1. Introduction

The client wanted a furnace duty controller controlling an average temperature. Due to the DCS configuration , this needed a three-layered cascade configuration: temperature to burner gas flow, burner gas flow to pressure, and finally pressure to valve.

These three PID controllers needed tuning that was both stable but sufficiently fast to offset the inevitable sluggishness introduced by cascading three loops. Note that only the pressure controller had previously been tuned by the client, as the other loops were newly created.

The three PID controllers were sequentially tuned using INCA AptiTune's PID tuning capability.

## 2. Tuning Project Details

The initial and final PID tuning parameters are shown below:

Initial: PID LOOP 1   gain = 0.2   Integral = 0.5min   derivative = 0

          PID LOOP 2   No initial tuning

          PID LOOP 3   No initial tuning

Final: PID LOOP 1   gain = 0.3   Integral = 0.5min   derivative = 0

          PID LOOP 2   gain = 0.48   integral = 1.25 min   derivative = 0

          PID LOOP 2   gain = 5.16   integral = 5.87 min   derivative = 0

DCS is Honeywell TDC3000; the used PID algorithm is Interactive Type A.

3. Results

A before and after trend is shown below:
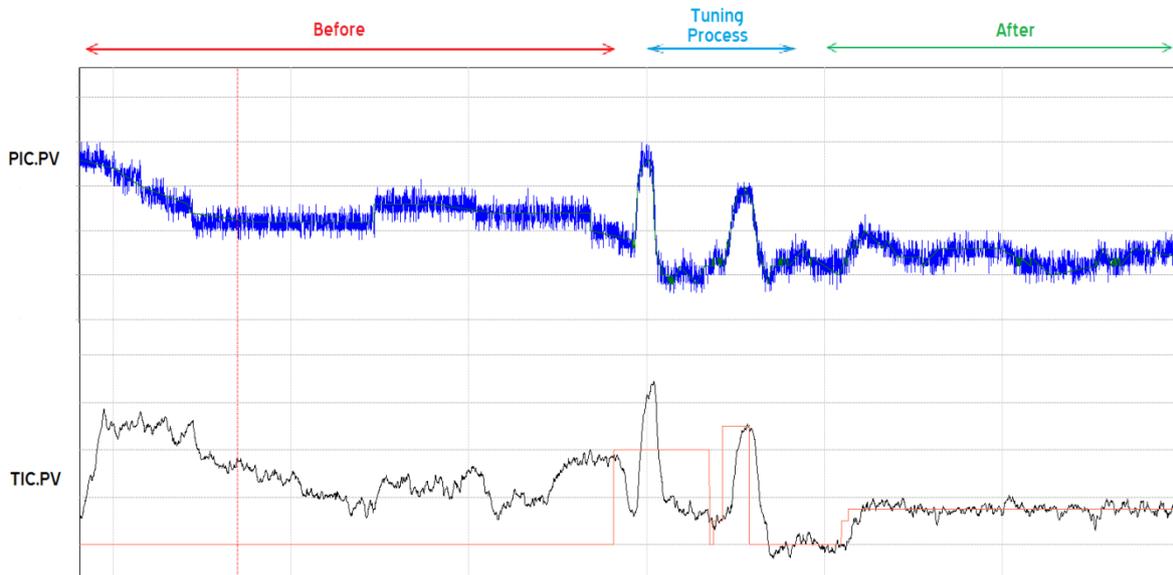
4. Conclusion

The duty controller as requested by the client shows a largely improved temperature control. Disturbance rejection was improved drastically as well (e.g. burner gas pressure disturbances).

In addition to this feedback control, a feedforward component was implemented as well for even better control.