TITLE:

EVALUATION OF VARIOUS TUNING RULES FOR TUNING OF LEVEL PROCESS CONTROL

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ABSTRACT

This research will study the effects of various tuning rules on the level process control. The tuning rules being studied are Ziegler-Nichols, Cohen-Coon, and Takahashi tuning rules. Level process control is the process of maintaining a desired liquid level in a tank or vessel by adjusting the flow of liquid into or out of the tank. The basic components of a level control system include a sensor to measure the level of liquid in the tank, a controller to compare the measured level to the desired setpoint, and an actuator to adjust the flow of liquid into or out of the tank. Tuning a level control system involves adjusting the parameters of the controller to achieve the desired performance. There are several different methods for tuning a level control system, including manual tuning, trial-and-error tuning, and automatic tuning. Manual tuning involves adjusting the controller's parameters based on the operator's experience and knowledge. This method is often used when the process is not well understood or when the process is in a steady state. Trial-and-error tuning involves adjusting the controller's parameters and observing the process response. This method can be used when the process is well understood, but it can be time-consuming and may not result in the best performance. The Ziegler-Nichols tuning rule is a popular method that uses process oscillations to determine the controller's parameters. The process is first run in open-loop, and the controller's parameters are adjusted based on the amplitude and period of the oscillations. In summary, level process control is the process of maintaining a desired liquid level in a tank or vessel by adjusting the flow of liquid into or out of the tank. Tuning a level control system involves adjusting the parameters of the controller to achieve the desired performance. There are several different methods for tuning a level control system, including manual tuning, trial-and-error tuning, and automatic tuning. By the end of this study, it had been decided that Takahashi tuning rules are the most suitable and have the best performance for tuning of Level Process Control.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

In general, process control is the study and application of automatic control in the field of chemical engineering. Its objective is to maintain a process at a desired operating condition, safely and efficiently, while satisfying environmental and product quality requirements. There are several segments in process control like PID controller and Tuning.

PID stands for Proportional Integral Derivative, and it's a control algorithm used in various control systems and industrial processes. It works by continuously calculating an error value as the difference between a desired setpoint and the current process variable. The integral term yields zero steady-state error in tracking a constant setpoint, a result commonly explained in terms of the internal model principle and demonstrated using the final value theorem. Integral control also enables the complete rejection of constant disturbances. While integral control filters higher frequency sensor noise, it is slow in response to the current error. On the other hand, the proportional term responds immediately to the current error, yet typically cannot achieve the desired setpoint accuracy without an unacceptably large gain.

Tuning is the process of adjusting the parameters of a control system, such as a PID controller, to optimize its performance. The main objective in tuning PID controllers is to adjust the reactions of PID controllers to setpoint changes and unmeasured disturbances such that variability of control error is minimized. PID controllers are implemented primarily to hold measured process value at a setpoint, or desired value.

It is important to note that these are just a few examples of the tuning rules that are available, and the best rule to use will depend on the specific process being controlled. Additionally, these rules are not always suitable for all processes and may need some tweaking based on the process dynamics. In most cases, an experienced engineer will use the trial-and-error method, with some knowledge of the process dynamics, to arrive at the best set of tuning parameters.

In conclusion, tuning rules can be used to determine the optimal control