Q. **Asset Management**

Does Hydro conduct periodic electrical quality testing on distribution substation transformers? If so, describe the preventive maintenance and testing conducted.

A. Hydro conducts electrical quality testing on distribution substation transformers rated at 1.0 MVA and above. The preventive maintenance is scheduled on a six-year cycle and performed as per the "6 Year (PM) Preventive Maintenance" procedure found in PUB-NLH-363 Attachment 1. Included in this PM would be the following:

- Dielectric oil test;
- Megger test on protection devices;
- Winding resistance test;
- Dielectric absorption test; and
- Low resistance (Ductor) test for all ground connections to arrestors.

POWER TRANSFORMER MAINTENANCE PROCEDURE:

120 DAY GENERAL INSPECTION

Normally completed from ground level. Visual inspection.

1 Check oil levels in Main Tank, Conservator tank and Bushings. Check for oil leaks. Record findings.

2 Observe all HV connections for signs of overheating or broken terminations.

3 Inspect all oil and winding temperature devices and record findings.

4 Check explosion vent diaphragm for signs of damage or deterioration.

5 Observe for signs of oil leaks. Clean up any stains or spills.

6 Check condition of silica gel. Change if 50 % or more contaminated.

7 Check that all equipment grounds are in place and all connections are sound.

8 Check condition of concrete foundations for cracks and/or heaving.

9 Check Main Tank, Radiators and other metal parts for signs of rust penetration.

10 Control Cabinets and devices:

10.1 Check cabinet heaters, function test and record amperage. Observe for signs of overheating such as burn marks on adjacent wires and/or cabinet paint coating.

10.2 Inspect control wiring and terminations for breaks, corrosion, overheated or damage.

10.3 Manually operate each cooling fan stage and record amperage.

10.4 Observe all cooling fans while running for abnormal noise, vibrations or bearing overheating.

10.5 Check all cabinet doors for free operation. Lubricate as required.

11 Complete Transformer 120 Day Inspection Form.

6 Year (PM) Preventive Maintenance

1 Perform on site dielectric oil test for Main Tank and Conservator Tank.

2 Check conservator tank drain for presence of water, drain if present and record.

3 Function test & complete 500 Volt megger test on protection devices:

- 3.1 Winding temperature relay.
- 3.2 Liquid temperature relay.
- 3.3 Fault pressure gas relays & pressure relief devices.
- 3.4 Low oil level gauge.

4 Check cabinet heaters (Record Amperage).

8 Tap changer off load (TYPE):

- 8.1 Complete winding resistance test on Tap position **Found**.
- 8.2 Operate the tap changer through all of the tap positions to wipe contacts clean.
- 8.3 Complete winding resistance test on Maximum Tap position **Raise**.
- 8.4 Complete winding resistance test on Maximum Tap position **Lower**.
- 8.5 Select final tap position and complete a mechanical centre and continuity check.
- 8.6 Complete winding resistance test on Tap position **Left**.

9 Inspect all HV/LV connections, look for signs of overheating. Apply Anti-Oxide Compound (Pentrox) to all connections that were opened and are to be remade.

10 Complete dielectric absorption test. Record Polarization Index (10 Minute Divided by 1 Minute reading = Polarization Index)

11 Inspect all ground connections to arrestors. Complete low resistance (Ductor) test from each Arrestor Base to the closest point to the Ground Grid.

12 Complete a close up inspection of all porcelain for cracks and wipe down if required.

13 Repair identified oil leaks.

14 Clean and paint rust areas found on the top of transformer tank.

15 Complete applicable Form.