Stability study of electroless capacitor-less drive system based on Neural Networks

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In this paper, the power characteristics of the electrolytic capacitor drive system is investigated. Due to the absence of high-capacity energy storage components on the DC bus, the topology of the electrolytic capacitor variable frequency drive system requires fast response of the rectifier and inverter switching tubes to avoid the instantaneous surge voltage generated during load shedding operation. Traditional control methods have fixed control parameters and cannot provide optimal control parameters for dynamic operation, making it difficult to control the switching tube to quickly achieve energy flow and threatening the stability of the system.

The experiments covering steady-state and off load operation in different power ranges be designed. A dataset of instantaneous stable operation control parameters for each loop has been obtained by debugging the optimal operating state. And a data generator is built to support the steady-state operation of the system by controlling the parameter dataset through instantaneous stable operation. At the same time, a systematic analysis of mathematical models and energy flow laws is conducted to determine the sampling frequency for data collection, including data from system start-up to steady-state and dynamic multi working conditions such as load shedding, in order to digitize the entire process and optimize and improve the database. Finally, based on the data, deep network modeling is carried out to achieve differentiated control and stable operation of the system.

A simulation model and an experimental platform are built to verify the feasibility of the control strategy of the electrolytic capacitor-less variable frequency speed control system, and it is proved that the proposed control strategy can effectively improve the reliability of the system.

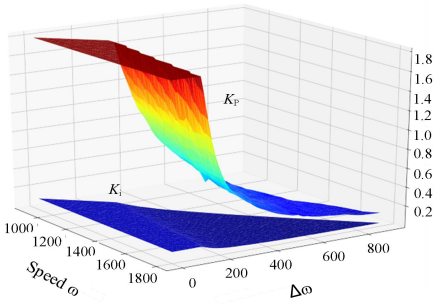

Fig. 1 The PI parameter stable dataset of speed loop

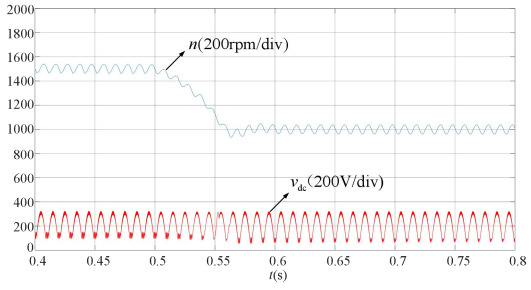

Fig.2 Bus voltage and speed waveforms

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