A Hybrid Method for Load flow Calculation based on LVDC Power Distribution Networks

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Abstract- Low voltage direct current (LVDC) distribution system stability, supply security and power quality are evaluated by computational modelling and measurements on an LVDC research platform. Computational models for the LVDC organize investigation are created. The LVDC arrange control misfortune model is produced in a MATLAB domain and is prepared to do quick estimation of the system and segment influence misfortunes. The model integrates analytical equations that describe the power loss mechanism of the network components with power flow calculations. For an LVDC network research platform, a monitoring and control software solution is developed. The solution is used to deliver measurement data for verification of the developed models and analysis of the modelling results. In the work, the power loss mechanism of the LVDC network components and its main dependencies based on hybrid method is described. Energy loss distribution of the LVDC network components is presented.

Keywords- *LVDC, MATLAB, Hybrid.*

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I. INTRODUCTION

Current trend show that overall power dissemination systems are encountering a change towards direct-present (DC) at both era and utilization level. This propensity is fueled by the upheaval of different electronic burdens and, in the meantime, with the battle to meet the high set objectives for offer of sustainable power sources (RESs) in fulfilling absolute request. RESs work either locally at DC or have a DC connect in the heart of their energy electronic interface, while the end point association of electronic burdens, batteries and power modules is only DC.

A load flow study is especially valuable for a system with multiple load centers, such as a refinery complex. The power flow study is an analysis of the system's capability to adequately supply the connected load. The total system losses, as well as individual line losses, also are tabulated. Transformer tap positions are selected to ensure the correct voltage at critical locations such as motor control centers. Performing a load flow study on an existing system provides insight and recommendations as to the system operation and optimization of control settings to obtain maximum capacity while minimizing the operating costs.

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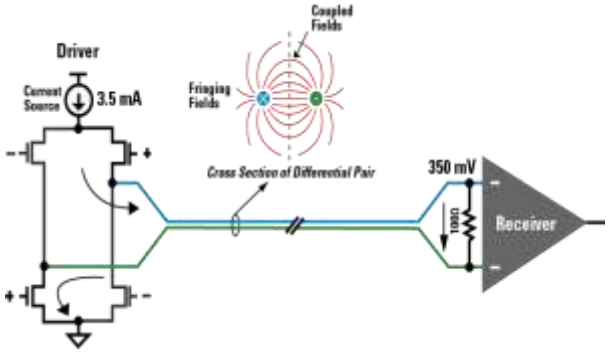

Fig. 1 Basic LVDS circuit operation

The results of such an analysis are in terms of active power, reactive power, magnitude and phase angle. Furthermore, power-flow computations are crucial for optimal operations of groups of generating units.

II. BACKGROUND

The background of load flow analysis in power system is two types-

A. Conventional Methods of Power Study
   (i) Y-matrix Iterative Lad Flow Methods
   (ii)Z-matrix Load Flow Methods
   (iii)Newton Raphson Method
   (iv)Fast Decoupled Method

B. Non Conventional Methods of Power Flow Study

   (i)Fuzzy Logic Method
   (ii)Artificial Neural Network Method
   (iii)Other Miscellaneous Methods IEEE 14- bus and IEEE 39-bus

III. LOADING POINT DETERMINATION BY HYBRID APPROACH

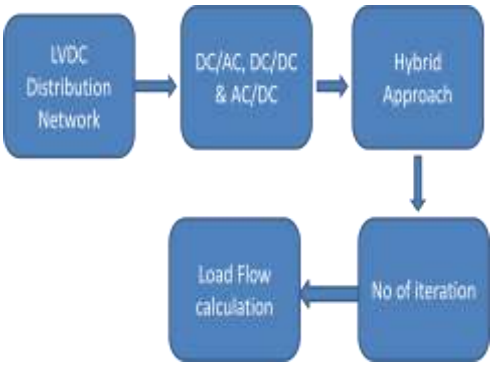

Fig. 2 Flow Chart

In such approach we are using hybrid method for load flow calculation. In hybrid approach Newton Raphson Method , Gauss–Seidel method and Fast Decoupled Method are used.

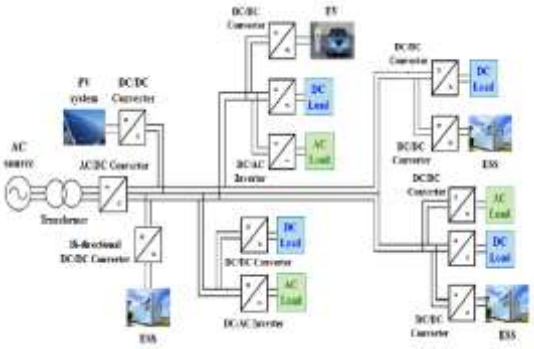

Fig. 3 Load flow in LVDC distribution system

A LVDC circulation framework develops of energy electronic converters and DC interface between the converters. The topology of LVDC conveyance framework can have diverse sort of varieties. Basic to these diverse topologies are that AC/DC change is constantly situated close MV line. The DC/AC transformation can rather be situated at various areas. Contingent upon the area the LVDC framework can be either a HVDC interface sort arrangement or a wide LVDC conveyance locale where the DC/AC change is made at the client closes. The wide LVDC dissemination locale can be contrasted with existing LVAC organize topology with different

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branches. For this situation there is no requirement for particular 3-stage AC arrange on the grounds that the AC lines have been supplanted with DC lines.

IV. SIMULATION & RESULT

All the simulation are performed in MATLAB Version: 8.3.0.532 with one network.

The simulation results are as follows-

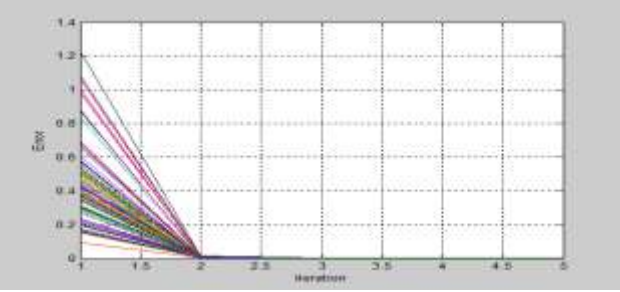

Fig.4 No of iteration with error relation

In above Convergence from random initial points with this simulation we can conclude the load flow converge for any initial point. Select an initial point, and then use the method for 5 iterations. Finally plot the error in each case. The error is less than 3x10E-8 no matter the initial point

Bus Admittance Matrix

2.1569 - 8.6275i -0.5882 + 2.3529i 0.0000 + 0.0000i -0.3922 + 1.5686i -1.1765 + 4.7059i
-0.5882 + 2.3529i 2.3529 - 9.4118i -1.1765 + 4.7059i -0.5882 + 2.3529i 0.0000 + 0.0000i
0.0000 + 0.0000i -1.1765 + 4.7059i 2.3529 - 9.4118i 0.0000 + 0.0000i -1.1765 + 4.7059i
-0.3922 + 1.5686i -0.5882 + 2.3529i 0.0000 + 0.0000i 0.9804 - 3.9216i 0.0000 + 0.0000i
-1.1765 + 4.7059i 0.0000 + 0.0000i -1.1765 + 4.7059i 0.0000 + 0.0000i 2.3529 - 9.4118i

Table: 1 Detail of using network

Network				
From to R km			Type P load or G load	
1	2	0.0050	Type R	0.00
2	3	0.0015	Type P	-0.80
2	4	0.0020	Type P	-1.30
4	5	0.0018	Type P	0.50
2	6	0.0023	Type R	1/2.00
6	7	0.0017	Type P	0.00
7	8	0.0021	Type P	0.30
7	9	0.0013	Type P	-0.70
3	10	0.0015	Type R	1/1.25

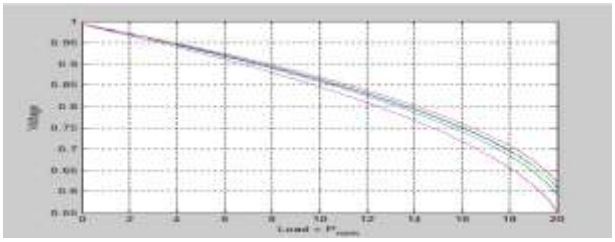

Fig. 5 Voltage vs LoadxP $_{Nom}$ Graph

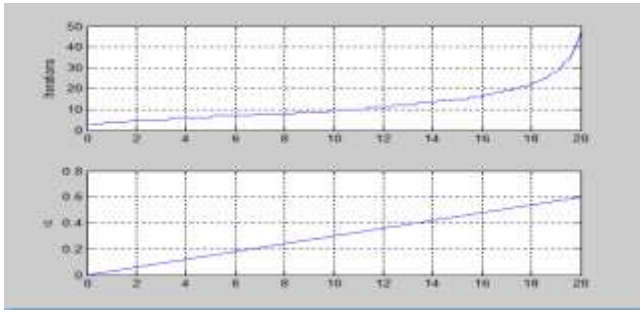

Fig.6 No of Iteration with value of alfa

Result for a high load system ,Now we change the load of the system

The load increases in steps = paso until 20 times the nominal load!

We plot the required iterations, the value of alpha and the losses of the system. Of course, for paso=20 the system is close to voltage collapse

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All Values are in p.u. and Angles in degrees

Now initial and final result are showing in table no 2 and table no. 3

Table 2 Different parameters at initial condition

Initial BusNumber	Voltage Magnitude	Vector Angle
1	1.02	0
2	1	0
3	1.04	0
4	1	0
5	1	0

Table 3 Different parameters at Final condition

Final BusNumber	Voltage Magnitude	Vector Angle
1	1.02	0
2	0.97652	-4.9441
3	1.04	1.1921
4	0.96883	-8.9032
5	0.99845	-2.6301

V. CONCULSION

Consequently Computational models for the LVDC organize investigation are produced. The LVDC organize control misfortune model is produced in a MATLAB situation and result demonstrates that it is prepared to do quick estimation of the system and part influence misfortunes. The model incorporates systematic conditions that depict the power misfortune instrument of the system segments with influence stream computations. For a LVDC organize look into stage, a checking and control programming arrangement is produced. The arrangement is utilized to convey estimation information for check of the created models and investigation of the demonstrating comes about. In the work, the power misfortune instrument of the LVDC organizes segments and its principle conditions in light of crossover strategy are depicted.

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