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Bulletin 793 - 11/11 - Defective Reefers Update - Worldwide

Following on from last week's Bulletin alerting the industry to the hazardous issues of defective reefers the Club has gained insightful analysis from Industry experts, Cambridge Refrigeration Technology. CRT have kindly given permission for the Club to publish their initial findings. Their present advice is outlined below;

QUOTE

COUNTERFEIT REFRIGERANT IN REEFER CONTAINERS

There have been cases of reefer containers suffering explosions.

Refrigerated Container refrigeration units should contain polyolester oil and the refrigerant HFC-134a (1,1,1,2-Tetrafluoroethane) and should therefore be incapable of exploding.

Material recovered from the exploded units have been analysed by a laboratory and have found to be corroded by a chlorinated compound. Traces of alumina (AL_2O_3) were also found at the sites.

From the above data we can be reasonably certain that the pyrophoric liquid (burns in contact with air) to be is trimethyl aluminium ($Al_2(CH_3)_6$). The explanation is that the system has been contaminated with a counterfeit refrigerant containing methyl chloride (chloromethane, CH_3Cl). This gas works as a refrigerant but reacts with the aluminium in the compressor forming trimethyl aluminium, which is a liquid at room temperature.

The issues that need to be resolved are:

1. How can this be prevented from occurring again?
2. How can the withdrawn units be checked for contamination?
3. What is the procedure for making safe a contaminated reefer unit?

1 How can this be Prevented from Occurring Again?

Refrigerant gas supplied to service depots needs to be from a certified source with a certificate of veracity of contents. Existing refrigerant gas held in stock can easily be checked using a standard halide lamp flame test.

2 How can the Withdrawn Units be Checked for Contamination?

Withdrawn units need to have their refrigerant gas checked, though the likely hood of a problem unit may be increased by examination of the service records. According to Johnson Controls and Konika, the counterfeit refrigerant is a blend and therefore even if the methyl chloride and dichloromethane were consumed by reaction with aluminium, then the flame test would still detect the R-22 and R-141b. This can be lab verified once further samples have been analysed.

Any units that show positive to the flame test should be sampled and sent to a laboratory for analysis.

3 What is the Procedure for Making Safe a Contaminated Reefer Unit?

Once a contaminated unit has been identified a procedure for making them safe needs to be identified. The problem is that trimethyl aluminium is a liquid and will be sitting in the crankcase of the compressor.

A possible solution might be to find a reagent that could be injected into the compressor, which would slowly react with the trimethyl aluminium and passivate it. Another solution could be to find a way of puncturing the base of the crankcase and blowing out the oil and trimethyl aluminium into a barrel of water using dry nitrogen. Some reefer units already have an appropriate fitting, e.g. the Carrier EliteLine and some Daikin units.

At lower temperature, below 15°C the trimethyl aluminium would be solid and therefore less prone to ignite.

SUMMARY

It is now clear, with near certainty that the cause of the explosions is due to counterfeit refrigerant containing chloromethane.

Looking forward, the following points need to be addressed:

- Existing refrigerant stock needs to be checked for contamination
- A refrigeration certification scheme needs to be put in place for future purchases
- A method for checking the withdrawn reefer units for contamination is required
- A safe method for compressor removal of contaminated units to be identified

UNQUOTE

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