TECHNICAL
ScottishPower Express

Reference no.: EXP-11-231 Incident: HV transformer bushings (RIP) - Storage Date: 18/09/2017

INAPPROPRIATE STORAGE OF HV TRANSFORMER BUSHINGS OF THE RIP TYPE

Inappropriate temporary storage of HV transformer bushings of the RIP type (Resin Impregnated Paper) has become a regular issue on new power transformer installations within SP Energy Networks (e.g. Kilgallioch SGT2, Devonside T2…). Project delays or issues during transformer post-delivery checks have required HV bushings to be stored on-site longer than initially planned.

Inadequate storage of these components for prolonged periods of time can lead to moisture ingress within the paper insulation system of the bushing making them unfit for service. The extent of the problem can be ascertained on-site by conducting tan delta and capacitance measurements of the bushings as detailed in the relevant SP Energy Networks power transformer site commissioning specifications (TRAN-03-122 & TRAN-03-124). Prior to assembly on the transformer these tests shall be performed and the results checked against the values on the bushing data plate. When the bushings are dry and in good condition, the site test results will be comparable with those on the bushing data plate.

In circumstances where the measured values are beyond transformer supplier / bushing manufacturer recommendations, the HV bushings will need to be returned to the manufacturer for a drying process to be carried out and a full bushing re-certification to be performed. This will have a direct impact on transformer installation timescales, resulting in delayed energisation dates and / or potential financial implications.

275kV RIP bushings stored outdoors in the rain with crates not fully closed

275kV RIP bushing stored outside its original packaging, with no moisture absorbent and with oil-end exposed

Recommendations and action points

- HV transformer bushings shall be stored in accordance with the guidance provided by the bushing manufacturer. This information shall be supplied with the transformer O&M manual. If this is not the case, it shall be requested.
- Although the above will take precedence, it is good practice to keep the HV bushings indoors within its original packaging (polyethylene tubular film) and crates. Under no circumstances, shall HV bushings be stored outdoors unprotected from rain and humidity.
- Adequacy of the packaging provided and the condition of the moisture absorbents shall be checked regularly when in storage.
- If long term storage of HV bushings is anticipated (> 6 months), contact shall be made with the transformer supplier to seek advice. Special packaging may be offered in those cases (e.g. aluminium foil bags supplied with moisture indicators).
- Electrical tests shall be performed prior to assembly (e.g. tan delta & capacitance measurement) to confirm the bushing condition.
- Staff are also reminded that any piece of equipment, not only bushings, shall be handled and stored in accordance to manufacturer instructions and Company polices.