Continuous Emissions Monitoring of Substation Assets

Spotlight on Sulfur Hexafluoride (SF$_6$)

J. Wacker
INCON
6 May 2014
wacker@franklinfueling.com
Presentation Overview

- Flexibility Hurdles for SF$_6$ Monitoring
- Installation, Serviceability, Features
- SF$_6$ Data Collection Solutions
  - Universal Interface
  - Novel Gauge-to-Sensor Capability
- Predictive Analysis of SF$_6$ Pressure and Density
- Summary
Flexibility Hurdles for SF$_6$ Monitoring

For SF$_6$ monitoring, one size can fit all if:

- Setup is intuitive
- In-situ and continuous
- Interface to asset is kept simple
- High resolution sensing can detect small leaks
- Sensors make use of legacy/existing accessories
Installation, Serviceability, Features

Requirements
- Involvement of human assets
- Solutions must be easy to perform in the field and expedient
  - Necessitates pre-engineering & innovation
- First line of environmental defense - Field Technicians

Comprehensive Features
- Contact wear
- Restrike detection
- Timing
  - Trip (interruption)
  - Contact travel
- Control circuit failure
- Mechanism problems
Proven in all SF$_6$ equipment types - Breakers, Bus, GIS, Bushings
Sensor Plumbing Adaptors for any legacy SF$_6$ circuit breaker:

- ABB PA/PM Breaker
- HICO 144kV Breaker
- Crompton-Greaves 245kV Live Tank
Regardless of SF$_6$ monitor brand …

… the most critical part is the sensor installation

- Moisture ingress
- You might create a leak
- Do you have the right parts?
- You might break a 40+ year-old fitting
- Where is the best place for the sensor?
• Sensor function without plumbing
• Innovation and finesse rather than brute force
• Simple lens replacement for most SIEMENS breakers
Predictive Analysis of SF₆ Pressure and Density

- 12 bit resolution assures the smallest leak is detected
- Leak Rates are trended
  ✓ Forecast days until “Block Trip” condition exists
- “Drill-down” pressure/density/temperature data capability
  ✓ Captured and quantified

Circuit Breaker Located in South Texas

7 refills and 81 lbs. of SF₆ in 1.5 years
Summary

OPTImizer²
- Simple to install
- Compatible with all SF₆ equipment
- Automates EPA emissions reporting
- Gives timing and wear analysis on circuit breakers
- Approved by ABB, Alstom, HICO, HVB, Mitsubishi, & SIEMENS

LenSense
- Adds value to existing high-quality gauges
- Ensures monitoring and control data agree
- No plumbing connections- no risk of creating leaks
- Minutes to install and configure resulting in minimal labor costs

Reactive   Scheduled

Condition-Based Maintenance for Continuous Emissions Monitoring
“... Reliability, Stewardship, Affordability ...”

Mr. Alan Hodnik
Chairman, President, & CEO
Allete
3 February 2014
EUEC, Phoenix, Arizona
Keynote Speaker

“Flexibility is absolutely key in the power sector.”

Ms. Janet McCabe
Acting Assistant Administrator
US Environmental Protection Agency
3 February 2014
EUEC, Phoenix, Arizona
Keynote Speaker