



Application Note

Trace Moisture Measurement in SF₆ Gas



Sulfur hexafluoride (SF₆) is a critical insulating and arc-quenching gas widely used in high-voltage electrical equipment. Ensuring the purity of SF₆, especially controlling trace moisture levels, is essential for safe and reliable operation. This application note highlights the significance of trace moisture measurement in SF₆ gas, common moisture-related issues, effective solutions, and references to key standards.

What is SF₆ Gas?

SF₆ is a colourless, odourless, non-flammable gas with exceptional dielectric properties. Its high electro negativity and thermal stability make it ideal for use in:

- Gas-insulated switchgear (GIS)
- Circuit breakers
- Transformers
- Cables and busbars

The ability of SF₆ to withstand high voltages and suppress electrical arcs has made it indispensable in modern power transmission and distribution systems.

SF₆ gas is used in cables and busbars as a high-performance electrical insulator and arc quencher in gas-insulated switchgear (GIS). It allows for more compact equipment designs compared to air-insulated systems because its superior dielectric strength enables conductors to be placed closer together. In circuit breakers, SF₆ gas is also used to instantly extinguish the arc that forms when a circuit is opened.

As an Electrical Insulator

- High dielectric strength: SF₆ has a much higher dielectric strength than air, meaning it can withstand higher voltages before an arc forms, allowing for smaller clearances between live parts and grounded components.
- Protection: This insulation is crucial in medium and high-voltage switchgear, protecting the live parts and preventing electrical arcing in normal operation.

As an Arc Quencher

- Arc interruption: When a circuit breaker opens to interrupt a fault, an electrical arc is created.
- Quenching process: A blast of pressurized SF₆ gas is directed over the arc, which rapidly cools it and absorbs free electrons, increasing the gas's dielectric strength to extinguish the arc.
- Self-healing property: After quenching the arc, the SF₆ gas molecules can "self-heal" by recombining, which is a key feature for its repeated use in switchgear.





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Benefits in Cables and Busbars

- Compact designs: The superior insulating properties allow for gas-insulated substations that are significantly smaller (about one-tenth the size) than conventional air-insulated ones, which is especially beneficial in areas with limited space.
- Reliability: The dry, inert gas environment protects internal components from moisture, dust, and UV radiation, leading to a longer equipment life and less frequent maintenance requirements for internal components.

Moisture Problems in SF₆ Gas

Despite its stability, moisture contamination in SF₆ can lead to several critical issues:

- Reduced dielectric strength: Water vapour lowers SF₆'s insulating properties, increasing the risk of electrical breakdown.
- Corrosion: Moisture reacts with SF₆ and metal surfaces, forming corrosive by products such as hydrogen fluoride (HF), which can damage equipment.
- Formation of toxic compounds: Moisture can facilitate the generation of hazardous substances during electrical arcing.
- Operational failures: High moisture levels may cause malfunctions, reduced equipment lifespan, and costly outages.

Solutions: Trace Moisture Measurement

Accurate trace moisture measurement is vital for maintaining SF₆ gas quality. Key approaches include:

- Portable dew point meters: Allow periodic checks during filling and maintenance.
- Online moisture analysers: Provide real-time monitoring of water vapour content in SF₆.
- Gas sampling and laboratory analysis: For detailed assessment and compliance verification.
- Regular monitoring enables early detection of moisture ingress, preventing equipment failure and ensuring compliance with industry standards.

Reference Standards

To ensure safety and reliability, adhere to the following standards:

- IEC 60376: Specification of technical grade SF₆ for use in electrical equipment.
- IEC 60480: Guidelines for the reuse of SF₆ and its handling.
- IEEE C37.122.3: Standard for SF₆ gas monitoring and handling in switchgear.

In conclusion, trace moisture measurement in SF₆ gas is essential for safeguarding electrical equipment, preventing failures and complying with international standards. Implementing robust monitoring solutions ensures the long-term reliability and safety of power systems.

Suitable Products



Online Hygrometers



Portable Dewpoint Meters



Sample Systems

If you would like more details of trace moisture measurement in SF₆ gases, please contact:
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