A CASE STUDY OF SHORT CIRCUIT ANALYSIS AT 66 KV SUBSTATION USING ETAP

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ABSTRACT - A Short Circuit Analysis will help to ensure that personnel and equipment are protected by establishing proper interrupting ratings of protective devices (circuit breaker and fuses). If an electrical fault exceeds the interrupting rating of the protective device, the consequences can be devastating. it can be a serious threat to human life and is capable of causing injury, extensive equipment damage, and costly downtime.

On large systems, short circuit analysis is required to determine both the switchgear ratings and the relay settings. No substation equipment can be installed with knowledge of the complete short circuit values for the entire power distribution system. The short circuit calculations must be maintained and periodically updated to protect the equipment. It is not safe to assume that new equipment is properly rated.

KEYWORDS: ETAP SOFTWARE, , data of 66 kV odhav Substations.

1. INTRODUCTION

Load flow analysis using software is accurate and gives highly reliable results. This research makes effective use of Electrical Transient Analyzer Program (ETAP) to carry out load flow analysis of 66 kV substation [1],[2]. The actual ratings of Power Transformers, Circuit Breakers, Current Transformers, Potential Transformers and Isolating switches are taken and modelled accordingly in ETAP. This 66 kV substation is located in ODHAV (AHMEDHABAD), ODHAV under Gujarat State Electricity Board Limited (GSEB) which comprises of 2 Power Transformers, 17 Circuit Breakers, 13 Current Transformers, 1 Potential Transformers and 7 Isolating switches.

Section 2 is the name of components use in ETAP, Section3 is the simulation of single line diagram of 66 kV substation in ETAP based upon practical data. Section 4 is the short circuit Analysis of the substation. Section 7 is the conclusion of this research work

2. NAME OF COMPONENTS USE IN ETAP

Component	name
Power Transformer	T01
	T02
	T03
Circuit Breaker	CB 1–CB 17

PT	PT2
CT	CT01
FEEDER	LOAD 1 TO LOAD

3. SIMULATION OF SINGLE LINE DIAGRAM OF 66KV ODHAV SUBSTATION IN ETAP

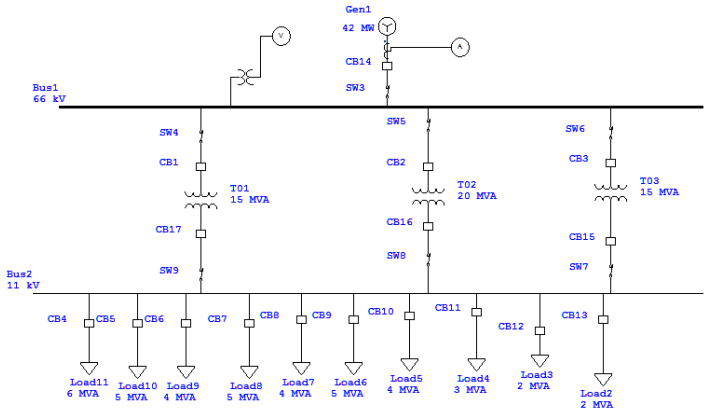

fig. **SIMULATION OF SINGLE LINE DIAGRAM OF 66KV ODHAV SUBSTATION IN ETAP**

4. SHORT CIRCUIT ANALYSIS

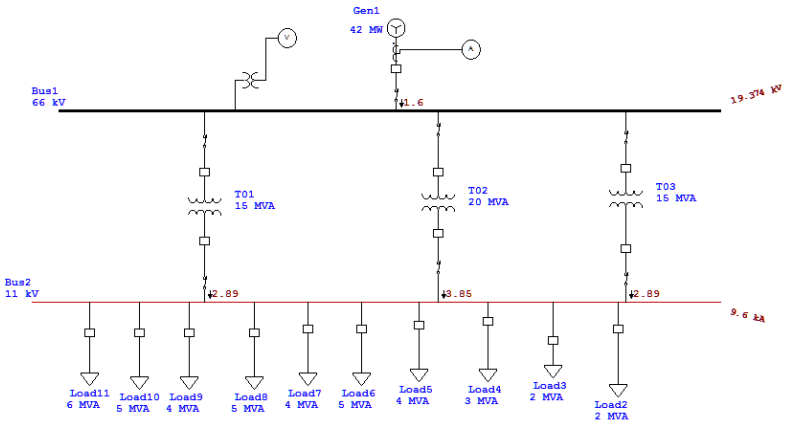

fig. after simulation of short circuit analysis after simulation summary report is generated below show the type of fault and it report

A. LINE TO GROUND FAULT(L-G)

SHORT - CIRCUIT REPORT

Fault at bus: **Bus2**

Prefault voltage = 11.000 kV = 100.00 % of nominal bus kV (11.000 kV)
= 100.00 % of base kV (11.000 kV)

Contribution		Line-To-Ground Fault													
		% Voltage at From Bus						Current at From Bus (kA)							
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic		Sequence Current (kA)		
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
Bus2	Total	0.00	0.0	88.15	-103.8	86.84	101.9	12.790	-86.0	0.000	0.0	0.000	0.0	4.263	4.263	4.263
Bus1	Bus2	60.66	55.2	98.49	-91.0	58.74	124.0	3.837	-86.0	0.000	0.0	0.000	0.0	1.279	1.279	1.279
Bus1	Bus2	60.66	55.2	98.49	-91.0	58.74	124.0	5.116	-86.0	0.000	0.0	0.000	0.0	1.705	1.705	1.705
Bus1	Bus2	60.66	55.2	98.49	-91.0	58.74	124.0	3.837	-86.0	0.000	0.0	0.000	0.0	1.279	1.279	1.279

# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

fig. report of line to ground fault

B. SHORT CIRCUIT ANALYSIS

SHORT - CIRCUIT REPORT

Fault at bus: **Bus2**

Prefault voltage = 11.000 kV = 100.00 % of nominal bus kV (11.000 kV)
= 100.00 % of base kV (11.000 kV)

Contribution		3-Phase Fault		Line-To-Ground Fault					Positive & Zero Sequence Impedances Looking into "From Bus"			
From Bus	To Bus	% V	kA	% Voltage at From Bus			kA Symm. rms		% Impedance on 100 MVA base			
ID	ID	From Bus	Symm. rms	Va	Vb	Vc	Ia	3I0	R1	X1	R0	X0
Bus2	Total	0.00	9.630	0.00	88.15	86.84	12.790	12.790	2.88E+000	5.44E+001	8.59E-001	1.60E+001
Bus1	Bus2	29.35	2.889	60.66	98.49	58.74	3.837	3.837*	9.61E+000	1.81E+002	2.86E+000	5.33E+001
Bus1	Bus2	29.35	3.852	60.66	98.49	58.74	5.116	5.116*	7.21E+000	1.36E+002	2.15E+000	3.99E+001
Bus1	Bus2	29.35	2.889	60.66	98.49	58.74	3.837	3.837*	9.61E+000	1.81E+002	2.86E+000	5.33E+001

# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

fig. report of circuit

CONCLUSION

perform the simulation of short circuit analysis using ETAP software determine the fault current and overload device alarms are displayed on the one line diagram, compare these values against manufacturer short circuit current.

Short circuit analysis is to provide necessary over current protection devices in the power system.