

Study Of PLC & SCADA Controlled Thermal Power Plant

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Abstract - Thermal power plant consist of many important equipment which is required for the generation such as boiler ,coal conveyer belt ,ash handling plant ,cooling system etc. These equipment requires continuous inspection and monitoring .this paper outlines the automation of boiler & coal conveyer .Automation leads to greater efficiency & reliability .The automation is achieved by using PLC& , SCADA. PLC & SCADA is connected through communication cable .This paper focuses on passing the inputs to the equipment so that equipment operation must not get affected .SCADA is used for monitoring the operation of equipment and PLC is used to control the operation . The different sensors are used to sense different parameter such as temperature, pressure, tearing of belt, overloading, water level etc. If the parameter exceed the predetermined value the n it is informed by SCADA system to the operator.in order to automate the boiler and coal conveyer belt the ladder logic is developed. The SCADA screen shows the status of equipment so that operator can take necessary corrective action. In case of emergency different automated check valves are used to release pressure, steam and inform the concerned authority through alarm. The most common Faults in coal conveyer belt are belt tear up fault, moisture content and overloading fault

Key Words: Communication cables, Programmable Logic Controller (PLC), Power Plant, Supervisory Control and Data Acquisition system (SCADA)

1. Introduction

In thermal power plant the demand for higher reliability & efficiency is increasing. Power plant requires continuous inspection & monitoring after regular intervals. There may be chances of errors while measuring at various stages by human workers. In order to increase reliability the automation is needed so that overall efficiency of power plant get improved. The automation is developed by using PLC & SCADA which reduces the errors caused by human workers .PLC is programmable logic control. It is used for implementing various function such as sequencing, timing, counting, logic, arithmetic control through analog and digital input output modules. In order to store the programme in PLC it must be interfaced to computer via interfacing unit. The programmed can be implemented through various languages. In this paper ladder logic is used for programming .SCADA system is used to supervise a complete

process. The output of different sensors is given to the PLC which takes necessary action to control the parameter. SCADA system consist of subsystem such as human machine interface, remote terminal unit, and programmable logic control and communication cable. The alarm system is also provided to inform the operator. SCADA is used to monitor water level, temperature, pressure using different sensors and corresponding output is given to the PLC. For controlling these parameter. In coal conveyer belt the belt tear up, overloading and moisture content is sense by different sensors. The sensor used are IR sensor, temperature sensor, and humidity sensor.

2. Objective

To develop a programming for automation of boiler and coal conveyer belt and ash handling plant by using PLC & SCADA .The automation is achieved by developing a ladder logic for controlling various parameter of boiler, coal conveyer belt, and ash handling plant.

3 NEED FOR BOILER AUTOMATION

Boiler produces steam at very high temperature. Boiler requires continuous inspection and monitoring at regular interval. Boiler steam temperature in thermal power plant is very high .It is difficult to control boiler temperature manually as it may cause serious injury to human workers. The boiler temperature should not be too high or too low. It must be kept within permissible limits. Various mechanism are used to control the temperature of boiler so that boiler works properly. For reliable operation it is necessary to develop automation for boiler. The automation is achieved by using PLC & SCADA

3.1 BOILER AUTOMATION USING PLC AND SCADA

In boiler the control parameters are temperature control, pressure control, and water level control. These parameter are control by temperature sensor, float switches and pressure sensors .Temperature sensors are used to sense the variation in the temperature. Temperature sensor is passive element. RT pressure sensors are used to sense the variation in pressure inside the boiler. Whereas float switches are used to detect the liquid level float switches are available from low range to high range. Float switch output is given to PLC and

necessary corrective action are taken if required. The diagram for automation o boiler by using plc.

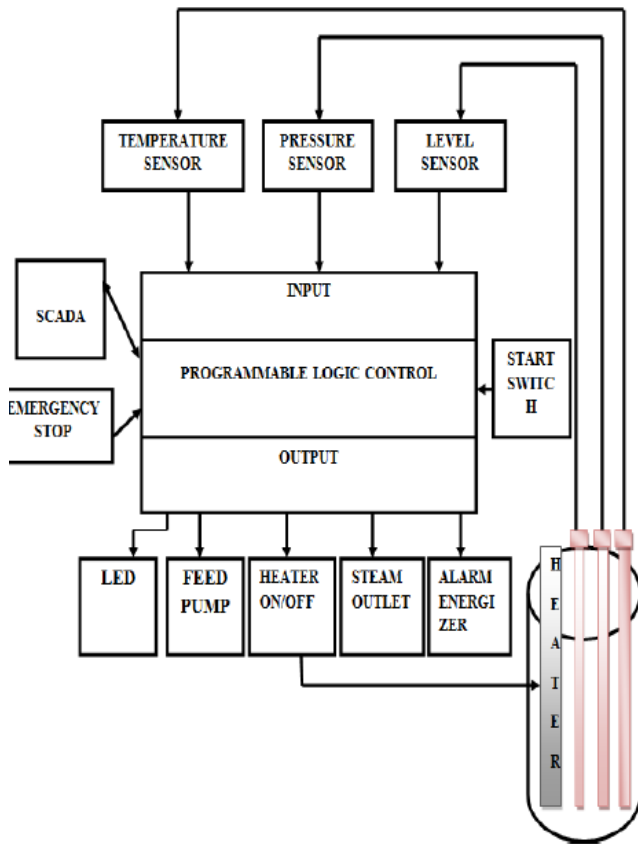


Fig.1.Ladder Diagram for boiler

Boiler automation ladder diagram was simulated using totally integrated automation. For ease of PLC programming ladder diagram is.

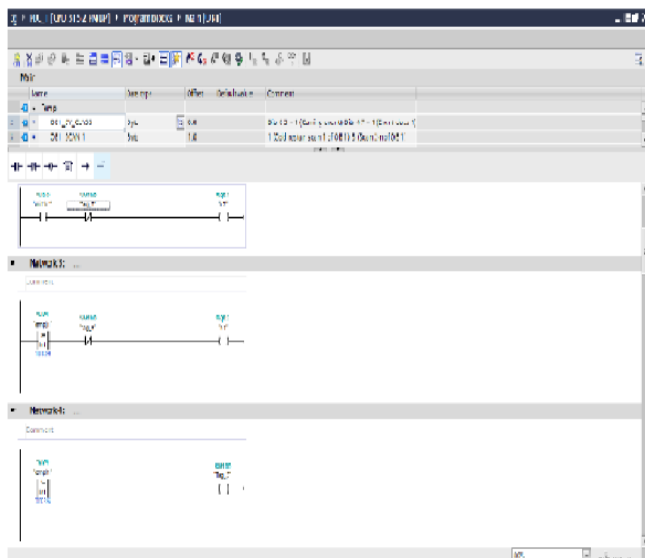


Fig.2. Ladder for controlling temperature

The ladder diagram for controlling Pressure and the Temperature. When X1 is switched ON heater 2 will ON. When the temperature exceeds more than 10000 C heater 1 will switch ON. If the temperature exceeds 15000 C both heaters will switched off.

If pressure exceeds 10bar then automated check values switched on to release the steam and pressure and the alarm circuit will be energized. For controlling the pressure the ladder is developed as follows;

The ladder for controlling pressure

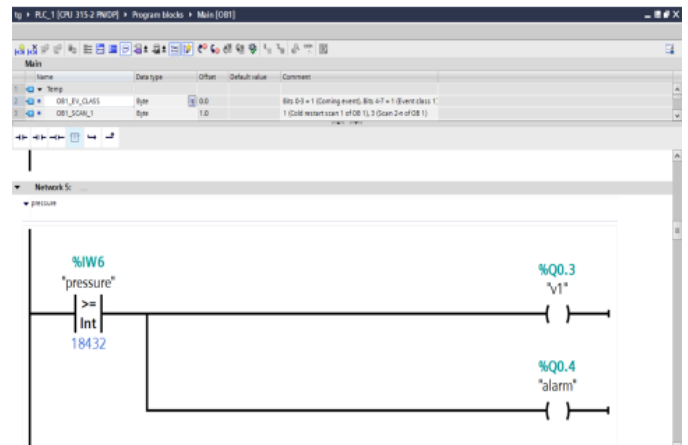


Fig.3.ladder for pressure

The ladder for controlling flow rate

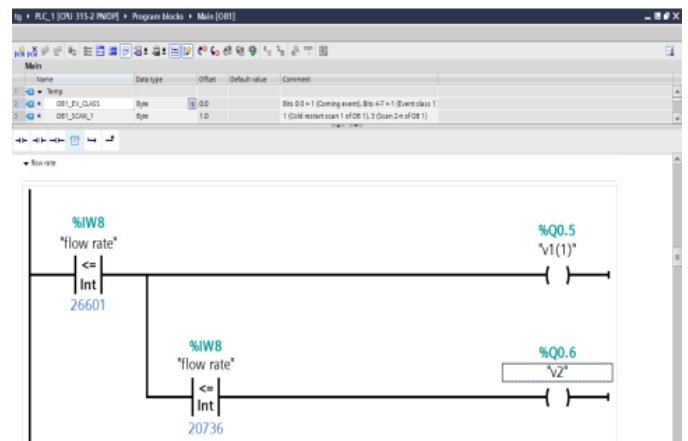


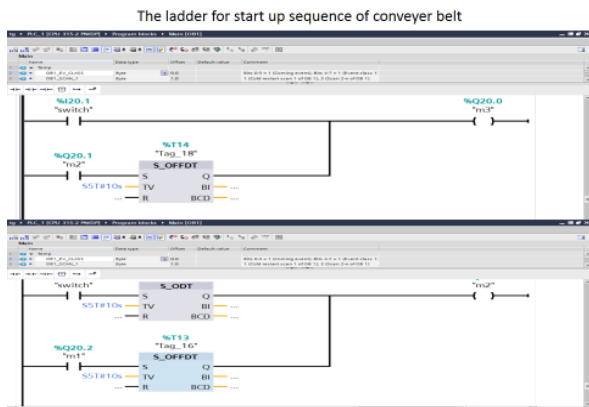
Fig.4. ladder for controlling flow rate

4. Automation Coal Conveyor Belt Fault Detection

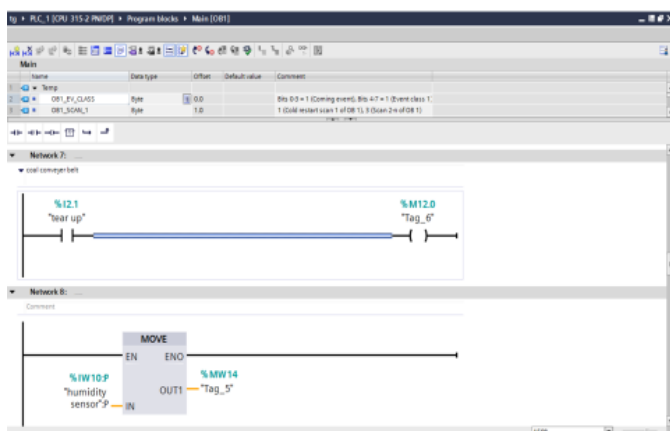
Automation will overcome the drawbacks of existing system by detecting faults using different various sensors such as IR sensor, proximity sensor, humidity sensor and temperature sensor in the operation of Siemens PLC and SCADA Wonderware intouch. In this way the tear up in the conveyor belt is detected using the IR sensor.

The rise in temperature is automatically detected by temperature sensor. The moisture content is detected by using humidity sensor, the overloading of load on the conveyor belt is detected by proximity sensors, thus with the help of all these sensors automatic and immediate fault

detection is possible, so that the damage occurring in the coal conveyor belt can be avoided. In order to avoid interlocking the sequence is decided .As the starting of the belt conveyor is done in proper sequence, starting from the conveyor belt 3, then conveyor belt 2 is started and then at the last conveyor belt 1 is started. Similarly, stopping of the conveyor belt is also done in sequence, first conveyor belt 1 is stopped, then conveyor belt 2 is stopped and then at last conveyor belt 3 is stopped.



Ladder for detecting tear up & humidity in coal conveyer belt



5. Automation of Ash handling plant

Ash disposal system consist of two slurry tank .slurry tank A and slurry tank B. pulverized coal from pulverizer come in furnace & combustion process is carried out in furnace. The burned coal converted into ash, and this ash is stored into the bottom ash hopper. This collected ash need to be removed from hopper as per the load condition. This is done by using three high pressure water pump.

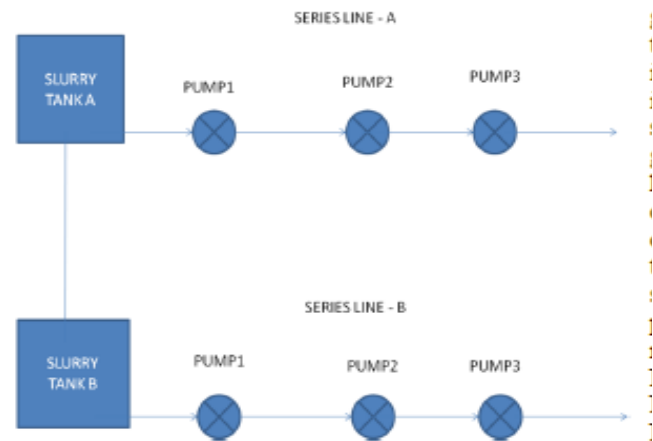


Fig. 1 Ash disposal system overview

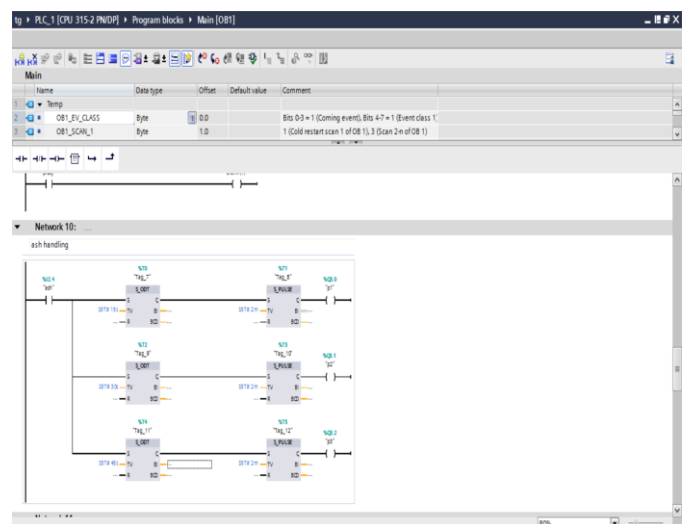


Fig.5.The ladder diagram for ash handling plant

3. CONCLUSIONS

In this paper Boiler, Coal conveyer belt, Ash handling plant ladder are developed in PLC. Different sensors are used to measure pressure, temperature and water level. Different sensors are used to the monitor and measure the parameter and PLC used to control the system operation. SCADA system are developed to estimate and monitor current operation states and to collect, analyze and diagnose fault alarm.

6. REFERENCES

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