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Safety Alert – Reports of Recent Accidents Due to Poor Practices

Introduction

Refrigerants of any type are generally used safely but there are a number of recent reports of the results of investigations where fatal mistakes have been made which highlight the importance of ensuring that those carrying out site work have the appropriate level of qualification, skills, knowledge and experience. British and European product standards, design codes and training procedures are generally extremely good, but they do not have any effect on preventing accidents if people don't follow them. To quote the coroner from the case in Australia below, it served to "highlight the dangers of unqualified people doing work that requires qualifications or, at least, a solid understanding of the substances and risks involved". Similarly the report from Canada of the fatal accident at Fernie Memorial Arena identified shortcomings in operating procedures and inspection regimes. Again a case of people doing things that they shouldn't.

The Institute of Refrigeration continually monitors official reports of such incidents to identify whether there is any additional learning that can be shared with the whole industry, other than the critical importance of appropriate levels of competence, adequate risk assessment and following working procedures that adhere to safety standards and health and safety legislation.

Flammable refrigerant ignited in a cellar whilst removing a compressor

As reported in HVAC&R News Australia

The Coroner has completed its official investigation into the deaths of Barry Purtell and David Lobb. The two men, aged 34 and 52 respectively, died after gases from a refrigeration compressor ignited in the cellar of the Hotel Rochester, Bendigo in June 2014. Purtell and Lobb, neither of whom were qualified refrigeration mechanics, were helping the publicans close down the hotel by removing the refrigeration compressor in the basement.

Site of Australian accident

The investigation found that the compressor was known to be leaking refrigerant and had been doing so for several years. Purtell, a motor mechanic, had topped up the unit with car hydrocarbon air conditioning refrigerant eight months before the accident. At this point the system contained a mix of flammable and non-flammable refrigerants.

When the hotel was being cleared, the copper refrigerant pipework was cut with a hacksaw, resulting in the refrigerant mix leaking into the cellar. The explosion occurred when Purtell or Lobb used a cigarette lighter.

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Coroner Paresa Spanos noted that the deaths were preventable in the sense that the explosion could have been averted through correct maintenance, correct use and labelling of refrigerants, and correct dismantling and removal processes. However, she declined to make recommendations for changes to industry practices.

> "Mr Lobb and Mr Purtell died in circumstances of a tragic accident in the course of removing the compressor to help out a friend. While both men were good with their hands and happy to lend a hand, their deaths highlight the dangers of unqualified people doing work that requires qualifications or, at least, a solid understanding of the substances and risks involved.
>
> There is ample evidence before me that the refrigeration industry, which is not without its regulatory complexities, faces additional challenges with the move to low-GWP refrigerants, none the least because the low-GWP refrigerants are flammable and the vast majority of refrigeration mechanics/technicians were not trained in the use of such refrigerants.
>
> However, as neither Mr Lobb nor Mr Purtell were qualified refrigeration mechanics/technicians, I do not consider it appropriate to make further comment or recommendation about industry practices."

Meanwhile, many industry bodies have been working to establish more effective training and practices for handling flammable refrigerants. Australia's first official training course for A2/A2L (mildly flammable) refrigerants has now been announced, and AIRAH continues to offer a Flammable Refrigerant Safety Guide.

Ammonia leak at a brewery during removal of a dormant compressor by sub-contractors

As Reported by BBC News 2 July 2018

David Chandler, from Bridgnorth, Shropshire, died at the Carlsberg plant in Northampton on 9 November 2016. Northampton Coroner's Court heard the 45-year-old died from inhalation of ammonia having been exposed to a "sudden release" of gas. The jury concluded the leak from a valve on a compressor was "preventable".

Last week, Jamie Davies from the Health and Safety Executive told the inquest he found an isolation valve in the pipework had not been closed at the time of the leak. A project engineering manager at the brewery at the time said Carlsberg had not carried out a risk assessment on the isolation of the gas.

Ammonia compressor at Carlsburg plant

Mr Chandler had been employed as a subcontractor to remove a dormant compressor unit.

His colleague Stuart Wright said "grey and white smoke" had burst out of a valve in pipework surrounding the compressor following a "massive explosion". The jury heard the father-of-two would have become "rapidly unconscious".

Coroner Philip Barlow said the risk assessment, method statement and permit-to-work system for sub-contractors were not "accurate or at least sufficiently detailed to provide a safe system".

Mr Barlow told the court Carlsberg now have a system in place to improve safety.

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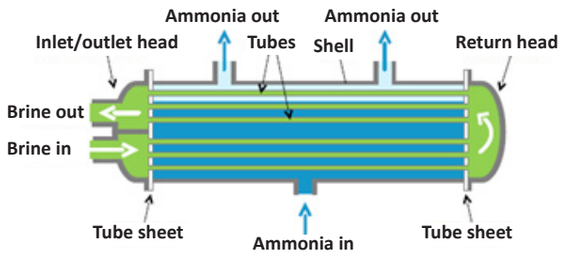
Ammonia leak into brine in ice rink chiller

Extract from Technical Safety British Colombia Investigation Report 25th July 2018

On October 16, 2017, the curling brine chiller at the Fernie Memorial Arena was put back into operation after a seasonal shutdown. During the shutdown and seasonal maintenance, ammonia had been detected in the curling brine system, indicating that the curling brine chiller was leaking. An ammonia alarm in the arena's mechanical room was triggered and the system was shut down. Rising pressure contained within the curling brine system led to the separation of a pipe coupling in the mechanical room. Upon separation of the coupling, an estimated 9 lb. of ammonia was rapidly released into the room followed by additional ammonia from the system. The atmosphere in the mechanical room may have reached or exceeded concentrations of 20,000 parts per million (ppm) of ammonia. Ammonia odour was reported from nearby areas of the community. An electrician discovered a worker in the mechanical room, called 911, removed the person, and performed CPR until the arrival of the fire department.



Generic diagram of a two-pass flooded chiller similar to that used at the Fernie Memorial Arena

A total of three people were found deceased in the mechanical room: the director of leisure services, the refrigeration operator, and a refrigeration mechanic. Responders opened the emergency discharge valve and pressed the emergency stop for the ammonia system located on the exterior wall of the arena. Opening the discharge valve resulted in an estimated initial release of 55 lb. of ammonia into the atmosphere with approximately 632 lb. of ammonia from the system being slowly released during the subsequent days.

Due to the three fatalities, the ammonia release and the unknown amount of ammonia remaining in the arena on the day of the incident, the City of Fernie issued a local state of emergency and evacuated approximately 55 homes and 95 residents from the surrounding area.

Following the incident, Technical Safety BC conducted an investigation to determine factors that contributed to the ammonia release. The objective of the investigation was to identify causes and contributing factors to inform an understanding and management of safety risks associated with refrigeration systems. The investigation identified three areas where evidence indicates causal and contributing factors leading to the incident and the subsequent impact to the arena and surrounding community:

1. Failure of refrigeration system equipment
2. Operational decisions that contributed to the incident
3. Impact of inadequate ventilation and discharge systems

Further reading

Guidance on conducting site specific risk assessment is available from the HSE http://www.hse.gov.uk/risk/controlling-risks.htm and more detailed recommendations can be seen in SES Bulletin No.17 issued in 2006 and available to download at www.ior.org.uk

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