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Abstract— The main aim of the distribution companies is to reduce their operating costs to get ahead of competition. One of the most popular approach is to increase the degree of reliability of distribution system. The management of network defeats (e.g. earth fault, short circuits) offers a lot of feasibilities for automation. The main jobs are fault localization, fault detachment and system refurbishing. The network manipulator needs excellent knowledge about the controlled network area to accomplish these tasks efficiently. In this paper a fault management system is described which magnifies the reliability of the system with the help of network reconfiguration. The fault localization, segregation and refurbishing allowance to remedy the operator from these demanding tasks during network defeats. This paper present a CYMDIST based analysis for the loss minimization problem. This method is tested in 11 KV distribution systems for loss minimization.

Index Terms— network reconfiguration, segregation, refurbishing, detachment.

I. INTRODUCTION

The inefficiency in operation of the distribution networks is usually because of its complicated radial configuration, fluctuating load demand and frequent occurrence of faults. The optimum and reliable operation of distribution networks increase rewards for distribution companies and satisfaction to customer. A considerable fraction of losses in power system is related to the electricity distribution network also because of low level of voltage. There are different ways to reduce losses in distribution system. Various methods necessitate the new equipment installed within the system. The installation of new equipment imposed financial burden for distribution companies, and also new errors produce in the system due to perturbance in their service.

One of the simple and cheap way of reducing losses in the distribution network is reconfiguration/changing the status of the sectionalizing switching operation. By changing the status of the sectionalizing switch, there is no need to invest capital and installed new equipment in the system. We can truncate the losses only by changing the state of sectionalizing switches. There are various objectives for reconfiguration of distribution system such as:-

A) To reduce the losses
B) To increase stability & enhance voltage profile
C) To increase the reliability of network.

II. PROBLEM CHARACTERIZATION & FORMULATION

Electricity distribution is the final stage of distribution of power to the end users. The distribution system carries electricity from the transmission lines and delivers it to consumers. The distribution network contains two levels of voltages, medium level/primary distribution & low voltage level/secondary distribution [1]. In secondary distribution stage, sectionalizing switches are used for various purposes like for protection, to isolate a faulty section and to reconfigure the network. Feeder reconfiguration is performed by opening/closing two types of switches, tie and sectionalizing switches [2].

The 1st paper was developed in this field presented by Merlyn and Back [3], this paper presents a global optimality condition. This is the planning study, the objective is to minimize the cost of construction. This method was later modified by Shirmohammadi and Hong [4] in this method the computational time is reduced by applying efficient load flow. Two different search algorithms are used for feeder reconfiguration by Ross et al. [5] After that Civanlar et al. [6] derived a formula for the reduction of losses, by altering the state of on/off switching action. An Expert System with a set of rules for restoration and minimal loss reconfiguration was proposed by Chen-Ching at al. [7].

In this paper network reconfiguration is done on the basis of CYMDIST software package analysis. Figure shows a distribution network together with sectionalizing switches.

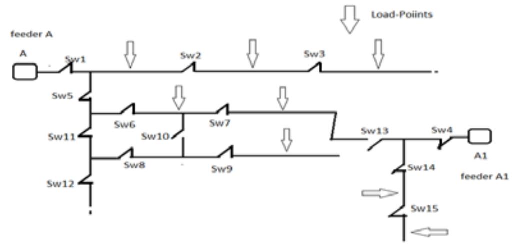

Fig.1

In this network configuration feeder A and A1 connected to two areas. Switches (1,2,3,4,5,6,7,8,9,11,12,14,15) are normally close. Switches (10,13) are normally open. Whenever some portion of the load on feeder A is overloaded then some load will be transfere to feeder A1 in swithcing arrangement. Network Reconfiguration is done to relief the overloaded network, for load balancing and reduction of losses (e.g i^2*r). Mathematically the total power loss can be expressed as follows [1]:

$$\sum_{i=1}^{L} r_i \frac{P_i^2+Q_i^2}{V_i} \qquad (1)$$

$$V_i^{min} <= |V_i| <= V_i^{max} \qquad (2)$$

Where ri , Pi , Qi and Vi are respectively, the resistance, real power, reactive power, and voltage of branch, and L is the total number of branches in the system. The main goal of this study is to minimize the loss represented by equation (1), subjected to (2). The voltage magnitude must lie within the range in each node of the network.

AS A TEST CASE OF 11 KV DISTRIBUTION FEEDER.

For the simulation of 11 KV test feeder in CYMDIST software environment attention to the equation (1) in section 1, some information are needed like electrical condition of feeders, station & substation, impedance of the lines, load of transformers etc. Table shows the information of the distribution feeder A [3]:

TABLE 1

End of line	Total length(KM)	Peak of load(A)	feeder	Station capacit
Test Feeder	17	170	Test feeder	20 MVA

All the information received such as impedances, peak load of buses, properties of the lines, distances, switching configuration etc. Figure (1) shows the single line diagram with all details was designed in CYMDIST software package.

NETWORK CREATED IN SOFTWARE ENVIRONMENT

Network reconfiguration in distribution system for loss reduction, a distribution system network is created in software environment. Fig. shows..

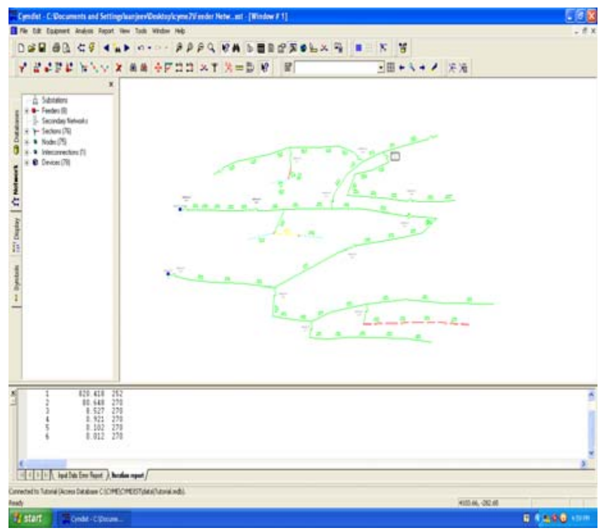

Fig.2

During power flow analysis, table shows the results i.e total load read, total load adjusted, total conductor capacitances, total losses and total power from sources.

TABLE 2

VOLTAGE DROP SUMMARY TEST FEEDER

	Total load			
	kW	kVAR	kVA	PF(%)
Total load read (Non-adjusted)	5580.69	2738.73	6216.49	89.77
Total load	5580.6	2738.7	6216.4	89.77

used (Adjusted)	8	2	8	
Total shunt capacitor (Adjusted)		0.00		
Total shunt reactor (Adjusted)		0.00		
Total load from motor	0.00	0.00	0.00	0.00
Total power from generator	0.00	0.00	0.00	0.00
Total power to others	0.00	0.00	0.00	0.00
Total conductor capacitances		12.55		
Total losses	193.76	551.49	584.54	33.15
Total power from sources	5774.44	3277.72	6639.85	86.97

VOLTAGE PROFILE OF TEST CASE 11KV DISTRIBUTION FEEDER

Fig. 3

During network re**co**nfiguration with opening and closing 5 suitable switches. With opening the switch 14407NH 47122 and closing 14408 SB 45132, some load would be transferred from feeder A to A1, and losses will be reduced a small fraction. Similarly, with the opening of switch 12407NH53635 and closing 1240NH54640 losses will be reduced about 2.79 kW.

REPORT OF SWITCHING POSITION/RECONFIGURATION

TABLE 3

Section Id	Action	Switch Id
14407NH 47122	open	14407NH 47122
14408 SB 45132	close	14408 SB 45132
12407NH53635	open	1240NH54640

KVA PROFILE OF TEST CASE 11KV DISTRIBUTION FEEDER

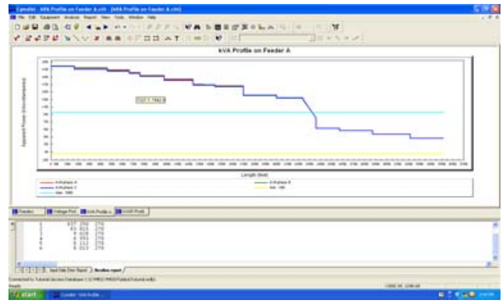

Fig. 4

KVAR PROFILE OF TEST CASE 11KV DISTRIBUTION FEEDER

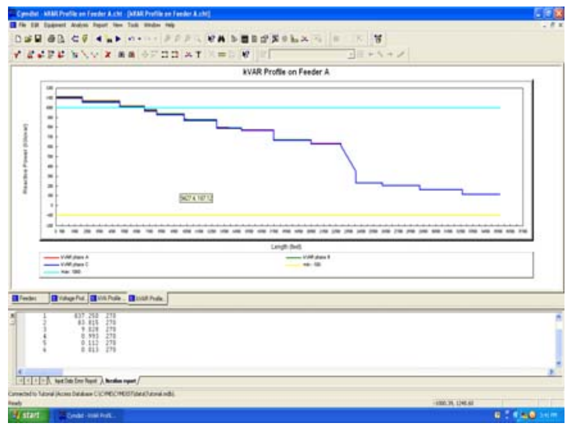

Fig. 5

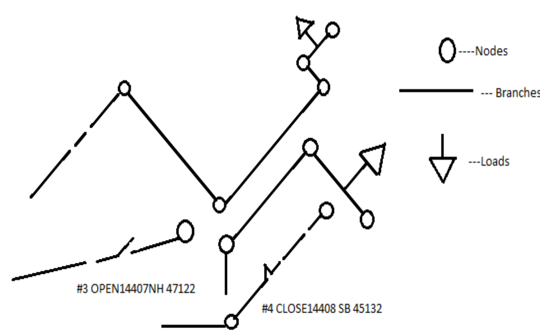

Fig. 6 Initial reconfiguration of keys 1 and 2.

SWITCHING POSITION IN NEW RECONFIGURATION

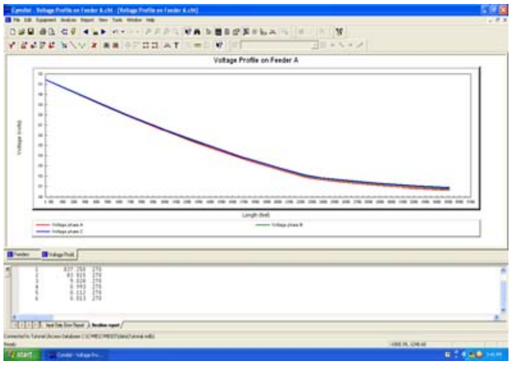

TABLE 4

Section Id	Action	Switch Id
12403NH03062-S	Close	12403NH03062-S
12403NH03112-S	Close	12403NH03112-S
12402NH00534-S	Close	12402NH00534-S
12402NH00510-S	Open	12402NH00510-S
64-S	Open	64-S
12402NH48520-S	Close	12402NH48520-S
14510NH48012-S	Open	14510NH48012-S
12407NH48307-S	Close	12407NH48307-S
15-S	Close	15-S
14402SP-46532-S	Open	14402SP-46532-S

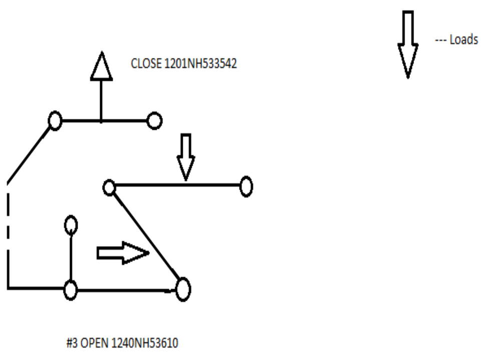

Fig. 7 schematic of 7 and 13 in new reconfiguration.

CONCLUSION

In this paper, study & simulation has been done on a distribution feeder network using CYMDIST software and total losses calculated by power flow analysis before and after optimal reconfiguration. Result shows that the total losses will be reduced by suitable switch arrangement.

In future, we can reduce losses maximally by a renewed reconfiguration and put number of proposed keys by software in new position.

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