Flammable and Combustible Liquids

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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 $<100^\circ F$
- Combustible liquids flashpoint is $\leq 100^\circ F$ and $<200^\circ F$
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)
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
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
Prevent Fire and Explosion

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