

Distribution Transformer

# Preventive Maintenance Descriptions and Guidances



QTC Energy Public Company Limited

Customer Service Contact Number 089-444-0844

## The Importance and Guidances of Distribution Transformer Preventive Maintenance

All of you might already understand the importance of “electricity” and the role its play in our daily life, and it might not be overly stated that electricity is one of the essential factors for our living since the electricity shortage often bring severe troubles and heavy economic damage in the case of large industrial conglomerates.

The prevention of electrical shortage is therefore a serious matter and a priority for many stakeholders, especially for the responsible authorities. In electrical engineering, we call this “The reliability and stability of the electrical system” which could be achieved by performing preventive maintenance for all equipments in the electrical distribution system, for example cable wires, electrical poles, breakers, relays, distribution transformer, ground system among many others, to stay in a good condition that is always fits for use.

“Distribution transformer” is considered as one of major equipments in the electrical distribution system in our daily usage. It transforms high-voltage electricity from the MEA’s or PEA’s electrical distribution system to low-voltage electricity for further relaying to buildings, houses, roads, and others, for us to utilize the full benefit. If we carefully consider, distribution transformers are used 24 hours per day for years without interruption so the maintenance should be carried out in an appropriate interval such as annually, bi-annually, tri-annually, to ensure the continuity of services and lifetime extension. The maintenance frequency should be considered by taking into account load distribution profile, environment, or location, and the type of maintenances should be appropriate and consistent with distribution transformer types such as Conservator, Nitrogen Gas Sealed, or Sealed Fully Oil Filled. Technicians, operating procedures, tools, machines, and equipments should be up to standard. Additionally, the truly “preventive maintenance” is recommended to maximize the benefits as protective equipments would also be covered in addition to distribution transformers, since the transformers could be easily damaged even with proper maintenance if other protective equipments are not ready for used such as coils in the transformers could be damaged from even modest lightning strikes if the resistances are not working well. The guidance of the electrical transformer preventive maintenance is listed as follow:



## Preventive Maintenance

Distribution Transformer Maintenance	Supporting Accessories Maintenance	Protective Equipment Maintenance
<ul style="list-style-type: none"> <li>• Tank and fin</li> <li>• Painting and rust condition</li> <li>• Gaskets and leakages</li> <li>• Bushing</li> <li>• Others</li> </ul>	<ul style="list-style-type: none"> <li>• Thermometer</li> <li>• Oil level gauge</li> <li>• Buchholz relay</li> <li>• Cooling fan</li> <li>• Dehydrating breather and Silica Gel</li> <li>• Others</li> </ul>	<ul style="list-style-type: none"> <li>• Lightning arrester</li> <li>• Arcing Horn</li> <li>• Grounding system</li> <li>• High/low-voltage fuses</li> <li>• Others</li> </ul>



## Preventive Maintenance for Distribution Transformer

Distribution transformer is the origin of power distribution in the business. The lack of maintenance does not cost only the repair expenses or the rental expenses for the replacements but also damaging business continuity, where this damage could be severe in some industries such as metal forging, frozen food, cement manufacturing, healthcare, media, theatre or recreational, for instance.

QTC Energy Public Company Limited has experienced and understood this problem. The company emphasizes that in addition to choosing quality distribution transformers, preventive maintenance would also be another solution to the problems, so we have a team with experienced engineers and technicians to perform preventive maintenance for distribution transformers before the problem arises.

We usually wish to maximize the lifetime of distribution transformers, by performing a maintenance with depth understanding of the structure and each components used in distribution transformers is a way to prevent damages and extend the lifespan as wished.

The maintenance of Dry-type transformers would be performed primarily by cleansing and checking its cooling system.

For Oil-type transformers, which are widely-used, the roles of oil are system cooling and insulating. Most of the root causes for transformer damage is attributed to degraded oil, the preventive maintenance could be done by performing and electrical, physical, and chemical analysis of oil, which would allow us to recognize the abnormal conditions in distribution transformers as well as their root causes so we could prevent further damages from happening, and this is what we call "the preventive maintenance".

Interested customers may choose one of these two distribution transformer preventive maintenance plans

1. Standard annual contract
2. Ad-hoc laboratory testing and maintenance

## Distribution Transformer Preventive Maintenance Plan

Sequence	Activity	Duration	Person in action	
			QTC	Owner
1	Collect information about transformers	8-10 transformers per day  Depend on quantity and condition of the examples	✓	✓
2	Pre-inspection/collect oil and other electrical data		✓	
3	Analyze the oil insulation and other electrical data including general conditions of transformers and accessories		✓	
4	Present the analysis result and maintenance plan		✓	
5	Maintenance decision			✓
6	Perform maintenance according to the operating plan		✓	
7	Prepare the conclusion report		✓	
8	Propose annual maintenance contract (continuous)		✓	





## Distribution Transformer Maintenance Under Standard Contract

### For Oil-Immersed Distribution Transformers

#### 1. Conditions of service

- 1.1 Cover all electrical voltage in the distribution system.
- 1.2 Must be distribution transformers that are using transformer oil or silicone oil for system cooling.
- 1.3 Must be the Off-load tap changer type.

#### 2. Service Duration

One year after the agreement date. The maintenance shall take place at the installed location once every six months or twice annually.





### 3. Scope of Services

- 3.1 Provide distribution transformers maintenance according to the detail in Section 4.
- 3.2 Equipment/spare parts that would be provided free of charge are silica gel, transformer oil (not more than 5 liters), rubber gasket/seal of transformer parts that do not require fuel change or special lifting equipments.
- 3.3 24-hour support would be provided without additional service/transportation charges in case of emergency.
- 3.4 Temporary distribution transformers would be provided without additional charge if transformers under the contract are damaged and under repair except transportation charge, forklift charge, or crane charge.
- 3.5 Additional charge will be applied to the customer if the repair or equipments/parts replacement or transformer oil analysis is required in order to investigate problems/damages as appropriate, such as DGA test, Moisture Content test, Neutralization Number test, or Power Factor test, or filtering and oil changing that are apart from the description above.
- 3.6 Provide additional advices/suggestions to the customer if the problems are discovered to perform appropriate repair/modification to extend lifespan and maximize power distribution reliability of the transformers.
- 3.7 Prepare the maintenance report for each transformer for the customer to keep as a transformer record.

## 4. Maintenance Descriptions

- 4.1 Perform an Insulation Test for high-voltage coil, low-voltage coil, and grounds.
- 4.2 Perform a Grounding Resistance Test.
- 4.3 Inspect oil leakage from tank gaskets and gaskets of other equipments from all parts of the transformer
- 4.4 Inspect oil leakage from all joints and other part of the transformer tank.
- 4.5 Inspect the tightness, clean, and apply the corrosive protection substance for high-voltage terminal and low-voltage terminal.
- 4.6 Inspect the tightness, clean, and apply the corrosive protection substance for earthing terminal.
- 4.7 Inspect the operation and clean external equipments such as tap changer, thermometer, oil filling pipe ignition tube, Buchholz relay, and others.
- 4.8 Inspect the operation and clean protection equipments for high-voltage and low-voltage side, high-voltage fuse and low-voltage fuse, lightning arrester, and others.
- 4.9 Specific test, inspection, and maintenance

### A. Conservator Type Transformer

- Perform Oil Dielectric Breakdown Strength Test for all transformers.
- Inspect dehydrating breather (Silica Gel) for degradation, and provide replacement if necessary

### B. Fully With Oil Sealed Type Transformer

- Perform Oil Dielectric Breakdown Strength Test when the insulation level of coils is lower than the standard or in case of transformer leakage.

### C. Nitrogen Gas Sealed Type Transformer

- Perform Oil Dielectric Breakdown Strength Test when the insulation level of coils is lower than the standard or in case of nitrogen leakage.
- Inspect for nitrogen gas by the pressure level.



## Distribution Transformer Maintenance Under Standard Contract

### For Dry-Type Transformers

#### 1. Conditions of service

Cover all electrical voltage in the distribution system.

#### 2. Service Duration

One year after the agreement date. The maintenance shall take place at the installed location once every six months or twice annually.

#### 3. Scope of Services

- 3.1 Provide Dry type transformers maintenance according to the detail in Section 4.
- 3.2 Parts/equipments that are provided without additional charges are nuts or screws, and insulation tape for coils or joints.
- 3.3 24-hour support would be provided without additional service/transportation charges in case of emergency.
- 3.4 Temporary transformers would be provided without additional charge if transformers under the contract are damaged and under repair except transportation charge, forklift charge, or crane charge. (if the company is unable to provide temporary transformers then ten percent discount will be offered)
- 3.5 Additional charge will be applied to the customer if the repair or replacement of parts/equipments are required, or additional tests have to be conducted to investigate problems/defects as necessary apart from the above description.
- 3.6 Provide additional advices/suggestions to the customer if the problems are discovered to perform appropriate repair/modification to extend lifespan and maximize power distribution reliability of the transformers.
- 3.7 Prepare the maintenance report for each transformer for the customer to keep as a transformer record.



#### 4. Maintenance Descriptions

- 4.1 Perform an Insulation Test for high-voltage coil, low-voltage coil, and Earth.
- 4.2 Perform a Grounding Resistance Test.
- 4.3 Inspect the temperature of cooling system in the room or the installed location whether or not it is sufficient or up to standards.
- 4.4 Inspect the tightness, clean, and apply the corrosive protection substance for high-voltage pole and low-voltage pole.
- 4.5 Inspect the tightness, clean, and apply the corrosive protection substance for tap joints inside the transformer for high-voltage terminal and low-voltage terminal.
- 4.6 Inspect the tightness, clean, and apply the corrosive protection substance for Earthing terminal.
- 4.7 Inspect the operation and clean protection equipments for high-voltage and low-voltage side, high-voltage fuse and low-voltage fuse, lightning arrester, and others.
- 4.8 Specific test, inspection, and maintenance

##### A. Dry Type Class F, H Transformer

- Inspect the function and cleaning external equipments such as thermometers and alarm signals.

##### B. Dry Type Cast Resin Transformer

- Clean and blow dust in the heat-exhaustion pipe of high-voltage coil, low-voltage coil, and inside enclosure.
- Inspect the tightness, clean, and apply the corrosive protection substance for tap terminal inside the high-voltage side of the transformer.
- Inspect the function and cleaning external equipment such as controller, thermometers, thermal detection equipments, cooling fan, and other (alarm) signals, among many others.