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TRANSFORMER COLD START PROCEDURE

In Dry Type Transformers, the air inside and surrounding the enclosure are a critical part of the transformer's function. Low ambient temperatures generally do not adversely impact an energized transformer, as the energization (no-load) losses typically generate enough heat to maintain appropriate conditions, in low ambient temperatures as low as -40 °C.

There are two main issues with energizing transformers which have been stored at low ambient temperatures:

- The insulation in the coils can become brittle at low temperatures. The expansion of the conductors after loading a transformer from a cold start, or the contraction of the conductor during storage at lower temperatures can lead to a crack in the insulation between turns or between layers, leading to an internal fault.
- Low ambient temperatures can lead to condensation forming within the transformer enclosure, as well as on and inside the transformer coils. Energizing a transformer with condensation on the coils can result in an internal fault and damage to the insulation.

In order to avoid damaging a transformer which has been stored at freezing temperatures, it is important to ensure that the coils are dry and free from any condensation or moisture The rate at which the coils are brought up to temperature must be controlled, so that conductors do not expand more quickly than the insulation. The following cold start procedure should be followed when energizing a transformers below 0 °C:

1. If the transformer coil temperature is below -20 °C, warm up the transformer coils to -20 °C or warmer, using external heaters. The transformer's enclosure ventilation can be blocked in order to speed up the process, however a minimum of 6" of the top and bottom ventilation openings /louvers should remain clear to allow for moist air to escape. Refer to the drying instructions in the transformer manual.
2. Once the transformer is above -20 °C, perform the recommended pre-service tests as outlined in the transformer manual, including the insulation resistance (megger) test.
3. If the megger readings are below the recommended value specified in the manual, external heat should be applied for an additional 12 hours and the transformer should be re-tested. This should be repeated until the insulation resistance measurements are acceptable.
4. At this stage, the transformer can be energized with no load and left to warm up for 24 hours, or until the winding temperature reaches at least 0 °C. External heat and blocking of ventilation may remain in place to speed up the process.
5. Upon reaching at least 0 °C, the external heat and ventilation blockage may be removed, and the transformer may be loaded fully or as appropriate.

Note: When placing a transformer back into storage, it is recommended that the transformer be allowed to reach ambient temperature, following which the ventilation could be sealed (ie wrapped). Placing moisture absorbing desiccant packages inside the enclosure will further help prevent buildup of condensation.