
Risk Element

- Explosion;
- Refrigerant escape to atmosphere;
- Non-ventilated areas.

Precautions to Eliminate/Reduce Risk

- Always use correct tools and equipment for the charging process;
- Use mechanical handling equipment for cylinders when possible;
- Ventilate area before commencement of task;
- Trained and qualified personnel only;
- Works to be carried out in conjunction with J & E Hall technical section 5 and COSHH information.

Safe Working Method

- Area in immediate vicinity of Ammonia cylinders and charging line will be vacated by all non-essential personnel;
- Ensure Ammonia cylinders secured before charging commences;
- Area will be cordoned off and hazard warning signs prominently displayed. The charging procedure must NOT be left unattended;
- Protective chemical coveralls, goggles, nitrile gloves, boots/wellingtons, respiratory protective equipment (air powered hood) will be worn by the competent persons carrying out the charging;
- Adequate supplies of water, e.g. hose reel, will be available in case of emergency;
- Charging hose between cylinder and system charging valve will be kept as short as possible and will be of a flexible material suitable for use with Ammonia. It will be fitted with a N.R.V. to prevent back filling if system pressure becomes higher than cylinder pressure. Check hoses for integrity before use;
- The valves on the Ammonia cylinder and system will be checked to ensure they are fully closed before slackening and removing protective caps;
- The charging hose will be connected to the cylinder valve and tightened, the other end connected to the system valves;
- The cylinder valve will be cracked open and the charging hose carefully slackened at the system valve to purge the line of air. As refrigerant begins to escape the connection will be re-tightened and the cylinder valve closed;
- Provided the charging hose connections are gas tight the system will be opened. The cylinder valve will then be slowly opened to allow refrigerant vapour to pass into the system gradually until a pressure well above atmospheric pressure is achieved. The cylinder valve will at all times be used to control the charging process;
- On completion of charging, the cylinder valve will be closed first, followed by the system valve, to encourage the charging hose to empty of any liquid Ammonia present;
- The charging hose will be carefully slackened at the system valve allowing any remaining refrigerant to vent to atmosphere. The charging hose will then be disconnected at both ends and protective caps re-fitted to cylinder and system valves.

Charging Refrigerant

Personnel who are going to charge the system must possess a permit to work certificate to show they are authorised and competent to work on the plant and are fully aware of the potential hazards involved.

A minimum of two personnel should always be present when working on ammonia refrigeration plant. Only properly qualified and trained personnel should be allowed to charge ammonia refrigeration equipment.

If this publication relates to a plant supplied by J & E Hall International, these instructions should be read along with procedures specific to the plant; these are described in Part G : Charging With Refrigerant in Section 1 of the plant instruction manual.

Immediately Before Charging Takes Place

Check that the area where charging will take place is clear of all unnecessary tools, portable equipment or other items which might prohibit rapid evacuation of the area.

Gangways must be completely clear.

Emergency exits from the charging area must be accessible, free from obstructions, and their location well known to all personnel carrying out the charging procedure.

The presence of other naked flames, for example gas space heaters, must be prohibited while charging takes place.

The plant room must be effectively ventilated in case ammonia should accidentally escape. If ventilation fans are available, these should be switched on.

Vacate all non-essential personnel from the immediate vicinity before cordoning off the area.

Erect hazard warning notices in prominent positions to warn that the system is about to be charged and the area is closed to unauthorised personnel.

Initial Charging - Breaking the Vacuum

Verify the contents of the container of refrigerant.

The cylinder of refrigerant must be mounted on a suitable weighing device (scales) to determine the weight of refrigerant charged into the system. Secure the cylinder to prevent it falling off the scales.

It is a requirement to keep a record of the quantity of refrigerant charged into the system; this information must be recorded in the plant log book.

Check that stop valves throughout the system are fully open **except** the oil drain valves and purge valves that open to atmosphere. Also, recheck that no part of the system is isolated by a solenoid valve, back-pressure valve or other flow control device.

Connect the other end of the line to the charging valve on the system; refer to the system schematic flow diagram.

Arrange the container of refrigerant so that vapour only enters to break the vacuum.

Crack open the cylinder valve, then carefully slacken the connection at the charging valve to purge the line of air. As refrigerant begins to escape, retighten the connection and close the valve on the cylinder.

Purging the charging line involves the release of refrigerant, sometimes liquid refrigerant. Adequate protective clothing must be worn, to prevent injury to personnel. For this reason, respiratory protective equipment (air powered hood) must be worn.

Provided the charging line connections are gas-tight, open the charging valve, then gradually open the cylinder valve, allowing refrigerant vapour to pass into the system. Always use the charging manifold valve to control the charging process.

Charge the system with refrigerant vapour, using the pressure difference between the refrigerant cylinder and the system.

Charging liquid in to the system could seriously damage the systems components due to the very rapid cooling.

Continue charging vapour until the pressure in the system has risen above 0.5 bar g.

If the system is fitted with a heat exchanger that is likely to contain residual amounts of water, to avoid freezing, continue charging vapour until the pressure in the system has risen above 3.6 bar g. This will avoid thermal stress damage to the heat exchanger.

How much of the total contents of the cylinder of refrigerant it is possible to transfer depends on the ambient temperature surrounding the cylinder. The lower the ambient temperature, the less refrigerant is induced to enter the system; also when charging vapour, the cylinder is itself cooled as the refrigerant evaporates.

Continue charging the system with liquid refrigerant, as required, until the quantity of charge is correct. These instructions should be read along with procedures specific to the plant; these are described in Part G : Charging With Refrigerant in Section 1 of the plant instruction manual.

On Completion of Charging

Containers of refrigerant, cylinders or drums, must be disconnected from the system immediately after the full charge has been achieved.

The charging lines and manifold set must be removed with minimum loss of refrigerant.

Take care because some of this refrigerant may be liquid.

Whenever possible draw the refrigerant remaining in the lines into the suction of the system.

If the system can be pumped down do this to reduce the suction pressure and draw most of the refrigerant from the lines.

Remove the charging line, test the service valves with leak spray remembering to check the spindles as well.

Refit the protective caps to the service valves and the cylinder valve to prevent accidental damage.

Record of the quantity of refrigerant charged into the system.

Check the plant for leaks.