


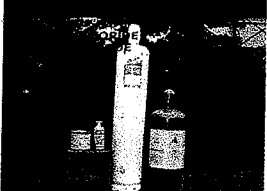
Fumigation... Workshop Basic Training



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Fumigants Available Today...


- Methyl Bromide
- Chloropicrin
- Sulfuryl Fluoride
- Carbon Dioxide
- Nitrogen
- Phosphine
 - Aluminum Phosphide
 - Magnesium Phosphide
 - Cylinderized Phosphine



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Many Dangers Exist...

- Handling Deadly Gases.
- Flammability Issues.
- High Pressure Hazards.
- Industry Settings.
- Heights, Ladders & Fall Protection.
- Confined Space Issues.
- Engulfment.
- Falling Objects.
- Heat
- Moving Transports
- Cryo-Burn
- Hazards associated with dangerous co-workers.
- More...



Farmer dies in grain bin.

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Many Dangers Exist...

- Food Safety Concerns
 - Product Contamination
- Structural Damage
 - Hydro-bromic Acid Gas
 - Fog-out
- Lost do to time schedules.
 - Unforeseen delays with weather
- Department of Transportation [DOT] issues.
 - Transporting Fumigants
 - Improper ventilation



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Environmental Dangers...



Getting Started:

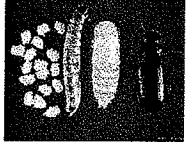
Fumigant selection should be based on:

- 1] Target Pest.
- 2] Commodity to be fumigated.
- 3] Type of structure.

Getting Started

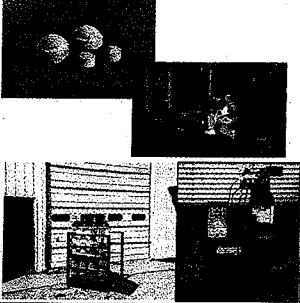
All fumigants:

- Are restricted use chemicals.
- Must be used with proper personal safety equipment.
- Are designed to kill hidden infestation.
- Kill all stages of insects.



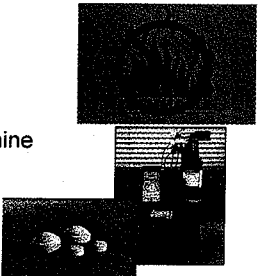
Focusing on phosphine – PH₃...

- Phosphine
 - Metal Phosphine
 - Aluminium Phosphide
 - Magnesium Phosphide
 - Cylinderized
 - ECO₂FUME
 - VAPORPH₃OS



Phosphine

- Flammability
 - Metal Phosphides
 - Cylinderized Phosphine
 - ECO₂FUME
 - VAPORPH₃OS



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Phosphine

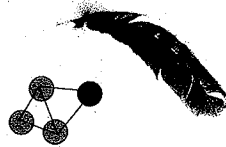
- Flammability
 - Enclose Fumigant
 - When wet.
 - 1.7% x volume
 - 17,000 PPM



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Phosphine

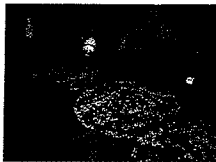
- Weight
 - 1.17 x Air
 - Colorless?
 - Odor – Ammonia or Carbide



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Metal Phosphide

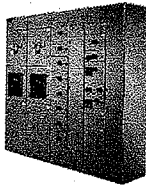
- Reacts with moisture in the air – Hydrolysis
- Phosphine gas is generated.
- Other gas released:
 - Carbon dioxide
 - Ammonia



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Metal Phosphide

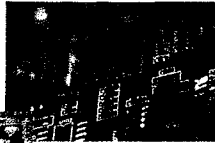
- Reacts with soft metals.



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Metal Phosphide

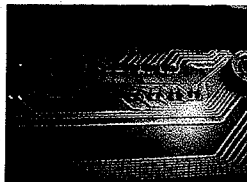
- Reacts with soft metals.



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Metal Phosphide

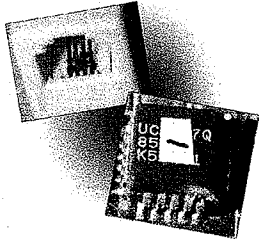
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Metal Phosphide

- Reacts with soft metals.



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Metal Phosphide

- Reacts with soft metals.



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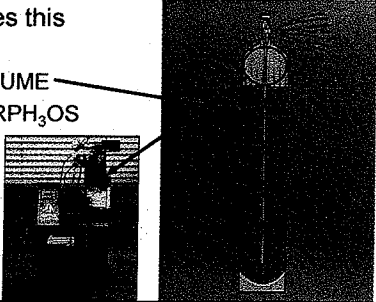
Metal Phosphide

- Remove:
 - Activated Charcoal
 - Live Plants
 - Animals and Fish
 - Brass Sprinkler Heads
 - Welding Rods
 - Film: Undeveloped film and video tapes.



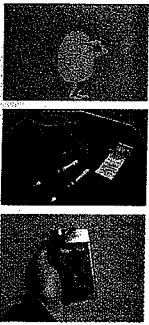
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- How does this react?
 - CO_2 FUME
 - $\text{VAPORPH}_3\text{OS}$



Phosphine

- Best detected by:
 - Smell?
 - Aluminum Phosphide
 - Magnesium Phosphide
 - Cylinderized Phosphide



Fumigation Safety Terminology

- Safety First!!!
 - PEL = Personal Exposure Levels
 - TWA = Time Weighted Average
 - TLV = Threshold Limit Value
 - STEL = Short Term Exposure Limits



Phosphine Limits...

PEL's for phosphine

- TWA = 0.3 PPM
- TLV = N/A [MBr = 5 PPM]
- STEL = 1.0 [for 20 minutes]



Phosphine

- Respiratory Protection






0.3-15ppm = Full face canister mask



Above 15ppm or unknown concentration = SCBA
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Dosage Calculation

- Phosphine
 - Tablet weight = 3 grams
 - Pellet weight = .6 grams



- 1 tablet weighs 3 grams and produces 1 gram of phosphine.
- 1 gram of phosphine = 25 PPM in 1,000 ft³

Dosage Calculation

- Phosphine
 - 1 gram of phosphine = 25 PPM in 1,000 ft³

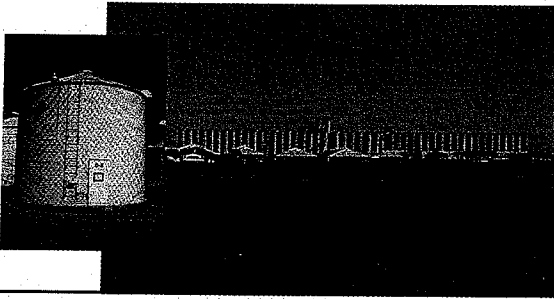
Time (Hours)	PH ₃ (PPM)	MgSP ₂ (PPM)	Cylinder H (PPM)	Cylinder L (PPM)
12	0	0	0	0
24	1400	1200	400	200
36	1000	800	400	200
48	600	400	400	200
60	400	200	400	200
72	200	100	400	200

Fumigating Ingredient Storage

- Flour bins
 - One Fumi-Cel per bag.
 - Nylon string
 - Colored ribbon
 - Retrieval system



Bulk Grain Storage

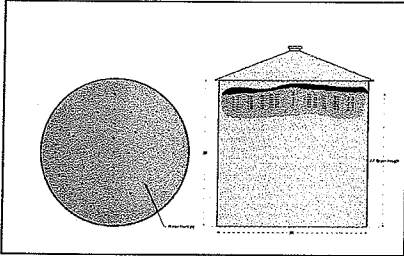


Bulk Grain Storage – Small Bins

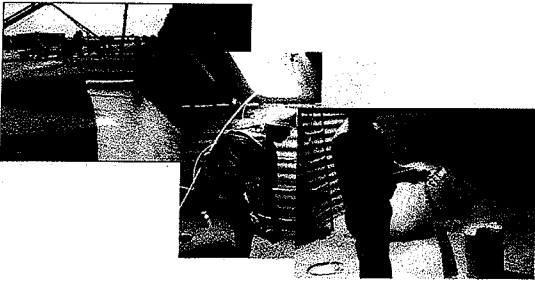
Phosphine is the best fumigant for penetration.



Bulk Grain Storage – Small Bins



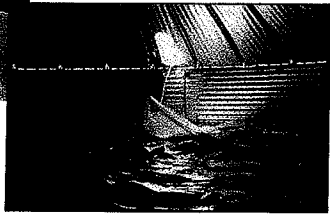
Bulk Grain Storage – Small Bins



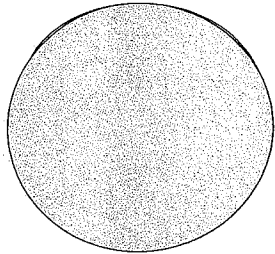
Bulk Grain Storage – Small Bins



Direct Addition



Bulk Grain Storage - Dispersion



Sealing Grain Bins

- CONFINED SPACE ATMOSPHERE
- HEIGHTS OF UP TO 100'
- GETTING MATERIALS TO THE TOP
- AERATION FANS
- BIN BASE
- UNLOADING SPOUTS, CONVEYORS, AND AUGERS



Bulk Grain Storage - Dispersion

