**Experiment No. (6) Pressure Control**

**Process Control Technology**

**Pressure Control PCT-M3**



**Objective of the experiment:**

The objective is to control pressure level in the tank using pump, valve and the measured value from the pressure transducer.

**The PCT-M3**

The PCT-M3 consists of a reservoir tank; compressor; control valve; pressure sensor and two needle valves. Control is achieved using the pump, solenoid valve and the pressure transducer to measure the signals. The controller is linked to the PC using a USB connection.

**Connecting the PCT-M to the PC**

1. Using the supplied USB cable, connect one end to the PCT-M and the other end to the PC.

2. Switch on the PCT-M.

3. Start the software on your computer.

4. There are two menu options in the software, PID Control and Manual Control and there are options for each of the PCT-M units.

**Manual Procedure:**

1. Selecting the pressure unit in manual mode.



2. Set the valve to close.

3. Set the motor speed at a constant value.

4. The pressure record by a stopwatch and reading at interval two second until steady state reading is reached.

5. The same procedure was repeated for different values of the motor speed.

6. Switch the valve (open) to reset the pressure in the tank.

**PID Control Procedure:**

1. Select the PID control option from the software and choose the pressure control.

2. Apply control of proportional (P) by setting the PG only (Set Integral to off (un check box); Set Derivative off (un check box); Set Period to 50).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SP**  | **PG**  | **Delay time**  | **Rise time**  | **Response time**  | **SP**  | **PG**  | **Delay time**  | **Rise time**  | **Response time**  |
| **1.5 / 1.0**  | **5**  | **0.8/0.5**  | **10**  |
| **1.5 / 1.0**  | **10**  |
| **1.5 / 1.0**  | **15**  | **1.0/0.8**  | **10**  |
| **1.5 / 1.0**  | **20**  |
| **1.5 / 1.0**  | **40**  | **1.5 / 1.0**  | **10**  |
| **1.5 / 1.0**  | **60**  |
| **1.5 / 1.0**  | **80**  | **2.0/1.5**  | **10**  |
| **1.5 / 1.0**  | **100**  |

3. Click start and when reach the steady state, click stop after this read the rise time, dead time, response time.

4. Repeat the procedure in a PI controller by changing in value of PG and integral for three times to reach the best response.

5. Repeat the procedure in the PID controller by changing in value of PG, integral and derivative for three times until reach the best response.

6. Using different types of disturbance (step change, ramp and sine wave).

7. Clicking the Menu button returns to the main screen and resets the pressure

**Discussion:**

1. Plot the response between the pressure and time in manual mode.

2. What conclusions about the nature of ‘proportional only control’ may be drawn from your observations?

3. What conclusions about the nature of PI control may be drawn from your observations?

4. Why is an integral term in the controller unnecessary?

5. What conclusions about the nature of PID control may be drawn from your observations?

6. Compare between the three controllers P, PI, and PID at the best response.