

# Protection System for a Commercial Dynamic Reactive Power Compensator

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## Abstract

Power systems loads are very dynamic. Varying reactive power causes voltage fluctuations, line overloading, increase power transmission loss and some critical operations may lead to voltage instability. As a smart solution, Dynamic Reactive Power Compensator (DRPC) comes handy. Continuous and smooth reactive power compensation improves the power system performance. As a result voltage fluctuation, power loss, threat on instability and kVA demand charges are reduced. Further the power system transmission lines are utilized to transmit more active power while improving the reliability of the supply. Designing an optimized protection system is very important for the DRPC's safe and reliable operations. In this paper, a parallel optimized protection system required for industrial operation of the DRPC is discussed. The DRPC protection requirements were identified and their responses for possible faults were studied. The protection paths were divided into three categories and nine methods of techniques in each path were discussed. Main path consisted of a protection system, implemented with hardware for instantaneous measurement and tripping. Secondly the auxiliary path consisted of a dSPACE system designed to block the operation of the DRPC for any fault operation through its interface shutdown control signal. Thirdly the supervisory protection system was designed by using the standard relays to trip the circuits. The three parallel protection systems were designed to look after over voltage, under voltage, over current, ground faults and Thyristor failures of the DRPC systems. Further a fuse based slow acting backup protection system was also designed. Finally individual protections for the switching devices were designed, which confirmed the normal operation of each switching devices