Abstract

In this paper, a fuzzy logic technique is used to control the power factor (PF) that compensate the reactive power of the load by controlling the excitation system of synchronous machine. This fuzzy logic controller can give a fast response compensation to meet the required load reactive power and hence keeping the load bus at constant set point PF value. The V curve of PF is treated in a way to get the flexibility and the limitation the over or under values, as well as time delay could therefore be eliminated with such a control configuration. The results show that fuzzy based power factor controller using synchronous machine is reliable, sensitive, faster and more efficient compare with the other methods such as capacitor groups.

Matlab-Simulink program was adopted for the architecture and learning procedure of fuzzy system depending of construct an input-output mapping based on both knowledge and stipulated input-output data pairs. A model of the synchronous machine was also presented in this paper. The variable DC voltage based excitation field current controller was built based on fuzzy logic controller to generate the firing angle of six-pulse rectifier circuit.
References


Index Terms

Computer Science       Fuzzy Systems
Keywords

Fuzzy logic controller, Power factor controller, Synchronous machine model, and Reactive power compensation. List of Symbols: SM = Synchronous machine. \( v_a, v_b \) and \( v_c \) = Thee phase terminal voltages (Volt). \( i_a, i_b \) and \( i_c \) = Thee phase terminal current (Ampere). \( \alpha \) = Firing angle (degree). \( V_f \) = DC field voltage (volt). \( I_f \) = DC field current (amper). \( R_f \) = Resistance of field circuit (ohm). \( L_{ff} \) = Self of rotor inductance (henry). \( L_a, L_b \) and \( L_c \) = Stator self-inductance (static)/phase (henry). \( L_{ab}, L_{bc} \) and \( L_{ca} \) = Mutual inductance between stator Phases (henry). \( L_{af}, L_{bf} \) and \( L_{cf} \) = mutual inductances between stator phases and rotor (henry). \( L_s \) = Part of phase inductance harmonic because of salience (henry). \( \lambda_a, \lambda_b \) and \( \lambda_c \) = Instantaneous linkage flux for stator phases (Wb). \( \lambda_f \) = Instantaneous linkage flux for rotor (Wb). \([V]\) = Voltage matrix (volt). \([R]\) = Resistance matrix (ohm). \([i]\) = Current matrix (amper). \([\lambda]\) = Linkage flux matrix (Wb). \([L]\) = Inductance matrix (henry). \( T_e \) = Electrical torque (N.m). \( T_L \) = Mechan