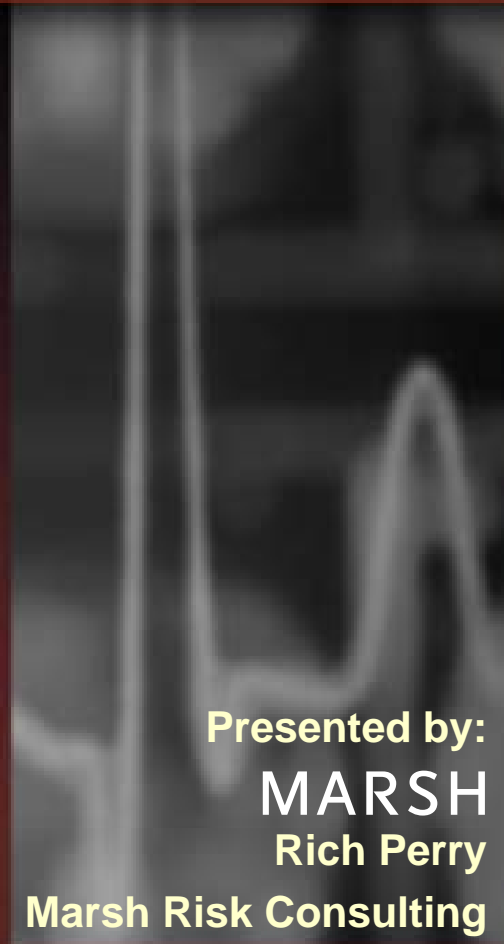


# Flammable and Combustible Liquids



Presented by:

**MARSH**

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# What's the Big Deal?

- Flammable and combustible liquids are easily ignited
- Ignite with explosive force
- Burn readily and give off twice the heat as paper or wood fire
- Common materials taken for granted or used carelessly



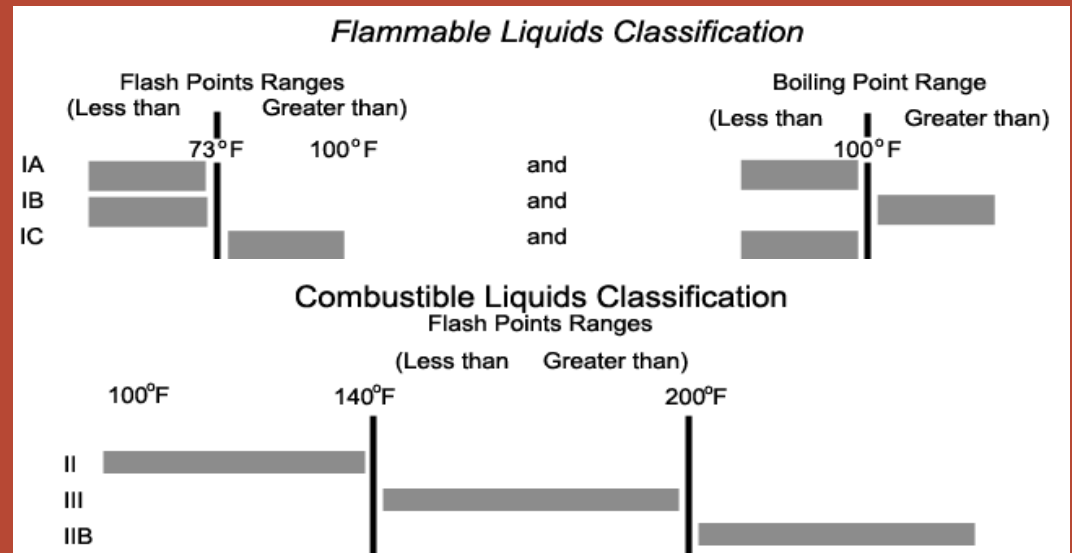
# Session Objectives

- You will be able to:
  - Identify a flammable liquid and a combustible liquid
  - Identify the hazards of flammable and combustible liquids and the types of controls to prevent their ignition
  - Follow the procedures to safely store, dispense, and handle these liquids



# Flammable Liquids

- Flammable—flashpoint below 100°F (37.8°C)
  - Isopropyl alcohol
  - Propane
  - Solvents such as acetone, MEK, paint thinner, varnish
  - Fuels such as gasoline
  - Aerosol cans



# Combustible Liquids

- Flashpoint at or above 100°F
  - Oil, kerosene
  - Greases and lubricants
  - Oil-based paints



# What's the Hazard?

- Flammable and combustible liquids vaporize and form flammable mixtures with air when:
  - Exposed to air (containers are left open)
  - Leaks or spills occur
  - Heated or aerosolized



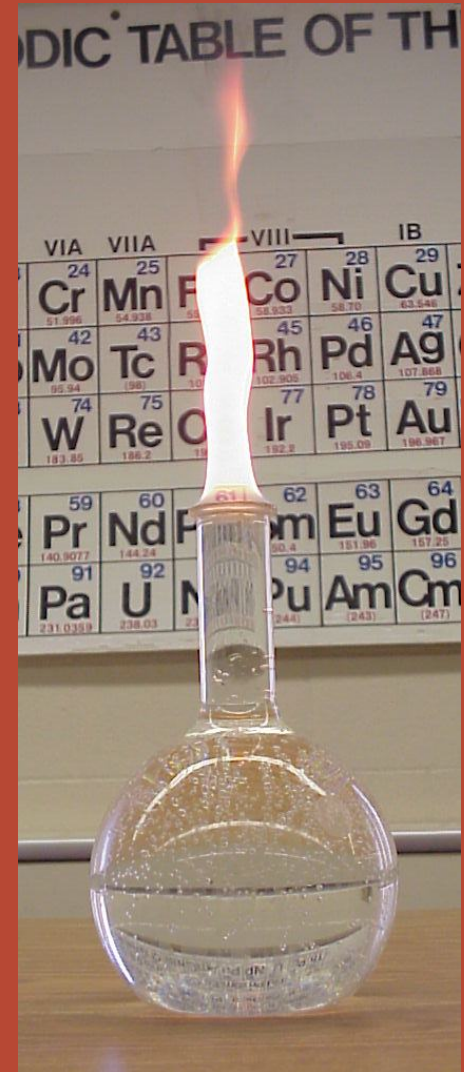
# Degree of Hazard Risk

- Determined by:
  - The flashpoint of the solvent
  - The vapor's concentration in the air
  - The presence of potential ignition sources
  - Remember—vapors burn or explode, not the liquid



# Flashpoint

- The lowest temperature at which a liquid gives off enough vapors at its surface to be ignited
- Low flashpoint = high flammability
- Flammable liquids flashpoint is  $< 100^{\circ}\text{F}$
- Combustible liquids flashpoint is  $\leq 100^{\circ}\text{F}$  and  $< 200^{\circ}\text{F}$





# Flammable Range

- Not all mixtures of fuel and air will burn
- In order to burn, the fuel/air ratio must be within the flammable range, between the:
  - Lower Explosive Limit (LEL)
  - Upper Explosive Limit (UEL)

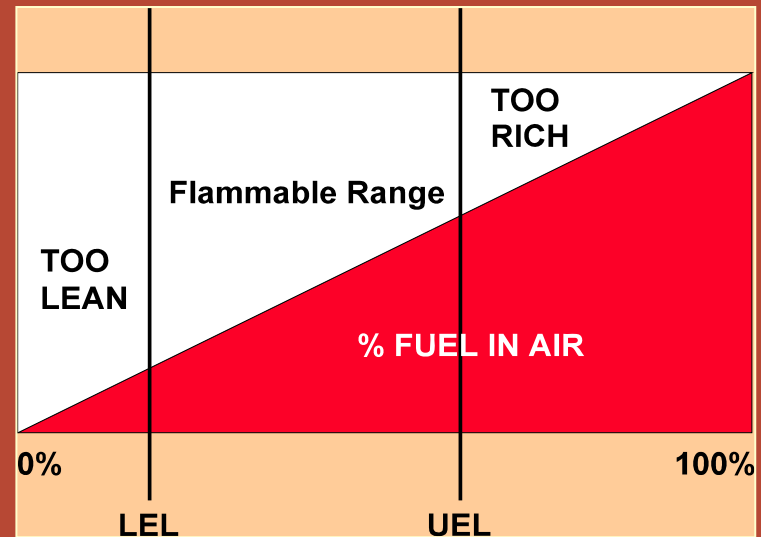


Image credit: Tom Ouimet

# Measuring Flammable and Combustible Vapors

- Real-time instruments read out in percent of LEL
- A reading of 25% LEL indicates the fuel-air mixture is 1/4 of the way to the lowest fuel concentration that can burn
- Never enter a >25% LEL atmosphere



# Sources of Ignition

- Some potential sources of ignition are:
  - Lit cigarettes
  - Welding and cutting
  - Static electricity
- Flammable vapors can travel some distance to a source of ignition and flash back



# Sources of Ignition (cont.)

- Sparks from machinery
- Internal combustion engines
- Hot surfaces or machinery
- Electrical equipment



# Warning Signs and Labels

- Signs identify areas where flammable or combustible liquids are stored and used
- Individual containers are labeled:
  - DOT label
  - HMIS® labels
  - National Fire Protection Association (NFPA) labels



# Read Fine Print on Labels

- Look for special warnings:
  - Special handling or storage instructions
  - Inhalation hazards - many flammable solvents are hazardous to inhale
  - Recommend personal protective equipment

**HAZARDOUS WASTE**  
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

Generator: \_\_\_\_\_

EPA#: \_\_\_\_\_

Person to contact regarding information on tag:  
Name \_\_\_\_\_ Phone \_\_\_\_\_  
Dept. \_\_\_\_\_ Dept. # \_\_\_\_\_

Beginning fill date \_\_\_\_\_

Chemical Name(s) — if a mixture, list all chemical and concentration / volume%. Use full chemical name (no formulas or abbreviations).  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Physical State: Gas \_\_\_\_\_ Liquid \_\_\_\_\_ Sludge \_\_\_\_\_ Solid \_\_\_\_\_  
Hazardous Category: Flammable \_\_\_\_\_ Air/Water Reactive \_\_\_\_\_  
Toxic \_\_\_\_\_ Corrosive pH \_\_\_\_\_ Oxidizer \_\_\_\_\_

Accumulation Start Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Waste Code \_\_\_\_\_ Bar Code # \_\_\_\_\_

Employee Name \_\_\_\_\_

**EHS** 7172

# MSDS—A Primary Source of Chemical Information

- Special storage and handling precautions
- Dispensing techniques
- Flammability limits
- Reactivity hazards
- Fire-fighting protective equipment and instructions
- Hazardous combustion products

Material Safety Data Sheet		Date Last Revised
<b>I. General Information</b>		
Chemical Name & Synonyms	Trade Name & Synonyms	
Chemical Family	Formula	
Proper DOT Shipping Name	DOT Hazard Classification	
Manufacturer	Manufacturer's Phone Number	
Manufacturer's Address	Chemtrec Phone Number	
<b>II. Ingredients</b>		
Principal Hazardous Components	Percent	Threshold Limit Value (units)
<b>III. Physical Data</b>		
Boiling Point (°F)	Specific Gravity (H <sub>2</sub> O = 1)	
Vapor Pressure (mm Hg.)	Percent Volatile By Volume (%)	
Vapor Density (Air = 1)	Evaporation Rate (_____ = 1)	
Solubility in Water	pH	
Appearance & Odor		
<b>IV. Fire &amp; Explosion Hazard Data</b>		
Flash Point (Test Method)	Auto Ignition Temperature	
Flammable Limits	LEL	UEL
Extinguishing Media		
Special Fire Fighting Procedures		
Unusual Fire & Explosion Hazards		

Image credit: Tom Ouimet

# Prevent Fire and Explosion

- Eliminate ignition sources - prevent flames, sparks, and arcs
- Eliminate static electricity - ground or bond containers
- Minimize vapor concentrations



Image credit: Tom Ouimet



# Use Safe Storage Practices

- No open flames, smoking, sparks, or welding
- Keep away from sunlight
- Ventilate well
- Store oxidizers separately
- Use secondary containment
- Return to storage immediately after use



# Dispense Flammable Liquids Safely

- Ensure primary container or drum is grounded and bonded
- Transfer liquid with a hand pump or grounded, explosion-proof motorized pump
- Use spark-proof tools
- Perform transfer in well vented area away from all ignition sources



Automatic hazardous materials dispenser

# Handle Liquids and Containers Safely

- Use only approved containers—never use glass
- Close containers when not in use
- Label containers properly
- Take only the amount needed for the job and use with adequate ventilation



# Handle Liquids and Materials Safely

- Put rags soaked with flammable liquids in approved, closed containers
- Avoid mixing flammable and combustible solvents
- Do not weld or torch empty containers



# Personal Protective Equipment (PPE)

- Eye—goggles for splash hazard
- Hand—solvent-resistant chemical protective gloves
- Body—chemical protective clothing such as an apron or coveralls
- Lungs—respirator



# Common First-Aid Procedures

- Inhale vapors—move to fresh air
- Splash liquid to the face or eyes—flush the eyes/face for 15 minutes
- Splash to skin—wash skin with soap and water
- Ingest liquid—consult the MSDS, and call a doctor



# Fire Response

- Remove yourself from danger
- Notify others, trigger the alarm
- Use a Type B fire extinguisher
- Call for help
- Continually evaluate for evacuation
- Don't fight structural fires yourself



# Spill Response

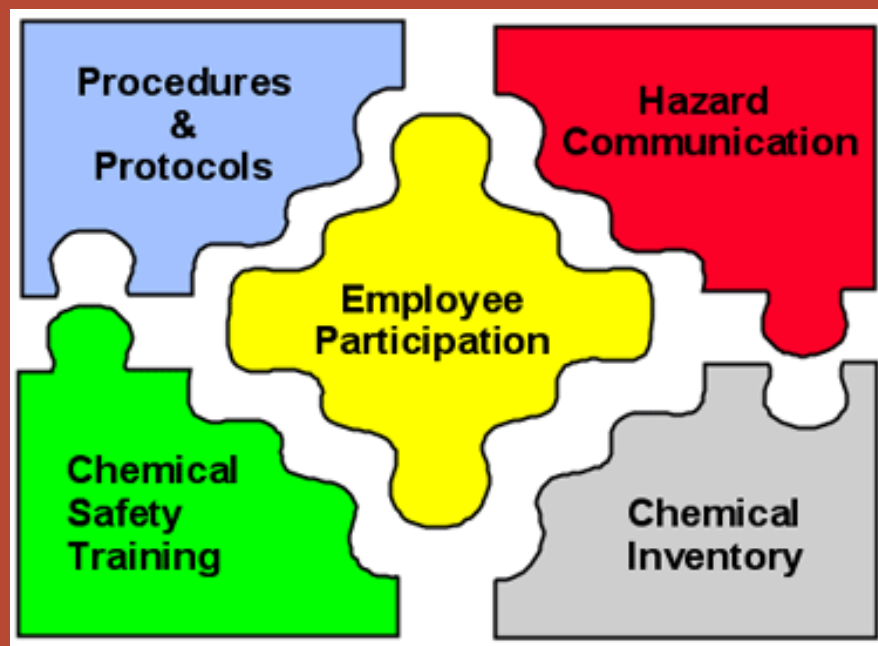
- Report all spills immediately and clean up small spills
- Large spills require a specialized response team
- Eliminate ignition sources
- Evacuate the area
- Help clean up only if properly trained





# Key Things to Remember

- Flammable and combustible liquids can ignite with explosive force
- Keep away from ignition sources
- Follow proper storage, dispensing, and handling procedures
- Use only approved containers that are properly labeled.
- Review labels and MSDSs for additional information



# Flammable and Combustible Liquids

*Questions or Comments?*

