TAKING CARE OF MARY JANE'S WORKERS

James Lieberman

Industrial Hygiene and Occupation Safety for Marijuana Facilities

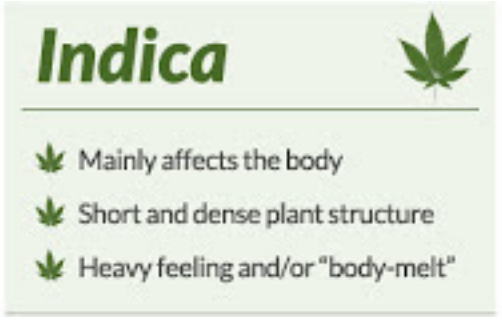
Marijuana

Evil Spell or Healing Herb

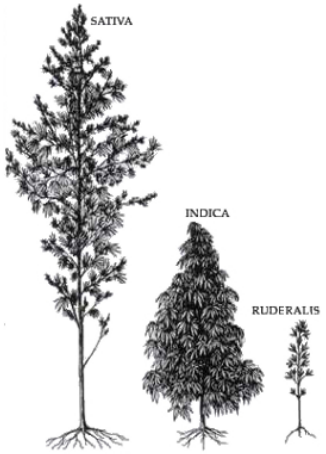
A Look at the History of Mans Relationship With Cannabis

The Plant and Its Properties

Cannabis sativa



Cannabis sativa L



The First Recorded Use

Imperial China 2727 BC

大麻

Nature's Medicine Salida

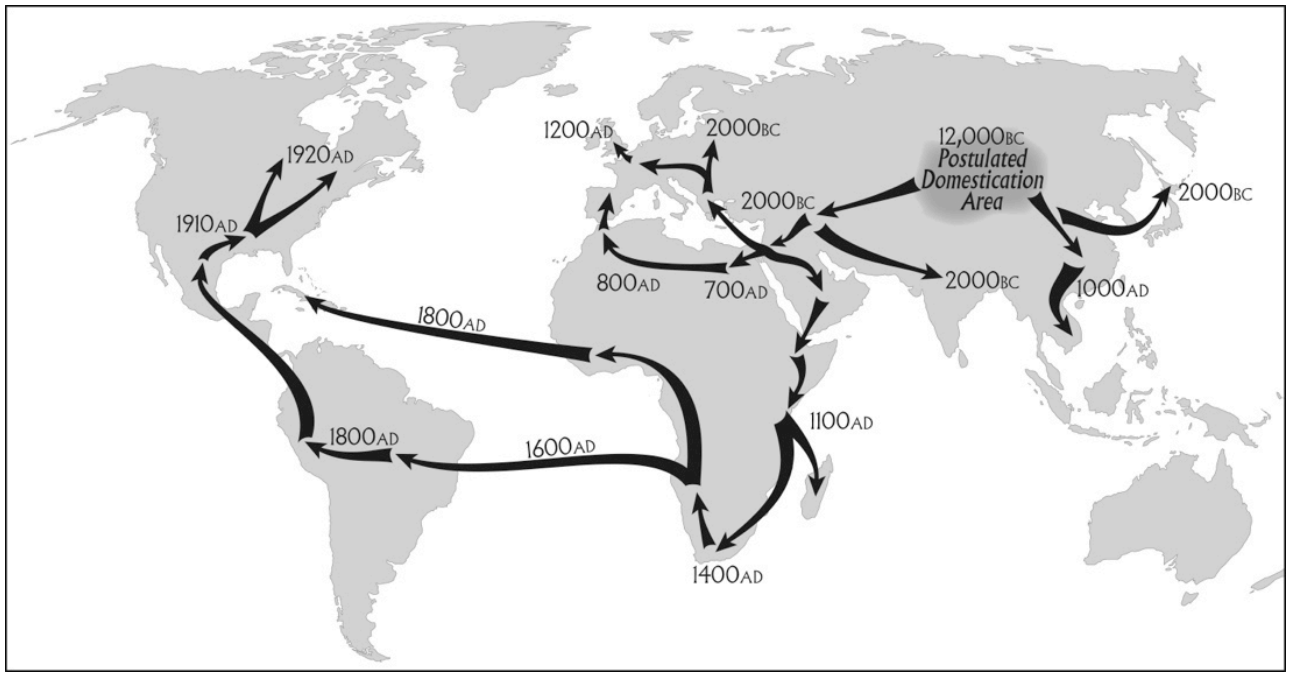
The Spread Of Cannabis

Most Ancient Empires knew about and used cannabis

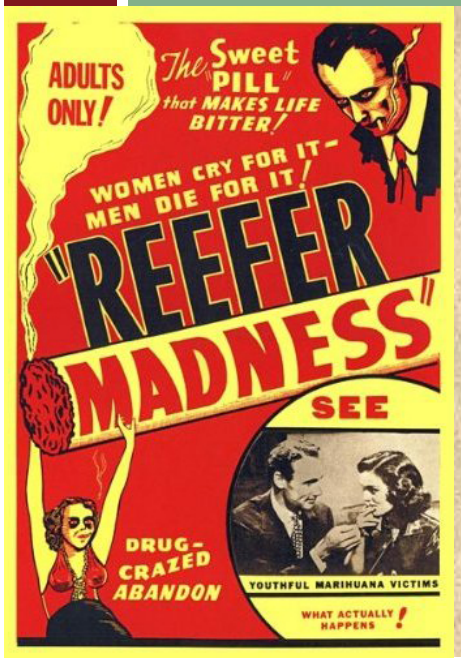
From Rome To America

Known for its many uses, cannabis was a commodity spread world wide by 1545

- Toothaches
- Child Birth
- Rope
- Paper
- Clothing
- Fibers

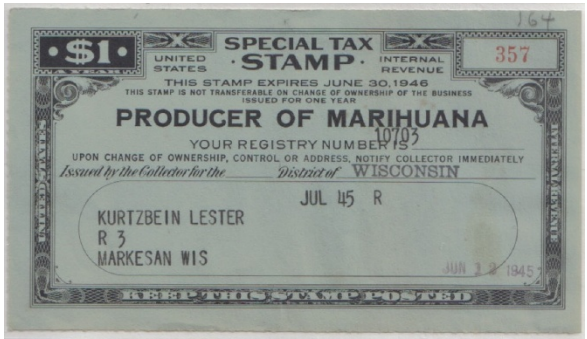


The Stigma Starts



Federal Bureau of Narcotics
Established 1930

The Marijuana Tax Act
of 1937



Possession Becomes a Felony

1950's-Mandatory Sentencing for Possession

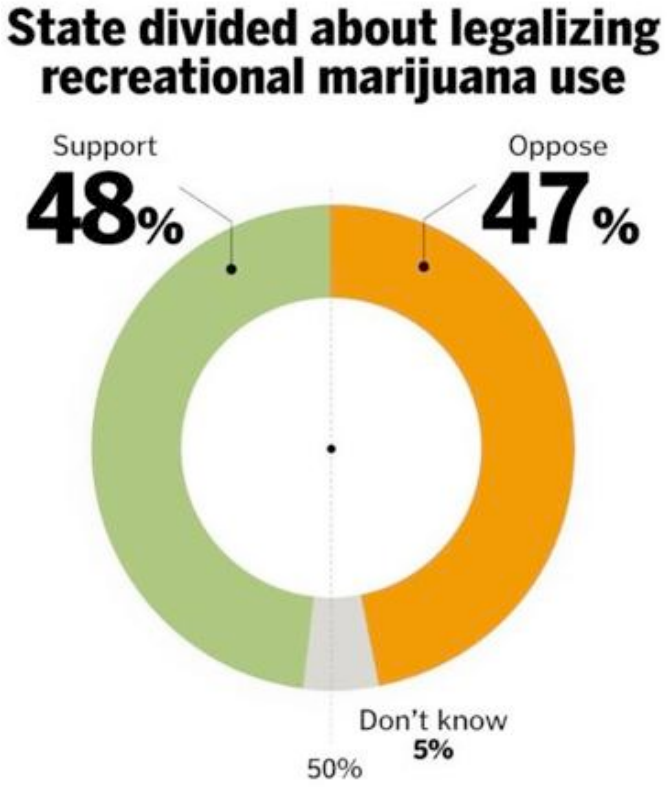
Cannabis schedule I drug under Controlled Substances Act

A New Task Force Forms

The Birth of the DEA in 1973

Up to 20 Years in Jail

States fight Back



44,816 people incarcerated for cannabis in 2004
- Not including 700,000+ locally incarcerated

<u>Legal in</u>
Alaska
Colorado
Oregon
Washington

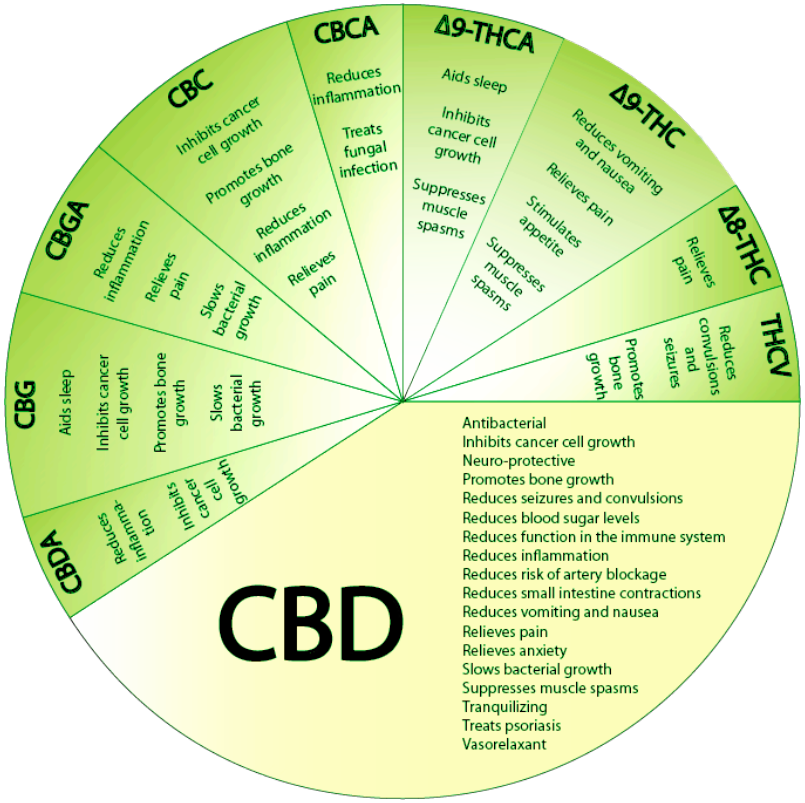
27 States + D.C. have legal MMJ

Medically Beneficial

A Gateway Drug?

The Endocannabinoid System

Inflammation
Glaucoma
Nausea
Pain



15/10/2014

Industrial Hygiene and Occupation Safety For Marijuana Facilities

Colorado Regulations: Why CIH's Needed

Industrial hygiene is dedicated to anticipating,
recognizing, evaluating
and controlling occupational hazards

We are responsible for protecting and enhancing heath and safety

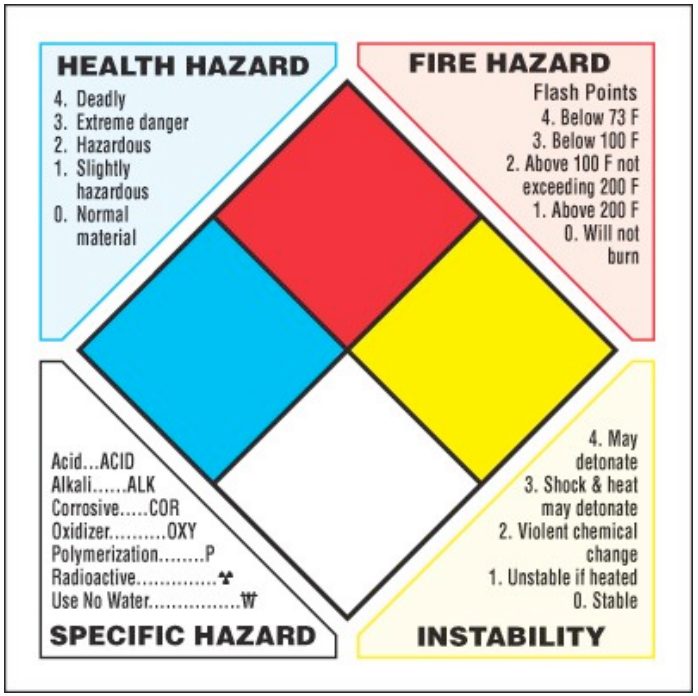
Process Safety Management Review

PSM: A basic tool for ID and controlling hazards from operations

Identifying:

1) Physical hazards

2) Chemical hazards



Anticipated Facility and Process Parameters

Query client to determine:

- Anticipated processes
- Equipment
- Throughput
- Chemicals
- Future expansion

Common Marijuana Operations

Cultivation

Marijuana Concentrate Production (MCP)

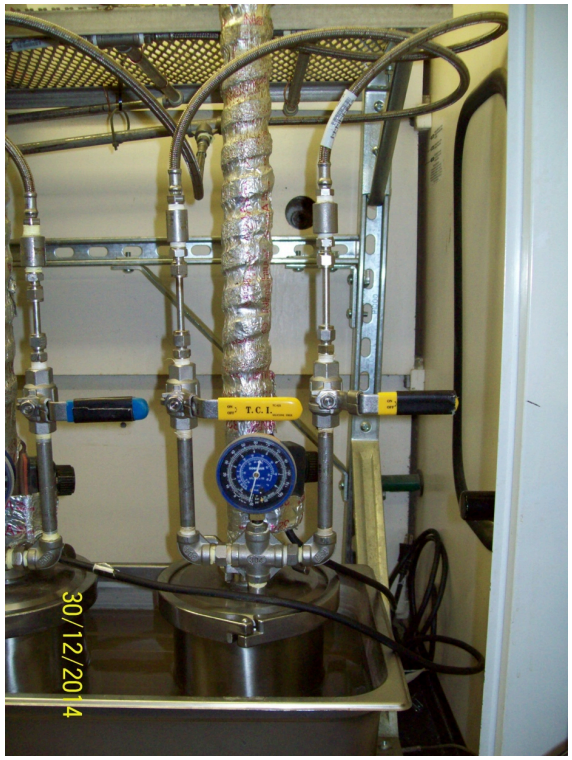
Manufactured Infused Products (MIP)

Hazards: Butane & Solvent Extraction

Flammability/Explosivity

Pressure

Exposure

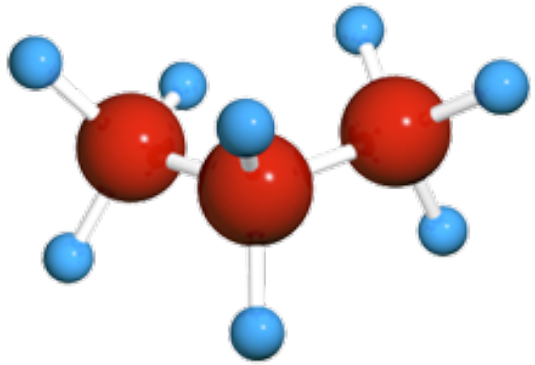


Physical Hazards

Flammability

LEL for common used solvents

Butane: 1.8%
Ethanol: 3.3%
Heptane: 1.1%
Hexane: 1.2%
Propane: 2.1%



Chemicals Used

DOT Hazard Class

- Flammable Liquid- 3
- Flammable Gas - 2.1
- Non-Flammable Gas

Non-Flammable Gas – CO_2

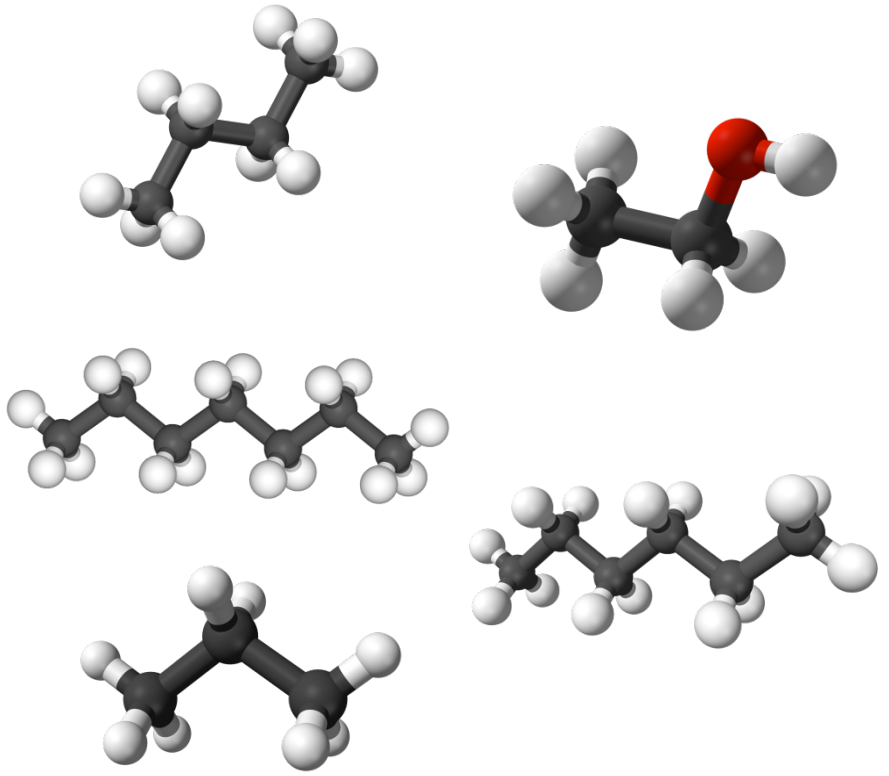
IDLH - 40,000 ppm

PEL/TLV - 5,000 ppm

Action Limit – 2,500

OEL - Common Solvents

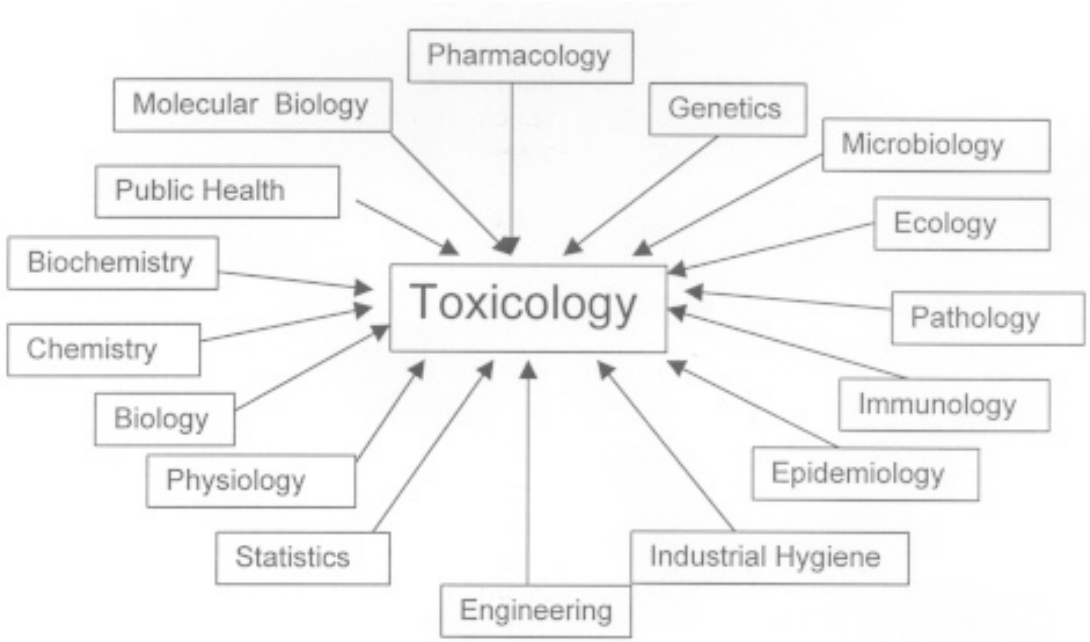
- Butane: N/A :1000
- Ethanol: 1,000
- Heptane: 500:400
- Hexane: 500:50
- Propane: 1,000:1,000



Toxicology

Basic principle of toxicology

The dose makes the poison!



Setting OEL for THC & Extract

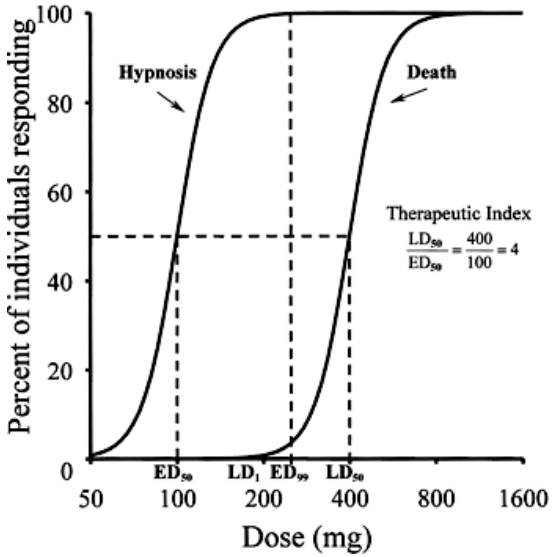
Measurements of Exposure

No Observed Effect Level (NOEL)

Lowest Observed Effect Level (LOEL)

Lethal Dose 50% (LD_{50})

Dose Effective 50% (DE_{50})



Therapeutic Index (TI) – Margin of safety for a drug – LD_{50}/DE_{50}

Oral OEL

Studies of THC psychotropic oral dose threshold

- First study: 0.1 to 0.2 mg/kg
- Second study: 0.2 to 0.3 mg/kg
- Third study: ~0.07 mg/kg = 5 mg dose for average adult

<u>Set target OEL to be NOEL/10</u>
Therefore 0.5 to 2 mg/day
1 mg/day average

Dermal Exposure

Very Conservative Assumptions:

- 10% dermal absorption
- Avoidance dose 5 mg
- Extract containing 80% cannabinoids

- Dermal occupational exposure avoidance dose:
  - (5 mg/0.10)/0.80 = 62.5 mg of extract

- Add Safety Factor of 10:
  - Dermal OEL =6.25 mg/day

Inhalation OEL

D = Absorbed dose in mg

C = Average exposure level concentration in mg/m^3 over time duration exposure

V_R = Pulmonary ventilation rate in m^3/min

K = Fraction absorbed

t = Exposure time in minutes

$C\ (mg/m_3) = D / (V^R * K * t)$

$C = 5 / (0.016 * 0.50 * 480)$

$C = 1.3\ mg/m^3$

Using safety factor of 10

$OEL = 0.13\ mg/m^3$

Average Dose from a "J"

Quantity: 0.5- 1.0 g/Joint

THC concentration: 15 %

Assumed: 50% inhaled vapor absorbed

Dose = 38 – 75 mg

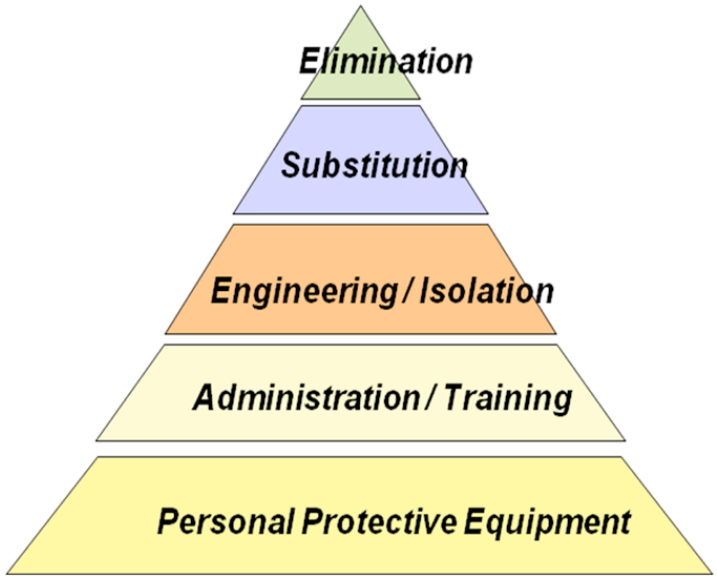
Hazard Controls

Engineering & administrative controls determined through:

1) Hazard Assessment

2) Process Safety Management Review

3) Exposure Assessment



Controls: Butane & Solvent Extraction

Containment

Ventilation

Storage

Procedures

PPE

Training

Controls for CO_2 Extraction

Good process layout

Dedicated room & ventilation

Safely directing relief exhaust

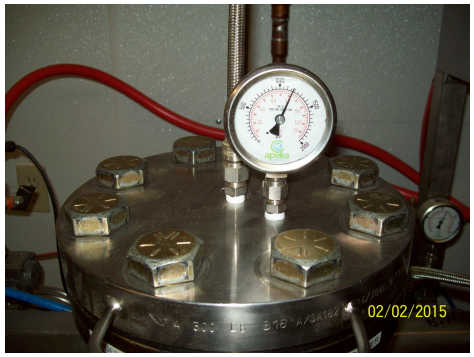
Gas alarm for high levels

Creation of operating procedures

Hazard, equipment, and operations training

Emergency action plans

Appropriate PPE



Thank You For Your Time

Any questions?