



Coolstore hydrocarbon refrigerant injures technician



INCIDENT

A refrigeration technician suffered burns to his face and hands while conducting maintenance on a coolstore refrigeration unit. He assumed that the unit was charged with R22 (known as Freon, a non-flammable gas) when the system actually contained a flammable hydrocarbon-based refrigerant.

CIRCUMSTANCES

The technician was contracted to repair a valve on the refrigeration unit's evaporator inside the coolstore. The valve's markings stated that the refrigerant used in the system was R22.

The system was pumped down, isolating the bulk of the refrigerant to the main plant situated outside the building. The technician climbed approximately five metres up a ladder to access the valve and began replacing it, which involved welding around the valve area. The welding generated heat, which in turn caused a rapid expansion of the residual refrigerant inside the system. The refrigerant ignited, causing a rapidly expanding ball of fire to erupt from the system directly into the technician's face. He slid down the ladder to avoid further injury as the fireball rose to the coolstore's ceiling.

This incident caused significant damage to the refrigeration plant and equipment.

INVESTIGATION

This incident bears some disturbing similarities to the coolstore fire at Tamahere in 2008 and therefore is seen as extremely serious. The investigation to date has revealed the following:

- The owner of the coolstore was not aware that a highly flammable/explosive refrigerant was being used in the refrigeration system.
- There was no signage to identify the refrigerant or hazard type, i.e. "Flammable".
- The system was not designed to be charged with a hydrocarbon refrigerant.
- No records were available to determine what the system had been charged with when commissioned. No subsequent records were available to suggest that the system had been retrofitted to operate using a hydrocarbon refrigerant.
- The owner of the plant and the technician believed that the system was safe and that it complied with all relevant legislative requirements.
- The refrigeration unit had been installed eight to ten years ago and had not required servicing subsequent to installation involving the refrigerant.



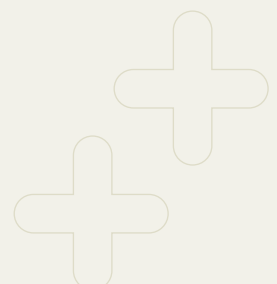
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Picture 1: this photo shows the location of the evaporator unit inside the coolstore. The ladder off to the right indicates where the technician was working when the fireball erupted. Repairs were undertaken on the unit and nearby pipework after the fire, but fire damage to the coolstore's ceiling is still evident.



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Picture 2: this picture shows the refrigeration plant located outside the coolstore.





- The type of refrigerant used did not contain a stenching agent; therefore it was difficult to determine if a leak occurred. As a result, there was the potential for the coolstore to be filled with a flammable gas which could remain undetected until a source of ignition was introduced.

GUIDANCE

The Department of Labour recommends that employers, owners, persons in control of cool stores should *immediately* determine the substance their refrigeration unit/s are charged with. Where the system has been charged with a hydrocarbon refrigerant, they should determine if the system is suitable for that substance, having regard to the practical limit requirements as per AS/NZS 1677.2:1998¹.

If the system is suitable for use with a hydrocarbon refrigerant then consideration needs to be given to the following requirements:

- Signage
- Gas detection
- Ventilation (plant room)
- Monitoring for leaks
- Emergency procedures in event of a leak
- Information to employees and others.

It is also recommended that refrigeration engineers, technicians, and service persons be vigilant as to the hazards associated with flammable hydrocarbon refrigerants, including the need to use a gas detector compliant to AS/NZS 60079.29.2:2008² where plant is not explicitly labelled as being charged with a hydrocarbon refrigerant.

Where there is uncertainty as to what the system is charged with, advice/assistance should be sought from a refrigeration engineer, or other competent person.

The Department of Labour produced the Fact Sheet 'Safe use of Hydrocarbon Refrigerants' following the Tamahere incident, which provides information regarding the safe design of plant and control systems, adequate maintenance, and safe operation practices when using hydrocarbon refrigerants. This can be downloaded from the Department of Labour's website www.osh.dol.govt.nz.

WHICH INDUSTRIES/SECTORS OR MATTERS WILL THIS INFORMATION BE RELEVANT TO?

Refrigeration contractors, technicians and engineers, owners of industrial and commercial refrigeration plant.

Note: This material has been prepared using the best information available to the Department of Labour at the time of publication. Information may change over time and it may be necessary for you to obtain an update. This material is also only intended to provide general advice and does not constitute legal advice. You should make your own judgement about action you may need to take to ensure you have complied with your workplace health and safety obligations under the law.

1. AS/NZS 1677.2:1998 Refrigerating Systems – Safety Requirements for Fixed Applications
2. AS/NZS 60079.29.2:2008 Explosive Atmospheres – Gas Detectors – Selection, Installation, Use and Maintenance of Detectors for Flammable Gases and Oxygen