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Boiler Automation Using LABVIEW

Sivareddy Satyanarayana[1], Cheekati Jagadeesh[2], Mr. P. Kamalakar[3] and Mr. T. Suman[4]

[1, 2]Final Year B.Tech, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India
[3]Associate Professor, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India.
[4]Assistant Professor, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India.
E-Mail: kamaleee209@gmail.com

Abstract - A boiler is an enclosed vessel that provides a means for combustion and transfers heat to water until it becomes hot water or steam. The hot water or steam under pressure is then usable for transferring the heat to a process. Water is useful and cheap medium for transferring heat to a process. When water is boiled into steam its volume increases about 1,600 times, producing a force that is almost as explosive as gunpowder. This causes the boiler to be extremely dangerous equipment and should be treated carefully. The heating surface is any part of the boiler; hot gases of combustion are on one side and water on the other. Any part of the boiler metal that actually contributes to making steam is heating surface. The amount of heating surface of a boiler is expressed in square meters. The larger the heating surface a boiler has, the more efficient it becomes. A gas/oil central heating boiler (heat generator) is like the engine of a car, this provides the heat that the facility needs to warm itself up. The size of the boiler is matched to the size of the facility.

Keywords - Boiler, Heating, Engine, Automation, LABVIEW

I. INTRODUCTION

The ideal size for a boiler is one that just copes adequately on the coldest day of the year. Most boilers are oversized by at least 30%. This is due to the way systems used to be calculated with a card calculator. These were always over-calculated "to be on the safe side." Today, the emphasis is on energy conservation, and the fact that heat loss calculations can be done very accurately, means there is no need to oversize. This allows smaller radiators and less water in the system, which in turn, means a smaller boiler and reduced costs for both installation and fuel bills. The boiler does not directly govern the amount of radiators fitted to the system. It is the power of the pump and circulation of the water through adequately sized pipes that determines the number of radiators you can have. But the total output of all the radiators, pipes, and cylinders determines the size of the boiler. Boilers are pressure vessels designed to heat water or produce steam, which can then be used to provide space heating and/or service water heating to a building. In most commercial building heating applications, the heating source in the boiler is a natural gas fired burner. Oil fired burners and electric resistance heaters can be used as well.

Steam is preferred over hot water in some applications, including absorption cooling, kitchens, laundries, sterilizers, and steam driven equipment. Boilers have several strengths that have made them a common feature of buildings. They have a long life, can achieve efficiencies up to 95% or greater, provide an effective method of heating a building, and in the case of steam systems, require little or no pumping energy. However, fuel costs can be considerable, regular maintenance is required, and if maintenance is delayed, repair can be costly. The pressure vessel of a boiler is usually made of steel (or alloy steel), or historically of wrought Iron. Stainless steel, especially of the austenitic types, is not used in wetted parts of boilers due to corrosion and stress corrosion cracking. However, ferric stainless steel is often used in super heater sections that will not be exposed to boiling water, and electrically-heated stainless steel shell boilers are allowed under the European “Pressure Equipment Directive” for production of steam for sterilizers and disinfectors.

In live steam models, copper or brass is often used because it is more easily fabricated in smaller size boilers. Historically, copper was often used for fireboxes (particularly for steam locomotives), because of its better formability and higher thermal conductivity; however, in more recent times, the high price of copper often makes this an uneconomic choice and cheaper substitutes (such as steel) are used instead.

For much of the Victorian “age of steam”, the only material used for boiler making was the highest grade of wrought iron, with assembly by riveting. This iron was often obtained from specialist iron works, such as at clearator Moor (UK), noted for the high quality of their rolled plate and its suitability for high-reliability use in critical applications, such as high-pressure boilers. In the 20th century, design practice instead moved towards the use of steel, which is stronger and cheaper, with welded construction, which is quicker and requires less labor. It should be noted, however, that wrought iron boilers corrode far slower than their modern-day steel counterparts, and are less susceptible to localized pitting and stress-corrosion. This makes the longevity of older wrought-iron boilers far superior to those of welded steel boilers.

II. EXISTING BOILER AUTOMATION BY PLC SCADA

Programmable Logic Controls can provide the right solution at the right time. Using the PLC can extend your performance gains across the business with, the only integrated control and information platform that runs discrete, motion, drives, process and safety control, assuring the different automation technologies work together. While using

PLC the entire manufacturing cycle will be simple and power full technology. In this system we have to measure load with the help of CT (in case of AC/DC Motor) or PT (in case of Steam Turbine/ Hydraulic drive) & water is measure by The Water Flow Meter & all above input are feed to PLC. Controller is calculating with input & set point. On the controller's output Control valve will be operating & you will find the actual result as per you get. In this project the water level of the boiler tank is monitored with the aid of an analog interface with the Programmable logic controller (PLC).The level is then controlled by controlling the feed water input which is affected on a DC motor. The temperature in the same way is measured using a temperature sensor and the measured analog value is interfaced with the PLC.

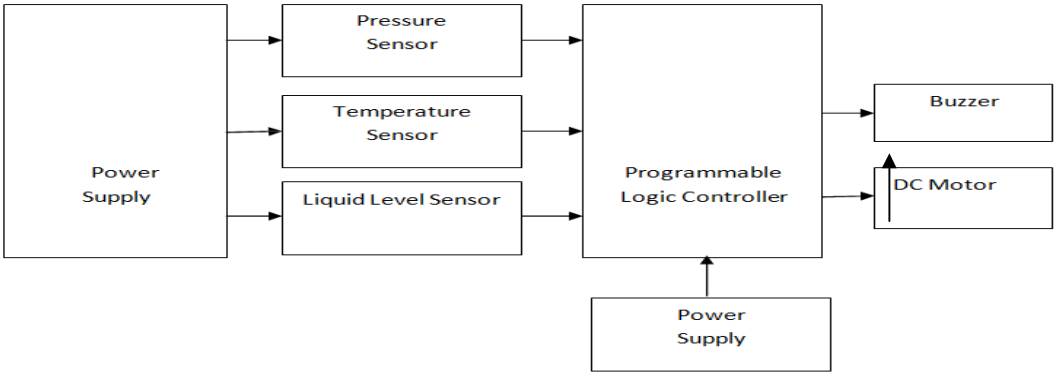

Fig. 1. Block diagram of existing system

III. Introduction To Labview

The name LabVIEW is a shortened form of its description: Laboratory Virtual Instrument Engineering Workbench. LabVIEW is a visual programming language: it is a system-design platform and development environment that was aimed at enabling all forms of system to be developed. LabVIEW was developed by National Instruments as a workbench for controlling test instrumentation. However its applications have spread well beyond just test instrumentation to the whole field of system design and operation. LabVIEW is a graphical structured dataflow language sometimes referred to as "G" - not to be confused with G-Code.

IV. Result And Discussion

In this project boiler start up controller is designed using LabVIEW. The front panel of the simulator resembling has shown in below fig 8.0 with a VI on the USB memory stick.

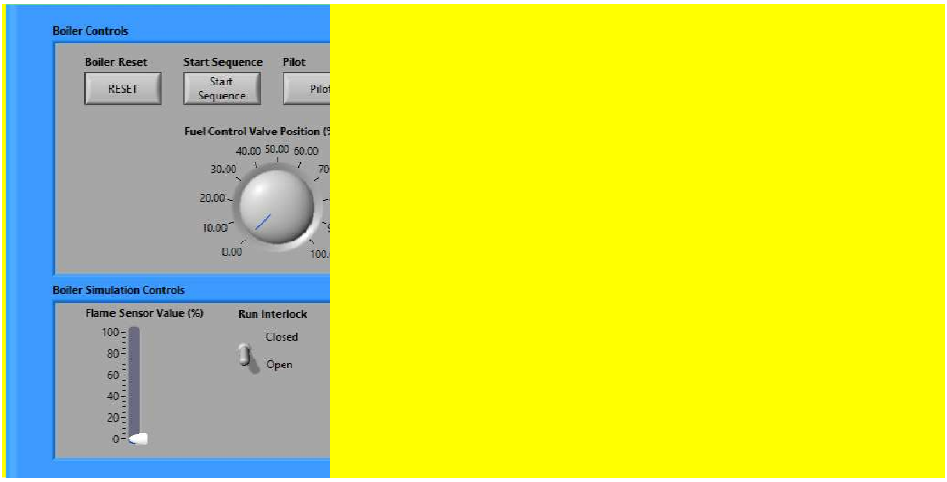

Fig. 2. Front panel of boiler automation using labview

OPERATION

The boiler start up controller allows a user to start up and shut down a boiler. The user interacts with controls on the front panel to start up and shut down the boiler and simulate conditions in the system. Indicators on the front panel display the status and the current step in the startup and shutdown process. The controller also logs events as they occur during the process.

V. CONCLUSION

The most important aspect of any power plant is the boiler control. Several techniques can be implemented to control the boiler in power plant. The method that has to be used relies on varied objectives like superior quality, increased efficiency, high profit and other such points depending upon the purpose of the company that implies it. With the prime objective of catering to these necessities and the needs of the industrial sector, significance has been given to automation. This project brought about a cost and time effective alternative for the industries by accurate measurements and control of boilers using LABVIEW. The boiler has been controlled automatically by using LABVIEW thereby it reduces the requirement of the skilled operators. This project has shown a control of single boiler and the same can be extended for the entire plant in large industries.

VI. FUTURE SCOPE

At present we have automated the feed water level monitor and the steam drum temperature. In future we would extend the automation to all the critical parameters leading to a completely automated boiler In future the system would be upgraded to find faulty sensors also using redundant logic. For example to determine the temperature of steam drum three temperature sensors would be used and the output of the three sensors would be compared. If the three sensors give the same output the output value would be used for processing. If a particular sensor fails then voting logic would be applied to generate the output. The output value produced by majority of the sensors would be used for processing.

REFERENCES

[1] Boiler Plant Automation available at http://www.microinstruments-controls.com/boiler-plant.htm

[2] Coal Power Plant available at http://coalpowerplant.us/ power-plant/water-and-steam-system-a- power-plantboiler-work/

[3] Pulverising Mill available at http://www.draxpower.com/ explore_drax/power_station/?id=1867

[4] A.V.Sudhakara Reddy, M. Ramasekhara Reddy, M. Vijaya Kumar "Stability Improvement During Damping of Low Frequency Oscillations with Fuzzy Logic Controller", International Journal of Engineering Research and Applications (IJERA), Vol.2, No.5, pp.1560-1565, September 2012.

[5] P Prasad, B Bhargava Reddy and A V Sudhakara Reddy "Power Loss Minimization in Distribution System using Network Reconfiguration with Particle Swarm Optimization", International Journal of Engineering Science & Advanced Technology, Vol.5, Iss.3, pp.171-178, May 2015.

[6] K.Surekha and A.V.Sudhakara Reddy "A New Control Topology for Smart Power Grids using Bi-directional Synchronous VSC", International Journal of Informative & FuturisticResearch, Vol.2, No.10, PP.3695-3704, June 2015.

[7] B Bhargava Reddy, D Sivakrishna and A V Sudhakara Reddy "Modelling and Analysis of Wind Power Generation Using PID Controller", International Journal For Scientific Research & Development (IJSRD), Vol.1, No.9, pp.2045-2049, November 2013.

[8] A. V. Sudhakara Reddy, Prof. M. Damodar Reddy, "Optimization of network reconfiguration by using particle swarm optimization",2016 IEEE First International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES-2016), July 4th - 6th, 2016.

[9] S.Bharathi, A.V.Sudhakara Reddy and M.Damodar Reddy, "Optimal Placement of UPFC and SVC using Moth-Flame Optimization Algorithm", International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-4046, Vol.5, No.1, pp.41-45, May2017.

[10] A. V. Sudhakara Reddy, M. Damodar Reddy and N.Vinoda, "Optimal Placement of Dynamic Voltage Restorer in Distribution Systems for Voltage Improvement Using Particle Swarm Optimization", International Journal of Engineering Research and Applications (IJERA), ISSN: 2248-9622, Vol.7, No.3, pp.29-33, March 2017.