Discharge of tubular busbar terminals



Overview

In this work, the partial discharge (PD) in epoxy/paper insulated tubular busbars with two types of artificial defects and different aging time were measured.

Key Takeaways

Discharge at tubular busbar terminals occurs due to high electric stress, surface defects, or environmental factors, and can be detected using UV, infrared, and ultrasonic testing.

Causes of Discharge

Discharges at tubular busbar terminals, such as corona or partial discharge, typically occur when the local electric field exceeds the dielectric strength of air. Common causes include: Surface defects or roughness on terminal balls, which increase local electric stress and promote corona formation, especially in areas exposed to wind and sand erosion. Aging or deterioration of support insulators, leading to reduced insulation strength and higher likelihood of discharge.

Poor workmanship or improper installation, including loose connections or misaligned terminals. Environmental factors, such as high humidity, pollution, or altitude, which can lower the breakdown voltage of air around the busbar.

Detection Methods

Early detection of discharge is critical to prevent insulation failure and potential blackouts. Key diagnostic methods include: Ultraviolet (UV) Imaging: Detects UV light emitted during corona discharge, allowing precise localization and intensity assessment. Infrared (IR) Thermography: Measures temperature differences to identify overheating or abnormal current paths that may indicate discharge.

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Ultrasonic Testing (UT): Detects high-frequency acoustic emissions from partial discharges, useful for identifying internal defects or voids in insulation. Partial Discharge (PD) Testing: Measures discharge in Coulombs across the conductor-insulation interface, revealing inefficiencies or defects in power transfer.

Prevention and Maintenance

To minimize discharge risks at tubular busbar terminals: Regular inspection and maintenance of terminal surfaces and support insulators, replacing aging components as needed. Surface treatment of terminal balls to reduce roughness and prevent corona amplification, particularly in areas prone to wind and sand erosion. Strict adherence to installation standards and torque specifications for bolted or compression connections.

Comprehensive testing combining insulation tests with UV, IR, and ultrasonic diagnostics to detect early-stage or hidden discharges. Environmental considerations in design, including adequate clearances, proper insulation, and protection against pollution or moisture.

Summary

Discharge at tubular busbar terminals is a critical issue in high-voltage substations, caused by electrical stress, surface defects, aging insulators, and environmental factors. Early detection using UV, IR, ultrasonic, and partial discharge testing, combined with proper maintenance and design practices, is essential to prevent insulation failure and ensure reliable power distribution.

Article Content

Partial Discharge Behavior of Epoxy/paper Insulated Tubular Busbars ...

In this work, the partial discharge (PD) in epoxy/paper insulated tubular busbars with two types of artificial defects and different aging time were measured. The aging voltage imposed on the samples

Study on the influence of wind and sand erosion on the audible noise

Yukang Cao, Sufen Li, Jingjing Cheng, "Study on the influence of wind and sand erosion on the audible noise of corona discharge at the terminal ball of pipe-shaped busbars in 750kV substations," Proc.

What Is a Bus Bar in Electrical Engineering? Full Guide

A bus bar (also spelled busbar) is a metallic strip or bar used in electrical power distribution to conduct electricity within a switchboard,

Technical Library & Engineering Resources

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Technical library of busbar engineering resources - Free downloads - Product guides, Ampacity charts and Whitepapers

Business Documentation (DBD)

The purpose of this document is to detail the requirements of Northern Powergrid in relation to the tubular busbar systems and associated fittings detailed within this document.

Busbar Testing Procedure

The test measures the amount of partial discharge in Coulombs, also known as arcing, across the copper (or) aluminum conductor & the insulation placed to the surface of the bus bar.

Review of Substation Busbar Component Reliability

Busbars are the central nodes of substations, collecting and distributing power through incoming and outgoing feeders. Circuit configurations depends on the substation criticality, flexibility, supply

Infrared, UV & Ultrasonic Busbar Discharge Testing

Analyze causes of substation busbar discharge. Learn detection methods like UV, IR, and ultrasonic testing, and effective prevention strategies.

Electrical-Mechanical Model of Electrical Breakdown of Epoxy ...

The main reason for the breakdown of insulated tubular busbar containing bubble defects is that the air pressure of the air gap generated by partial discharge exceeds the critical value of...

Partial Discharge Behavior of Epoxy/paper Insulated Tubular Busbars ...

In this work, a model representing partial discharge (PD) behaviour of a spherical cavity within a homogeneous dielectric material has been developed to study the influence of cavity surface...

Design Guide for bus bars

Impedance In the design of laminated bus bars, you should consider maintaining the impedance at the lowest possible level. This will reduce the transmission of all forms of EMI (electromagnetic

Busbar vs Cable: When to Use Busbars in Power Distribution

Laminated busbars — multiple thin layers separated by insulation, used in high-frequency or high-density applications like inverters and EV battery modules. Tubular busbars — hollow round

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Method Statement for Testing & Commissioning Of Enclosed Bus Assemblies

Category: Electrical Method Statements Tags: busbar testing method, Enclosed Bus Assemblies, enclosed busbar testing, testing of bus bar system Post navigation ← 3 way switch

PowerPoint Presentation

Innovative IGBT & SiC busbar technology for Improved Temperature, Partial Discharge Inception Voltage and Power Density Presented by:

Study on the influence of wind and sand erosion on the audible noise

Obtained the starting and extinguishing voltages of corona discharge at the terminal ball of tubular busbar caused by wind erosion, as well as the distribution pattern of audible noise.

Purpose and Types of Busbars in Electrical Engineering

What makes busbars crucial in electrical systems? Busbars, key components in substations and distribution systems, efficiently transmit electrical energy. This article explores their

Busbar pre commissioning test procedure

The purpose of busbar test procedure is to define the step by step method to implement the correct practices for the precommissioning &

Busbar Testing | Hipot Testing | Partial Discharge

Three of the most important tests performed on the busbar are the High Potential or Hipot Test, Partial Discharge Test, and the Insulation resistance test, also known

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