

ABSTRACT

In this thesis a comprehensive analysis on distribution load flow, network reconfiguration of distribution system, branch conductor optimization of radial distribution system and distribution system planning is presented.

Chapter 1 introduces the various aspects of distribution system in general and presents a critical survey of the past work concerning distribution load flow, network reconfiguration, optimum conductor selection and distribution system planning. It clearly lays down the objectives and motivations of the research work presented in the thesis.

Chapter 2 presents a simple approach for solving radial distribution networks. The proposed method completely exploits the radial feature of the distribution networks. The proposed method is also extended for solving meshed distribution networks. Several radial and meshed distribution networks are successfully solved using the proposed method.

Chapter 3 presents two algorithms for the reconfiguration of distribution feeders. For the first algorithm (OPTION 1), during iterative process, closing of an open tie switch is based on the maximum voltage drop across it and this drop must be greater than some specified value (ϵ). For the second algorithm (OPTION 2), during ^{iterative process,} closing of an open tie-switch is arbitrary, but the voltage drop across it must be greater than some specified value (ϵ). The main advantage of the proposed algorithms is that they minimize the number of switching operations.

Chapter 4 deals with the branch conductor optimization of radial distribution feeders. A novel method is presented for selecting the optimal branch conductors by minimizing an objective function. The main advantages of the proposed method are that it can maintain the minimum voltage within prescribed limit and the current flowing through each branch is less than the maximum current carrying capacity of the corresponding branch conductor.

The proposed method is simple and its effectiveness is demonstrated through two examples.

Chapter 5 deals with the planning of distribution system. The distribution system planning problem is divided into three subproblems: (1) radial feeder planning problem, (2) selection of optimum size of branch conductors, (3) selection of tie-lines for open loop design of distribution systems.

A simple procedure is proposed for obtaining the optimal radial path by satisfying all constraints. After obtaining the optimal radial feeder path, branch conductors are optimized using conductor optimization algorithm.

For the purpose of reconfiguration of feeder under normal operating condition, the feeder is planned as open loop structure and the final choice of tie-lines is selected based on network reconfiguration algorithm (minimum power loss) as developed in **Chapter 3**.

Chapter 6 brings out the significant conclusions of the entire work and the scope for further research.