BOREAL

Carbon Capture Utilization & Storage

Laser Based–Open Path (CO_2) Gas Detection

Grade 'A' Hazard Rank Applications

"A 'credible' release *may not necessarily be detectable* **with any degree of certainty."** – *Center of Chemical Process Safety.*

References: [1] ISA-TR84. [2] DNV GL.

It is WHEN will a gas leak will occur, not IF
Prevention alone cannot prevent all leaks/releases

Grade A Hazard Rank Applications Require
>10x Risk Reduction Factors (RRF) improvement[1]

Effective Gas Detection Rate is at best 60%
For Traditional – Fixed Point Gas Detectors[1]

In the Event of an Incident at your Facility
Are you confident that you mitigated enough risk?

#1 – Compression/Heat Exchangers

Problem: Mechanical Probability of Failure
Compressors: 6.18 in 100 / Exchangers: 3.9 in 1,000[2]

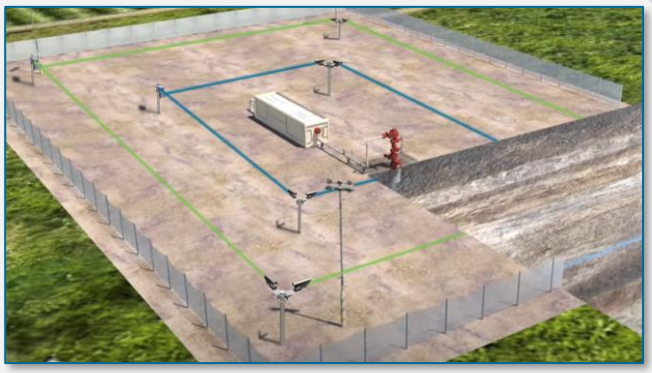
Challenge: 90% Geographic Area Coverage
May not be feasible with Fixed Point Gas Detectors

Opportunity: Protect the 'Inaccessible'
Which is over the Exchangers Fin-Fan Louvers

Solution: Achieve Risk Mitigation Targets
With Laser Based – Open Path Gas Detection

Laser Based – Open Path Gas Detection is **positioned** over **Fin-Fan Louvers**. Due to high air velocity and the obstructions caused by the Shell & Tube Exchanger, **the air flow is sufficiently turbulent that often leak will be detection on each of the paths.**

#2 – Injection Skid(s) and Well(s)



To detect **Incipient Level Leaks**, paths should be **positioned closer** to the localized area of release to **increase the signal-to-noise ratio** (e.g., concentration of fugitive CO_2 over atmospheric background).

Photo Credit: Shell Canada (Original Photo has been edited)

Problem: Atmospheric Monitoring Needed
Measurement Monitoring & Verification (MMV) Plan

Challenge: Unambiguous Leak Detection
Independent of Ambient Concentrations of CO_2

Opportunity: Act on specific Release Rates
With Quantifiable Volumetric Measurements

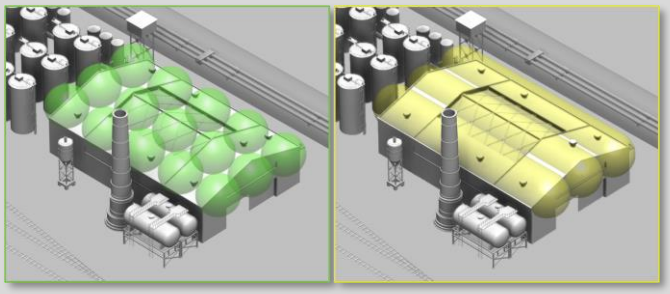
Solution: Exceed Regulatory Requirements
With Laser Based – Open Path Gas Detection

16646 114 Ave NW, Edmonton, AB, CA T5M 3R8 P +1.780.488.5173 E info@boreal-laser.com W boreal-laser.com REMOTE PRECISION. SURE DECISION.

Geographic Area Coverage

Definition: The fraction of the geometric area or volume of a defined monitored process area that would be detected.

Traditional – Fixed Point Gas Detectors **vs.** *Lased Based – Open Path Gas Detectors*



Laser Based – Open Path Gas Detection is the *most economically viable option* to minimize both the **Total Install Cost + Total Operational Cost (TIC-TOC)** in *High Hazard Rank Applications.*

Exceed your Area Coverage Requirements
With Laser Based – Open Path Gas Detection

Increasing the Probability of Detection
Offers the greatest Risk Reduction Factor return[1]

To Mitigate Risk in a Grade A Hazard Rank
You will need 90% Geographic Area Coverage[1]

Laser Based – Open Path Gas Detection
Easiest & most economical way to Mitigate Risk

[1]: As stated in ISA-TR84

Safety Availability

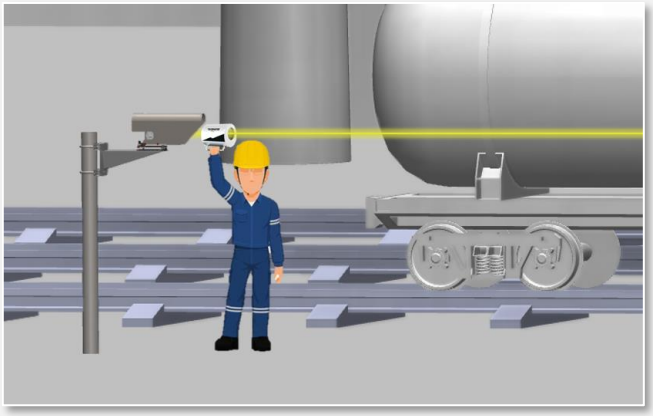
Definition: The availability of the FGS function designed to automatically mitigate the consequences of hazards.

Surpass Safety Availability Requirements
With Laser Based – Open Path Gas Detection

Survive & Continue to Detect after a Leak
Lifespan/performance not effected by exposure

Smart Fail-Safe Device + SIL2 Suitable
Only outputs gas concentrations if 'fully functional'

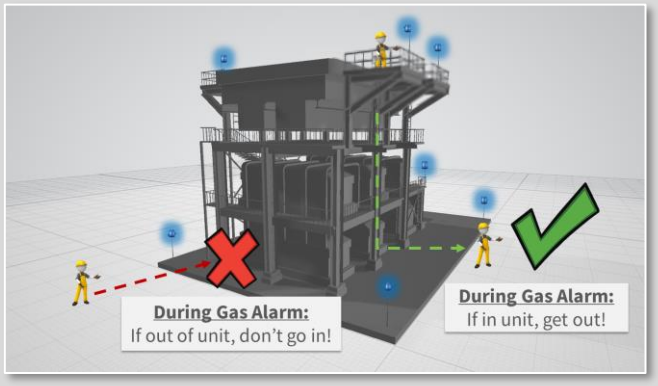
Eliminate your Maintenance Burden
No Calibration and easily perform Functional Tests



To perform **Function Test**, simply hold the **Response Cell** in the Laser Beam to '**Bump**', '**Challenge**', or '**Verify a Response**'.

Mitigation Action Effectiveness

Definition: The confidence that the final element(s) actions will successfully mitigate the consequence of the hazard.



During a Release: Prevent personnel from *entering the area* or *evacuate personnel from that area.*

Alarm Faster and at Lower Concentrations
With Laser Based – Open Path Gas Detection

Confidently Detect Incipient Level Leaks
Lowest Actionable Concentrations clearly stated

Gain an Instantaneous Response to a Leak
New and independent sample every second

Importance of Timely Personnel Evacuation
Rapid recovery actions prevent escalating event

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