

Food and Beverage Industry Gas Detection Issues and Answers



*Bob Henderson
GfG Instrumentation, Inc.*

*1194 Oak Valley Drive, Suite 20, Ann Arbor,
Michigan 48108*

Toll free (USA and Canada): (800) 959-0329

Local: 734-769-0573

Internet: www.goodforgas.com

GfG Instrumentation



*World-wide manufacturer of fixed
and portable gas detection solutions*



Food and Beverage Industry Gas Detection Questions

- “Food and Beverage” is a very broad category!
- Safety, hygiene, facilities and production managers deal with an extremely wide range of atmospheric hazards, monitoring applications and activities
- Managers need to anticipate critical requirements ahead of time
- Gas detection equipment must be fit for purpose!



What are your most urgent concerns and problems?

- The more detailed grasp you have of the activities and risks that involve atmospheric hazards, the better.
- Drill down to make sure you understand what is most important.
- Are you currently meeting all requirements?
- Where do you need to make improvements?
- Gas detection issues are not necessarily limited to safety!
 - Toxic exposure limits are getting lower every year!



Fixed or Portable solution?

- When hazards are generally present or associated with specific activities (like CS entry) gas detection solutions focus more on portable instruments.
- When hazards are chronically present, or present in specific areas, fixed gas detection should be considered as well.
- Optimal solution often includes both fixed and portable instruments!



What are some of the most important types of facilities?

- Canneries
- Fish processing
- Food packaging plant
- Meat packing plants (beef, pork, chicken)
- Slaughterhouses
- Rendering plants
- Sugar industry (beet mills, sugar mills)
- Dairies
- Agricultural processing (fresh, canned, frozen, fruit)
- Bakeries
- Grain elevators
- Wineries / distilleries / breweries
- Soft drinks / bottling plants
- Distribution centers
- Refrigerated warehouses
- Bottling plants
- Greenhouses / hydroponics
- Mushroom farms



What atmospheric hazards are especially associated with certain industries?

- Poultry industry
 - Growing (barns)
 - Chicken processing
 - Flash freezing facilities
 - Egg production
- Hazards
 - NH_3
 - H_2S
 - Formaldehyde (CH_2O)
 - Cl_2



What atmospheric hazards are especially associated with certain industries?

- Pork industry
 - Farms and barns
 - Sewage / wastewater / lagoons
 - Slaughterhouses
 - Processing facilities
 - Flash freezing / refrigerated storage
- Hazards
 - Confined spaces / waste pits / sewage lagoons
 - NH_3 (from waste as well as refrigeration systems)
 - H_2S
 - Cl_2



What atmospheric hazards are especially associated with certain industries?

- Beef production and products
 - Farms and feedlots
 - Production facilities
 - Rendering plants
- Dairies
 - Farms and barns
 - Dairy product production
- Hazards
 - Confined spaces / waste pits / sewage lagoons
 - NH_3 (animal waste as well as refrigeration)
 - H_2S
 - SO_2
 - Cl_2



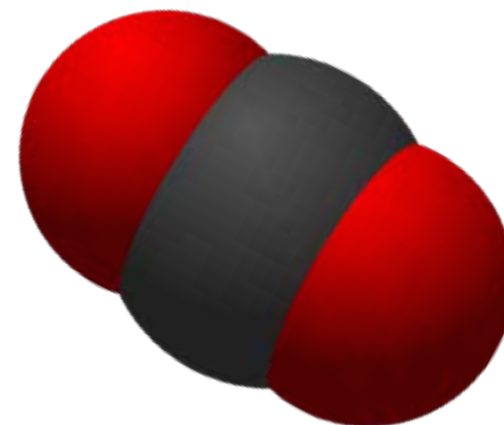
What atmospheric hazards are especially associated with certain industries?

- Breweries / wineries / distilleries
 - Confined spaces
 - Grain / grapes (LEL / O₂ / H₂S)
 - Fermentation
 - Microbial decomposition
 - Disinfecting / sanitizing procedures
- Hazards
 - Carbon dioxide (toxic as well as displacement hazard)
 - Oxygen deficiency due to displacement by CO₂
 - CH₄ LEL
 - Alcohols (fermentation / used in sanitization)
 - Can be very hard on catalytic LEL sensors!
 - Interference issues with CO sensors
 - Cl₂ (used in sanitization procedures)
 - Ammonia
 - Refrigeration systems and compressors
 - H₂S (especially when grapes treated with sulfur)
 - Phosphine (PH₃)



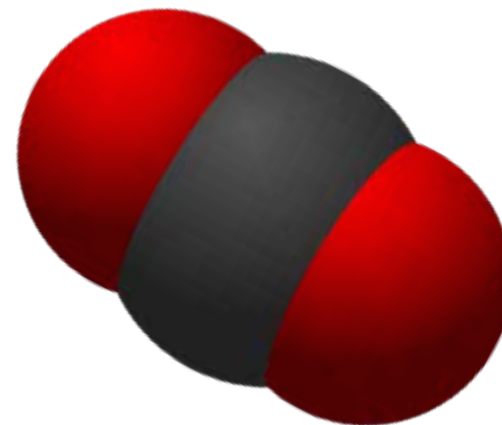
What are the properties of CO₂ ?

- Present as a natural component in fresh air (approximately 420 ppm)
 - Colorless
 - Odorless
 - Tasteless
 - Heavier than air (density of 1.5 times that of fresh air)
 - When released into enclosed space it tends settle to bottom
 - Because of tendency to settle, as CO₂ produced it can reach higher and higher concentrations

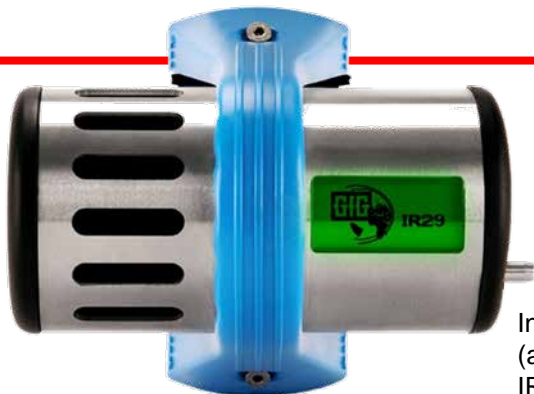


What are the symptoms of exposure to CO₂ ?

- Besides displacing oxygen in fresh air, high concentrations may worsen symptoms related to oxygen deficiency, and interfere with successful resuscitation
- Exposure Symptoms include:
 - Headaches
 - Dizziness
 - Shortness of breath
 - Nausea
 - Rapid or irregular pulse
 - Depression of central nervous system
- Even moderate exposure can be serious
 - Normal indoor fresh air concentration: 420 – 1000 ppm
 - 1000 – 2000 ppm: complaints of drowsiness
 - OSHA / NIOSH / TLV: 5000 ppm TWA limit
 - IDLH: 30,000 ppm
 - Exposure to very high concentrations (30% volume CO₂ for 20-30 seconds) linked to losing consciousness and permanent heart damage



What are the typical fixed gas detection requirements for breweries, distilleries and wineries?

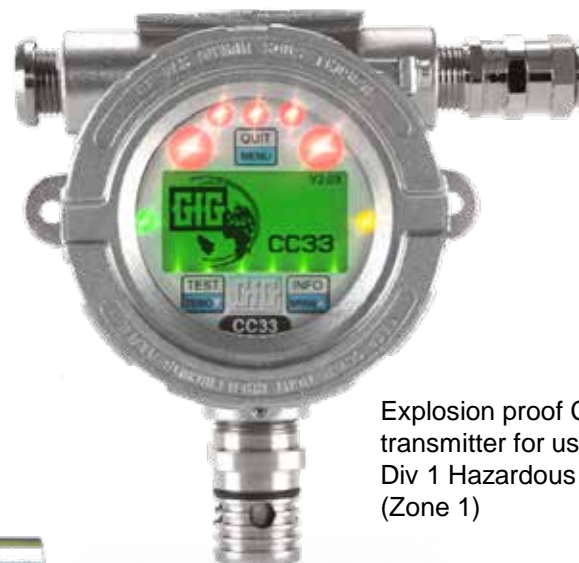


Intrinsically safe IR LEL (alcohol or CH₄) and / or IR CO₂ transmitter for use in Class I Div 1 Hazardous Locations

Infrared (IR) CO₂ transmitter for use in areas which do not have the presence of combustible gas



Intrinsically safe low range NH₃ transmitter with EC sensor for use in Class I Div 1 Hazardous Locations



Explosion proof CC LEL transmitter for use in Class I Div 1 Hazardous Locations (Zone 1)

Solid state (CS) high range NH₃ transmitter for use for leak detection and vent lines



What are the periodic calibration and inspection requirements?

- Fixed detector sensors must be tested and calibrated on a regular basis
- Typically inspected quarterly or biannually
- Typically calibrated or tested by exposure to gas at least biannually



GMA 200 MW/4 one to four-point controller

CO₂ gas sensor assembly (transmitter) with display



“Blind” CO₂ gas sensor assembly (transmitter) w/o display



Food and beverage industry gas detection requirements can include

- Personal protection
- Toxic exposure monitoring
- Fixed systems (esp. NH₃ and CO₂)
- Production
- Process
- Facilities
- Industrial hygiene
- Community (such as fence line or nuisance odor)
- Regulatory (EPA)
- Disaster response (flood, spill or fire)
- Construction (shut-downs)
- Confined space
 - Routine entries
 - Large scale ongoing-entries
 - Hot work
 - Cleaning / sanitization procedures between batches



What are the most common food and beverage industry atmospheric hazards?

- Oxygen deficiency
- Presence of toxic gases
 - H₂S
 - CO
 - NH₃
 - CO₂
 - Cl₂
- Presence of combustible gases
- Typically use single-gas or a 4 gas or 5 gas with:
 - LEL
 - O₂
 - CO
 - H₂S
 - Plus CO₂ / NH₃ / Cl₂



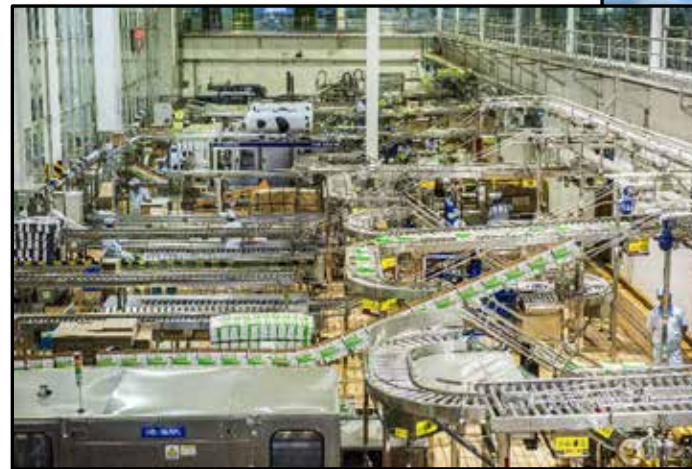
The presence of dangerous atmospheric conditions may be due to:

- Materials used or produced by operations
 - Sewage / urine / dead plant or animal material
 - Fertilizers
 - CO₂
 - Alcohols
 - LEL gases
 - Sulfur / sulfites
- Refrigeration gases
 - Ammonia
 - Propane
 - Freons and halocarbons
 - Nitrogen
- Process(es) used to transform raw materials into finished goods
 - Chemical reactions (ethylene)
 - Curing / drying (nitrates / CS₂)
 - Additives
 - Baking



The presence of dangerous atmospheric conditions may be due to (continued):

- Facilities
 - Battery charging (generation of hydrogen)
 - Spills
 - Leaks
 - Fueling stations (hydrogen or propane)
- Combustion
 - Stack gas (SO_2 , acid gas, NO_2 , NO , CO , CO_2)
 - Engine exhaust (CO , NO_2 , NO , CO_2)
 - Accidental or intentional release of contaminants



The presence of dangerous atmospheric conditions may be due to (continued):



- Natural process(es)
 - Fermentation (CO₂ as well as O₂ deficiency)
 - Decomposition
 - Oxidation
- Confined space entry activities
 - Hot work
 - Scraping
 - Mucking
 - Paints and sealants
- Deliberate creation of potentially dangerous atmospheric conditions
 - Pesticides (PH₃ or MeBr)
 - Inertion (controlled atmosphere storage)

Many site-specific hazards

- O₂ deficiency – especially in pits and confined spaces!
- Chlorine – used as disinfectant
- Ammonia – refrigerant gas
- SO₂ – naturally produced as “silo” gas or by combustion
- NO₂ – diesel exhaust
- CO₂ – fermentation (bakeries / breweries / distilleries)
- H₂S – microbial decomposition animal waste / sulfites / sulfur
- Ozone – used in disinfection / sanitization
- Phosphine – used as pesticide
- Alcohol – produced by fermentation
- LEL gas – microbial decomposition
- And many more!



There are many new developments in gas detection!

- New products
- New sensors
- Wireless communication
- Integrated fixed and portable networks
- Third party support through call centers
 - Emergency response
 - Record keeping and notifications
 - Internet based maintenance programs



What brand(s) and model(s) of gas detection equipment do you currently use?

- Before making a change or investigating new products, make sure you understand your current products and requirements
 - If you are not sure, make sure to find out the brands and models currently in service.
 - Make sure you understand the capabilities; the strong points as well as the weak points, of the products you are currently using.
- Ask the manufacturers or distributors of the products you work with (or are interested in) for help.
 - Download specifications and comparison charts if the manufacturer has them.
 - Discuss ways the manufacturer and distributor can help meeting your needs with regards to product, capabilities or support.



How well is your current equipment performing?

- This is a critical starting point in the conversation.
 - Are you generally happy?
 - Are you experiencing problems?
 - How old is your current equipment?
 - What features have you heard about that you are interested in?
 - What brand(s) and model(s) of gas detectors are you considering?
 - What are the alternatives?
- Distributors are a great source for product information!
- When in doubt, or with regards to advanced technical questions, ask the manufacturer!



Avoid being overly focused on price!

- Eventually, the decision of whether to proceed involves price and affordability.
- However, there is a difference between the initial purchase price and the true cost of ownership.
 - The questioning process is designed to uncover your needs, and what would provide the optimal solution.
 - Once you fully identify the problems and how the new product is going to help, it's easier to understand the costs.
 - Once you have clarified the tradeoff between benefits and costs is when to widen or restrict choices as a function of price.

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Identify “cost of ownership” issues

- Are you spending a fortune keeping your current equipment in service?
- Are you being charged a monthly fee for reports and factory support?
- Do you trust your gas detectors?
- Do you have many sensor failures?
 - If so, what kinds of sensors are failing?
- Do you have battery problems?
 - Do the instruments run long enough on a single charge or set of batteries?
- How often do you test and calibrate your instruments?
 - Do you do it yourself or use a service?
- Are there any special conditions or contaminants that are causing problems?
- Do you feel you are currently getting a good deal?



Do you have any plans to update, replace or change the equipment you are currently using?

- If you have relationships with gas detection manufacturers and distributors you trust, get them involved!
 - Distributors generally have more than one manufacturer option.
 - Gas detection manufacturers are happy to discuss issues directly with end-user customers.
 - The Internet and social media are terrific tools for finding out what's new, and what customers have to say.
 - You have multiple sources of information!
- Gas detection decisions are typically made by a group of individuals who have different roles in the decision process, including process or facilities management, safety, hygiene, purchasing, and (often) union representatives.
 - Make sure you don't leave anyone out!
 - The same issue often looks considerably different to a manager with different responsibilities.

Who is currently looking after your instruments?

- Do you do it yourself, use a third-party service, or work directly with the factory?
- If you like your current instruments, and want to keep them in service, you might want to talk about maintenance agreements or refurbishment programs.
- Ask your local distributor whether they offer calibration or repair services.
- Ask your current manufacturer whether they have factory maintenance programs, or a loaner or replacement instrument policy.
- You should expect excellent after the sale support!



Don't be afraid of considering fixed system solutions!

- Many common solutions based on small standalone single point systems, or small systems with 1 to 4 points of detection.
- Larger systems can be complicated, but your manufacturer partners are there to help you through the specification process.
- Make sure to include everyone with a stake in the outcome in the discussion and selection process!



Make sure you understand company policies and procedures for fixed systems



- Specification and purchase of fixed gas detection systems can be complicated
- Are fixed system decisions made by a third-party design firm or contractor?
- Are fixed system decisions made by managers at the site?
- Are there any open projects?
- Who is involved in the specification and evaluation process?
- Who is responsible for calibration and routine maintenance?

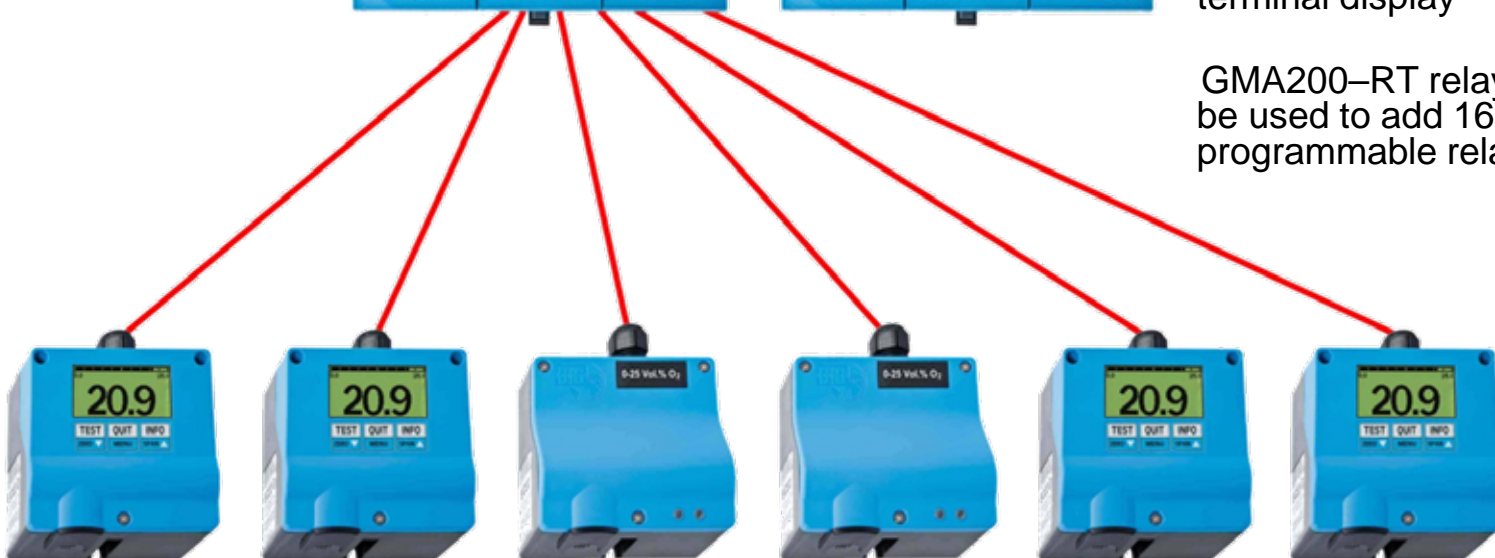
GMA200-MT/16 DIN Rail Mounted Controller

Connect controller via 4-20mA or digital RS-485 BUS



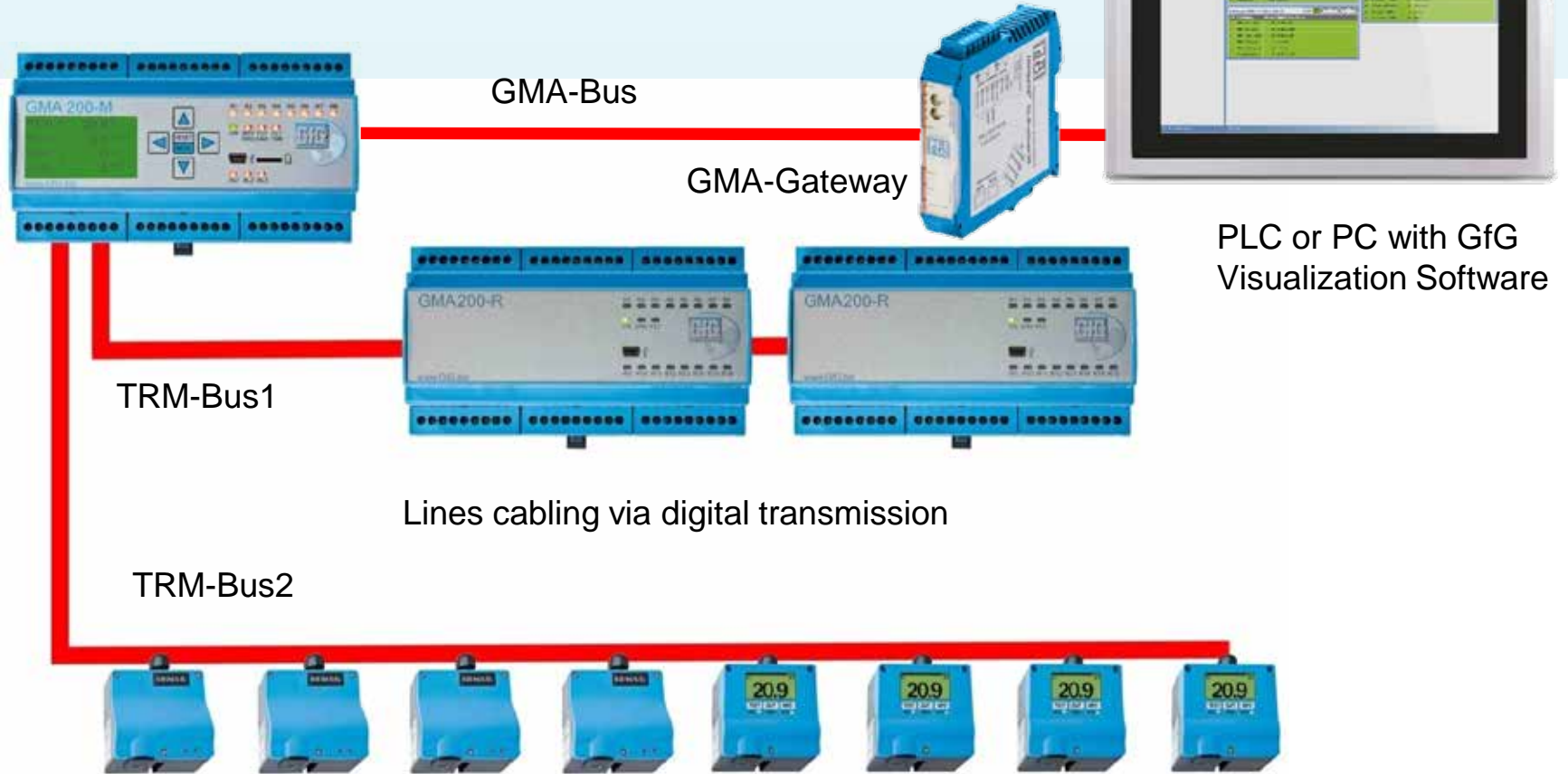
RS-485 GMA-Bus can be used to connect GMA-200 controller with additional control or relay modules, or with a remote terminal display

GMA200-RT relay module can be used to add 16 additional programmable relays to system



GMA200-MT/16 DIN Rail Mounted Controller

Connection via digital interfaces



Do you have a “Fixed System Questionnaire” from the manufacturer you are working with?

- The design firm, distributor and manufacturer need the information in this usually simple form to provide the best solution.
- If you do not have a copy, contact the manufacturer ahead of your meeting!
 - Clarifying what you need by means of a detailed questionnaire reduces the chances for specifying or purchasing the wrong equipment.
 - Don't be afraid to ask the manufacturer for help with the answers.
 - Answer as many questions as you can, but don't worry if you can't answer them all.
 - The manufacturer will tell you if there is something that must be nailed down before they can generate a quote.
- Don't go it alone!
 - Don't be afraid to ask the manufacturer for help.

In terms of units sold, personal protection is the largest gas detection segment

- For personal protection instruments do you mostly use:
 - Single gas H₂S?
 - 4 gas meters?
 - Other single gas meters?
 - H₂S is still the most common single gas instrument, with CO a distant second, but don't overlook other toxic gases that may be present at a particular site.
- Some of the other commonly used personal single gas instruments include:
 - NH₃
 - NO₂
 - SO₂
 - Ozone
 - As well as many others!



Multi-gas portable instrument considerations

- Do you have other gases of concern beyond the basic four most common atmospheric hazards (O₂, LEL, CO and H₂S)?
 - SO₂?
 - Alcohols and VOCs?
 - CO₂?
 - NO₂?
 - Other gases?
- Do you use pump equipped or diffusion for toxic gas measurement?
 - Is it possible to equip your single-gas meters with a pump?



Even more multi-gas questions

- Do you have alcohol, heavy fuels or VOCs on site?
 - VOC vapors are potentially explosive, but toxic at much lower concentrations.
 - Especially true for VOCs like benzene, hexane, toluene and xylenes.
 - Consider including a PID sensor in multi-gas instruments used for spills and other situations that involve VOC vapor.
- Do you encounter VOCs during confined space entry?
 - If so, your CS instruments should include a PID sensor.



Are your gas detectors wirelessly enabled (or are you considering this option)?

- Most manufacturers now offer a “wireless” communication option.
 - Each manufacturer has its own strategy, with its own benefits and limitations.
 - Make sure you understand the wireless options and competitive benefits!
- Common communication methods:
 - Blue Tooth
 - Cellular
 - ISM RF
- Do you intend to use wireless communication during CS entry?
 - How do you get the information out of the space?



Have you addressed “third-party” issues?

- Do you intend to use a remote call center service to coordinate emergency response?
- Do you intend to use a third-party rescue service (such as a corporate emergency response team, or the local fire department)?
- How will you coordinate real-time emergency information with all involved parties?



What sensor configurations do you currently use for confined space entry?

- Do you have the right configuration, or are you thinking about a change?
- How many / what kinds of sensors are installed in your instruments?
 - Traditional 4 gas (LEL / O₂ / CO / H₂S)?
 - 5 gas with PID?
 - Some other sensor configuration?
- What type of sensor are you using (or interested in using) for LEL?
 - Traditional CC LEL?
 - IR LEL?
 - MPS?
- Does the type of LEL sensor require changes in use or types of the other installed sensors?
 - Do you use different multi-sensor instruments for different activities or types of CS entry?
 - Confined spaces that contain VOC vapors?
 - CS entry into inerted vessels?



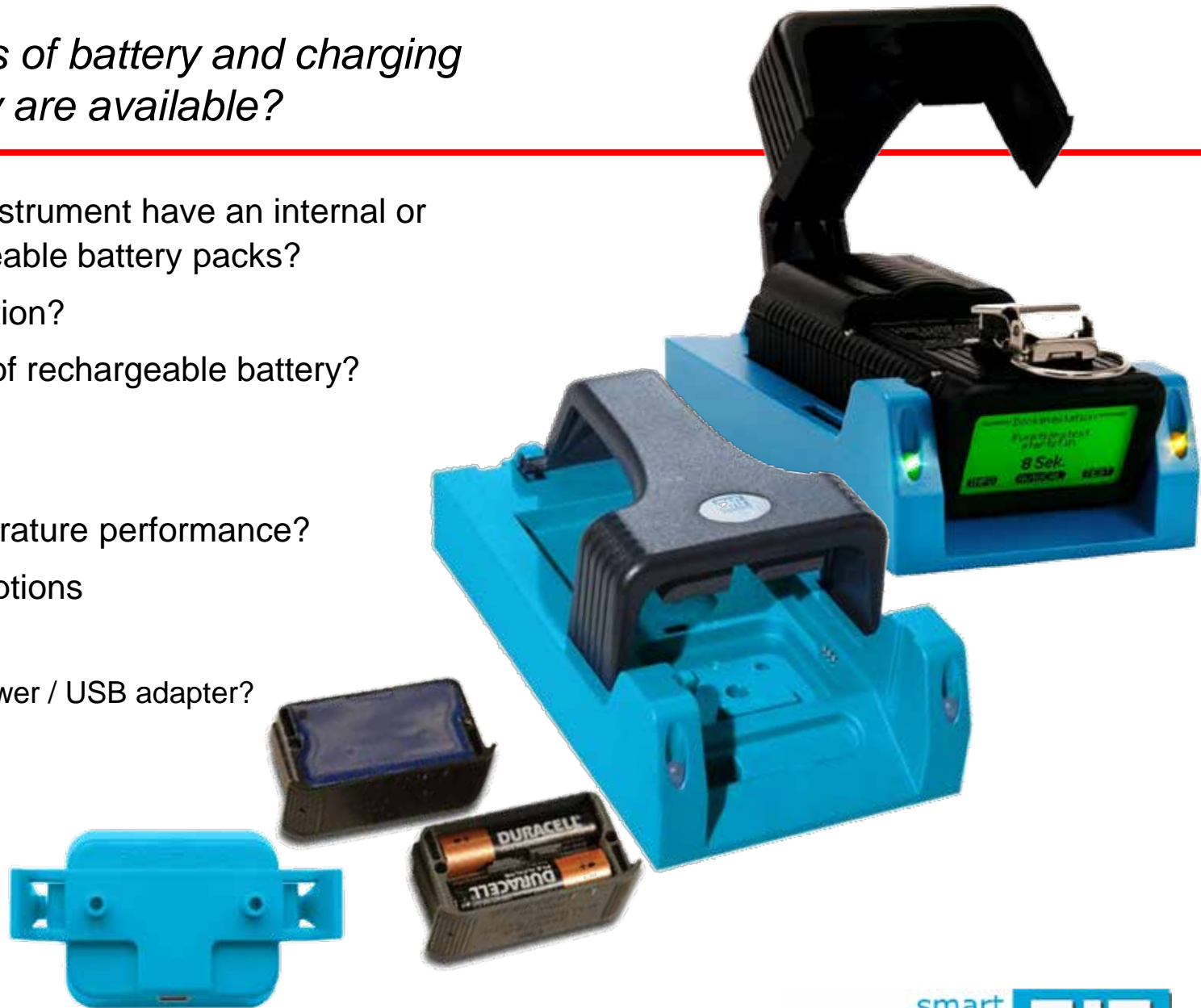
How do you sample the atmosphere from within the confined space?

- Is the instrument a diffusion only design?
- Does the instrument have an attachable sample pump?
- Does the instrument have a built-in pump?
- Does the instrument have the option of switching from diffusion to sampling by means of the built-in pump?



What types of battery and charging technology are available?

- Does the instrument have an internal or interchangeable battery packs?
- Alkaline option?
- What type of rechargeable battery?
 - Li Ion?
 - NiMH?
- Cold temperature performance?
- Charging options
 - Cradle?
 - Wall power / USB adapter?



What about periodic testing and calibration?

- How often do you perform a bump test?
 - Before each day's use?
 - Do you keep bump test kits (with gas) with the instruments?
 - How do you prove your instruments have been bumped?
 - What do you do if you fail a bump test?
- How often do you perform a full calibration?
 - Do you use a docking station for bump tests and calibrations?
 - How do you prove your instruments are properly maintained and calibrated?
 - How do you retain maintenance and calibration records?
- Is your current strategy working?
 - Is it easy?



What about after the sale support?

- Satisfaction is a function of ongoing support.
 - Atmospheric monitors and systems are life critical safety equipment.
 - Customers should expect excellent after the sale support.
- Don't forget to consider:
 - Warranty
 - Sensors
 - Instrument
- Technical support
 - Is your vendor there to provide help?
- Training
 - Videos?
 - In person?
 - Internet resources?



Questions?

Thank you!

Bob Henderson

bhenderson@goodforgas.com

For additional information or gas detection help:

Website: www.goodforgas.com

GfG Technical Support:

service@goodforgas.com

USA and Canada: 800-959-0329

Local: 1-734-769-0573

