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COMPARISON OF PID TUNING METHODS FOR FIRST ORDER PLUS TIME-DELAY SYSTEM

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ABSTRACT

Controlling the process is the main issue that rises in the process industry. It is very important to keep the process working probably and safely in the industry, for environmental issues and for the quality of the product being processed. PID control is a control strategy that has been successfully used over many years. Simplicity, robustness, a wide range of applicability and near-optimal performance are some of the reasons that have made PID control so popular in the academic and industry sectors. Recently, it has been noticed that PID controllers are often poorly tuned and some efforts have been made to systematically resolve this matter. This paper demonstrates an efficient method of tuning the PID controller parameters using various tuning techniques. It involves calculating the gain of the controller (K_p), integral time (T_i) and the derivative time (T_d) for PID controlled system whose process is modeled in First order plus time-delay (FOPTD) form. In this paper the performance of PID tuning techniques is analyzed and compared based on time response specifications.

***Keywords**:Comparison, MATLAB, Performance Specifications, PID Controller, Tuning rules.*

I. INTRODUCTION

The Proportional- Integral- Derivative (PID) controller is widely used in the process industries. The main reason is their simple structure, which can be easily understood and implemented in practice.

A PID controller produces an output signal consisting of three terms – one proportional to error signal, another one proportional to integral of error signal and third one proportional to derivative of error signal. The combination of proportional control action, integral control action and derivative control action is called PID control action. The combined action has the advantage of each of the three individual control actions. The proportional controller stabilizes the gain but produces a steady-state error. The integral controller reduces or eliminates the steady-state error. The derivative controller reduces the rate of change of error. The main advantages of PID controllers are higher off stability, no offset and reduced overshoot. According to the survey more than 90% of the control loops were of the PID type.