

CASE STUDY: On-line Partial Discharge Testing Confirms Effectiveness of Repairs To 6.6kV Air-cooled Motor

Company: Texas utility
Plant: Nuclear
Unit: Confidential
Ratings: 6.6 kV, 2500 HP, 257 RPM
Manufacturer: Confidential
Related Info: Epoxy-mica insulation, manufactured in 1975
PD Sensors: 3 EMC's

Details: In September 2001 a periodic test with a TGA-B instrument was done and plant personnel noted extremely high PD activity as compared with the Iris database. Iris Power Engineering provided an informal analysis. The patterns indicated “non-classic” partial discharging between the high-voltage components of the ‘B’ and the ‘C’ phases, along with an unusual grouping on the ‘B’ phase plot that was 180° out-of-phase. These patterns were all cross-coupling to the ‘A’ phase.

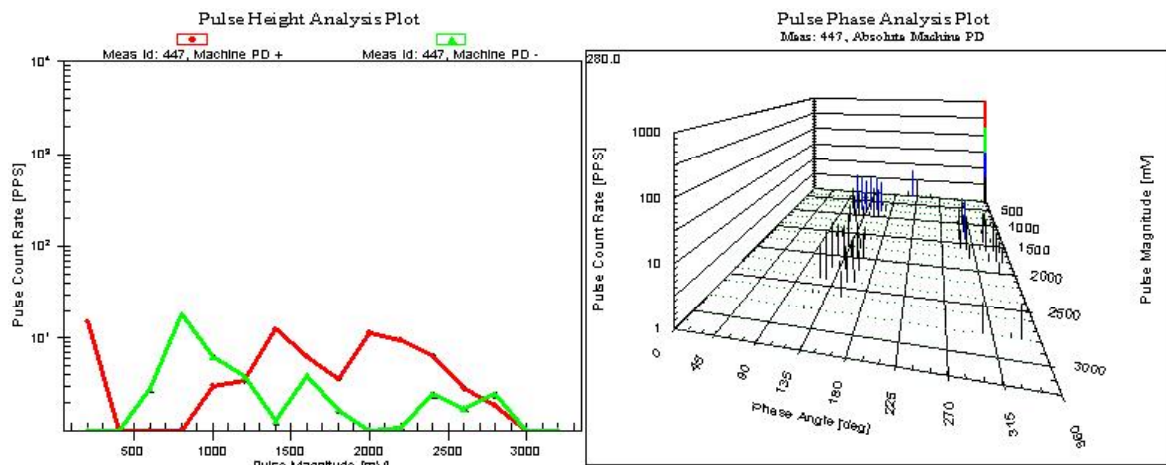


Figure 1. Online Partial Discharge Test September 2001

At magnitudes in excess of 2000 mV, this PD would be considered extremely high for an air-cooled machine of this voltage class. Subsequent periodic testing showed the continued presence of high-magnitude, non-classic PD. Therefore, this was not an intermittent or transient problem.

Utility and Iris personnel conducted a visual inspection of the motor's terminals. The following observations came out of the inspection:

- A white powder residue indicative of PD activity between the various motor leads was visible on the neutral leads.
- The neutral leads were found to be in close proximity to the HV leads and in actual physical contact with the 'C' phase sensor, which would also cause high electric stress and subsequent partial discharge activity.
- Insufficient spacing between the 'B' phase HV lead and ground produced PD that was visible with a CoronaScope.

The motor was removed from service for repairs to the associated pump. Bench tests on the motor in the shop prior to any work confirmed the continued presence of a problem.

The remedial actions taken by the utility were as follows:

- Shortening and isolation of the neutral leads.
- Neutral leads tied back into the winding away from the HV terminals and PD sensors.
- Insulating material placed between the 'B' phase HV lead and ground.

Off-line PD testing on the motor following the repairs yielded no high magnitude PD.

The low-level classic PD, due to voids within the groundwall, was largely unchanged from levels prior to removal from service. On-line testing after the motor was returned to service showed the PD magnitudes were reduced by about forty times. With the sources of non-classic PD eliminated the overall winding condition is considered stable and the PD levels typical when compared to other windings of the same voltage class.

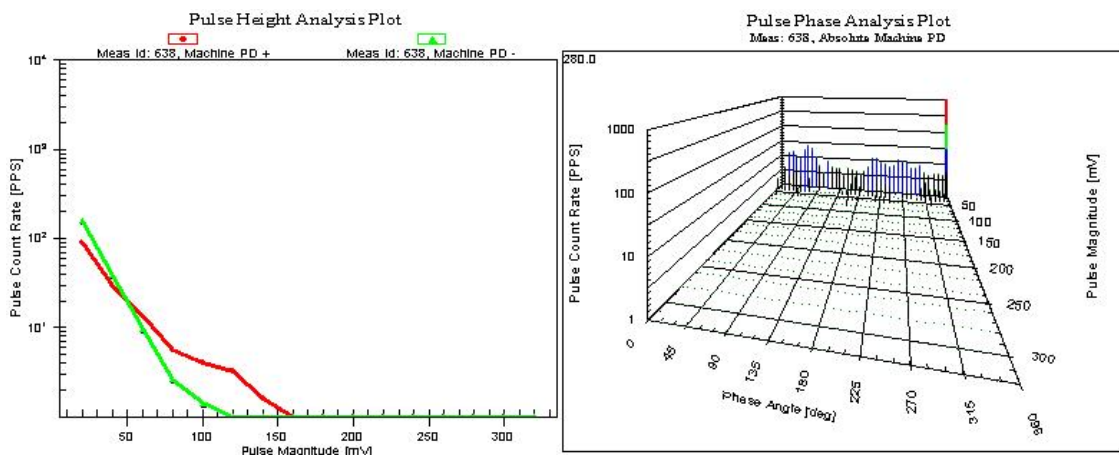


Figure 2. Online Partial Discharge Test After Remedial Work