

Wireless Toxic Gas Monitoring Systems

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Emerson - Rosemount Flame & Gas Detection



**Safety Case
Symposium 2019**
Singapore
Mar 26 - 27, 2019

Bridging the Safety Gaps

The Broader View: Why Toxic Gas Monitoring?



Personnel Safety



Systems go beyond those required by regulatory agencies

Prevent toxic cloud formation

Intended to assure that personnel exposure remain within health based exposure indices

Property Protection



Provided to detect and avert situations that could lead to fires and explosions

May be used to control other means of property loss (ex. excessive corrosion)

Regulatory Monitoring



Ensures or proves that the concentrations of airborne contaminants are kept below regulatory levels

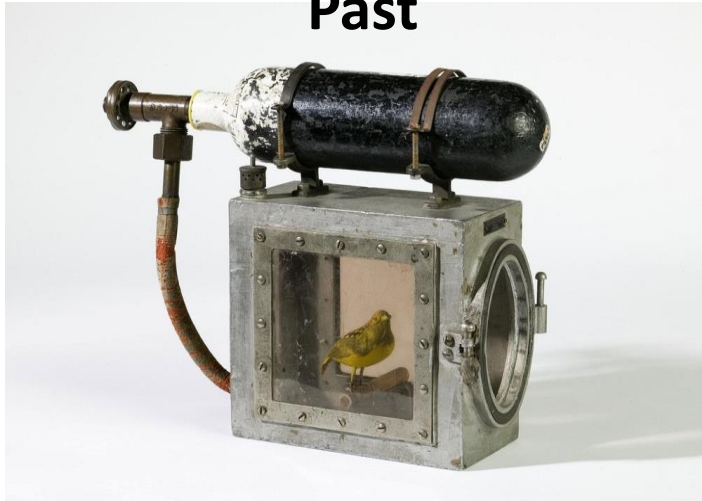
Community Impact



Detect or avert large releases that could pose a hazard to a large portion of the facility or public outside the fence line

The Wireless Innovations in Toxic Gas Monitoring

The Wireless of the Past



The Canary Resuscitator

Source: <https://www.amusingplanet.com/2018/05/canaries-as-poisonous-gas-detectors.html>

The Wireless Now



**Some of these detectors are lost, damaged and improperly maintained*

The Current State of Gas Monitoring

Portable Gas Detector

- Identifying events and removing personnel from adjacent sites
- Personal exposure monitoring for health risk assessment
- Alarms are usually set at lower levels (more sensitive)

Fixed **Wired** Gas Detector

- Prevents entry to a hazardous site
- Fixed place monitoring does not usually reflect the amount of toxic gas people could breathe in, which determines the risk to health.
- Alarms are usually set at higher levels

The Current Gaps in Gas Detection

Only **62%** of gas leaks were
detected by F&G system^{2, 3}

Remaining **38%** of releases
were mainly detected by
personnel^{2, 3}

2 HSE Offshore Technology Report – OTO 1999 079, Offshore Hydrocarbon Release Statistics, January 2000.
<http://www.hse.gov.uk/research/otohtm/1999/oto99079.htm>. Downloaded October 18, 2010.

3 HSE Offshore Technology Report – OTO 2000 112, Offshore Hydrocarbon Release Statistics, 2000.
<http://www.hse.gov.uk/research/otohtm/2000/oto00112.htm>. Downloaded October 22, 2010.

Some questions to think about

- More detectors mean better safety; less detectors mean more risky?
- Was the maintenance procedure followed?
- How harsh conditions (e.g. Wind, Rain, Temperature) impact requirements?



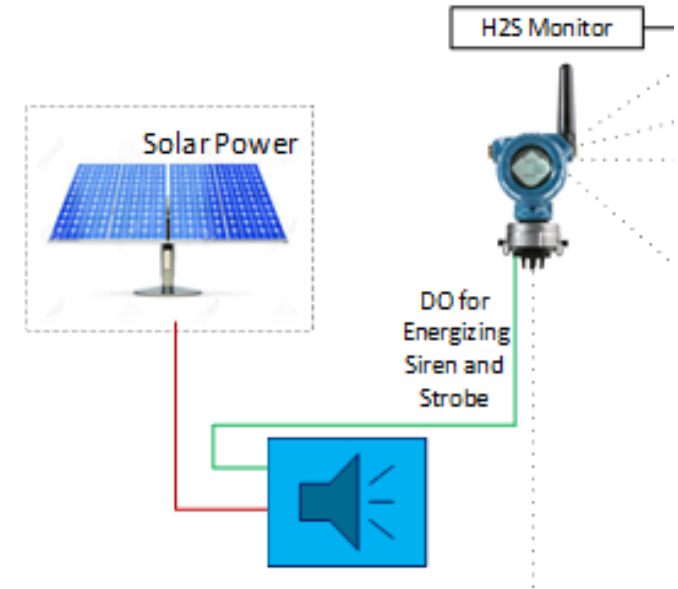
Bridging Safety Gaps and Solving Operational Pains with Wireless toxic gas monitoring systems

Assessing the risks with a wireless gas monitoring system before sending people into the field...

A remote wireless H₂S gas monitoring system



A wireless electrochemical toxic gas monitor



Applying innovations

Some common toxic gases we encounter

- **Hydrogen Sulfide**



NIOSH REL: ceiling = 10 ppm, for 10 mins

OSHA PEL: ceiling = 20 ppm General Industry (Peak Limit: 50 ppm) for 10 mins

IDLH = 100 ppm

NIOSH REL: National Institute for Occupational Safety and Health recommended exposure limits

OSHA PEL: Occupational Safety and Health Administration permissible exposure limit

IDLH: Immediately dangerous to life or health

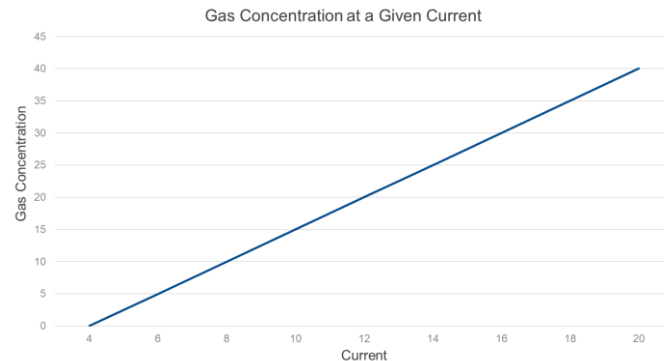
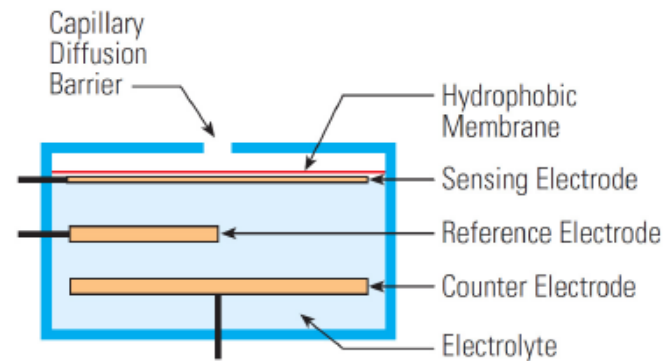
- **Oxygen Deficiency in Confined Spaces**



- **Carbon Monoxide (The silent killer)**



Detecting Toxic Gases with Electrochemical Sensor



$$i = nFDC$$

where n is the number of electrons transferred, F is the Faraday constant, D is the mass transfer coefficient, and C is the bulk gas concentration.

Electrochemical sensor for harsh environment

- Great **innovations** over the last 10 years to improve operating temperature range and reliability
- Most proven, consistent and reliable technology of today
- Operating temperature range: -40° C to +50 °C
- Gas concentration is linearly proportional to current output; great for multiple alarm levels
- Electrochemical sensors are highly sensitive, consume low power; thus lending themselves well for wireless gas monitors

Today's Process Environment is Creating Opportunities to Improve Operational Performance



Exponential
Growth in Data



Increase in
Cyber Security
Threats



Shrinking of
Process
Workforce



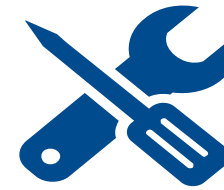
Focus on
Industrial
Insights



Stricter Safety
and
Environmental
Regulations



**Acceptance and
Adoption of
Wireless
Technology**



Shift Toward
Predictive
Maintenance

Case Study #1: Water Reclamation Plant

Challenge

Remote site and **costly** to run wires to cover large areas. Hydrogen sulfide in wastewater collection system resulted in **bad odor** that is conducive to creating septic condition and **corrosion** where the acid collects.

Solutions

Control and monitor chemical feed system to maintain an effective and efficient treatment system. Implement **H₂S monitoring** at the basement of headworks building to **improve safety**



Case Study #2: Chemical Plant

Challenge

Risk of H₂S leaks in the Vinyl Acetate / Sewage tank unit of a chemical plant. Currently, operators are just using portable wear-on gas leak detectors and over time, some of these detectors are **lost, damaged and improperly maintained**. No advance warning of gas leaks and installation of fixed gas detectors is costly and more difficult to implement.

Solutions

Customer wants to **increase the overall safety** of on-site operators and to avoid property damage. Wireless gas monitors offer easy plug and play, and operational cost savings of wiring.



Summarizing Benefits

Benefits of Wireless Toxic Gas Monitoring Systems

Safety Credit – Bridging the Gaps



Large % of gas leaks were detected by **personnel**, and not by a Fire & Gas System (People are effective gas detectors (sight, sound, and smell)).



“Safety by Choice, not by Chance” (e.g. “Smart upgrades”).

Digital Transformation



“Digital Oilfields”; “Smart Fields” ; Digitalizing safety monitoring.



Users rely solely on portable and/or personal monitors.

Management of Change



Many high risk sites go completely unprotected.



Additional monitoring points – a quick way to implement an additional monitoring system **without disrupting** existing wired systems.

Costs Management

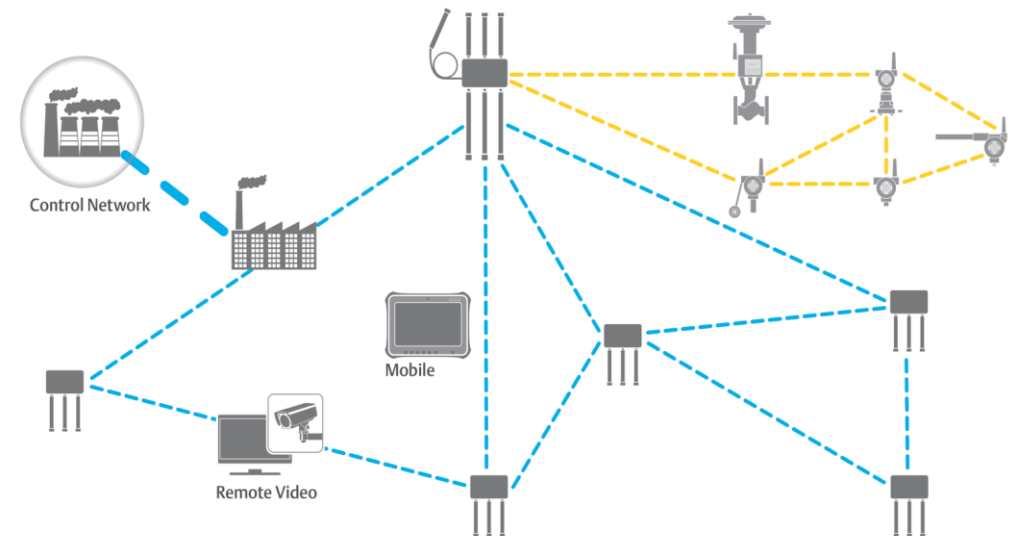


Significantly **reduce systems cost, tooling cost, space and manhours** required to install and commission conventional wired detectors. Up to \$10k cost savings per point.

Improving Productivity and Safety – for Your People and Your Plant

Finally, Wireless monitoring enables greater workforce productivity and safety regardless of skill or experience

- **Less training needed**
- **Constant connectivity**
- **Avoid sending personnel into the field** more often than necessary



WirelessHART

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Thank you!

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