

# **SF6 Gas in Substation Circuit Breakers**







**There's a Lot of it!**

**SF6 allows compact circuit breaker design.**

**Arc in Air- Basketball**

**Arc in SF6- Golf Ball**

# Internal Action



**Global Warming Potential (GWP)**  
**SF6 X 23,900 = CO2 Equivalent**



**What's the risk?**  
**They're Sealed, Right?**



Fugitive Emissions- (leaks)  
They don't Heal on their own  
Worse in Cold Weather  
Leaks Allow Moisture In  
Breaker Failure Releases Gas

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# Gas Refills



# Introduce Moisture





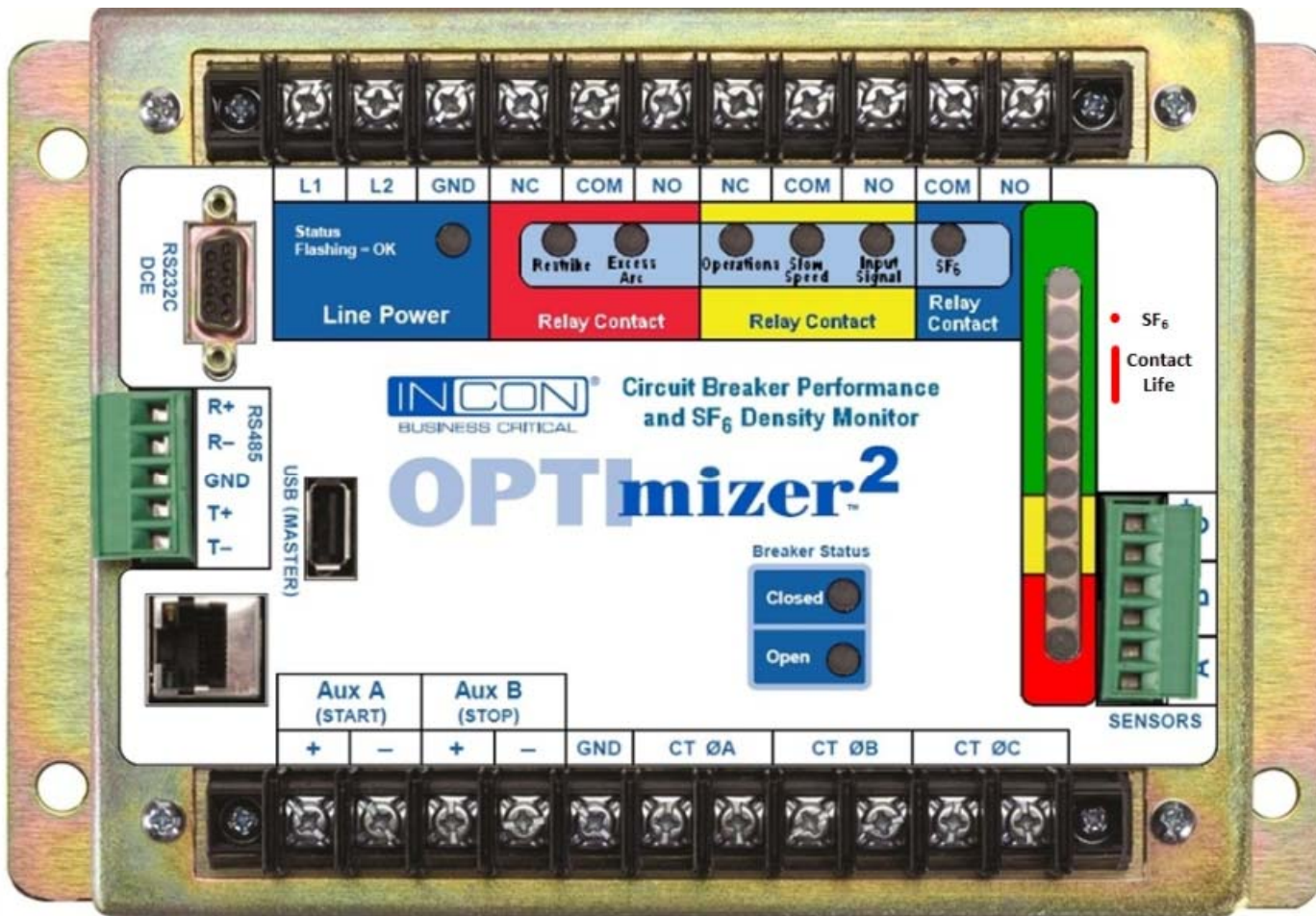
**Breaker Rots,  
Fails, Explodes**



**2 Hours of Navajo**

**Environmental Stewardship  
is Linked to  
Asset Management**





**Provides**

**6 SF6 Gas System Metrics**

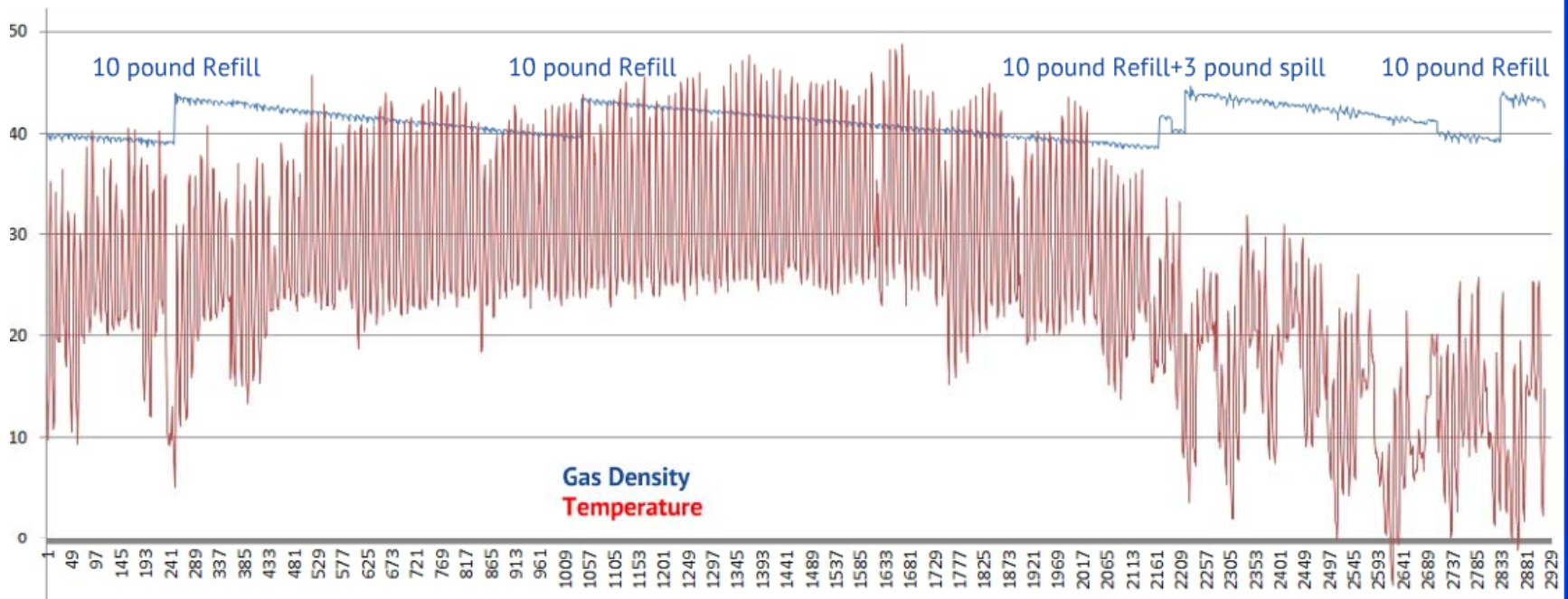
**Lifetime Totalization of emissions**

**Gas Refill Forecast in days-to-lockout**

**Local Display of SF6 Density**

**12 Mechanism/Interrupter Metrics**

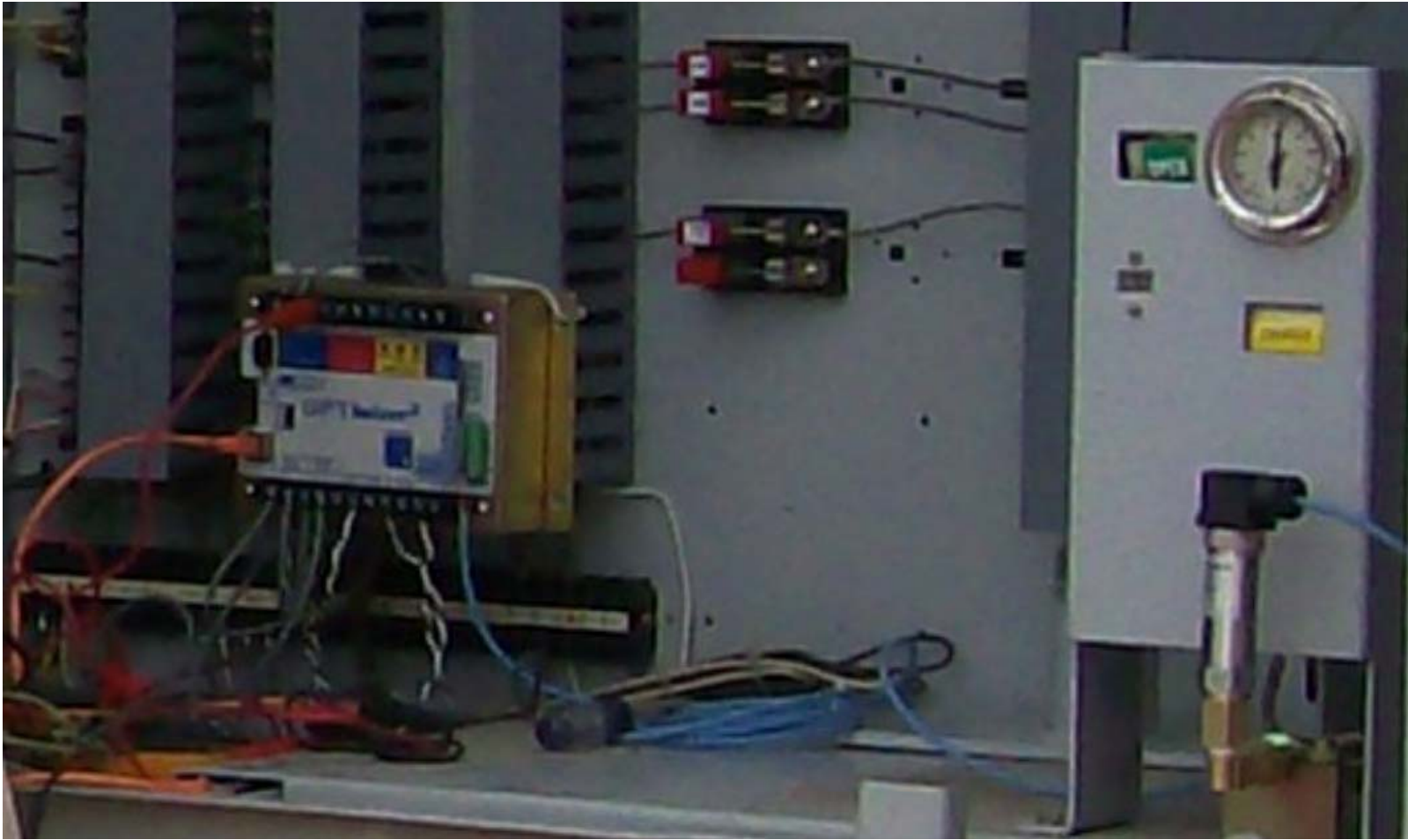
**Clearing Time, Trip Time, Duty, etc.**



261 Days, 43 pounds SF6 Lost









**Actionable Info is Available  
to the Crew that needs it**



**A System Solution**



**Integrates into existing Dashboards**

**Using DNP3.0 or VPNs**

**Info is available to ALL stakeholders**

**Asset Management**

**Environmental**

**Substation Maintenance**

**Reliability**

# Benefits

Easy Emissions Reporting

Parses Emissions from Handling Losses

Quickly Installed, Field Retrofit or by OEM

Many Levels of Integration- Manual Read to Ethernet

Provides Info to Multiple Stakeholders

Update: Dumbgrid to Smartgrid

Planned Maintenance vs: Panic Reaction ●

Timely Repairs Reduce Emissions & Extend Breaker Life

Empowers Field Crews to Act Responsibly

Excess Arc	Ok
Clearing Time	Ok

**SF6 Gas Monitor**

**Channel A**

Current Gas Density	42.94 Grams/Liter
Density Trend	-0.0535 Grams/Liter/Day
Trend Confidence Level	65 %
Low Density Alarm Forecast	83 Days
Temperature	15.3 °C
Alarm Status	
Low Density Warning	Ok
Low Density	Ok
Trend	Ok
Sensor Malfunction	Ok

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**From INCON**

**Over 20 years experience in Environmental Monitoring and Inventory Control products for Petroleum Retailing (Gas Stations).**

