Options for a mandatory registration scheme for UK refrigerant handlers

Robert D Heap, December 2001

A report produced on behalf of the ACRIB steering group considering the feasibility of a mandatory registration scheme for refrigerant handlers in the United Kingdom.

This project is part of a FETA managed programme, HEVACR 2005, which is DTI supported.

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Options for a mandatory registration scheme for UK refrigerant handlers

Executive summary

An ACRIB steering group has considered the feasibility of a mandatory registration scheme for refrigerant handlers in the UK. This arises both from the legal requirements of EC 2037/2000 regarding ozone depleting substances and from ACRIB's wish to see a more regulated industry. The scope of the scheme includes about 100,000 operatives from all sectors.

Several schemes existing in various countries have been identified. The USA has restricted sales to certified people. The Netherlands has a comprehensive refrigerant control and monitoring system run by STEK. CORGI is the closest scheme currently in existence under UK legislation.

The results of a qualitative survey of stakeholder representatives are presented. Most people favour a scheme, but there are differing views as to the form it should take. There are differing views on acceptable costs, though most think a fee of around £50 per operative per year would be fair. Many think the ACRIB voluntary scheme administration could form a good basis for a mandatory scheme. For companies, the existing REFCOM scheme forms a starting point.

The information in this report is aimed at defining the type of refrigerant handler scheme most likely to be found appropriate for the UK, and identifying the main stakeholders. The scheme should be based on both individuals and businesses, in order to ensure proper refrigerant handling. What is legally possible without falling foul of trade restriction legislation needs to be considered. Many people favour the restriction of sales to registered businesses or individuals, as happens in the USA. This requires consideration of possible legal problems under EU law. Any scheme requires a careful definition of scope.

Following a meeting of stakeholders at which a draft of this report was discussed, a suggested structure for the scheme is proposed. Recommendations regarding competence criteria and the implementation of a scheme are given.

1. Introduction

An ACRIB steering group and working party was formed in mid 2001 to consider the feasibility of a mandatory registration scheme for refrigerant handlers in the United Kingdom. This project is part of a FETA managed programme, HEVACR 2005, which is DTI supported. This report provides the background to the recommendations developed by the steering group, and includes recommendations formulated after discussion of the draft report with stakeholders at a specially convened meeting on 30th October 2001 in London. A list of those organisations sent the draft report and invited to attend that meeting is given in Appendix VII. The objectives of this report include setting the scene in relation to other activities in the UK and elsewhere, and highlighting the issues that need consideration in drawing up recommendations.

The report includes details of a structured qualitative survey of representatives of key stakeholders, who have been included in the process of developing the recommendations. Whilst all views have been taken into account, and efforts have been made to find consensus, the final recommendations are those of ACRIB. It is anticipated that Government will use these recommendations in preparing legislation.

The work is being done as a priority task in the Skills and Training element of the HEVACR 2005 Programme – phase 2.

2. Project brief

The outline requirements for the steering group were initially set as follows:

- To cover the entire RAC sector and supply chain; including commercial, industrial and domestic businesses, and to encompass automotive a/c, reclamation & disposal of refrigerants.
- Assess the scope of such a scheme and the impact on individuals and companies.
- Assess/ estimate the numbers of people and companies involved.
- Recommend competencies and qualifications required for registration – including mature/ experienced operatives.
- Propose a registration scheme and supportive administration system, including if time permits, estimated set up and running costs (This scheme needs to be robust enough to encompass other competencies, including electrical wiring and brazing, at some time in the future.)
- If time permits and based on running costs for the proposed administration system, establish the fees required for the scheme to be self-funding.
- Recommend a practical "policing and enforcement" procedure.
- Establish a realistic timetable for the creation and operation of a suitable registration scheme.

The working group first considered a scheme for registration of individuals, covering the handling of all refrigerants, with the intention to consider Company registration schemes later. It was thought that competencies other than refrigerant handling could be developed at a later stage.

The priority areas for study were

- Recommend competencies and qualifications required for registration – including mature/experienced operatives
- Registration administration
- Policing and enforcement

The aim was to publish by mid-December 2001 a final report of the feasibility study into a national registration scheme for refrigeration engineers.

3. Background

3.1 EC 2038/2000

From a Government viewpoint, interest in legislating for refrigerant handlers arises from Regulation EC 2037/2000, Articles 16 and 17.

Paragraph 5 of Article 16 states:

> *5. Member States shall take steps to promote the recovery, recycling, reclamation and destruction of controlled substances and shall assign to users, refrigeration technicians or other appropriate bodies responsibility for ensuring compliance with the provisions of paragraph 1. Member States shall define the minimum qualification requirements for the personnel involved. By 31 December 2001 at the latest, Member States shall report to the Commission on the programmes related to the above qualification requirements. The Commission shall evaluate the measures taken by the Member States. In the light of this evaluation and of technical and other relevant information, the Commission, as appropriate, shall propose measures regarding those minimum qualification requirements.*

Article 17 paragraph 1 states:

> *1. All precautionary measures practicable shall be taken to prevent and minimise leakages of controlled substances. In particular, fixed equipment with a refrigerating fluid charge of more than 3 kg shall be checked for leakages annually. Member States shall define the minimum qualification requirements for the personnel involved. By 31 December 2001 at the latest, Member States shall report to the Commission on the programmes related to the above qualification requirements. The Commission shall evaluate the measures taken by the Member States. In the light of this evaluation and of technical and other relevant information, the Commission, as appropriate, shall propose measures regarding those minimum qualification requirements.*

There have been clear indications from DEFRA that the Government wishes to include all refrigerants, not only ozone depleting substances, and that this could be done within the Environmental Protection Act.

3.2 The UK industry

The fullest survey of the UK refrigeration and air conditioning industry was carried out by March Consulting Group in 1992, in a study for the Department of the Environment entitled, “CFCs in the UK refrigeration and air conditioning industries – usage and scope for substitution”.

This report identified the following at that time:

- The domestic sector
- 156,000 small retail outlets
- 5,500 supermarkets and 600 cash-and-carry outlets
- 254,000 pubs, hotels, restaurants and canteens
- 2,803 food and drink industrial sites
- 761 chemical industrial sites
- About 60,000 air conditioned offices
- Maybe 30,000 other air conditioned commercial premises
- Unassessed numbers in public sector buildings, transport, mobile air conditioning, and heat pumps for heating

The report also identified about 4,000 contractors with 26,000 employees, and 80 OEMs with 8,000 employees. In 2001, the HVCA alone has 1,250 members employing 50,000 people, but many of these will not be refrigerant handlers.

Recent (May 2000) data from March Consulting Group are as follows:

- Domestic refrigeration, 25 million systems
- Small hermetic units, 250,000 systems
- Small commercial distributed systems, 250,000 units
- Supermarket systems, 3,000
- Industrial systems, 2,500
- Building air conditioning systems, 100,000
- Refrigerated transport, 150,000 systems

The more recent data probably overcomes some of the uncertainties inherent in the 1992 data.

The mobile air conditioning sector has grown considerably since 1992. It has been estimated that by the end of 2002 there will be at least 7.6 million cars in the UK with air conditioning, mostly using HFC-134a, containing about 5,700 tons of refrigerant. This is perhaps 50% more refrigerant fluid than there is in domestic systems. The majority of air-conditioned cars are less than four years old, and should not have required their systems servicing yet. By about 2007 the number of cars with air conditioning is expected to rise to double the 2002 figure.

Resources do not permit a detailed survey at this time, but the indications are that there could be 30,000 to 40,000 refrigeration engineers and technicians in the commercial and industrial refrigeration and air conditioning sector, plus a proportion of 30,000 domestic refrigeration service technicians, plus 50,000 motor vehicle repair workshops which could employ one or more repairers of mobile air conditioning systems. If all these were to be included in a registration scheme, there would be around 100,000 potential registrants. A company scheme might have to include over 50,000 businesses.

3.3 Previous UK involvement

The industry, through ACRIB, has been in discussion with government about a refrigerant monitoring and control system for several years. A scheme outline was drawn up in 1998, which included a list of relevant sectors, a proposal for an audit trail, definitions, and compliance criteria for companies and individuals. The outline developed then is reproduced in Appendix I, which includes definitions which might be used in a handler registration scheme.

ACRIB has a voluntary registration scheme for refrigerant handlers, using either CITB or City and Guilds competence assessments. The voluntary register has about 2,300 names, and administration of the register is subcontracted to the Institute of Refrigeration. 13,200 people have passed the City and Guilds assessment (2078) since its introduction in 1996; about 7,200 have been accredited on the CITB scheme since 1995. A set of common agreed performance and knowledge criteria based on the C&G 2078 requirements is listed in Appendix II.

To join the voluntary scheme, although only the short assessment is compulsory, a training course costing around £250 and taking two days is typical. If only the assessment, certificate and registration are needed, the cost is about £150, of which the actual registration is about £20. These costs do not include the employee's time, which may typically be costed at £350 per day.

The ACRIB scheme requires re-registration at three-yearly intervals; this does not usually require re-assessment, though ACRIB will require re-assessment at renewals if there is a subsequent substantial change in the technology or fluids in use.

For companies, REFCOM operates a registration scheme. Before a company can join this scheme, proof of registration of its operatives on the ACRIB register is required. The essential requirements for registration are as follows:

a) company must be registered as a carrier of controlled waste;

b) refrigerant recovery equipment must be used;

c) operatives must be certificated as competent to handle refrigerants. Satisfactory proof of competence would be registration on the ACRIB register of operatives competent in the handling of refrigerants;

d) company must conform to all current legal requirements;

e) company must have an auditable procedure in place which will enable proper control of refrigerants to be demonstrated.

At present there are about 30 separate companies registered with REFCOM, some at several separate locations. Fees are £225 initially, plus £175 per year, with reduced fees of £100 and £50 for additional locations.

There are other UK schemes, which might relate to refrigerant handler certification, including a recently developed Engineering Services Skillcard, aimed at providing provide a data base for manpower planning in the industry, and also ensuring safety on major construction sites. This is based on N/SVQ registration, or on attendance at a one-day course on safe working practices. Cards will be issued costing £20 to renew every five years. In due course it is intended to extend the scheme to operatives in domestic heating and plumbing, service and maintenance, and refrigeration and air conditioning.

3.4 Future requirements including EU

For the future, it will be necessary to integrate any proposed scheme both with European legislation and with other UK Skills and Training programmes, including S/NVQs. The integration of a refrigerant handling module within appropriate S/NVQs is seen as straightforward. It will also be necessary later or perhaps immediately to integrate a personnel registration scheme with a company scheme. For some sectors, the scheme may need to be suitable as part of a wider voluntary scheme covering competences in addition to refrigerant handling, e.g. brazing or appliance servicing.

Within Europe, the European Climate Change Programme has provided a forum for formulation of ideas, and a report was issued in mid-2001. The most relevant outcome was a recommendation for a community directive on fluorinated gases. The recommendation is as follows:

Recommendation 2: Establish a regulatory framework in a "Community Directive on Fluorinated Gases"

A key recommendation of the Working Group is the elaboration and adoption of a "Community Directive on Fluorinated Gases". The key objectives of such a Directive would be:

Improved monitoring and verification of emissions of fluorinated gases. *The Directive should ensure that significant improvements are made to the coverage and accuracy of emissions monitoring within the EU. The Directive should place reporting obligations on organisations, either through trade associations or companies, such as:*
- fluid manufacturers and importers
- purchasers of fluids (e.g. manufacturers, users and maintainers of refiigeration equipment, fillers of aerosol cans, foam producers)
- fluid recyclers and destroyers.
- owners of facilities from which fluorinated gases are emitted as by-products
These obligations would enable accurate estimates of emissions from each major market segment to be established at both Member State and EU levels.

Improved containment of fluorinated gases. *The Directive should ensure that when fluorinated gases are used in products and equipment that optimal technologies are used to minimise emissions during equipment manufacture, equipment life and at end of life. To the extent practicable, the Directive should place obligations on manufacturers, users and maintainers of equipment to achieve defined standards of performance in relation to emissions. Legislation of this type already exists on Member State level; for example the Netherlands refrigerant leakage regulation was considered by the Working Group as an important reference.*

Marketing and use restrictions in certain applications.*The Directive (or the Community chemicals legislation) could be used to ban the use of fluorinated gases in a certain number of applications such as car tyres, double-glazing and potentially certain novelty aerosols.*

The group suggested that in a number of matters (e.g. monitoring) the Directive should build on requirements and instruments created under the EC Regulation 2037/2000 on Ozone Depleting Substances.

The Working Group agreed, that the primary objectives described above are best addressed via legislation at EU level. The Directive could address other issues as well, although there was less consensus about the content and scope of such provisions. In particular, it was discussed whether the Directive could provide some guidance about substitution of fluorinated gases by the use of alternative fluids and about addressing the energy efficiency issue.
However, there was general agreement that these issues were more difficult to tackle than the primary objectives and it might be more practical to concentrate on the early adoption of a Directive that successfully deals with the primary objectives.

This recommendation has been considered within the EC and legislation has been proposed, in the form of development of a framework directive on fluorinated gases. The final proposal is expected in the first half of 2002. It is important to maintain contact with the relevant EC officials during the formulation of a UK proposal for registration, to avoid possible future conflicts with EU legislation.

Also on a European level, AREA has drafted an outline for a European certification scheme for both companies and personnel. The project was approved in an AREA General Assembly in October 2001. This proposal will presumably also be an input to the EC as it formulates legislation.

4. Other schemes

It is important to be aware of some of the other schemes which may provide useful background information for a UK registration scheme. The following list is not intended to be comprehensive, additional information is given in Appendix VI.

4.1 USA

US legislation is under section 608 of the Clean Air Act. Considerable detail is available on the EPA web site.

In order to purchase refrigerants and to service a refrigerant system, technicians must have passed an EPA examination. This pertains to all systems, large and small. In addition, there is an obligation on contractors to certify that they are using approved recovery/recycling equipment. Refrigerants (including HFCs) can only be purchased by technicians who have passed the examination.

4.2 EU member states

Sweden, Norway, Denmark, and France are known to have schemes, and Belgium is believed to be developing a scheme. The Swedish scheme, introduced in 1997, requires servicing and installation of refrigeration and air-conditioning systems to only be carried out by competent (accredited) enterprises, these must have:

- Certified and trained personnel (6 different classes of competence depending on system and refrigerant charge, re-examination every 5 years).
- Necessary equipment for recovery, leak testing and maintenance etc.

The most widely quoted scheme is that in the Netherlands, operated by an organisation called STEK. Full details of the STEK scheme have been obtained, but full details of schemes in other member states have not been determined.

4.3 STEK

In the Netherlands there is a mandatory system, managed by STEK, set up in 1991 for the handling of ozone depleting refrigerants. In addition to certification of individuals, it also includes

- Registration of contractors
- Registration of equipment over 500 watts nominal compressor power input
- Mandatory technical requirements for equipment design and manufacture (excluding equipment of less than 500 Watts nominal compressor power)
- Auditing of companies
- Monitoring of refrigerant use

The STEK system depends on

a) Registration of “installers” (including service and repair personnel) but not manufacturers, excluding installers of domestic appliances, but including those servicing domestic equipment. Registration is in effect a licence to trade.
b) An accepted environmental responsibility of users to use registered installers, enforced by legislation with substantial penalties
c) Good co-operation between government and representative organisations in the industry. For example, there is a law mandating repair of any leaks detected.

Individuals are certified free of charge on completion of an examination, which differs for general refrigeration and air conditioning and for mobile air conditioning. Employers pay an annual fee of 400 to 4400 Euros depending on the number of employees and the audit company chosen. There are no exceptions to the requirements, either for companies or for established employees.

The individual examination is taken at one of a number of independent centres, typically costing 363 Euros. It can be based on a 5-day study course using a standard book. The examination itself includes a short theory exam and two practical exams (only one for MAC) in handling and installation, which are done on a standard model system with real components. Demonstrably equivalent qualifications from other countries are accepted.

The system was set up by co-operation between government and trade associations representing 80-90% of their sectors. Cap Gemini Ernst & Young have an Association Management section, which manages STEK amongst many other associations. Examination and auditing are “subcontracted” to approved bodies. Administration is largely electronic, including transmission of audit reports, using standard forms on laptop computers on site. The STEK scheme registers include 2,400 companies, 1.4 million installations, and about 8,000 individuals. The individual register is not generally available under Dutch privacy laws.

The system has reduced leakage to an average of 4.8% p.a., with 92% of installations having no leaks. The greatest leakages are now in the industrial sector. STEK covers CFCs, HCFCs and

HFCs. National and European standards (e.g. EN 378) set requirements for flammable and for toxic refrigerants, and it is not clear whether there will be future moves to include these later.

Future moves could result in mandated maximum leak rates, possibly per contractor rather than per installation. There is also some feeling that the STEK organisation should face competition, to reduce costs and to avoid the danger of it taking on more than its statutory obligations.

Registration is not a precondition for purchase of refrigerants, as this is understood to go against free trade rules in the EU.

Further details of the STEK scheme are in Appendix III.

4.4 Australia

Australia is a federation of states. In 1999 the National Public Affairs Group published a feasibility study for the establishment of a nationally consistent accreditation scheme for refrigeration and air conditioning companies and technicians. This resulted in the setting up of a company (the Air Conditioning and Refrigeration Institute Australia Pty Ltd) to establish such a scheme.

This study found that

- Accreditation should be competency based, not refrigerant based
- It must be available to all
- It can be delegated to industry groups
- It must be self-financing, but would incur start-up costs of around £100,000 including the necessary promotion.
- It might cover about 37,300 technicians.

There are existing schemes in some states. In New South Wales, all except those dealing with plug-in domestic equipment and automobile air conditioning need a handlers accreditation certificate plus an apprenticeship or trade certificate or a defined combination of experience and qualifications.

4.5 CORGI

The Council for Registered Gas Installers has been set up on the basis of legislation, which requires contractors working with gas to be CORGI registered. There is no specific legal requirement for certification of individuals, but CORGI rules insist on certification as a proof of competence and only CORGI registered contractors can work. (This appears to be a way of overcoming trade restriction rules, which works.) There is also an HSE requirement. The CORGI model is widely seen as effective, and any deviation from this model might raise questions as to why another model was necessary.

CORGI has 44,000 businesses and 95,000 employees registered. The registration is by company and costs are as follows.

- £180 for the application
- £166 for annual registration including one employee
- £48 per extra employee

Benefits, in addition to registration, include

- a technical help line
- installer manuals
- a monthly magazine
- a members web site
- briefings and presentations
- logo use
- a guarantee scheme

All operatives are assessed to nationally agreed standards, to gain certificates valid for five years. There are 150 assessment centres approved by one of six certification bodies accredited by the United Kingdom Accreditation Service (UKAS). Training can be by home study or by attending a course. The certification only covers matters of gas safety – other competencies are not covered.

5. Structured qualitative survey

5.1 The survey

During August 2001, a structured qualitative survey was carried out by visit and telephone to determine the knowledge and views of representatives of major stakeholder groups. Interviewees were given advance warning by e-mail, and the opportunity to choose a convenient time. The structured telephone questionnaire reproduced as Appendix IV was used as the common basis for the survey. Thirty-seven interviewees provided responses, but not everyone responded to all the questions.

The replies obtained provide a good indication of the questions that will need to be addressed in the final proposal for a registration scheme, if it to receive widespread support.

The replies are often those of individuals given without consultation, and must not be taken as policy statements on behalf of the respondents organisations unless specifically stated.

5.2 Results

Awareness of proposals (questions 2,4)

The vast majority were aware of the proposals. Several outside the ACRIB network were only aware in relation to ozone depleting substances. There were a few who were unaware of the proposals.

Comments on proposals (questions 3,5)

Many people said that the ideas made good sense, and several of these were strongly in favour of implementation as soon as possible. Many other people qualified a positive reply. Only AMDEA seemed to regard certification as unnecessary, both practically and legally.

There were the following three distinct views volunteered in roughly equal numbers.

1. That any scheme should require no more than C&G 2078

2. That other competencies should be included at the start
3. That other competencies should be added later.

Other comments included:

- Companies (particularly industrial companies) working on their own plant should not need certification or registration, only their individual employees (Nestlé).
- Any scheme would give added status within Europe.
- The scheme must build on what already exists.
- There are benefits for industry, consumers, and the environment.
- The scheme must be simple and cost effective.
- Existing members of REFCOM should be accepted without reassessment (HVCA).
- A scheme is essential to remove the incompetent and uneducated operators (DASA).
- A good idea but needs to discriminate between different sectors.
- It is important to keep all concerned parties well informed as the scheme is developed.

Should there be a common standard and should it be C&G 2078?

It was almost universally thought that if C&G 2078 criteria were chosen, they should be applicable through any equivalent scheme and there could not be a C&G monopoly. All agreed that there should be no exemptions or concessions for mature/experienced operatives. Otherwise there was a range of opinions, none clearly associated with any particular group of people.

- Seven people thought that the 2078 equivalent should be the one standard to use.
- Five considered that sector differentiation is needed. For example, those only concerned with recovery from scrap equipment do not need to know how to charge a system.
- Four wanted additional sector-specific criteria for servicing or installation, and a further three favoured differing criteria with a common core.
- Three thought differentiation should not be sectoral but fluid based.
- Three clearly considered C&G 2078 insufficient or unsuitable or unnecessary.
- DASA considered it necessary for any criteria to be expressed in language that would be more specific and more easily understood by operatives, which would need to be sectorally differentiated.

Impact on business (question 7)

Most considered the impact would be positive, several anticipated little impact as they already implement such schemes voluntarily. Comments included the following:

- The scheme will need to be co-ordinated with NVQs, etc. (ESTTL).
- If the scheme included customer liability as in the Netherlands, there could be problems of definition (CSDF).
- Any sales limitation (as in the USA) must allow sales to companies, not just named individuals – many sales are provided initially to a van driver, not a technician (HRP).
- Could add registration needs to 30,000 people in garage trades (RMIF).
- Should have no effect on retailers, only on contractors (BRC).

Awareness of STEK (question 8)

A few people were not aware of STEK. The rest were equally split between those considering themselves substantially aware and those only vaguely aware of it. About half of those aware of the provisions thought it the right target to aim for and the rest thought it would be too much for the UK.

Costs (Question 9)

Details of costs of various existing schemes are given in sections 3 and 4 above.

Many people preferred not to comment. The majority of those commenting regarded CORGI as a reasonable benchmark, even if they did not know what the CORGI cost was. The majority regarded £50 per person as reasonable.

Several people said that companies should be on a sliding scale based on number of operatives, in the range £150 to £1,000.

A few people involved with training thought £50 was excessive, suggesting £10-£25.

Several employers noted that registration costs were small compare with the total costs of assessment, so were unlikely to be a problem as long as they were universally applied.

Awareness of the ACRIB scheme and its suitability as a basis for a mandatory scheme (questions 10 and 11)

- Twenty-four people were aware of the scheme and of these thirteen considered that it would be a good, suitable or ideal basis for a mandatory scheme.
- Five were unfamiliar with the scheme.
- Four considered it would need some modification, and would then be suitable.
- Two people pointed out that ACRIB does not have the necessary infrastructure and resources to manage a scheme of the scale required, which is certainly true at present.

Policing and enforcement (question 12)

This was generally regarded as a difficult question. Several respondents discussed the need for proper quality control of evaluators, rather than enforcement of legal requirements.

- Twelve people thought that a sales restriction to certified personnel/companies (similar to the USA model) was either the best or the only effective means of enforcement.
- Four saw an essential need for Government policing.
- Two regarded enforcement as unnecessary.
- One person thought large fines essential, another thought large fines inappropriate.

Additional comments (question 13)

About half those consulted thought the questions had covered the issues.

Some of the additional comments were as follows:

- Any registration scheme must provide added value.
- Legislation is essential for progress.
- Consumers must be consulted.

- Impacts need detailed quantification.
- Consistent quality control of assessors is essential.
- A scheme would provide benefits of perceived quality, which in turn would aid recruitment.
- There should be early discussions with NGOs to ensure their support.
- The environment will be an increasingly important issue so a scheme would be timely.
- Government must assess cost increases to the final consumer.
- Any scheme must be practical and moderate if it is to succeed.
- "Give us the clout and we'll sort it out", or in other words, industry is best placed to devise and implement a scheme.

Desire to comment on a draft report (question 15)

Representatives of a number of organisations wished to comment on a draft.

5.3 Conclusions

The survey was well received, and is large enough to have brought out the likely range of views and issues to be considered.

6. Options considered

6.1 Scope

The scope of the scheme could cover any combination of the following:

- The commercial RAC sector, including transport refrigeration
- Domestic refrigeration servicing
- Vehicle air conditioning
- Industrial installations
- Recovery and reclaim

It could cover all those handling refrigerants, or could be restricted to those doing so for another party by way of business. Whatever the chosen scope, great care will be needed to ensure that definitions cover all of but only the intended targets. The working group considers that any scheme must include all of those listed above if it is to be effective. The intention is to ensure that no industry sector involved with handling refrigerants is omitted from the scope. Detailed definitions will be required in order to ensure comprehensive coverage. It is noted that the act of transportation of refrigerant fluids and equipment containing them by people not involved in breaking into refrigeration circuits should not come within the required scope.

The fluids covered should include ozone depleting substances, HFCs and blends, ammonia (in a separate qualification) and hydrocarbons used as refrigerants. It should not include refrigerant fluids sold for other (e.g. laboratory reagent) purposes, or relatively non-hazardous "natural" refrigerants. Carbon dioxide in closed compression cycle systems should be included, on safety grounds, whereas carbon dioxide or nitrogen used in total loss applications should be excluded.

6.2 Basis of regulation

Although EC 2037/2000 only refers to personnel, the scheme should be based on both individuals and businesses. This will aid administration and enforcement, and may become a necessity under future EU legislation relating to fluorinated gases. Businesses need to possess suitable equipment and to maintain appropriate records. What is legally possible without falling foul of trade restriction legislation needs to be considered. The preferred option is to follow the established model for gas equipment installers, which is legally based on registered businesses employing certified operatives, with only registered businesses allowed to operate. The existing ACRIB scheme for individuals and REFCOM scheme for companies could be starting points.

6.3 Qualification basis

The core qualification should cover a set of common performance and knowledge criteria based on the City & Guilds 2078 refrigerant handling assessment (but not limited to that organisation as an assessing and certifying body). Realistically, there will need to be differing certifications under the agreed common criteria for each industry sector. Nevertheless a scheme based on mandatory core criteria is the preferred option. There should be no differentiation between mature/experienced operatives and others. It may be necessary to provide a derogation for industrial operators who are approved for handling prescribed substances, as defined by the Environmental Protection Act 1990, in order to limit the number of specific qualifications required for these people.

The current City and Guilds competence assessment differentiates between refrigerant charging and refrigerant recovery. It also differentiates ammonia from other refrigerants. It seems likely that further discrimination in assessment modules could include the following:

- Charging refrigerant – ammonia
- Charging refrigerant – other fluids, all applications including industrial and commercial equipment
- Charging refrigerant – domestic equipment only and small commercial
- Charging refrigerant – vehicle air conditioning equipment only
- Recovering refrigerant – ammonia
- Recovering refrigerant – other fluids, all applications including industrial and commercial equipment
- Recovering refrigerant – domestic equipment only and small commercial
- Recovering refrigerant – vehicle air conditioning equipment only

6.4 Enforcement

It will be illegal for incompetent people to handle refrigerants. The preferred enforcement option is to restrict sales of refrigerant to authorised businesses and individuals as happens in the USA. However, this requires consideration of possible legal difficulties. Initial advice from Government lawyers was as follows:

There would be a real difficulty here with a scheme to restrict the sale of refrigerant only to those companies and individuals registered. The free movement of goods as enshrined in Article 28 EC is a fundamental freedom, which can only be infringed in certain circumstances as set out in Article 30 EC. These include "public policy", but as a derogation from Article 28 EC this is narrowly construed, and the ECJ has construed it very restrictively, so much so that a leading text book on EC law states that "no Member State can feel confident of success when it puts forward public policy as a justification for hindering the free flow of goods between Member States." I therefore think there are real problems with any such proposal, and that an attempt to surmount them will require careful thought.

Subsequent consideration suggests the difficulties can be overcome.

Further research may be required as to existing mandatory scheme provisions and mechanisms for enforcement. Both users and owners should be subject to any fines or other enforcement provisions. The possible role of the Environment Agency, Local Government or other technically specialised agency needs to be considered.

The RMIF on behalf of the Retail Motor Industry has drawn attention to what they consider to be the key option already in existence, the Local Authority Air Pollution Control regime brought in under the Environmental Protection Act 1990. This, they argue, is legislatively the easiest regime for DEFRA to introduce as it only requires refrigerant handling to be added to the list of prescribed processes and suitable Secretary of State's guidance written for local authorities. The latter need only be a very brief document given that it would call up mandatory qualification requirements by reference only. The issue of enforcement is an integral part of the LAPC regime. ACRIB considers that such a regime would not provide a sufficient degree of control, and that an independent full registration scheme for refrigerant handlers is needed.

It must be remembered that the decision as to what should be covered by law is the prerogative of Parliament and depends on political pressures. CORGI only came to be as a result of the widely publicised Ronan Point disaster, and only gained its legal status once a voluntary scheme was seen to be inadequate.

7. Implementation

It will be necessary to consult with a wide audience at all stages of the development of a scheme, to ensure there are no stakeholders who have not been considered.

Details of how a scheme would be administered and what it might cost require careful consideration. The general criteria for certification bodies laid down in EN 45013 should be considered both by

certification bodies and by the registration body. The registration body could be a Government department or agency, an Industry body, or a Local Authority organisation: the object should be to provide an effective, lowest cost, self-funding scheme. However, the costs of initially setting up the scheme may need to be provided. The basic structure of a scheme can be derived from existing schemes as follows.

1) There should be an Advisory Board or Council comprising representatives of government, industry trade associations, major user groups, and other interested parties, which would be involved in standard setting and approval of certifying bodies.
2) There should be a register of individuals and businesses administered on the basis of certificates received. Registrants could receive ancillary services including public relations, a help line, manuals and other training material, a web page, a newsletter and a logo. The administration of this register could build on the existing ACRIB scheme for individuals and REFCOM scheme for companies, but would probably need to be overseen by a new and independent organisation on a larger scale.
3) There should be about half a dozen certification bodies, possibly all subject to UKAS accreditation. This provides some assurance of quality, but is relatively expensive (of the order of £10,000 initially, with 4-yearly renewals at around £4,000), and may only be appropriate for large organisations involved in many types of assessment (many of whom will already hold this accreditation).
4) There should be many assessment centres approved by a number of certification bodies, carrying out assessments and issuing or causing to be issued the appropriate certificates. It is envisaged that many of these assessment centres would be sector specific, e.g. vehicle air conditioning, and would carry out the assessments on equipment appropriate to the sector.
5) There would be optional training provided by the assessment centres, to enable people to meet the certification criteria referred to in 6.3 above.

Assuming that the scheme is accepted by Government and is set up, the assessments will require a period of two to three years after publication of the relevant Act in which handlers must become certified as competent. In this period there should be a progressive implementation, starting with individuals already in possession of suitable certificates from C&G or elsewhere, and companies already registered with REFCOM. This progressive implementation scheme needs further consideration.

The costs of setting up and implementing the scheme have yet to be assessed, and can only be considered in detail following a Government response to this report.

8. Acknowledgement

The author wishes to thank all those who have contributed to this report by interview or by provision of data for their willingness to assist and for their helpful comments.

It is acknowledged that the information in this report can never be fully complete and detailed, and it is largely dependent on other sources. Resources are not available to confirm the accuracy of all the data, so the author will gratefully receive any corrections.

Appendix I

REFRIGERANT MONITORING AND CONTROL SYSTEM
ACRIB DRAFT PROPOSALS, October 1998

SCHEME OUTLINE

This monitoring and control system is intended to apply to all organisations and persons that handle refrigerant.

Refrigerant Handling: Refrigerant handling involves breaking into a refrigeration system e.g. charging or recovery of refrigerant or otherwise servicing any refrigeration system. Competence in carrying out this operation is required by any person who by his/her individual action can cause refrigerant to be emitted to atmosphere.

All individuals must demonstrate competence, be certified and registered as refrigerant handlers.

Sectors of the industry that require licenses are as follows:

All Producers/Importers/Bottlers of refrigerant will be required to be licensed to sell refrigerant. A condition of that license will be that only registered individuals and companies will be supplied. Records of virgin refrigerants sold and recovered, refrigerant manufactured brought or bought in plus all refrigerants sent for disposal will be maintained in an approved manner. Failure to observe the licensing conditions will result in substantial fines culminating in the loss of license and therefore the right to trade in refrigerants.

Wholesalers/Sub-Distributors of Refrigerant/Distributors of Automotive Air Conditioning Equipment will be licensed to purchase refrigerant and to sell refrigerant only to persons or organisations registered as competent to handle refrigerant. Similar penalties to above will apply to the sale of refrigerant to non registered persons.

Manufacturers of Original Refrigeration and Air Conditioning Equipment shall only purchase refrigerant from licensed suppliers. A detailed audit trail of incoming and outgoing refrigerant will be maintained and only competent persons within their organisation will be permitted to handle refrigerant.

Contractors and Installers that carry out refrigeration and air conditioning work, including service, maintenance or installation, shall purchase refrigerant only from licensed suppliers, should maintain an approved audit trail providing a detailed record of all purchases and sales, quantities and types of refrigerant. and shall maintain detailed return notes, waste transfer notes for all recovered and returned refrigerant. All persons handling refrigerant within the company shall be registered as competent.

Garages, Motor Dealerships, Vehicle Manufacturers or Other Organisations Installing or Servicing Automotive Air Conditioning shall purchase refrigerant only from licensed suppliers, shall maintain an approved audit trail providing a detailed record of all purchases and sales, quantities and types of refrigerant and shall maintain detailed return notes, waste transfer notes for all recovered and returned refrigerant. All persons handling refrigerant shall be registered as competent.

Organisations that Install or Service Refrigeration and Air Conditioning in Commercial Transport, Refrigerated Container Equipment and Plant including Vehicle Manufacturers shall purchase refrigerant only from licensed suppliers, shall maintain an approved audit trail providing a detailed record of all purchases and sales of quantities and types of refrigerant. They shall maintain details of return notes, waste transfer notes for all recovered and returned refrigerant. All persons handling refrigerant shall be registered as competent.

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Although the above sets out the usual structure and operation of the industry , it should be

particularly noted that the following categories are included in the scope:

Vehicle Bodyshop Operatives

In House Service/Maintenance Engineers shall purchase refrigerant only from licensed suppliers and shall maintain an approved audit trail providing a detailed record of all purchases and use of refrigerant by quantity and type and they shall maintain detailed returns notes, waste transfer notes for all recovered and returned refrigerant. All persons handling refrigerant shall be registered as competent.

Individual or Company Domestic Appliance Engineers shall purchase refrigerant only from licensed suppliers and shall maintain an approved audit trail providing a detailed record of all purchases and sales by quantity and type of refrigerant. They shall maintain detailed records of returns notes, waste transfer notes for all recovered and returned refrigerants. All persons handling refrigerant shall be registered as competent.

Hire Company Installation/ Service Engineers shall comply with similar requirements to the in house service maintenance engineers.

Domestic Air Conditioning Installation Engineers shall comply with similar requirements to that of air conditioning contractors.

Wholesalers/Distributors of Split Air Conditioning or Split Refrigeration Systems shall be licensed to sell refrigerant and shall sell refrigerant or equipment containing refrigerant only to registered persons. They shall maintain a record of all sales by quantity and customer.

Scrap Dealers, Demolition Contractors and Local Authorities shall maintain an approved audit trail providing a detailed record of all recovered refrigerants by quantity and type, including detailed records of returns notes and waste transfer notes for all recovered and returned refrigerants. All persons handling refrigerant shall be registered as competent.

Appendix II. DRAFT COMMON CRITERIA FOR HANDLING REFRIGERANTS (based on City & Guilds 2078 – changes shown in italics)

1. Charging refrigerant

Performance criteria
The assessor must observe each candidate performing the following practical activities:

1.1 Select, check and use appropriate safety and personal protective equipment
1.2 *Recognise* type and condition of refrigerant and its state (e.g. liquid or vapour, subcooled, saturated or superheated)
1.3 Connect gauges, lines and charging apparatus with minimum contamination and loss to atmosphere and hazards to health and property e.g. toxicity, flammability and combustibility, *where appropriate*.
1.4 Charge the system with refrigerant in the liquid phase to the correct charge level. *Domestic and Commercial assessments must also charge with zeotropic blends.*
1.5 Remove gauges *lines, charging apparatus*, with minimum contamination and loss to atmosphere and hazards to health and property (e.g. toxicity, flammability and combustibility), *where appropriate.*
1.6 Check and test for leaks and appropriate action taken if leak is discovered
1.7 Refit caps

Knowledge evidence

Candidates are required to give satisfactory responses to oral questions for each of the following:

1.9 Effect of *EU Regulation 2037 – 2000 and (name of UK enforcing document to be inserted)* on the operations of the Refrigeration and Air Conditioning Industries *in respect of* the control and use of refrigerants
1.10 Safe working practices including risk assessments and permits to work *(where appropriate)*
1.11 Responsibilities that the COSHH Regulations impose on both employer and employee in relation to handling refrigerants.
1.12 Hazards presented by refrigerants in current use *in that industry*, e.g. CFCs, HCFCs, HFCs and blends, *as appropriate*
1.13 Evidence that retrofilling has occurred
1.14 Additional hazards presented by hydrocarbon refrigerants and hydrocarbon blends, *where appropriate*, including additional *safety* equipment and circumstances in which it may be required and conditions which give rise to dangerous situations in terms of flammability combustibility, percentage concentrations to avoid, potential ignition sources and actions to take in the event of leaks or spills.
1.15 Differential separation *of zeotropic blends used in Commercial and Domestic applications* and the effects this may have during charging, *where appropriate.*
1.16 Labelling of systems after charging to indicate types of refrigerant and lubricant *as appropriate*
1.17 Requirements for safe handling, storage and transportation of cylinders of refrigerant
1.18 Potential hazards which could occur while charging refrigerants into systems
1.19 Actions to be taken on discovering a leakage after removal of gauges *and charging apparatus, where appropriate.*
1.20 Requirements of *industry best practice* for the minimisation of refrigerant emissions and of relevant industry safety standards (*see References*)
1.21 Reasons for ensuring the integrity, tightness and cleanliness of systems
1.22 Strength, pressure and leak testing procedures
1.23 *Appropriate* vacuum procedures and dehydration of system prior to charging with refrigerant.

2 Recovering Refrigerant

Performance criteria
The assessor must observe each candidate performing the following practical activities

2.1 Select, check and use appropriate safety and personal protective equipment
2.2 *Recognise* type and condition of refrigerant and its state (e.g. liquid or vapour, subcooled, saturated or superheated)
2.3 Connect gauges, lines and recovery apparatus with minimum contamination and loss to atmosphere and hazards to health and property e.g. toxicity, flammability and combustibility, *where appropriate.*
2.4 Select and check appropriate recovery cylinder to ensure its integrity and fitness for use prior to connection.

2.5 Recover refrigerant from the system until the gauges read zero (atmospheric pressure)
2.6 Disconnect gauges, lines and recovery equipment and cylinder with minimum c*ontamination* and loss to atmosphere and hazards to health and property e.g. toxicity, flammability and combustibility, *as appropriate*.
2.7 Prepare cylinder for transportation in compliance with the regulations (*eg the Waste Transport Regulations.)*
2.8 Refit caps

Knowledge evidence

Candidates are required to give satisfactory responses to oral questions for each of the following:

2.10 Effect of *EU Regulation 2073 – 2000 and (name of UK enforcing document to be inserted)* on the operations of the Refrigeration and Air Conditioning Industries and the requirements of current European regulations on the control and use of refrigerants
2.11 Safe working practices including risk assessments and permits to work, *as appropriate*
2.12 Responsibilities that the COSHH Regulations impose on both employer and employee in relation to handling refrigerants.
2.13 Hazards presented by refrigerants in current use *in that industry*, e.g. CFCs, HCFCs, HFCs and blends.
2.14 Evidence that retrofilling has occurred
2.15 Additional hazards presented by hydrocarbon refrigerants and hydrocarbon *blends if appropriate*. Including additional *safety* equipment and circumstances in which it may be required, and conditions which give rise to dangerous situations in terms of flammability combustibility, percentage concentrations to avoid, potential ignition sources and actions to take in the event of leaks or spills.
2.16 Differential separation and the effects this may have during recovery *as appropriate*.
2.17 Labelling of recovery cylinders to indicate contents
2.18 Requirements for safe handling, storage and transportation of cylinders of recovered waste refrigerant
2.19 Potential hazards which could occur while recovering refrigerants and other contaminants into recovery cylinders, as appropriate.
2.20 *Where appropriate*, methods of field testing recovered refrigerant and/or oil for contamination in order to decide whether it is fit for re-use in the same equipment or should be sent for recycling.
2.21 Hazards from recovered refrigerant, refrigeration oil and other contaminated mixtures.
2.22 Special requirements for the storage and disposal of waste refrigeration oil *if appropriate.*
2.23 Duty of care imposed on both employer and employee under waste regulations to complete necessary documentation during transfer of waste.
2.24 Methods for minimising refrigerant retention in oil
2.25 Methods for recovering both liquid and vapour refrigerant *if appropriate*.

NOTE
Candidates taking BOTH units (l and 2) for full certification are not to be assessed on the COMMON knowledge areas (1.9 to 1.16 or 2.10 to 2.17) twice but only on the areas special to that unit.

REFERENCES
Institute of Refrigeration Code of Practice for the Minimisation of Refrigerant Emissions
Other industry specific Guides for Good Practice to be inserted.

Appendix III.

The Dutch example: STEK

Introduction

Since the implementation of the Kyoto protocol there have been many policy discussions in the several markets that have to deal with non CO2-greenhouse gasses on how to reach the targets formulated. In the refrigeration and air-conditioning market, dealing with the HFCs, interest is raised in the Dutch STEK-model. Since the CFC-issue in the early 90's, good results have been achieved with this construction of a certification model supported by governmental legislation.
In this article the STEK-approach is explained, which is a form of public-private cooperation between government and industry. First the background is set out, then the STEK-organisation is explained, and the article finishes by giving some insight in the results and the targets for the future.

Background

International: UN Montreal Protocol/EU

By signing the protocol of Montreal in September 1987, many countries, including the Netherlands, committed themselves to reducing the use of CFCs and HCFCs. The protocol has been reviewed with regards to advancing the targets on a number of occasions. The participating countries have agreed on a date by which the production and use of these substances which damage the ozone layer and contribute to the greenhouse effect will be brought to a complete end. Agreements have also been reached at the European level. Implementation involves a long-term program that will be concluded at 2015 for the refrigeration and airconditioning market.
Since the signing of the Kyoto Protocol the international agreements are now forcing the EU and the individual states to adopt an actual HFC policy for the refrigeration and airconditioning markets in order to address the issue of the greenhouse-effect.

Netherlands: CFC-Action Program (including HFCs)

In early 1990, the Dutch Ministry of Housing, spatial Planning and the Environment (VROM) launched a national action program to end the use and production of CFCs and HCFCs. This approach, to end the use of CFCs, is based on achieving four key objectives through cooperation:

- improving expertise;
- developing technical standards for refrigeration and air conditioning equipment;
- setting up an independent authority to approve companies which are allowed to work with installations filled with chemical refrigerants;
- support for these points in the form of government legislation.

Measures were taken to prevent leakage and realize emission reduction. Because of the expected substitution of the use of CFCs and HCFCs by HFCs, the program for the refrigeration and air-conditioning market also included the HFCs.

Trade and industry organizations, so-called Business Representative Organisations (BROs) representing the interests of companies in the fields of refrigeration engineering, air treatment and air conditioning for both stationary and mobile installations contributed the technical know-how required to carry out the program Industry involved. The other participating organizations provided support at the user level depending on their specialized fields.

Through successful cooperation between 16 involved BROs, measures have been adopted which are in some respects unique, such as a certification program for companies working on refrigeration and air conditioning installations, technical requirements to reduce leakage for such installations and training and educational requirements for refrigeration engineers who deal with CFCs. Not only has

this produced a sharp decline in the use of CFCs in the refrigeration industry but also improved environmental quality and a more discerning market system.

Governmental legislation
From the start, the Netherlands has voiced strong support through the Dutch Ministry of Housing, Spatial Planning and Environment (VROM) for the strictest targets to reduce the use of CFCs and HCFCs. The result is that Dutch legislation more than complies with the current European arrangements which are themselves both more detailed and a year in advance of those of the rest of the world. As pointed out earlier the greater part of the Dutch legislation focuses on technical requirements for refrigeration equipment to reduce leakage for installations. From the beginning legislation was supported by an active inspection policy.

Project approach
When the BRO's and the government decided to implement the model, soon to be called the STEK-model according to the name of the foundation formed, a project was started to actually organise the certification and examination.
The Ministry of Environmental affairs granted a subsidy (about 100.000 Euro) to a bureau of experts on association management (predecessor of Cap Gemini Ernst & Young, practice Association Management). The bureau supported the newly formed board, the advisory board for certification and the central examination committee. According to the decisions taken in these organs, the bureau managed to inform all the parties concerned, the companies and the personnel in the divers sectors. Within a year, certificates and the first diplomas to the mechanics were issued.

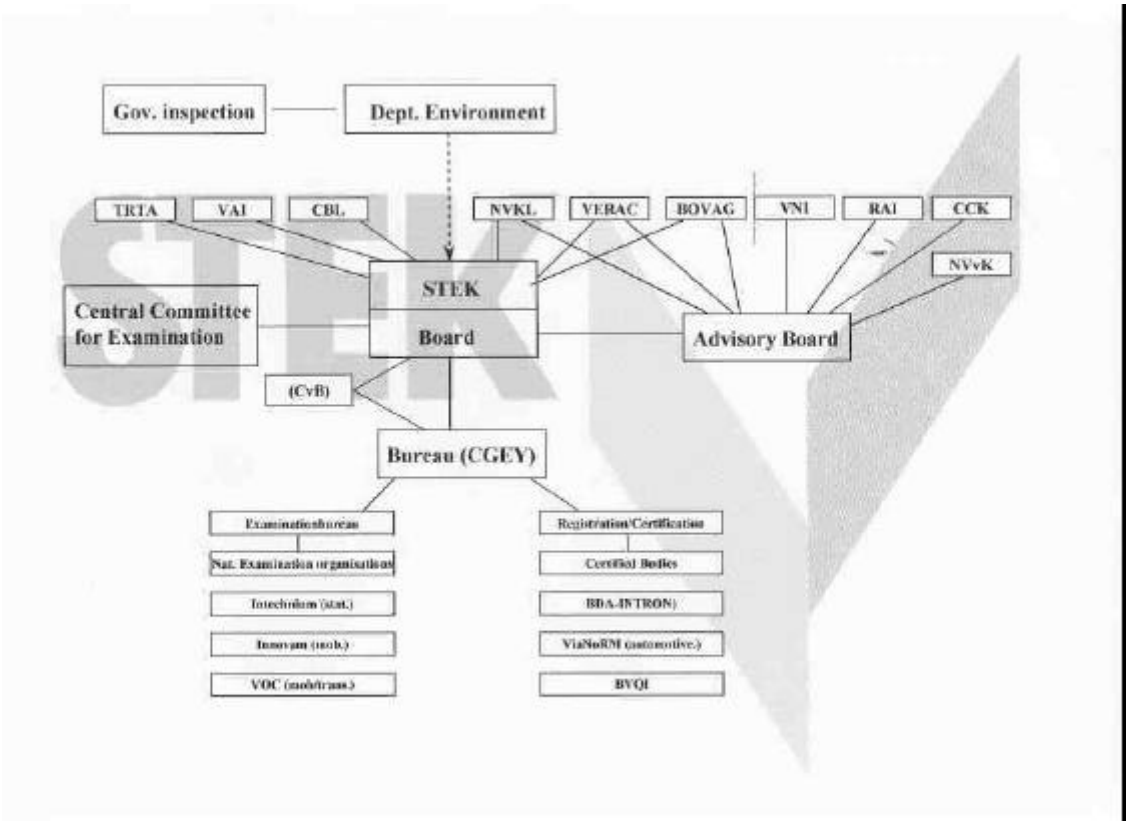
Overview STEK

STEK and its framework
STEK was founded in 1991 on the initiative of the involved trade and industry organizations (BROs) in the refrigeration and air conditioning industries and the government. Its aim is to promote and achieve careful and skillful handing of cooling agents. The underlying goal is to prevent emissions from refrigeration and air conditioning equipment filled with CFCs, HCFCs or HFCs.

The industry has itself decided to check compliance with the guidelines rather than leaving it to the government. STEK checks company operations for compliance with the CFC regulations and carries out inspections to assess the environmental skills of CFC engineers. So, in fact, the monitoring body is a privatized organization. The government has provided initial guidance and financial support.

Owners or users of equipment filled with CFCs, HCFCs and HFCs are obliged by law to have their equipment serviced and repaired by a company approved by STEK. Therefore only companies with a STEK approval certificate may carry out work on refrigeration equipment.

Organization
The organization of STEK consists of a Board, a Central committee for examination, an Advisory Board and a Committee of Appeal. The daily activities are delegated from the Minister of Housing, SpatiaI Planning and the Environment (VROM) to the STEK bureau which is located in Utrecht (The Netherlands). Because of the character of STEK as a project organization, from the early beginning the bureau function has been outsourced to Cap Gemini Ernst & Young, Practice Association Management. The audits are monitored, registered and coordinated by the bureau, but in practice they are carried out by independent certified bodies. An overview of the STEK organization is given below.



Activities

In 1992 the Minister of Housing, Spatial Planning and the Environment (VROM) by assigning STEK transferred the responsibility for the certification program, under which it grants approval to companies which meet a number of conditions. The most important condition is that the company must employ qualified CFC-engineers and must observe standards stated in the procedures for approval relating, among other things, to management and accounting. In consultation with experts from the refrigeration industry, STEK set up a program to train the engineers in the new regulations and technical requirements for refrigeration and airconditioning equipment.
This program has led to a number of activities which STEK contributes to. In fact, STEK looks after the coordination and registration of:

- Installers (handling requests for examination and distribution of diplomas);
- Companies (certification of activities by a sector approach);
- Auditing activities & results (execution of audit and feedback on results);
- Refrigeration installations (registration of installation, refrigerant, volume, etc.)
- Refrigerants used (registration of CFCs, HCFCs and HFCs used per activity).

Focus

All activities mentioned above are enforced and driven by a single goal: to prevent emissions from refrigeration and air conditioning equipment.
The targets of prevention of leakage are reached by multiple pillars.

Competence of personnel
Since the technicians in practice have to realize the emission reduction goals, it was foreseen as an important precondition that the competence of all personnel in the market should be brought to a higher level of awareness and skills. Therefore an education and examination program was set out. Professional examination organizations in the market (both stationary and mobile) execute the examination of the personnel which is required as a part of the certification of the companies.

Quality improvement: business processes and administration

In order to get the entire industry at the required level to meet the ambitious goals, the business processes from the craftsmen working according to traditional methods had to be improved. Business procedures like accounting of the use of refrigerants, the handlings and working prescriptions had to be introduced. Therefore, there was a common awareness that a certification model had to be implemented.
Within the model a pivotal point was the administration of refrigerants both in the administration of the engineer and in the logbook at the installation. This infrastructure can be used for planning and control, both by the engineer and by STEK.

Reduction of leakage due to technical requirements and preventive service
Technical measures were formulated after scientific studies on the reasons for leakage out of refrigeration and air-conditioning installations. These causes for emissions were translated into regulations focussed on the improvement of design, and the handlings for installation and maintenance of an installation. After the first studies the sectors in the industries were involved in the discussions on the final regulations. So when the final legislation came into force the industry was prepared for the task to come.For an effective preventive policy, government and industry agreed on the essentials: you need to have preventive leakage control in stead of repairing the calamities having already caused emissions. With this agreement, an obligatory preventive emission control regime was defined: for installations with more than 3 kilograms of refrigerants, there had to be an annual preventive control, mounting op to a monthly control and a permanent detection regime for installations with over 1000 kg. This prevention program has proven to be effective. For the owner of the installation it now became possible to have the continuous cold he required combined with service level agreements with predictable costs instead of calamities and reparations.

HFCs not prohibited
Since the policy so clearly was focused on reduction of emissions, the outcome of the discussions was evident as well. If installations are to be leak free, there is no need to prohibit the use of HFCs. In fact the results we now have indicate, that the Dutch refrigeration and air-conditioning market is ahead in the discussions on the implementation of Kyoto.

Results and future goals

Results

Quality improvement and no free riders

The described developments have lead to the situation that refrigeration engineering in the Netherlands occupies a leading position on the international scene in terms of reducing the use of CFCs and HCFCs. Through successful cooperation between 16 involved trade and industry organizations (BROs), measures have been adopted which are in some respects unique, such as a certification program for companies working on refrigeration and air conditioning installations, technical requirements to reduce leakage for such installations and training and educational requirements for refrigeration engineers who deal with CFCs.

Not only has this produced a sharp decline in the use of CFCs in the refrigeration industry but also improved environmental quality and a more discerning market system. The certification scheme has had a major impact on the refrigeration and air conditioning industry. In fact it is fair to say that the entire refrigeration industry has set a remarkable step in quality improvement. The companies involved have instituted their own CFC policy based on the program. This means that they not only comply with existing legislation but that they have also gained in environmental quality on this specific point. And of course this benefits the entire refrigeration and air-conditioning sector.

Because of active policy by the governmental inspection, free riders trying to avoid the legally obliged certification were handled adequately. There are practically no ‘fly-by-nighters’ in the Dutch refrigeration and air-conditioning market.

Administration
Every installation in the Netherlands with a content of refrigerants of more than 3 kilograms has a logbook. In this logbook the handlings with refrigerants are administered, both by the amounts used as well as the reparations or service handlings carried out. The owner of the installations is responsible for his logbook. The amounts of refrigerants are administered in the administration of the engineer as well. Because of the administration of refrigerants it is possible to generate figures on emission rates.

Figures
A recent studies which has just been finished, shows the following figures.
In total 1.4 million refrigeration and air-conditioning installations are installed and being maintained by STEK-certified companies. 2400 companies and organizations had been approved by STEK by January 2001. There are practically no free riders, because of the active governmental inspection policy.
Fees for contribution are from 500 Euros for small-sized companies (with one or two technicians) to a maximum fee of 4000 Euros for the largest companies (with more than 50 technicians).

Emissions
From leakage rates at the level of 30% at the early 90's, emissions in the Netherlands now are at the average level of 4,8 %. This is a remarkable achievement from the industry.
The research indicates that 92% of the installations have no emission at all in the reference year 1999, and it's 8% of the installations which cause the emissions.

Future goals
Diminishing emissions

In line with the results already achieved, further goals and targets have been set out. Of course the intent is to diminish leakage rates as far as possible, but this will be quite an achievement from the point we are now.
A good option is to create systems with a smaller content of refrigerants, but this will mean we now have to focus more on the design than on the installation and service handlings.

Utilising the infrastructure
We have an infrastructure, the STEK-organisation, which can be utilised for further steps to take:
- 'From means to ends': flexibility with technical requirements for technological developments.
- Tangible targets to be defined: for instance (benchmarks of) leakage rates, i.e. goals per sector, show results per enterprise & nationwide.
- Same system for Alternative refrigerants in order to prevent safety risks with toxic and/or inflammable refrigerants

Lessons learnt: organizing the process
The main lessons we have learnt in The Netherlands based on our experience with the STEK-model are:

1. *High commitment of the government is essential:* both legislation and an active inspection policy were crucial for the success of the certification model.
2. *Industry involved:* the role of the BROs involved from the start was necessary for the creation and growth of the common awareness in the industry for the environmental issue.
3. *Defining the wins:* in the Netherlands it was foreseen as a win-win-situation, that preventive environmental policy means business: the maintenance for the installer was organised and for the owner the continuity in the delivery of cold was organised as well.
4. *Active Communications policy* is required: in order to get the awareness and support of all the parties concerned (the installers as well as the owners of these 1.4 million installations).

5. *Implementation by project approach*: to organise the entire process of creating common awareness, organising an education and examination program, organising the certification process, it was vital to adopt a project approach with an active board of representatives of the industry, equally actively supported bby a strong partner for implementation.

(Above text from STEK, Utrecht, June 2001)

Appendix IV.
Telephone survey questionnaire

Good (morning). My name is Robert Heap and I am working on behalf of FETA (the Federation of Environmental Trade Associations). I am carrying out a study on a National Registration Scheme for Refrigeration Engineers and Technicians.

1) Is it a convenient time for me to ask you some questions about such a registration scheme? It might take about 10 minutes.

2) Did you know that the Government is committed to introducing a scheme to define minimum competency requirements for all handlers of ozone depleting refrigerants?

3) Do you have comments on this?

4) Did you know that the UK scheme is likely to be extended to handlers of all refrigerants and also later to all companies employing refrigerant handlers?

5) Do you have comments on this?

6) One of the challenges in defining a scheme is deciding if a single standard can be set for all refrigerant handlers, or if different standards are needed for different sectors (e.g. domestic appliances, auto air conditioning). One standard suggested is the City & Guilds 2078 assessment. Do you have a view as to whether there can be one standard, or what standards should be used?

7) Assuming there was a mandatory national registration scheme, what impact would it have on your business?

8) Did you know that there has been a mandatory scheme in the Netherlands for some years, run by an organisation called STEK, which has given positive results?

9) It has been suggested that a registration scheme will improve standards, reduce breakdowns, and so will save money and energy. It may also reduce the environmental pressure to phase out HFCs. But there will have to be some costs of assessment and registration. And there would be non-compliance penalties. How much do you think would be a reasonable cost for (say) annual registration? Per individual? (£50, £20) Per Company? (£500, £200).

10) Are you aware of the ACRIB voluntary registration scheme for refrigerant handlers?

11) Do you think the ACRIB scheme would form a good basis for administering a mandatory scheme?

12) Do you have any thoughts about how a scheme should be policed and enforced?

13) Is there anything else you would like to add?

14) Is there anyone else you think I should talk to?

15) Thank you for your time. A draft report will be produced in the Autumn and a final report in December. Would you like to be able to comment on the draft?

16) If so, can I have your e-mail address and postal address, please?

Thank you.

Appendix V.

Acronyms & abbreviations

ACRIB	Air Conditioning and Refrigeration Industry Board
AMDEA	The Association of Manufacturers of Domestic Electrical Appliances
AREA	Air Conditioning & Refrigeration European Association
BFFF	British Frozen Food Federation
BRC	British Retail Consortium
BSRIA	Building Services Research & Information Association
C&G	City and Guilds
CIBSE	The Chartered Institution of Building Services Engineers
CITB	Construction Industry Training Board
CORGI	The Council for Registered Gas Installers
CSDF	The Cold Storage and Distribution Federation
DASA	Domestic Appliance Service Association
DEFRA	Dept. for Environment, Food, and Rural Affairs
DTI	Dept. for Trade & Industry
ECSLA	European Cold Storage & Logistics Association
EPA	Environmental Protection Agency (US)
ESTTL	Engineering Services Training Trust Ltd.
FETA	Federation of Environmental Trade Associations
HEVACR	HEVACR 2005 is a DTI supported and FETA managed strategic initiative for the RAC sector
HSE	Health & Safety Executive
HVCA	Heating & Ventilating Contractors Association
MAC	Mobile air conditioning (i.e. in vehicles)
NGO	Non-governmental organisation (e.g. Greenpeace)
NVQ	National Vocational Qualification
RAC	Refrigeration and air conditioning
REFCOM	Register of Companies Competent to handle Refrigerants
RMIF	Retail Motor Industry Federation
SMMT	Society of Motor Manufacturers and Traders
STEK	Managers of the Dutch refrigerant handling scheme
UKAS	United Kingdom Accreditation Service

Appendix VI
Summaries of national refrigerant recovery and recycling programmes

The following summaries are taken from a survey reported by W Keith Snelson of the IEA Heat Pump Centre in a paper entitled, “Refrigerant recovery and recycling: an international assessment”, presented at a recent IIR Conference in Dubrovnik.

AUSTRALIAN REFRIGERANT CONSERVATION PROGRAM	Industry-run national program responsible for recovery, recycle, reclaim, and safe destruction of all fluorocarbon refrigerants
Date Introduced	July 1993.
Control Organization	Refrigerant Reclaim Australia (RRA)
Refrigerants Included	Currently CFCs and HCFCs.
Applications Covered/Excluded	Refrigeration, Air-Conditioning and Heat Pumps (stationary and mobile market sectors)
Regulations and Enforcement Level	Mandatory regulation enforced by government legislation requiring recovery of ozone depleting refrigerants. Voluntary participation of companies in RRA program.
Finance Arrangements	Industry supported by payment of a levy added to the cost of all new refrigerant purchases. Service companies and wholesalers are recompensed for their refrigerant recovery activities.
Refrigerant Reclaim Infrastructure Availability	RRA makes arrangements for refrigerant recovery, provision of clean refrigerant containers, collection of containers, and transfer to reclaim or destruction facilities.
Programme Elements:	
Certification requirements	Certification of companies not required nationally, but accreditation under State law is generally necessary in order to purchase any ozone depleting refrigerants or to work on such systems.
Servicing practice requirements	CFCs and HCFCs must be recovered at service or disposal. Refrigerant may then be recycled, sent for reclamation, or destroyed.
Equipment requirements	Certification required (under State law) for some equipment used in recovery/recycling/reclamation.
Training/education requirements	Contractors must obtain accreditation under applicable State laws by completing a recognized trade course or satisfying other approved criteria.
Leak tightness inspection, documentation required	Annual leak tightness inspection is mandatory under the industry Code of Good Practice which is called up into law in some States. System leaks must be repaired prior to any new refrigerant being added.
Penalties for non-compliance	Under State law fines of up to $AUD240,000 may be imposed for knowingly releasing ozone depleting refrigerants plus a further $AUD120,000 per day for any continued violation.

CANADIAN REFRIGERANT CONSERVATION PROGRAM	Responsibility rests with provincial governments and all have programs in place controlling refrigerant Recovery, Recycling, and Reclaim.
Date Introduced	Separate legislation passed within the provinces at various times between 1993 and 1997.
Control Organization	Federal-Provincial Working Group (FPWG) on Ozone Depleting Substances and Halocarbon Alternatives established in Jan. 1998 to provide harmonization of control measures.
Refrigerants Included	CFCs, HCFCs, and HFCs.
Applications Covered/Excluded	Refrigeration, air-conditioning and heat pumps.
Regulations and Enforcement Level	Provincial regulations are enforced as appropriate where they apply to the various control measures. Federal regulations enforced at national facilities.
Finance Arrangements	Funded by federal and provincial government ministries having responsibilities for Ozone Depleting Substances.
Refrigerant Reclaim Infrastructure Availability	Ten out of 12 jurisdictions require containers to be refillable/recyclable. Industry uses ARI 700-1993 as the refrigerant reclaim standard.
Programme Elements: Certification requirements	Eleven out of 12 jurisdictions require certification of any technicians involved in refrigerant recovery/recycling activities
Servicing practice requirements	In all jurisdictions release of ODS is prohibited and refrigerant recovery, recycling or reclaiming is required during equipment service or disposal. All reports and records must be kept up to date.
Equipment requirements	Five provinces have standards in existence for safety and testing of refrigerant recovery and recycling equipment.
Training/education requirements	FPWG has implemented environmental awareness training programs in all provinces for equipment service personnel. ODP card issued on successful completion of training course. (Purchasers of any new refrigerant must possess an ODP card.)
Leak tightness inspection, documentation required	Annual leak testing required in four jurisdictions (excluding small equipment). Eleven jurisdictions require leak testing and repair prior to recharging and topping up of any equpment.
Penalties for non-compliance	Various penalties including fines (up to $ 1 million CAD) or imprisonment (up to 3 years) or both.

FRENCH REFRIGERANT CONSERVATION PROGRAM	Government run national programs in force covering refrigerant Recovery/Recycling/Reclaim and Leak Tightness Control
Date Introduced	Recovery/Recycling/Reclaim - December 1992. Leak Tightness Control – 1998.
Control Organization	Ministère de l'Environnement
Refrigerants Included	CFCs, HCFCs, and HFCs and their blends.
Applications Covered/Excluded	Refrigeration, Air-Conditioning and Heat Pumps (excluding residential/domestic appliances and automotive air-conditioning sectors and systems with charge less than 2 kg)
Regulations and Enforcement Level	Mandatory regulations enforced by government legislation.
Finance Arrangements	Industry supported by payment of a surcharge added to the cost of all new refrigerant purchases. To encourage refrigerant recovery a premium is paid as an incentive if returned product is reusable after recycling.
Refrigerant Reclaim Infrastructure Availability	Service companies make arrangements for refrigerant recovery, provision of clean refrigerant containers, collection of containers, and transfer to reclaim or destruction facilities.
Programme Elements:	
Certification requirements	Companies involved in installation, service, repair, or decommissioning of regulated equipment must be registered.
Servicing practice requirements	CFCs, HCFCs and HFCs must be recovered at service or disposal from equipment containing more than 2 kg of charge. Refrigerant may then be recycled, sent for reclamation, or destroyed.
Equipment requirements	Recovery, recycling, and reclamation equipment must be registered.
Training/education requirements	Technicians must possess a diploma, certificate, or similar qualification recognized in the EEC, or have six years of relevant professional practice.
Leak tightness inspection, documentation required	Annual leak tightness inspection is mandatory. Equipment owners and technicians must sign a special document whenever maintenance is carried out on a system, and records must be kept for at least three years.
Penalties for non-compliance	Fines of up to 6,000 FRF may be imposed, increasing to 12,000 FRF in case of repetition.

JAPANESE REFRIGERANT CONSERVATION PROGRAM	Industry-run national program in place covering refrigerant Recovery, Recycling, and Reclaim.
Date Introduced	October 1993
Control Organization	Refrigerants Recycling Promotion and Technology Centre (RRC) - founded voluntarily by related industry associations
Refrigerants Included	CFCs and HCFCs.
Applications Covered/Excluded	Commercial refrigeration, air-conditioning and heat pumps (excluding residential/domestic appliances and automotive air-conditioning sectors)
Regulations and Enforcement Level	Refrigerant recovery and recycle not regulated by law. Measures promoted by RRC to encourage voluntary RR&R activities within the industry. Safety of equipment during operation and service is regulated by High Pressure Gas Safety Law.
Finance Arrangements	Jointly funded 50/50 by government and industry.
Refrigerant Reclaim Infrastructure Availability	RRC makes arrangements for refrigerant recovery, provision of clean refrigerant containers, collection of containers, and transfer to reclaim or destruction facilities.
Programme Elements: Certification requirements	RRC participation requires certification of companies and any technicians involved in refrigerant recycling activities
Servicing practice requirements	CFCs and HCFCs voluntarily recovered at service or disposal. Refrigerant may then be recycled, sent for reclamation, or destroyed.
Equipment requirements	RRC has standards in existence for safety and testing of refrigerant recycling equipment.
Training/education requirements	Service technicians must acquire certification by attending a training course operated by RRC and passing the relevant examination.
Leak tightness inspection, documentation required	Inspection not required for most equipment, but large scale units (over 70 kW) are required under High Pressure Gas Safety Law to have annual maintenance including refrigerant leakage check.
Penalties for non-compliance	No penalties (voluntary system)

DUTCH REFRIGERANT CONSERVATION PROGRAM	National program in place aimed at refrigerant leakage reduction and emission limitation through preventive maintenance.
Date Introduced	March 1993
Control Organization	STEK – an industry driven organization set up and authorized by national government
Refrigerants Included	All refrigerants except ammonia and flammable refrigerants.
Applications Covered/Excluded	All refrigeration, air-conditioning and heat pump applications with compressor power above 500W.
Regulations and Enforcement Level	Mandatory regulation (RLK) applied to companies involved in equipment installation/maintenance, with supporting government legislation in place.
Finance Arrangements	Industry supported by participating firms paying entry fees and annual dues.
Refrigerant Reclaim Infrastructure Availability	A few companies are currently set up with the equipment and facilities required to collect used refrigerant and conduct product reclamation.
Programme Elements:	
Certification requirements	Only companies with a STEK approval certificate are permitted to do service work on refrigeration, air-conditioning and heat pump equipment
Technical requirements	Specifications for materials, mechanical design of piping, joints, valves, gauges, overpressure protection, etc. are prescribed for various components to limit refrigerant emissions.
Training/education requirements	Service personnel must be qualified to work on installation and/or maintenance of equipment. They must pass a STEK-approved written examination.
Leak tightness inspection, documentation required	Inspection required annually if charge > 3 kg; quarterly if charge > 30 kg; monthly if charge > 300 kg. Leak testing equipment must have detection limit of at least 5 ppm. Any leaks must be repaired forthwith. No recharging permitted prior to repair. All maintenance activities to be recorded in system logbook.
Penalties for non-compliance	No financial penalties, but government inspection authorities (IHM) may impose sanctions with varying severity, up to withdrawal of licence.

USA REFRIGERANT CONSERVATION PROGRAM	National Recycling Rule in force which regulates refrigerant Recovery, Recycling and Reclaim
Date Introduced	May 1993
Control Organization	US Environmental Protection Authority (EPA)
Refrigerants Included	CFCs and HCFCs in the stationary sector CFCs, HCFCs, and HFCs in the mobile sector
Applications Covered/Excluded	Refrigeration, Air-Conditioning and Heat Pumps (stationary and mobile market sectors)
Regulations and Enforcement Level	Mandatory regulations enforced by authority from US Congress (Sections 608/609 of Clean Air Act)
Finance Arrangements	Financed by US Government. Funds are disbursed by EPA to regional program offices
Refrigerant Reclaim Infrastructure Availability	Checklist established for EPA approval of refrigerant reclaimers. (Over 60 companies are currently certified.) Refrigerant analysis procedures and measurement equipment must comply with ARI 700-1993 standard of purity.
Programme Elements: Certification requirements	EPA certification required for: • Recovery and recycling equipment • Service and repair technicians • Ownership of recycling/recovery equipment • Refrigerant reclaimers
Servicing practice requirements	CFCs and HCFCs must be recycled or recovered from equipment at service or disposal. Appliances must be evacuated to specific vacuum levels depending on type of appliance and the age of recovery/recycle equipment.
Equipment requirements	Recycling and recovery equipment manufactured since 1993 must be tested by an EPA-approved third party (such as ARI or UL). The equipment must comply with ARI 740-1993 standard.
Training/education requirements	Technicians must undergo mandatory training and pass EPA-approved test before being permitted to repair equipment or purchase refrigerants.
Leak tightness inspection, documentation required	Inspection not mandatory but for equipment containing charges of more than 50 pounds regulations require repair or replacement of appliances when leak rates exceed specified levels. Equipment owners must keep records of refrigerant quantities added during maintenance.
Penalties for non-compliance	EPA can assess fines of up to $USD 27,500 per day per violation

Appendix VII
Stakeholder's Meeting – Options for a Mandatory Registration Scheme - 30th October 2001
List of Organisations Invited

ACRIB RS Steering Group
Association of Air Conditioning and Refrigeration Contractors (ARC)
Association of British Insurers (ABI)
Association of Manufacturers of Domestic Appliances (AMDEA)
Automotive Consortium on Recycling and Disposal (ACORD)
British Frozen Food Federation (BFFF)
British Retail Consortium (BRC)
British Vehicle Salvage Federation (BVSF)
Cambridge Refrigeration Technology (CRT)
Chartered Institution of Building Services Engineers (CIBSE)
City and Guilds of London Institute (CGLI)
Cold Storage and Distribution Federation (CSDF)
Confederation of Passenger Transport (CPT)
Construction Industry Training Board (CITB)
Department of the Environment, Food and Rural Affairs (DEFRA)
Department of Trade and Industry (DTI)
Directors of ACRIB
Domestic Appliance Service Association (DASA)
Engineering Services Training Trust Ltd (ESTTL)
EU DG Environment
Federation of Environmental Trade Associations (FETA)
Freight Transport Association (FTA)
Friends of the Earth (FOE)
Garage Equipment Association (GEA)
Greenpeace
Health and Safety Executive (HSE)
Heating and Ventilating Contractors Association (HVCA)
HEVACR 2005 Steering Group Chairman
Institute of Refrigeration (IOR)
Local Government Association (LGA)
Local Refrigeration Societies
Ministry of Defence (MOD)
Motor Vehicle Dismantlers Association (MVDA)
National Caravan Council (NCC)
National Salvage Group (NSG)
Office of Government Commerce
REFCOM
Refrigerant Users Group (RUG)
Retail Motor Industry Federation (RMIF)
Road Haulage Association (RHA)
Service Engineers Section of IOR
Society of Motor Manufactures and Traders (SMMT)
The Environment Agency (EA)
Vehicle Builders and Repairers Association (VBRA)