

Boiler Level Drum Boiler

## Application Notes

### Three-element boiler drum level control using the SC100/200 series Multi-Fu

#### Application Field

## Boilers for power generation plants and process plants

### Product

#### SC210

A drum is a cylindrical reservoir of boiled water/steam used to separate the side and to collect steam to be

Maintaining correct water level in the drum is critical for safe and efficient boiler operation. Too high a wa

Steam flow and feedwater flow are two elements that affect the drum level. The addition of them to the c

\*1.

Drum boilers are used to generate high pressure steam, typically installed in relatively small power plants such as private power generation plant in a factory. Once-through boilers typically used in large-scale power plants.

\*2.

Drum level control is also called 'feedwater control,' as its purpose with a drum boiler is to maintain a constant level.

This article introduces an application example of M-System's Multi-function PID Controller, model SC210 used to provide an effective control of drum level.

A basic objective of the drum level control is to manipulate feedwater flow in response to water level feedback in order to maintain a constant level. The water flow is manipulated typically by changing rotation speed of a feedwater pump or by opening/closing a control valve.

The feedback control explained above is acceptable if the boiler load (steam demand) is steady. However, a sudden change in the load would cause a transient disturbance called 'reverse response of the drum level'<sup>\*3</sup> which is disruptive in its stability. In order to provide the tight control during both steady and transient conditions, the steam output flow, cause of the disturbance, is measured in advance of any change of the level, and is used to directly manipulate the feedwater. This is called 'two-element control.'

Furthermore, the feedwater flow control loop added in cascade from the drum level control loop suppresses effects of the feedwater pressure variation and improves the controllability. The addition of these three elements, (1) drum level, (2) steam flow and (3) feedwater flow, enables the Controller to predict the amount of water added to the drum in spite of the disturbances to maintain the drum level.

Figure 1 shows an example of the SC210 function block combinations for the three-element boiler drum control. The PID control block output (MV) of the drum level control loop (LIC) is supplied as the setpoint (SP) of the second PID control block for the feedwater flow control loop (FIC) in cascade. The LIC output (MV) is added with the steam flow to compensate its variations (feedforward control). Single SC210 can provide necessary computing and PID functions.

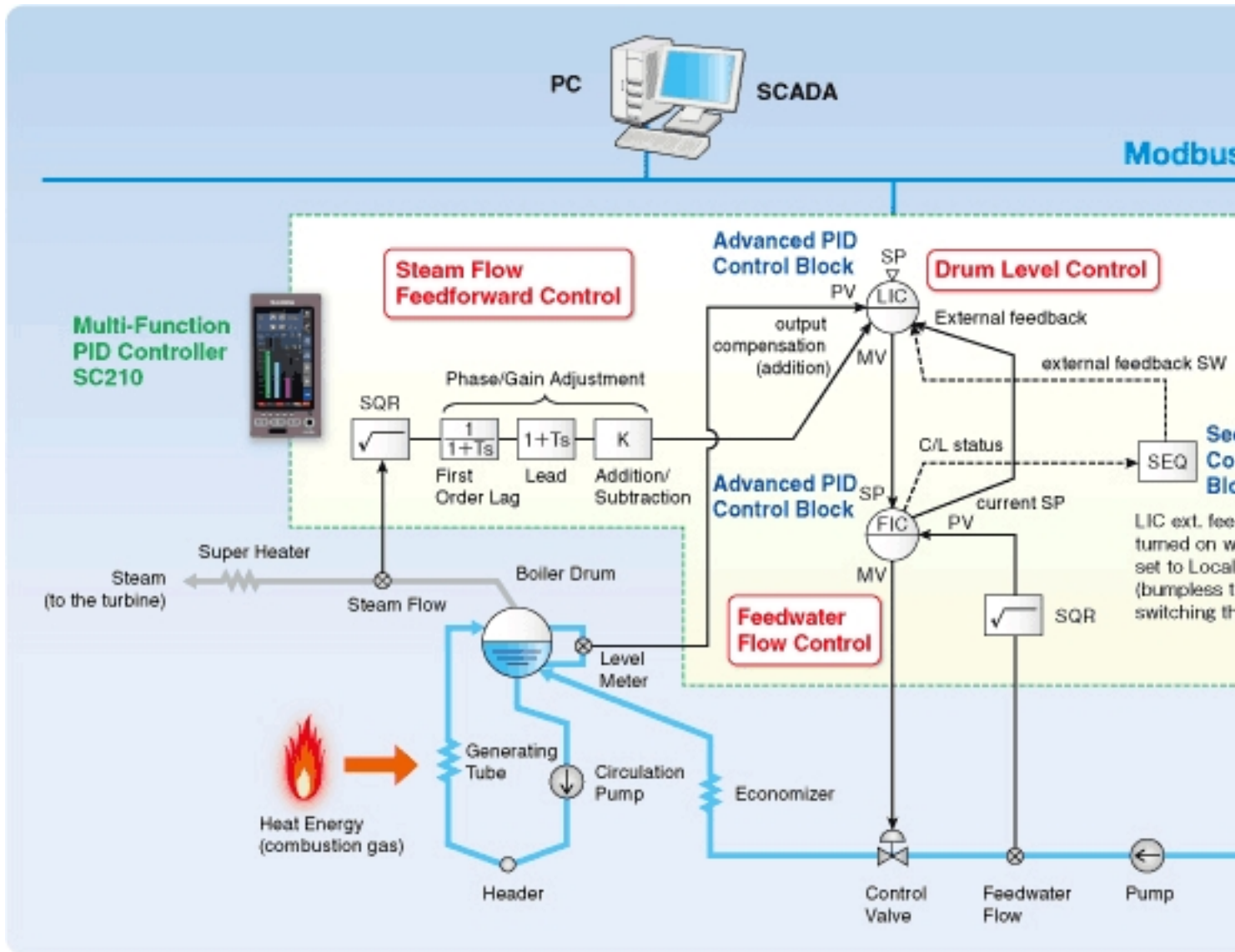


Figure 2. Response of fluctuation example

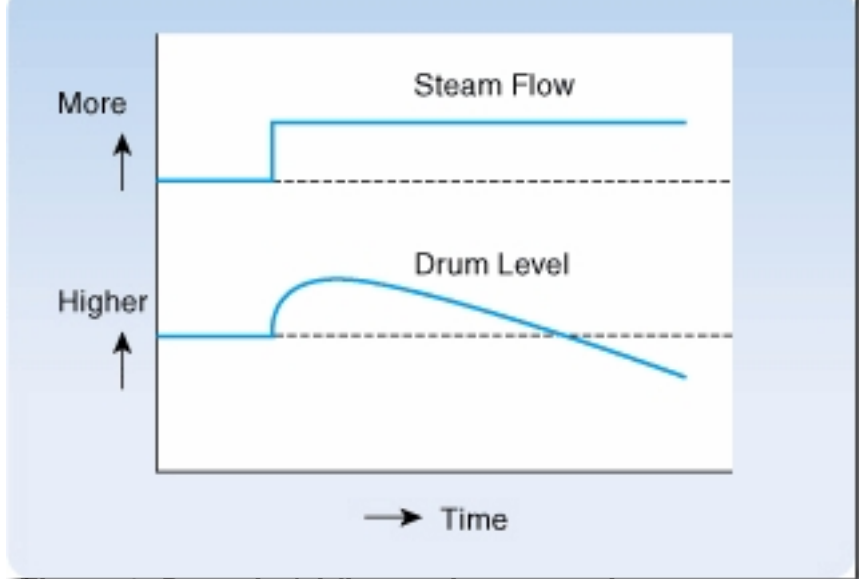


Figure 2. Response of fluctuation example

[Spec Sheet](#)