Turbine protection system using Microcontroller in 210mw generator

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Abstract- *The protection of turbine generator systems is an important factor that has to be considered in power plant for efficient production of electricity. This project deals with monitoring temperature level of the power generator and it will be compared with the predetermined standard value through a LM35 sensor. Once if it exceeds the predetermined value then the cooling fan will be automatically turn ON will be useful to prevent the motor from fault or failure. It consists of 16*2 LCD display, LM35 sensor, a coolant fan and a microcontroller [ATMEGA328P]. The temperature is increased the turbine is rotated in its axial position which may lead to major damages in the axial position of the turbine generator. To over comes, a LM35 sensor is fixed with the microcontroller which senses the temperature and once the temperature value exceeds the standard (540 degree) temperature the coolant fan will be automatically turned on and the heat of the steam will be compensated by the cooling air produced by the coolant fan.*

Keywords- Arduino UNO, LCD Display, Coolant fan, LM35 temperature sensor, L293D motor driver, Stepper motor, Transformer, Bridge Rectifier.

I. INTRODUCTION

Nowadays electrical energy plays a vital role in many different industries like textile, chemical, steel, mining, petroleum, manufacturing, etc. So the protection of turbine `generator systems is an important factor that has to be considered in power plant for efficient production of electricity. This project deals with monitoring the turbine which temperature level of the turbine generator the power and it will be compared with the predetermined standard value through a LM35 sensor. In Mettur Thermal Power Station consists of four units with a generation of 840MW. Each generator has a capacity of 210MW, 15.75Kv and 3 phase output. The main aim is to improve cooling system of the generators used in thermal power plants which in turn results in improving the efficiency of the generator. When the efficiency is increased people will be benefitted due to increase in power production and also the protection of generators improvised. The winding temperature of the coil will be increased due the continuous generation of the power from the generator. Non conductivity water is used to reduce temperature of generator winding. This water system is known as Stator Water System (SWS). The stator water system includes measurements of winding temperature and the current through the coil since temperature directly proportional to current (T~I). The existing system makes use of individual hard wires with relay logic, electrical contacts and individual monitoring system process complicates the present system

II. BLOCK DIAGRAM

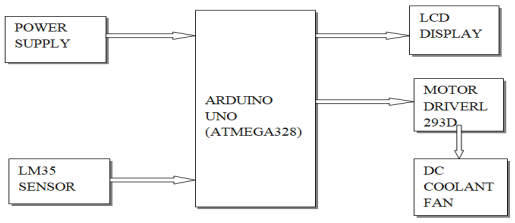
In proposed work, using Arduino the step response is given to the solenoid value, which can circulate and control the temperature by automating the coolant fan to turn on so that the stator can maintain the winding temperature at constant level. The stator cooling water plant conditions circulates and monitors the cooling water (neutral water with very low oxygen content and electrical conductivity).

2.1 Arduino.
2.2 Temperature Sensor.
2.3 Coolant Fan.
2.4 Liquid Crystal Oscillator (LCD).
2.5 Motor Driver.

The proposed work methodology is achieved by interfacing various components like temperature sensor, coolant fan and LCD display to the arduino board. The power generation on the steam generator is normally high. Due to continuous generation of the power from generator, the winding temperature of the generator coil will be increased. So the coolant fan is used to reduce the generator winding temperature. The winding temperature of the generator is reduced by using the coolant fan if it exceeds the predetermined temperature. Hence the standard temperature is maintained. Block diagram of the proposed system is explained below

The protection of turbine generator systems is an important factor that has to be considered in power plant for efficient production of electricity. Our project deals with

monitoring temperature level of the power generator and it will be compared the predetermined standard through a LM35 sensor. Once if it exceeds the predetermined value then the cooling fan will be provided to the generator which will be useful to prevent the motor from fault or failure.



Arduino

Arduino is an open source prototyping platform based on hardware and software. The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. Arduino UNO board synchronize the temperature of the power generator winding as an input to the arduino. The input is measured by using the temperature sensors in the analogue form and this gets converted into digital form using analogue to digital convertor (ADC) which is inbuilt in the arduino. The predetermined value of the temperature is programmed into the arduino. The actual input that is the temperature is compared with the predetermined value which is programmed in arduino. If there occurs any variations in the compared value then it will sends the signal to the driver circuit to automate the coolant fan to control the temperature of the generator.

Temperature Sensor

LM35 sensor is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35 sensor, the temperature can be measured more accurately than a thermistor. Temperature sensor is used to measure the heat developed in winding of the generator in analogue form and the data is fed to the arduino in digital form.

Coolant Fan

The coolant fan is fixed to the arduino which is connected to the LM35 sensor. Once the temperature of the winding generator exceeds the predetermined value, the coolant fan will be automatically turns on and the temperature will be compensated by the cooling air produced by the coolant fan and it will help to maintain the temperature of the generator.

Liquid Crystal Oscillator (LCD)

Liquid Crystal Oscillator (LCD) screen is an electronic display module and find a wide range of applications. A 16*2 LCD display is a very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

All these operations are monitored in LCD display which is interfaced with arduino. It displays the predetermined value of the temperature. In abnormal condition, the variations in the temperature will be displayed in the LCD display. According to the variations the coolant system is activated and the current status of the coolant system is also displayed.

Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller

III. PROPOSED MODELLING

The ultimate aim of our project is to automate the existing system and to increase the efficiency of the turbine generator by reducing the temperature when it exceeds the predetermined value by using the coolant fan so that the temperature will be controlled and maintained within its predetermined value

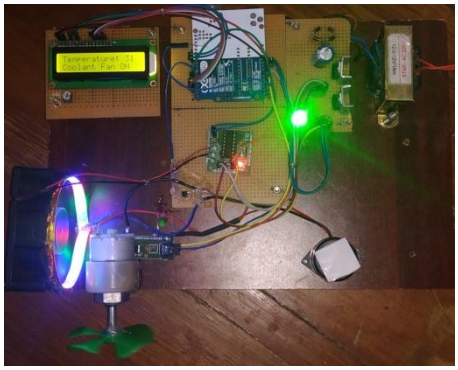
IV. CONCLUSION

The stator water cooling system will increase the efficiency of power generator by reducing the heat developed in the winding of the power generator by using the cooling air from the coolant fan. This is achieved by automating the coolant system to turn on when the temperature is high. In this system the stator winding of power generator was fully

monitored in the LCD display. The cooling air into the stator will lead to effective control and maintenance of the temperature in the stator winding with more sensitivity which prevent the increase in winding temperature in case of any sudden increase in the load of the power generator. It adopts man-machine dialogue interface and large screen LCD character display technology and is prominent in displaying the characters, stable and reliable temperature control system. It has automatic control circuit, stable and reliable air flow system using coolant fan. When this project executed the complex existing system easier and user friendly and reduces the cost of the controller. The outcome of our project will have more sensitivity and accuracy.

V. RESULT

Temperature is measured and monitored continuously using the LCD display. If the temperature of the winding is less than or equal to 29°C then the system is in normal condition. In Figure the temperature is 29°C which is in normal condition.



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