

CASE STUDY

- 11 kV Switchgear
- Mining Industry
- Asset Management
- Failure Prevention



Project

A mining operator in Australia, with a large number of remote HV substations, required a cost effective, condition monitoring (CM) strategy to **identify, locate and monitor** partial discharge (PD) activity on their network. This Case Study describes the successful implementation of the first 3 phases of HVPD's complete **4-Phase OLPD Asset Management Solution** that helped in this instance to prevent the failure of 11 kV air insulated switchgear (AIS). Such a failure could have led to an arc-flash, placing the entire substation and any personnel in the vicinity at risk.



Short-term Monitoring of 11 kV Switchgear with HVPD Kronos® Portable Monitor

Solution

Phase 1 of the solution utilised a number of **PDS Insight™ handheld** units to routinely screen the 11 kV switchgear. If PD activity is detected during these walk-by tests, the **Phase 2 - HVPD Longshot™** diagnostic test technology is then deployed to **pinpoint** the exact source of the PD. In the example shown below a source of very high 'Local PD' of 49dB was detected from the back of Panel 2. As these high levels were a cause for concern, so the **Phase 3 - HVPD Kronos® Portable Monitor** technology was deployed to conduct continuous OLPD monitoring to ensure that the levels of PD did not increase further, which would point to a 'trend-to-failure'. The graph below shows continuous OLPD monitoring data from 19 days of continuous monitoring of Panel 2 with the HVPD Kronos® Portable Monitor, up to the time of outage for inspection. This confirmed high, persistent but steady levels of 'local' PD activity (49 dB peak and 744 mV/cycle activity) with no upwards trend observed.

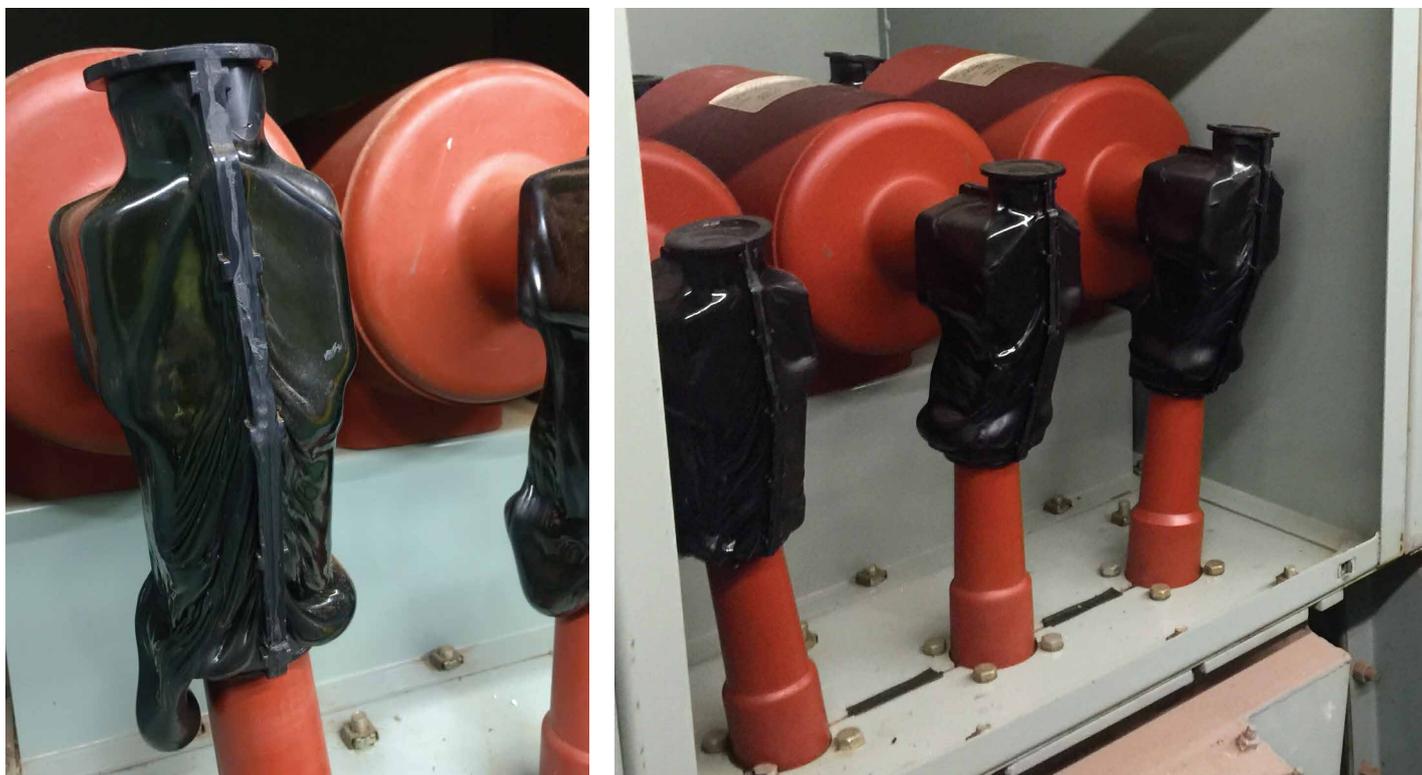
Asset	Sensor Type	Cable PD Peak (nC)	Cable OLPD Activity (nC/cycle)	Local PD (dB)	Local OLPD cctivity (mV/cycle)	Condition / Comments
Back Panel 2	HFCT	1.17	11.81	49	744	Major concern, locate PD and then repair or replace



Continuous OLPD Monitoring Data from 11 kV Air Insulated Switchgear Panel 2 over 19 days – high and continuous partial discharge

Results

An outage of the switchboard was arranged to carry out a visual inspection of the 11 kV cable box and CT chamber and to carry out any repairs necessary. The visual inspection showed **significant insulation degradation issues with the cast epoxy resin 'riser' and synthetic resin-bonded-paper (SRBP) bushings** on all phases in the CT chamber in 11 kV switchgear Panel 2.



Source of High PD Activity: Deteriorated Insulation of the Cast Epoxy Resin Riser

Conclusions and Recommendations

- A visual inspection of the CT chamber confirmed a significant deterioration of insulation on the epoxy risers all phases of Panel 2 with both partial discharge and thermal runaway identified.
- The detection and diagnosis of the PD activity in this case **prevented a costly and potentially dangerous arc-flash failure and unplanned outage** for the mining operator by directing a preventative maintenance intervention supported by HVPD's OLPD test and monitoring technology.
- HVPD strongly recommend that any repaired HV plant is re-tested after being put back into a service, in order to confirm the effectiveness of the repairs made i.e. they are 'PD-free'.
- As this mining operator's 11 kV substations are located at remote locations, without communications infrastructure in place, the HVPD Kronos® Portable Monitor is presently being moved between substations to provide short-term OLPD monitoring (typically for periods of 2-4 weeks per site).