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QUESTION N°: Q5

Introduction

Australia and New Zealand have experienced around 25 years in polymer insulation on HV equipment. To date, we have experienced issues which can be related to the two following categories:

1. UV
2. Organic Pollution (algae and plant growth)

This report will further explore these two categories, delving deeper into the topics of PASS M0 Bushings, CVTs Bushings and lichen growth on equipment.

UV Related

Regardless of which manufacturing brand the polymer was sourced from, after being in service over several years the polymer shed become hard and tear through inadvertent contact. If the damage does not extend to the core of the polymer, the shedding may either be repaired using specific products or trimmed with a sharp knife, removing the damaged area (only if the resultant loss of creepage distance causes no issues). Within areas that experience a higher UV, such as in far North Queensland, the polymer insulators hardening and brittleness worsens. We will explore these issues in two types of equipment as an example:

1. PASS M0 Bushings

Resulting from a high UV environment, small cracks form on the surface of the polymer if bent. In comparison to the underlying polymer, the surface layer appears to be drier and more brittle. Previously, there has been issues with PASS M0 associated with the relocatable capacitor bank, as the surface cracks were greater causing the polymer to be damaged. Therefore, the bushings were replaced to mitigate issues. Similarly, there have been other sites that have experienced less severe issues on the PASS M0 bushings, and the unit was able to be back in service.

2. CVTs Bushings

The CVTs that were supplied on the relocatable cap bank (~20 years in service) contain a polymer which is very brittle and easy to damage from minor contact. At one of the locations, the polymer was damaged during maintenance work, being torn at the core, and immediately requiring replacement of the CVT.

Organic Pollution Related

A very common issue faced is the development of algae, mould, moss and other plant growth (lichens), especially at sites experiencing heavy rainfall such as North Queensland.

The large amount of algae and lichen growth developed on the equipment and although testing concluded that it would not cause electrical problems (i.e. the surface leakage currents remained low as long as the creepage distance remained high), the growth still presented two key issues:

- a. If the lichen growth proceeds and bridges the sheds, a large percentage of the creepage distance is lost, with the possibility of a flashover in wetter weather
- b. When removed from the polymer shed, each lichen took out a little divot of polymer, damaging the insulator surface

Conclusion

Even though most polluted polymer bushings were tested with no signs of a flashover, the development of algae and lichens in some areas is rapid. This may significantly influence the polymer insulation property, reducing the creepage distance. Therefore, it is important that the Routine Substation Maintenance monitors the pollution levels, scheduling cleaning of the bushings before the sheds are bridged by growth.