EVALUATION OF THE EFFECT OF DIFFERENT TANGENTIAL METHODS ON THE PERFORMANCE OF PID CONTROLLER (PRESSURE)

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ABSTRACT

This study's objective was to evaluate the effects of various tangential techniques on the effectiveness of pressure controller's open loop tuning. The process reactions curves obtained from the open loop tests were analysed and the resulting parameters for PID controller are determined based on three different tangential methods which are Tangent Method, Reformulated Tangent Method and Two-Point Method. In this experiment, the set point change test is performed to determine whether the process will become more or less stable by increasing the set point value by 10% of the process span. The Load Disturbance test came after, and this test involved changing a Manipulated Variable (MV). The disturbance will be crucial in deciding which approach has the fastest and most steady process. Changes in the setpoint variable (SV) also play an important role in determining the best approach, as changes in the setpoint variable and the load disturbance value are approximated. Based on settling time and IAE, the results section below shows the tangential method giving the fastest settling time and lowest IAE. In light of this, the tangential method provides greater process stability because the settling time is short, allowing the controller to quickly recover PV to SV after a disturbance, and the smaller IAE means less vibration.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

One can see the fundamental concept of a PID controller shown in a nineteenth-century steam engine governor design, with Elmer Sperry developing the first actual PID-type controller in 1911. The first theoretical evaluation of a PID controller was published by Nicolas Minorsky in 1922. His findings came as a result of work on the U.S. Navy's automatic steering system design (Wojsznis & Blevins, 2013). Afterwards, in order to reduce overshooting problems, the first pneumatic PID controller was developed in 1940. Tuning criteria were developed by Ziegler & Nichols in 1942 to assist engineers in determining and setting the proper PID controller values. In the middle of 1950, automatic PID controllers were finally widely deployed in businesses (Agarwal, 2013).

A PID controller is a device that regulates temperature, flow, pressure, speed, and other process variables in industrial control applications. Proportional Integral Derivative (PID) controllers, which regulate process variables through a control loop feedback mechanism, are the most precise and reliable.

A control loop is a feedback device that makes an attempt to eliminate differences between a process variable that can be measured and the desired setpoint. This difference is referred to as error. In an attempt to remove the error, the controller applies the necessary corrective steps using an actuator that can shift the process variable up or down. The main components that are typically used in control processes are a primary sensing element, controller, transmitter, and an actuator or final control element. The primary goal of process control is to regulate or control the value of a particular quantity.