**What is a Distribution Transformer?**

Definition: A distribution transformer is also known as a typical kind of isolation transformer. The main function of this transformer is to alter the high voltage to the normal voltage like 240/120 V to use in electric power distribution. In the distribution system, there are different kinds of transformers available like single phase, 3-phase, underground, pad-mounted, pole-mounted transformer.

* Generally, these transformers are available in different sizes with efficiencies along with insulating oil.
* There are four types of distribution transformer connections available like star-star, delta-delta, star-delta, delta-star and Zig Zag/delta zigzag.

**Distribution Transformer Construction**: The designing of a distribution transformer can be done similarly to small size transformers. The main parts of this transformer mainly include Oil Tank, Conservator, Buchholz Relay, Breather Unit, Oil Indicator, Temperature Detector, Pressure Relief Device, Thermal Relay, Radiator, and Bushing.

1. The oil tank is used to soak the windings by placing it in.
2. A conservator is arranged above the oil tank at the outside of the transformer frame. It is connected to the main tank with the help of a metallic tube. The oil within the tank can be easily contacted & enlarge throughout loading so that the temperature of the oil can be increased & decrease.
3. Buchholz relay is used when a conservator tank is used. Because it indicates errors like loss of oil once it goes low, improper flow of oil between the tank & transformer.
4. Breather Unit includes silica gel that absorbs moisture in the oil. It changes its color from blue color to pink color it is not capable to absorb moisture in the oil.
5. The oil indicator indicates the level of the oil within the conservatory unit.
6. The temperature detector monitors the temperature of the oil. If the temperature of the oil increases to a certain level then the transformer will be disconnected from the service.
7. Pressure relief device decreases the pressure within the transformer to avoid an explosion of the transformer.
8. Thermal relay is used as an indicator for the temperature of the winding
9. The radiator is used to increase the transformer’s cooling efficiency.
10. The bushing is used to connect the internal windings of the transformer with the help of an exterior electrical network.

Internal faults occur within the transformer itself, typically due to issues with the insulation, windings, or connections between them. These faults can cause various problems, including overheating, damage to the transformer components, and even explosions.

**About this Dataset**

Transformers plays a very important role in the power system. Though they are some of the most reliable component of the electrical grid they are also prone to failure due to many factors both internal and external. There could be many initiators which cause a transformer failure, but those which can potentially lead to catastrophic failure are the following:   
Mechanical Failure  
Dielectric Failure

**Content**

This data is collected via IoT devices from June 25th, 2019 to April 14th, 2020 which was updated every 15 minutes.  
Parameters Description:  
Current Voltage:  
VL1- Phase Line 1  
VL2- Phase Line 2  
VL3- Phase Line 3  
IL1- Current Line 1  
IL2- Current Line 2  
IL3- Current Line 3  
VL12- Voltage line 1 2  
VL23- Voltage line 2 3  
VL31- Voltage line 3 1  
INUT- Neutral Current

Overview:  
OTI- Oil Temperature Indicator  
WTI- Winding Temperature Indicator  
ATI- Ambient Temperature Indicator  
OLI- Oil Level Indicator  
OTI\_A- Oil Temperature Indicator Alarm  
OTI\_T- Oil Temperature Indicator Trip  
MOG\_A- Magnetic oil gauge indicator

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| Parameter | Description | Addition |
| VL1 | Phase Line 1 | These represent the line voltages |
| VL2 | Phase Line 2 | These represent the line voltages |
| VL3 | Phase Line 3 | These represent the line voltages |
| IL1 | Current Line 1 | current flowing through each phase |
| IL2 | Current Line 2 | current flowing through each phase |
| IL3 | Current Line 3 | current flowing through each phase |
| VL12 | Voltage line 1 2 | voltage between phase 1 and 2 |
| VL23 | Voltage line 2 3 | voltage between phase 2 and 3 |
| VL31 | Voltage line 3 1 | voltage between phase 3 and 1 |
| INUT | Neutral Current | The sum of the currents in all three phases. |
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| OTI | Oil Temperature Indicator |  |
| WTI | Winding Temperature Indicator | Indicates the Winding Temperature to prevent high winding temperature |
| ATI | Ambient Temperature Indicator | The surrounding air temperature around the transformer |
| OLI | Oil Level Indicator | Essential for proper cooling and insulation within the transformer. |
| OTI\_A | Oil Temperature Indicator Alarm | Triggers when the oil temperature exceeds a specific threshold |
| OTI\_T | Oil Temperature Indicator Trip | Automatically shuts down the transformer when the oil temperature reaches a critical level. |
| MOG\_A | Magnetic Oil Gauge Alarm | Triggers when the oil level falls below a specific threshold. |

The "Distributed Transformer Monitoring" dataset, utilized in this study, was sourced from Kaggle, a widely recognized platform for hosting and sharing datasets across various domains. It was collected via Internet of Things (IoT) devices, the dataset spans from June 25th, 2019, to April 14th, 2020, with updates recorded at 15-minute intervals. It consists of 19,353 rows and 17 columns, with each row representing a unique observation and each column denoting a specific feature or attribute. The dataset encompasses both numerical and categorical variables, providing comprehensive insights into transformer health and performance.

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Table 1: Transformer Dataset Parameters