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TO STUDY AND ANALYSIS OF PNEUMATIC PRESSURE CONTROL USING PID CONTROLLER

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ABSTRACT

This paper presents the basic analysis of pneumatic pressure controlling. Also it presents theory behind PID control action. As we all know the control mechanism of PID theoretically. There is a need to understand it practically. So the paper represents how the pneumatic pressure control mechanism is established in practical way in the form of experimental kit like structure. From which any one can simply learn the controlling action satisfactorily.

Keywords: Basic block diagram, structure analysis, ziegler nichol method.

I.INTRODUCTION

Even though control theory has been developed significantly, the proportional-integral(PI) and proportional-integral-derivative (PID) controllers are widely used in many industrial control systems for several decades since Ziegler and Nichols proposed their First PID tuning method. In process control industries mostly work done with pid controller .Example of tempreture controller using PID controller .In this paper we design basic diagram of pneumatic pressure control using PID.But in on-off controller action is done with only two ways.In PID if error is generated ,this error is minimized in process control system.In this system we control pneumatic pressure using PID with different components .like as Pneumatic Actuator Pressure Sensor.The purpose of this system to control the pressure at different level as per requirment.And also minimized error ,and incresed efficiency of plant.Many pressure control industries using pid control the pressure.

II. INDENTATIONS AND EQUATIONS

ZIEGLER-NICHOLS (Z-N) METHODSThe Z-N presented two classical methods for determining the parameters of PID controllers in 1942 .These methods are not model based and still widely used in various industries. The controller parameters are expressed in terms of the dynamics of process by simple procedure.

The two methods are

1. Step response method or open loop transient response method.
2. 2. Frequency response method or ultimate cycle method.

The Step Response Method:

The first design method presented by Z-N is based on a open-loop step response of the system, so that no feedback occurs. Then it is characterized by two parameters. The parameters are determined from a unit step response of the process. This method is summarized in the following steps:

1. After the process reaches steady state at the normal level of operation, switch the controller to manual.

2. With the controller in manual, introduce a small step change in the controller output and record the transient,

3. The point where the slope of the step response has its maximum is first deter- mined, draw a straight line tangent to the curve at the point of infection, the intersection between the tangent and the coordinate axes gives the parameters a and L.

4. The Z-N have given PID parameters directly as a function of a and L.

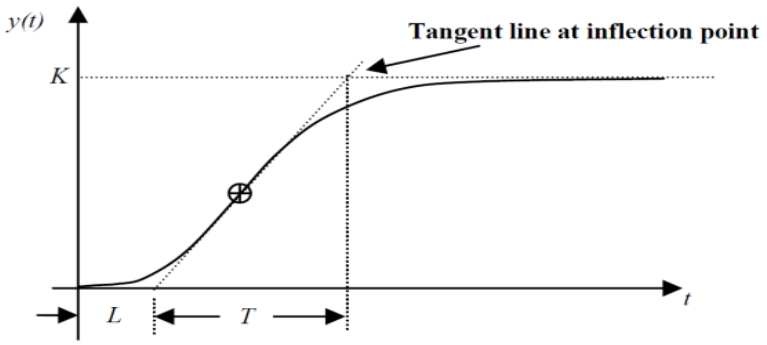

Fig 3.1 Step response of Ziegler Nichols PID tuning method

Where,

L=Delay time

T=Time constant

- **The Frequency Response Method** -This method is also based on a simple characterization of the process dynamics. The design is based on the knowledge of the points on Bode plot of the process transfer function where the parameters Ku and Tu, which are called the Ultimate gain and the Ultimate frequency need to be marked.

III.FIGURES AND TABLES

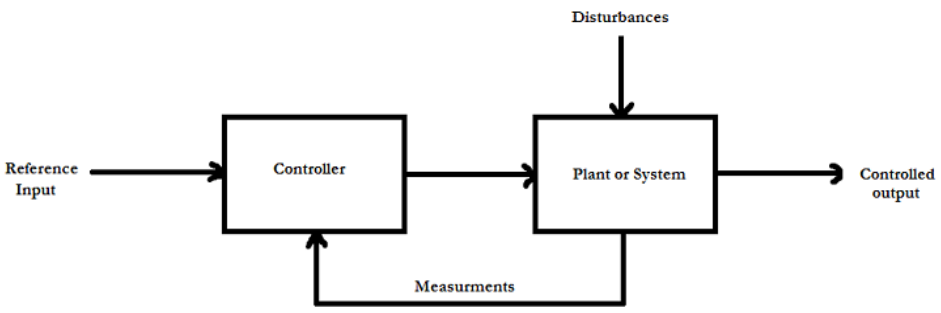

Fig 3.1 basic feedback system

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I.The inputs or outputs shown in Figure 1.1 could actually be representing a vector of signals. In such cases the plant is said to be a multi-variable plant. In this controlling of the plant is exercised by feedback, which means that the corrective control input to the plant is generated by a device (Controller) that is driven by the available measurements. Thus the controlled system can be represented by the feedback or closed-loop system shown in Figure 3.1.There are number of parameters to be consider for enhanced performance of the Plant or system. Some of them are enlisted as follows,

3.1 Process design in which if the size and dimensions of the components used to design the process are not correct then output of the process is not proper as desired.

3.1 Infrastructure of a control system in which signal transmission, control panel arrangement, distributed control system selection, and DCS configuration are the key issues.

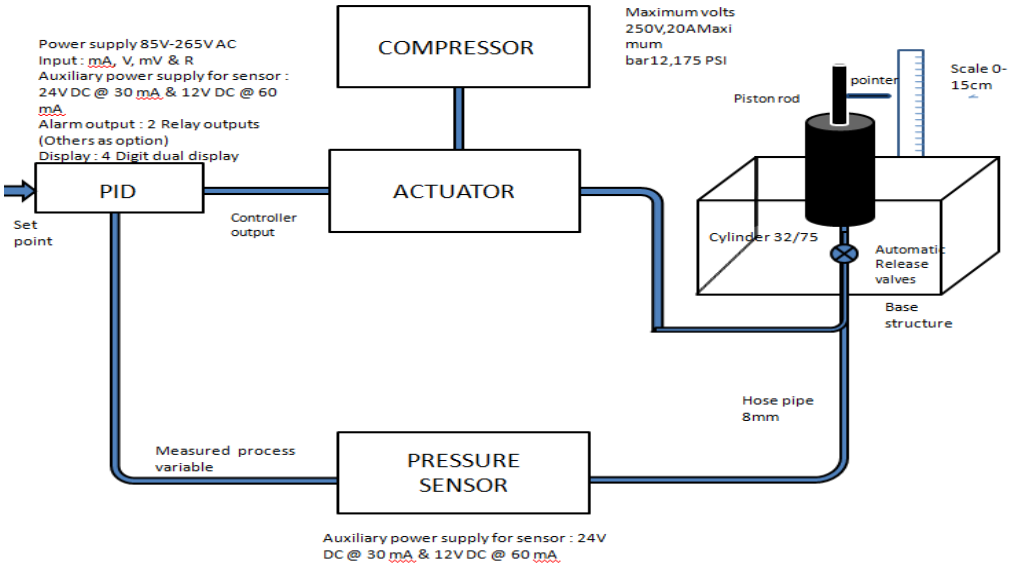

Fig 3.2 block diagram

3.2.1) As we learn in our college feedback control system and design. We learnt physical property control using PID controller theoretically. To know practically, how pressure can be controlled using controller, we are designing this system.. In "ON-OFF" control mode, it works in only two action that is ON and OFF. It is also called as two position controller. In PID there is linear relationship in between 'p'(controller output) and 'ep'(percentage of error). It reduces offset hence it is more accurate. It gives rapid response it can handle load more accurately. The PID controller only introduces significant improvement in the control system.

3.2.2)In this figure we shown that how pressure is controlled .the inlet pressure coming from the compressor pneumatic actuator control the pressure of air after this pressure sense by sensor .And this pressure goes into the cylinder.In PID we set setpoint if error is generated then pressure sensor sense a pressure and generate current signal then pid read a signal and generate voltage signal and gives to actuator.actuator work on this signal and contol the flow of air pressure in cylinder. set decide by scale. And finally minimize error using feedfack signal come from pressure sensor.

IV. CONCLUSION

In this project, the pressure system with its components and control system are explained. In this project, it is shown that the proposed controller design method is useful for wide range of linear time invariant system. Satisfactory responses can be expected for processes with various dynamics, including those with low- and higher order, small and large dead time responses of the process. Here different methods of tuning are proposed, from experiments it is concluded that Z-N tuning technique is comparably good.

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REFERANCES

[1] K.J.Astrom, and T. Hagglund, "PID controllers: theory design and tuning".

[2] W.K.Ho, C.C. Hang, and L.S. Cao, "Tuning of PID controllers based on gain and phase Margin specifications",Automatica, 31(3), p.g 497-502.

[3] C.D.Johnson, "Process Control Instrumentation Technology".

[4] J.G. Zieglar, N.B. Nichols, "Optimum control for Automatic controllers", p.g 759-768.

[5] Jorge Stephanopolous, "Chemical Process Control".

[6] Aidan O'dwyer , "PID control: the early year",(http://arrow.dit.ie/engscheleart/86)

[7] Econ DT 9812- Manual.

[8] Mr.Satish D.Nikam,"An Intensification of Systems Performance by PI/PID Controllers"

[9] David C. Dobson," Mathematical Modeling Lecture Notes"

[10] Tony Kealy and Aidan O'Dwyer."Closed loop identification of a first order plus dead time process model under PI control"

[11] K. Valarmathi, D. Devaraj and T. K. Radhakrishnan,"intelligent techniques for system identification and controller tuning".