HOW THE WIKA GD-20-W GAS DENSITY SENSOR IS TRANSFORMING SUBSTATION MONITORING

AN ENVIRONMENTALLY AND ECONOMICALLY OUTSTANDING SF_6 SOLUTION IN PARTNERSHIP WITH ELIA

Saving resources, protecting the environment, and driving digitalisation – all at once: The innovative wireless GD-20-W gas density sensor makes it possible. Over two years, WIKA, the market leader in sensing solutions, collaborated with the Belgian transmission system operator Elia to pilot the GD-20-W. The sensor which can be easily integrated in IIoT environments, enables a wide range of alarm settings. In case of low density or high temperature, it instantly sends a warning, even outside of scheduled transmission times. This significantly reduces the risk of SF_6 leakages.

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WIKA
Smart in sensing

Challenge

SF_6:
Essential yet hazardous

SF_6 gas is essential for grid operators, used in substations, wind turbines, and gas-insulated switchgear (GIS), especially in high-voltage systems for onshore and offshore wind farms. However, SF_6 is the most climate-damaging greenhouse gas. The EU's new F-gas regulation (effective January 2035) mandates the use of treated or recycled SF_6 for maintenance, making recovery crucial for environmental and economic reasons.

The goal:
Minimising SF_6 leakages to a minimum

SF_6 gas is typically monitored using density monitors, triggering an alarm when the density drops below a threshold. However, by this point, 7-8% of the SF_6 may already be lost. Preventing SF_6 leakage is crucial, as the amount lost in each plant isn't tracked. Effective monitoring is vital for maintaining system availability, as plants in the "red zone" may need to shut down, potentially causing power loss. With SF_6 costing around €1,500 for 50 Liters, the financial impact is significant.

About SF_6

- **Sulphur Hexafluoride**
  The most potent greenhouse gas
- **Global Warming Potential**
  GWP 24,300 – 1 kg of SF_6 gas equals 24,300 kg of CO_2
- **Extremely long atmospheric lifetime**
  Approximately 3,200 years
- **Exceptional insulating properties**
  Five times the electric strength of air
- **Critical for power systems**
  Prevents short-circuits and arcs

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Consistent system availability is key to avoiding a loss of power supply.

Jannik Schäfer
Head of T & D Specialists EMEA, WIKA

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It's crucial to prevent SF_6 from escaping due to its environmental impact and high cost.

Manuel Micheler
Head of Inquiry & Product Management, WIKA

Solution

The approach:
Implementing a pilot project with Belgian transmission system operator Elia

WIKA has partnered with Elia, a long-standing customer. “Elia has a lot of SF_6 gas in its grid,” states Jannik Schäfer. “Elia is also prepared to be innovative,” adds Manuel Micheler. Additionally, Elia embraced the opportunity to directly influence product development and provide feedback on the required features of the solution. This made Elia the perfect partner for this project.

The solution:
A wireless gas density sensor

Laying cabling in an existing substation and retrofitting new sensors is a significant effort, as is manually reading mechanical density monitors on-site. To address this, a wireless sensor was developed. The GD-20-W gas density sensor provides continuous monitoring of gas condition parameters in closed tanks.

Elia requires 100 to 400 of these sensors per 400 kV substation. An intensive test phase with pre-series products has been conducted over the past two years.

About Elia System Operator S.A

- Belgian transmission system operator
- Owns and operates the entire Belgian high-voltage electrical grid
- The Elia Group also includes the German transmission system operator 50Hertz
- 50Hertz builds and operates the electricity transmission grid in northern and eastern Germany with more than 2,100 specialists

ELIA Group (2023), INTEGRATED ANNUAL REPORT 2023

“We have a huge amount of high-voltage electrical equipment installed across Belgium – and it is only growing due to the increasing demand for renewable energy. Digital monitoring of these assets is the logical step to keep up with growth and ensure the availability of the grid.

Diederik Moers
Head Asset Condition & Control, ELIA Group

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Solution

The game-changer:
Wireless data transmission

The GD-20-W gas density sensor operates on a battery with an 8-10 year life, aligning with Elia's maintenance schedule. It continuously monitors for leaks, reducing the need for frequent checks. Using LoRaWAN® protocol, it transmits data over long distances. The sensor sends a daily "keep alive" message and can alert immediately if a threshold is exceeded. Data is processed in the WIKA cloud or the operator's platform, enabling real-time monitoring and preventing unplanned shutdowns, extending plant life.

Accurate Gas Density Measurement:
Ensured by microprocessor

The GD-20-W gas density sensor offers high measurement accuracy and seamlessly integrates into existing power grids, saving space. It calculates gas density using pressure and temperature data processed through a virial equation in its microprocessor. Temperature-induced pressure changes are automatically compensated for precise output. The sensor is suitable for indoor and outdoor SF_6-insulated equipment, alternative gases, and non-corrosive media like transformer oil in power transmission.

Compatibility:
Across Europe

The GD-20-W offers a unique selling point, supporting all frequency bands across Europe except Italy. In Nordic countries, where climate protection is a key priority, awareness of SF_6 emissions is significantly higher than in other regions, making this new solution particularly interesting. Development for other global regions is already underway, with a phased rollout plan to expand frequency compatibility.

Retrofitting made easy:
Plug-and-play installation within one minute

Elia also owns 50Hertz, which operates the electricity transmission grid in several German states, including Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, Thuringia, Berlin, and Hamburg. The new sensor will be deployed there, with existing plants being upgraded using a "plug-and-play" approach. This allows for easy installation, with sensor setup completed within a minute, posing no organizational challenges.

Service:
Ongoing availability

WIKA offers seven-day-a-week support through a ticket system and is a certification body for F-gas, issuing SF_6 gas certificates. All field employees hold this certification. When sensors detect a leak, WIKA experts respond promptly, using additional products like the GIR-10 gas presence detector to locate the source.

The product:
GD-20-W with wireless
LoRaWAN® output signal

- For indoor and outdoor SF_6- and alternative gas insulated equipment
- High-accuracy sensor technology
- Permanent monitoring of the relevant gas condition parameters in closed tanks
- Long battery life
- Very compact design

Benefits

A successful partnership between Ellia and WIKA

- **Reduction of SF_6 losses**
  Minimises gas leakage through continuous monitoring
- **Environmental & cost benefits**
  Protects the environment while lowering operational expenses and extending plant lifespan
- **Prevents incidents & shutdowns**
  Reliable data helps avoid unplanned outages and safety risks
- **Real-time, highly accurate data**
  Enables immediate access to precise measurements from anywhere
- **Automation & digitalization**
  Replaces manual monitoring with smart, automated processes
- **Addresses labour shortages**
  Helps mitigate the impact of skilled worker shortages
- **Long-range data transmission**
  Uses LoRaWAN® protocol to send measurements over long distances
- **Seamless retrofit of GD-20-W**
  Can be integrated into existing plants
- **Plug-and-play installation**
  Sensor setup in just one minute

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With the comprehensive digital monitoring of SF_6 gas in switchgear, we ensure that we detect leakages as quickly as possible and much faster than with classical gas densimeters. This enables us to reduce our SF_6 emissions by initiating the repair faster. WIKA is helping us to achieve our goal of reducing SF_6 emissions.

Thomas Wijnhoven
Asset Manager
Substations, ELIA Group

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Elia Group

Ready to go

WIKA is confident in its new product, having rigorously tested it for practical suitability through piloting with Elia. Their partnership was key to successfully developing the new gas density sensor in a short time. Customers can expect a solution of uncompromising quality. The WIKA team is excited to launch the GD-20-W sensor, providing an environmentally and economically outstanding SF_6 solution that is transforming substation monitoring for good.

Related solutions, products and technologies:

- T & D Solutions
- Service
- Digitalisation

Contact

If you are also looking for an environmentally and economically outstanding SF_6 solution for your application, please contact us:
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WIKA