



IICL RTB 004, 9 June 2015 (Revised)

Title: Process for Testing and Issuing Clean Refrigerant Certificate

Background

The current issue of contaminated refrigerants being found in R134a refrigerated container machines has prompted tests to be developed to check system refrigerant. The tests assess whether the system is contaminated with refrigerants other than R134a. Some of the contaminants are known to be able to create dangerous bi-products in the system potentially resulting in explosions. Other contaminants have been found that will cause changes to the performance of the machine and may impact long term wear and reliability.

Requirement for Testing

When refrigerated containers are off-hired, it is essential that the system refrigerant is checked by an effective test method to establish if the system contains R134a as specified by the manufacturer or if there is any contamination present. Depending on the initial test result, more detailed testing may be required.

Initial Test Methods

The service depot should use a test method that can reliably identify if organic chloride contamination is present in a sample taken from a refrigeration machine. It is reported that many service depots around the world have been using the flame halide test while some have been using gas sniffer tube tests.

The flame halide lamp has a sensitivity of 0.03% or 300ppm. Some owners have reported “false alarms” and inconsistent results using the gas sniffer tube test, which has a sensitivity of 0.01% or 100ppm. Therefore, owners may prefer a particular initial test method, and require their service depots to perform the test of their choice.



Initial Test Result

If the initial test result does not indicate the presence of any organic chloride contamination above that test method's detection level, then a Clean Refrigerant Test Certificate will be issued (see section below for detail).

If the initial test identifies the presence of organic chlorides above that test method's detection level, the depot must notify the owner and agree to any further testing or other action to be taken.

Secondary Tests

Where a sample of gas from a machine is identified as containing organic chloride contamination, the owner may require a laboratory test to be carried out to identify in detail what chemicals the sample contains. The most accurate test method is by GC/GCMS (Gas Chromatography or Gas Chromatography/Mass Spectrometry) where the laboratory has been given detailed instructions on the test parameters.

The GC/GCMS test results will be submitted to the owner who will then decide what further action is to be taken which will depend on the levels and type of contamination identified.

Contamination Levels

To comply with the provisions of the Montreal Protocol, the US government adopted a standard of purity for new refrigerant used to charge new machinery or for in-service repairs as defined under AHRI 700 – the ASHRAE recommendation – and that will be included in ISO standard 817. In summary, AHRI 700 requires less than 0.0003% of hydrochloric acid or metal chlorides and less than 0.5% of organic chlorides.

The IICL criteria for testing refrigerant gas samples from machinery will follow AHRI 700's requirement of a maximum of 0.5% of organic chlorides. An exception to this will be for R40, R133a or R40 + R133a combination less than 0.03% or 300 ppm which does not warrant action based on the study published by ASHRAE RP-1665 reports dated December 2014.

Due to R40's toxicity, and its potential to react with other system materials to create dangerous bi-products and cause serious system damage, the IICL prefers that all refrigeration systems are free of R40. However, that is an aspirational goal and IICL realizes that practical realities may make it difficult, if not impossible in many situations, to attain that goal. As such, it is deemed acceptable at this time to allow for minimal amounts of R40 to be present, up to the detection limits of the various initial test methods discussed above.

The calibration of different testing devices and methods can vary for several reasons including temperature, humidity and operator experience and it is accepted that test result accuracy may have a tolerance of at least 0.01%.



As yet, there is no scientifically tested guideline or system test to establish with certainty if interior components are damaged or if dangerous chemicals have formed in the system due to the presence of R40 and R133a. Therefore, in situations where there is presence of R40, R133a or R40 + R133a combination, decontamination of action to be taken will be made by the owner in conjunction with the service depot and technical experts as how best to proceed.

Suggested Action

1. Contamination with HCFCs, CFCs, HFCs and HCs:

Suggested action if HCFCs such as R22 and R142b; CFCs such as R12; HFCs such as R125 and R152a but excluding R134a; HCs such as iso-butane (R600a), propane (R290) etc. contamination is found in the system:

- If total contamination is greater than or equal to 0.5%, clean the machine by an approved procedure.
- If total contamination is less than 0.5%, take no action per AHRI700. It is recommended you consult with each owners policies and procedures since they may decide to take some action.

2. Contamination with R40, R133a, or R40 + R133a combination (Methyl Chloride / Trifluoro Chloroethane)

Possible Actions if contamination is found in the system with R40, R133a or R40 + R133a:

- If total R40, R133a or R40 + R133a contamination is detected with 0.03% or 300ppm or less using GCMS laboratory test, it is possible clean the machine by an approved safety procedure authorized by the owner
- The equipment owner, at his discretion, may attempt to clean/decontaminate R40, R133a or R40 + R133a above 0.03% or 300ppm from the machine. The owner reserves the right to perform extensive testing to assure all components are safe and in proper operating order, otherwise, the machine must be either replaced or written off.
- If it is decided by the owner not to attempt to clean/decontaminate a machine containing R40, then the unit should be isolated pending safe disposal as directed by the owner.



Clean Refrigerant Test Certificate

1. Where a machine has been tested and found not to contain any organic chloride contamination, a Clean Refrigerant Test Certificate will be prepared by the service company (see Appendix 1).
2. Where a machine has been tested and found to contain less than 0.5% of organic chloride contamination but does not contain any R40 and/or R133a above the detection limits of the test methods as described above, then the equipment owner, at his discretion, may prepare a Clean Refrigerant Test Certificate and attach a copy of the GCMS test showing the content of the system refrigerant.
3. Where a machine has had contamination removed by an approved cleaning process and a subsequent gas sample from the “decontaminated” machine has been tested by an Initial Test or Secondary Test if required, a Clean Refrigerant Test Certificate will be prepared as in (1) or (2) above as appropriate.

All reefers, except new units ex-factory, being presented for on-hire will require a Clean Refrigerant Test Certificate (Appendix 1).

Note: New machines are being delivered with factory installed anti tamper seals. If units are redelivered with all factory installed seals in place no gas test is necessary and unit can be noted as clean.

The certificate must provide the following information:

- Logo, name & address at the top of the certificate
- Container Unit Number
- Name of Tester and Signature Test method used
- Test result

The Clean Refrigerant Test Certificate will be sent to the owner

Appendix 2 is a summary of the process flow.



Appendix 1:
Clean Refrigerant Test Certificate format.

	<i>"Place depot's logo/name/address at the top left hand corner."</i>	
INDIVIDUAL CLEAN REFRIGERATION TEST CERTIFICATE		
Container Number	<input type="text"/>	
Date of Testing	<input type="text"/>	
Name Of Tester	<input type="text"/>	Signature: <input type="text"/>
Location	<input type="text"/>	
Test Method	<input checked="" type="checkbox"/> Flame Halide Test	<input type="checkbox"/> Sniffer Test (Alternative)
Results	<input type="text" value="BLUE FLAME / PASSED"/>	
<p>The depot confirms that the reefer has been tested in accordance with Seaco's Reefer R-134a Health Check instructions and has passed the selected test method.</p>		

Appendix 2

Reefer Refrigerant Checking Process

