Integrated Pest Management and Fumigation Safety Training

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Personal Protection and Gas Detection Equipment

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Gas Detection

• Contaminated air or insufficient oxygen levels are hazards in many industries.
• Adequate oxygen levels, toxic levels of carbon monoxide and flammable or explosive gases are the most common industrial monitoring needs.
• Your interest will primarily be phosphine fumigant gas.
• First criteria is monitoring specific gas at right sensitivity for safety assurance.
Ideally fumigation contractors would provide satisfactory monitoring and safety assurance

• Some organizations want to maintain some of their own monitoring and safety equipment.
Phosphine safety thresholds:
0.3 – 15 parts per million (ppm)

- Detection needs to be sensitive to 0.1 ppm or better for reading 0.3 ppm
- 0.3 ppm phosphine is threshold between “safe”, or when appropriate gas mask is needed for protection.
- 15 ppm phosphine is limit of protection with gas masks. Evacuate to a safe atmosphere.
- 50 ppm is considered “immediately dangerous to life and health”.
Draeger Safety is one good manufacturer with global sales and service

- One option is detection tubes
  - single use, specific for gas and conc. range
  - open, draw specific volume of air through
  - color change border on a scale indicates

(video demo clip)
Tube advantages and disadvantages

• **Advantages**
  - Simple
  - Versatile pump for many tubes.
  - Virtually no maintenance.

• **Disadvantages**
  - Need to read and interpret.
  - High expense of single reading.
  - Slow
  - Glass hazards
Electronic safety monitors: More automated and economical

• Draeger Pac 7000 PH3 Detector (video demo clip)

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<th>Advantages</th>
<th>Disadvantages</th>
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<td>Continuous reading</td>
<td>Periodic maintenance</td>
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<td>Automated alarms</td>
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Other possible fumigant gases

- Methyl bromide: Mostly phased out of use. Potential presence in cargoes recently quarantine-fumigated at borders.
- Sulfuryl fluoride: New fumigant in developed countries. Possible solution to phosphine resistant insects.
- Both odorless and tasteless. Possibly mixed with tear gas for warning agent. Detection tubes likely your best alternative.
High Concentration Monitoring for Effectiveness

- Highly specialized and expensive electronic equipment is realistically limited to fumigators.
- Supplemental suction pump may be needed to draw samples from interior of product mass.
- High range phosphine Draeger tube is a realistic option.
Phosphine Efficacy Monitoring: Equipment Options

- Not the same as safety monitors!
- Need to read 200-300 ppm or higher. Need pump to draw sample from space.
- Draeger tube CH21201: About $8.10 each + glass hazard.
- Electronic Instruments: About $1600 - $4100. Expensive maintenance.
Aerosols and other insecticides (non fumigants)

• Generally waiting periods and ventilation before re-entry.
• Odors can linger.

• Dichlorvos (DDVP, Vapona) is an effective insecticide against stored product insects used in some parts of the world with gas-like vapor action and greater exposure hazards. A Draeger tube is available.
Equipment part numbers, and approximate cost reference

- Draeger Accuro Pump # 640000, about $450.00
- Draeger Tubes (boxes of 10)
  - Phosphine, extra low #8101611, about $100.00
  - Phosphine, low # 8103711, 0.1-4.0 ppm, about $80.00.
  - Phosphine, high #CH21201, 50-1000 ppm, about $85.00
  - Methyl bromide, #8101671, 0.5-30 ppm, about $150.00
  - Sulfuryl fluoride, box/5, #8103471, 1-5 ppm, about $160.00
  - Phosphoric acid, # 6728461, 0.05 ppm DDVP, about $150.00
- Draeger Pac 7000 PH3 Detector, 0-20 ppm, #8318974 about $650
Respiratory Protection

• Need a brand that matches a full face mask with cartridge availability for the toxic gas.

• Need cartridges rated specifically for phosphine, designated PH (do not confuse with P-100 for particulates).

• Cartridges often have ratings for multiple gases.

• Organic vapors (OV) may be another need.

• Normal service life for a cartridge is about 40 hours of use.

*Full Face Mask and air-purifying respirator.* Store equipment near where it is needed in clean condition. *Beware of expiration dates.*
Respiratory Protection Parts and Costs

- Draeger X-Plor 5500 mask
  #R55270, about $165.00
- Draeger Canister, Phosphine, for X-Plor
  #6737360, about $60.00
- Draeger Organic Vapor cartridges for X-Plor
  2 pk, #R6738024, about $12.00
Dermal Protection Suits and Gloves
Less specialized; easier to find sources.

• Tyvek disposable coverall with hood and zipper, case of 25, about $187.50, or $7.50 each (from IFC)
• Microflex safegrip gloves, box/50, about $17.00/box
Tips for purchasing safety equipment

- Multiple brands are available; Draeger is a good one with global sales and service. Look for a local distributor for sales and service.
- Fumigation product and supply companies may be easier sources to find for phosphine safety equipment.
- Reputable US companies might include: Cardinal Professional Products, Industrial Fumigant Co., Pestfog Sales, Univar and others.
- Export sales can be complicated. Consider having a traveler purchase in the US and carry the items when they visit.
Thank you!
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