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Simulation of 132kv Substation by Using ETAP® Software

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***Abstract*: -- For development of any country, power is an essential requirement. Power losses, under voltage, over voltage are the main causes to maintain the power in transmission and distribution system. To reduce such problems the innovative concept introduce in this paper. This paper deals with simulation of 132kv Hingna II substation by using Electrical Transient Analyzer Program(ETAP®) Software, Which can perform numerical calculation of large integrated power system with tremendous speed and provides easy to follow output reports. Recorded data is obtained from an actual 132kv substation which has been implemented in ETAP for the simulation.**

***Keywords:* - Line harmonics, motor drives, voltage sags, Z-source inverter.**

I. INTRODUCTION

Power system study using software is accurate and gives highly reliable result. Electrical Transient Analyzer Program (ETAP®) is the most comprehensive solution for the design, simulation, and analysis of generation, transmission, distribution, and industrial power system. ETAP® allow us to easily create and edit graphical one line diagram, it organizes our work on project basis. This paper makes effective use of ETAP to carry out simulation of 132kv substation. The actual rating of power transformers, feeders, Circuit Breakers, current transformers, potential transformers, and isolating switches are taken and modelled accordingly in ETAP®. Under voltage is the main cause of almost all the major power system. Under heavy load condition reactive power(VARS) cannot be transmitted very far, so it must be generated close to the point of consumption. As the difference in voltage causes reactive power to flow but the voltages on power system are only +/-5 percent of nominal value so this small voltage difference does not cause suitable reactive power to flow over long distances and if that reactive power is not available at load centre, the voltage level go down. Section 2 is the overview, details of the components of 132kv substation Hingna II, Nagpur. Section 3 is the simulation of system in ETAP. Section 4 is the conclusion of this research work.

2. 132KV SUBSTATION HINGNA II, NAGPUR

2.1 Overview

There are two main 132kv bus incoming for the substation. These buses are:- 1.132kv kalmeshwar 2.132kv Ambazari Now the transmission line first parallel connected with lightning arrester to diverge surge, followed by CVT connected parallel.CVT measures voltage and steps down from 132kv to 63.5 volts A.C for control panel, at the location a wave trap is connected to carrier communication at higher frequencies. Switchgear equipment is provided, which is the combination of circuit breaker having an isolator at each end. Two transformers are connected to main bus . In addition to the main bus, Transfer bus is also provided in substation incase any maintenance work is to be carried out on the main bus. After the main bus, lightning arresters, current transformers, isolators and circuit breakers before the transformers are provided. Then transformers step downs voltage from 132kv to 33kv & 11kv respectively. The main bus is then again provided with switchgear equipment & a current transformer. Capacitor bank is connected to main bus. It is provided to improve power factor & voltage profile.

2.2 EQUIPMENT DETAILS OF HINGNA II 132KV SUBSTATION

The details of the equipment are taken from 132KV Hingna II substation of Nagpur ring main EHV system.

- It comprises of 4 transformers out of which 2 are of 50MVA rating & other 2 are of 25MVA each
- The 132KV substation consists of 35 buses,out of which there is 1 generating bus & 2 load bus.
- The substation also consist of step down transformers of rating 33 kv/0.4 kv and 11kv/0.4KV of 0.2 MVA each for distribution purpose.

Following table explains the load calculation done by manually at each feeder with considering primary line current.

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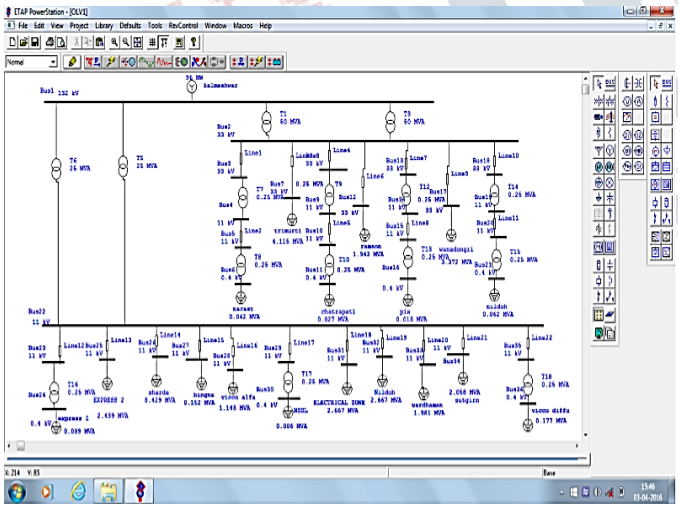
Table 1. Manual load calculation

Name of feeder	Currents (amp)	Load at feeder end voltage(MVA)
Nildoh	140	2.667
Electronic Zone	140	2.667
Vicco	60	1.143
Sutgimi	108	2.058
Waddhamna	104	1.981
Hingna Rural	8	0.152
Sharda	180	3.429
Express-II	128	2.439
Express-I	56	0.039
Vicco Alpha	256	0.177
NSSL	8	0.006

III. SIMULATION OF SYSTEM IN ETAP®



IV. CONCLUSION

In this paper simulation of 132kv substation using ETAP® software is carried out with an approach to
overcome the problem of an under volatge. Over loading of power/distribution, transformers, line conductors/cables current carrying ability,power factor, supply demand gap, voltage drop at the tail end, technical losses, active and reactive power flow, voltage and current magnitudes, total harmonic distortion in voltage and current etc. can be analyzed and monitored at any desired location using this innovative approach. Moreover, utilities can simulate the complete power system . This simulation can also be helpful for utilities in their planning and development sectors. Once the simulation is performed in ETAP for complete power system, it may be very helpful for converting conventional substation network into smart substation.

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