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Hot work on small tanks and drums





Fire and explosion

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Hot work is any process that generates flames, sparks or heat. It includes welding, cutting, grinding and sawing.

Flammable liquids and vapours such as petrol, diesel, fuel oil, paints, solvents, glue, lacquer and cleaning agents are found in many places of work. If a welding torch or powered cutter is used on a tank or drum containing flammable material (solid, liquid or vapour), the tank or drum can explode violently.

People have been killed or seriously injured by such explosions. Tanks and drums that seem to be 'empty' usually still have residues in the bottom, in seams and other crevices. Just a teaspoon of petrol in a drum can be enough to cause an explosion, when heated and turned into vapour.

Risk assessment

Employers are legally required to assess the risks in the workplace and take all reasonably practicable precautions to ensure the safety of workers and others who could be affected.

Before carrying out any hot work, a careful assessment of the risks should be made. Other safer options should be considered. These include:

- * using cold cutting or cold repair techniques; and
- * replacing rather than repairing.

If hot work is necessary, the risks should be avoided by using a specialist company or reduced by using methods such as gas-freeing, cleaning or inerting (see page 8) before hot working.

An operator was badly injured when a cylindrical fuel storage tank exploded. He had been using an oxy/propane torch to cut up the tank. It exploded with such pressure that one end flew over a fence into the premises next door.

Permit-to-work

Many companies operate a written permit system for hot work. The permit details the work to be carried out, how and when it is to be done and the precautions to be taken. A written permit system is likely to result in a higher standard of care and supervision. The system should also apply to contractors and subcontractors.

Hot work should not be carried out unless it is authorised and properly supervised by an experienced manager or supervisor who has knowledge of the work to be carried out, the risks involved and the precautions to be taken.

Training

Drums, tanks and other containers should not be repaired or cut up unless the operator has received adequate training in the risks involved and the precautions to be taken.

Alternative methods

Cold cutting and cold repair methods should be used where practicable.

Cold cutting methods include the use of hydraulic shears or cutters and pneumatic chisels. Less common techniques include abrasive water-jetting and the use of pneumatic hacksaws. Cold repair methods involve the use of materials such as epoxy resins and fibreglass to seal cracks and holes.

Even cold cutting can generate some heat and is not completely without risk. Cooling water can be applied to the area being cut but it is advisable to clean out the container first (see next section on 'Preparing tanks and drums for hot work').

If a tank is being cut up, it is often advisable to try and remove all or part of the top using cold cutting methods. This will allow the inside to be inspected and will also provide some pressure relief.

A risk assessment specified the use of a pneumatic chisel to remove the top of a drum that had contained engine oil. The operator decided it would be quicker to use a flame cutter. The oil residues in the drum vaporised and ignited. The drum exploded and the operator was seriously injured by the drum lid.

Preparing tanks and drums for hot work

This section gives general advice on the preparation of tanks and drums for hot work. All the operations mentioned have associated health and environmental hazards and may require specific skills, knowledge and equipment. More detailed guidance is available in Guidance Note CS15 *Cleaning and gas-freeing of tanks containing flammable residues* (see end of leaflet). Use of a specialist company may be advisable.

The preparation of the tank or drum should be considered as part of the risk assessment and control measures should be identified.

Isolation

Tanks should be isolated from other equipment, preferably by removing pipe sections. If possible, disconnect small tanks and remove them to a safe place. Do not rely on isolation valves; even small leaks can have serious consequences.

Emptying

The tank or drum should be emptied by pumping or draining the liquid into a suitable container. The residues should be disposed of in line with environmental requirements and not tipped into drains, sewers or water courses.

Cleaning

In most cases, cleaning will be necessary. Cleaning methods include:

- * washing or jetting using water or detergent solutions;
- * steam cleaning; and
- * solvent washing/jetting.

Control measures will be needed to ensure that the cleaning operations are carried out safely.

Gas-freeing

Vapours and other volatile material can sometimes be removed by blowing air or steam through the tank. This is termed 'gas-freeing'. The vapour concentration should be monitored using a gas detector.

Gas-freeing, on its own, is rarely adequate, as most tanks and drums will still contain liquid or solid residues trapped in seams and crevices. A gas detector may not detect these residues but they may still be capable of producing flammable vapours when heated by hot-work operations.

A worker used a drum to support the container he was cutting up. The drum exploded and he was badly burned. In a similar incident, a worker sat on a drum while carrying out hot work. The drum exploded and he received severe burns.

Inspection

Inspecting the inside of a tank or drum that has limited openings is difficult. Mirrors and torches can be used, but any light used inside the tank must be 'flameproof', ie designed for use in flammable atmospheres. Never assume that a tank is clean; always inspect it carefully.

A gas detector or explosimeter can be used to check for vapour, but it needs care and training to be used safely. It will not detect solid material or non-volatile liquids.

Inerting

Another way to reduce the risk of an explosion is to replace the air in the tank or drum by filling it with water or an inert gas, such as nitrogen. This can be useful where cleaning is difficult, although the tank should always be cleaned as much as possible beforehand.

If water is used, a vent for the steam will be necessary. Contaminated water may require specialist waste disposal.

If an inert gas is used, it can be difficult to prevent the gas escaping and air getting back in. Therefore, an oxygen meter will be needed to monitor the oxygen levels. This method should be left to specialists.

Key advice

Hot work on tanks and drums is very hazardous. Carelessness in hot work processes has resulted in death and serious injury.

Consider alternative methods to hot work. These include:

- * using cold cutting or cold repair techniques; and
- * replacing rather than repairing.

If hot work is necessary, the risks should be avoided by using a specialist company or reduced by using methods such as gas-freeing, cleaning or inerting before hot working.

No one should repair or cut up tanks or drums unless they have received adequate training in the risks involved and the precautions to be taken.

An operator received fatal head injuries when a drum exploded. He had been using an oxy/propane torch to cut the lid off the drum which contained paint residues.

For more information

Cleaning and gas-freeing of tanks containing flammable residues Guidance Note CS15 HSE Books 1985 (rev 1997)
ISBN 0 7176 1365 8

Tank cleaning safety code (Model code of safe practice in the petroleum industry, Part 16) Institute of Petroleum 1996 (2nd ed)
ISBN 0 4719 7096 4 Available from: Portland Press,
Commerce Way, Whitehall Industrial Estate, Colchester
CO2 8HP. Tel: 01206 796351.

Guidance on permit-to-work systems in the petroleum industry
(3rd ed) HSE Books 1997 ISBN 0 7176 1281 3

Five steps to risk assessment INDG163 (rev) HSE Books 1998
Free leaflet; also available in priced packs, ISBN 0 7176 1565 0

Permit-to-work systems INDG98 (rev) HSE Books 1997
Free leaflet; also available in priced packs, ISBN 0 7176 1331 3

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<p>This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you may need to do.</p>

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