

A. Terms in Flow Control and Explanation.

There are three Controls to be Adjusted to make a Proportional Flow Controller Perform Properly. This method has to be practiced and experience gained from it can be used to get very good and stable Control of the Flow or Velocity of a Fluid.

1. Set Point. (SP)

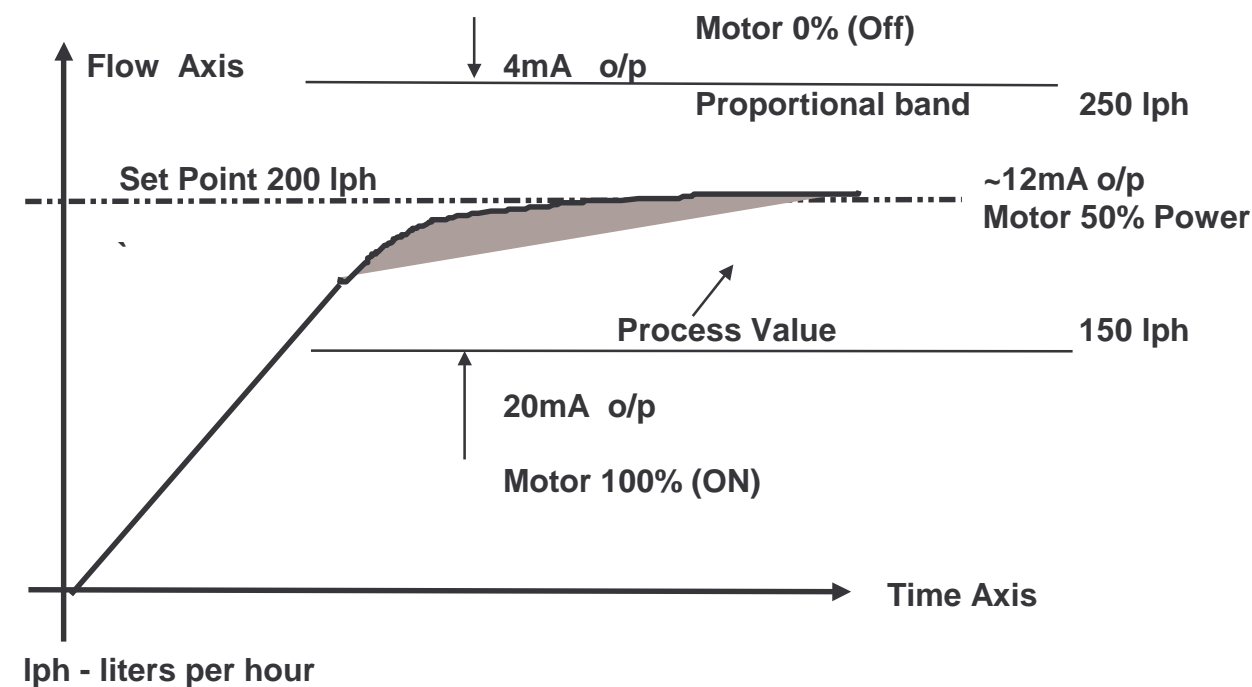
This is the Flow Rate at which you require the Fluid to be controlled at. Adjust the rate at which the fluid flow is expected to be controlled .

2. Process Value. (PV)

This is the Actual Flow Rate of the fluid in the flow sensor or its path. It is very important that the Flow Sensor is placed at a position in the fluid circuit in such a way to avoid cushions which may lead to oscillations around the Setpoint.

3. Proportional Band or Dead band. (PB)

Dead band or H % or Hysterisis are terms used in on / off Controllers in proportional controller we use the term proportional band.



The Flow rate zone in which the Output is 4.1mA to 19.9mA which in turn Drives the AC-Drive >> Motor from 0% to 100% is the proportional Band. It is Given in % e.g. 50% PB of 200 lph SP is 100 lph. Band 150 lph - 250 lph eg : The Motor is at 100% Drive 'on' till 150 lph and 'off' above 250 lph. Between 150 to 250 is the PB. A little above 150 the Motor reduces power gradually till at 250 it turns off. When SP=PV the output is 12mA (ideal) here the motor runs at 50% of the total power.

Selection of Motor / Drive and circuit Capacity:

The Motor / Drive Combination must at 12mA Control signal give a flow Rate at which the system is used for most of the time this gives good stability. The max flow rate setting required by system must be achievable at 80% of Motor Power this is to make allowance for load and line regulations. The Flow Circuit should have normal resistance to flow to reduce Oscillations.

STC1000PFC P = PROPORTIONAL CONTROL, F = FLOW, C = CURRENT OUTPUT.

C. Tuning or Adjusting a Proportional Flow Controller.

Step # 1

Ensure Flow Sensor Output 4-20mA is properly connected to the Flow Controller polarity reversal will show reducing reading in the Display as Flow rises. The Motor / Drive used and Power selected must be able to bring the Flow more than the maximum required Flow rate directly without control (open loop). So when in doubt connect motor/drive and run at max power and observe maximum flow rate e. g. if max. flow obtained with Motor at 100% Power (direct) is 300 lph the STC1000PFC can control flow rates upto 260 lph.

Step # 2

Keep PB in middle position and power on system e.g. set Flow rate to 200 lph. Now Observe maximum overshoot. and adjust proportional band as in table. (PB Control is a 300 lph Single Turn Control with Ends.)
 SP 200 lph
 PV (Process Value or Measured Temperature)

PV overshoot	Proportional Band.
10 % 220 lph or more	Near Maximum fully clockwise till end.
5 % 210 lph to 220lph	Middle of the PB Control towards max.
2% 204 lph to 210 lph	Little more than present setting.
Less than 200 lph Droop e. g. 190	PB is Critically set Do not Change.

THUMB RULE !

Increment PB to Decrease Overshoot.
 Increment PB to Decrease Oscillations.

Stop adjustment when PV droops around SP with no oscillations.

Adjust EC to match SP = PV after PV is stable at a point less than SP.

After each change turn on system again to see response till 2 % or less variation or overshoot or oscillations are obtained.

IF PROPORTIONAL BAND SETTING IS MAXIMUM FULLY CLOCKWISE TURN TILL END (SINGLE TURN POT) THE MOTOR WILL SLOWLY RAMP UP TO FULL FLOW SPEED AND RAMP DOWN SLOWLY TO REDUCE FLOW.

IF PROPORTIONAL BAND IS AT THE MINIMUM THE MOTOR WILL GO FULL SPEED TILL IT COMES CLOSE TO THE SET FLOW RATE AND TURN OFF ABRUPTLY ALMOST LIKE AN ON / OFF CONTROLLER THE MOTOR MAY PULSATE ON & OFF NEAR SETPOINT.

Step # 3

There is an additional control called Reset or Error Cal EC (Integral) which is factory set for SP=PV 50% Power Output i.e. Output Control = 12mA. In certain cases after stable reading is obtained after adjusting or tuning PB the Flow may stabilize say at 195 lph for a set point of 200 lph the process is stable but a ten lphrees process error is present. this can be Corrected with EC or RESET POT at the rear panel (this is a endless 10 Turn Pot). Adjust Error Cal provided in the back panel to increase Flow rate to 200 lph from 190 lph. when this is done give some time for system to respond after every 1/2 a turn 180 lph of the RESET (EC) control pot . The RESET control is a Ten turn potentiometer like the SP potentiometer after 10 turns the direction of turning must change. Clockwise Increases Flow rate Anticlockwise decreases Flow rate. (at min. PB setting EC pot sets the On / Off or Operating Point).

