

# THE PARTIAL DISCHARGE SOLUTION FOR SUBSTATION RELIABILITY

Orion's maintenance programme has been proven to reduce plant and equipment failure and prolong asset life.

By Greg Linton, HV Diagnostic Services Ltd

Orion's central Canterbury electricity distribution network consistently rates as one of the most reliable in New Zealand. Over the past five years Orion has 'kept the lights on' for 99.9% of the time and on average, consumers experience less than one interruption to their electricity supply each year. These results are achieved in a diverse network that covers 8000 square kilometres and includes Christchurch, farming communities and the high country area inland to the South Island's main divide.

Regular equipment monitoring contributes to Orion's reliability. It allows Orion to prioritise equipment replacement and refurbishment based on the actual condition of the equipment, rather than just its age. Orion's maintenance programme has been proven to reduce plant and equipment failure and prolong asset life.

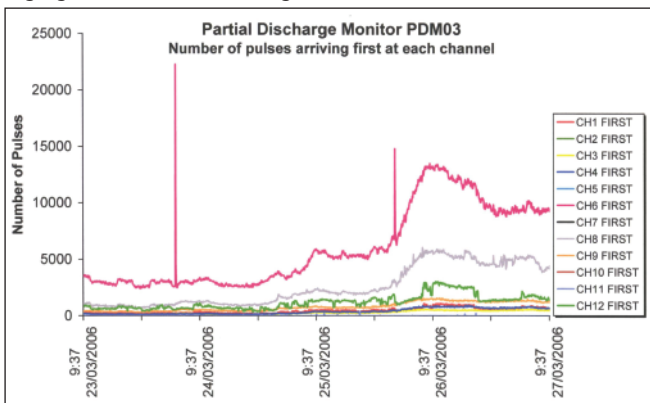
## IMPROVED MAINTENANCE TECHNIQUES

Five years ago planned maintenance was the primary cause of electricity supply interruptions on Orion's network. Today, however, most interruptions are caused by severe weather, unforeseen plant and equipment failure and problems created by trees. Planned interruptions rank after all of these other events, due to improved maintenance techniques and an altered maintenance program for ageing equipment.

With the age spread of 11kV switchgear for example, Orion has introduced additional testing to detect the breakdown of insulation at an early stage. This early detection means that targeted remedial work can be undertaken without disruption to consumers. This is achieved through partial discharge non-invasive location and monitoring, a modern technology producing excellent results that reveals potential problems early on. Two types of partial discharge checks are carried out at different intervals as appropriate for the age and location of the switchgear.

## EXTENSIVE DATABASE OF READINGS

Since introducing partial discharge testing in 1998, Orion has created an extensive database of readings from their 11kV switchgear population. Almost 300 substation surveys are completed each year and a further half of these are regularly monitored, making it possible for subtle changes to be identified. This monitoring is especially important as plant that was installed to meet high growth in the 1960's edges towards the end of its useful life.



Results of 4 days continuous Partial Discharge Monitoring. All channels are following Probe 6 located on a switch tank with an average amplitude of 26dB recorded. The aerials CH 1, 2, 11 & 12 are clear confirming that the activity is internal to the switchgear.



The author making a non-intrusive measurement on the switch tank of an aged Oil filled Circuit Breaker using the Partial Discharge Locator (PDL1) from EA Technology UK.

In the 12 months to March 2006, HV Diagnostic Services has been involved with Orion on an average of almost one detailed investigation per month based on the annual test programme results. In all cases the undesirable effects were recognised, remedied and subsequently tested to confirm improvement to the recorded levels. Furthermore, a greater number with suspected discharge activity have been targeted for closer and ongoing monitoring. This 'unplanned' maintenance is the key to maintaining a healthy network allowing for intervention when and only when it is necessary.

## MEANINGFUL COMPARISON

But this is not the whole story. Orion is also vigilant when it comes to brand new substations and upgraded sites containing new replacement vacuum switchgear. Typically an Ultrasonic and TEV survey is undertaken just days after a site has been commissioned allowing the database to continue its development. Testing a newly installed switchboard provides the all important benchmark reading essential for meaningful comparison in the years ahead, and is also used as a final check on the installation.

This 'forward thinking' will enable Orion to maintain its excellent record and help with its planning into the future.

## CONCLUSION

The focus on reliability of supply has resulted in the increased use of partial discharge technologies for a range of unplanned maintenance projects. Supply authorities and Industry are adopting partial discharge testing as a permanent part of their overall maintenance programs.

Greg Linton of HV Diagnostics has been involved with partial discharge testing in New Zealand from the beginning and has accumulated extensive knowledge in this field.

# PARTIAL DISCHARGE

**Here is the PROOF you need!**

*(Actual defects located allowing correction before equipment failure)*

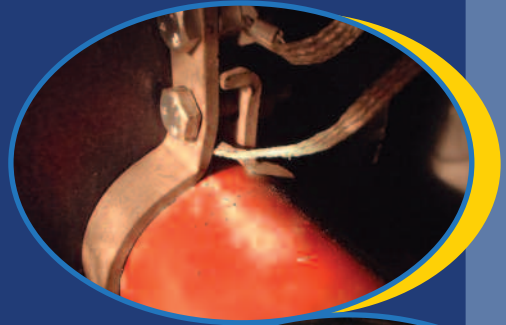
Dedicated to the prevention of unplanned outages through Online Partial Discharge Location and Monitoring.

## Available services include:

- Non-intrusive Online Switchgear Surveys & Monitoring utilising TEV and Ultrasonic detection methods.
- Kiosk & termination inspections and testing.
- PD Cable Mapping & VLF testing.
- Aged PILC Cable condition assessment and/or new XLPE circuit acceptance tests.
- New Zealand representative for EA Technology UK, with access to innovative products and services for HV asset owners and the Electrical Supply Industry.

**Extensive image gallery accessible online at**  
**[www.hvds.co.nz](http://www.hvds.co.nz)**

*Contact **Greg Linton** for further information.  
Locating Partial Discharge since 1998,  
no-one's been doing it longer!*



## HV Diagnostic Services Ltd

50 Disraeli Street, PO Box 33078, Christchurch, New Zealand  
Phone 64 3 962 0225 – Fax 64 3 366 0680 – Mobile 021 663 491  
Email [glinton@hvds.co.nz](mailto:glinton@hvds.co.nz) – Website [www.hvds.co.nz](http://www.hvds.co.nz)