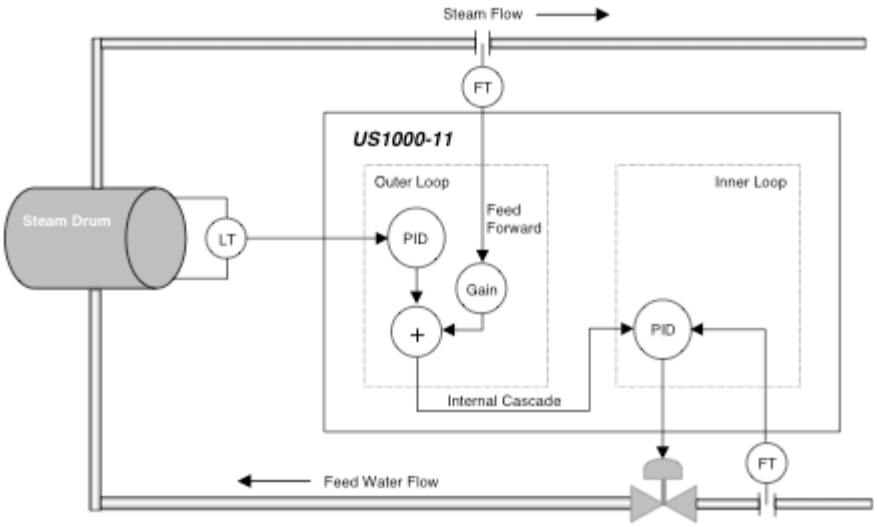
Boiler Drum Level Control Using US1000

OVERVIEW

The US1000-11 Dual Loop Digital Indicating Controller can easily be implemented as a three element boiler drum level/feed water controller. Steam drum level control is necessary to add makeup water as steam is delivered into the header pipe. The level measurement and feed water flow input are the process variables (PV) for a cascade control strategy. A steam flow signal is applied to the feed forward input of the US1000 allowing it to anticipate changes in the steam demand and adjust the feed water flow rate accordingly. Refer to the diagram below.

modified for gain and bias. Discrete inputs and outputs are available for mode switching and alarming. Seven discrete inputs allow CASCADE/AUTO/MANUAL switching, RUN/STOP switching to a pre-set output or OPEN/CLOSE of the cascade control. Up to seven discrete outputs allows high and low alarms for both control loops. Yokogawa's renowned Auto Tune and Super Control (fuzzy logic) functions permit quick and easy startup. Initialize Auto Tune on the feed water loop first, followed by the level controller. The US1000 will automatically install the optimum tuning parameters to minimize level fluctuations. The Super Control algorithm eliminates overshoot after set point changes.



US1000 IMPLEMENTATION

Two universal inputs are available, used for drum level and feed water flow. The inputs can be scaled for engineering units and shown in the upper LED display area. Pressing the DISP key allows viewing of the drum level and feed water flow alternately. Both PV's are shown simultaneously in the left and right vertical bar graphs. A single station cascade control strategy is used. Additionally, the steam flow is used for a three element configuration. The steam flow input can be

EASY CONFIGURATION

The configuration can be performed at the front panel. Press the ↵ key for 3 seconds to access the Operating and Set Up menus. The menu or parameter name is shown in the upper LED display. An eleven segment upper LED display allows the alpha-numeric characters of the parameters to be easily read. Parameter data is shown in the lower LED display. Use the Δ or ∇ keys to modify the parameter setting and press ↵ to apply the change.

INPUTS/OUTPUTS

♦ The three analog inputs are pre- assigned for 1-5VDC. Square root extraction can be applied to the flow inputs if differential pressure transmitters are used. Input filters can be used for noisy flow signals.

♦ The control output is assigned as a 4-20mADC signal. The level input can be retransmitted as an isolated 1-5VDC signal to a recorder or other receiving device. The US1000-11 has twoisolated 24VDC supplies to power two field transmitters.

♦ Five discrete inputs are pre- assigned and functionality may be changed while configuring the US1000. DI1 allows the output to the feed water valve to be forced to a pre-set output value, e.g., fully open (100%) if the contact input is made. DI2 allows the inner (feed water) control loop to be forced to AUTO, bypassing the CASCADE (remote) set point input from the outer level controller. DI3-5 permit switching from CASCADE/AUTO or AUTO/MANUAL. Refer to the diagram below for more details.

♦ Four discrete outputs are available for alarming. The default functions are high and low alarms for both control loops. During configuration, the functions can be changed for specific requirements.

RS485 COMMUNICATION OPTION

The US1000-11 can be provided with a digital communication option to interface with a PC, DCS or PLC network. Yokogawa developed the PC-Link protocol for PC communication. Modbus protocol can be selected during configuration for interface to a PLC or other compatible device.

SUMMARY

Yokogawa's US1000-11 controller is a cost effective means of implementing optimum drum level control. Multiple inputs allow the three element configuration for boilers with varying steam demands and feed water pressure. The digital communication option allows connectivity to a PC, providing an excellent operator interface. Easy front panel configuration makes startup a snap. US1000 is the right choice in digital control.