

AMMONIA SAFETY

Introduction

Ammonia (Refrigerant 717, NH₃) was one of the earliest compounds to be used as a refrigerant. Its use was curtailed with the development and widespread adoption of CFCs and HCFCs, however today CFC's have been phased out and HCFC's are being phased out. The use of ammonia is once again expanding, this time beyond just the industrial plants, to the larger end of commercial refrigeration and even certain air conditioning applications. As a matter of interest even the International Space Station has an ammonia refrigeration system on board.

Things to remember when working with Ammonia:

- Ammonia is flammable. It is forbidden to weld or use open flames unless all specific safety instructions are observed.
- Smoking is not allowed in the refrigeration machinery room.
- Escape routes should be known and must be free from obstacles.
- Suitable personal protective equipment (PPE) must be worn (BS EN 378-4, 4.)
- Fire fighting equipment should be accessible within the machinery room
- Work should only commence on equipment after carrying out a full and approved risk assessment plus method statement so that "everyone" is aware of what works are being undertaken and by whom.
- **Only qualified or experienced engineers should work on ammonia systems.**

- ***If carrying out works other than routine checks then engineers should work in pairs.***

Installation Operation and Service

There are a number of Laws and British Standards that must be observed when working on ammonia systems some of these are:

- Health and Safety at work Act etc 1974
- The Management of Health and Safety at Work Regulations 1999
- BS EN 378 2000 parts 1-4,
- Health and Safety Executive Publication PM81 – Safe Management of Ammonia Refrigeration Systems in Food and Other Work Places
- The Institute of Refrigeration Safety Code for Compression Refrigeration Systems Utilising Ammonia Parts 1 and 2
- Rules and Regulations for Refrigerated Stores, Lloyds Register of Shipping, January 1988
- ***Common Sense!***

Keeping Safe

Ensure Breathing apparatus and or respirator masks are available and close to hand. In fact good practice is for engineers to wear their respirator mask loose around the neck when carrying out any works other than visual inspections.

Wear gloves and goggles at all times.

If you do come into physical contact with Ammonia, you should administer the following first aid, and seek immediate medical attention

- **Skin contact**
Remove contaminated clothing. Drench with large quantities of water and continue to wash affected skin areas for at least 20/30 minutes - use safety shower if available. In the case of freeze burns clothing may adhere to the skin, immerse the affected area in comfortably warm water to defrost.
- **Eye contact**
Flood eyes with clean tap water for at least 20/30 minutes followed by immediate medical attention.
- **Ingestion**
Rinse mouth with water and give plenty to drink. Do not induce vomiting but seek medical attention immediately.
- **Inhalation**
Remove patient to fresh air immediately. Remove contaminated clothing keep patient warm and rested. Seek medical assistance immediately. Patient must be kept under observation for at least 48 hours after exposure as delayed pulmonary oedema may develop.

Explosive Limits

Lower explosive limit (LEL) is 16%
Higher explosive limit (HEL) is 27%
For an explosion to take place the level of concentration must be between these limits, explosions have very little energy and would only occur in an enclosed space.

The power created at combustion is only 14% when compared to natural gas and the rate of combustion is 2% of natural gas. The ignition temperature is 6500°C. All these factors make it very difficult for an explosion to take place.

Operating Limits

Anhydrous Ammonia will attack any moist body parts such as armpits, eyes, throat and groin at relatively low concentrations. It is detectable by most people at 2 to 5 ppm. Low temperatures increase the sensitivity to the presence of ammonia. High humidity reduces the level at which ammonia is perceived. Liquid ammonia will burn skin or eyes if it comes into contact.

Ppm	Effect on unprotected human body	Exposure Limits
20	Smell readily detected by most people	Unlimited
25	HSE long term exposure limit	8hrs per day 5 days per week
35	HSE short term exposure limit	15mins per day not more than 1 hour per week
50	Smell is distinctive and may be irritating	Do not stay longer than necessary
70	No dangerous effects on healthy people	Leave the area
400-700	Immediate irritation to eyes, nose, throat and respiratory system.	Under normal circumstances no serious injury in 1 hour
1700	Severe coughing, cramp, serious irritation to nose, eyes, throat and respiratory system	30 mins exposure can lead to serious injury
2000-5000	Severe coughing, cramp, serious irritation to nose, eyes, throat and respiratory system	30 mins exposure can lead to death
5000	Respiratory spasm, rapid asphyxia	Lethal within a few minutes

The information contained in the Bulletin should be seen as a guide to interpretation of relevant industry standards, legislation and statutory information which should be consulted by the relevant competent person responsible for servicing refrigeration equipment. The Service Engineers' Section and the Institute of Refrigeration accept no liability for any errors or omissions.

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