

ON - LINE PARTIAL DISCHARGE

Re- Evaluating High Voltage Switchboard Insulation for the over 25 year olds!



The Rogue's Gallery - typical 25 plus year old switchgear.

A high percentage of 6.6 / 11 / 33kV switchboards (cubicles) have been installed for 25 years. During this period they have been subjected to various types of duty and increasing high fault clearing duty plus a varied level of maintenance due to the ever increasing skill shortage.

Industries such as power stations, airports, refineries, and processing plants now have as a result taken an increased importance with clients who are less tolerant than ever before.

COMMONLY ASKED QUESTIONS

How good is the insulation?

Are you able to detect any weak areas of insulation?

Can you evaluate this in service?

Can you provide information to better help the company plan for capital replacement?

I have a planned shutdown in 18 months – will the existing switchgear need replacing?

By using modern On-Line Partial Discharge techniques and testing programs, it is possible to provide some assurance that the 25 year old switchboard insulation will continue to be reliable.

By having a planned inspection, a “second” pair of eyes can reveal some startling facts.

CASE HISTORY

A client requested an insulation inspection be carried out on two High Voltage switchboards. The maintenance prior to inspection was carried out as per the manufacturer's hand book, but the client noted that the insulation values varied from year to year.

An On-Line Partial Discharge test was carried out while this equipment was in-service, and revealed the following:

Partial Discharge was discovered in the voltage transformer. This VT was isolated from circuit and the following defects were found.

- Transformer oil tested poorly - (17kV flash over, highly acid, dark oil)
- Blue phase High Voltage fuse blown.
- Heavy Partial Discharge identified in the bushing spouts. (Refer Figure 1)
- Free roaming Iron / copper partials in bottom of tank and on ledges of VT.
- Protection scheme in-operative due to VT fuse blown (no alarm monitoring on VT supplies)

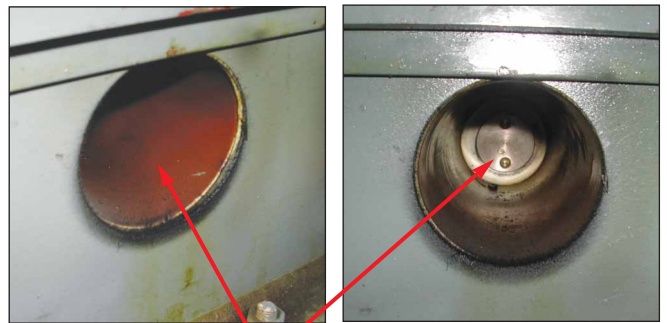


Figure 1: Heavy Partial Discharge on all three bushings.

One of the industry standards for detecting Partial Discharge within High Voltage Switch gear is by using Ultrasonic / Acoustic measurements and Transient earth voltage (TEV) measurements.

ULTRASONIC / ACOUSTIC MEASUREMENTS

Ultrasonic tests complement non-invasive partial discharge tests on air, oil and compound insulated chambers in switchboards. These tests are carried out using a specially designed detector.

TRANSIENT EARTH VOLTAGE (TEV) MEASUREMENTS

This test works on the principal that if a partial discharge occurs in the phase-to-earth insulation, a small quantity of electrical charge is transferred capacitively from the High Voltage conductor system to the earthed metal cladding.

The TEV probe detects these short duration voltages, measures the peak amplitude of the pulses and displays peak sensitivity in the vicinity of the discharge site.

Measurements are made by placing one or two TEV probes onto the earthed metal cladding of the switchgear. The instrument senses the short duration electrical transients produced by partial discharges and gives visual indications each time a discharge is detected by the oscilloscope.

The double probe instrument has the advantage that the exact location of a discharge site can be established from relative times of arrival of the transient at different detection points. Discharge magnitude is displayed in MV.

Back ground noise levels can be significant and this is measured both in air and on adjacent metalwork prior to carrying out tests on the switchboard.

