Transmission of electrical power through high voltage direct current (HVDC) has attracted the attention of a number of researchers in the recent years. For economic design and optimal operation, HVDC system requires a detailed simulation model. Therefore, in this paper a detailed Matlab simulation model of line commutated converter (LCC) based monopolar HVDC system, feeding a strong AC network, with a fixed capacitor (FC) as a reactive power compensator is presented. Firefly algorithm based optimal proportional integral (PI) controller has been proposed for the rectifier and the inverter control. The transient performances of the HVDC system under various AC and DC fault conditions were studied. The results show the supremacy of the firefly algorithm based optimal PI controller over the conventional PI controller. The harmonic analysis is also carried out under steady state operation to assure the quality of power supply on the inverter AC side.


**Index Terms**

Computer Science \hspace{1cm} Circuits And Systems

**Keywords**

Monopolar HVDC \hspace{1cm} Strong AC system \hspace{1cm} PI controller \hspace{1cm} Firefly Algorithm.