Condition monitoring and fault diagnostics of electrical machines are extremely important in any industrial setup. In some applications, such as the oil and gas industries, production units, power generation, refining and milling, the failure of critical equipment like generators, milling machines, motors, fans and pumps costs millions of dollars in reduced output, emergency maintenance costs and lost revenues. However, in the utility industry, malfunctioning of the electrical machinery is not acceptable not only because of its financial damage, but also the threat that is caused by a sudden failure or malfunctioning of the part.

The research is aimed at developing a system that will detect incipient failures of electrical machinery before actual failure results in system or industrial process disruption. The objective is to make repeatable decisions based on complex relationships between large amounts of measured and estimated data. The condition of the machines will be available at all times, and the incipient detection and predictive maintenance system will provide an accurate prediction of any potential failure on demand. Two techniques are under consideration, the first one is based on pattern recognition that analyzes electrical measurements of electrical components to characterize the profile of electric machines at the beginning of life for a 'baseline signature'. Then, at regular intervals, or when a failure is suspected, the technique will be used to derive the present profile and compare it with the 'baseline' profile. The other method is based on adaptive neuro-fuzzy inference system (ANFIS). The synergy of artificial neural network and expert fuzzy logic yield ANFIS that is a simple and effective diagnostic tool not requiring precise mathematical models of the motor and controllers. The proposed ANFIS controller will provide qualitative and quantitative knowledge of the health of a rotating machine through valid heuristic reasoning. Various types of electrical and mechanical faults will be investigated and the technique based on expert knowledge (ANFIS system) will be utilized for incipient fault diagnostics.