**Experiment 2 : Temperature Control Trainer**

**1.1**

**Aim:** To study the open loop response of a temperature control trainer.  
**Procedure:**

* The mains supply was switched on.
* The pump was switched on and the water was adjusted to flow at a constant rate.
* The digital calibrator was kept at manual mode.
* The controller output was changed in steps of 10% from 100-0%.
* The process value was noted for each step change.

**1.2**

**Aim:** To study the P-only Controller.  
**Procedure:**

* The digital calibrator was kept at auto mode.
* The software was opened in the computer and the controller was chosen as P.
* The P bandwidth value was set.
* The set point value was changed twice during the run cycle.
* The cycle was repeated thrice with different controller parameters.

**1.3**

**Aim:** To study the PD Controller.  
**Procedure:**

* The digital calibrator was kept at auto mode.
* The software was opened in the computer and the controller was chosen as PD.
* The P bandwidth and derivative time constant value were set.
* The set point value was changed twice during the run cycle.
* The cycle was repeated thrice with different controller parameters.

**1.5**

**Aim:** To study the PID Controller.  
**Procedure:**

* The digital calibrator was kept at auto mode.
* The software was opened in the computer and the controller was chosen as PID.
* The P bandwidth, integral time constant and derivative time constant value were set.
* The set point value was changed twice during the run cycle.
* The cycle was repeated thrice with different controller parameters.

**Discussions:**

* The temperature control trainer responds slower with respect to the pressure control trainer because the change in temperature requires more time than for pressure to change. Therefore usually multiloops are used in case of temperature controlling.
* For calculating the offset values we need to wait for steady state to be attained.
* The graph patterns and offsets show that the parameters are very important for optimum offset and fast action.
* The addition of derivative action added to the speed of the control action, but the process value was seen to execute an oscillatory motion.
* The addition of integral action is used to eliminate the offset when there are step changes, but this slows down the process.
* The offset values do not exactly have any pattern for parameter changes at different set points. But different optimizing techniques can lead to exact ranges for these values and then the experiment can be carried out to see which values give best results.