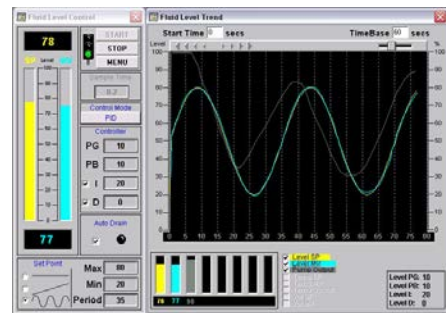# Process Control Technology PCT-100

Key Features:

- Control and measurement of Temperature, Level, Pressure and Flow
- PID control PC SCADA type software with Control and Data Acquisition
- LCD meters and LEDs provides instant information
- Mimic of the rig on the control console
- Test and measurement points for the transducers and fault insertion switches
- Connection to PC through a USB
- Control console can be connected to either PC or a PLC
- Clear process tank and pipes

The PCT-100, Process Control Technology unit, is a fully integrated, self-contained bench top apparatus consisting of a Process Module, and a Control Console with a built in power supply. A Windows based software with full control and data acquisition is included. A number of experiments in process control are included covering Flow, Level, Pressure, Temperature.

The control console is easily connected to a PC using the USB connection or to a PLC using D type connectors. The console has a mimic of the process module on the front and includes fault switches, and test points from all of the transducers. Level is measured using a 0 to10v Magnetostrictive sensor; pressure is measured using a Gage 0 to 5bar sensor and Flow using A turbine flow rate sensor. PT1000 are used to measure temperature in both the sump and process tank. A diverter valve can be used to direct the liquid through a forced air-cooling process to cool the liquid in the system. Two proportional valves are used to control flow into and out of the process tank, a manually adjustable needle valve is used to add disturbances to the system and a pressure relief valve fitted for safety.

Data is displayed on the five LCD displays fitted to the process module, and through the software data can be monitored, saved or printed. The software has a PID controller with Supervisory Control and Data Acquisition and trending features.

Curriculum Coverage

• Introduction	• Final value theorem	• Process models from time domain tests	• Pulse transfer functions
• On/off control	• The Routh-Hurwitz test	• PID controllers	• Z transform initial and final value theorems
• Open loop control	• Bode plots	• Proportional control term	• Stability of sampled data control systems
• Closed loop control	• Bode phase lag versus frequency plot	• Integral control term	• Inverse Z transformations
• Basic control principles	• Nyquist plots	• Derivative control term	• Digital controllers
• 1st. order systems	• Process modelling	• Multi term control	• Digital three term controller
• Transfer functions	• Process models from step data tests	• Ziegler Nichols tuning	• The effects of sampling time
• Block diagrams	• Process models from frequency response tests	• Digital control	• Use of simulation
• Assessment of system performance		• The analysis of digital control systems	
• Transient responses			
• Control system instability			

Labworks

• Proportional control	• Ziegler / Nichols tuning	• Bode plots
• Proportional and integral control	• Temperature control	• Flow loop model using Caldwell's method
• Saturation and integral windup	• Fluid level control	• Flow loop model using Sundaresan's method
• Three term or PID control	• Open loop control	• Design of controller for PCT-100 flow loop.

Process Module

Sump tank volume	8 litres
Process tank volume	4.5 litres
Maximum flow rate	~ 3 litres per minute
Heating element power	48v dc 400W
Control elements	2 x 24V d.c. proportional valves 1 x Manually adjustable disturbance needle valve with incremental markings 1 x Finger type drain valve
Pressure transducer	0 to 5 bar
Level transducer	Magnetostrictive position sensor
Flow transducer	Turbine flow rate sensor
Operating pressure	14 bar maximum
Burst pressure	170 bar
Operating temperature	-20°C to 100°C (ambient +80°C for cable)
Input power	5 to 24 VDC @ 8mA
Accuracy	±3% of reading
Repeatability	0.5% of full scale
Flow range	Litres per minute 0.5 to 5
Temperature transducers	2 x Pt1000 Platinum Resistance Thermometers
Pump	24v and 7 litres per minute open flow rate with 1.5 bar safety cut-out
Safety switch	3 bar Cracking Valve
Cooling system	Radiator with Forced Air Cooling
Number of LCD displays	5 x Fluid level: process tank and sump tank temperature: pressure level and flow rate
Indicators	4 x Heater on: drain valve open: diverter solenoid active and cooler active
Connections	2 x 25 way 'D' connectors
	1 x Power connector for the heater

Control Console

Fault switches	6 x Illuminated push to latch, (self resetting on power off)
Front of console	Graphical representation of process module
Test points	5 x Heater output; level output; sump tank and process tank temperature output, flow rate
Indicators	6 x Heater on; drain valve open; flow and diverter solenoid active; pump active and cooler active
Connections	2 x 25 way 'D' Connectors for connection to process module/rig 1 x 9 way 'D' Connector and 1 x 15way 'D' connector for connection to PLC
	1 x Power connector for heater
	1 x USB connection for PC
	1 x Mains power connector
Power supply voltage	100-250V AC @ 50/60Hz.

Software

Windows based SCADA type software and interface with data logging, printing and saving features

Weights and Dimensions

Un-Packed		Packed	
Approximate	Module (Rig) – 1030W x 750H x 380D	Approximate	Module (Rig) – 1100L x 850H x 460D
Dimensions (mm)	Control Console – 340W x 250H x 200D	Dimensions (mm)	Control Console - 500L x 380H x 500D
Approximate	Module (Rig) - 34Kg	Approximate	Module (Rig) - 39Kg
Weights	Control Console – 10Kg	Weights	Control Console – 12Kg

Required

A suitable PC with Minimum; Pentium processor, 1GB RAM, 20GB HDD, CDROM Drive, USB 2 interface and Windows XP or above

Ordering Information

Model Number: **PCT-100**

Consists of: 1 x Process module
1 x Control console with power supply
1 x Set connecting cables; USB, Power cord, 'D' and heater connector cables
1 x User and courseware Manual
1 x CD with Windows based SCADA type software

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