LADRC-based non-characteristic harmonic suppression strategy for pumped storage power plants

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April 15, 2024

Abstract

The Static Frequency Converter (SFC) in a pumped storage power plant often causes harmonic problems in the dragging processes, which may lead to the false operation of automatic devices in the power station, and even damage to the power equipment. These harmonics caused by SFC contain both characteristic and non-characteristic degrees, and the components are more complex. Hence, the existing harmonic suppression methods using APF or PPF compensation all have some problems. The SFC starting control strategy based on Linear Active Disturbance Rejection Control (LADRC) is proposed in this paper to reduce the non-characteristic subharmonics. Firstly, the factors affecting the non-characteristic harmonic content are analyzed, and a mathematical model of the conventional SFC starting transfer function is established. On this basis, the LADRC controller is used as the speed loop of SFC starting to replace the PI controller. The stability is judged by drawing the Bode plot and the zero-pole plot. Finally, A Matlab/Simulink simulation model of LADRC-based SFC starting is established in a pumped storage power plant with actual parameters, and simulation accurate measurements verify the effectiveness of the proposed control strategy for non-characteristic harmonic current suppression.

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