

Industrial Visit report

NEHU 132 KV Substation

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SUBSTATION/ SWITCH YARD:

A Substation is a high – voltage electric system facility. It is used to switch generators, equipment, and circuits in an out of a system. It is also used to change AC voltages from one level to another, and or change alternating current to direct current or direct current to alternating current.

The purpose of the Substation is to stepdown high voltage electricity from the transmission system to lower voltage electricity so it can be easily supplied to homes and businesses in the area through lower voltage distribution line.



Fig 1: Substation in Nehu

Power transformer

Electrical transformer is a static electrical machine which transforms electrical power from one circuit to another circuit, without changing the frequency. Transformer can increase or decrease the voltage with corresponding decrease or increase in current. Power transformers are generally rated above 500KVA are used on primary transmission lines for the transmission and distribution of relatively large quantities of energy. They are essential to the proper co-ordination and interconnection of the different circuits of any power system design. They are used for voltage and current transformation, voltage control, phase shifting for load control or permit correction of system phase relations, phase transformations.

WAVE TRAPPED (WT):

Wave trapped is a device which prevents the high frequency carrier signal to enter the Substation side it is also known as line trap. It is connected in series with the transmission line. It is designed to carry the rate power frequency (50Hz or 60Hz) current, as well as to withstand the Substation fault current.



Fig 2: Wave trap

LIGHTNING ARRESTER (LA):

Lightning arrester is used in electric power transmission and telecommunications systems to protect the insulation and conductor of the system from the damaging effects of lightning. The typical lightning arrester has a high – voltage terminal. Lightning is a deadly but often avoidable hazard. If the proper precautions are taken the threat of this hazard can be greatly reduced Through education people can raise awareness and understanding the lightning strikes, therefore reducing their risk of injury or dead.



Fig 3: Lightning Arrester

CURRENT TRANSFORMER (CT):

Current transformer CT is used to measure the current of another circuit. CTs are used worldwide to monitor high-voltage lines across national power grids. CT is designed to produce an alternating current in the secondary winding that is proportional to the current that is measuring in its primary.



Fig 4: Current Transformer (CT)

POTENTIAL TRANSFORMER (PT):

Potential transformer or sometimes called it as voltage transformer are a parallel – connected types of instrument transformer. Potential transformer is mainly used to measuring high voltage in power system, potential transformer is step- down transformer, i.e. they have many turns in the primary winding while the secondary has few turns. They are designed to present a negligible load to the supply being measured and have an accurate voltage ratio and phase relationship to enable accurate secondary.



Fig 5: Potential Transformer (PT)

LINE SIDE ISOLATOR (LSI):

Line side isolator is connected in between the bus bar and the line feeder. It is used to isolate the particular from the supply feeder. Transformer bus side Isolator used in both transformer incoming and outgoing ends. It is used to isolate the transformer from the power system for maintenance or any other reason. Line side Isolator is to isolate a circuit equipment for a source of power.



Fig 6: Line side Isolator LSI

Transformer

The basic principle behind working of a transformer is the phenomenon of mutual induction between two windings linked by common magnetic flux. The figure at right shows the simplest form of a transformer. Basically, a transformer consists of two inductive coils; primary winding and secondary winding. The coils are electrically separated but magnetically linked to each other. When, primary winding is connected to a source of alternating voltage, alternating magnetic flux is produced around the winding. The core provides magnetic path for the flux, to get linked with the secondary winding. Most of the flux gets linked with the secondary

winding which is called as 'useful flux' or main 'flux', and the flux which does not get linked with secondary winding is called as 'leakage flux'. As the flux produced is alternating (the direction of it is continuously changing), EMF gets induced in the secondary winding according to Faraday's law of electromagnetic induction. This emf is called 'mutually induced emf', and the frequency of mutually induced emf is same as that of supplied emf. If the secondary winding is closed circuit, then mutually induced current flows through it, and hence the electrical energy is transferred from one circuit (primary) to another circuit (secondary).

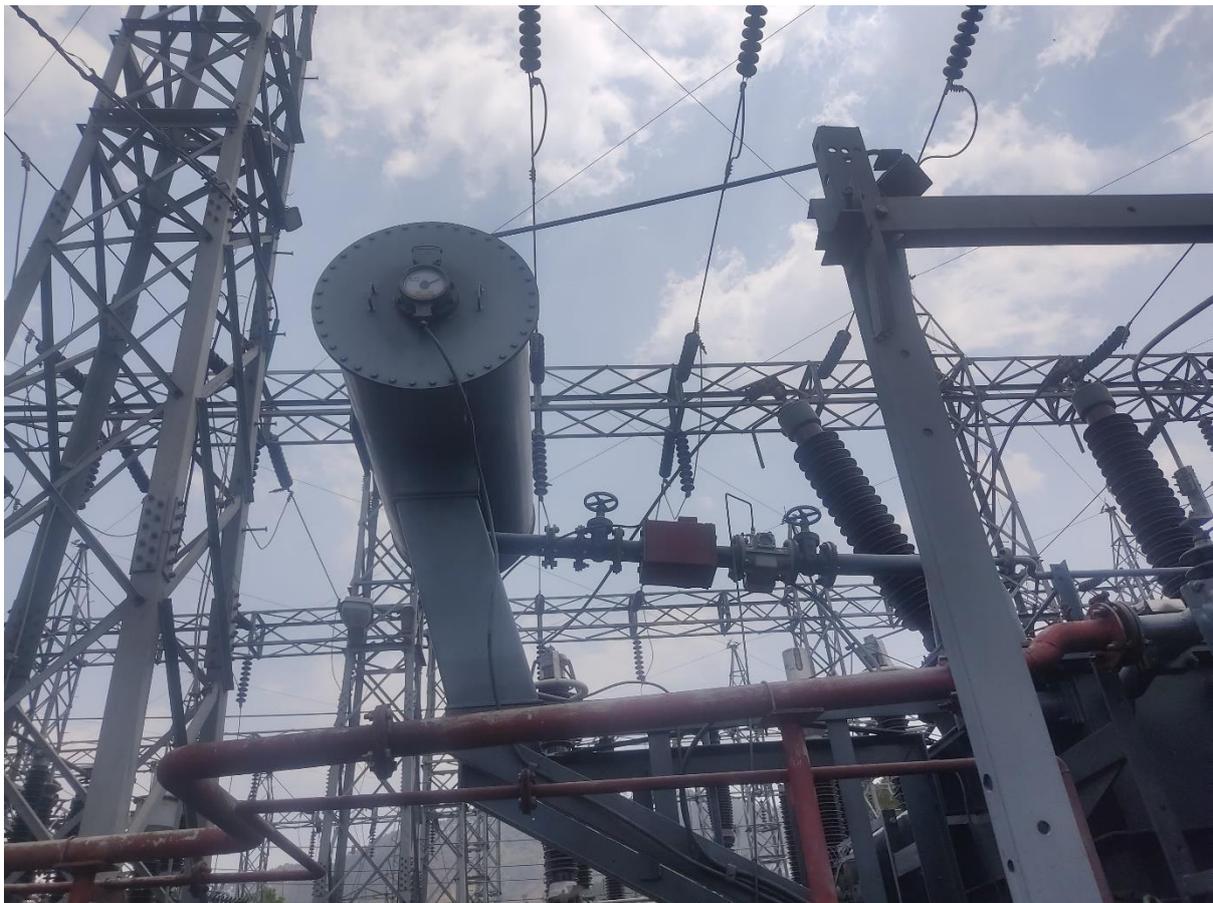


Fig 7: 132 KV to 33KV transformer.

Circuit breaker

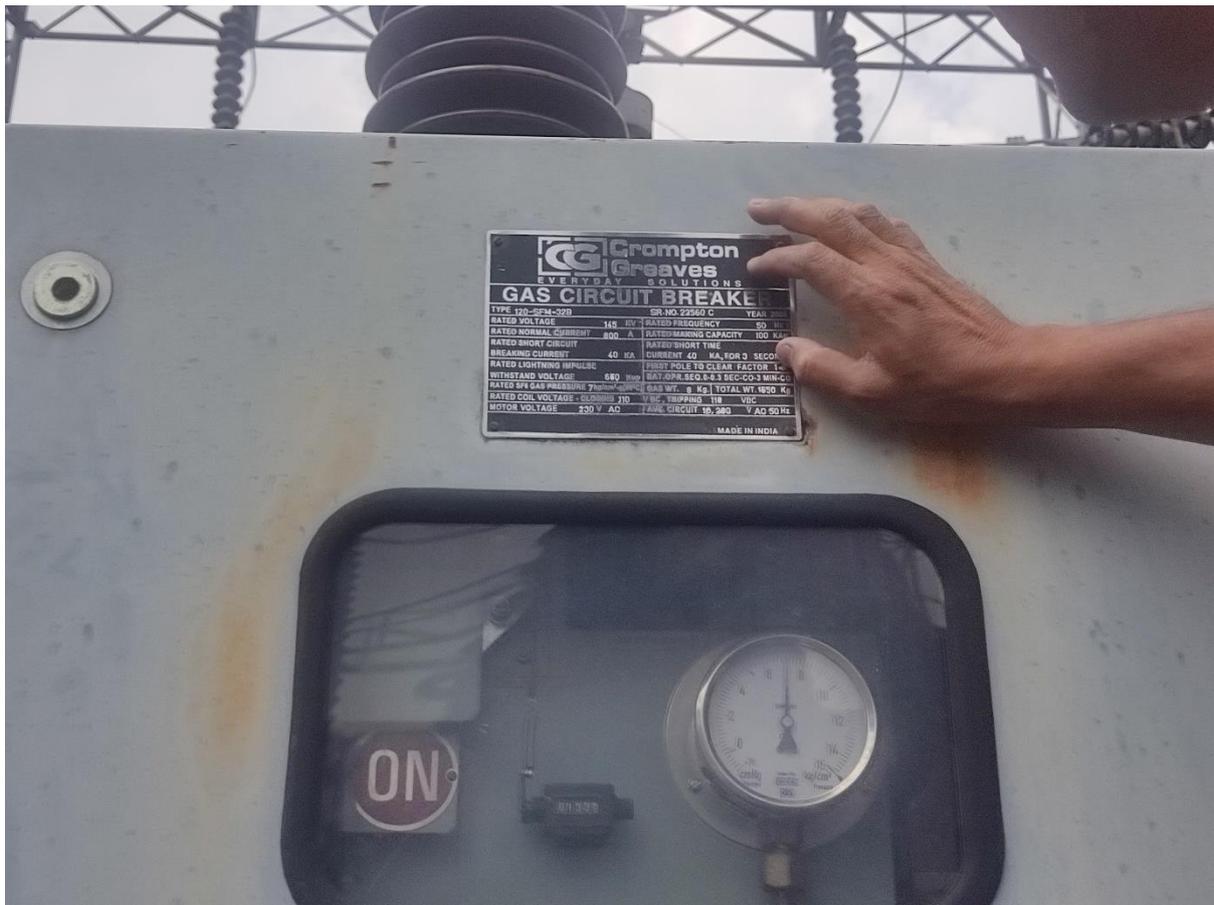


Fig 7: Circuit breaker

Control room



Fig 8: Control room.

