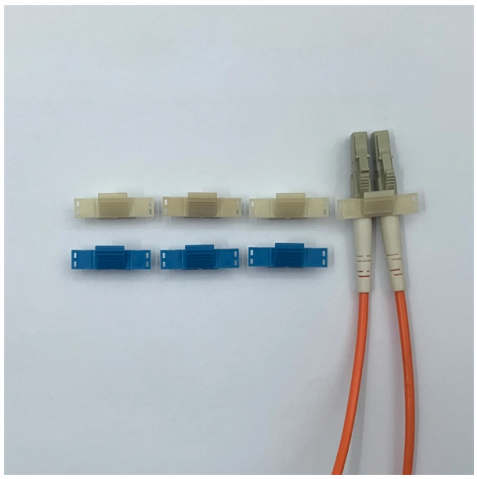
Causes of 10kV bus resonance



Overview

Research on the mechanism and restraining measures of The results show that when eliminating the single-phase ground fault, it is easy to cause the frequen.

Key Takeaways

10kV bus resonance occurs when the bus system interacts with nonlinear inductances and capacitances, leading to voltage fluctuations, harmonic amplification, and potential equipment damage.

Overview

The 10kV bus resonance phenomenon is primarily associated with ferroresonance and harmonic resonance in medium-voltage power systems. It typically arises when a voltage transformer (VT/PT) or a capacitor bank is connected to a bus with certain inductive and capacitive characteristics, creating conditions for series or parallel resonance. This can result in voltage spikes, irregular fluctuations, and abnormal currents, which may damage transformers, fuses, or other connected equipment.

Causes

Ferroresonance: Occurs when a nonlinear inductance, such as the excitation winding of a voltage transformer, interacts with the bus capacitance. Common in neutral ungrounded systems or when a bus is lightly loaded or de-energized. Can be triggered by switching operations, lightning strikes, or single-phase-to-ground faults, causing high-voltage oscillations in the transformer secondary.

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Harmonic Resonance: Arises when capacitor banks or other reactive components resonate with harmonic currents generated by loads like VFDs or industrial drives. Unequal capacitor bank ratings or switching operations can shift the resonance frequency into the range of dominant harmonics (e.g., 9th–10th harmonic), causing audible humming, vibration, and voltage distortion. Equipment Malfunction: Faulty PT fuses or poor internal contacts can intermittently disconnect the voltage transformer, leading to irregular bus voltage fluctuations between high and low values, which may trigger alarms or reactive power device switching.

Effects

Voltage Fluctuations: Bus voltage may swing significantly, sometimes exceeding rated limits (e.g., 6. 5kV to 11. 3kV on a 10kV bus),.

Harmonic Amplification: Certain harmonics are amplified, potentially causing overheating, insulation stress, and equipment failure. Audible and Mechanical Effects: Capacitor banks may hum or vibrate due to electromagnetic forces during resonance. Protection Tripping: Protective devices may operate unexpectedly, leading to system instability.

Mitigation Strategies

System Design: Proper sizing and coordination of capacitor banks and voltage transformers to avoid resonance at dominant harmonic frequencies. Use of neutral grounding resistors or damping resistors to limit ferroresonance amplitude. Monitoring and Maintenance: Regular inspection of PT fuses, harmonic elimination devices, and bus protection systems.

Continuous monitoring of zero-sequence voltage in ungrounded systems to detect early signs of resonance. Operational Measures: Avoid energizing empty buses with voltage transformers connected. Sequential switching of capacitor banks to prevent sudden resonance conditions.

Use of series reactors or detuning filters to shift resonance frequencies away from harmonic sources.

Conclusion10k

V bus resonance is a complex phenomenon resulting from the interaction of nonlinear inductances, bus capacitances, and harmonic currents. It can lead to voltage instability, equipment damage, and operational hazards. Understanding the system configuration, monitoring key parameters, and implementing proper design and operational measures are essential to prevent or mitigate resonance events in medium-voltage distribution systems.

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Article Content

Research on the mechanism and restraining measures of

The results show that when eliminating the single-phase ground fault, it is easy to cause the frequency division resonance of the system, and the use of these two measures can effectively

Ferroresonance in Power Systems:Causes, Effects & Mitigation

Understand ferroresonance in power systems—its causes, risks, and why low inductance leads to dangerous overvoltages. Learn proven engineering mitigation guidelines for MV and HV

Analysis of Ferromagnetic Resonance Influencing Factors of 10kV ...

Simulation results show that the study analyzes the key influencing factors of ferromagnetic resonance and provides a theoretical basis for the prevention and inhibition of ferromagnetic resonance faults.

Analysis and Measures of 10kV Bus PT Breakdown Accident

Firstly, the bus voltage variation is analyzed when two-phase grounded occurs. Then, the ferromagnetic resonance mechanism and the reason of PT magnetic saturation are introduced in neutral point

Study on ferromagnetic resonance characteristics and suppression ...

Ferromagnetic resonance often occurs in distribution networks with ungrounded neutral points due to transient impacts. Under different parameter combinations, fundamental resonance,

Mitigating the ferroresonance resulting from HILGF clearing in a

The neutral point ungrounded system can cause Ferroresonance in the system when experiencing asymmetrical faults such as single-phase grounding, single-phase disconnection or

Ferroresonance in Distribution Systems – State of the Art

Recently, there are increasing interest in studying the ferroresonance phenomenon, due to the various problems it causes to power quality and the destruction of network parts, insulators

Anti-Ferroresonance Methods in 10kV Systems

If capacitance leads the system into resonance with the inductance at a given frequency, it may result in overvoltage or overcurrent. Managing this issue involves increasing capacitance out of the

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Impedance-frequency characteristic curve of 10kV bus

Due to the 34th resonance at the 35kV bus at the distance of 26.3km from the main transformer, the 34th harmonic current and voltage amplification phenomenon in the 10kV bus and 35kV bus...

PT 10kV high-voltage fuse bus causes and solutions

Neutral systems to 10kV high voltage fuse of Bus PT analyze the causes of possible causes for a variety of solutions were discussed. And Phoenix Zhengzhou 220KV substation power company actually

An experimental investigation of resonance sources and

This paper presents an efficient analytical strategy for identifying the resonance sources and vibration transmission for a pure electric bus.

Analysis of Ferromagnetic Resonance Influencing Factors of 10kV ...

Aiming at the existing ferromagnetic resonance protection measures have the disadvantage of after-the-fact remediation, this paper analyses the influence factors of ferromagnetic resonance, determines its

Research on the mechanism and restraining measures of

Abstract In order to monitor the three-phase voltage of the busbar to ground, the substation bus is usually connected to the electromagnetic voltage transformer by YN connection in

Ferroresonant Phenomena on 6 to 10kV Substation Buses

If the output winding in the power transformers that are connected to the buses of the 6 to 10kV net work is starconnected, it is reasonable to foresee a possibility of connection of a highvalue resistor to the

Managing high voltage line ripple rejection

Electric vehicle HV bus overview and inverter ripple High voltage ripple occurs on high voltage bus during propulsion and regeneration as a result of inverter''s (PIM) operation. Most of the ripple is

Simulation Analysis of Ferromagnetic Resonance of Low

PDF | On Jan 1, 2016, Lin Gong and others published Simulation Analysis of Ferromagnetic Resonance of Low Magnetic Flux Density-Type PT under Single-Phase Earth Fault of 10kV Power Grid | Find ...

Examples of Ferroresonance in a High Voltage Power System

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Abstract— Catastrophic equipment failures continue to occur today due to ferroresonance even though this phenomenon has been extensively studied over the past ninety years. This paper is concerned

Paper Title (use style: paper title)

First, the operation mode switching system, causing VT produce ferromagnetic resonance. Second is a system of 10kV single-phase ground fault occurs, resulting arc grounding over-voltage.

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

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