

Adi Prasetyo Hutomo. 091515053003, 2019. Design of Energy Dosing Controll System Automation for Electrical Stimulation Therapy. Thesis supervised by Prof. Dr. Ir. Suhariningsih and Dr. Suryani Dyah Astuti, M.Si., Master of Biomedical Engineering Program, Sekolah Pascasarjana, Airlangga University

ABSTRACT

The electrical stimulation design using monophasic spike-exponential waveform is proposed and described in this study. The monophasic square waveform has benefit in generating an action potential, but it can cause side effects such as toxic which is caused by the electrode polarization. The square signal which is the frequency and pulse width can be modulated will be manipulated to be the monophasic spike-exponential waveform. Transformer OT240 is applied at the end of the FES system part and functioned as a voltage amplifier and DC signal isolator. On every frequency range between 4-100 Hz, the 16 peak voltage stages with the lower limit of 45 Volt and an upper limit of 400 Volt is arranged in order to obtain V_{RMS} value in each stage. Characterization result shows that the produced waveform is monophasic spike-exponential with the narrow pulse width ($t_{1/2} = 10 \mu s$). This study proved that designed FES has benefit in high V_P and low V_{RMS} , thus, it can be concluded that this FES system design can be applied clinically as a medical rehabilitation tool due to its effective, safe, and comfortable application.

Keywords: electrical stimulation, monophasic spike-exponential waveform, energy dosing control system, automation electrical stimulator