

Chillventa Specialist Forums 2022 **Chillventa Fachforen 2022**

**CONNECTING
EXPERTS.**





Refrigerant Gas Detection Vs. Refrigerant Leak Detection

Safety Compliance and Emissions Reduction

Gas Detection vs. Leak Detection



Gas Detection

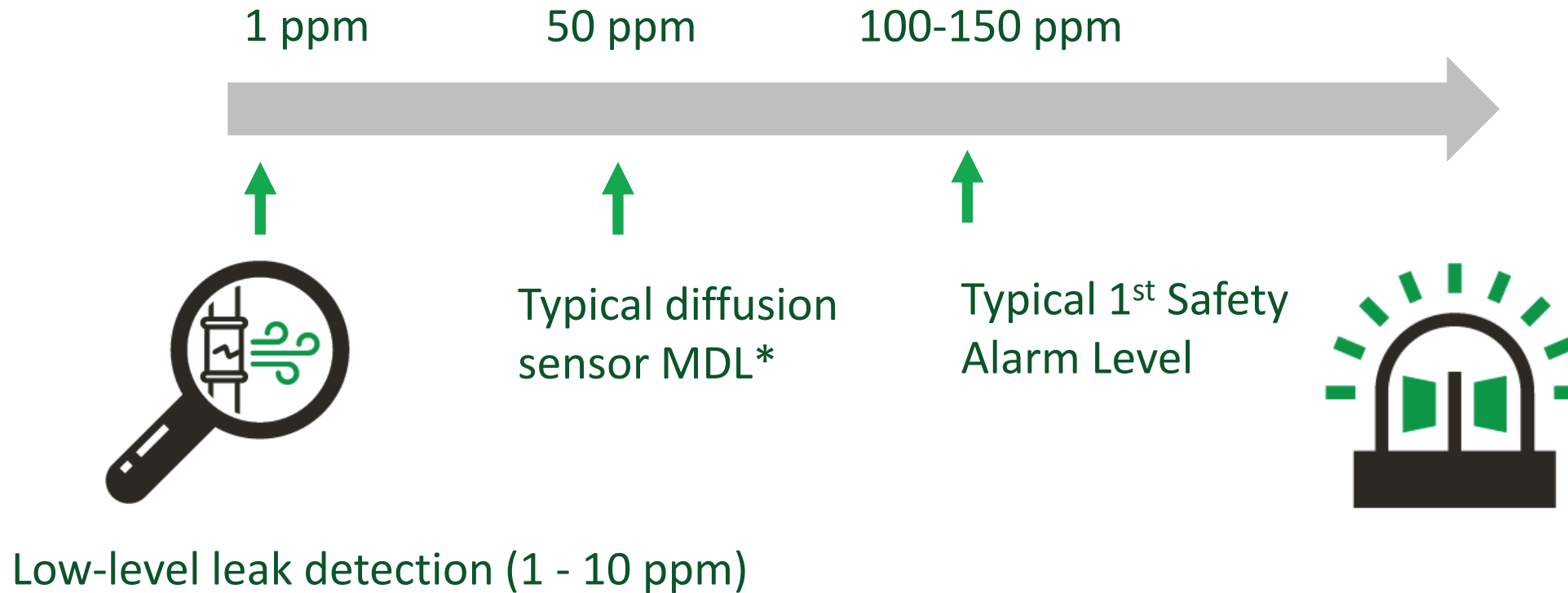
- Sensors designed for EN 378 safety compliance to detect the presence of gas at unsafe concentrations, typically alarming at 10-~100-1000+ ppm



Leak Detection

- High-performance sensor (1ppm MDL) that detects low-level leaks for environmental regulatory & economic needs (and can also support EN 378 safety compliance)

General Detection Ranges



* Minimum Detection Level

Primary Drivers for Refrigerant Detection



Safety

- Regulatory requirements (EN 378)
- Corporate safety policy

Gas Detection



Environmental

- Regulatory requirements (F-Gas)
- Corporate goals

Leak Detection



Economic

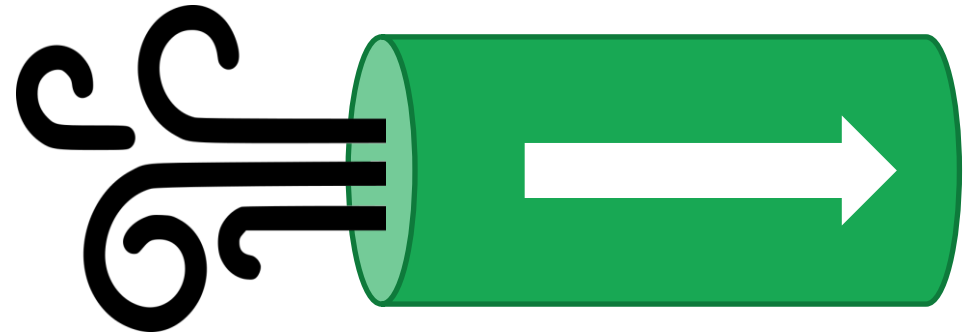
- Operating cost reduction (reduce refrigerant loss/refill)
- Mitigate refrigerant supply risk

Methods of Refrigerant Detection



Passive Diffusion

- Gas has to reach the sensor by diffusing in the air



Active Sampling

- Gas is actively drawn to a sensor with a pump

What is Refrigerant Detection?

- Permanent 'fixed' installation
- Designed to activate alarm & instigate mitigation
- Continuous detection of refrigerant
- Differing sensor technologies to support various refrigerants/applications
- Typical Solutions:
 - Aspirated/pumped
 - Point detector
 - Others



Diffusion vs. Aspirated Sensors



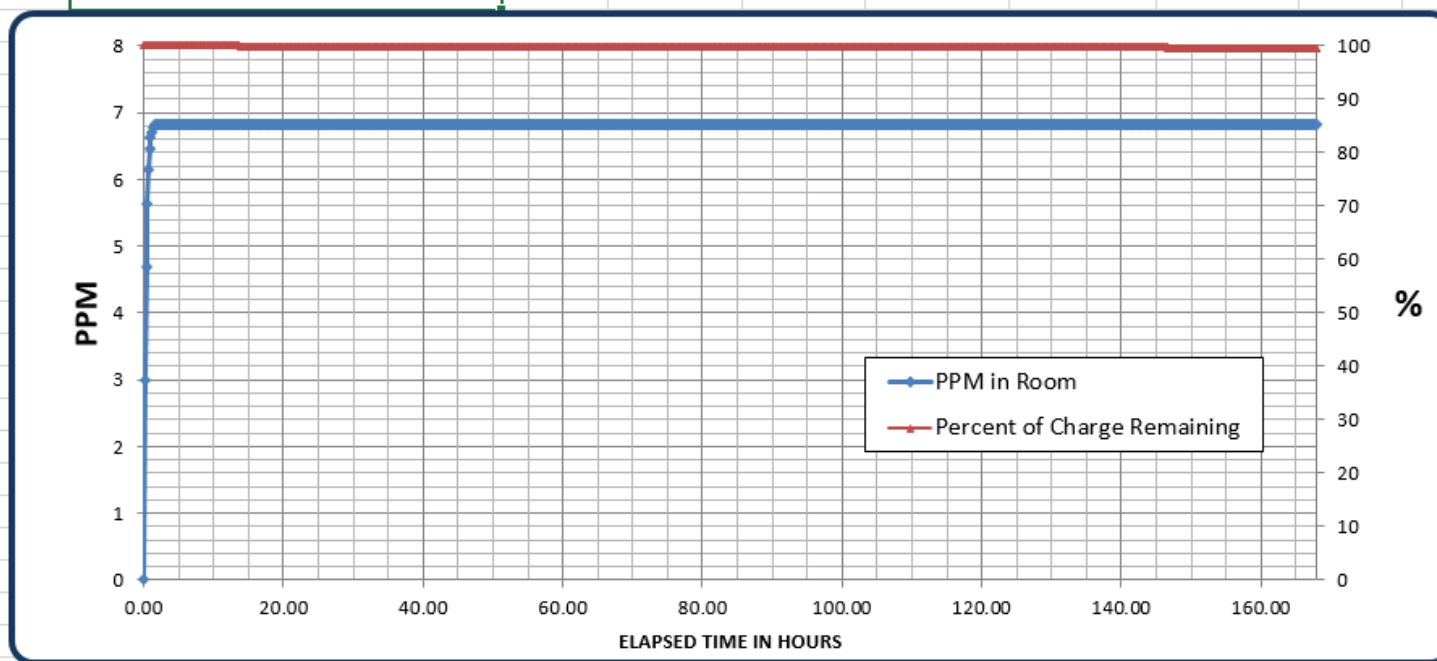
Item	Diffusion	Aspirated
Sampling Type	Passive	Active
Sensing Channels	1-2 per device	Up to 16 per device
Sensor Technology	EC, SC, CT, IR	IR
Minimum Detection Level	+50 PPM (typical)	1 PPM
Accuracy	Standard	High
Calibration	Annual (typical) – 5+ years	Never *
General Selection Guideline	Lowest cost to meet EN 378 safety	Small leak detection, optimize energy usage, reduce emissions

* Subject to regulatory requirements

Importance of Minimum Detection Level (MDL)

Gas Concentration Calculator

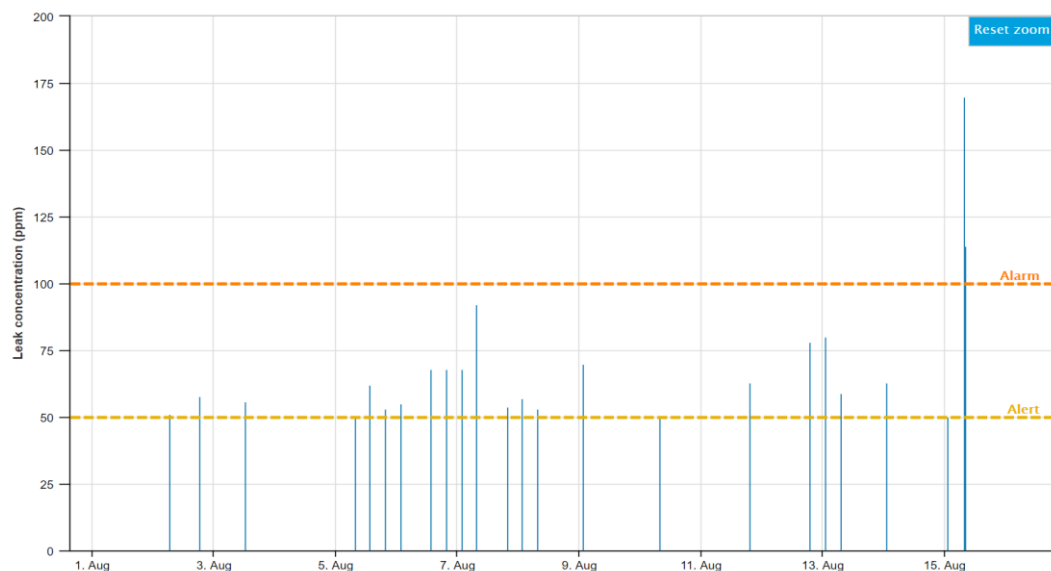
STEP		INPUTS					
1	Refrigerant Molecular Weight (R404A)	97.6	grams/mole			1.4	ppm/hr initial rise 5hrs
2	Refrigerant charge	3500.0	lbs	1587.6	kg	0.4	ppm/hr initial rise 16hrs
3	Room Volume	10000.0	cubic Feet	283.2	cubic meters	283200.0	Liters
4	Air exchanges/hour	5.00	X	0.083	X/minute	3645.8	days to 50% charge
5	Leak rate	0.08000000	lbs/hr	11212.80	Oz/yr	317322.2	g/yr
						6.04E-01	g/minute



Air Exchanges/Hour: 5
Room Volume: 283 m³
Leak Rate: ~0.6 g/min
Max Concentration: 7ppm

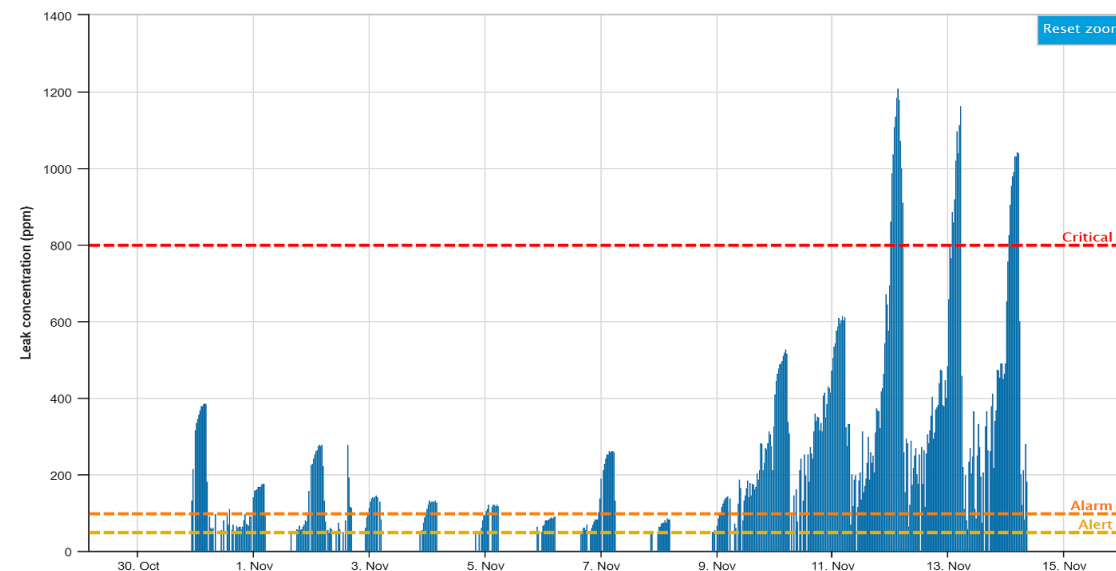
**Diffusion sensors
will NEVER alarm
for this leak.**

Leak Detection for Refrigerant Emissions Reduction



Defrost-Cycle Leak Pattern

(not always active when the technician inspects)
Refrigerated Case Example #1



Preventable Catastrophic Leak

(data revealed significant leak)
Refrigerated Case Example #2

Primary Drivers for Refrigerant Detection



Monitoring Locations

- Chillers
- Cold rooms
- Cylinder storage areas
- Vent lines



Sensor Placement

- Within 6m of each chiller
- Locate sensors in areas the specific gas is likely to accumulate
 - low, middle (breathing zone), high
- Locate sensors in the air flow path created by mechanical ventilation



Sensor Quantity

- At least one sensor for each gas to be detected
- At least one sensor per chiller
- At least one sensor per enclosed, occupied space (e.g. cold room)
- Near the exhaust ventilation intake



Controller & Alarms

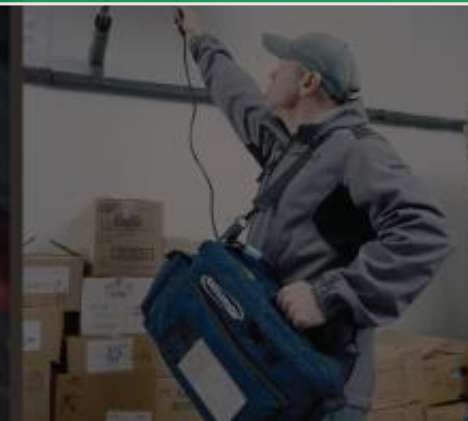
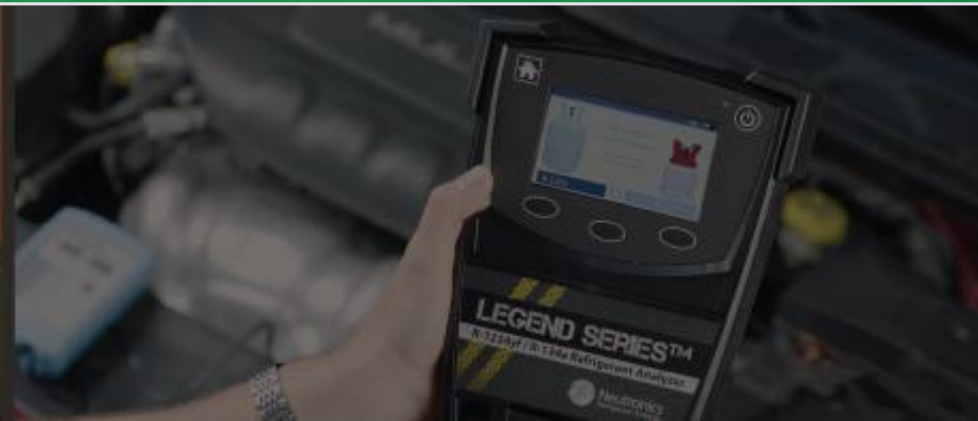
- AV alarm required both inside and outside the machinery room
- Locate the controller outside the machinery room
- Beacons/sounders at each additional entrance (with optional remote alarm silence button)



Safeguarding **PEOPLE, PLACES, & THE PLANET**



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