Alerts

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Use of forklift trucks where flammable atmospheres may exist

Purpose

The purpose of this document is to inform users of forklift trucks, supervisors of people who drive forklift trucks, equipment purchasers and safety professionals about the hazards of using forklift trucks in areas where flammable atmospheres may exist.

Background

In January 2004, a forklift operator was using an LPG powered forklift to load plant into the doorway of a flammable liquids mixing and storage area. During the operation a flammable atmosphere was likely to have existed due to vapours being produced from a mixing process involving a flammable liquid with a flammable range of between 1 to 7% in air. The operation took place without the normal ventilation requirements. This was likely to have allowed a flammable atmosphere to come into contact with numerous ignitions sources on the forklift truck. The atmosphere was subsequently ignited causing a fire and explosion which resulted in the operator of the forklift truck receiving severe burns over most of his body.

Issues of concern

Unmodified forklift trucks can present a hazard when used in or near flammable atmospheres from one or more of the following reasons:

- Flames or sparks from the exhaust can become a potential ignition source;
- Flashback produced by vapours being drawn into and ignited in the combustion engine system can ignite the flammable atmosphere;
- Over-speeding of the engine can occur due to the additional combustion of the flammable vapours in the combustion engine;
- Hot surface temperatures of the exhaust system and other engine components may act as an ignition source;

portable (scuba) cylinders
Enriched air nitrox (EANx) compressor systems
Tender vessels and propeller guarding for rescue of divers
Twin tail fall arrest lanyards
Underwater diving work and medical certificates
Uwatec analogue submersible pressure gauges5

Print options

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- Arcs and sparks from electrical equipment and starter motors can be a potential ignition source;
- Sparks from discharge of static electricity or from friction (e.g. forklift tines rubbing against concrete surfaces) can be an ignition source;
- Sparks and heat from brake components in action are a potential source of ignition;
- Tyres and other material rubbing or moving in close proximity to shelving can discharge static electricity producing a risk of ignition.

Using unprotected electric, diesel, or LPG powered forklift trucks where flammable dangerous goods[1] are stored or handled without precautions can create an immediate and severe risk of fire or explosion.

Recommendations

The following approach to the management of this severe hazard must be taken to ensure risk is at an acceptable level:

1. Where flammable dangerous goods are stored or handled, the occupier must have a system of identifying the hazardous properties of each flammable dangerous goods by reviewing the MSDS and package labelling;
2. The occupier must classify areas where flammable liquids, gases or solids are stored or handled as **hazardous areas**[2] according to AS 2430 *Series Classification of hazardous areas* (non-Queensland Government link) ;
3. Each hazardous area must be clearly identified by the use of markings, warning lights, and warning signs designed to provide sufficient warning time to prevent ignition sources from entering these areas;
4. Ignition sources must be separated from hazardous areas by the use of appropriate distances or physical barriers;
5. Training, information and effective supervision must be provided to workers and others about the risk of ignition sources near the hazardous areas and the procedures that need to be adhered to in order to prevent a fire or explosion;
6. **Spark ignition**[3] type forklift trucks such as L.P.G forklift trucks **must never be used in any Zone 0, 1, or 2 area**.
7. In **Zone 0 areas**, the use of any forklift truck in this type of hazardous area is not advisable. These areas should be made free of any sources contributing to the flammable atmosphere, prior to forklift entry.
8. In **Zone 1 and Zone 2 areas** a forklift compliant with AS 2359.12 must be used unless the forklift truck used is not a "spark ignition engine" and an **appropriate "hot work permit" system** is effectively implemented.
9. In **Zone 2 areas** a powered forklift truck may be used provided it has been modified for use in a Zone 2 area; or is not a spark ignition engine forklift and is used with an effective "hot work" permit system.
10. If work permit systems[4] are relied on for protection the permit must be adhered to at all times. **See Appendix 1 and 2 of this alert for guidance on entry permit preparation**.
11. Strategies in the work permit will need to include thorough

flammable vapour/gas monitoring using calibrated flammable atmosphere devices, inspection of the area and forklift prior to entry, additional ventilation if required; or removal and shut down of processes or materials that may give rise to a flammable atmosphere.

12. Under no circumstances must an unprotected forklift truck be permitted into a flammable atmosphere (e.g. near areas where mixing, transferring or decanting operations are still being carried out).

Legislative requirements

Under section 16 of the ***Dangerous Goods Safety Management Act 2001*** everyone who is involved with the storage or handling of hazardous materials, who may affect the safety of persons or harm property or the environment at a place must ensure that all reasonable precautions and care is taken to minimise risk as far as practicable.

Failing to discharge a safety obligation can result in significant penalties of up to 3000 penalty units or 3 years imprisonment.

Additional obligations for safety also exist under each of the following provisions:

- Part 4 of The ***Dangerous Goods Safety Management Regulation 2001*** prescribes the occupier's obligation with respect to the licensing of flammable and combustible liquids. Compliance with AS 1940 or equivalent is a standard condition of the flammable liquids storage licence which is administered by each local government authority;
- Part 3 of The ***Dangerous Goods Safety Management Regulation 2001*** provides a series of safety obligations at workplaces that store or handles dangerous goods which are enforceable by Workplace Health and Safety QLD;
- Section 36 of the ***Dangerous Goods Safety Management Regulation 2001*** requires that occupiers must remove or control the risk of ignition sources in areas where flammable atmospheres may exist (hazardous areas);
- The *Gas Act 1965* and the *Gas Regulation 1989*.

Further information

The following technical standards or publications may be of use in providing guidance in relation to use of forklifts in hazardous areas:

- AS 2430.3.1 Series, 1997 "Classification of Hazardous Areas, example of classification";
- AS 2359.12, 1996; "Powered Industrial Trucks-Part 12: Hazardous areas";
- AS 1940, 1993; "The storage and handling of flammable liquids"; Section 3.2.9;
- AS 1596; 2002, "Storage and Handling of LP Gas";
- AS 1915, 1992; "Electrical Equipment for Explosive Atmospheres, Battery Operated Vehicles";
- AS 1674.1, 1997; "Safety in welding and allied processes-Part 1,

Fire Precautions"; and
- *Lift Trucks in Potentially Flammable Atmospheres* HSE Books, 1996, United Kingdom, ISBN 0 7176 0706 2.

Additional information may also be obtained from the contacts below:

Principal Adviser (Dangerous Goods), Workplace Health and Safety Queensland
Phone: (07) 3872 0504 Web: http://www.whs.qld.gov.au/

CHEM Unit, Department of Emergency Services
Phone: (07) 3247 8444

Appendices

- Appendix 1 - Example of work permit for internal combustion engine forklift (PDF, 66 kB)
- Appendix 2 – Example of work permit for electric engine forklift (PDF, 65 kB)

[1] Flammable dangerous goods include materials of class 2.1, 3, and 4 stated dangerous goods or those goods with subsidiary risk of class 2.1, 3, or 4.

[2] Hazardous areas are classified under AS 2430 as either Zone 0, 1, or 2 areas. Zone 0 areas are those areas where flammable atmospheres may exist continually (e.g. inside flammable liquid drums head space, or process rooms where vapours are continually present even after operation). Zone 1 areas are where flammable atmospheres may be present during normal operation (e.g near process operations during operation). Zone 2 areas are areas where a flammable atmosphere may occur for short periods of time (e.g. package stores where a forklift may puncture a drum during movement).

[3] Spark ignition forklifts include petrol and liquefied petroleum gas powered forklift trucks.

[4] Guidance on how to develop an effective hot work permit system can be sought from AS 1674.1, "Safety in Welding and allied process, Part 1: Fire Precautions, Appendix B & C.

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