

REAL ZERO CASE STUDY 1

Refrigeration Systems in the Retail Sector

The retail sector, including supermarkets, is one of the largest users of F-gas (fluorinated greenhouse gas) refrigerants. In the UK, leakage of HFC refrigerants from supermarket refrigeration systems is estimated to have been 769,000 kg in 2005¹. Under the F Gas Regulations, operators of refrigeration and air conditions (RAC) systems containing more than 3kg of HFC refrigerants are required to perform regular leak testing and must not add more refrigerant without first identifying and repairing the source of the leak. There are also strict requirements on recovery of refrigerant from systems, recording of refrigerant use and labelling of equipment. A REAL Zero site survey can help operators ensure that they comply with the F Gas Regulations and reduce potential and actual sources of refrigerant leakage.

Supermarket Site Survey Case Study

The refrigeration systems in a medium sized supermarket were surveyed using the REAL Zero methodology. The systems comprised low and high temperature refrigeration packs, with multiple condenser units. The systems were around 5 years old and charged with R404A refrigerant. Although the refrigerant leakage rate was lower than the average for the sector, the survey identified a number of leaks and other faults. There was also evidence that both packs were short of refrigerant charge, leading to reduced operating efficiency. The available F Gas logs and site maintenance records did not demonstrate that leak testing had been carried out at the required frequency (twice a year), nor did they specify the location for leaks that had been detected and repaired. Several recommendations were made for improving maintenance and leak testing regimes and reducing the future leakage potential.

Leak testing was carried out using hand held leak detectors that were capable of detecting leakage rates as low as 5g/ year. New leaks found included a significant leak in the Schrader valve used for charging refrigerant on the end housing of the liquid line filter drier, a leaking Pressure Relief Valve (PRV) and a leaking flare joint at the inlet to a filter drier. Additionally there was visual evidence of past leakage from a Receiver outlet valve and a drier outlet, as evidenced by oil stains. Caps were missing on several valves and bolts were also missing in some locations. Recommendations were made to the client for the repair of leaks, replacement of missing bolts and the fitting of caps to all valves.



The analysis of refrigerant leakage and the associated carbon emissions and financial impact are shown in the table below. The costs shown include only the cost of replacement refrigerant – in practice the costs associated with equipment downtime and repair and possible damage to perishable goods could be much higher.

Pack Ref	Refrigerant Type	Leaks Recorded in Site Log	Refrigerant Additions (kg)	Record Period (Months)	New Leaks Detected at Site Survey	Refrigerant Cost Over Period Recorded (£)	Total CO ₂ Emissions Equivalent (tonnes)
A	R404A	1	11	12	1	209	41.6
B	R404A	1	24	12	1	456	90.7
C	R404A	0	0	12	1	0	0
D	R404A	1	1	12	0	27	5.3
TOTALS		3	36		3	692	137.6

REAL ZERO CASE STUDY

Conclusion

The site survey identified that leak testing was not being carried out in full compliance with the F Gas regulations, as well as detecting several leaks and shortage of refrigerant. The report provided recommendations on practical steps to repair existing leaks and reduce the potential for leakage in the future. Good design practice and effective maintenance regimes will minimise the financial cost and environmental damage caused by refrigerant leakage.

REAL Zero Site Survey Process

REAL Zero site surveys are undertaken by advisers who have received training and assessment in refrigeration leakage reduction skills. They are RAC professionals who are members of the UK Institute of Refrigeration and may operate within a service and maintenance company, or as consultants. A site survey comprises:

- A visual examination of the RAC plant
- A leak test of readily accessible joints using a hand held electronic leak detector
- An examination of the F Gas log and other service records
- Discussions with site personnel who have day to day experience of the operation and service of the RAC equipment



The client is provided with a comprehensive report that includes:

- Executive summary and analysis of the carbon and financial impact of refrigerant leakage, based on site records
- Benchmarking of refrigerant leakage (comparison with the average for the sector)
- A review of site compliance with F Gas Regulations, including logs and record keeping, with recommendations for improvements where appropriate
- Identification of leaks and potential leakage points found during the survey, together with design or installation issues that may affect leakage
- Recommendations for resolving leaks and other problems identified during the survey
- A review of the site service and maintenance strategy

Refrigeration and Air Conditioning systems are responsible for significant emissions of Global Greenhouse Gases, resulting from their energy consumption and leakage of HFC and HCFC refrigerants. In the UK the emissions due to leakage of HFC refrigerants from all types of stationary refrigeration and air conditioning systems was estimated to be equivalent to 3,555,000 tonnes of CO₂ in 2005¹. REAL Zero is a UK Institute of Refrigeration initiative to help RAC system owners and operators to identify sources of refrigerant leakage and to take practical steps to reduce it. For more information on REAL Zero visit the website at www.realzero.org.uk

¹ AEAT (2004), *Emissions and Projections of HFCs, PFCs and SF6 for the UK and Constituent Countries*, Report No. AEAT/ED50090/R02