alert message through IOT (internet of things). The assistant engineer know when and where the problem was occurred in the plant through LCD display.

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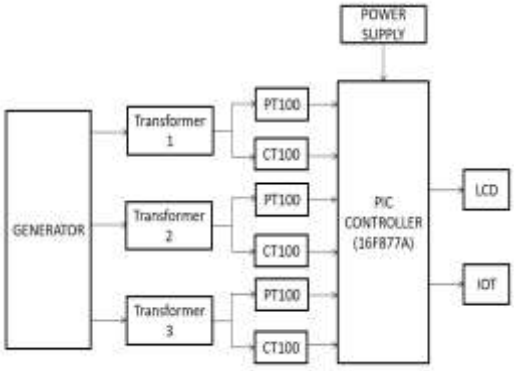

Fig.2 Block diagram of proposed system

VI. COMPONENT DESCRIPTION PIC CONTROLLER

- PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller" now it is "PIC" only.It is an 8-bit PIC microcontroller that comes with 40-pin interface (PDIP). It is based on Flash type memory. The High-Performance RISC CPU is incorporated inside the device that comes with only 35 single-word instructions, targeting mainly two types of instructions: single cycle and double-cycle. Its features, pinout and pin description, main functions, memory interface, compiler and burner used and applications.It features 256 bytes of EEPROM data memory, 368 bytes of RAM, and program memory of 14K.This microcontroller version incorporates CPU, timers, 10-Bit ADC and other peripherals that are mainly used to develop a connection with external devices.The timer mode is mainly used to increment the instruction cycle while the counter mode plays a vital role to increment the rising and falling edge of the pin.This module involves two pins known as TX and RX where former is used for transmitting serial data while later is used for receiving the serial data across the attached devices.

Fig.3 PIC controller

TRANSFORMER

A transformer is a static device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction. This is a very useful device, indeed. With it, we can easily multiply or divide voltage and current in AC circuits. Indeed, the transformer has made long-distance transmission of electric power a practical reality, as AC voltage can be "stepped up" and current "stepped down" for reduced wire resistance power losses along power lines connecting generating stations with loads. At either end (both the generator and at the loads), voltage levels are reduced by transformers for safer operation and less expensive equipment. A transformer that increases voltage from primary to secondary (more secondary winding turns than primary winding turns) is called a step-up transformer. Conversely, a transformer designed to do just the opposite is called a step-down transformer.

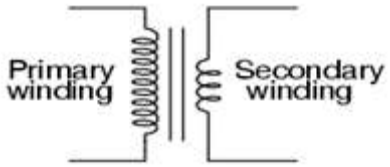

Fig.4 Transformer

CURRENT TRANSFORMER (CT)

A **current transformer** (**CT**) is used for measurement of alternating electric currents. Current transformers, together with voltage (or potential) transformers (VT or PT), are known as **instrument transformers**. When current in a circuit is too high to apply directly to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. A current transformer isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry.

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Like any other transformer, a current transformer has a primary winding, a magnetic core and a secondary winding. The alternating current in the primary produces an alternating magnetic field in the core, which then induces an alternating current in the secondary winding circuit. An essential objective of current transformer design is to ensure the primary and secondary circuits are efficiently coupled, so the secondary current is linearly proportional to the primary current.

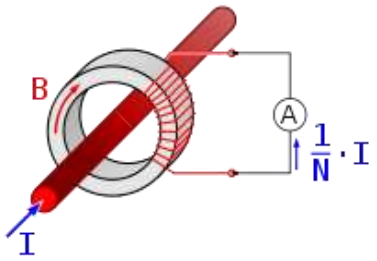

Fig.5Current Transformer

POTENTIAL TRANSFORMER (PT)

A **voltage transformer theory** or **potential transformer theory** is just like a theory of general purpose step down transformer. Primary of this transformer is connected across the phase and ground. Just like the transformer used for stepping down purpose, potential transformer i.e. PT has lower turns winding at its secondary. The system voltage is applied across the terminals of primary winding of that transformer, and then proportionate secondary voltage appears across the secondary terminals of the PT.The secondary voltage of the PT is generally 110 V. In an ideal **potential transformer** or **voltage transformer**, when rated burden gets connected across the secondary; the ratio of primary and secondary voltages of transformer is equal to the turns ratio and furthermore, the two terminal voltages are in precise phase opposite to each other. But in actual transformer, there must be an error in the voltage ratio as well as in the phase angle between primary and secondary voltages.

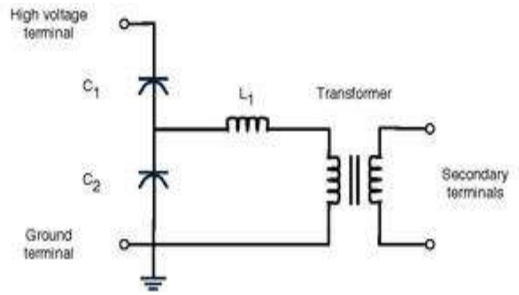

Fig.6 Potential Ttransformer

LIQUID CRYSTAL DISPLAY (LCD)

LCD is a type of display used in digital watches and many portable computers. LCD displays utilize to sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in lap top computers. Technical achievements has resulted in brighter displace, higher resolutions, reduce response times and cheaper manufacturing process.The liquid crystals can be manipulated through an applied electric voltage so that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of light is allowed to pass, the LCD monitor is able to display images. A backlight provides LCD monitor's brightness. Over the years many improvements have been made to LCD to help enhance resolution, image, sharpness and response times.One of the latest such advancement is applied to glass during acts as switch allowing control of light at the pixel level, greatly improving LCD's ability to display small-sized fonts and image clearly.Other advances have allowed LCD's to greatly reduce liquid crystal cell response times. Response time is basically the amount of time it takes for a pixel to "change colors", in reality response time is the amount of time it takes a liquid crystal cell to go from being active to inactive.

Fig.7 LCD Display

INTERNET OF THINGS (IOT)

The 'Thing' in IoT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact with internal states and the external environment, which in turn helps in decisions making process. In a nutshell, IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices – all of which gather and share data about how they are used and the environments in which they are operated. A developer submits the

application with a document containing the standards, logic, errors & exceptions handled by him to the tester. Again, if there are any issues Tester communicates it back to the Developer. It takes multiple iterations & in this manner a smart application is created. Similarly, a room temperature sensor gathers the data and sends it across the network, which is then used by multiple device sensors to adjust their temperatures accordingly. For example, refrigerator's sensor can gather the data regarding the outside temperature and accordingly adjust the refrigerator's temperature. Similarly, your air conditioners can also adjust its temperature accordingly. This is how devices can interact, contribute & collaborate. IOT systems allow users to achieve deeper automation, analysis, and integration with in a system. They improve the reach of these areas and their accuracy. IOT utilizes existing and emerging technology for sensing, networking, and robotics. IOT exploits recent advances in software, falling hardware prices, and modern attitudes toward technology.

VII. CONCLUSION

The controlling of multiphase flow in thermal power plant has the potential to preventing accidents and minimizing the risk of equipment damage. It has improved efficiency and enhanced safety of thermal power plants by identifying potential hazards and responding to them in a timely manner. This paper has proposed to control the flow rate of multiphase in thermal power plant. The device must be able to operate in the harsh conditions of a thermal power plant, including high temperatures, pressures, and potential exposure to corrosive or abrasive materials.

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