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PID control is a combination of proportional, integral and derivative control.

A PID controller would generally be selected when there is a requirement for the temperature to be controlled smoothly with minimal fluctuations.

What is an on/off controller?

On/off control is a simple control function with the controller operating like a switch or thermostat. This type of temperature controller will turn on the heat when the process reading is below the set point and turn it off when the process reading is above the set point. These controllers or thermostats normally include a hysteresis setting. Setting a hysteresis will cause the temperature at which the output changes from OFF to ON to be lower (or higher) than the set point by the amount set for the hysteresis.

What is the set point?

The set point is the parameter that the temperature controller should react to. The time required to achieve stable control varies for each controlled system.

What is the P in PID control?

With the Proportional action, the control produces an output of a size that is proportional to the input. A proportional band is set for the set point. This enables smoother control with less hunting than ON/OFF operation.

What is the I in PID control?

Due to the limitation of proportional control, there will always be an offset between the process variable and the set point. The integral function provides the necessary action to eliminate the steady state error.

What is the D in PID control?

The derivative mode of the PID controller is an additional and separate term added to the end of the equation that considers the derivative (rate of change) of the error as it varies over time.

What is Auto-tuning?

Most modern PID controllers will have a function like this included, it could be called auto-tuning, self-tuning or self-optimization depending on the manufacturer. The controller will adjust the PID terms in the same way that an experienced engineer may do manually. The auto tuning can either take place at the set point or at the beginning of the process when a load is being heated up from ambient to the set point.