Contribution ID: **312** Type: **Poster Presentation**

Tokamak Vertical Stability Coil Power Supply based on Modular Multilevel Converter

Thursday 7 July 2016 14:40 (20 minutes)

Modular multilevel converter (MMC) has gained tremendous attention in high power applications since its introduction in 2003. It has enabled the usage of IGBT devices for high voltage applications without the need to connect a large number of switches in series. Although mostly adopted in medium voltage drives and high voltage dc transmission converter stations, MMC can be very promising solutions for pulse power supplies. The author has proposed a MMC based vertical stability power supply design previously where the design and real time simulation has demonstrated the feasibility to meet the fast dynamic requirement of Tokamak vertical stability coil [1]. However, it utilized only two groups of modules per arm with separate ideal dc power supply for each module which may not be practical for real field implementation. In this paper, a MMC with a single centralized power supply is proposed for the vertical stability coil power supply with ITER as an example. Considering the limitations of available IGBT voltage rating, the number of switches used in each arm is much increased, which then increases the controller design challenge. More importantly, with the centralized power supply, capacitor voltage unbalance and circulating current issues will arise, especially with the unsymmetrical pulse power load. Therefore, in this paper, voltage balancing strategies and circulating current suppression controller design will be presented. With the large number of switches used and complicated controller, real time simulation is preferred for more efficient and accurate design verification. The simulation results of the proposed circuit and controller with OpalRT simulator platform will be presented in the paper.

[1] X. Yao, Y. Huang, F. Guo, and J. Wang. "Advanced concepts for vertical stability power supply in fusion devices," IEEE Trans. Plasma Sci, vol. 40, no. 3, pp. 761-768, 2012.

Primary author: YAO, Xiu (University at Buffalo)

Co-author: Mr LEE, Inhwan (University at Buffalo)

Presenter: Mr LEE, Inhwan (University at Buffalo)

Session Classification: Poster 2-A

Track Classification: Power Electronics, Power Supplies, Prime Power, Rotating Machines, and Energy Converters