HIGH VOLTAGE EQUIPMENT MAINTENANCE INFORMATION

MAINTENANCE ROUTINES

There are numerous inspection and testing procedures for in-service equipment, however they can be broken down as per the following list.

Switchgear

Maintenance routines for both high and low voltage switchgear are similar.

- Circuit breaker testing includes the following:
  (General)
  - Insulation resistance testing
  - Main contact resistance testing
  - Mechanism inspection, lubrication and physical operation
  - Auxiliary contact inspection and operation/test
  - Inspection, resistance and operational checks of fitted accessories such as trip & close coils, spring charge motors, mechanical fuse trip linkages etc

  (Oil insulated / filled unit specific)
  - Oil inspection and testing
  - Carbon and sludge inspection
  - Contact condition inspection
  - Internal mechanism inspection
  - Dashpot inspection

  (Gas insulated specific)
  - Gas pressure verification

- Bus bar & bus chamber:
  - Visual inspection
  - Contact resistance testing
  - Insulation resistance testing

- Protection relay servicing:
  - Documentation of settings
  - Downloading of relay file (microprocessor based)
  - Cleaning of mechanism, induction disk, magnets and contact sets (electro-mechanical)
  - Injection testing to prove various relay elements
  - Trip and operational tests

Transformers

- Insulation resistance testing of high and low voltage windings
- Insulating oil analysis
    - DGA – (Dissolved Gas Analysis): This test determines quantities of gases that may be present. As the name suggests, various gases dissolve in the oil. *This is considered the principle oil test for determining the overall condition of the oil.*
    - Acidity – The acidity (neutralization value) of oil is a measure of the acidic constituents or contaminants in the oil. Determines acid values which can damage the transformer core winding insulation properties.
    - Water content – Determines the amount of free water that may be present; important in outdoor units. *Degradation of cellulose (transformer winding insulation materials), and/or the oil itself are the two sources of water increase*.
    - Resistivity – This parameter is sensitive to the presence of soluble polar contaminates, ageing products or colloids in the oil.
    - Dielectric strength – This is a measure of the ability of the oil to withstand electric stress, its primary function.
    - Furan - The main goal of furan testing is to determine whether the insulating paper in a given transformer has been or is being damaged by heat. Degradation of the paper causes it to lose its tensile strength and results in the release of furans.
- Cable box inspection
- High and low voltage cable termination inspection
- Inspection and testing of protection devices, such as temperature indicators and bucholtz relays
- Visual inspection of unit for general condition, oil leaks, valve condition, breathers etc
- Secondary control checks i.e. cooling fans, tap changer units

High Voltage Cables

- Insulation resistance testing
- Termination inspection and cleaning

Earth System

- Visual inspection of bars and associated conductor connections
- System resistance measurement to general mass of earth

DC Systems

- Visual inspection of batteries
- Voltage measurements
- Load testing