Improvement of Performance and Response Time of Cascaded Five-Level VSC STATCOM Using ANN Controller and SVPWM During Period of Voltage Sag

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Abstract:
Power system is an extremely nonlinear system with a number of interconnected loads. When the system is subjected to the faults, the stability of the system will be disturbed. The major problem dealt here is voltage sag. A static synchronous compensator (STATCOM) is one of the FACTS devices which can inject proper reactive current at the point of common coupling (PCC) to compensate voltage sag. A non-linear controller like artificial neural network (ANN) is used with the FACTS devices for better performance. This paper introduces the design of a cascaded 5-level voltage source converter (VSC) STATCOM based on the ANN controller and space vector PWM (SVPWM) technique to nullify the impacts of voltage sag. ANN and SVPWM were employed to enhance the performance and response time (RT) of STATCOM with regard to correction of voltage magnitude and power factor (PF) amplitude during voltage sag period. The performance of STATCOM was analyzed using MATLAB in IEEE 3-bus system with two different types of faults, which are single line to ground (SLG) fault and line to line (LL) fault (both creates voltage sag). The simulation result showed that the ANN-based STATCOM control circuit performed efficiently compared to the PI controller. The ANN controller was able to recover voltage magnitude very quickly (during 0.02 sec) with unity.

Keywords : Cascaded H-bridge five-level VSC STATCOM; Artificial neural network; SVPWM; Voltage sag

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