



What are Flammable liquids?

Two people dead, 89 injured. Millions of dollars in damage to a factory, and more than 160 buildings damaged or destroyed in the surrounding neighborhood.

The fire and explosion that caused this destruction are an example of what can go wrong when flammable liquids are present. The cause of the blast? Vapors from a highly flammable cleaning solvent leaked from a chemical reactor and ignited.

Some incidents involving flammable materials turn out to be relatively minor. However, all too often they are not easily contained, and the costs can be enormous, both in terms of property damage and the costs on which you can place no price tag — human lives.

In a highly industrialized state like Ohio, there is significant potential for explosions, if chemical process and storage safety rules are not strictly observed. Improper storage and handling of flammable chemicals, and failure to recognize and control ignition sources, have accounted for many of the catastrophic accidents involving flammable liquid manufacturing.

Statistics have indicated that more than 21 percent of industrial fires and 15 percent of office fires start with the ignition of a flammable or combustible liquid.

Contributing factors might include:

- Lack of a flammable liquid safety program;
- Improper container storage;
- No storage limits;
- Inadequate employee training, including fire-response techniques;
- Inadequate bonding and grounding procedures;
- Lack of interaction with local emergency management agencies (fire, emergency medical service, etc.);

- No preventive maintenance programs for emergency equipment and devices;
- No procedures to control ignition sources during maintenance and contractor activities;
- No established hot work procedure;
- No employee smoking policy.

You can prevent flammable liquid fires through employee education, safe work practices, and use of proper equipment and materials.

What are flammables?

A combustible substance is one that catches fire and burns easily; a flammable substance is one that continues to burn even after the ignition source is removed.

Determine the flammability of a combustible liquid by:

- Flash point — the lowest temperature at which vapours or gases will ignite;
- Fire point — the temperature at which a combustible liquid gives off vapors;
- Minimum concentration of extinguishing agents needed to extinguish the fire;
- Combustion rate;
- Temperature increase during combustion.

Flammable liquids burn with intensity. Few materials can generate as many British thermal units (BTUs) per pound as flammable liquids. This accounts for the rapid heat buildup and how fast the fire spreads.

It is extremely important for employees to realize that the liquid itself does not burn, but its vapors, which are invisible and generally heavier than air. The vapors settle to the floor and are moved by air flow. Always consult the material safety data sheet (MSDS) provided by the manufacturer to determine the flammability of a particular liquid.

Potential ignition sources

Employees need to know the various sources that might ignite flammable liquid vapors. They include, but are not limited to:

- Open flames;
- Electrical switches;
- Open motors;
- Static electricity;
- Friction and mechanical sparks;
- Smoking;
- Heat guns;
- Cutting and welding;
- Radiant heat.

Ohio employers must implement employee-awareness programs that address these types of hazards. These programs must be a part of the overall safety process of employee training and education.

Inventory control

Proper inventory control, reduction in the volume of chemicals in storage and in the work area, and disposal of unused, outdated or waste materials should be elements of any flammable liquid fire-prevention program.

Standard operating procedures should limit the amounts of any given flammable liquids stored on-site and in the work area. You can develop storage strategies by considering daily usage requirements, storage capacity and delivery time.

Ultimately, this will eliminate and reduce surplus flammable liquids stored on-site. Efficient communication is important. However, to ensure day-to-day operations are not hindered by a lack of raw materials.

Large container storage

You may further reduce or eliminate the potential for fires by following a strict policy of prudent storage and handling procedures. As much as possible, remove potential fire hazards from the main operation. Each facility should review its layout and designate a storage area.

Keep a storage area for 55-gallon drums and other large containers of chemicals, if possible, separate from the main facility. If this is not possible, separate the storage area from the main facility, at a minimum, by a two-hour fire wall equipped with

one and one-half-hour fire doors. Dike this storage area. Make sure floor drains do not share the common sanitary storm drain.

Additional protection should include automatic or manual alarms and a fire-suppression system such as a sprinkler system. Design storage areas to prevent entry by unauthorized persons.

The Occupational Safety and Health Administration (OSHA) recommends storing large containers on pallets, rather than directly on the floor. For greater stability and easier access to the products, if storing containers several levels high, store them on racks instead of stacking them on top of other containers.

OSHA requires, however, that no containers be within 3 feet of overhead beams and fixtures. Aisles must also be at least 3 feet wide, to allow greater access for fire equipment.

Do not allow smoking or open flame in chemical storage areas.

Storing smaller quantities

Store smaller containers of flammable liquids — paint spray cans, thinners and solvents, for example — in approved cabinets.

Storage cabinets must be fire resistant and visibly marked “Flammable — Keep Fire Away.” Lock cabinet to prevent unauthorized entry.

Practice good housekeeping, with regular inspections, to prevent spill hazards.

Proper handling

Only trained, authorized employees should handle and dispense flammable materials. You must label and design containers properly for flammable liquids and equip them with flame arrestors.

Grounding

Always use proper grounding techniques both in the storage area and during dispensing activities. Consult the facility electrician or an electrical engineer for an approved grounding program.

Ventilation

Incorporate general exhaust ventilation for storage locations housed inside the facility. The exhaust system should include low-level venting, approximately 12 inches above floor level, since flammable vapors are heavier than air. OSHA standard 1910.106 requires six room-air changes per hour.

Fire response

Develop an emergency fire plan for each facility that includes employee training in response procedures, so employees know the appropriate action to take if a fire occurs.

In all cases, give local responding agencies an annual tour to familiarize them with the layout of the facility, storage areas, fixed fire-suppression systems and water supply.

Education and training

Employee education and training is an integral part of the safety process. Recognition and control of flammable liquids will complement the operation of any facility.

The educational portion of a company's flammable liquid control program should cover:

- Identification and hazards of specific flammable liquids;
- Labeling requirements;
- Storage and control methods;
- Spill containment, cleanup and disposal techniques;
- Bonding and grounding requirements;
- Dispensing and handling procedures;
- Housekeeping requirements;
- Fire alarm and suppression systems;
- Security, including outside visitor and contractor control;
- Warning sign requirements;
- Personal protective equipment;
- Emergency response procedures.

Provide employee training programs with instructions for handling flammable liquids for every newly hired worker. An ongoing employee training program should be part of the safety process when flammable liquid-handling equipment or procedures are changed.

Decreasing the danger

Flammable liquids are a manageable hazard. Establishing an effective control program is possible as long as it is recognized as a part of the management control process.

For more information on the practices outlined in this guide, refer to OSHA's hazard communication standard, 29 CFR 1910.1200. Employers also should refer to the OSHA flammable liquids standard, 1910.106, for more help in setting up a flammable liquids safety program.