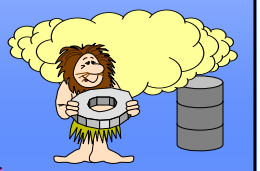
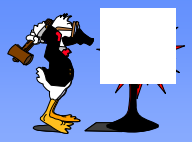
THE MATERIAL PRESENTED IN THIS MODULE IS INTENDED AS AN OVERVIEW. SPECIFIC INFORMATION ON CALIBRATION, OPERATION, AND INTERPRETATION OF RESULTS SHOULD BE OBTAINED FROM EQUIPMENT MANUFACTURERS.

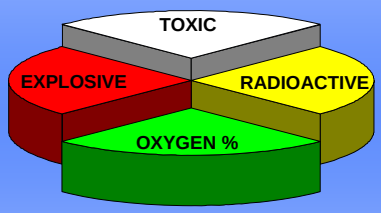
IDENTIFYING AIRBORNE CONTAMINANTS

- on-site use of direct-reading instruments
- laboratory analysis of air samples obtained by gas sampling bag, filter, sorbent, or wet-contaminant collection methods





DON'T OVERLOOK A PIECE

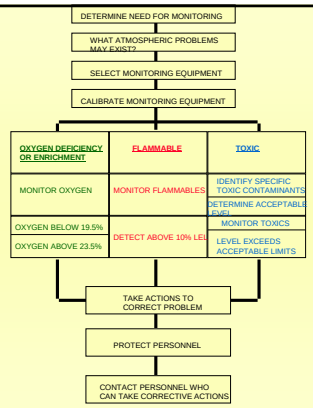


HAZARDOUS ATMOSPHERES

OBJECTIVES OF AIR MONITORING

- detect and quantify airborne contaminants
- assist in defining work zones
- define evacuation areas and control tactics
- ensure proper selection of work practices
- determine the level of worker protection
- document exposure for post-incident medical surveillance

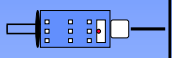
MONITORING TREE



GENERAL CONSIDERATIONS IN MONITORING

- **PURPOSE OF MONITORING EQUIPMENT**

Detect the presence of a hazard
Determine if material is dispersing or concentrating
Ensure responders have adequate protection
Determine if hazard is affecting surrounding areas
Ensure proper selection of work practices.



FACTORS INFLUENCING THE READING

INSTRUMENT FACTORS

Proper equipment operation
Instrument calibration & calibration checks
Equipment detection range
Device relative response (compared to calibration gas)
Response time
Inherent safety

NON-INSTRUMENT FACTORS

Nature of the hazard

Environmental conditions

Location of monitoring

ACTION LEVELS

Combust GASES	**20% LEL**
Confined Spaces	**10 % LEL**

OXYGEN **BELOW 19.5%**
ABOVE 23.5%

INTERPRET READINGS IN MORE THAN ONE WAY

Converting PPM to %

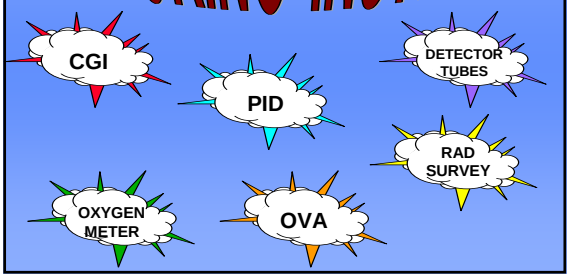
1 PPM = .0001%
10 PPM = .001%
100 PPM = .01%
1,000 PPM = .1%
10,000 PPM = 1%
100,000 PPM = 10%
1,000,000 PPM = 100%

Converting O_2 reading to PPM:

21% - 19.5%= 1.5%
1.5%=15,000 PPM of potential contaminant present

THE CONCENTRATION OF 1 ppm IS ROUGHLY EQUIVALENT TO ONE CUP OF A GAS IN A 32 FEET BY 33 FEET ROOM WITH AN 8 FOOT CEILING.

MONITORING INSTRUMENTS



TO BE USEFUL IN THE FIELD, AIR MONITORING INSTRUMENTS MUST BE:

PORTABLE

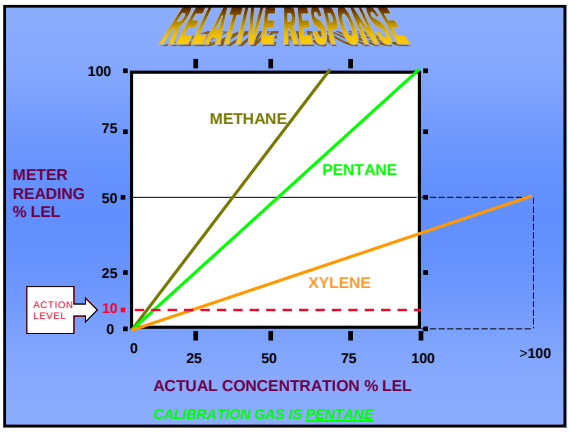
INHERENTLY SAFE

ABLE TO GENERATE RELIABLE & USEFUL RESULTS

SENSITIVE & SELECTIVE


PINEWALD FIRE CO.


MSA
PASSPORT
COMB
%O2
ppm CO
ppm H2S
Page
On/Off
Reset



CGI SUMMARY

- TYPE OF ATMOSPHERE: FLAMABLE
- METHOD OF DETECTION: CATALYTIC FILAMENT
- CALIBRATION STANDARD: METHANE, PENTANE, HEXANE
- CHECK STANDARD: METHANE, PENTANE, HEXANE
- RANGE OF DETECTION: PERCENTAGE CONCENTRATIONS
- RESPONSE TIME: DEPENDENT ON LENGTH OF SAMPLE LINE
- POWER SOURCE: BATTERY-POWERED
- OPERATING TEMPERATURES: DEPENDS
- KEY LIMITATIONS: AFFECTED BY LEAD, O_2 DEPENDENT

OXYGEN METER SUMMARY

- TYPE OF ATMOSPHERE: NORMAL
- METHOD OF DETECTION: CHEMICAL REACTION
- CALIBRATION STANDARD: OXYGEN
- CHECK STANDARD: ATMOSPHERIC OXYGEN (21%)
- RANGE OF DETECTION: 0 - 25%
- RESPONSE TIME: DEPENDS ON DIFFERENCE FROM 21%
- POWER SOURCE: VARIES
- OPERATING TEMPERATURES: ABOVE FREEZING
- KEY LIMITATIONS: CO_2 INTERFERES WITH METER

MEASUREMENT OF CONCENTRATION

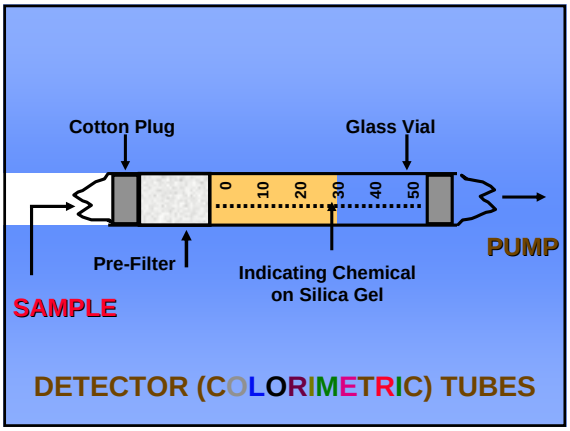
CONVERTING PERCENT (1/100) TO PPM (1/1,000,000)
ONE PART PER MILLION IS EQUAL TO 1/1,000,000

EXAMPLE:
LEAKING PROPANE TANK
FLAMMABLE RANGE FOR PROPANE (2.1% TO 9.5%)

LET'S SAY A READING ON THE CGI YIELDED 25% LEL
THIS WOULD INDICATE THE PRESENCE OF ONE-FOURTH THE CONCENTRATION OF PROPANE NEEDED TO READILY IGNITE.

THE CGI IS THEREFORE READING THAT 0.53% OF PROPANE EXISTS IN THE AIR. (2.1 ÷ 25 = .53)

BY CONVERTING PERCENT (1/100) TO PPM (1/1,000,000), THE CONCENTRATION CAN BE EXPRESSED AS 5,3000 PPM



WHAT TO DO IF A CGI IS NOT AVAILABLE...

A DETECTOR TUBE CAN BE USED TO MEASURE THE CONCENTRATION OF GASOLINE IN THE SEWER

EXAMPLE:

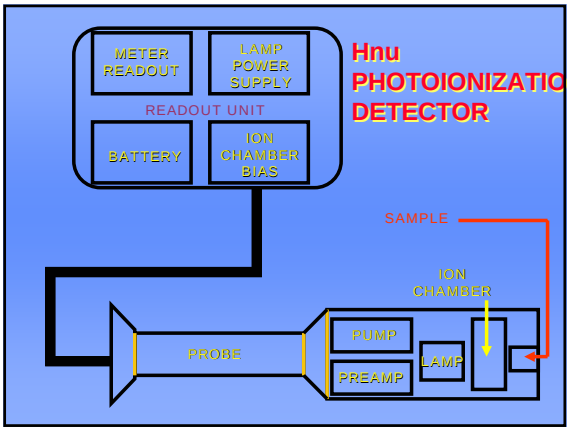
YOU ARE FACED WITH A GASOLINE CONTAMINATED SEWER

GASOLINE HAS AN LEL OF 1.4% OR 14,000 ppm

A TUBE READING OF 1,400 ppm REPRESENTS 10% OF THE LEL OF GASOLINE

DETECTOR TUBE SUMMARY

- TYPE OF ATMOSPHERE: INORGANIC/ORGANIC VAPORS/GAS
- METHOD OF DETECTION: CHEMICAL REACTIONS
- RANGE OF DETECTION: PPM TO PERCENT
- RESPONSE TIME: 50 SECONDS TO 30 MINUTES
- POWER SOURCE: NOT REQUIRED
- OPERATING TEMPERATURES: DEPENDS ON TUBE
- KEY LIMITATIONS: INTERFERENCES



PHOTOIONIZER SUMMARY

- TYPE OF ATMOSPHERE: ORGANIC VAPORS
- METHOD OF DETECTION: PHOTOIONIZATION
- CALIBRATION STANDARD: BENZENE, ISOBUTYLENE
- CHECK STANDARD: ISOBUTYLENE
- RANGE OF DETECTION: < 2,000 ppm
- RESPONSE TIME: 5 TO 30 SECONDS
- POWER SOURCE: LEAD ACID GEL OR LITHIUM BATTERY
- OPERATING TEMPERATURES: ABOVE FREEZING
- KEY LIMITATIONS: HIGH HUMIDITY, ONLY GASES WITH Ips BELOW THE LAMP eV CAPACITY WILL BE DETECTED

FLAME IONIZATION DETECTOR

TYPE OF ATMOSPHERE: ORGANIC VAPORS
METHOD OF DETECTION: FLAME IONIZATION
CALIBRATION STANDARD: METHANE
CHECK STANDARD: METHANE
RANGE OF DETECTION: UP TO 10,000 PPM METHANE
RESPONSE TIME: 5 TO 15 SECONDS
POWER SOURCE: LEAD ACID GEL BATTERY
OPERATING TEMPERATURES: ABOVE FREEZING
KEY LIMITATIONS: SUPPLY OF PURE FUEL IS NEEDED, NEEDS OXYGEN TO OPERATE