SVC Placement in unbalanced distribution network to reduce the neutral lines current and ohmic losses using intelligent optimization algorithms

S. Rezaeian-Marjani; V. Talavat

Abstract-

Distribution Network (DN) unbalancing and their unfavorable effects such as energy losses is an important challenge in electrical engineering. The system unbalancing problem is highly regarded due to increasing energy costs in DN. In this paper, the use of SVC (Static Var Compensation) is to improve the unbalancing and reducing the energy losses in DN. To handle power flow procedure, a novel circuit solution is presented to modeling the DN unbalancing situations. Furthermore, the nominal active and reactive loads in different phases have been multiplied into a specified value which is defined by the Unbalancing Factor (UF). Intelligent optimization algorithms such as PSO (Particle Swarm Optimization), CSA (Cuckoo Search Algorithm) and FA (Firefly Algorithm) are used to optimal sitting and sizing of the SVC with a three terms objective function, including losses, Neutral Lines Current and SVC installation cost in the distribution networks. The effect of SVC number installation in DN is evaluated. To demonstrate the effectiveness of the proposed method, the modified standard IEEE 123 nodes network has been tested. Simulations are carried out in two options. The results verify the ability of presented method to improve the performance of the unbalance distribution network significantly.

Index Terms- CSA, Energy Losses, FA, Neutral Lines Current, PSO, SVC, Unbalance Distribution network