INTISARI

Teknologi elektronika daya semakin modern dengan munculnya konverter yang ringkas dengan rapat energi dan efisiensi yang tinggi seperti konverter *dual-active-bridge* (DAB). DAB menjadi topologi konverter dc-dc yang memanfaatkan dua jembatan jenis *H-Bridge* yang dirangkai secara simetris sehingga memungkinkan aliran dua arah *bi-directional*. Konverter DAB perlu dikendalikan agar beroperasi secara optimal. Metode kendali konvensional kurang andal seperti kendali PI yang parameternya perlu diatur secara berkala. Sebagai alternatif, *nerual network* (NN) berjenis *long-short-term memory* (LSTM) dapat digunakan karena kemampuannya dalam memodelkan sistem dinamis.

Penelitian ini bertujuan untuk merancang dan mengoptimalkan model kendali LSTM untuk meregulasi tegangan keluaran konverter DAB. Metodologi yang digunakan adalah membentuk model *baseline* kendali berdasarkan *inverse dynamics* yang dioptimalkan melalui eksperimen hingga mendapatkan hasil yang paling optimal sesuai dengan konverter DAB berdasarkan pengujian performa. Pengujian dilakukan dengan variasi referensi, beban, tegangan sumber, dan parameter konverter DAB. Hasil penelitian membuahkan model kendali LSTM yang cepat dan andal terhadap perubahan serta dapat mengurangi kerumitan dibandingkan kendali PI konvensional.

Kata kunci : *long-short-term memory*, sistem kendali, konverter *dual-active-bridge*

ABSTRACT

Power electronics technology is modernizing with the advent of compact converters with high energy density and efficiency, such as the dual-active-bridge (DAB) converter. DAB is a DC-DC converter topology that utilizes two symmetrically assembled H-bridge type bridges to allow bi-directional power flow. The DAB converter needs to be controlled to operate optimally. Conventional control methods lack reliability, such as PI control, whose parameters need to be adjusted periodically. As an alternative, a neural network (NN) of the long-short-term memory (LSTM) type can be used due to its ability to model dynamic systems.

This research aims to design and optimize an LSTM control model to regulate the output voltage of a DAB converter. The methodology consists of creating a baseline control model based on the inverse dynamics of the DAB converter. The model is then optimized through experiments to reach the most optimal results according to the DAB converter based on the performance tests. The tests are conducted by varying the references, loads, source voltage, and parameters of the DAB converter. The research results in a fast and reliable LSTM control model that reduces complexity compared to conventional PI control.

Keywords : *long-short-term memory, control system , dual-active-bridge converter*