ABSTRACT

In this final assignment paper, a research on PID control algorhytm designing in an oxyhydrogen cell system model is reported. The oxyhydrogen system model consists of a buck-boost converter model and an electrolytic cell model which are integrated in a closed-loop system.

This research is divided into several steps.The first step is the designing and modelling of the system. The following step is to obtain the PID control constants using Ziegler-Nichols Ultimate Cycle Method. After the control constants are obtained,set-point testing is done. The result of the set-point testing portrays system's dynamic characteristics which will be analysed further.

From the research, the PID control constants K_p, K_i, *and* K_d *are found to be 0.0298, 39.237* s^{-1}, *and 5.67 x* 10^{-6} *s, respectively. The system's damping ratio (ζ) and natural frequency* (ω_n) *are found to be 0.0268 and 2187.782 Hz, respectively. After the control constants are applied to the system, it is found that the system is able to achieve the desired set-point with the steady-state error value of 0.02* cm^3*/minute and maximal overshoot percentage of 48.92 %. The result of the research also showed that the system behavior is slower than analytically-predicted second-order system behavior. This is due to the existence of right-half-plane zero in the system's transfer function and the buck-boost converter characteristics. On the other hand, the PID control algorhytm was found to stabilize system, proven by its set-point test result and Nyquist plot of the closed-loop system's transfer function.*

Keywords : PID, oxyhydrogen, buck-Boost converter, MATLAB, Simulink