TITLE:

EVALUATION OF THE EFFECTS VARIOUS TANGENTIAL METHODS ON THE PERFORMANCE OF FLOW PROCESS CONTROL

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ABSTRACT

The purpose of this study is to determine the effect of three different tangential methods which are Tangent method, Reformulated tangent method, and Two-point method applied towards the performance of flow process using Proportional-Integral-Derivative controller. This experiment includes the open loop test tuning on the flow controller which includes Performing Set Point Change Test by changing the set point value that was increase by 20% and 30% of the process span and see whether the process can be stable or not. Next test was the Load Disturbance Test where a change in manipulated variable was done to see if the changes made can be handled by the process to get a stable process again after the load disturbance. Settling time and Integral Absolute Time are used to determine which tangential method gives the best performance on the flow controller.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

Process control is the ability to monitor and adjust a process to give a desired output Process controls are essential for managing a plant process upset and carrying out the necessary emergency measures. Without sufficient and reliable process controls, an unexpected process occurrence cannot be tracked, managed, or eliminated. Simple manual actions to remote computer logic controllers with instrumentation feedback systems are all examples of process controls. These systems ought to be built without the need for additional safety precautions. Process principles, permitted margins, reliability, and process control techniques are all built-in safety features that have an impact on a facility's risk level. Human observation and surveillance are the most commonly used and reliable process controls in the process industry. Local plant pressure, temperature, and level gauges, as well as control room instrumentation, are provided to allow for human observation and action to maintain proper process conditions.

It have three major type of feedback controller, the controller are proportional controller (P), proportional-integral controller (PI) and proportional-integral-derivative controller (PID). PID controllers are used in a variety of industrial process control applications. PID controllers are used in approximately 95% of the closed-loop operations in the industrial automation sector. These three controllers are combined in such a way that a control signal is produced. It delivers the control output at the desired levels as a feedback controller. PID control was implemented by analogue electronic components prior to the invention of microprocessors. However, microprocessors now process all PID controllers. PID controller instructions are also built into programmable logic controllers. PID controllers have traditionally been used in process control applications due to their flexibility and dependability. By using closed-loop operations, the PID controller maintains the output so that there is no error between the process variable and the setpoint/desired output. PID employs three basic control behaviours, which are described below.

P- Controller

Proportional or P- controller gives an output that is proportional to current error e (t). It compares the desired or set point with the actual value or feedback process value. The resulting error is multiplied with a proportional constant to get the output. If the error value is zero, then this controller output is zero. When used alone, this controller necessitates biassing or manual reset. This is due to the fact that it never reaches a steady-state condition. It provides stable operation but always keeps the steady-state error constant. When the proportional constant Kc increases, so does the response speed.

I-Controller

I-controller is required in order to provide the necessary action to remove the steady-state error due to the limitation of p-controller, where there always exists an offset between the process variable and setpoint. Until the error value is zero, the error is integrated over a period of time. It stores the value for the last control mechanism before error is zero. Integral control decreases its output when a negative error takes place. It limits the speed of response and affects the stability of the system. The speed of the response is increased by decreasing integral gain, Ki.

D-Controller

D -controller is unable to foresee how errors will behave in the future. Once the setpoint is altered, it responds as expected. By foreseeing how the error will behave in the future, the D-controller solves this issue. Its output is determined by the derivative constant multiplied by the error's rate of change over time. It provides the catalyst for the output, boosting system responsiveness.