PD MONITORING FOR CONDITION BASED ASSETS

The availability of an experienced On Line Partial Discharge Field Service Provider to undertake plant surveys on high voltage cables and switchgear while the plant is running is now a reality.

Having accurate, real-time facts about your key cable and switchgear assets allows you to:

1. Reduce the overall level of risk on the power system;
2. Target replacement and refurbishment programs by identifying and locating high risk sections of cables and/or to reconfigure networks: i.e. replace assets that ***need*** to be replaced and not because they are old.
3. Develop systems and tools that can later be applied to other power systems assets.

CONDITION-BASED APPROACH

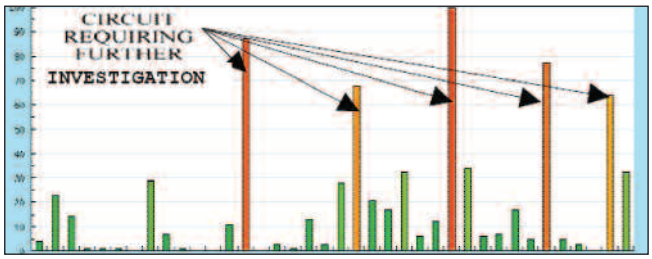
The other main 'business driver' in the development of the condition assessment technologies are the incentives which require all electricity utilities company to continuously improve network performance and to operate the network smarter and at reduced costs.

These drivers underpin the need for a condition-based approach for the management of ageing cable assets. In order to achieve an effective condition-based asset management policy, it is critical that the condition of MV cables are checked both regularly and in a systematic manner.

Partial Discharge Analysis is the foundation of a viable predictive maintenance program for medium or high-voltage equipment. This technology can be applied to motors, generators, switchgear, bus ducts, cables and their accessories and transformers. Periodical use of this technology allows the identification of problem areas in insulation systems *prior* to failure. Trending of this data allows timely planning of corrective maintenance actions.

PROGRAMMING PRIORITIES

The PD screening program exercise involves conducting a one-day inspection of substations to evaluate a snapshot condition (a five minute test per plant item), thus allowing measurement of the magnitude/level/phase waveform and a combination of these attributes. This allows circuits within the substation to be prioritized as shown in Graph 1.



Graph 1 *PD screening identifies circuits requiring priority maintenance.*

Many Partial Discharge service providers can identify a problem but leave it to the client to resolve. This is a hard ask for a client to do so HVS choose to provide tailor-made solutions for each identified problem. With 39 years experience dedicated to the high voltage industry and with the understanding of the applications, properties, installations or insulation, this service is a natural responsibility that is appreciated by HVS customers.

CASE STUDY

Background

An Australian generator to the mining industry was experiencing random, insulation-based, cable failures with an installation that was less than 10 years old. The primary cause of the failures was an installation/termination problem. Though the customer did not share specifics, it indicated the lost productivity figures in terms of dollars were substantial.

An example of what was found

The nature of the operation and the design of the cable network and switchgear basically precluded the more traditional forms of insulation testing as the customer was particularly vulnerable to unplanned outages.

Problem

How to ascertain (while on-line and without loss of productivity) the insulation integrity of the cable network and switchgear in order to avoid a forced outage to its mining clients. (Mines are a 24/7 critical industry. Having no power is not only dangerous but can cripple a mine with underground backflows of water.)

Solution

The customer used regular On-Line Partial Discharge surveys provided by High Voltage Solution Ltd (HVS) to monitor all cables on a 2 yearly cycle. The surveys are to include newly installed HV cables, thus enabling a "footprint" to be taken from day one.

Benefit

Typically, the only way to examine the main generator cables is to disconnect both ends. This evolves a complete outage and is not a reality where shutdowns are the last option. Using On-Line Partial Discharge surveys will provide partial discharge information while the generator cable/switchgear is energized.

CONCLUSION

By using regular On-Line Partial Discharge surveys, the customer will always know the status of their equipment's insulation without having an outage. Knowledge of the conditions that may lead to a forced outage reduces outage risk, thus, productivity is maximized.

Levels (magnitude and pulse rate) of partial discharge are a well known indicator of insulation quality and can provide information as to the expected life of the cable network or switchgear.

The measurements will also allow the customer to plan an outage by their ordering spare parts and allocating required manpower in advance.