



Flammable Gas and Vapor Hazards in the Foundry Industry

Safety and Health Factsheet

This fact sheet covers the most common fire and explosion hazards from flammable gases and vapors in foundries. It does not cover the most frequent cause of explosions in foundries -- molten metal and water. Nor does it cover other health and safety hazards in foundries.

A vapor is a gas that results when a liquid evaporates. Foundries use a variety of flammable gases and liquids, ranging from natural gas in ladle pre-heaters to amines and other chemicals used in coremaking. It is easy to become complacent about these hazards. But many foundry chemicals are highly dangerous if released. Explosive mixtures can be formed by as little as one percent of a flammable gas or vapor in the air. At that point, an explosion only needs a spark or a flame from arcing electrical equipment, open flames, molten metal, grinders, a tool striking metal, static, or any other cause.

This factsheet lists the most common trouble spots. However, every foundry is different, and yours may contain fire and explosion hazards not mentioned here. While the company bears the ultimate responsibility for safety in the plant, the union safety and health committee can help make sure they identify and fix the hazards. The best way to do that is to inspect every area where a problem could occur. Read the material safety data sheets for chemicals used in the operation. Check out the written procedures for doing each job safely. Get a copy of the safety literature provided by the equipment suppliers. Above all, talk to the people doing each job. Ask about routine hazards, and those that might occur only on the night shift or when something breaks. Ask what could go wrong in each area. This factsheet can be a guide, but it is no substitute for your own knowledge and judgement, and that of your co-workers.

Melting and Pouring

Investigate the supply of fuel to all fuel-burning equipment, especially:

- Ladle, slag pot, and scrap pre-heaters
- Personal gas heaters
- Portable gas torches used for pre-heating or other purposes

Make sure that all fuel lines and valves are designed for the fuel they carry. (Some foundries have been caught using water hoses and valves for gas, a very dangerous practice.) Make sure all gas-fired equipment is protected with a regulator and automatic shut-off valve. Make sure the lines are guarded against being cut or broken by mobile equipment. Make sure that the equipment uses the fuel it was designed for. Although it is not the subject of this factsheet, this would be a good time to check for the possibility of an explosion caused by molten metal and water.

Molding and Core Making

In some cases, Class I flammable liquids or gases (the most dangerous ones) are used in this process. Two of the most common are dimethylethylamine (DMEA), and triethylamine (TEA). Make sure there is a material safety data sheet (MSDS) for every chemical. Study the MSDSs carefully. As in the melting and pouring area, look at equipment using natural gas, LPG, kerosene, and other fuels. It is especially important to check:

- Gas-fired hot box core or molding machines
- Cold box core machines
- Personal gas heaters

Check the equipment for potential leaks. The amines listed above have a strong fishy smell, but other core making chemicals are odorless. Look at the entire system, starting from the way the chemicals are received into the plant, to the lines for getting the chemicals into molds and cores, to the handling of used containers. Ask workers in the area about past leaks. Some of these chemicals are toxic, so leaks too small to cause an explosion could cause health problems.

Finishing and Heat Treating

Most foundries have finishing and heat treating facilities, using flammable gases and liquids. It is especially important to check:

- Fuel gases used in welding, cutting, and brazing
- Heat treating furnaces
- Portable gas torches used for pre-heating
- Fuel gases used for mobile equipment, like fork trucks

Be sure to look at how the fuels are received and stored, as well as how they are used.

Pattern/Wood Working Shops

Numerous flammable liquids are used in these areas, some of them Class I. Wood and plastic dust can also be explosive if suspended in the air. Be sure to check:

- Wood and plastic dust from sanding and grinding
- Paints, thinners, lacquers and shellacs used to cover patterns and other surfaces
- Ventilation systems carrying dust, to ensure they are kept clean, and have spark arrestors
- Personal gas heaters
- Heat-producing portable tools

Shipping and Receiving

Most hazardous materials used in the plant come through these areas. You should carefully evaluate how flammable and combustible material is received, shipped, and stored. Be sure to include:

- Flammable liquids and gases, including fuel gases in cylinders
- Flammable solids
- Personal gas heaters
- Oxygen cylinders. Although oxygen is not flammable, it will greatly accelerate combustion.

Maintenance Areas

These areas also contain fire and explosion hazards. Check the general housekeeping, and the storage and use of:

- Grease, oil, solvents, and flammable liquids
- Fuel gases in cylinders used in welding, cutting, and brazing
- Personal gas heaters
- Portable gas torches used for pre-heating

Metallurgical Labs

In addition to the usual hazards of flammable liquids and gases, met labs also contain chemicals like strong acids, which can react violently with flammable liquids to cause a fire or explosion. Be sure to look for:

- Flammable gases, liquids, and solids
- Reactive chemicals such as acids or corrosives
- Bunsen burners and other heating devices
- Personal gas heaters

Other

- Calcium carbide is sometimes used to produce ductile iron. When exposed to water or moisture, it will produce explosive acetylene gas. Check the calcium carbide storage and use.

General

Keep in mind that many flammable gases and vapors are heavier than air and will accumulate in low-lying areas such as cellars, basements and pits. One exception is hydrogen, which is lighter than air and has a tendency to rise. Flammable gases and vapors will ride the air currents. When the gas or vapor finds a spark or flame, it will flash back to its source.

A good preventative maintenance program is essential for all gas or liquid-fired equipment. All equipment that could cause a fire or explosion should be included in a regular inspection, maintenance, and repair program. In addition, the safety and health committee should include this equipment on their regular safety tours.

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(Updated, 3/24/00)*

