

Maintenance Guidelines for Transformers

Electrical transformers are critical pieces of equipment for many businesses. If one breaks down, it can leave your business without power, interrupting essential business functions. Since transformers can fail without any visible signs of trouble, a periodic inspection, testing and maintenance program is important to identify problems early so steps can be taken to avoid unexpected shutdowns.

Recommended Protective Devices and Features

All transformers should be equipped with primary and secondary side overcurrent protection. Additionally, for liquid-filled transformers, the following devices and features are recommended:

- Lightning/surge protection consisting of lightning arrestors should be installed on outdoor transformers that have bushings directly connected to overhead lines.
- A mechanical pressure relief device should be installed on transformers greater than 1,000 kVA.

Preventative and Predictive Maintenance

Establishing a formal preventative and predictive maintenance program can help identify potential problems and associated risks as well as minimize down time.

The following practices should be included in your regular maintenance program. Only qualified technicians should carry out these inspections, testing and maintenance activities.

- **Electrical testing:** Routine voltage ratio testing is recommended in order to identify potential issues prior to a breakdown and to allow time for repair or replacement planning.
- **Transformer enclosures** should be opened, cleaned, and visually inspected annually. Maintenance intervals should be adjusted depending on the physical environment where the equipment is located (e.g., excess dust and debris).
- **Bolted connections** should be re-torqued to the manufacturer's specifications annually. Thermography can be a useful inspection method to help identify loose or high-resistance connections.
- **Oil sampling for liquid-filled transformers:** The interval between sampling tests can depend on conditions such as the load carried, age, condition and past test results, but in general, the following oil sampling, testing and analysis should be conducted annually on transformers 500 kVA or greater:
 - > Oil screen tests, including dielectric strength, interfacial tension, neutralization number and color
 - > Karl Fischer (measures moisture in oil)
 - > Dissolved gas-in-oil analysis (DGA), also called dissolved gas chromatography

For transformers that are left idle or designated as spares, an oil sample test should be completed annually to measure the oxygen and moisture content.

Contingency Planning

Since transformers often support critical business functions, it is important to also have contingency plans in order to minimize business interruption, should a transformer break down. The following elements should be included in your contingency plan:

- Replacement transformer availability
- Transformer rental options
- Qualified electrical contractors
- Expected time and procedures to restore service in the event of an outage

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