

CONTROLLING AND MONITORING THE BOILER OPERATION USING PLC-SCADA

VEERESH BHAIRI^{a1} AND SIDDARUD BANNIKOPPA^b

^{ab}Department of Electronics and Communication Engineering, Basaveshwar Engineering College, Bagalkot Karnataka, India

ABSTRACT

This paper discuss about the controlling and monitoring of the boiler operation. Boiler is a large part in an industry which boiles the water and generates the steam. This steam can be used to run the engines or turbines. In this work Boiler operation is controlled by PLC (programmable Logical Controller), which controls the parameters such as Temperature, Pressure and water level of the boiler. This is because PLCs are very flexible, cost effective, space efficient and reduce complexity. SCADA (Supervisory Control and Data Acquisition) gets the data from the PLC and monitors on the screen.

KEYWORDS: PLC, Boiler, Water, SCADA

In earlier days all the industries were dependent on human power (machines were not automated) for monitoring and controlling of the processes. This was causing the low quality products and also production rate was less. As the industrial revolution took place, machines became automated and this increased the quality of products and also the production rate. Boiler is a large arrangement in the industries which generates the steam energy by boiling the water [Boyer, 1993]. Controlling of a boiler operation is a very important task in many industries. Controlling the boiler operation means controlling the water level in the boiler, temperature and pressure of the steam. This steam will be used to run the turbines or engines in the industries[Ezell, 1997]. In this work the PLC (Programmable Logic Controller) is used to control the boiler operation. And the SCADA (Supervisory Control and Data Acquisition) system that monitors the plant and helps reduce the errors caused by humans. This will be a fully automated system.

INDRALOGIC PLC

Programmable Logic Controller or PLC is an intelligent system of modules, which was introduced in the control, & instrumentation industry for replacing relay based logic. Over a period of time, better I/O handling capabilities and more programming elements have been added along with improvement in communication.

Interfacing

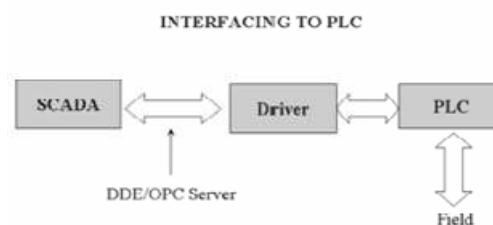


Figure 1: Interfacing of PLC and SCADA

BLOCK DIAGRAM

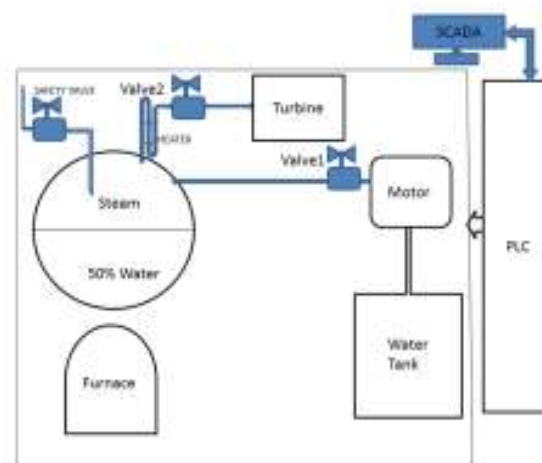


Figure 2: Block diagram shows interfacing of PLC-SCADA to the boiler plant

WORKING PRINCIPALS

Motor: Motor is used to supply the water from the water tank to the boiler. When water level in the boiler reaches 50%, motor will be turned off.

Furnace: Which supplies the heat energy to the boiler by burning the fuel like diesel, petrol or coal.

Boiler: This contains the 50% water. Whenever heat energy is supplied from the furnace which boils the water and generates the steam. This steam occupies the remaining space in the boiler and this constitutes the steam pressure inside the boiler.

Turbine: When pressure of the steam in the boiler reaches a pressure which is required to run the turbine, valve2 will be opened and turbine runs.

Safety valve: If pressure of the steam exceeds normal level, the safety valve will be opened to send out the steam from the boiler to reduce the pressure.

Table 1: Inputs and Outputs

Sl. No	INPUTS	OUTPUTS
1	Switch(s1)	Motor
2	Water level sensor(LS)	Valve1, valve2
3	Temperature sensor, pressure sensor	Safety valve, turbine

SIMULATION RESULTS

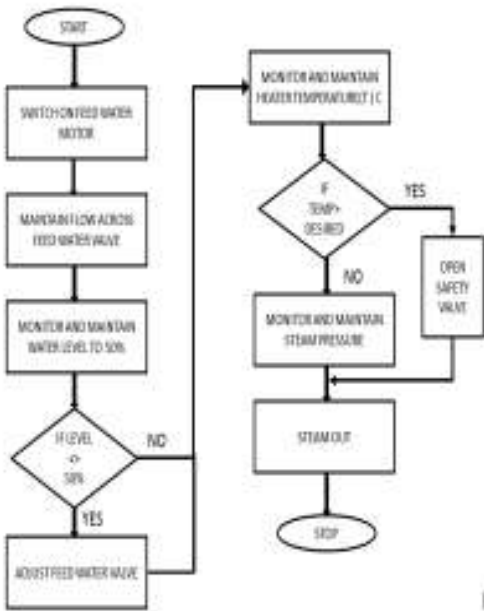
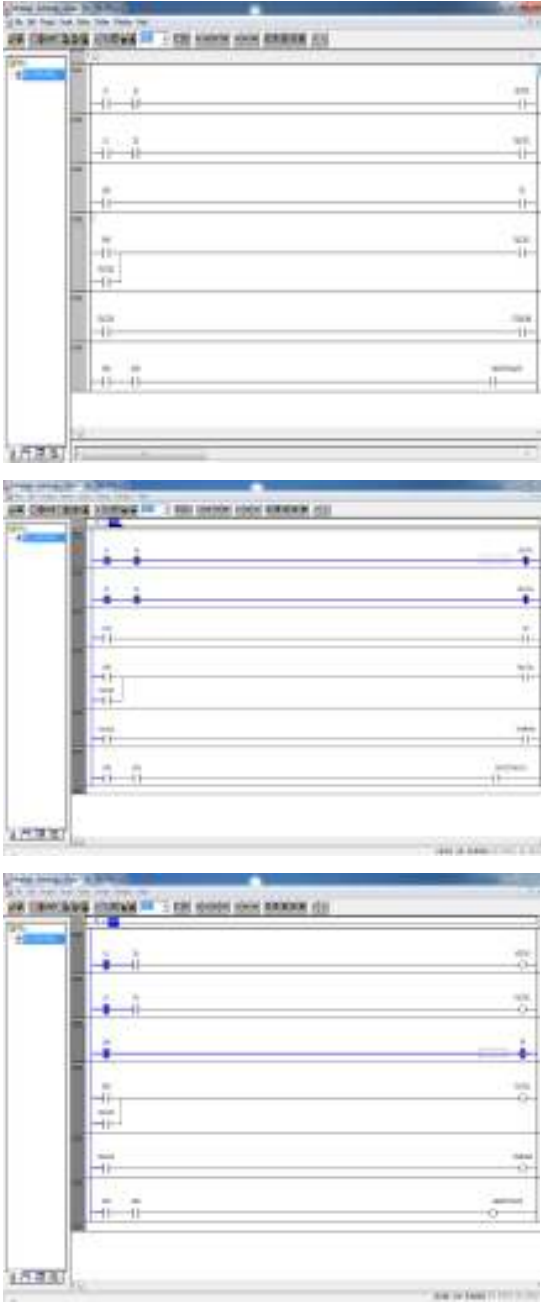
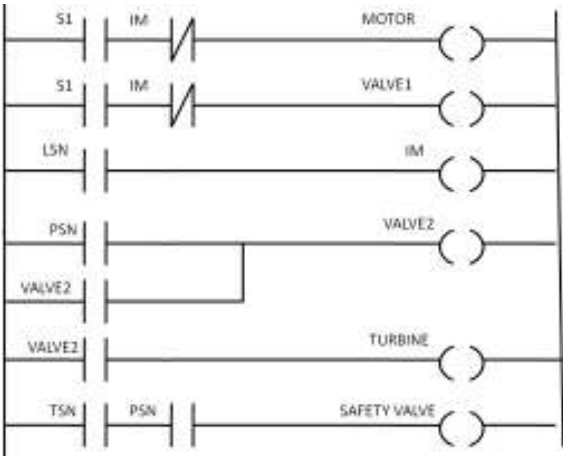
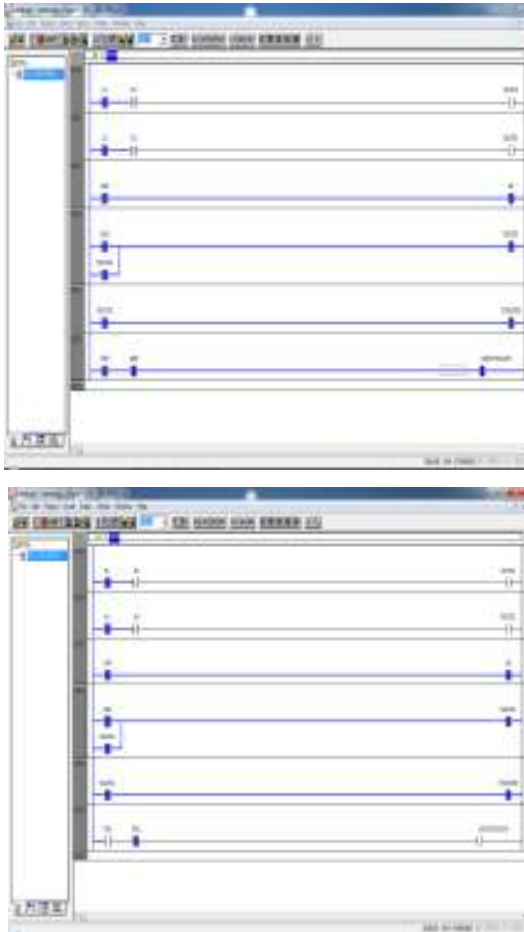


Figure 3: Flow chart

LADDER DIAGRAM





CONCLUSIONS

The most important thing in any industry is controlling of boiler operation. Controlling of boiler using PLC and SCADA gives the better

control over the boiler operation. This enhances the quality of products and makes profit to the industry.

REFERENCES

- Boyer, Stuart, A. SCADA: Supervisory Control and Data Acquisition, Instrument Society of America, Research Triangle, NC. 1993.
- Ezell, Barry, "Supervisory Control and Data Acquisition Systems for Water Supply and Its Vulnerability to Cyber Risks" available on the internet at: <http://watt.seas.virginia.edu/~bce4k/home.html>. (August 1997).
- Ezell, Barry, "Scenarios One and Two: Source to No 1 PS to No 1 Tank to No 2 PS to No 2 tank for a Master-Slave SCADA System", SCADA Consultants, SCADA Mail List, scada@gospel.iinet.au (August 1997).
- Rockwell Automation SCADA System Selection guide Allen-Bradley, Publication AG-2.1. 1998.
- Knight. U. "The Power System and its Operational and Control Infrastructure in emergencies" from contingency planning to crisis management.
- Analysis of Fault-Tolerant systems, "IEEE transactions on Computers", vol.38, No.6, 1989.