

ABSTRACT

The subject of minimizing losses at the distribution level of electrical power networks has gained a great deal of attention due to the high cost of electric energy. One objective of the feeder reconfiguration of distribution systems is to minimize the total power losses for a specific load. Distribution networks restoration is the process of restoring the out of service areas in the systems by altering the open/closed status of switches to transfer loads among the feeders.

This thesis adopts an efficient one tool for the restoration process of electrical distribution systems. The real ants'-behavior inspired Ant Colony Optimization (ACO) algorithm implemented in addition to the use of another tool which is the Fuzzy Logic Control (FC). Fuzzy Control – Ant Colony Optimization (FC-ACO) is used for the restoration of distribution systems so that the active power losses are globally minimized with turning on/off sectionalizing and tie switches. The proposed method FC-ACO introduces some modifications to the pheromone updating rules used in ACO algorithms, where pheromone is a chemical trail produced from each ant on the trail to represent the desirability of this trail. The range of pheromone trails is assumed in the first iteration without considering the amount of the power from the feeders. To verify the effectiveness of the proposed method, studies are conducted on three test systems with promising results. A 13-bus, 14-bus and 30-bus electrical distribution.

Systems are selected to study the variety of the inputs and the flexibility of the proposed method. The obtained results, using the proposed FC-ACO method, are compared with the results of the ACO stand alone to examine the performance and the efficiency.

Keywords: Ant Colony Optimization; Fuzzy Logic Control; distribution networks; restoration process; loss reduction; optimization; power loss; reconfiguration.