Do’s and Don'ts of SF₆ Gas Handling


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Do’s and Don'ts of SF$_6$ Gas Handling

Outline

- Benefits of SF$_6$ gas usage in our Industry
- Situational Analysis
- Products that use SF$_6$ gas
- Benefits of Proper SF$_6$ Handling Techniques
- The Do’s and Don'ts of SF$_6$ Gas Handling
Benefits of SF$_6$ Gas usage in our industry

- High dielectric strength
- High arc interruption capability
- High heat transfer characteristics
- Non-toxic / biologically inert
- Chemically stable and non-corrosive
- Easy to handle
Situational Analysis

- SF₆ gas handling requirements have increased over the years because of environmental and governmental concerns.
- Question is:
  - “How do you prepare in advance for possible changing regulations?”
- We need to plan for the future – NOW!
Situational Analysis

- Successful use of SF$_6$ has been achieved for over 40 years for insulation and arc interruption in HV transmission and MV distribution equipment because of its unique combination of properties and characteristic.

- We as SF$_6$ users must execute proper gas handling processes when installing, maintaining or decommissioning these assets “**without emissions!**”.

- SF$_6$ handlers must be properly training while using appropriate testing and handling equipment.
Benefits of Proper SF$_6$ Handling Procedures

- **Lower risk**
  - Improved Safety performance
  - Reduce risk of non-compliance to climate change regulations
  - Adherence to standards
  - Use of trained SF$_6$ handlers
  - Make reporting to authorities easier

- **Reduce costs**
  - Reduce asset maintenance and replacement costs
  - Improve protection and extension of asset life
  - Enhance asset management capabilities

- **Decrease carbon footprint**
  - Support environmental policy objectives
  - Reduction in greenhouse gas emissions
HV Assets that use SF$_6$ Gas

- Deadtank Circuit Breaker
- Gas Insulated Substation
- Live tank and Circuit Switchers
- Hybrid Circuit Breaker
- Generator Circuit Breaker
- Instrument Transformers
Do’s and Don'ts of SF$_6$ Gas Handling

Cylinder Handling Practices

- Do not drop or roll SF$_6$ cylinders.
- Do not apply direct heat to cylinders.
- Do not allow cylinder temperature to exceed 122°F.
- Do not store cylinders in direct sunlight.
- Do store cylinders with the valve cap firmly in place.
Do’s and Don'ts of SF₆ Gas Handling
Filling from a SF₆ cylinder

- Do use a blanket heater or submerse in warm water to facilitate the transfer of SF₆ gas.
- Do not use an open fire for this purpose.
- Do not invert cylinders while removing SF₆.
- Do use an appropriate fill hose with a proper regulator or relief device when filling from a cylinder.
Do’s and Don'ts of SF₆ Gas Handling
Record Keeping

- Do weigh and document SF₆ gas usage **every time** it is added or removed from equipment, regardless of amount.
- Do use a mass flow controller or weigh scale for this purpose.
- Do not rely on pressure differential calculations.
Do’s and Don'ts of SF$_6$ Gas Handling

SF$_6$ Leaks

- Do locate and repair all leaks on equipment.
- Leak detection tools are readily available - such as:
  - Halogen leak detector  - “Sniffer”
  - Camera detector – does not require an outage
  - Soap Solution – outage may be required, location dependent
Do’s and Don'ts of SF$_6$ Gas Handling

- Do keep hoses and equipment sealed and capped
- Do use care when connecting hoses to a SF$_6$ source so as to not let air into the system
- After the handling procedure is completed – do test for moisture and purity to verify the integrity of the SF$_6$ gas
- A vacuum of $\leq$ 1 torr must be held for 1 hour. Check with specific manufacturer for their equipment specification.
- Do not fill an asset with SF$_6$ that has not been evacuated
- SF$_6$ must be filtered for decomposition products
Do’s and Don'ts of SF$_6$ Gas Handling

- Do use a multi-gas SF$_6$ decomposition analyzer that tests for purity, moisture and acids to address safety concerns.
- Do not intentionally “sniff” SF$_6$ to check for a faulted condition
- SF$_6$ must be reclaimed – Do not vent to the atmosphere
- Moisture in SF$_6$ combined with switching could produce harmful acids – Do perform routine moisture measurements.
Questions

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