Lesman
A KELE COMPANY

Thank You for Attending Our October Webinar

Reducing Safety Risk with Layered Gas and Flame Detection

Your Host

John Greivell
Vice President and Plant Safety Specialist
Lesman Instrument Co

Featured Speaker

Charles Simek
Customer Experience Training Professional
Honeywell Analytics

Featured Speaker

Jason Winburn
Honeywell - Fixed Gas and Flame Detection
Honeywell Analytics

AGENDA

1. **Types of Gas Hazards**
2. **Exploring Different Technologies**
3. **Considerations when Layering Technologies**
4. **Ask the Expert: Q&A**

THREE TYPES OF GAS HAZARDS

Flammable or Explosive

Property Damage — Personal Injury
Loss of Life — Destruction of Environment

Toxic

Physical Harm — Loss of Life

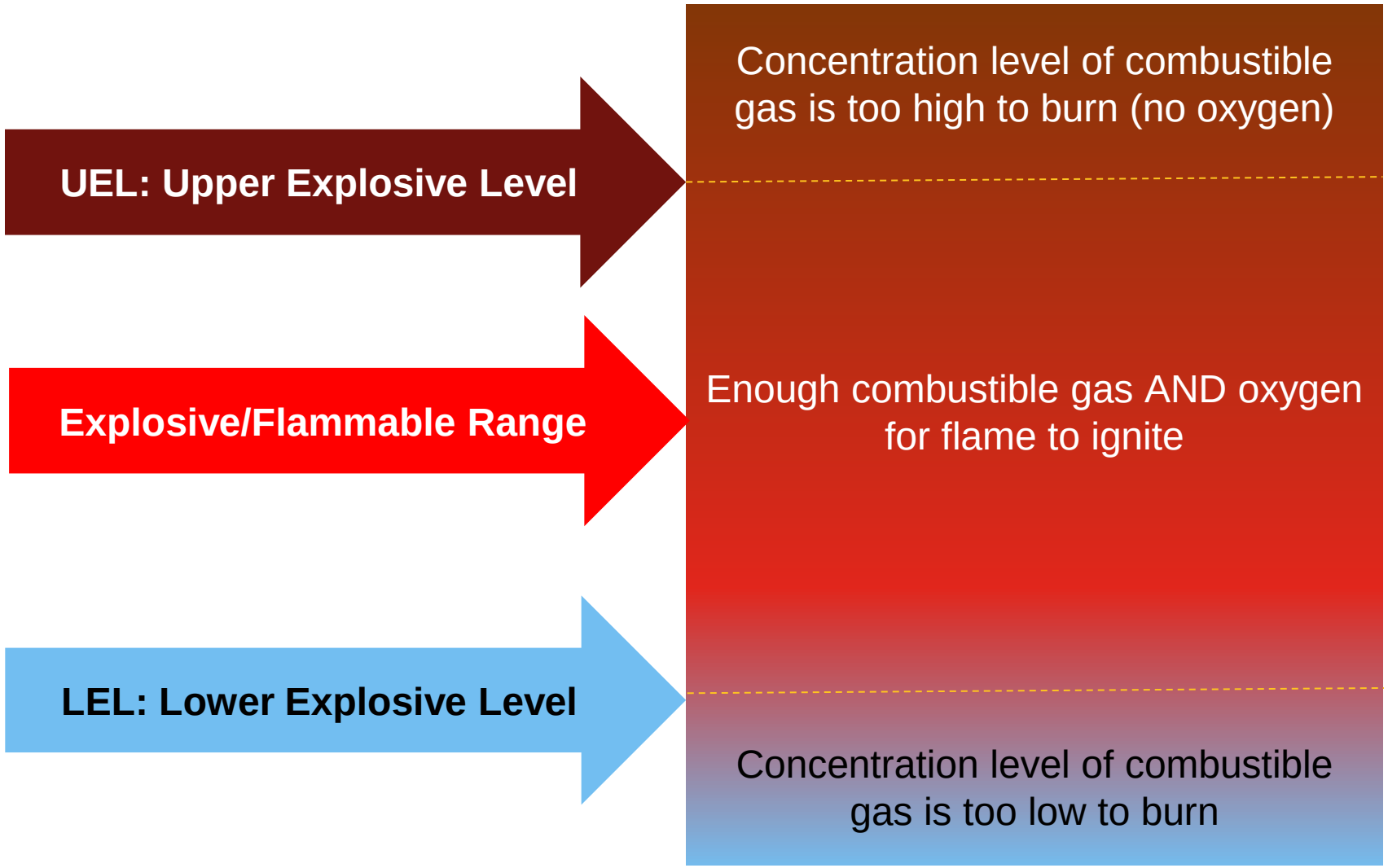
Asphyxiates

Physical Harm — Loss of Life

Combustible Gas

TERMS TO KNOW:

CONCENTRATION LEVEL (COMBUSTIBLE GASSES)



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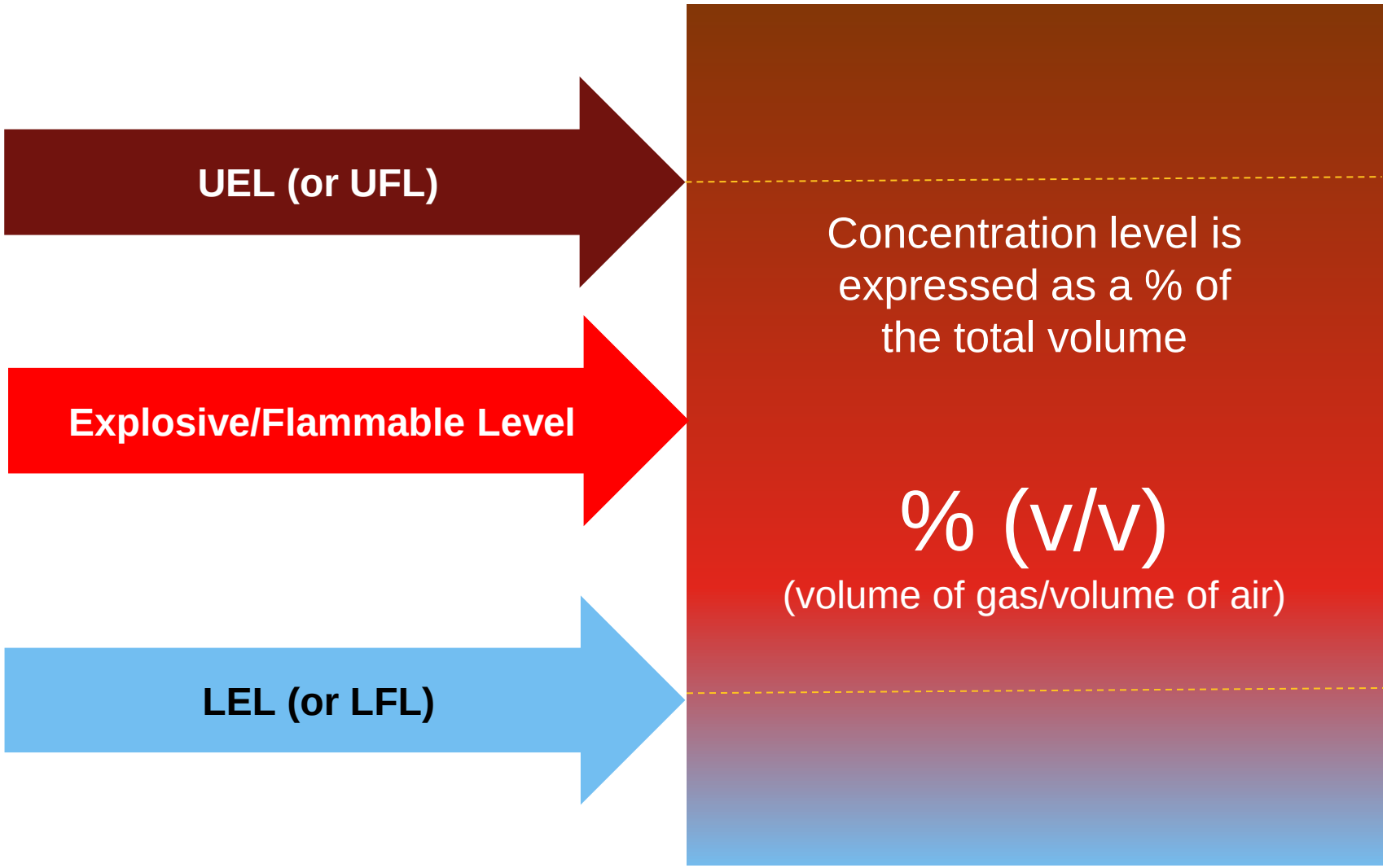


EXAMPLES OF COMBUSTIBLE GASES

	Gas	LEL	UEL
C_3H_8	Propane	2.2%	9.5%
H_2	Hydrogen	4%	75%
CH_3CH_2OH	Methanol	6%	36%
C_2H_6	Ethane	3%	12%
CH_3OH	Ethanol	3%	19%
CH_4	Methane	5%	15%

Toxic Gas

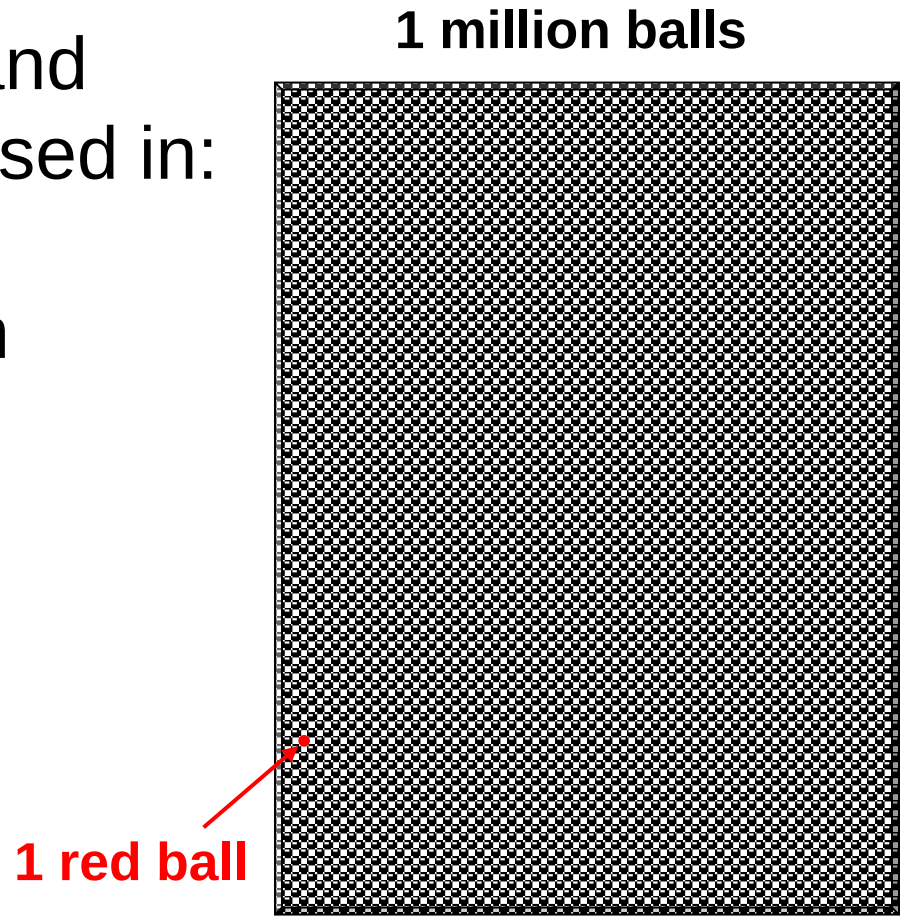
TERMS TO KNOW: CONCENTRATION LEVELS

PEL	Permissible Exposure Limit	The legal limit for exposure to a substance.
TWA	Time Weighted Average	Average exposure over a specified time, usually 8 hours.
STEL	Short-Term Exposure Limit	Average exposure over a short period of time, usually 15 minutes.
TLV	Threshold Limit Value	A worker can be exposed day after day for a working lifetime without adverse effects.
IDLH	Immediate Danger to Life or Health	Exposure level will immediately endanger life/health.

TERMS TO KNOW: PPM/PPB

PEL, TWA, STEL, TLV and IDLH are usually expressed in:

- PPM Parts Per Million
- PPB Parts Per Billion

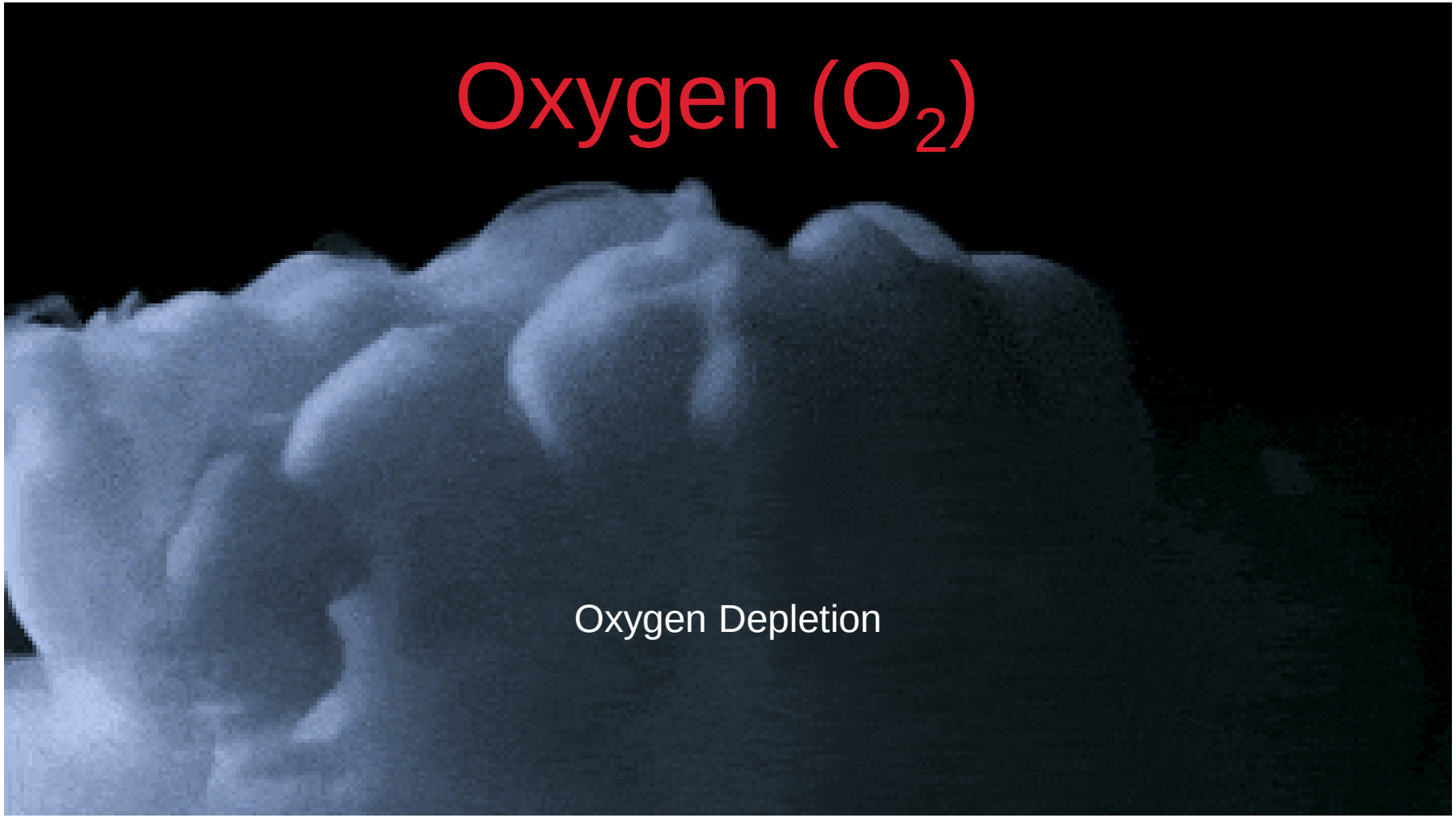


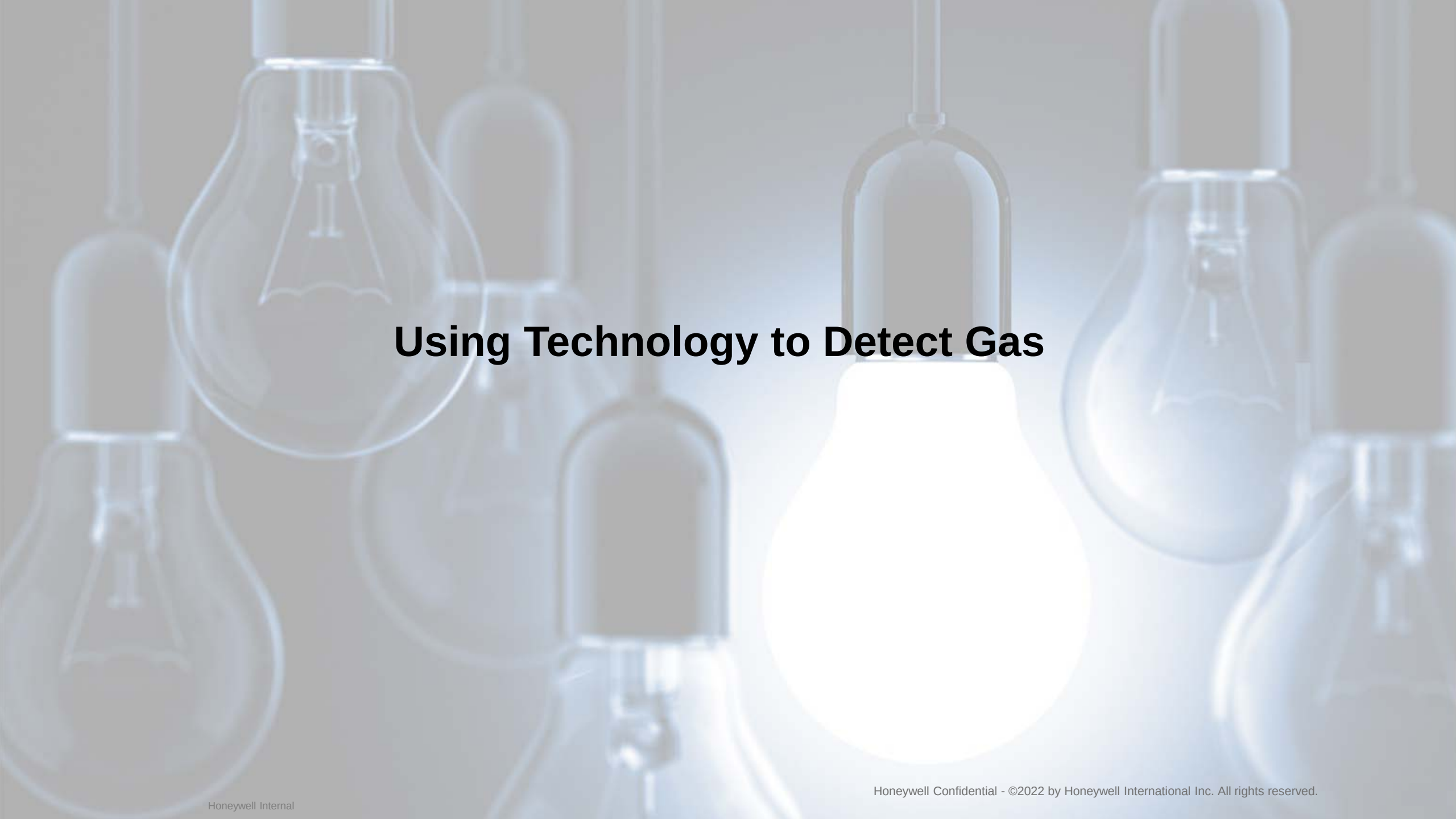
EXAMPLES OF TOXIC GASES

NH_3	Ammonia
CO	Carbon Monoxide
CL_2	Chlorine
H_2S	Hydrogen Sulfide
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
SO_2	Sulfur Dioxide

Asphyxiate Gas

ASPHYXIATE GASES

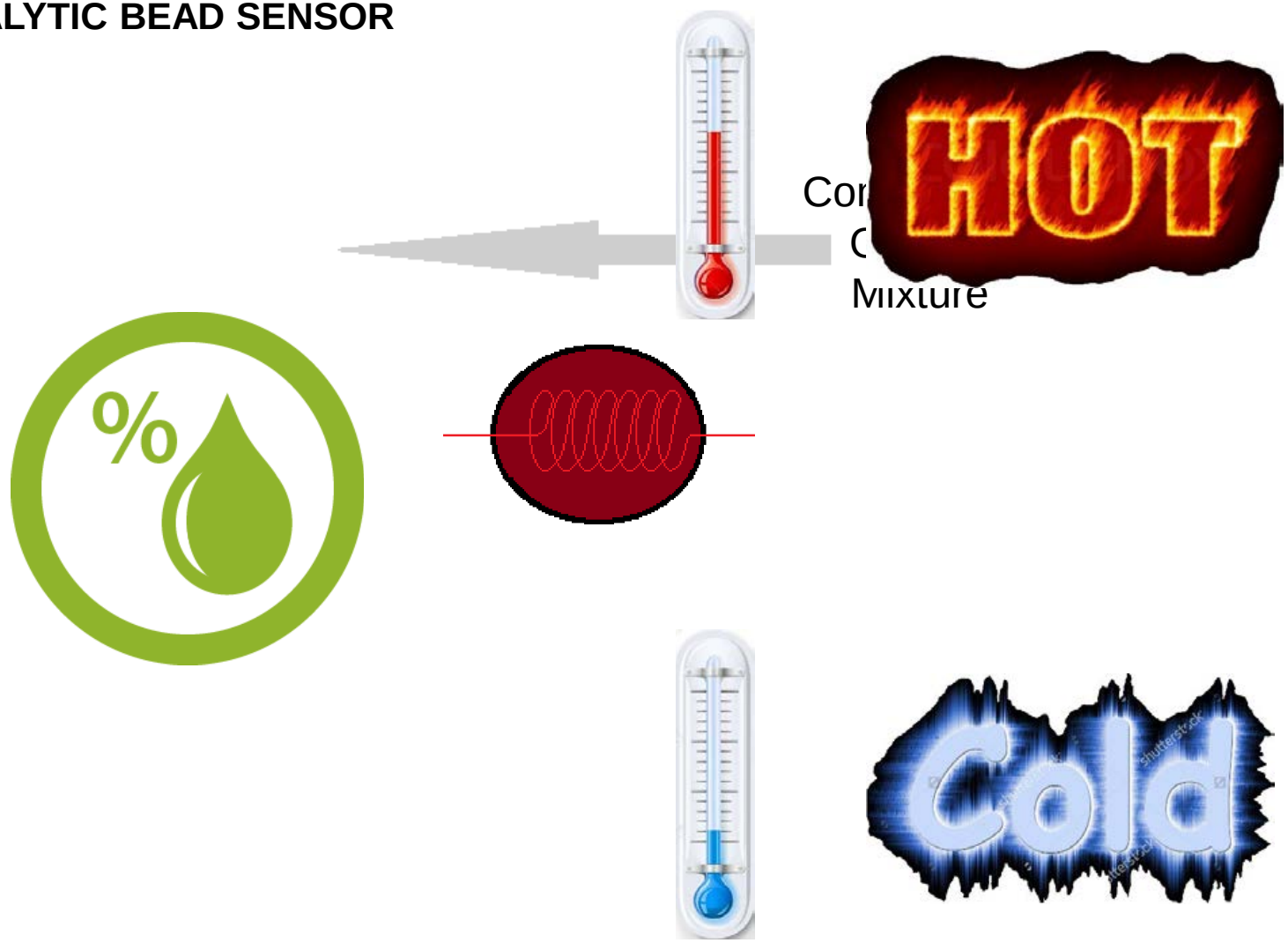




Using Technology to Detect Gas

DETECTION TECHNOLOGY – COMBUSTIBLE GAS

CATALYTIC BEAD SENSOR



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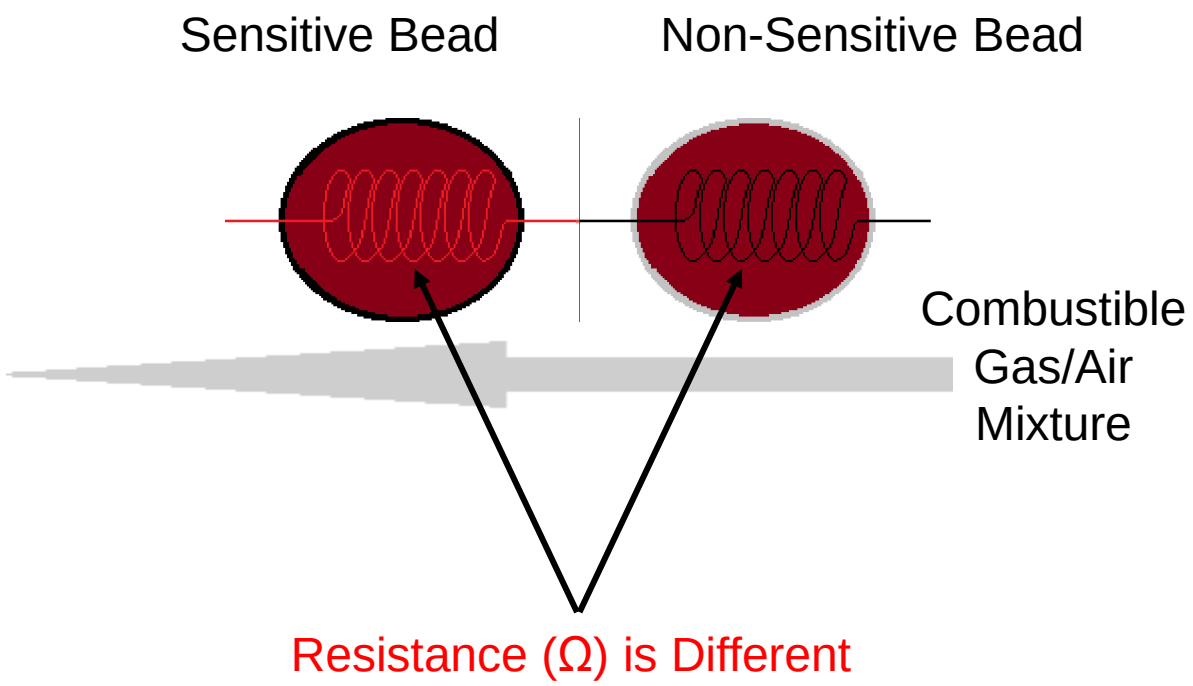
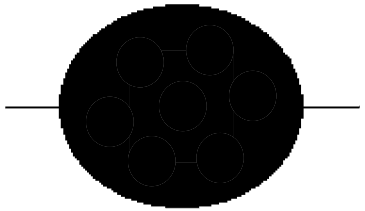


DETECTION TECHNOLOGY – COMBUSTIBLE GAS

Catalytic Poisoning



CATALYTIC GAS DETECTION PROS & CONS

<u>Advantages</u>

Relatively low cost

Accurate and linear over sensor detection range relative to calibration gas

Broad band sensor

Long history, proven technology

<u>Limitations</u>

Unable to identify type of gas detected

Requires sufficient O_2 to support operating principle

High power consumption

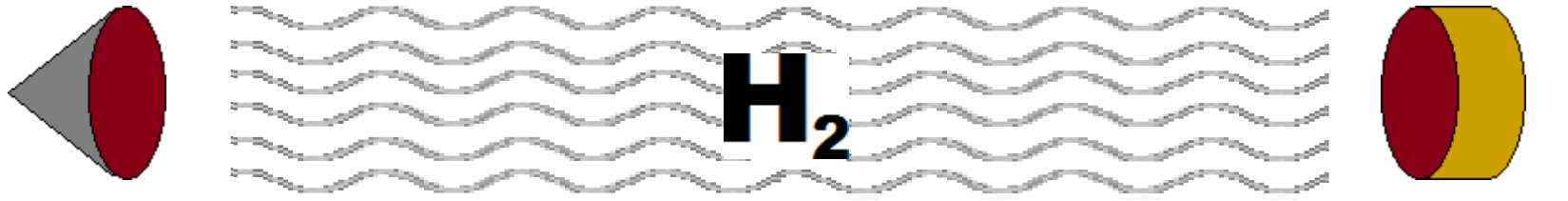
Not fail safe

- Poisoned by: sulfurs, silicones, Phosphors & leads
- Inhibited by: chlorinated & fluorinated hydrocarbons

Combustible gas readings may not reflect the true concentration of a combustible gas hazard.

DETECTION TECHNOLOGY – COMBUSTIBLE GAS

Non-Dispersive Infrared (NDIR)



Infrared Inactive

DETECTION TECHNOLOGY – COMBUSTIBLE GAS

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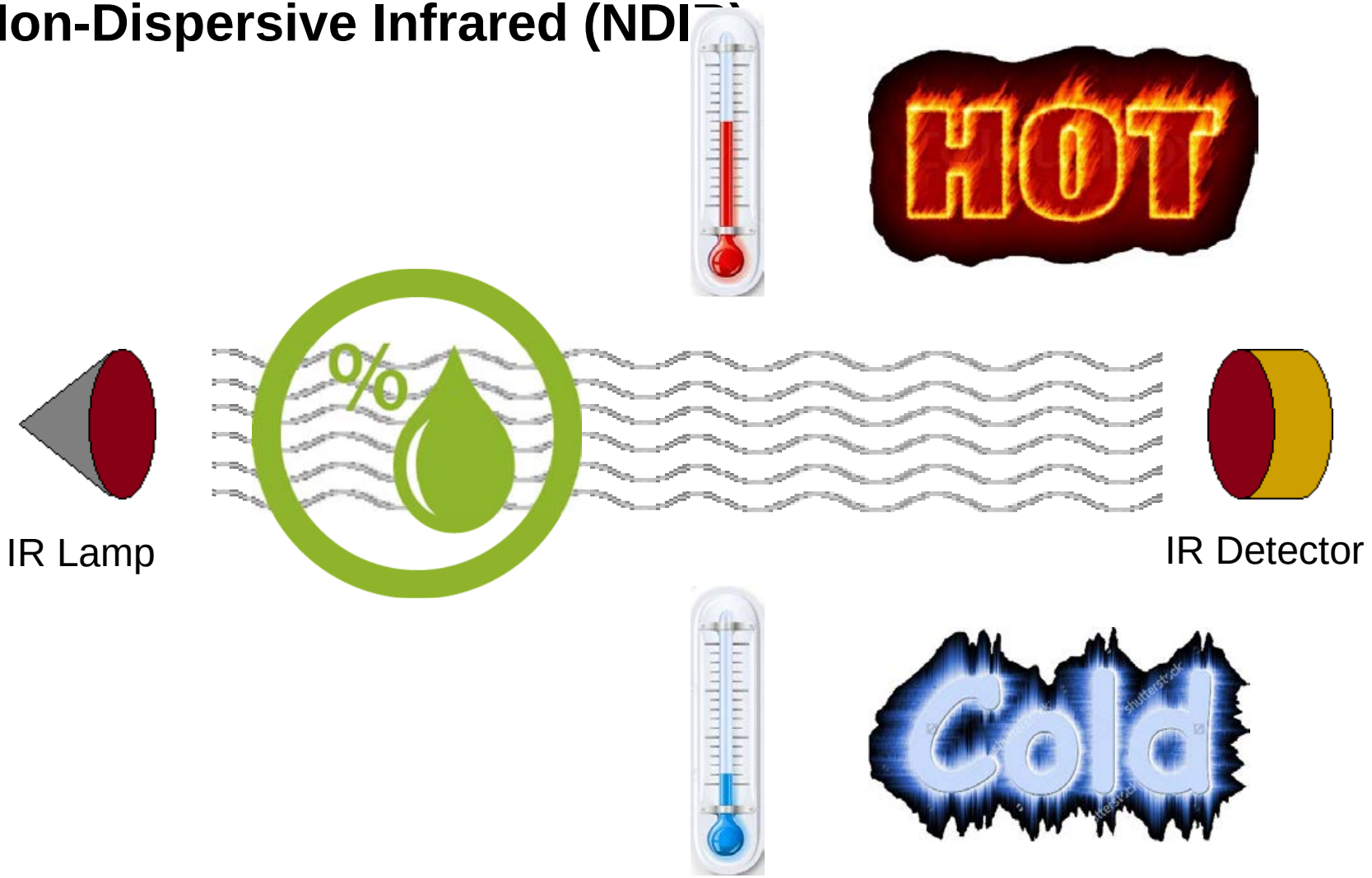

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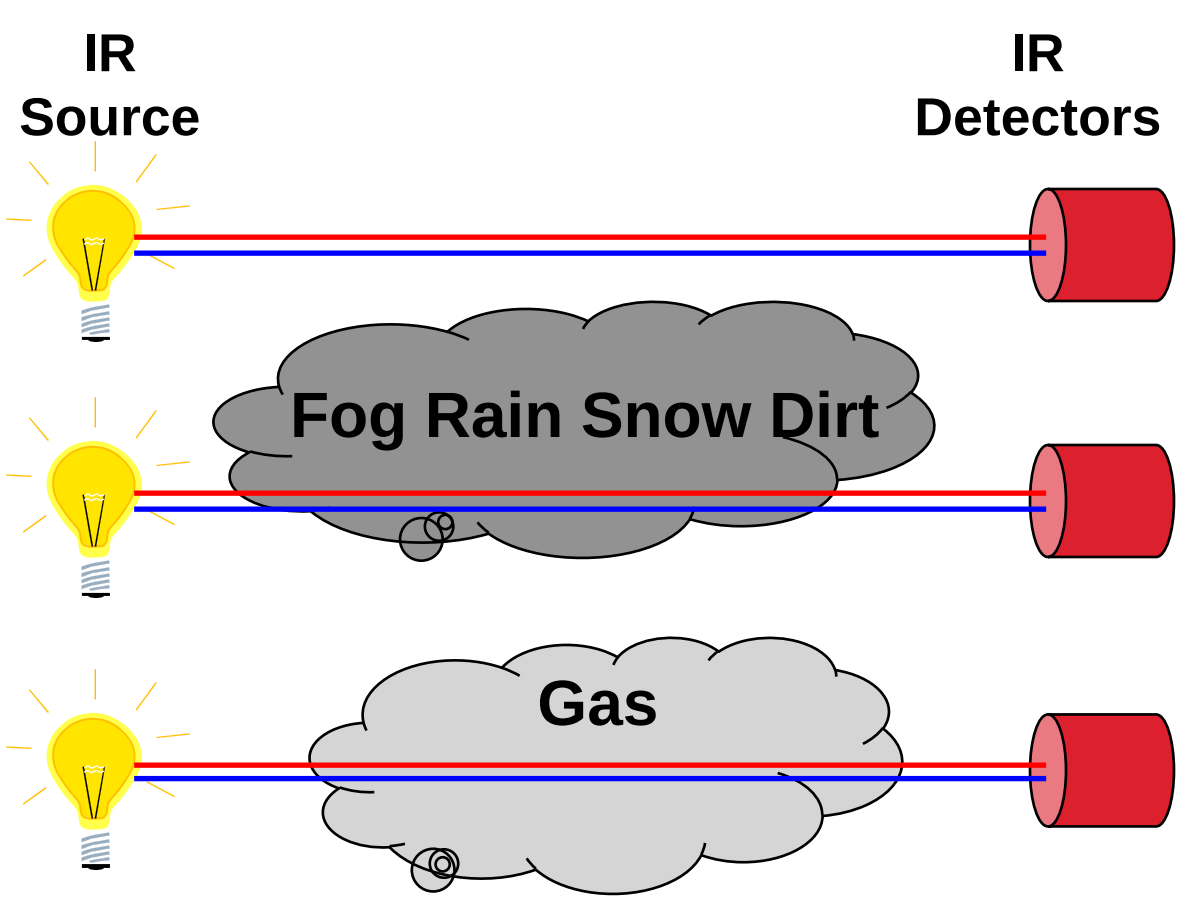
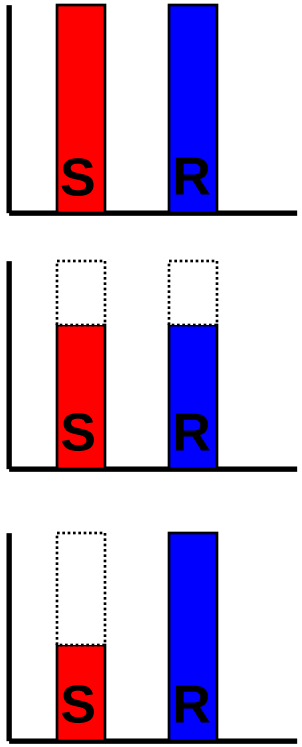


Sample & Reference signal strengths



INFRARED GAS DETECTION PROS & CONS

Advantages

Does not require presence of O_2
Not affected by typical catalytic poisons
Lower power consumption than catalytic bead sensor
Accuracy very stable
Sensor available for 100% v/v CH_4
5 year MTBF - lower cost of ownership over lifespan

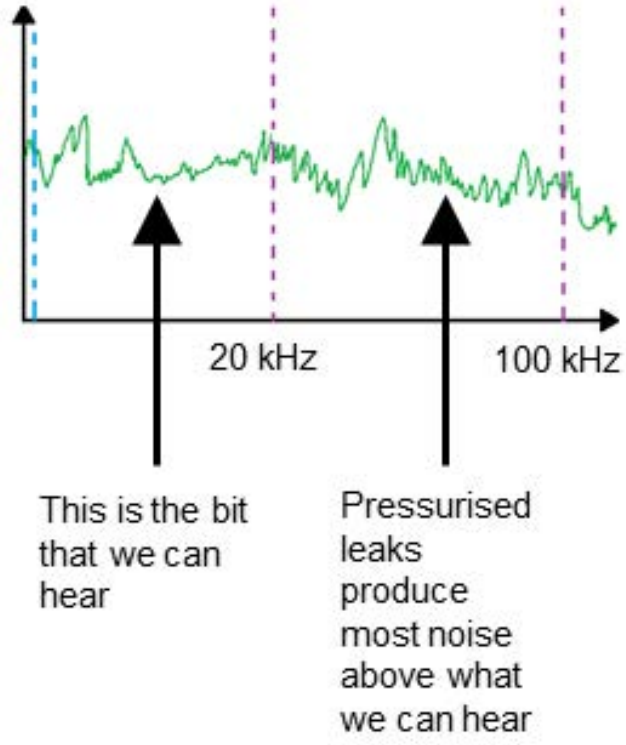
Limitations

Cannot detect hydrogen, acetylene, carbon disulfide
High cost compared to catalytic bead sensor
Affected more by changes in temperature and pressure.
Response is linear to methane but non-linear to other hydrocarbons

ULTRASONIC GAS LEAK DETECTION

How Ultrasonic Gas Detection works

- A high pressure gas leak generates an audible and ultrasonic sound as the gas molecule are propelled from high pressure to low pressure
- The acceleration of the gas produces a broadband “white noise” signal
- Ultrasonic detectors listen for this signal in the 18 kHz to 70 kHz region
  against any background noise
- The ultrasonic signal is proportional to the leak rate
- The sound travels from the source of the leak to the detector in milliseconds



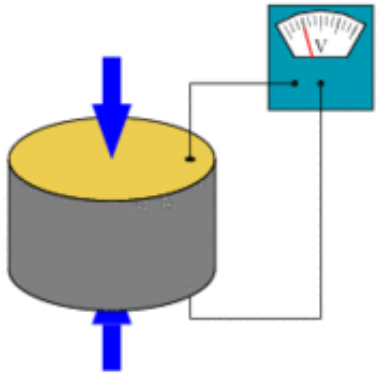
ULTRASONIC GAS LEAK DETECTION METHODS

Microphone

- Well proven technology, many uses
- Stainless Steel construction for this application
- Directional
- Moving parts
- Prone to damage from pressure wash down or driving rain, not ideal for gas detection applications

Piezoelectric Sensor

- Durable, robust
- No moving parts
- Many uses, e.g. automotive, avionics, military
- Superior temperature performance



ULTRASONIC DETECTION PROS & CONS

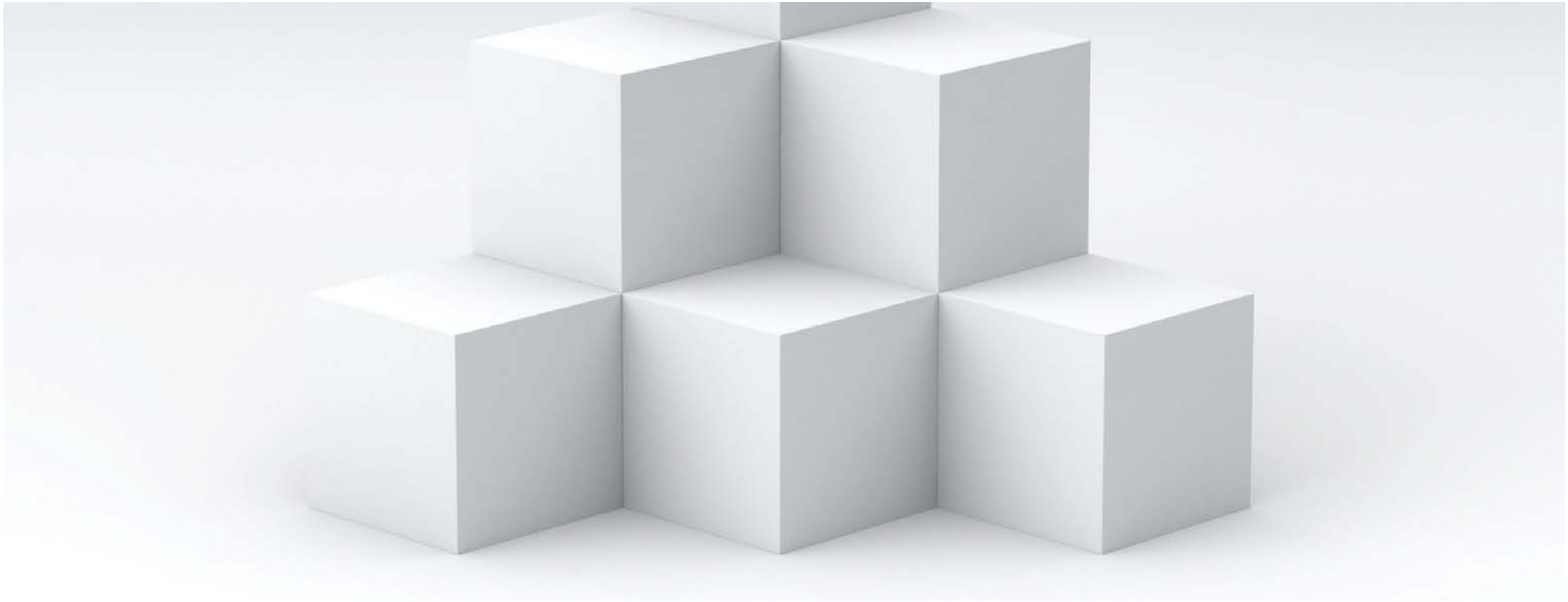
Advantages

- Detects pressurized gas releases (flammable or toxic gas) within a 20 m range.
- Is not affected by wind speed or direction.
- Can detect very small leaks at low leak rates meaning it does not depend on a gas cloud to accumulate.
- Ensures high-speed response, activating as soon as it detects the sound of a leak.
- Isn’t affected by rain, mist or fog.
- Requires no calibration.

Limitations

- Has higher initial purchase cost than point gas detectors.
- Cannot activate unless gas is pressurized and emits ultrasounds, meaning it may not detect large holes with small pressures.
- Other ultrasonic noise sources can reduce its effectiveness and/or trigger nuisance alarms.
- Is not as effective for multiphase gas streams containing droplets or liquids, which can dampen the ultrasound signal.
- Does not provide an indication of the gas concentration, providing notification of the leak only.

CONSIDERATIONS WHEN LAYERING TECHNOLOGIES



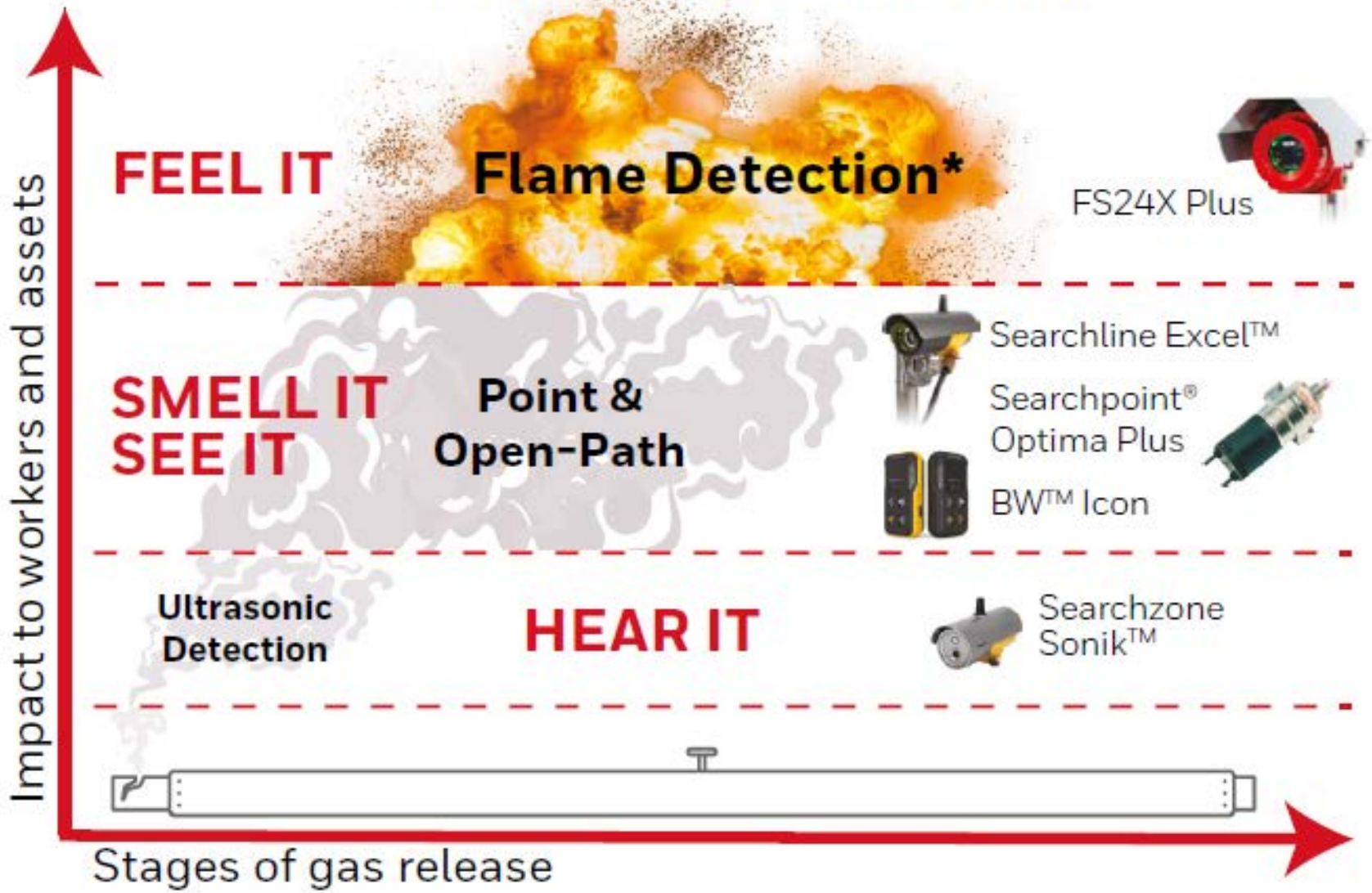
Flammable Gas Applications

POINT DETECTION

OPEN PATH DETECTION

ULTRASONIC GAS LEAK DETECTION

Layering Gas & Flame Technology when seconds count



THANK YOU

Honeywell