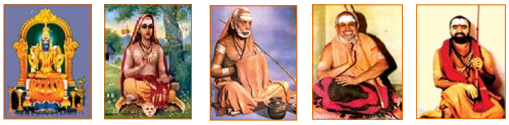
With the blessings of Their Holinesses



SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA
SCSVMV
(Deemed to be University U/S 3 of UGC Act 1956)
Accredited with "A" Grade by NAAC

PROCESS CONTROL

LABORATORY MANUAL

(EIGTH SEMESTER – EEE)

Subject Code: BEEF188TE5A

(For the Academic year - 2023-2024)

PREPARED BY:

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DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING
SCSVMV

Course Code:	PROCESS CONTROL LAB	L	T	P	Credit	CIA Marks 40
Course Category: PEC		3	0	0	3	SEE Marks 60

COURSE OBJECTIVES:

To verify the process concept on the selected process loops.

COURSE OUTCOMES:

Ability to understand and analyse the process control loops

After the successful completion of the course students will be able to

COS NO.	Course Outcomes	Bloom's level
CO1	Design the ON/OFF controller and PID Controller using EDA tool	Knowledge
CO2	Apply the PID controller on various bench mark processes.	Apply
CO3	Apply the different PID controller tuning methods on various bench mark processes	Apply
CO4	Analyze the characteristics of control valve with and without positioner.	Analyse
CO5	Demonstrate the PID implementation issues using EDA tool.	Understand
CO6	Design and implement PID controller for multi variable systems	Apply

ASSESSMENT PATTERN:

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	TEST - I	TEST - II	
Remember	15	15	30
Understand	5	5	10
Apply	-	-	60
Analysis	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total			100

SYLLABUS:

LISTOFTHE EXPERIMENTS:

1. Operation of interacting and non-interacting systems.
2. Responses of different order processes with and without transportation lag.
3. Response of on-off controller.
4. Response of PID controller.
5. Characteristics of control valve with and without positioned.
6. Operation of on-off controlled thermal process.
7. Closed loop response off low control loop.
8. Closed loop response of level control loop.
9. Closed loop response of temperature control loop.
10. Closed loop response of pressure control loop.
11. Tuning of controllers.
12. Study of complex control system (ratio/cascade/feedforward).

LEARNING RESOURCES:

Online resources:

1.www.nptl.co.in

2.www.electrical4u.com

Mapping of Course Outcome to Program Outcomes:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	S	M	M	S
CO2	S	S	S	S	S	M	M	M	S	S	M	S
CO3	S	M	S	S	S	S	S	M	S	M	S	S
CO4	S	M	S	S	S	S	M	M	S	S	M	S
CO5	S	S	S	S	S	M	M	M	S	S	M	S
CO6	S	S	S	S	S	S	M	M	M	M	M	M

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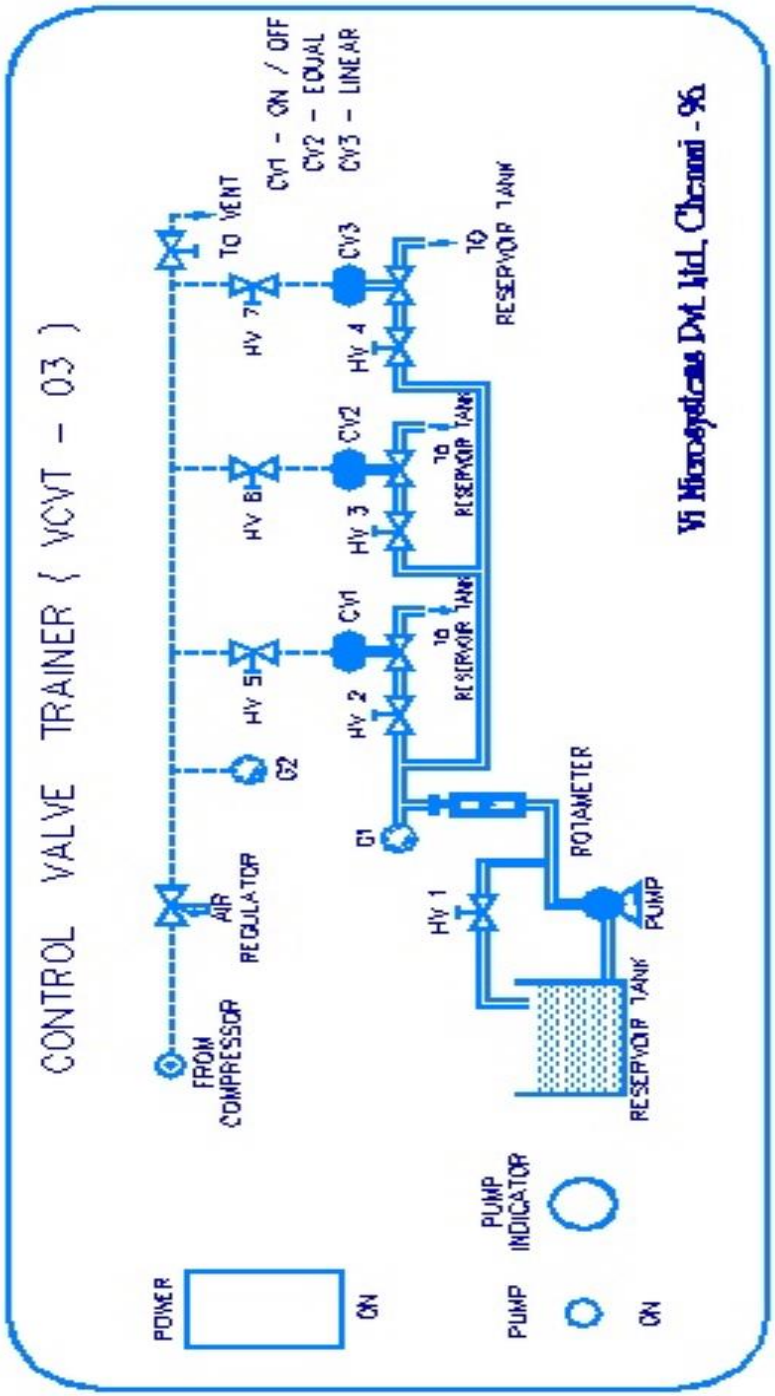
EX.NO	DATE	NAME OF EXPERIMENT	PAGE NO	REMARK	SIGNATURE

PROCESS CONTROL LAB

FRONT PANNEL:



CHARACTERISTICSOFQUICKOPENING(ON/OFF)VALVE

EXP No :
DATE :

AIM

To studythecharacteristicsofquickopening(ON/OFF)controlvalve.

APPARATUSREQUIRED

* VCVT-03A

PROCEDURE

* Before conductingthe experiment,make sure that availabilityof waterin reservoir tank.Fillclean and soft water in the reservoir.

* Connectairsupplypipeto theregulator.Confirm thereisnolooseconnection.

* HandvalvesettingsforON/OFFcontrolvalvecharacteristicsstudy;HV2(the regulating valve, which is provided at the inlet of control valve) and HV5 should be fully open. Regulating valves of other control valves should be fully closed.

* Initially,set the output pressure of air regulator to 15 Psi by varying the knob. The quick opening valve is fully open.

* Keeppartiallyopentheventvalve(HV8),whenairregulatorliftstoitsmaximumrange.

* Switch on the unit. Setthemaximumflowintherotameterbyadjustingthebypassvalve(HV1)and inlet regulating valve (HV2).

* Maintain the pressure drop across the control valve in pressure gauge (G1) (e.g. 1/1.5/2Psi)remainsconstantbyvaryingthehandvalve(HV2).Notethepressuredrop across the valve at fully open (G1).

* Neverdisturbthehandvalve(HV2),onceit isadjustedforparticular opening.

* Observe flow and inlet pressure variations. Note down the air regulator pressure (G2), rotameter flow, and stem position in control valve.

* Decrease the pressure in air regulator to 12 Psi, at same time, pressure across the control valve slightly increases, adjust hand valve (HV1) to maintain predefined pressure in G1.

* Notetheflowinrotameterandstempositionincontrolvalve,airregulatorpressure.

* Slowlydecrease/increasetheairpressureregulatorforachievingdifferentstem positions till the valve is fully closed/open.

* Tabulatetherotameterflow,airregulatorpressureandstem position.

* Plotthegraphbetweenrotameterflowinthey-axisandstempositioninx-axis.

TABULATION

PRESSUREDROPACROSSCONTROL VALVE(ΔP)=

Actuatorpressure(Psi)	Stemposition(%)	Rotameterflow (LPH)

* Calculatethecontrolvalveco-efficientfrom thetable,

CONTROLVALVECO-EFFICIENT

ThenoofUsgallonsofwater/minthatflowthroughafullyopenvalvewithaΔp Of 1psi.

$$C_v = Q\sqrt{\frac{G}{\Delta p}}$$

Where,

Q= flowratein GPM (1GPM=227.1247LPH)G=

specificgravityof water(=1)

Î

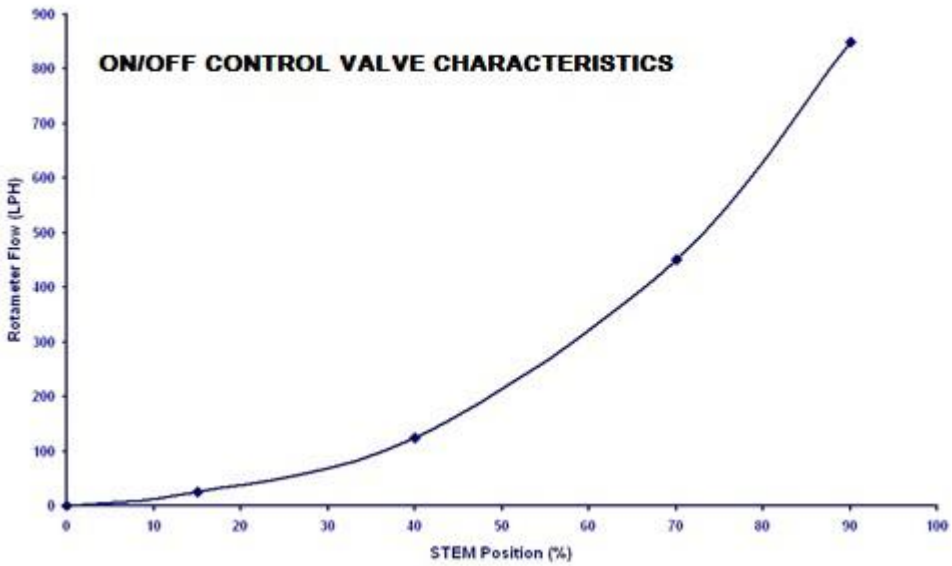
p= pressuredropacrossthecontrolvalveinPsi

Determinethecontrolvalve gain,

$$Gain = \frac{\text{Change in flow rate}}{\text{Change in pressure}}$$

$$\text{Hysteresis} = \frac{\text{Cv at decreasing pressure - Cv at increasing pressure}}{\text{Maximum Cv}}$$

MODEL GRAPH:



RESULT:

Thus,thecharacteristicofquick opening(ON/OFF)valvewasstudied.

CHARACTERISTICSOFEQUAL%CONTROLVALVE

EXP No :
DATE :

AIM

Tostudythecharacteristicsofequalpercentagecontrolvalve.

APPARATUSREQUIRED

* VCVT-03A

PROCEDURE

* Before conductingthe experiment,make sure that availabilityof waterinreservoir tank.Fillclean and soft water in the reservoir.

* Connectairsupplypipeto regulator.Confirmthereisnolooseconnection.

* Hand valve settings for equal percentage control valve characteristics study; HV3 (the regulating valve, which is provided at the inlet of control valve) and HV6 should be fully open. Regulating valves of other control valves should be fully closed.

* Initially, set the output pressure of air regulator to 15 Psi by varying the knob. The equal percentage valve is fully open.

* Keeppartiallyopentheventvalve(HV8),whenairregulatorliftstoitsmaximumrange.

* Switchontheunit.

* Set the maximum flow in the rotameter by adjusting the bypass valve (HV1) and inlet regulating valve (HV3).

* Maintainthepressuredropacrossthecontrolvalveinpressuregauge(G1)(e.g.1/1.5/2 Psi)remainsconstant varyingthehandvalve(HV3).Notethepressuredropacrossthe valve at fully open (G1).

* Neverdisturbthehandvalve(HV3),onceit isadjustedforparticular opening.

* Observe flow and inlet pressure variations. Note down the air regulator pressure (G2), rotameter flow, and stem position in control valve.

* Decrease the pressure in air regulator to 12 Psi, at same time, pressure across the control valve slightly increases, adjust bypass valve (HV1) to maintain predefined pressure in G1.

* Notetheflowinrotameterandstempositionincontrolvalve,airregulatorpressure.

* Slowlydecrease/increasetheairpressureregulatorforachievingdifferentstem positions till the valve is fully closed/open.

* Tabulatetherotameterflow,airregulatorpressureandstem position.

* Plotthegraphbetweenrotameterflowinthey-axisandstempositioninx-axis.

* Calculatethecontrolvalveco-efficientfrom thetable,

CONTROLVALVECO-EFFICIENT

ThenoofUsgallonsofwater/minthatflowthroughafullyopenvalvewithaΔp of 1psi.

$$Cv = Q\sqrt{\frac{G}{\Delta p}}$$

Where,

Q= flowrateinGPM(1GPM=227.1247LPH)G =
Î specificgravityof water(=1)
p= pressuredropacrossthecontrolvalveinPsi

Determinethecontrolvalve gain,

$$Gain = \frac{\text{Change in flow rate}}{\text{Change in pressure}}$$

$$\text{Range ability} = \frac{\text{Cv (max)}}{\text{Cv(min)}}$$

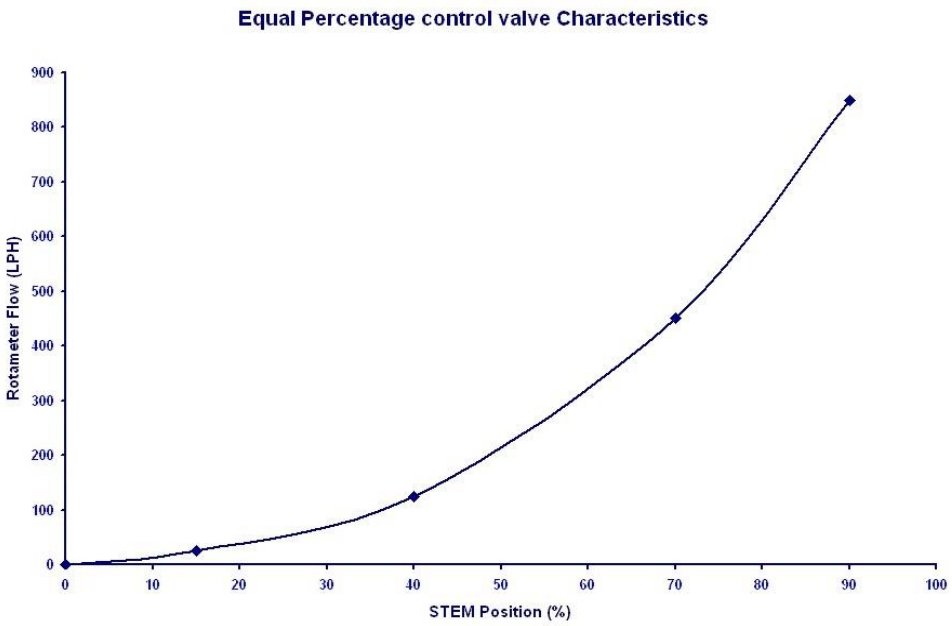
$$\text{Hysteresis} = \frac{\text{Cv at decreasing pressure - Cv at increasing pressure}}{\text{Maximum Cv}}$$

TABULATION:

Pressure drop across control VALVE (ΔP) =

Actuatorpressure(Psi)	Stemposition(%)	Rotameterflow (LPH)

MODEL GRAPH:



RESULT

Thus,the characteristicofequalopeningvalvewasstudied.

CHARACTERISTICSOFLINEARCONTROLVALVEWITHOUTPOSITIONER

EXP No :
DATE :

AIM

To studythecharacteristicsoflinearcontrolvalvewithoutpositioner.

APPARATUSREQUIRED

VCVT-03A

PROCEDURE

* Before conductingthe experiment,makesure that availabilityof water in reservoir tank.Fillclean and soft water in the reservoir.
* Connectair supplypipeto regulator.Confirmthereisnolooseconnection.
* Controlvalvepositionershouldbein“bypass”mode
* Handvalvesettingsforlinearcontrolvalvecharacteristicsstudy;HV4(theregulatingvalve, which is provided at the inlet of control valve) and HV7should be fully open. Regulating valves of other control valves should be fully closed.
* Initially, set the output pressure of air regulator to 15 Psi by varying the knob. The linear valve is fully open.
* Keeppartiallyopentheventvalve(HV8),whenairregulatorliftstoitsmaximumrange.
* Switchontheunit.
* Set the maximum flow in the rotameter by adjusting the bypass valve (HV1) and inlet regulating valve (HV4).
* Maintainthepressuredropacrossthecontrolvalveinpressuregauge(G1)(e.g.1/1.5/2 Psi)remainsconstantvaryingthebypassvalve(HV4).Notethepressuredropacross the valve at fully open (G1).
* Neverdisturbthehandvalve(HV4),onceit isadjustedforparticular opening.
* Observe flow and inlet pressure variations. Note down the air regulator pressure (G2), rotameter flow, and stem position in control valve.
* Decrease the pressure in air regulator to 12 Psi, at same time, pressure across the control valve slightly increases, adjust bypass valve (HV1) to maintain predefined pressure in G1.
* Notetheflowinrotameterandstempositionincontrolvalve,airregulatorpressure.

* Slowlydecrease/increasetheairpressureregulatorforachievingdifferentstem positions till the valve is fully closed/open.

* Tabulatetherotameterflow,airregulatorpressureandstem position.

* Plotthegraphbetweenrotameterflowinthey-axisandstempositioninx-axis.

TABULATION:

Pressure drop across control VALVE(ΔP)=

Actuatorpressure(Psi)	Stemposition(%)	Rotameterflow (LPH)

CONTROLVALVECO-EFFICIENT

ThenoofUsgallonsofwater/minthatflowthroughafullyopenvalvewithaΔp of 1psi.

$$Cv = Q\sqrt{\frac{G}{\Delta p}}$$

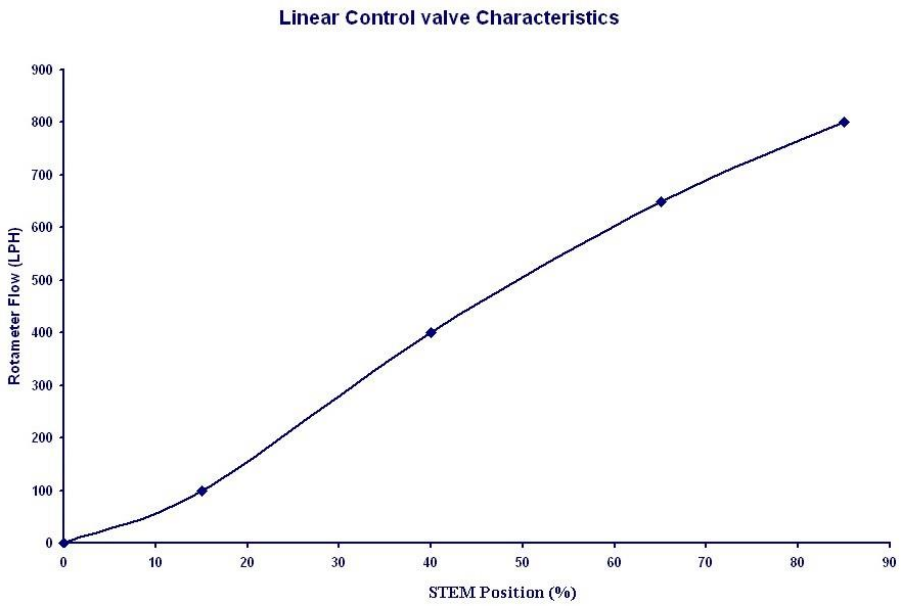
Where,

Q=flowrateinGPM(1GPM=227.1247LPH)G=specific
ĵgravityofwater(=1)
p=pressuredropacrossthecontrolvalveinPsi

Determinethecontrolvalve gain,

$$Gain = \frac{\text{Change in flow rate}}{\text{Change in pressure}}$$

MODELGRAPH



RESULT

Thus,the characteristicoflinear valvewithoutpositionerwasstudied.

CHARACTERISTICSOFLINEARCONTROLVALVEWITHPOSITIONER:

EXP No :
DATE :

AIM

To studythe characteristicsoflinearcontrolvalvewithpositioner.

APPARATUSREQUIRED

VCVT-03A

PROCEDURE

* Before conductingthe experiment,make sure that availabilityof waterinreservoir tank.Fillclean and soft water in the reservoir.

* Connectairsupplypipeto regulator.Confirmthereisnolooseconnection.

* Initially,settheoutputpressureofairregulator(G3)to20Psibyvaryingtheknob..

* Controlvalve positionershouldbein“auto”mode

* Handvalvesettingsforlinearcontrolvalvecharacteristicsstudy;HV4(theregulating valve, which is providedatthe inletof controlvalve)and HV7shouldbe fullyopen. Regulatingvalves of other control valves should be fully closed.

* Settheoutputpressureofairpressureto15Psibyvaryingtheknob.Thelinearvalveis fully open.

* Keeppartiallyopentheventvalve(HV8),whenairregulatorliftstoitsmaximumrange.

* Switchontheunit.

* Set the maximum flow in the rotameter by adjusting the bypass valve (HV1) and inlet regulating valve (HV4).
* Maintainthepressuredropacrossthecontrolvalveinpressuregauge(G1)(e.g.1/1.5/2 Psi)remainsconstant varyingthehandvalve(HV4).Notethepressuredropacrossthe valve at fully open (G1).

* Neverdisturbthehandvalve(HV4),onceit isadjustedforparticular opening.

* Observe flow and inlet pressure variations. Note down the air regulator pressure (G2), rotameter flow, and stem position in control valve.

* Decrease the pressure in air regulator to 12 Psi, at same time, pressure across the control valve slightly increases, adjust bypass valve (HV1) to maintain predefined pressure in G1.

* Notetheflowinrotameterandstempositionincontrolvalve,airregulatorpressure.

* Slowlydecrease/increasetheairpressureregulatorforachievingdifferentstem positions till the valve is fully closed/open.

* Tabulatetherotameterflow,airregulatorpressureandstem position.

* Plotthegraphbetweenrotameterflowinthey-axisandstempositioninx-axis.

TABULATION:

Pressure drop across control VALVE(ΔP)=

Actuatorpressure(Psi)	Stemposition(%)	Rotameterflow (LPH)

* Calculatethecontrolvalveco-efficientfrom thetable,

CONTROLVALVECO-EFFICIENT

The no of Us gallons of water/min that flow through a fully open valve with a Δp of1psi.

$$Cv = Q\sqrt{\frac{G}{\Delta p}}$$

Where,

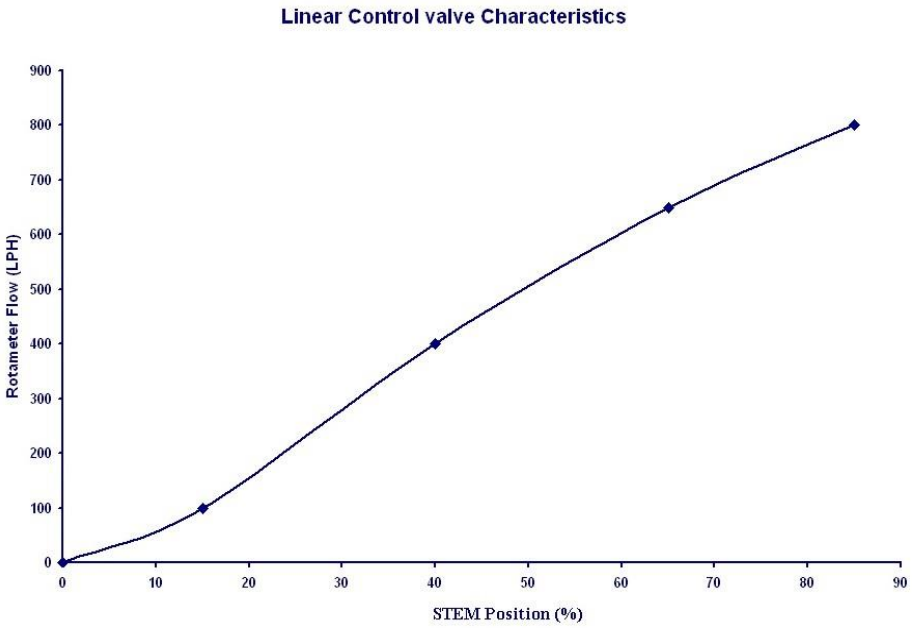
Q= flowrateinGPM(1GPM=227.1247LPH)G =
Î specificgravityof water(=1)
p= pressuredropacrossthecontrolvalveinPsi

Determinethecontrolvalve gain,

$$Gain = \frac{\text{Change in flow rate}}{\text{Change in pressure}}$$

$$\text{Hysteresis} = \frac{\text{Cv at decreasing pressure - Cv at increasing pressure}}{\text{Maximum Cv}}$$

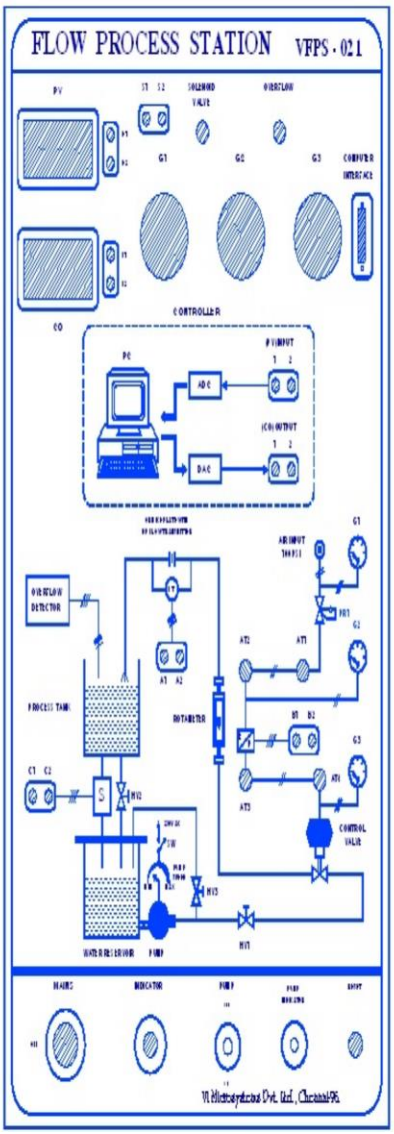
MODELGRAPH



RESULT:

Thus,the characteristicsoflinearvalve withpositioner valvewas studied

FRONTPANELDIAGRAM:



FLOWPROCESSSTATION
CHARACTERISTICSANDCONTROLACTIONOFON/OFF

EXP No :
DATE :

AIM

TostudythecharacteristicsandacontrolactionofON/OFFontheFlowProcessStation.

APPARATUSREQUIRED

i. VFPS-021unit

ii. PC

iii. DataAcquisitionCard(VAD-104)withsoftware

iv. Patch Chords

v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegiven.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the airregulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVFPS-021andDataAcquisitionCard(VAD-104).
5. PositiontheHandvalve(HV1)fullyopenand(HV2)fullyopened&(HV3)inthemidposition.
6. Invoke“ processcontrol”softwareinPCandselect‘Processstation>>Flow”.
7. Select“Control >>ON-OFF”.
8. Select“settings>> parameters”andentervaluesforeachparameters(i.eSP-500 Dead Band-20 & Delay).
9. Select“File>>Start”
10. BeforeswitchONthepump,checkthecontrolvalveopening.Checkwhetherthecontroller output is 100%.
11. Forgettingadesiredresponse,tunetheprocessparametertooptimumvalues.
12. Now,studytheresponseofON-OFFcontrolactionforvariousvaluesofsetpoint,Dead band.

1.Stop theprocess(Click“File>>stop”).

14. Save thefile indesiredfile name(Click“File>>Save”).

15. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

16. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

ThusthecharacteristicsandcontrolactionofON/OFFontheFlowProcessStationwasstudied.

FLOWPROCESSSTATION
PROPORTIONALCONTROL

EXP No :
DATE :

AIM

To study the action of "PROPORTIONALCONTROL" for Flowprocessstation using process control software.

APPARATUSREQUIRED

i. VFPS-021

ii. PC

ii. DataAcquisitionCard(VAD-104)withsoftware

iii. Patch Chords

iv. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegiven.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the air regulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVFPS-021andDataAcquisitionCard(VAD-104).
5. PositiontheHandvalve(HV1)fullyopenand(HV2)fullyopen&(HV3)inthemid position.
6. Invoke“Processcontrol”softwareinPCandselect“Processstation>>Flow
7. Select“control>>proportional”.
8. Select“settings>>parameters”andentervaluesforeachparameters(i.eSp,Kp&Delay).
9. Select“File>>Start”.
10. BeforeswitchONthepump,checkthecontrolvalveisopening.
11. For getting a desired response, tune the process parameter to optimum values. Tune the proportional gain to maintain the process variable within the proportional band without any oscillation.

12. Now,studytheresponseofP controlactionforvarious valuesofset point,Kp.
13. Stop theprocess(Click“File>>stop”).
14. Save thefile indesiredfile name(Click“File>>Save”).
15. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.
16. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

Thusthecharacteristicsand controlactionofproportionalcontrolon the FlowProcess Station was studied.

FLOW PROCESSSTATION
PROPORTIONALPLUSINTEGRALCONTROL

EXP No :
DATE :

AIM

Tostudy the actionof"PROPORTIONAL PLUS INTEGRAL CONTROL" for aFlow process using Process control software.

APPARATUSREQUIRED

i. VFPS-021unit

ii. PC

iii. DataAcquisitionCard(VAD-104)withsoftware

iv. Patch Chords

v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegiven.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the airregulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVFPS-021andDataAcquisitionCard(VAD-104).
5. PositiontheHandvalve(HV1)fullyopenand(HV2)fullyopen&(HV3)inthemid position.
6. Invoke“Processcontrol”softwarein PCandselect“Flow”.
7. Select“control>>"ProportionalPlusIntegralControl”.
8. Select“settings>> parameters”andentervaluesfor eachparameters(i.e Sp, Kp,Ki&Delay).
9. Select“File>>Start”.
10. BeforeswitchONthepump,Checkthecontrolvalveopeningcheckwhetherthecontroller output is 100%.
11. For getting a desired response, tune the process parameter to optimum values. Tunetheproportionalgaintomaintaintheprocessvariablewithinthe

proportionalbandwithoutanyoscillation.Tochangetheproportionalgain(Kp) and
Tune the integral gain (Ki) to maintain the process variable at set point

12. Now,studytheresponseofPIcontrolactionforvariousvaluesofset point,Kp,Ki
13. Stop theprocess(Click“File>>stop”).
14. Save thefile indesiredfile name(Click“File>>Save”).
15. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.
16. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

ThusthecharacteristicsandcontrolactionofPIontheFlowProcessStationwasstudied.

FLOW PROCESSSTATION
PROPORTIONALPLUSDRIVATIVECONTROL

EXP No :
DATE :

AIM

To study the action of "PROPORTIONALPLUS DERIVATIVECONTROL"for a Flow process using Process Control Software.

APPARATUSREQUIRED

i. VFPS-021unit

ii. PC

iii. DataAcquisitionCard(VAD-104)withsoftware

iv. Patch Chords

v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig.2shown.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the airregulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVFPS-021andDataAcquisitionCard(VAD-104)unit.

.5.PositiontheHandvalve(HV1)fullyopenand(HV2)fullyopen&(HV3)inthemidposition.

6. Invoke“ Processcontrol”softwareinPCandselect“ Processstation>>Flow”.
7. Select“Control >>ProportionalPlusDerivativeControl”.
8. Select“settings>>parameters”andentervaluesforeachparameters(i.eSp,Kp, Kd,&Delay)
9. Select“File>>Start”
10. BeforeswitchON thepump,checkwhetherthecontrolleroutputis100%.

11. For getting a desired response, tune the process parameter to optimum values. Tune the proportional gain to maintain the process variable within the proportionalbandwithoutanyoscillation.Tochangetheproportionalgain(Kp) and Tunethe derivative gain (Kd) to maintainthe process variableat set point.

12. Now,studytheresponseofPDcontrolactionforvariousvaluesofsetpoint,Kp & Kd.

13. Stoptheprocess(Click“File>>stop”).

14. Save thefileindesiredfile name(Click“File>>Save”).

15. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

16. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

ThusthecharacteristicsandcontrolactionofPDontheFlowProcessStationwasstudied.

FLOW PROCESSSTATION
PROPORTIONALPLUSINTEGRALPLUSDERIVATIVECONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALPLUSINTEGRALPLUSDERIVATIVE CONTROL"foraFlowprocessusingProcessControlSoftware.

APPARATUSREQUIRED

i. VFPS-021unit

ii. PC

iii. DataAcquisitionCard(VAD-104)withsoftware

iv. Patch Chords

v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegiven.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the air regulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVFPS-021andDataAcquisitionCard(VAD-104).
5. PositiontheHandvalve(HV1)fullyopenand(HV2)fullyopen&(HV3)inthemid position.
6. Invoke“Processcontrol”softwareinPC andselect“Processstation>>Flow”
7. Select“control>> ProportionalPlusIntegralPlusDerivativeControl”.
8. Select“settings>> parameters” and enter valuesforeach parameters(i.eKp,Ki,Kd&Delay)
9. Select“File>>Start”.
10. Before switchONthepump,Checkthecontrolvalve opening.

11. For getting a desired response, tune the process parameter to optimum values. Tune the proportional gain to maintain the process variable within the proportionalbandwithoutanyoscillation.Tochangetheproportionalgain(Kp) andTunetheintegralgain(Ki)andderivativegain(Kd)tomaintaintheprocess variable at set point

12. Now,studytheresponseofPIDcontrolactionforvariousvaluesofsetpoint,Kp,Ki,&Kd.

13. Stop theprocess(Click“File>>stop”).

14. Save thefile indesiredfile name(Click“File>>Save”).

15. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

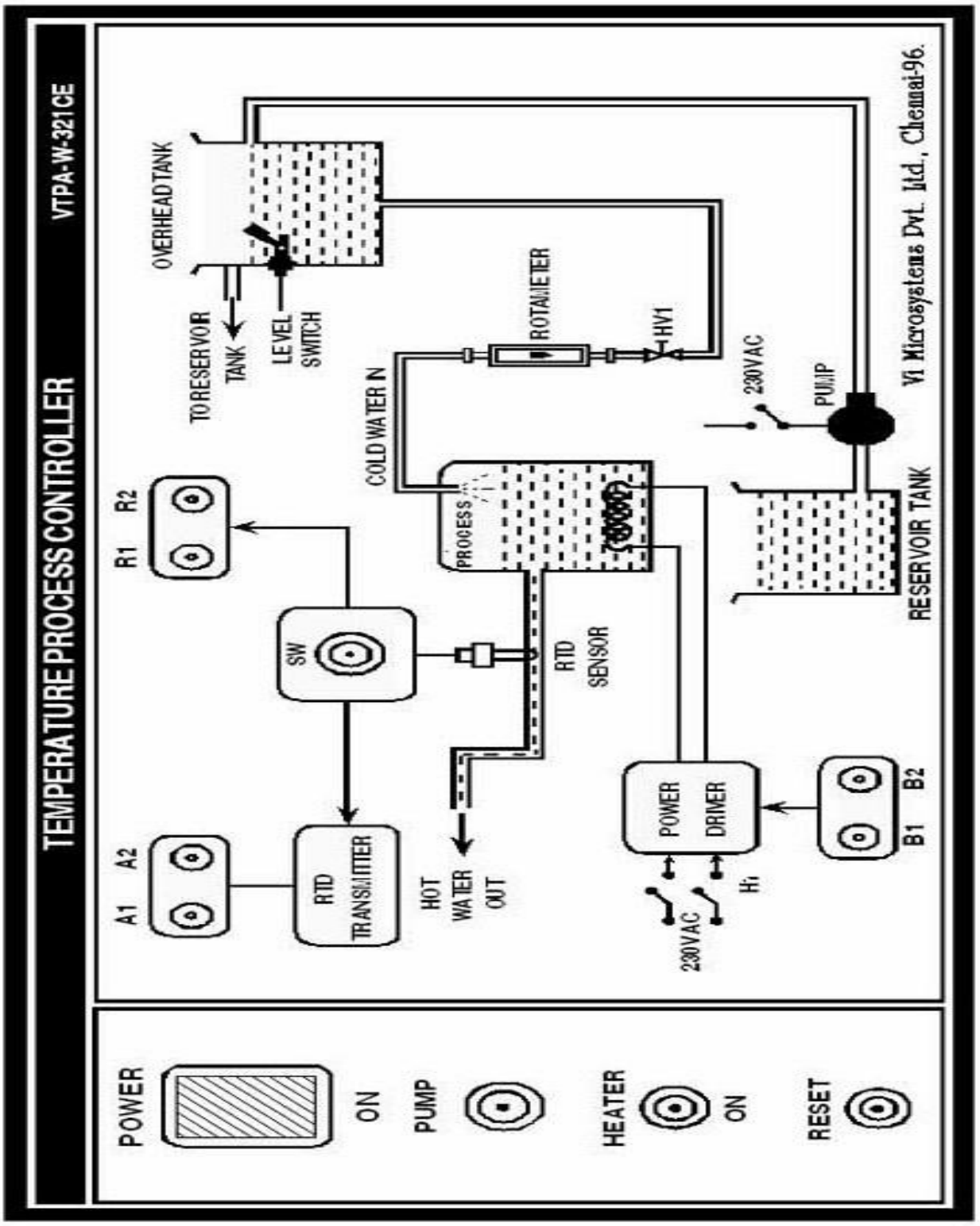
16. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

ThusthecharacteristicsandcontrolactionofPIDontheFlowProcessStationwasstudied.

FRONT PANNEL:



RESISTANCE-TEMPERATURE CHARACTERISTICS OF RTD

EXP No :
DATE :

AIM

Tostudytheresistance-temperaturecharacteristicsofRTD.

APPARATUSREQUIRED

1. VTPA-W-321CE.
2. DataAcquisitioncardwithcable
3. Multimeter(inresistancemode).
4. PCwithProcesscontrolsoftware.
5. Patchchords.

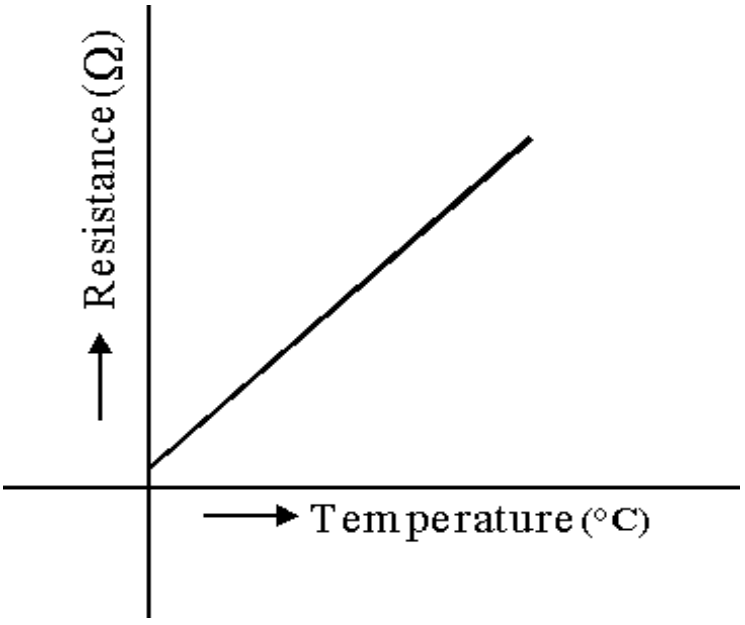
PROCEDURE

1. Ensuretheavailabilityof water.
2. InterfacethePCwiththeUnitandDataAcquisitioncard.
3. ConnectthepumpplugandHeater plugto the respectivesockets providedat the back panel
4. Connect the sensor terminalsand levelswitch terminalstotherespective connectors provided at the back panel.
5. Keeptheswitch‘S2'intherightposition(towards2).
6. ConnectthemultimeterinresistancemodetotheR1-R2terminals.
7. PatchA1-A2&B1-B2usingpatchchords.
8. Switchontheunit.
9. SwitchonthePump.
10. Settherotameteratsomeminimumflowrate(say40Lph)byadjustinghandvalve.
11. Switchontheheater.
12. Notedowntheresistancefordifferenttemperaturesandtabulate.
13. Plot thegraphbetweentempVsResistance.
14. SwitchOFFtheheaterandpump.

TABULATION

Sl.No.	Temperature(°C)	Resistance(Ω)

MODELGRAPH



RESULT

Thusthecharacteristic of the RTD was studied.

TEMPERATURE PROCESS
PERFORMANCEOFON/OFF/P/PI/PD/PIDCONTROLLERS

EXP No :
DATE :

AIM

TostudytheperformanceofON-OFF/P/PI/PD/PIDcontrollersontemperature process.

APPARATUSREQUIRED

1. VTPA-W-321CE.
2. DataAcquisitioncardwithcable
3. PCwithProcesscontrolsoftware.
4. Patchchords.

PROCEDURE

1. Ensuretheavailabilityof water.
2. InterfacethePCwiththeUnitandDataAcquisitioncard.
3. Connectthe pumpplugandHeater plugto the respectivesockets providedat the back panel
4. Connect the sensor terminalsand level switch terminalstotherespective connectors provided at the back panel.
5. Keeptheswitch‘S2'inleftposition(towards1)
6. PatchR1-R2,A1-A2,B1-B2,usingpatchchords.
7. SwitchontheunitwithPCandDataAcquisitioncard.
8. Switchonthepump.
9. Setrotameteratsomeminimumflowrate(say40Lph).
10. Select“Temperature<<control<<ON/OFF/P/PI/PD/PID”.
11. SwitchONtheheater.

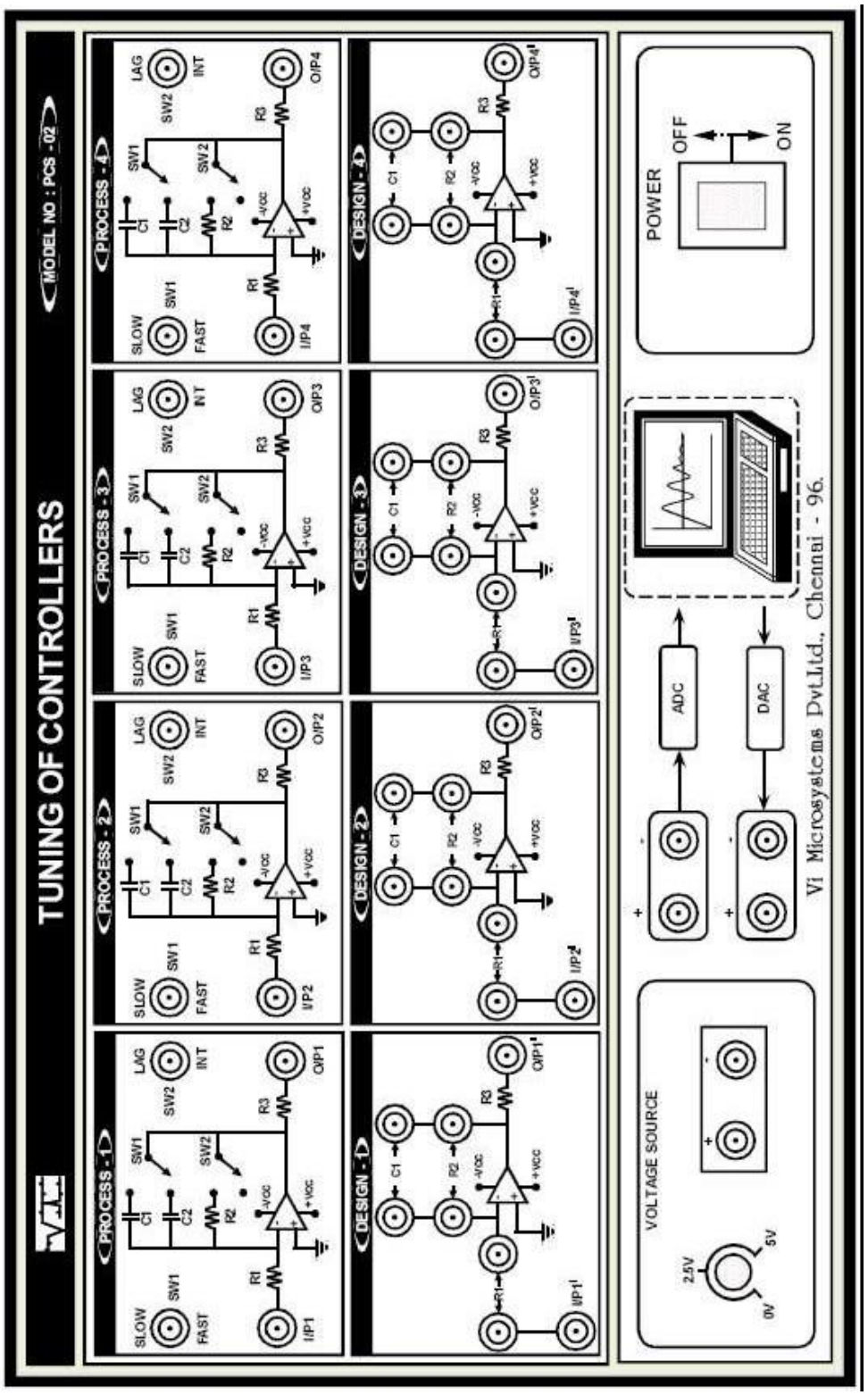
12. Enterdesiredparametersandobservetheresponsebysavingthegraph.

13. SwitchOFFtheheaterandpump.

RESULT

ThustheperformanceofON-OFF/P/PI/PD/PIDcontrollersontemperatureprocesswasstudied.

FRONTPANELDIAGRAM:



TUNINGOFCONTROLLERBY PROCESSREACTIONCURVEMETHOD

EXP No :
DATE :

AIM

Theobjectiveofthisexperimentistoanalyzetheplantdynamicresponseusingprocessreaction curve method.

APPARATUSREQUIRED

* Tuningofcontrollers(PCS-02)Unit.
* DataAcquisitionCard(VAD-104).
* Processcontrolsoftware
* Patch chords.
* IBM- PC.

PROCEDURE

* Connectionsaremadeas per thecircuitdiagram.
* SwitchONthemainunit andVAD-104Cardspowersupply.
* Involvethe*"**Tuning of controller**"*software.
* Select control5Manualmode5
* Softwaredisplays CPvalueinthetext box &enterthestepinput valueinthe range of 0 - 100%.
* Now,inputandoutputaredisplayedingraphicalformonthescreen.
* SavethecurJrentfile,loadtheJfile&usingtwopointmethodstodetermine, thedelay (dead) time$_d$, time constant () of the process.

* Substituethecalculate$_d$JvalueintotheZNproposal
* FindouttheK$_P$,K$_I$,K$_D$ valueareenteredintothetextbox.
* Startthe simulationprocess andsee theresponseofan appropriate controller

CALCULATION:

Step Input(ΔU):
Steadystate output (ΔY$_{ss}$):
Findthegain(K)valuebyusingtheformula:(ΔY$_{ss}$/ΔU) From the
ΔY$_{ss}$ value find,

0.632ΔY$_{ss}$:
0.283ΔY$_{ss}$:

Fromthegraphnotedownthet1andt2valuesandfindτandτ$_d$valuebyusingthefollowing formula.

i. The τ = 3/2 (t2-t1)
ii. Theτ$_d$=(t2-τ)

Set point value

Tabulatethe value byusing calculation

TABULATION

CONTROLLER	GAIN(K_C)	INTEGRAL TIME (T_I)	DERIVATIVE TIME (T_D)
P		-	-
PI			-
PID			

RESULT

Thus,thedynamicresponseoftheplantwasanalysed,usingprocessreactioncurvemethod.

CONTINUOUS OSCILLATION METHOD

EXP No :
DATE :

AIM:

Theobjectiveofthisexperimentistoinvestigatethedynamicresponseoftheplantusing continuous oscillation method.

APPARATUSREQUIRED

i. TuningofcontrollersUnit (PCC2)

ii. DateAcquisitioncard (VAD104)

iii. Processcontrolsoftware

iv. Patch Cards

v. IBMPC

PROCEDURE

* Connectionsaremadeas per thecircuitdiagram.

* SwitchONthemainunit andVAD-104Cardspowersupply.

* Involvethe*"**tuning of controller**"*software.

* Selectcontrol5proportional control5

* Enter the K_P valueformminimumto K_{cu}. Atoneparticularvalueof K_{cu} outputwaveform attains the sustained oscillation.

* Now,inputandoutputaredisplayedingraphicalformonthescreen.

* Savethecurrentfile,loadthefile&usingcontinuesoscillationmethodtodetermine,the K_{cu} and T_u value.

* Substitutethecalculate K_{cu} and T_u valuesintotheZNproposal.

* Findthevalues of K_P, K_I, K_D andenterintothetextbox.

* Startthe simulationprocess andsee theresponseofan appropriate controller.

Calculations:

K_{cu} =

T_u =

Tabulation:

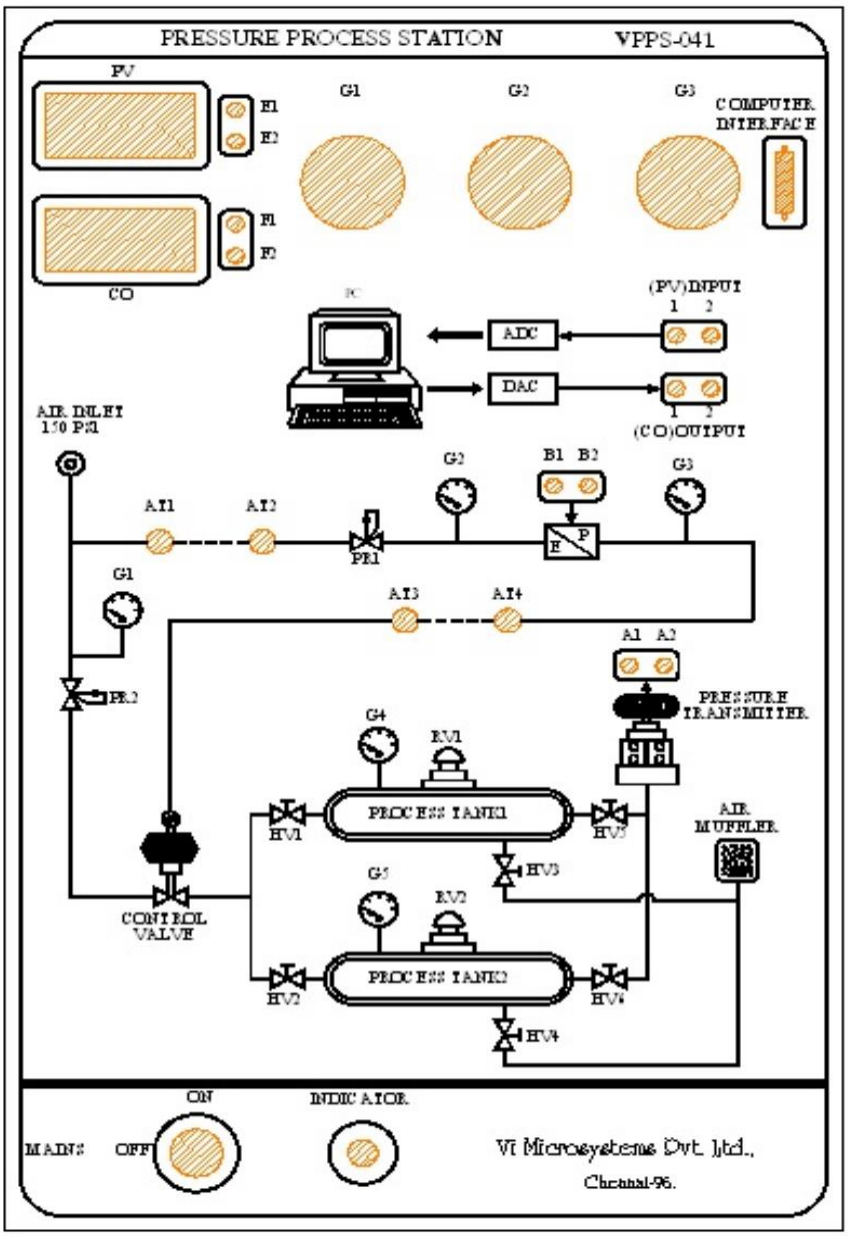
SL. NO	SETPOINT	K_{cu}	T_u

CONTROLLER	GAIN (K_C)	INTEGRAL TIME (T_I)	DERIVATIVE TIME (T_D)
P		**-**	**-**
PI			**-**
PID			

RESULT

Thus,thetimedynamic responseofplantwasinvestigated usingcontinuousoscillation method.

FRONT PANNEL DIAGRAM:



PRESSUREPROCESSSTATION
ON/OFF

EXP No :
DATE :

AIM

To study the characteristics and a control action of ON/OFF on the Pressure Process Station.

APPARATUSREQUIRED

i. VPPS-041unit
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. AirPressureregulator(1)inputshouldbemorethan25psiandmaintaintheairregulator(1)output pressure (G2) to 20 psi by varying the air regulator knob.
4. Airpressureregulator(2)inputshouldbemorethan100psiandmaintaintheairregulator(2)output pressure 100psi by vary the air regulator knob.
5. SwitchONtheVPPS-041andData AcquisitionCard(VAD-104).
6. PositiontheHandvalve(HV1,HV5)fullyopen,(HV3)inthemidposition.
7. Invoke“processcontrol”softwareinPCandselect‘Processstation>>Pressure”.
8. Select“Control >>ON-OFF”.
9. Select“settings>> parameters”and entervaluesfor each parameters(i.eSP-35 Dead Band-20, Delay).
10. Select“File>>Start”
11. Checkthecontrolvalveopening.Checkwhetherthecontrolleroutputis100%,
12. Forgettingadesiredresponse,tunetheprocessparametertooptimumvalues.
13. Now,studytheresponseofON-OFFcontrolactionforvariousvaluesofsetpoint,Dead band.
14. Stop theprocess(Click“File>>stop”).

15. Save thefile indesiredfile name(Click“File>>Save”).

16. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

17. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

ThusthecharacteristicsandcontrolactionofON/OFFon the PressureProcess Stationwasstudied.

PRESSURE PROCESS
PROPORTIONAL CONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALCONTROL"fora PressureprocessusingProcess Control Software.

APPARATUSREQUIRED

i. VPPS-041
ii. PC
iii.DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.

2. Interfacingconnectionshouldbegivenasperafig.1 shown.

3. AirPressureregulator(1)inputshouldbemorethan25psiandmaintaintheairregulator(1)output pressure (G2) to 20 psi by varying the air regulator knob.

4. Airpressureregulator(2)inputshouldbemorethan100psiandmaintaintheairregulator(2)output pressure 100psi by vary the air regulator knob.

5. SwitchONtheVPPS-041andData AcquisitionCard(VAD-104).

6. PositiontheHandvalve(HV1,HV2,HV5,HV6)fullyopen&(HV3,HV4)inthemid position.

7. Invoke“Processcontrol”softwareinPCandselect“Processstation>>Pressure”

8. Select“control>> ProportionalControl”.

9. Select“settings>>parameters”andentervaluesforeachparameters(i.eKpDelay).

10. Select“File>>Start”.

11. Checkthecontrolvalveopening.

12. Forgettinga desired response, tunetheprocess parameterto optimumvalues. Tune the proportional gain to maintain the process variable within the proportional bandwithoutanyoscillation. Tochangetheproportional gain(Kp) to maintainthe processvariable at set point

13. Now,studytheresponseofPcontrolactionforvariousvaluesofsetpoint,Kp.

14. Stoptheprocess(Click“File>>stop”).

15. Save thefileindesiredfile name(Click“File>>Save”).

16. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

17. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”

RESULT

ThusthecharacteristicsandcontrolactionofProportionalcontrolonthePressureProcess Stationwas studied.

PRESSURE PROCESS
PROPORTIONAL PLUSINTEGRALCONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALPLUSINTEGRALCONTROL"fora Pressureprocess using Process Control Software.

APPARATUSREQUIRED

i. VPPS-041
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.

2. Interfacingconnectionshouldbegivenasperafig.1 shown.

3. AirPressureregulator(1)inputshouldbemorethan25psiandmaintaintheairregulator(1)output pressure (G2) to 20 psi by varying the air regulator knob.

4. Airpressureregulator(2)inputshouldbemorethan100psiandmaintaintheairregulator(2)output pressure 100psi by vary the air regulator knob.

5. SwitchONtheVPPS-041andData AcquisitionCard(VAD-104).

6. PositiontheHandvalve(HV1,HV2,HV5,HV6)fullyopen&(HV3,HV4)inthemid position.

7. Invoke“Processcontrol”softwareinPCandselect“Processstation>>Pressure”

8. Select“control>> ProportionalPlusIntegralControl”.

9. Select“settings>>parameters”andentervaluesforeachparameters(i.eKp,KiDelay).

10. Select“File>>Start”.

11. Checkthecontrolvalveopening.

12. Forgettinga desired response, tunetheprocess parameterto optimumvalues. Tune the proportional gain to maintain the process variable within the proportional bandwithoutanyoscillation. Tochangetheproportional gain(Kp) and Tunetheintegralgain(Ki)tomaintainthe process variable at set point

13. Now,studytheresponseofPIcontrolactionforvariousvaluesofsetpoint,Kp,Ki.

14. Stoptheprocess(Click“File>>stop”).

15. Save thefileindesiredfile name(Click“File>>Save”).

16. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

17. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

Thusthe characteristicsandcontrolactionofPIonthePressureProcessStation wasstudied.

PRESSURE PROCESS
PROPORTIONAL PLUSDERIVATIVECONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALPLUSDERIVATIVECONTROL"fora Pressureprocess using Process Control Software.

APPARATUSREQUIRED

i. VPPS-041
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. AirPressureregulator(1)inputshouldbemorethan25psiandmaintaintheairregulator(1)output pressure (G2) to 20 psi by varying the air regulator knob.
4. Airpressureregulator(2)inputshouldbemorethan100psiandmaintaintheairregulator(2)output pressure 100psi by vary the air regulator knob.
5. SwitchONtheVPPS-041andData AcquisitionCard(VAD-104).
6. PositiontheHandvalve(HV1,HV2,HV5,HV6)fullyopen&(HV3,HV4)inthemid position.
7. Invoke“Processcontrol”softwareinPCandselect“Processstation>>Pressure”
8. Select“control>> ProportionalPlusIntegralPlusDerivativeControl”.
9. Select“settings>>parameters”andentervaluesforeachparameters(i.eKp,KdDelay).
10. Select“File>>Start”.
11. Checkthecontrolvalveopening.

12. Forgettinga desired response, tunetheprocess parameterto optimumvalues. Tune the proportional gain to maintain the process variable within the proportional bandwithoutanyoscillation. Tochangetheproportional gain(Kp) and derivativegain (Kd)to maintainthe process variable at set point

13. Now,studytheresponseofPDcontrolactionforvariousvaluesofsetpoint,Kp,Kd.

14. Stop theprocess(Click“File>>stop”).

15. Save thefile indesiredfile name(Click“File>>Save”).

16. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

17. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

Thusthe characteristicsandcontrolactionofPD onthePressureProcessStation wasstudied.

PRESSUREPROCESS
PROPORTIONALPLUSINTEGRALPLUSDERIVATIVECONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALPLUSINTEGRALPLUSDERIVATIVECONTROL"for aPressure processusingProcessControlSoftware.

APPARATUSREQUIRED

i. VPPS-041
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.

2. Interfacingconnectionshouldbegivenasperafig.1 shown.

3. AirPressureregulator(1)inputshouldbemorethan25psiandmaintaintheairregulator(1)output pressure (G2) to 20 psi by varying the air regulator knob.

4. Airpressureregulator(2)inputshouldbemorethan100psiandmaintaintheairregulator(2)output pressure 100psi by vary the air regulator knob.

5. SwitchONtheVPPS-041andData AcquisitionCard(VAD-104).

6. PositiontheHandvalve(HV1,HV2,HV5,HV6)fullyopen&(HV3,HV4)inthemid position.

7. Invoke“Processcontrol”softwareinPCandselect“Processstation>>Pressure”

8. Select“control>> ProportionalPlusIntegralPlusDerivativeControl”.

9. Select“settings>>parameters”andentervaluesforeachparameters(i.eKp,Ki,Kd, Delay).

10. Select“File>>Start”.

11. Checkthecontrolvalveopening.

12. For getting a desired response, tune the process parameterto optimumvalues. Tune the proportional gain to maintain the process variable within the Proportional bandwithoutanyoscillation. Tochangetheproportional gain(Kp) andTunetheintegralgain(Ki)andderivativegain(Kd)tomaintaintheprocess variable at set point

13. Now,studytheresponseofPIDcontrolactionforvariousvaluesofsetpoint,Kp,Ki, Kd.

14. Stop theprocess(Click“File>>stop”).

15. Save thefile indesiredfile name(Click“File>>Save”).

16. Opentheexistingfile(Click“File>>Load”).Observetheresponseoftheprocessingraphical format.

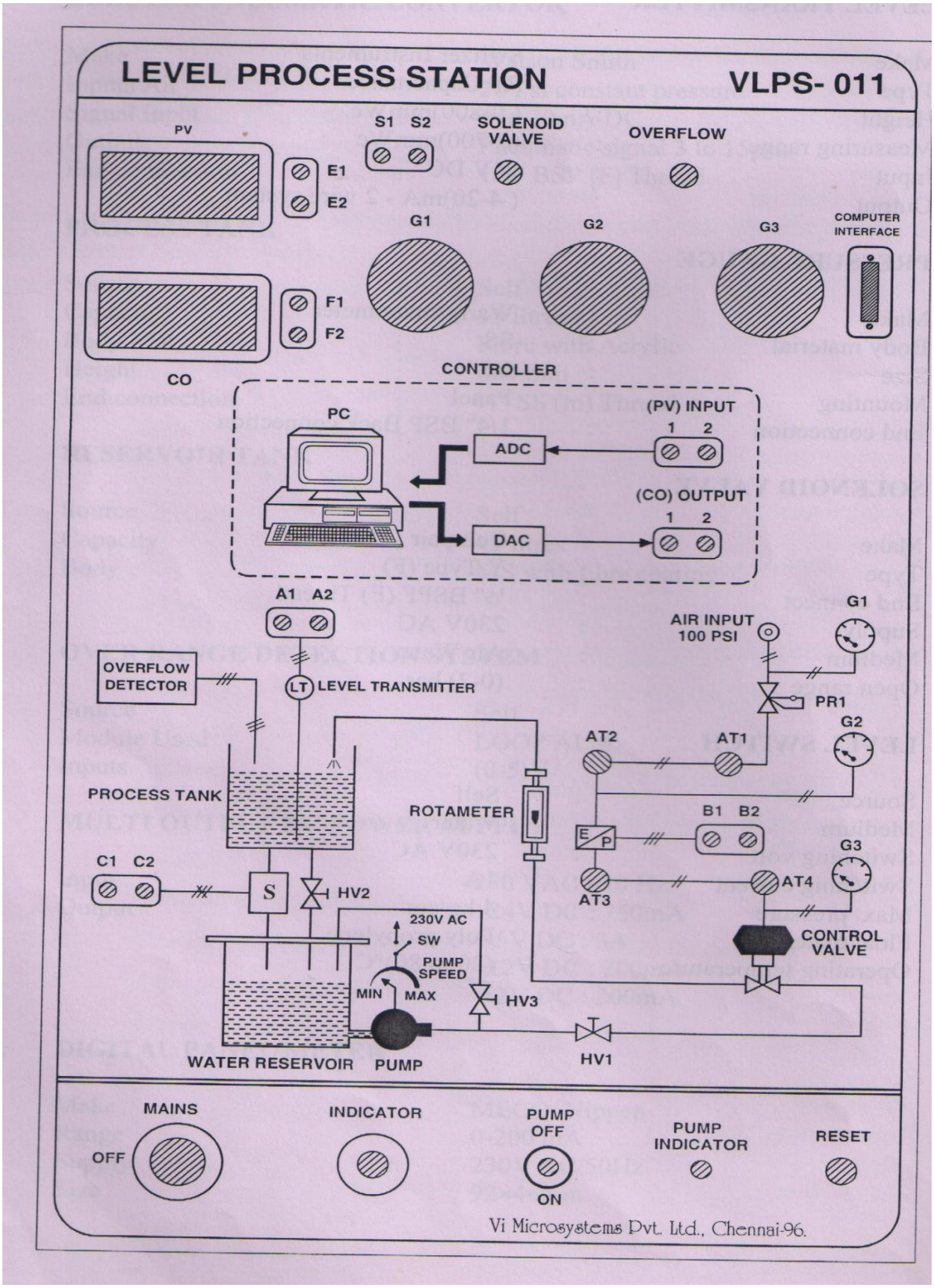
17. Ifyou wanttoviewthereport orprintoutselect

    “File>>Load>>option>>report”.
    “File>>Load>>option>>print”.

RESULT

Thusthe characteristicsandcontrolactionofPIDonthePressureProcessStationwasstudied.

FRONT PANEL:


LEVEL PROCESS STATION
VLPS- 011
PV
E1
E2
S1 S2
SOLENOID VALVE
OVERFLOW
G1
G2
G3
COMPUTER INTERFACE
F1
F2
CO
CONTROLLER
PC
(PV) INPUT
1 2
ADC
(CO) OUTPUT
1 2
DAC
A1 A2
G1
AIR INPUT 100 PSI
OVERFLOW DETECTOR
LT LEVEL TRANSMITTER
PR1
G2
AT2
AT1
PROCESS TANK
ROTAMETER
B1 B2
E/P
C1 C2
S
HV2
G3
AT3
AT4
230V AC
SW
PUMP SPEED
CONTROL VALVE
MIN
MAX
HV3
WATER RESERVOIR
PUMP
HV1
MAINS
OFF
INDICATOR
PUMP OFF
ON
PUMP INDICATOR
RESET
Vi Microsystems Pvt. Ltd., Chennai-96.

LEVEL PROCESS STATION
ON/OFF

EXP No :
DATE :

AIM

TostudythecharacteristicsandacontrolactionofON/OFFontheLevelProcessStation.

APPARATUSREQUIRED

i. VLPS-011

ii. PC

iii. DataAcquisitionCard(VAD-104)withsoftware

iv. Patch Chords

v. Loopcable

PROCEDURE

1.ElectricalandPneumaticconnectionsshouldbegivenasperfig2 shown.

2.Interfacingconnectionshouldbe givenasper afig.1 shown.

3.Air Pressureregulator input should bemore than 25psi andmaintain the air regulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.

4.SwitchON theVLPS-011andDataAcquisitionCard(VAD-104).

5.PositiontheHandvalve(HV1)fullyopenand(HV2)&(HV3)inthemidposition.

6.Invoke“processcontrol”softwareinPC andselect‘Processstation>>Level”.

7.Select“Control>> ON-OFF”.

8.Select “settings >> parameters” and enter values for each parameters (i.e SP-35
Dead Band-20).

9.Select“File>>Start”

10.BeforeswitchONthepump,checkthecontrolvalveopening.Checkwhetherthe controlleroutputis 100%, before you switch on the pump.

11.SwitchON thepump.

12.Forgettingadesiredresponse,tunetheprocessparametertooptimumvalues.

13.Now,studytheresponseofON-OFFcontrolactionforvariousvaluesofsetpoint,Dead band.

RESULT

ThusthecharacteristicsandcontrolactionofON/OFFontheLevelProcessStationwasstudied.

LEVEL PROCESS
PROPORTIONAL CONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALCONTROL"foraLevelProcessusingprocess Control software.

APPARATUSREQUIRED

i. VLPS-011
ii. PC
iii.DataAcquisitionCard(VAD-104)with software
iv.PatchChords
v. Loopcable

PROCEDURE

1.ElectricalandPneumaticconnectionsshouldbegivenasperfigshown.

2.Interfacingconnectionshouldbe givenasper afig.1 shown.

3.Air Pressureregulator input should bemore than 25psiand maintain the air regulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.

4.SwitchON theVLPS-011andDataAcquisitionCard(VAD-104).

5.PositiontheHandvalve(HV1)fullyopenand(HV2)&(HV3)inthemidposition.

6.Invoke“Processcontrol”softwarein PCandselect“Processstation>>Level”.

7.Select“control>>proportional”.

8.Select“settings>>parameters”andentervaluesforeachparameters(i.eSp,Kp).

9.Select“File>>Start”.

10. BeforeswitchONthepump,checkthecontrolvalveopeninginbeforeyouswitchonthepump.

11.SwitchON thepump.

12. Forgettingadesiredresponse,tunetheprocessparametertooptimum values.Tune the proportional gain to maintain the process variable within the proportional band without any oscillation.

13.Now,studytheresponseofP controlactionforvarious valuesofset point,Kp.

RESULT

ThusthecharacteristicsandcontrolactionofproportionalcontrolontheLevelProcess Station was studied.

LEVEL PROCESS
PROPORTIONAL PLUS INTEGRAL CONTROL

EXP No :
DATE :

AIM

To study the action of"PROPORTIONAL PLUS INTEGRAL CONTROL" foraLevel processusing Process control software.

APPARATUSREQUIRED

i. VLPS-011
ii. PC
iii.DataAcquisitionCard(VAD-104)with software
iv.PatchChords
v.Loopcable

PROCEDURE

1.ElectricalandPneumaticconnectionsshouldbegivenasperfig2 shown.

2.Interfacingconnectionshouldbe givenasper afig.1 shown.

3.Air Pressureregulator input should bemore than 25psiand maintain the air regulatoroutput pressure (G2) to 20 psi by varying the air regulator knob.

4.SwitchON theVLPS-011andDataAcquisitionCard(VAD-104).

5.PositiontheHandvalve(HV1)fullyopenand(HV2)&(HV3)inthemidposition.

6.Invoke“Processcontrol”softwarein PCandselect“Level”.

7.Select“control>>"ProportionalPlusIntegralControl”.

8.Select“settings>>parameters”andentervaluesforeachparameters(i.eSp,Kp, Ki)

9.Select“File>>Start”.

10.BeforeswitchONthepump,Checkthecontrolvalveopeningcheckwhetherthe controlleroutputis 100%, before you switch on the pump.

11.SwitchON thepump.

12.Forgettingadesiredresponse,tunetheprocessparametertooptimumvalues.Tunethe proportionalgaintomaintaintheprocessvariablewithinthe proportional band without any oscillation.Tochangetheproportionalgain(Kp) and Tune the integral gain (Ki) to maintain the process variable at set point

13.Now,studytheresponseofPIcontrolactionforvarious valuesofset point,Kp,Ki.

RESULT

ThusthecharacteristicsandcontrolactionofPIontheLevelProcessStationwasstudied.

LEVEL PROCESS
PROPORTIONAL PLUS DERIVATIVE CONTROL

EXP No :
DATE :

AIM

Tostudytheactionof "PROPORTIONALPLUSDERIVATIVECONTROL"for a Level process using Process Control Software.

APPARATUSREQUIRED

i. VLPS-011
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. PatchChords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig.2shown.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the air regulatoroutputpressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONtheVLPS-011andDataAcquisitionCard(VAD-104)unit.

.5.PositiontheHandvalve(HV1)fullyopenand(HV2)&(HV3)inthemidposition.

6. Invoke“Process control”softwareinPC andselect“Processstation”>>Level.
7. Select“control>>ProportionalPlusDerivativeControl”.
8. Select“settings>>parameters”andentervaluesforeachparameters(i.e Sp, Kp,Kd)
9. Select“File>>Start”
10. BeforeswitchON thepump,checkwhetherthecontrolleroutputis100%.
11. SwitchONthe pump.

12. For getting a desired response, tune the process parameter to optimum values. Tunetheproportionalgaintomaintaintheprocessvariablewithinthe band w i t h o u tanyoscillation.Tochangetheproportional gain (Kp) andTunethederivativegain(Kd)to maintaintheprocessvariableat set point.
13. Now,studytheresponseofPDcontrolactionforvariousvaluesofsetpoint,Kp,Kd.

RESULT

ThusthecharacteristicsandcontrolactionofPDontheLevelProcessStationwasstudied.

LEVELPROCESS PROPORTIONALPLUSINTEGRALPLUSDERIVATIVECONTROL

EXP No :
DATE :

AIM

Tostudytheactionof"PROPORTIONALPLUSINTEGRALPLUSDERIVATIVE CONTROL"foraLevelprocessusingProcessControlSoftware.

APPARATUSREQUIRED

i. VLPS-011
ii. PC
iii. DataAcquisitionCard(VAD-104)withsoftware
iv. Patch Chords
v. Loopcable

PROCEDURE

1. ElectricalandPneumaticconnectionsshouldbegivenasperfig2shown.
2. Interfacingconnectionshouldbegivenasperafig.1 shown.
3. Air Pressure regulator input should be more than 25 psi and maintain the airregulatoroutputpressure (G2) to 20 psi by varying the air regulator knob.
4. SwitchONthe VLPS-011andDataAcquisitionCard(VAD-104).
5. PositiontheHandvalve(HV1)fullyopenand(HV2)&(HV3)inthemidposition.
6. Invoke“Processcontrol”softwarein PCandselect“Processstation>>Level”
7. Select“control>> ProportionalPlusIntegralPlusDerivativeControl”.
8. Select“settings>>parameters”andentervaluesforeachparameters(i.eKp,Ki,Kd)
9. Select“File>>Start”

10. Before switchONthepump,Checkthecontrolvalve opening.

11. SwitchONthe pump.

12. For getting a desired response, tune the process parameter to optimum values. Tunetheproportionalgaintomaintaintheprocessvariablewithinthe proportionalband without any oscillation.To changethe proportional gain (Kp) andTunetheintegralgain(Ki)andderivativegain(Kd)tomaintaintheprocess variable at set point

13. Now,studytheresponseofPIDcontrolactionforvariousvaluesofsetpoint,Kp,Ki, Kd.

RESULT

ThusthecharacteristicsandcontrolactionofPIDontheLevelProcessStationwasstudied.