ABSTRACT

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Courses	*:*	*Electrical Engineering*
Heading	*:*	*Comparison of DC Motor Speed Control Results with PID Controllers Using the Ziegler-Nichols and Cohen-Coon Tuning Methods*

DC motors are actuators that are widely used in the industry because of their ability to control their speed according to the setpoint value. However, the speed of the motor can be disrupted by changes in load and system interference, so a controller that is able to maintain stability is needed. PID control is one of the most widely used methods because of its ease of implementation and ability to generate a good system response. This study compares two PID tuning methods, namely Ziegler-Nichols and Cohen-Coon, in regulating the speed of DC motors in conditions without load and under load. The parameters analyzed include rise-time, overshoot, settling-time, and steady-state error, to determine the performance of each tuning method. The test is carried out directly on a real (nonlinear) system, and the results of the motor speed readings are displayed in the form of a graph using LabVIEW software as a data viewer medium. The test results showed that Cohen-Coon had an advantage in risetime and overshoot (e.g. in no-load P tuning at 750RPM, 2.79% overshoot compared to 4.17% in Ziegler-Nichols), whereas Ziegler-Nichols was better at steady-state error and settling-time stability. Under load, the system experienced a decrease in performance, but both methods were still able to adjust the response. This study shows the effectiveness of both the PID tuning method in real systems and the use of LabVIEW as a visualization tool for motor speed test results.

Keywords: DC motor, PID control, Ziegler-Nichols, Cohen-Coon, Labview.