



Feed Water Deaerator Level Control using adaptive control Technique

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Abstract: This Project deals with the Feed water Deaerator level control using adaptive control system with DCS in Thermal Power Station. Deaerator is generally employed in Chemical Industries, Process Industries, Power Plants and in Paper and Pulp Industries. The oxygen with in the boiler feed water is the main reason of boiler corrosion. Oxygen corrosion is one of biggest dangers in boiler treatment. The performance of the deaerator is to get rid of the dissolved oxygen from the boiler feed water before stepping into boiler. The removal of dissolved oxygen from the water is claimed to be deoxidization. The deoxidization system with a nonlinear structure is characterized by multi-input multi-output and its level and pressure is powerfully coupled. The pressure and level must be unbroken steady to urge eliminate oxygen in water effectively. The Deaerator system is monitored by different level and pressure with respect to the load given. If the load is high- or low-level tripping conditions are enabled to protect the boiler feed water.

Keywords- Deaerator, Pressure and level control.

I INTRODUCTION

Most industries would like steam to run their production method. There is one drawback that happens with in the boiler, that is oxygen-induced corrosion. Deaerator is a very important instrumental equipment to get rid the oxygen and carbon monoxide in condensation water and to heat the condensation water to saturation temperature. There is a significant coupling relationship between deaerator level and steam pressure. Therefore, it's going to seem characteristic modification because of the various operating conditions. Industries use an impact system to manage the deaerator.[1] The PI system seems several drawbacks, particularly during disturbance on the system. moreover, the system should suit every instrument one by one. This causes the loss of the corporate each in terms of economic and material. feed water system maintains the boiler drum level at intervals permissible limits by regulation the feed water flow in order that the feed water flow matches the steam generation rate it's monitored and controlled by easy MAX DNA[2].A deaerator may be a machine that eliminates dissolved gases, like carbon-dioxide and gas, from feedwater before it gets to a boiler and its pipeline. Within the demineralization plant, the raw drinking water content are removed in order that it becomes demineralized water. The water that goes into the deaerator is sprayed into little grains, that aims to facilitate the separation method [3]. At a similar time, steam is injected from the lowest of the deaerator to lift the water temperature of the demineralized to the boiling purpose of water. The rise in temperature causes a decrease within the solubility of the gases contained within the feed water [4]. Water and steam that enter into the deaerator at the same time can collide on the receptacle.

Water and steam mixed with this facilitate the method of separation of the gases. So, with the blending of this turbulent water resulted within the method of separation of the gases. This project is concerned with elimination of oxygen and the level monitoring of the deaerator system Via DCS monitoring.

II BLOCK DIAGRAM

2.1 Deaerator level control

Each unit has been provided with two condensers operating in parallel. Both the condensers are maintained at the same hot well level. Interlock actions shall be governed by the signals generated from instrumentation provided on any of the two condensers.

Low level: Three level switches have been provided in "2 out of 3" logic for annunciation & BFP trip. In addition to three level switches for Low level, three electronic level transmitters.

LAA01CL011, LAA01CL012 and LAA01CL013 will be used in 2 out of 3 logic for controls, alarm & interlocks. The 2 out of 3 signals shall be used under DDC for feed storage tank level control. Limit value monitoring is done in DDCMIS on the 2 out of 3 signals to generate Low level, High level & High High-level alarm, interlocks & controls.

Normal low level: In the deaerator is maintained with three element control circuit by regulating control valves CDV-22 or CDV-25 (2 x 100% capacity) on the main condensate line to deaerator with selection facility from UCB which shall be mentioned separately in Auto control schemes. The feed water signal forms the primary element in a three-element control circuit.

- i) Feed water flow
- ii) Condensate flow
- iii) Deaerator flow

The feed water control signal anticipates the change in deaerator tank level and acting through the controller, positions the condensate flow control valve CDV-22/CDV-25 to the new position. The condensate flow signal, along with extraction steam flow and HP heaters 5A & B drain flow to deaerator is a feedback signal in the control circuit which shall confirm that In case level reaches high level set point, an alarm is given in the control room.

High level: When deaerator level rises 100 mm above high-level set point, it opens the deaerator overflow control valve DRV-48 to dump the excess condensate from deaerator to LP drain flash tank. The overflow valve is closed when the level falls 100 mm below the high-level set point. Maximum passing capacity of the overflow valve DRV-48 shall be about 10% BMCR.

2.2 Deaerator pressure control

Variable pressure operation of deaerator has been envisaged in the cycle. Normally deaerator is supplied with steam from turbine extraction. The pressure in deaerator varies as per turbine extraction pressure from 3.5 ata at approximately 55% load to 6.8 ata at 100% load. A minimum 3.5 ata pressure is to be always maintained in the deaerator by pegging steam from turbine extraction/CRH line. At low loads and under turbine bypass operation when turbine extraction pressure is less than 3.5 ata, the deaerator is supplied steam from cold reheat line and pressure in deaerator is maintained at 3.5 ata. The deaerator is also provided with steam supply from low temperature auxiliary steam header from where steam is supplied to deaerator prior to and during start-up of boiler.

Two pegging control valves, one on CRH line and the other on aux. steam line from auxiliary header, are provided to maintain the deaerator at 3.5 ata. Both the pegging control valves are modulated by two pressure transmitters LAA01CP011 & CP012 in "1 out of 2".

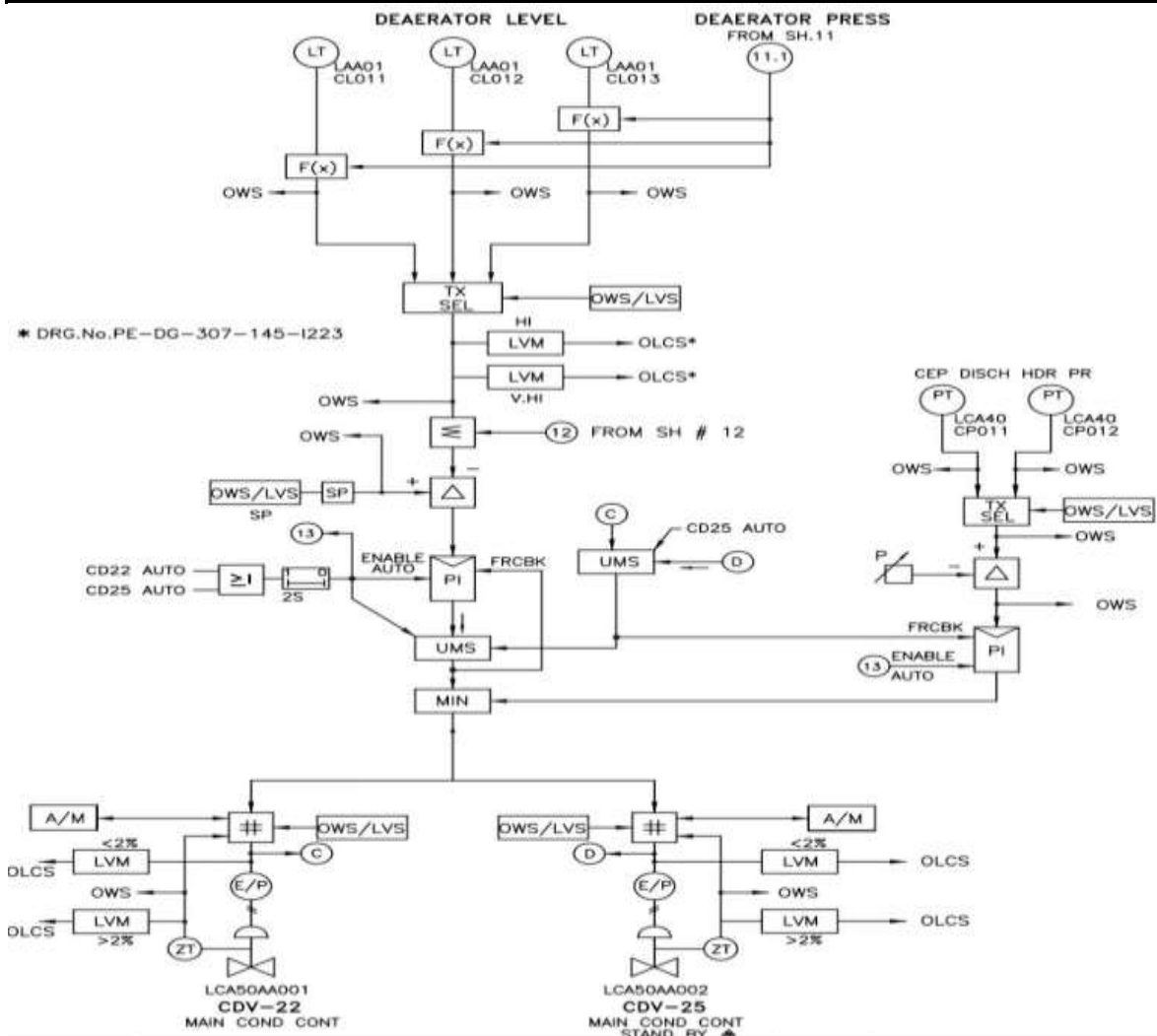


Figure 1 Deaerator level and pressure control

III SOFTWARE DESCRIPTION

3.1 Max DNA

The maxDNA Distributed system is comprised of multiple hardware parts, with each part humanities specific methodology management tasks whereas communication with various parts among the system. To properly maintain the maxDNA maxDPU4E/F based System, it is necessary simply} just understand the aim, function, and property of each hardware part. The maxDNA, maxDPU4E/F based System is comprised of one or extra workstations communication with one or extra remote method units over redundant 100 Mbps maxNET. Each Processor among the maxDNA maxSTATION communicates with the alternative processors through a twin native space network with HMI path used by a given attempt of processors area unit made public by one among the processors connect with management module maxDNA. Through this interface, the operator is prepared to watch and management information and methodology behaviour. commonplace and custom graphic displays area unit accustomed accomplish monitor and management tasks. The maxSTATION provides the human/machine interface (HMI) for the output to be produced.

3.2 Distributed Process Unit

The Distributed process Unit (DPU), may be a time period, multitasking, package, is that the hardware-processing engine of the maxDNA distributed management system. The DPU performs primary knowledge acquisition, control, and processing functions.

3.3 I/O Module

The I/O modules area unit rugged boxed in computer circuit board assemblies sting affiliation at the rear of every module provides the interface to the backplane and also the I/O bus. System power and field power, once applicable, is additionally accessible through this reference to 4-20ma. These modules offer the physical affiliation purpose for the input/output wiring of signals to and from a method. All plant knowledge signals and management signals withstand these units. MaxDPU Tools is employed to assign I/O modules to the

Distributed process Units. As noted, buffers area unit want to outline the required input or output modules. Each module has one to sixteen channels, every love a sign. The DPU processes analog and digital input/output signals via the family of parallel input/output modules. Use A tag and D tag atomic blocks to assign tag names to every signal.

3.4 Steam Control

Use the thermocouple junction Buffer (TC) signal to form temperature signals from thermocouple junction input cards out there to be used by the algorithms. This buffer, specify signal sorts for up to sixteen channels. Use the signal kind parameters (Sig Type) to specify a kind (J, K, T, R etc. Style of thermocouple), wherever xx is that the channel ranges from 01 to 16.

3.5 Control Valve

A control valve primarily contains a valve for restraining the flow of method medium associate degreed a mechanism for providing the push for the valve to control. The valve consists of a valve body, a flow restraining path-also referred to as a bore and a closure member. The force required for this operation is provided by the mechanism. The closure member reduces or increases the flow path by closing or opening the bore.

IV RESULTS AND DISCUSSION:

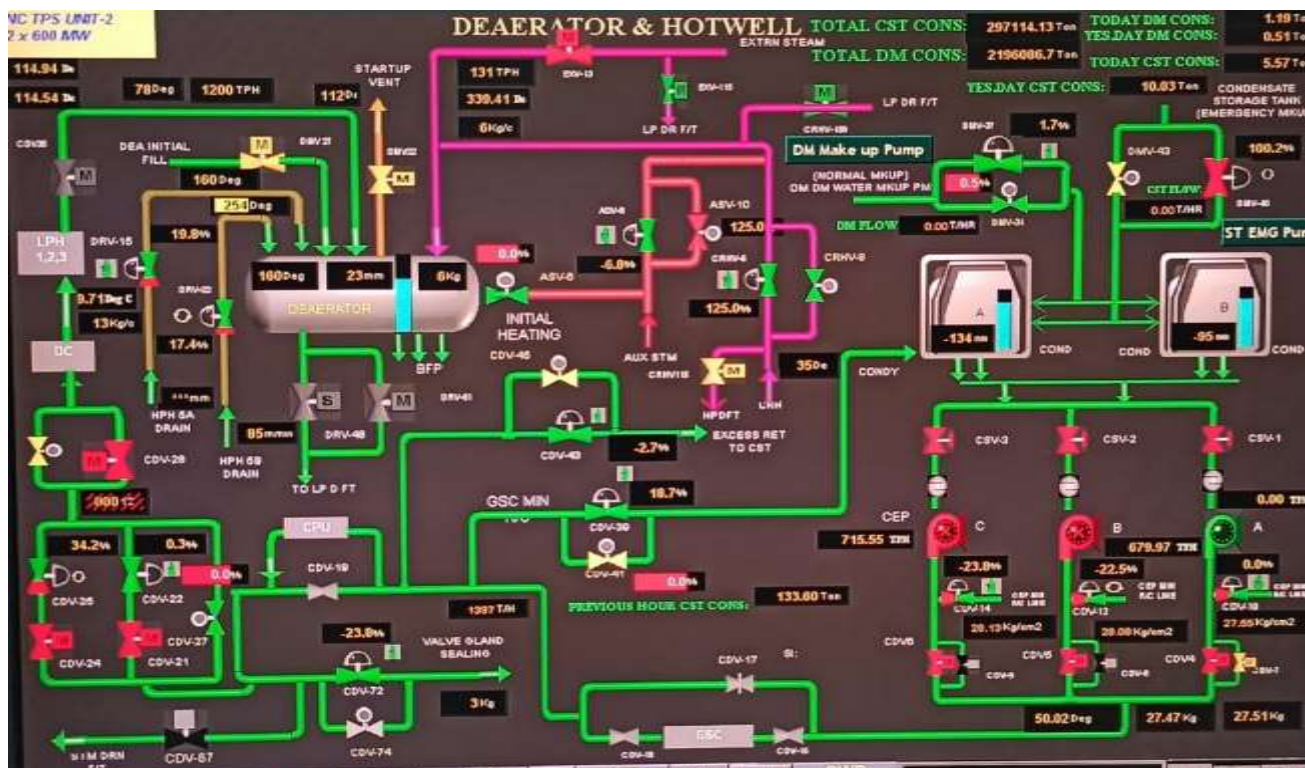


Figure 2 Deaerator level and Pressure control

Thus, the pressure and level control in the deaerator is monitored and then the corrosion of oxygen can be controlled by deaerator process. Depends on the level of the deaerator the tripping condition for boiler LNH protection is also implemented. The feed water flow is monitored by DCS MAX DNA System.

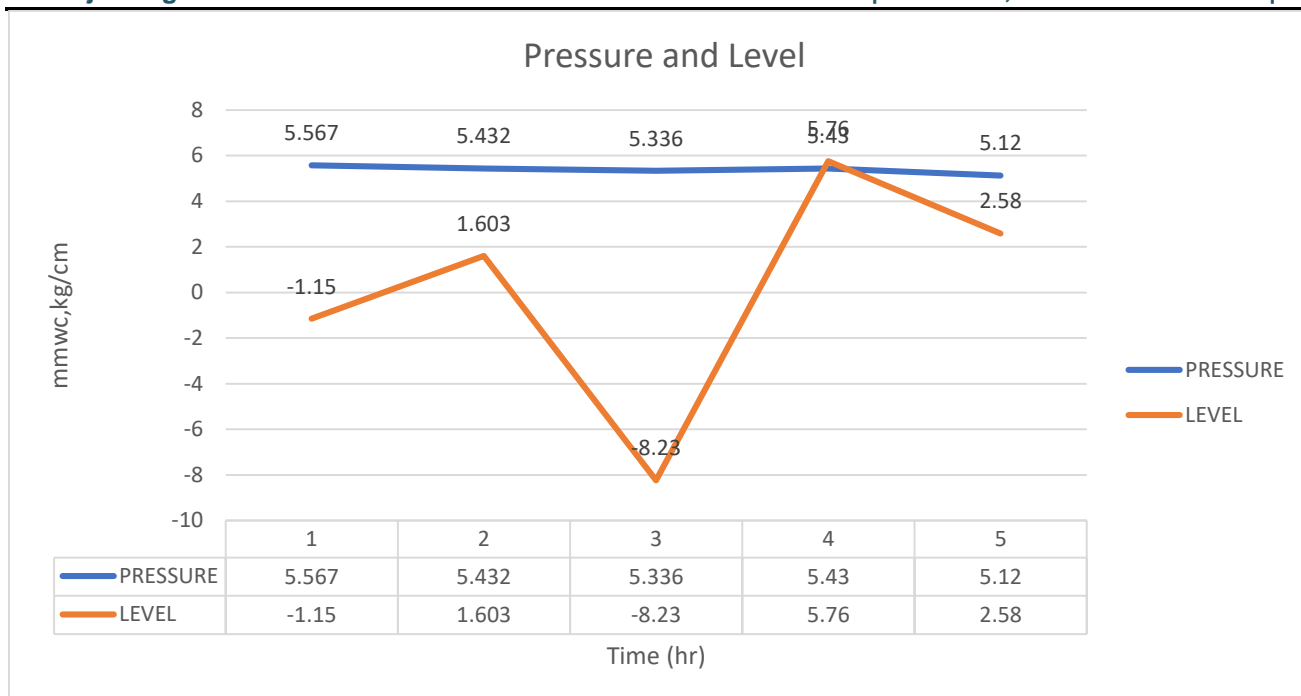


Figure 3 Deaerator level and pressure control variation with respect to time and load

V CONCLUSION:

The Feed water deaerator control is greatly improved by this DCS based control system. The deaerator level control has successfully replaced the human operator to gain automatic performance on removal oxygen corrosion in the boiler. This method uses level control where temperature, pressure and density of water and steam through the boiler and it eliminates the error would cause by the water carrying oxygen.

The DCS provides a simplified process mode of helping the user with less interference. The output is seen on the HMI (Human Machine Interface) helps the user interact better with system.

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