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Guidance Note

R22 Refrigerant systems – phasing out

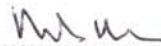
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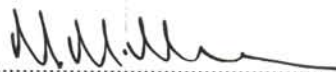
Robert Anderson, Senior Policy Development
Specialist (Buildings & Civils)

Authorised by:



Nigel Ricketts, Professional Head (Buildings &
Civils)

Accepted for issue by:



Mick McManus, National Standards Manager

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1 Purpose

The purpose of this guidance note is to advise the reader of changes in the law relating to the current use of the refrigerant gas designated R22, the need to plan and implement the phasing out of the substance, and options available for replacement refrigerants or renewal of complete systems.

2 Introduction

There are two EU Regulations that have a significant impact on the use of refrigeration equipment in the Rail Industry. These are:

EU Regulation 2037/2000 on ozone depleting substances

EU Regulation 842/2006 on certain fluorinated greenhouse gases (F-Gases)

It is not the intent of this briefing note to investigate the full implications of each of these items of legislation, only to be aware of them in the context of identifying the need to replace all our R22 (and other HCFC's) in refrigeration equipment.

The reasoning behind the changes in the R22 refrigeration legislation is simple- studies have shown they have a detrimental effect on the ozone layer resulting in excessive UV levels. Due to this, the R22 refrigerants may contribute to further environmental damage. The extent to which R22 refrigerants contribute to global warming is still the subject of intensive debate, although many affected companies have taken the opportunity to comply with the new regulations earlier than planned. This is being demonstrated at two levels:

Firstly, the majority of R22 refrigeration units are at least one third of their way through their foreseeable life. As existing R22 refrigeration systems begin to require modernisation, the majority of companies are choosing to phase these out rather than go to expense of needlessly repairing or maintaining them.

Secondly, unlike the R22 refrigerants, each new build will now use refrigerants such as ammonia and R404A which have zero ozone depleting potential. These refrigerants are also proven to be more energy efficient than the R22 refrigerant and could therefore be a wiser and more popular choice for Network Rail.

Most companies that are affected by the R22 legislation will have a policy to specify only the following environmentally friendly refrigerants are incorporated in new equipment: ammonia, R404A and R407c. The chosen alternative is usually decided at business unit level and is usually dependant upon the business' requirements towards energy efficiency.

Although many companies have undergone or are in the process of exchanging their R22 refrigerants, Network Rail has yet to formally announce any national policy on this issue. Huge conversions still need to be undertaken to meet the 2015 deadline for complete R22 replacement.

Additional complications come about when considering the pressure of changing R22 refrigeration systems on Network Rail which relies upon the refrigeration systems to maintain normal daily running of the rail network. Key to a smooth transition lies with

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ensuring the successful project management of the removal of the R22 refrigerant and professional installation of a replacement system.

Central project issues include effective and efficient utilisation of existing equipment wherever possible, minimising disruption to ongoing operations and the smooth integration of new plant during a suitable period. Most importantly, the careful and safe removal of the R22 and its integral chemicals is foremost to an effective exchange. The replacement of R22 also carries substantial risk as the new refrigerants contain Hydrocarbons. Consisting mostly of Iso-butane, Propane and Ammonia, these refrigerants have additional hazards associated with them which will require specialist engineering skills to deal with.

3 Scope

This guidance is provided for phasing out of R22 refrigerant systems currently in use on all Network Rail Operational Property, in accordance with EU Regulations for reduction of greenhouse gases and gases which are likely to cause damage to the ozone layer. Guidance is provided for suitable alternatives to R22. This guidance applies to all R22 refrigerant systems present in Stations, Depots and all lineside buildings.

4 Controls over the use of HCFC's

4.1 Current Regulatory requirements

- **From 01/07/1995**

HCFC's were banned except as solvents, as refrigerants, for the production of rigid insulating foams and integral skin foams in safety applications, in laboratory uses, including research and development, as feedstock in the manufacture of other chemicals and as a carrier gas for sterilisation substances in closed systems.

- **From 01/01/1996**

HCFC's were banned in the following uses: in equipment produced after 31/12/95 as: refrigerants in non-confined direct evaporation systems; refrigerants in domestic refrigerators and freezers; in motor vehicle, tractor and off road vehicle or trailer air conditioning and inroad public transport air conditioning.

- **From 01/01/1998**

HCFC use was be banned in equipment produced after 31/12/97 for rail public transport air conditioning.

- **From 01/01/2000**

HCFC use was banned in equipment produced after 31/12/99 for use as refrigerants in public distribution and cold stores and warehouses and as refrigerants for equipment of 150kW and over shaft input.

- **From 01/01/2001**

HCFC's were banned in all other refrigeration and air conditioning equipment produced after 31/12/2000, with the exception of fixed a/c equipment, with a cooling capacity of

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less than 100kW where use shall be prohibited from 01/01/2004 and of reversible air conditioning / heat pump systems where the use of HCFC's shall be prohibited from 01/01/2004 in all equipment produced after 31/12/2003.

- **From 01/07/2002**

All manufacture of Cooling-only air conditioning equipment using R22 ceased.

- **From 01/01/2004**

All manufacture of heat pump equipment using R22 ceased.

4.2 Regulatory requirements pending:

- **From 01/01/2010**

It will be illegal to use virgin hydrochlorofluorocarbons (HCFCs) such as R-22 (which has been the most commonly used refrigerant) when servicing and maintaining air conditioning equipment

Until the 31 December 2014 temporary use of recycled/recovered R-22 is possible but availability could be limited and costs high.

- **From 01/01/2015**

1 January 2015 sales or use of recycled/recovered R-22 will be prohibited.

The regulation also calls for all operators of HCFC refrigeration systems to take "all precautionary measures practicable" to prevent and minimise leakage. It states that all fixed equipment systems with a refrigerant charge greater than 3kg will require an annual check for leakage. This should be undertaken by qualified personnel and they will be required to properly recover any HCFC refrigerant removed from a system.

5 Alternative gases to HCFC's

There are presently 3 main alternatives to R22: R407C, R134a and R410A although there are other lesser used alternatives.

R407C is the most similar to R22 in terms of pressure and performance but has an operational temperature glide span of 5K.

R134A has a lower pressure than R22 and gives good performance as an air conditioning refrigerant. There are modifications required with this gas as a larger displacement compressor is required, and the system has to accommodate larger volume flows.

R410A operates at a significantly higher pressure than R22 and special systems have to be designed for this reason. Benefits of using this gas are superior heat transfer properties, lower pressure drops and a minimal temperature span. Also, because of its higher heat transfer properties the evaporator and condenser can be smaller.

A table is included as Appendix A outlining the performance characteristics and efficiencies of the alternative gases using R22 as a baseline 100%