CHAPTER 7

CONCLUSION AND SUGGESTION FOR FUTURE WORK

The performance of the insulation of the stator winding of 11 kV and 6.6 kV rotating machines were analyzed using

i. BPN algorithm
ii. Fuzzy Logic
iii. BPN with PID Controller concept and
iv. ANFIS approach

7.1 ANALYSIS OF INSULATION PERFORMANCE USING BPN APPROACH

i. The BPN network has been trained for three trial sets, consisting of ten sets of randomized weight samples by using the applied voltage, leakage current and capacitance as input parameters and dissipation factor as an output parameter.

ii. BPN network based analysis of the insulation performance shows fairly acceptable results with an error tolerance of 0.04, for the machine under test.
7.2 ANALYSIS OF INSULATION PERFORMANCE USING FUZZY APPROACH

i. The Mamdani fuzzy logic system with 125 rules and five triangular type membership functions both for the inputs of applied voltage, leakage current and capacitance and the output parameter of dissipation factor.

ii. The Fuzzy logic based analysis gives good response for a few input values and fairly average response for other inputs with a tolerance error of 0.031, which is better than 0.04 of BPN approach.

7.3 ANALYSIS OF INSULATION PERFORMANCE USING BPN WITH PID APPROACH

i. The BPN with PID network has been trained for three trial sets, consisting of ten sets of randomized weight samples by using the applied voltage, leakage current and capacitance as input parameters and dissipation factor as an output parameter.

ii. The test results almost closer to the measured value for all the test inputs with a lower error tolerance of 0.02, compared to 0.04 of BPN approach and 0.031 of Fuzzy approach, for the machine under test.

7.4 ANALYSIS OF INSULATION PERFORMANCE USING ANFIS APPROACH

i. The ANFIS with type - 3 reasoning mechanism, employing a hybrid learning procedure has been trained by using the
applied voltage, leakage current and capacitance as input parameters and dissipation factor as an output parameter.

ii. This approach gives the best results with an error tolerance of 0.015, compared to the error tolerance of 0.04 in BPN, 0.031 in the fuzzy and 0.02 in the BPN with PID.

7.5 CONCLUSION

This work presents the BPN, Fuzzy, BPN with PID concept and ANFIS approach for analyzing the performance of stator winding insulation from various measurements like applied voltage, leakage current, capacitance and dissipation factor. The accurate prediction of insulation level can be achieved by obtaining the correct experimental data base. In the present study, the experimental data obtained from seven machines were analyzed by the above said four techniques to predict the performance of their insulation. In the light of this experience, these intelligent techniques were extended to predict the performance of the eighth machine, a 11kV machine taken as the test machine.

The predicted results were found to be very closer to the actually measured values in ANFIS approach, compared with the other three techniques. Hence, of all the four methods of analysis tried, the ANFIS based method of analysis of insulation performance was found to be a better method than the other three methods for predicting the stator winding insulation performance, because of its improved performance characteristics with regard to the converging speed, oscillation in error characteristics and accuracy of predicted values with respect to their actual values.
7.6 SUGGESTION FOR FUTURE WORK

The indicators of the condition of insulation namely Capacitance, Dissipation factor and Insulation resistance are known to vary with

- The environmental condition such as temperature and humidity. Therefore these indicator data may be acquired for various temperature and humidity and their influence on the sensitivity of the methods mentioned above may be studied.

- Indicator data also depend heavily on the materials and the design used for the insulation system.

- An extensive database may be accumulated over a long period of time for different environmental conditions and advanced algorithms may be used for treating the processed data over time for different machines to provide information on the present condition of the insulation and its remaining life time.