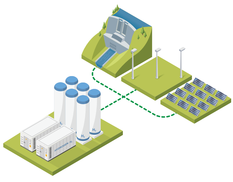
MSA
The Safety Company

GET TO KNOW HYDROGEN (H_2) GAS & FLAME DETECTION SOLUTIONS

PROTECTING NEW GREEN HYDROGEN APPLICATIONS



HYDROGEN PRODUCTION

Green hydrogen generation often requires co-locating hydrogen production with renewable energy production sites, like wind turbines, solar panel farms, or hydropower systems. This may cause additional issues for the whole local production infrastructure in the event of a hydrogen gas leakage, ignition, or explosion. Therefore, mitigation systems should be installed to ensure safe operation.

HYDROGEN STORAGE

For most applications, hydrogen is stored as a gas and is often compressed in high-pressure tanks. When under pressure, hydrogen gas leaks are likely to be in the form of gas jets. The shape of these jets is typically long but narrow, and the momentum of release can maintain this shape for a considerable time. This increases the likelihood of the gas jet bypassing conventional gas detectors for a lengthy period, requiring diversified sensing technologies.

HYDROGEN DISTRIBUTION

For hydrogen distribution, pipelines are seen as the primary method for mass transport of hydrogen gas. However, existing infrastructure, such as the natural gas network, would need to be adapted before it could distribute hydrogen from production centres to places of use. This is because hydrogen can degrade certain materials, such as commonly used metals, and make them brittle and more prone to leaking.

HYDROGEN APPLICATIONS

Hydrogen is mainly used for industrial needs, such as refining, ammonia, and methanol production. However, with green hydrogen cost optimization, usage for mobility, electricity production, decarbonized steel production, and energy storage will grow. Critical challenges for any site handling hydrogen include detecting leaks outside, where the gas can't accumulate, and installing detectors in appropriate quantities and locations is difficult to plan.

HYDROGEN GAS & FLAME CHARACTERISTICS

HYDROGEN GAS CHARACTERISTICS

- Flammability Range 4 – 77 Vol%
- Ignition Energy 0.02 mJ
- Invisible, Colorless, & Odorless

HYDROGEN FLAME CHARACTERISTICS

- Invisible in Daylight
- Low Thermal Radiation
- High Temperature of 4,010°F (2,210°C)

HYDROGEN STORAGE & PROCESS CONCERNS

H_2 STORAGE & PROCESS PRESSURES ARE CONSIDERABLY HIGH

- 200 bar (2900 psi) typical industrial
- 350 bar (5000 psi) to 700 bar (10,000 psi) fueling stations
- 120-200 bar (1750-2900 psi) high-pressure electrolysis

HIGH PRESSURE MEANS H_2 CONTAINMENT IS MORE DIFFICULT

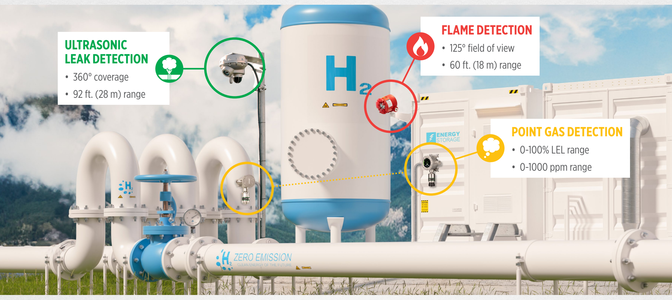
- Hydrogen gas impacts materials—proper material selection is very important
- Hydrogen can not be odorized with sulphur based odorants which are toxic to fuel cells
- Hydrogen when ignited burns with a nearly invisible flame and can lead to violent explosions

SETBACK DISTANCES FOR H_2 GAS APPLICATIONS CAN BE AN ISSUE

- Fueling stations are planned in densely populated areas for ease of access
- Large scale storage with rack solution has a large footprint on the ground and the potential for domino effects
- Additional and costly requirement to build barrier walls for reduced separation distances

EMPLOYING VARIOUS SENSING TECHNOLOGIES TO RESPOND TO HYDROGEN HAZARDS

THREE FIXED GAS DETECTION TECHNIQUES ARE EFFECTIVE FOR HYDROGEN GAS LEAK AND FIRE RESPONSE



PRESSURIZED LEAKS

SOLUTION: ULTRASONIC LEAK DETECTION

ACCUMULATED GAS CLOUDS

SOLUTION: POINT GAS DETECTION

INVISIBLE FIRES

SOLUTION: FLAME DETECTION

OBSERVER® i ULTRASONIC GAS LEAK DETECTOR

Ultrasonic gas detection helps provide the earliest possible response by detecting ultrasound generation by escaping gas at <2 bar min. pressure, responding at the speed of sound and unaffected by wind or gas dilution.

ULTIMA® X5000 GAS MONITOR

Conventional technologies aid in risk mitigation based on the location and application, through catalytic and electrochemical reaction in the sensor cell, providing measurement of gas concentration at the leak point.

FL500-H2 UV/IR FLAME DETECTOR FOR HYDROGEN

Optical flame detectors assist in the prevention of fire hazard escalation and explosions through monitoring of radiation in UV at 185-260 nm and IR at 2.95 µm ranges, providing fast response with increased immunity to false alarms.

LEARN MORE:

MSAsafety.com/hydrogen-detection-solutions

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