CASE STUDY : Protection Co-ordination Study

CLIENT NAME : **A Multinational company who is the project supplier**

END CUSTOMER : **Water Treatment Plant**

PROJECT TITLE : **Protection Co-ordination Study for a Water Treatment Plant**

INTRODUCTION

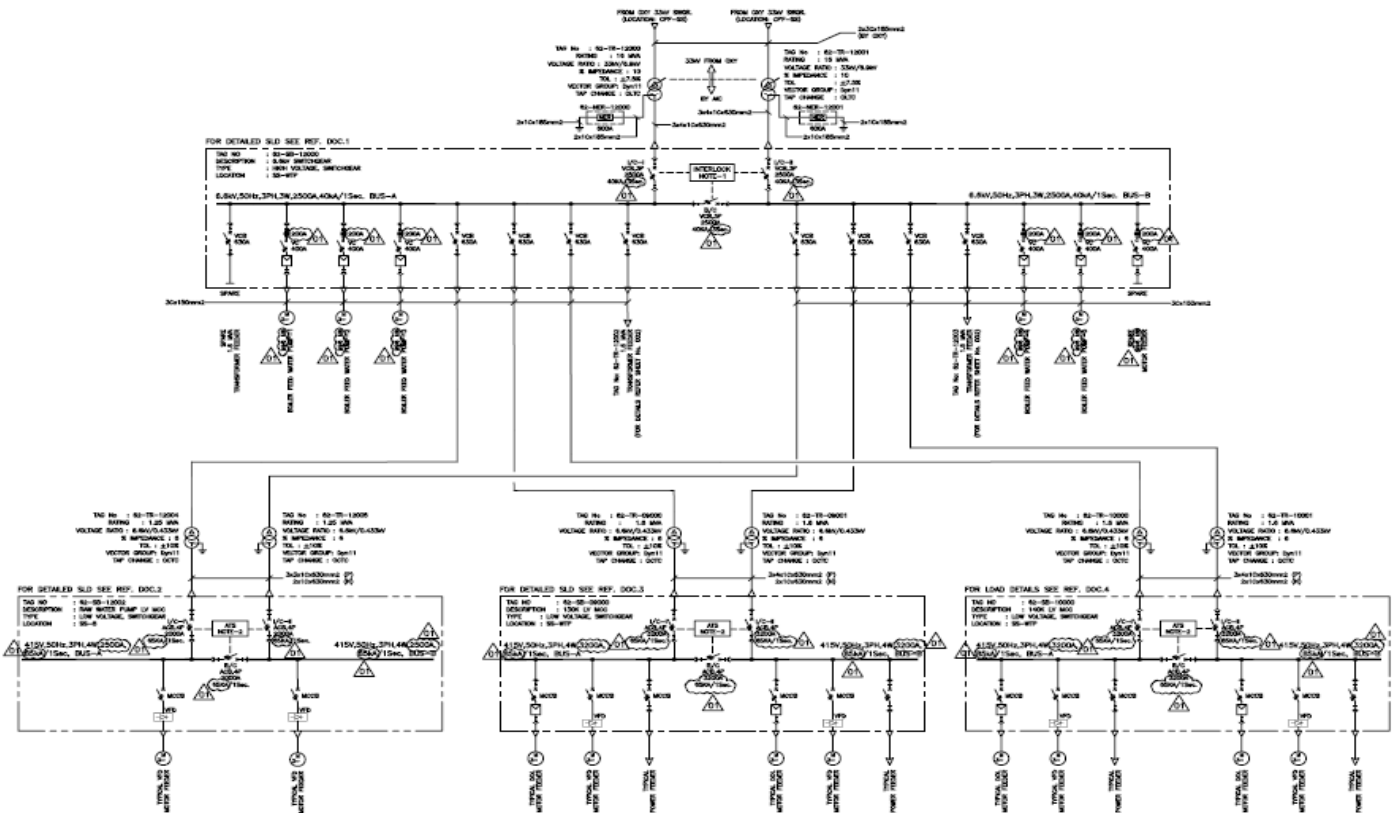
The primary function of protective devices in a power system is to detect short circuits and isolate the fault by activating the appropriate circuit interrupting devices, which increases the reliability and safety of the electrical system. The relay co-ordination study is required to properly select the protective devices and necessary settings so that circuit interrupter closest to the fault opens before other devices.

SCOPE OF WORK

Perform protective device co-ordination analysis for HV panels including 2 Nos HV incomer panel, 2 Nos 16 MVA, 33 kV/6.9 kV power transformer, 1 No bus coupler, 8 Nos +1 spare distribution transformers (including LV side breaker of the transformers), 5 +1 spare motor feeders etc and provide results and recommendations as required by the specification and client.

NETWORK DETAILS

Network was represented from 33 kV to last relay location at LV side. The Single Line Diagram is shown in the following figure.



- The incomer transformer panel is equipped with a SEPAM 80 Series relay for integrated transformer protections as follows,
  - 46- Unbalanced load protection relay
  - 50-Instantaneous Over Current Relay
  - 50N-Instantaneous Earth Fault Relay
  - 51- Time Delayed Over Current Relay
  - 51N-Time Delayed Earth Fault Relay
  - 64REF-Restricted Earth Fault Relay
  - 87T Transformer Differential Protection Relay

- The 6.6kV Motor feeders are equipped with a SEPAM 80 Series relay for integrated motor protections as follows
  - 12- Over Speed Relay
  - 14- Under Speed Relay
  - 27- Under Voltage Relay
  - 27D Positive Sequence Under Voltage Relay
  - 38-Temperature Monitoring
  - 46-Negative Sequence Unbalanced Load Protection Relay
  - 48-Excessive start Relay
  - 49RMS-Thermal Over Load Relay
  - 50-Instantaneous Over Current Relay
  - 50N-Instantaneous Earth Fault Relay
  - 51- Time Delayed Over Current Relay
  - 51N-Time Delayed Earth Fault Relay
  - 51LR-Locaked Rotor Relay
  - 66-Number of Starts per hour

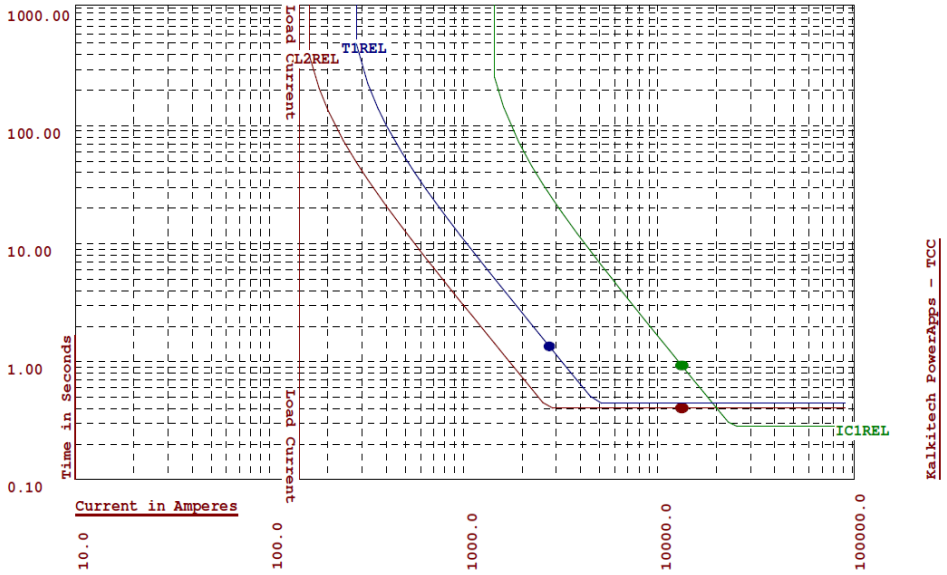
- The outgoing Feeders are equipped with a SEPAM 80 Series relay for over current phase and earth fault protections.
- The LV incomer panels are equipped with a SEPAM 80 Series relay for over current phase and earth fault protections.

SOFTWARE DETAILS

KALKITECH PowerApps was used for the Over current and Earth Fault relay Co-ordination studies.

A Sample Time Current Characteristics Curve of Relay Co-ordination Study

PowerApps TCC:Primary Relay L2REL LLLG Page 41 of 49
Load/Inst/Definite Current if specified is shown for the Primary Only
Identical Relays(settings, type, charact, currents) may show merged characteristics in TCC
Backup Relays current may be lower than Primary relay current-
and hence Backup TCC may appear below Primary TCC



(T) =Transformer Inrush Current Symbol(M) =Motor Starting Time-Current Point

Case ID = 0 Fault at bus 185 Fault on branch 3C150L2 Fault Number 41, Fault Type LLLG

Relay Operating Point is Indicated by a Filled Circle on TCC - >>Symbol ??? No Coordination warning Indication

RelayName	RelCur	RelTime	PMS	TMS	CTR	PRIMARY	Load_Cur	BRCD	BRANCH	BUS	CHAR
L2REL	13301.9	0.404	0.900	1.630	150.00	L2REL	142.1	LN	3C150L2	185	IEC/C
IC1REL	13301.9	0.926	0.600	1.140	2000.00	L2REL	1152.8	LN	1C630L1	424	IEC/C
T1REL	2764.0	1.346	0.600	1.790	400.00	L2REL	230.6	LN2X3C185IC1		134	IEC/C

REFERENCES

1. www.kalkitech.com/offerings/solutions-powerapps
2. http://www.powerapps.org/PAES_PSSystemStudies.aspx