DISCHARGE TESTING ON 33KV INDOOR TERMINATIONS

It is now possible to rank your HV assets in order that are at the greatest risk of failing ensuring that the risks of substation outages are absolutely minimised. It is not acceptable to have an unplanned production stoppage due to a cable / switchgear or accessory failure.

When an unplanned outage occurs, production stops, and in most cases, will cause waste or damage to occur within the plant. By using On-Line Partial Discharge Testing it is possible to have a "Real Time" report on the condition of your HV cable and switchgear assets while your plant is still running – in service with no production outages required which is ideal for the any 24 /7 operations such as mining, refineries and export operations etc.

The weakest links in a cable system are often the terminations or cable joints, mainly because they require on-site assembly. Cables do fail due to a number of factors, such as the ingress of moisture and water into the joint, which can lead to catastrophic arcing failure of the joint; corroded sheath that lets water enter the insulation; overloaded; mechanical damage; and natural aging causing insulation properties to change state and leads to cable failures. Undertaking On-Line Partial Discharge testing of cables and above ground switchgear in the field does requires extensive experience to know where to place the various numbers of sensors, (it is not possible to use one sensor) and analyse this data from the various sensors as it is being recorded in real time.

On-line Partial Discharge MaPPing **This means the *cable remains in-service* with no interruption to client's loads.**	**ADVANTAGE**
	Cable *does not need* to be electrically isolated from all points of supply.
	Increased numbers of cables tested per day.
	Tests a cable under normal operating conditions. (Thermal & magnetic effects are factored into test.)
	Cables do not have to be disconnected from the switchgear. They are tested at normal operating voltage, *ensuring no over stressing occurs*, to the in-service HV asset (Over stressing assets reduces their life.

CASE STUDY: YEAR 2010 AUSTRALIA

Client's objective:

1. To identify which 33kV termination is next to fail in his installation and stop the following from occurring (*See photo below*)
2. Report order of next failures, if no action is taken!

Work performed:

An on-line PD survey of the client's XLPE cables was carried out by High Voltage Solution (HVS) using in-house developed sensors, coupled with an instrument, having three input channels that allow for sequential acquisition of PD signals.

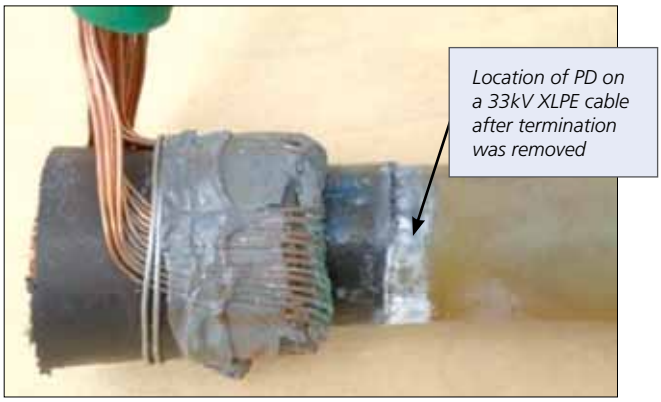
Unlike conventional PD monitors, HVS equipment acquires and stores the actual pulse shape of each signal measured. This enables both frequency and time- domain analysis. Specifically, for cables, the data acquired allows for identification of internal discharges, surface discharges and corona discharges.

The cables tested were ranked into three risk different categories: Low / Medium & High.

Specific recommendations and order of priority was given to cables being considered for possible replacement programs.

Test results:

From the on-line PD tests; HVS was able to measure PD in progress on selected 33kV terminations. This gave the asset owner; the luxury of ***having a control shut down*** & bring in correctly skilled 33kV jointers to undertake repairs



On-Line PD activity found

Direct client benefits:

The client was extremely satisfied with the findings, since an in-service failure would have produced significant costs, both in terms of downtime and repairs, coupled with the fact that a plant restart after shutdown would have required three days.

Conclusion

Partial discharge testing is a vital tool for determining the health of cable systems. This technology can be applied economically in an on-line survey fashion to provide excellent cable system condition assessments.

This information can then be used to channel maintenance resources to the areas that require the most attention. Several advanced methods can be used to identify, quantify, and locate partial discharge, depending on the cable system construction and the partial discharge location accuracy requirements of the facility.