



Annex II

to
Final Report
on the

**European Climate Change Programme
Working Group Industry
Work Item Fluorinated Gases**

- Position papers provided by Stakeholders -
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Annex II

Position Papers 2001

1 Member State Report on Utrecht Workshop

Towards a common view of the Member States on a framework for fluorinated gases

DRAFT Conclusions of the informal workshop for all Member States
held in Utrecht, the Netherlands, March 6, 2001

Representatives of eleven Member States met in Utrecht at the invitation of the Dutch ECCP representatives to enlarge their common view on a framework for fluorinated gases. The organisers of the ECCP process (The European Commission represented by DG Enterprise and DG Environment) were also present as observers.

The workshop was organised with a view to the finalisation of the work of ECCP working group 5 on the fluorinated greenhouse gases HFCs, PFCs and SF₆. The participants discussed key issues, with particular emphasis on cross-sector ones, based on the ECCP-work to-date and on extensive ECCP preparatory work by The Commission's consultants Ecofys and EnviroMarch. This work was summarised in two presentations on policies and measures by Environmental Resources Management (ERM).

The workshop had an informal character. Therefore, the conclusions in this document do not necessarily represent the individual positions of Member states but should be seen as a step towards a common view. The participants endorse this document as a useful starting point for further EU policy making for the fluorinated gases.

Introduction

The participants recognised that different national situations on the importance of reducing fluorinated gas emissions to meet national Burden Sharing targets would not keep them from agreeing an appropriate joint approach to address these gases. This joint approach should not exclude continuing existing and/or developing policies and measures to abate fluorinated gases emissions as part of the national Burden Sharing target.

They also recognised that the existing strong European policy on the phase-out of Ozone Depleting Substances should not be jeopardised by their common approach to fluorinated gases in the climate change context.

The discussions in the workshop led the participants to believe that there is a good potential to reach a common approach. This could best be characterised as a **framework approach** towards fluorinated gases as a group of greenhouse gases with a significant Global Warming Potential and a significant growth in emissions. The participants stressed that it is important that all sectors that use and/or emit f-gases would ultimately need to contribute to the emission reduction of these greenhouse gases, even if some sectors may be targeted for earlier actions than other.

A four-tier approach

The approach that was discussed would potentially consist of:

- a Council statement on the future of fluorinated gases in the context of European Climate Change Policy to send a clear political signal to producers and consumers of fluorinated gases in the EU). This Council statement should be agreed upon in accordance with the co-decision procedure between the Council and the EP and possibly included in the preambular part of a (framework) directive;
- a (framework) directive on f-gases, to be complemented by national implementation measures (recognising that different sectors of f-gases need to be addressed differently according to their own characteristics);
- a call for specified voluntary actions by sectors in which regulation is not yet feasible and voluntary actions are considered as an appropriate instrument;
- Member State actions to continue existing or develop new national policies and measures (where appropriate and compatible with EU law).

The elements are discussed below in some more detail.

Council statement

The Council statement will send a political signal to producers and users of fluorinated gases. The details of this statement can be elaborated in a later stage, but there are a number of elements that should play a role. One element is that the statement recognises that any policies and measures to reduce emissions of fluorinated gases must not undermine commitments to phase out ozone depleting substances. Another element is the recognition that the high GWP of these fluorinated gases makes

them important in climate policies. A third element is the conclusion that HFCs and PFCs cannot be seen as sustainable alternatives for ODS in the long term, if only because (in all likelihood) it will be impossible to contain those fluorinated gases during their entire life time and therefore it is important to find alternatives that are safe for human health, have a better overall environmental performance and are economically acceptable.

Thus, there is need for some regulatory approach to these gases, starting with major sources of emissions with high Global Warming Potentials in sectors or applications where more environmentally acceptable, safe, and technically and economically feasible alternatives are available.

Eventually, all emissions and uses of fluorinated gases may be subject to some sort of regulation, to be followed by more definite solutions. In this respect all voluntary, significant and early actions from the side of the industry should be welcomed.

Besides issuing this as a Council statement, the main elements could also be embedded in the preamble of the new directive.

(Framework) Directive

The participants see the need for an EU directive (possibly a framework directive) that would allow for a community-wide regulatory approach of the f-gases. They would like to include policies and measures at two levels:

1. Cross-sectoral policies and measures that would address **emissions and uses** of f-gases in the European Union. These 'cross-sectorals' would basically serve two purposes:
 - a. the establishment of an effective, transparent and comparable EU-wide monitoring, verification and reporting system on the production, import and export, use and emissions of fluorinated gases, to be defined quickly and accurately;
 - b. the establishment of a minimum requirement for containment and recovery (including end-of-life) for fluorinated gases, where applicable;
2. Sectoral policies in areas where the emissions are high, Global Warming Potential is high and/or alternatives are readily available or within reach. In general, a review and extension of this directive to other sectors at certain intervals was recommended.

The initial set of sectors/uses to be regulated under such a directive may include:

 - a. the use of *fluorinated gases in appliances* (like refrigerators and

air-conditioning), preferably by requiring Member States to set up a national system of leakage control, servicing requirements and management, training and recovery. Inclusion of a quantitative target on leakage control (per sector) in terms of i.e. a percentage per year would need to be discussed and studied further. Also, it would need some further study to assess the practical contribution of European standardisation of product specific characteristics through mechanisms like CEN to such requirements.

Some participants asked for flexibility in the application of such a national system because of the wide variety of sectors.

b. the use of *SF₆* in some open or semi-open systems, particularly in windows and tires, preferably by a phase-out.

c. some participants would opt for a third policy, by establishing a ban on new non-essential uses of gases.

d. some participants would ask for an extension of the ban on SF₆ use to other applications and gases.

Call for voluntary actions

Under this framework for addressing f-gases, the Commission would call for voluntary actions by industries and sectors not initially affected by sectoral policies in the (framework) directive but where voluntary action seems particularly feasible.

This call would be generic, but should in the short term at least be followed by concrete steps in the following fields:

- XPS foams
- Semiconductor Industry
- Gas Insulated Switchgear.

Other sectors and applications where voluntary action might be an appropriate instrument would follow over the next years, taking into account that these voluntary actions do not preclude future regulations under the (framework) directive. Partly this would happen to eliminate free rider behaviour, partly because the final goal of the Member States would be to eliminate the emission of fluorinated gases in Europe.

Such voluntary actions would need to be specific enough to demonstrate meaningful progress and to be measurable according to the monitoring, verification and reporting criteria to be established under the framework.

Member State actions

Member States would take different types of action at national level within the overall new framework.

Firstly, the framework would need to send a strong signal to all Member States as well as IPPC-regulated industries on the importance of expeditious national implementation of the IPPC directive in aluminium, magnesium and other relevant industries.

Secondly, the Member States would need to translate the contents of the directive as proposed above to the national situation.

Thirdly, some Member States will have the need for further actions by continuing existing and/or developing new policies and measures to abate fluorinated gases emissions as part of their Burden Sharing target.

Taking note of existing opportunities and restrictions enshrined in the Treaties for national action going further than EU action, the framework approach would allow for these additional policies and measures at national level.

March 6, 2001

Utrecht, The Netherlands

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2 EPEE / EUCRAR

CLIMATE CHANGE POLICY FRAMEWORK FOR REFRIGERATION AND AIR CONDITIONING SECTOR AN INITIAL PROPOSAL BY EUCRAR AND EPEE

I. INTRODUCTION

Set out below is a proposal for an EU approach to tackling the challenge of reducing the potential environmental impact of refrigeration, air conditioning and heat pump (including reversible air conditioning) equipment, and so contribute to the EU's objective of reducing its greenhouse gas emissions. Our objective is to achieve this by:

- industry designing and marketing equipment with a) increased energy efficiency and b) enhanced designs to prevent emissions of refrigerants; and
- ensuring that users of refrigerants utilise them responsibly.

This means a departure from “business as usual” by all those involved in the life-cycle of refrigerants.

This is the final industry contribution to the ECCP. A first proposal was presented by EUCRAR and EPEE to the February 22 meeting of the European Climate Change Programme (ECCP) Working Group 5 (fluorinated gases).

Our proposed approach to achieving the responsible use of refrigerants is based on:

- encompassing all refrigerants, apart from CFCs and HCFCs that are being phased out according to the Montreal Protocol and EU Regulation 2037/2000/EC of 29/06/2000;
- encouraging manufacturers to continue to develop the most environmentally sound solutions for air conditioning, heat pumps (including reversible air conditioning) and refrigeration systems;
- promoting good practices for installation and leak testing of distributed refrigerant system installations, and the recovery and recycling of refrigerants;
- encouraging the development of a “green” market by improving consumer awareness of the importance of purchasing energy efficient equipment;
- further limiting the environmental impact of energy consumption during the product life cycle of installed systems by documented regular maintenance procedures;

- proposing that (1) all actors connected to refrigerant use improve their environmental performance by assuming their own responsibilities; and (2) that these responsibilities be backed by government action whether by legislation or the development of alternative regulatory mechanisms. (An example of co-regulation would be the Netherlands, with their effective RLK legislation and STEK implementation scheme.); and
- proposing that an EU framework approach is needed to ensure uniformity of action across the EU. However, policies aimed at individual sectors will need to be developed separately in order to suit their very different circumstances. This is particularly true between self-contained appliances such as refrigerators, and stationary and mobile equipment.

II. OBJECTIVE

The purpose of a Directive would be to:

- a) limit the indirect impact of CO₂ emissions generated from the production of energy required to power equipment / systems by improved design and system control for energy efficiency;
- b) reduce the direct impact of refrigerants on climate change by reducing the emissions of greenhouse gases by improved design, installation, maintenance and disposal;
- c) ensure the responsible use of refrigerants in equipment / systems.

HFCs are used extensively as refrigerants due to the regulatory-induced change away from ozone-depleting refrigerants. This process should not be delayed by new policies or regulations that undermine consumer confidence while reliable, safe and energy efficient alternatives are made available on the market.

Other refrigerants, like hydrocarbons, ammonia, CO₂ and water vapour are in use in a limited number of applications, but are still short of widespread viability. Further technical research and development is required to resolve hazard, safety, cost and energy efficiency concerns before these refrigerants can reasonably be described as viable alternatives for the broad based use of HFCs.

III. SCOPE

Achieving this objective requires that actions are taken by all the actors involved in the life cycle of refrigerants: producers; manufacturers of equipment; architects, specifiers and construction engineers involved in the design of buildings/plants; users and those qualified to install, maintain and de-commission equipment (including the recovery and recycling of refrigerants).

It should apply to all equipment produced, imported and used in the European Union for cooling and heating regardless of the refrigerant used. A list of possible categories of applications to be covered is outlined in the last section of this document.

IV. REPORTING AND TARGETS

An accurate assessment of the use, refilling, recovery and recycling rates of refrigerant use needs to be built up in the European Union through regular reporting by the Member States. Currently, there is insufficient authoritative and publicly available knowledge of the real life environmental performances of refrigeration, air conditioning and heat pump (including reversible air conditioning) equipment. This has to be rectified before realistic targets can be set. Thus initial action should concentrate on achieving general improvements in current practices.

V. POLICY

The aim of policy should be three-fold:

- a) action on self contained equipment and major system components;
- b) action on installed systems at the design stage; and
- c) action during the installation, use, maintenance and decommissioning of equipment/ systems.

It is important to realise when assessing suitable policies to achieve these aims that a) equipment and component design decisions are largely within the control of manufacturers; b) equipment and component manufacturers, system designers and specifiers all participate in responsible installations; c) service and maintenance of equipment /components must be accomplished by trained and certified technicians, outside the control of manufacturers.

In recognition of this fact, the development of regulations or alternative regulatory mechanisms needs to be tailored to meet the specific needs of the different products and applications.

1. Action on Equipment and System Components

Industry needs to compete fairly in designing and marketing eco-friendly equipment. The quickest and most cost-effective way to achieve results is to create incentives for industry and users to produce and purchase the most energy efficient equipment and so “work with the market.”

The primary incentive is that the use of energy efficient products results in lower running costs of equipment. This should be encouraged through the use of such instruments as setting minimum energy efficiency levels and energy efficiency labelling (where applicable) to educate and encourage consumers to purchase eco-friendly products.

To ensure the integrity of self-declarations made by manufacturers, we believe that all specifications, efficiency and capacity claims of refrigerant-utilising equipment should be measured in full accordance to the official industry standard and be verified through a recognised certification programme such as EUROVENT/CECOMAF and ASERCOM.

A second instrument would be the establishment of EU tightness standards for components/systems. For example, this could be accomplished by incorporating relevant requirements for parts into a revised version of the EN 378 standard.

2. Action on Field Installed Systems

This is a more complex problem, as the performance of field installed systems depends on competent installation and maintenance. In other words, the benefits of using the most energy efficient components can be completely undermined by poor installation and maintenance. We expect that the best results will be gained by combining the use of energy efficient components with demanding installation and maintenance standards, in strict accordance with the manufacturers recommendations.

3. Action on Servicing and Maintenance

Equipment/systems need to be properly maintained to ensure optimal performance. Currently there are few requirements to ensure that this is done. New requirements shall cover leak detection and repair procedures. This should be extended to oblige users of equipment with more than 3 kg of refrigerant to have maintenance performed by certified technicians, covering not only leak detection and repair procedures, but also such factors as heat exchanger cleaning and the correct operation of controls.

VI. ACHIEVING RESPONSIBLE USE

To achieve the aim of improving the environmental performance of refrigerant equipment over their whole life cycle all actors need to assume their environmental responsibilities.

1. Producers and distributors of Refrigerants

Producers and distributors of refrigerants are responsible for:

- encouraging the responsible use of their products and providing advice on the safe handling, transport, containment and recycling of their products;
- supplying only manufacturers and persons who are certified to handle equipment containing refrigerants;
- Providing accurate annual statistics regarding the volume of refrigerants supplied to the air conditioning and refrigeration sector.

2. Manufacturers and importers of Equipment and Field Installed Systems

Manufacturers and importers of equipment are responsible for:

- encouraging retail consumers, users, installers, architects, specifiers and construction engineers involved in the design of buildings/plants, to specify the procurement of eco-friendly products by supporting energy efficiency labelling schemes;
- producing equipment which implement emission limiting technology by applying EU rules for equipment, components and field-erected systems;
- establishing and attaining minimum efficiency standards for products over time;
- continuing to develop the most environmentally sound solutions for air conditioning, refrigeration and heat pump (including reversible air conditioning) systems;
- ensuring that during manufacturing only qualified personnel handle refrigerants, braze (copper pipe welding) and dispose of parts and equipment;
- reporting annual refrigerant usage in all new products / systems to the appropriate national bodies;
- providing specialist training, product information and advice for certified installation and maintenance workers and users on best practice installation, leak detection techniques, and maintenance of equipment, e.g. via dedicated web sites;
- providing product information and advice on the latest installation, maintenance and decommissioning technologies to bodies overseeing the certification and training of professional installation and maintenance workers;
- raising the awareness of users of installed equipment of the environmental and financial benefits of responsible use of refrigerants, e.g. regularly promoting cases of good practices in installation, leak detection and decommissioning;

3. Users of refrigeration, air conditioning and heat pump (including reversible air conditioning) systems

Users of products and systems containing more than 3 kg of refrigerant are responsible for:

- using only certified personnel to install, maintain and dispose of their equipment;
- augmenting the performance of their equipment by taking basic precautions such as night covers on display cabinets to reduce energy consumption.
- keeping log books detailing maintenance records, leak detection, accidents, annual amounts of refrigerant used in servicing of equipment, and regularly reporting

their usage of refrigerants to the appropriate bodies in the Member States. Such records should be subject to periodic audit by an appropriate authority.

4. Member States

National and/or regional bodies are responsible for:

- ensuring that only properly trained and certified operators can handle refrigerants and install, maintain and de-commission refrigerating and air conditioning systems;
- obliging users (or their contracted maintenance company) of refrigerants (over 3kg) to have annual maintenance and inspection contracts and to report their refrigerant consumption via log-books;
- establishing appropriate bodies to develop certification qualifications for refrigerant handlers and brazers (i.e. copper welding/brazing certificates); and
- collecting data from refrigerant manufacturers and log books kept by users of refrigerants and providing this data on refrigerant consumption in their territories to the Commission.

5. The European Commission

EU authorities are responsible for:

- formulating a framework refrigerants Directive to ensure coherency of action by Member States on refrigerant use and so prevent unnecessary disruption of the workings of the internal market;
- developing an EU standard for refrigeration, air conditioning and heat pump (including reversible air conditioning) equipment. This could be done based on the good results achieved in the Netherlands and the experience in other countries. The improvements should be included in the revised version of EN 378. The members of the related committee has started this process already.
- establishing a data base on the usage rates of refrigerants in the European Union based on information from Member States. Use this “real life” data to identify areas for priority action.

VII. SECTORAL APPROACH

The air conditioning, heat pump (including reversible air conditioning) and refrigeration industry is very fragmented and produces equipment and components with a multitude of applications. Although a single legal framework should be developed at EU-level, individual approaches need to be tailored to the different product segments. Below is an initial idea for the development of a sectoral approach by categories.

1. Stationary Equipment and Systems

- a) Domestic refrigeration and air conditioning
 - Domestic refrigeration and air conditioning appliances
 - Residential air conditioning
 - Split systems, multi split & variable refrigerant flow systems
 - Self contained packaged cooling only and reversible heat pumps (below 45KW cooling capacity)
- b) Commercial / Industrial refrigeration
 - Compressors
 - Condensers
 - Evaporators
 - Condensing units
 - Display cabinets remote
 - Display cabinets plug in
 - Cold room walls
- c) Commercial air conditioning
 - Self contained package (above 45KW cooling capacity)
 - Water cooled chillers
 - Air cooled chillers
 - Reversible heat pump systems
 - Condensers
 - Condensing unit
- d) Other auxiliary equipment
 - Cooling towers
 - Circulating pumps
 - Fans
 - Air handling units

2. Mobile Equipment

- Mobile air conditioning in cars, light and heavy duty trucks, buses, coaches, rail and maritime vessels
- Mobile refrigeration – road, rail, sea and inland waterways
- Refrigerated container transport

3 Calorgas

CALOR GAS LIMITED - SUBMISSION TO ECCP WG5 F-GASES

HFCs - Environmentally Polluting

CFC and HCFC refrigerants damage the ozone layer and have significant GWP. Under the 1987 Montreal Protocol CFCs and HCFCs have been banned or are being banned in most developed countries. Most users of refrigerants decided to switch to HFCs for the lack of other alternatives. However, HFCs have on average 2,274 times the GWP of CO₂.¹ Kyoto included HFCs amongst the emissions that **must** be reduced to stop global warming.

The Appendix shows that NIKs are available to be used as viable, cost-effective and environmentally benign alternatives to HFCs for refrigeration and air-conditioning. EU Member States recognise that great technological potential exists for improvements in environmental performance and that alternatives to HFCs are available for most refrigerant applications. We welcome the growing support for an EU F-Gas Directive. Such a Directive should cover as a minimum: emissions monitoring, the training and certification of engineers and the banning of disposable HFC cylinders.

Strong and clear signals – whether by regulation, economic instruments, or education - need to be given to industry so that it does not get needlessly locked into capital stock which does not meet future requirements. Doing the bare minimum now could provoke more costly and painful change in the longer run. Strong signals of EU support for NIKs would prevent sections of industry suffering the cost of a double switch from HCFC to HFC to NIKs. This is a matter of great concern to Article 5 countries under the Montreal Protocol who are in the process of switching to HFCs and are now seeing some developed countries begin moves to reduce or eliminate the use of HFCs

Insofar as industry has switched to HFCs it sets up a vested interest in maintaining the capital stock even against overwhelming evidence of the environmental damage it causes. There are already substantial multinational companies marketing non-HFC technologies e.g. Electrolux, Bosch Siemens, Danfoss, York International, De'Longhi, Tecumseh and Carrier. However, most of these companies concentrate their efforts in HFC technologies and so the “voice” for NIKs seems smaller than it is in reality.

It may be for similar reasons that the refrigeration industry has a history of dragging its feet on such transitions. A speaker at the CFC and Halon Alternatives Conference in 1994 explained how various industries were meeting the EU deadline on CFCs but the “least progress” was in the refrigeration sector.²

The UK Situation

The UK now recognises HFCs as an intermediate, and relatively environmentally damaging technology. *“HFCs should only be used where other safe, technically feasible, cost-effective and more environmentally acceptable alternatives do not exist ... HFCs are not sustainable in the long term”*.³

Most HFC emissions arise through leakage from systems in the course of use or disposal. In the UK, some 75% of HFCs are used for topping up leaking systems (BSRIA 1998⁴). During 2000, some 1,700t of HFCs will have been emitted to air from refrigeration in the UK. By 2010 HFCs will account for 10.4m.t CO₂ equivalent of emissions, according to a 1999 DETR Report⁵ in a business-as-usual scenario. The UK accepts that leakage rates are “well above the minimum that can be effectively achieved”³. More pessimistic studies exist e.g. Eric Johnson of Atlantic Consulting, forecast that by 2010 HFCs may represent about 4% of UK GHG emissions. On this basis, phasing out HFCs would help the UK achieve a third of its legally binding target reductions of 12.5% of GHGs.

Hydrocarbons – A Safe, Proven and Energy Efficient Refrigerant

HCs do not damage the ozone layer and have an almost negligible GWP – the GWP is approximately 1000 times lower than the HFC average. Amongst the NIKs, natural HCs are a safe and proven refrigerant technology. 95% of German domestic refrigerators now use HCs and Germany has some of the toughest environmental and safety legislation in the world. After more than 100 million operational years in these domestic refrigerators, mostly in Germany, there has not been a single accident.

Table 1 shows the clear potential for the use of HCs in the various application sectors. The charge sizes are based on March figures and the sectors reflect those identified by March for their DETR report. The numbers of units are taken from BSRIA and are for the UK. The percentages are based on discussions with manufacturers and end users and assume no significant increase in cost. These numbers could increase with further investment or if new technology develops. The key point is that there are already sectors where HFCs could be completely replaced with safe, cost effective and more energy efficient non-HFC technology.

It would be far more economic to encourage the use of NIKs in these sectors rather than implement an intrusive, expensive and cumbersome system just to allow or justify the continued use of HFCs. In any event the only way to absolutely guarantee that there are no HFC emissions is not to use HFCs in the first place.

Table 1

Sector	Name	Common equipment	No. units	Charge sizes (kg)	NIKs can be used
R1	domestic	Domestic	1250000	0.05 - 0.3	100%
R2	other hermetic	Integral cabinets	23700	0.15 - 0.5	100%
		Ice makers	13800	0.15 - 0.5	95%
		Window units	4000	0.15 - 0.5	100%
		Portables	24183	0.15 - 0.5	100%
R3	small comm	Milk tanks	830	2 - 10	80%
		Beer cellar	4030	2 - 10	90%
		small coldstores	5225	2 - 10	80%
R4	supermarkets	Remote cabinets	29458	20 - 1000+	5%
		Retail coldstores	303	20 - 1000+	10%
R5	industrial	-	-	<50 - 5000+	50%
R6	DX air cond.	Small splits	71600	<5 - 50+	95%
		Large splits	67200	<5 - 50+	90%
		Indoor packages	1110	<5 - 50+	70%
		VRF	5600	<5 - 50+	5%
		Rooftop	1900	<5 - 50+	80%
R7	air cond chillers	Chillers	2809	<100 - 2000+	75%
R8	transport	Transport	5678	3 - 5	80%
R9	mobile air cond.	Car a/c	900000	0.5 - 1.2	100%

HCs and Energy Efficiency

HC systems are cost-effective: **users report savings of up to 22% in energy consumption.** This energy-efficiency was recently acknowledged by the Canadian Government.⁶ HCs, using less electricity, reduce the amount of CO₂ released to the atmosphere by power generators. Thus, the use of NIKs causes a double reduction in global warming. NIKs have negligible GWP, and NIKs reduce demand for electricity. This is not an insubstantial point – *“the refrigeration and air-conditioning market segments use significant quantities of electricity, which lead to indirect emissions of CO₂ at power stations.”*⁵

Independent studies¹² have repeatedly shown that HC refrigerants can, on their own, lead to significant reductions in energy consumption. The HFC industry has always argued against this fact as HFCs have generally been less energy efficient than the CFCs and HCFCs they have replaced. Systems have required major redesign to both allow the use of HFCs and to achieve similar or better energy efficiencies than the previous CFC or HCFC equipment.

DISCUSSION OF EMISSION CONTROL POLICIES

1. Marketing and Use Restrictions

Marketing and use restrictions are already a given of some national policies. This is the only concrete way of guaranteeing zero HFC emissions. There are already sectors where HFCs are not required and where alternatives are commercially available, proven technologies. However, translating policies such as the UK's policy of using alternatives wherever possible into actual implementation can encounter bureaucratic inertia even within Government. We are currently pursuing various UK Government Departments that appear to be recalcitrant. Setting policy that HFCs are an unsustainable technology, and that practical environmentally benign alternatives should be favoured is one thing – but implementing effective measures to reach the desired policy end is another.

2. Voluntary Restraints

Voluntary agreements are yet to be proven as an effective solution. To work, they need to be strong, policed, reviewed and carry penalties for non-compliance.

Of over 7,000 companies in the UK refrigeration industry still only 200 have signed the voluntary code agreed with the Government. "Sustainable Business" published by the DETR (1998) discusses voluntary agreements: "*The number of parties involved should be limited, but there needs to be sufficient coverage of the sector in question*" (para. 69) "*The objectives of agreements need to be clear, with milestones and targets. There should be provision for annual review and independent verification. Responsibility for measuring and verifying progress must be agreed*"(para 71). Using these criteria, the voluntary codes currently in use in the UK for HFCs have failed: they have insufficient coverage of the sector; there is no annual review procedure and there is no independent verification. The UK accepts that "*It is also clear that, in their present form, the voluntary agreements would not deliver significant reductions in emissions in the short and medium term.*"³

Lord Marshall, the "father" of the UK's Climate Change Levy was also not sanguine about voluntary agreements: "*Being voluntary, there is no guarantee they will deliver. Because of the imbalance of information between firms and the regulator, it is only fair to recognise that the Government cannot be sure that an agreement is offering the right deal in terms of emissions reductions. To the extent that agreements fall short, other sectors of the economy and industry will have to do proportionately more. For all these reasons I would not expect them to be the mainstay of the Government's programme.*"⁸

3. Training and Certification of Users

Ideally, training and certification should be mandatory and universal – this is a prime candidate for coverage under a Directive especially if Member States continue to be dilatory.

The Dutch experience with STEK, the foundation for R&D to support Dutch refrigeration engineers is one promising example of an official body promoting training and certification. The key to its success is strong political commitment resulting in effective regulation and inspection. The STEK experience could be copied by Member States or transferred to the EU level, but care needs to be taken that vested interests do not capture the mechanism.

4. Monitoring and Verification

This is a fundamental tool best achieved by EU Directive. Monitoring should cover production, use, import, export, recycling, destruction and emissions of F-gases. It ensures that policy is based on up to date figures rather than vague promises of emission reduction potential. It could also help ensure actual delivery of leakage reduction targets provided that it was accompanied by an effective system of penalties.

Of course where HFCs aren't used there will not be the same need to put such an expensive regime in place.

5. Leakage Reduction Targets

The HFC industry claims that its pollution potential can be minimised by reducing leakage and encouraging recovery and recycling. Target leakage rates of 3% to 4% are quoted but not in practice achieved. Even countries like the Netherlands and Sweden' where emissions are tightly regulated, have been able to reduce leakage rates to only around 10% at best. The 3-4% figures often quoted have only been achieved in a small number of new, tightly policed systems. Johnson found much larger leakage rates in countries where these emissions are not tightly regulated and policed. *Without a radical step-change in technology, incentives, or both, it is hard to see the leakage forecasts of the UK and Dutch Governments as realistic.*⁹

Historical HFC annual leakage rates are 30% for distributed systems (e.g. supermarkets, pub cellars etc), refrigerated transport and mobile a/c, and 15% for central chillers; the average loss of charge on disposal has been 75% for distributed systems, 25% for central chillers and 100% for refrigerated transport and mobile a/c¹¹. On a high emissions business-as-usual scenario the DoE⁵ estimated that emissions from refrigeration in the UK, using the 1990 baseline year as 0.0mt CO₂ equivalent, would rise to 0.8mt CO₂ equiv. in 1995, to 4.7mt CO₂ equiv. by 2010, the date by which public policy demands a fall of 20% in CO₂ emissions from 1990 limits.

Leakage reduction targets by themselves are little more than expressions of good intent. To be sure of delivering reductions, rigorous monitoring and effective penalties for non-compliance are pre-requisites. Outside of this context, we suggest that leakage reduction targets should only be considered as a policy option where other more effective and immediate alternatives are not available.

There will be no need to set leakage targets where no HFCs are used. The flammability of HCs and toxicity of ammonia are incentives enough to reduce leaks

6. Setting National or International Standards

Setting national or international standards have significant potential for good – or ill. Standards can make or break markets. As Juvenal wrote: “Quis custodiet ipsos custodes?” The outcome turns on who sets the standards. Many standards committees are composed to a significant degree of technical representatives of the major HFC marketers. Naturally, vested interests may introduce a bias towards today’s technology rather than tomorrow’s with all the uncertainties which that may represent to market share. Politicians and Officials, glad perhaps to be relieved of understanding technical matters, may be reluctant to second-guess the role of the “competent” technical committee. The danger is that what is essentially industry self-regulation turns into the erection of subtle trade barriers. The European Commission can request CEN – the European Committee for Standardisation - to prepare standards in order to implement European legislation. This standardisation is 'mandated' by the Commission, through the Standing Committee of the Directive, in support of legislation. Therefore, if action on an F-Gas Directive matures political and Official attention will need to be carefully directed towards compiling a mandate for CEN which will achieve rather than hinder environmental progress.

EU Directives are another “maze” and will need to be carefully monitored to ensure barriers to alternatives are not slipped through the back door! Industry could use this to limit EU/MS policy options by covertly banning or limiting alternatives if not watched carefully.

7. The Use of Economic Instruments/Taxation

There is a role for economic instruments to improve the industrial and commercial use of energy and help reduce emissions of GHGs. The imminent introduction of the UK Climate Change Levy is a model to build on in order to encourage a shift to more environmentally benign technology in refrigeration. Indeed DETR’s March report⁵ deemed the use of fiscal instruments, as a means of reducing emissions, to be either “good” or “reasonable” for a number of the major refrigeration market sectors.

The Danes agreed a tax in 2000 relating to the consumption of refrigerants and to the respective global warming impact of their ingredients. The Danish

position is summed up by the Danish Minister for the Environment and Energy, who acknowledged that “*we cannot solve one problem at the expense of another.*”¹⁰ i.e. it is best to move straight from CFCs/HCFCs to NIKs.

The tax is as follows:

Refrigerant	GWP	Tax (euro/kg)	Tax (£/kg)
R404A	3750	43.5 euro	£27.42
R134a	1300	20.5 euro	£12.92

The Norwegian Government has also announced that it is contemplating a levy of 0.03 euros per kg of CO₂ equivalent on HFCs, PFCs and sulphur hexafluoride (SF₆) with the aim of reducing their consumption and therefore emissions.

Such an economic instrument would encourage at least three of the four “technical opportunities” for reducing emissions that were identified in the March report⁵ i.e.: (a) minimising emissions through the lifecycle of a product, (b) using zero/low GWP alternative fluid, and (c) using an alternative or NIK technology.

A tax on the GWP of refrigerants would:

- be simpler and less bureaucratic to implement and administer than any leakage penalty system;
- give strong signals to business considering investments in refrigeration technology;
- not prohibit the use of any one refrigerant, but rather continue to allow market choice whilst encouraging the use of environmentally preferable alternatives;
- reward the industry’s own efforts in leakage reduction;
- be precisely targeted on what is increasingly recognised as an unsustainable technology and calibrated according to the GWP of each pollutant – “treating different refrigerants equally” as EUCRAR/EPEE propose is a recipe for lack of environmental progress.

The proceeds of a tax can be recycled back to business in the form of schemes to promote energy efficiency and reducing greenhouse gas emissions directly. Such a scheme could include funding of proper refrigerant reclamation and disposal schemes administered by local authorities; and, incentives to invest in the manufacture of environmentally benign refrigeration technology.

EUCRAR/EPEE argue that the best way to achieve results is for industry to compete fairly and “work with the market”. However, the current market is distorted by the external costs of HFC pollution being inflicted on the environment. As a UK Government Memorandum reads: “Environmental taxes may improve overall economic efficiency to the extent that they

internalise the externalities associated with environmental pollution...The application of the 'polluter pays' principle ensures that externalities are internalised, and environmental taxes that enforce this principle therefore improve the economic efficiency of the tax system as a whole"¹¹.

CONCLUSION

The EU has the opportunity to give industry a strong and clear signal about the future viability and acceptability of HFCs. The market is already seeing shortages of some HFC blends in 2001 due to the lack of sufficient production capacity for some of the constituent HFCs e.g. HFC 125. This shortfall exists due to the reluctance of the chemical industry to invest in HFC plant whilst political uncertainty exists. If they get the wrong signal and these investments are made it will be much harder and more costly for the EU to act against HFCs in the future.

Whilst some of the proposed actions should apply across all refrigerants (e.g. training) the scope should vary for different fluids e.g. whilst HFC disposable containers should be banned this should not be extended to HCs. This reflects the fact that over 4 billion HC aerosols are used in Europe every year.

Timescales will be a key variable across the sectors as will money. In addition, we are all different countries with different climates, different infrastructure, different problems and different concerns so we will need different solutions. That said there is obviously some scope for a common approach on certain matters.

Appendix 1 – Popular or Technically Possible Refrigerant Alternatives

	HCs	Ammonia	CO2	Water
Domestic use	✓			
Other small hermetic	✓			
Small commercial	✓			
Supermarkets	✓	✓		
Industrial	✓	✓		✓
Air-conditioning DX Systems	✓			
Air-conditioning Water Chillers	✓	✓		
Refrigerated Transport	✓		✓	
Mobile air conditioning	✓		✓	

(based on Table 2.1 p14 of ***UK Emissions of HFCs, PFCs and SF6 and Potential Emission Reduction Options***, The Department of the Environment, Transport and the Regions, 1999)

Sources

1. UK Use and Emissions of Selected Halocarbons, DoE, 1996
2. Chem. Eng. News, November, 1994; see also "Refrigeration Still Lags as Europe Moves Toward CFC Phaseout," Global Environ. Change Rep., pp. 1-3, Aug. 26, 1994
3. Climate Change: The UK Programme, DETR, November 2000
4. Building Services Research Industry Association (BSRIA) Report, 1998
5. UK Emissions of HFCs, PFCs and SF₆ and Potential Emission Reduction Options, Department for the Environment, Transport and the Regions, January 1999
6. Analysis of alternative technology options in the residential sector, Expert Panel on Alternatives to Refrigerants, Environment Canada. March 1999
7. Refrigeration and Air Conditioning, October 1998
8. Economic Instruments and the Business Use of Energy, Lord Marshall, November 1998
9. Global Warming from HFC, Eric Johnson, The Environmental Impact Assessment Review, November 1999
10. Speech by the Danish Minister for the Environment and Energy, Mr Svend Auken at the IIR Natural Refrigerants Conference in Aarhus, September 1996
11. Government Memorandum to the Environmental Audit Committee 1998.
12. Paper presented to ECCP WG by Paul Blacklock, February 22nd 2001. Available on CIRCA

4 EARTHCARE

Earthcare would like to see the EU adopt the following measures:

1. End-use restrictions as soon as EU manufactured alternatives are available.
2. Environmental impact labelling so purchasers can look beyond minimum first cost when making decisions.
3. Compulsory training, examination and registration of all refrigerant handlers.
4. Production caps on the manufacture of HFCs based upon their global warming potential. This should be based on the sum of imports minus exports plus manufacture, not the sum of the individual usage sectors. The monitoring of HFC consumption needs to be very vigorous. I would like to see a refrigerant balance of the EU calculated, i.e. manufactured output plus imports minus exports, this should match the sum of the individual usage sectors, any difference will give an indication of the accuracy of the monitoring process.
5. Moves towards the earliest possible total ban on the very high GWP halocarbons such as SF₆, PFCs and HFC23.
6. Prosecutions for deliberate or avoidable emissions of HFCs.
7. EU funding for Kyoto protocol implementation. To date we have no costings for implementation. However, if the timescale is to be of the order of magnitude as for ODS phase out, then costs are likely to be of the same order. We are unlikely to receive financial assistance from the chemical industry this time round! Given the perilous financial state of much of the refrigeration & air conditioning industry at the moment, assistance will be required and the most appropriate source would be from funding set aside specifically for implementation of the Kyoto agreement.
8. A commitment to ensure that EU manufacturers are in a position to supply all the necessary equipment for an HFC free Olympics in 2004.
9. A message of support for those operating in the alternative refrigeration & air conditioning sector, and a particular commitment to assist SMEs in this sector.

5 EECA / ESIA

Final version – 02/02/2001

**MEMORANDUM OF AGREEMENT
BETWEEN MEMBER COMPANIES OF THE
EUROPEAN ELECTRONIC COMPONENT
MANUFACTURERS ASSOCIATION
EUROPEAN SEMICONDUCTOR INDUSTRY ASSOCIATION**

I. COMMON AGREEMENTS AND PRINCIPLES

A. Even if Semiconductor Industry is not one of the major user of PerFluorinated Compounds (PFC) - which are emitted in the atmosphere and contribute to Global warming effect - it is proactively committed to reduce as much as possible the PFC emissions from its manufacturing processes. This is a voluntary agreement between Member Companies of the European Semiconductor Industry Association (collectively, the Participants). Individual Companies can terminate their participation in this agreement 30 days after written notification to the secretariat of the , European Semiconductor Industry Association (ESIA) with no continuing obligations. This agreement will expire on December 31, 2010, unless it is extended by mutual agreement of the participating member companies.

B. The Semiconductor industry production and sales grow of about 15% per year. The semiconductor industry is also aware of the long atmospheric lifetime and high global warming potential of PFC emissions.

C. The Participants to this agreement recognize that companies in the semiconductor industry rely upon certain PFCs used in the manufacture of semiconductor devices. At present, there are no proven substitutes with adequate performance characteristics for PFCs in these manufacturing applications.

The following PFCs are utilized by the industry and are the subject of this MOA. perfluoromethane (CF₄), perfluoroethane (C₂F₆), sulfur hexafluoride (SF₆), nitrogen trifluoride (NF₃), trifluoromethane (CHF₃), and perfluoropropane (C₃F₈) (herein referred to collectively as PFCs). The Participants are mindful that, as semiconductor manufacturing processes evolve, other process chemicals with significant global warming potential may be added to this list . The Participants will periodically evaluate whether additional compounds should be added to the list of PFCs covered by this MOA.

D. This agreement, signed by the Participants, applies only to PFC emissions associated with the manufacture of semiconductor devices in EU.

E. The semiconductor industry's reliance on PFCs has increased significantly in the past several years. Based on current trends, this reliance is expected to continue. This increase is the result of two factors: (1) the semiconductor industry has expanded (and is continuing to expand) rapidly to meet the ever-increasing worldwide demand for semiconductor devices; and (2) the complexity of semiconductor devices has increased significantly over the past several years, requiring increased PFC use in precision manufacturing applications.

F. ESIA will ask each participating company to estimate and report annually the data necessary to prepare the report specified at paragraph II C. and any other further data requested and agreed by WSC ;

(1) to estimate its annual PFC emissions by using one of the Intergovernmental Panel on Climate Change (IPCC) Good Practice Inventory Methods for Semiconductor Industry;

(2) and to maintain records that could be used to verify the accuracy of data reported annually to the designated law firm (e.g. gas purchase/use, instrument calibration records, etc).

G. The EU semiconductor industry participates in a highly competitive global market. Restrictions on the availability or use of important materials such as PFCs could significantly affect the industry's ability to compete in the global market.

H. The Participants recognize the purpose of this agreement is to endeavour to reduce PFC emissions from semiconductor device manufacturing operations.

The shared goal is to support and enhance the goal that EECA agreed to through the WSC, which is to reduce, by 2010, the annual absolute PFC emissions of the participating companies collectively by ten percent (on an MMTCE basis) below the 1995 baseline PFC emissions of these companies.

I. The Participants will use this MOA to support and enhance the global efforts of the World Semiconductor Council to reduce PFC emissions worldwide. The Participants recognize that an industry-wide strategy will result in greater environmental protection by this highly globalized industry. The Participants also believe that global emission reduction goals will help to ensure an internationally level playing field.

II. PARTICIPANT RESPONSIBILITIES

Commitment to reduce PFC Emissions

A. The Participants agree that they will endeavour to reduce PFC emissions from their European semiconductor manufacturing operations. The

Participants will endeavour to reduce PFC emissions through a combination of strategies, including supporting efforts to evaluate and to implement, whenever possible:

- (1) the more efficient usage of PFCs in the manufacturing process (prevention);
- (2) potential substitute compounds, including compounds that have lower global warming potentials, and that do not significantly increase the potential of an impact on people, or on environment or on other fields;
- (3) recycle and/or reuse options, where economically, technically and environmentally appropriate;
- (4) appropriate and proven abatement systems, where economically, technically and environmentally appropriate.

B. The Participants recognize that they are making a commitment to attempt to reduce PFC emissions, despite the current absence of replacements for PFCs for these applications and acceptable and tested techniques for reducing PFC emissions from semiconductor operations. The Participants acknowledge that they may not be able to attain this goal for a variety of reasons, including competitive factors related to the lack of similar investments by non-European semiconductor manufacturers. Nonetheless, the Participants are committed to using all reasonable efforts to attain the goal of reducing PFC emissions.

The participating companies will publish an interim report by December 15, 2005, dealing with the progress that has been made towards achieving the PFC goal.

Commitment to Estimate and Report PFC Emissions

C. The Participants agree to share PFC emission data with other S/C companies signing this agreement. The Participants will conduct workshops to address technical approaches for PFC emissions. Participants will measure their progress according to a frame defined in these workshops, and will report estimates of emissions to a law firm assigned by ESIA. The designated law firm shall be responsible for maintaining company-specific emissions estimates as confidential and will create a confidential data depository. The designated law firm shall receive emissions information from the Participants on an annual basis, and will prepare emissions reports based on information obtained from the confidential data depository and the frame defined by the ESIA PFC workshop.

The participants will report no later than April 1st of each year.

The designated law firm will report to ESIA no later than June 1st.

The report will include :

- 1) the aggregate (no company-specific) PFC emissions from all participating companies on a MMTCE basis
- 2) the aggregate (not company-specific) emissions of each PFC covered by this MOA from all participating companies on an MMTCE basis
- 3) the aggregate purchasing quantities (not company-specific) per PFC type
- 4) the aggregate Normalized Emission Rate (NER), (not company-specific)

Commitment to Share Information Regarding Successful PFC Reduction Strategies

D. The Participants agree that they will share with other Participants, in the semiconductor industry, information about successful PFC emission reduction processes and technologies that the Participants consider non-confidential.

III. SIGNATORIES

The undersigned hereby agrees with the content of this Memorandum of Agreement (MoA) and commits to co-operate and exchange information according to this MoA with other signatory companies.

Company name

Signature

(Name & title)

Date

6 FEA

FEA STATEMENT: ECCP FINAL REPORT (APRIL 2001)

Technical Aerosols

The Sector

The Technical Aerosol sector that currently uses hydrofluorocarbon propellants represents a very small percentage of the aerosol market. The majority of the market moved from CFC to alternative propellants such as hydrocarbons in the late 1980s. For many aerosols in the Technical Sector the use of such gases is inappropriate, primarily for safety reasons, consequently HFC is now the only alternative.

This industrial sector consists of a number of SMEs filling relatively small numbers of products.

It should be noted that PU foams and MDIs are specifically excluded from the discussion on this sector

Emissions

FEA estimates the GWP contribution in Europe from aerosols to be:

1988	673 Mt CO ₂ equivalents
1995	5.1 Mt CO ₂ equivalents
2010	Approx. 5.1 Mt CO ₂ equivalents

The FEA does not anticipate any trend to using HFCs in other aerosol sectors and expects that emissions will not increase significantly over the next 10 years. The possibility to use HFCs as a replacement of all or part of the VOC content of an aerosol does not exist in Europe, unlike the USA where HFCs are considered to be non-VOC.

The Aerosol Industry moved out of CFCs in the late 1980s. For uses that required a non-flammable product HCFCs were used. However, a further change to HFCs was made in the mid-1990s before many other industrial sectors and their use has essentially stabilised from then on.

Controlling Factors

Currently, the use of HFCs in a wider range of applications is limited by the relatively high cost of this propellant compared to alternatives such as hydrocarbons.

Little growth is to be expected as HFC do not offer an alternative solution in order to reduce VOCs in Europe. As it does not function as a current option it will not lead to a significant growth in HFC use non-Technical Aerosols. This could only happen if terms of definition change and parallel to that the legislative pressure exercised on VOCs diminishes.

A different situation occurs with US products: As HFC are included under the European definition of VOCs, but not in the US, thus benefit from a legislative advantage and hence a better marketing Europe.

Establishment of a Monitoring System

Difficulties in obtaining the correct data have convinced FEA to work out a method for an improved system of data collection. FEA has recently established a monitoring system which will provide annually HFC production data as a base for emission quantities of CO₂ equivalents. Founded on data collected from the various European producers a European statistic sheet on HFC emission will be the desired result.

FEA feels obliged to supply such information based on facts rather than on extrapolated figures. These data will lead to the base material for an accurate estimate directed at further use within the ECCP.

Cost Effectiveness

Little cost effectiveness data are available. In some current application where safety issues can be overcome, alternative propellants could be used with a good cost effectiveness.

However it is believed that there are few if any applications that fall into this category. Use of new propellant mixtures with a low GWP may be reasonably cost-effective, although will only reduce emissions by a small percentage. Alternative delivery systems are likely to prove relatively expensive. Recovery of propellant from used aerosols is likely to be relatively expensive and only feasible on that level where quality deficient aerosols are cast out during production process.

Reduction Options Already Under Implementation

The high price of HFC propellants compared to alternatives such as hydrocarbons have already restricted the use of HFC aerosols significantly.

The HFC supply industry is aware of the fact that development of unnecessary new markets for HFC aerosols is damaging to the environment. For that reason they limit themselves in their HFC supply to define essential uses in order not to extend HFC applications with Technical Aerosols.

Code of Practice

Additionally the European aerosol industry wants to promote the idea of essential uses only applications of HFC. Following the successful voluntary agreement on CFC's at EU level in the early nineties FEA has finalised a voluntary Code of Practice on essential uses of HFC in aerosols. This Code of Practice has been approved by the FEA Board of Directors during the 2001 Spring meetings and is in force since mid-March 2001.

The Code of Practice consists of 4 major demands:

* No other safe solution:

Applicable when replacing propellants put users at health risk.

Some examples: - danger of ignition

- lack of sufficient ventilation

- danger of accumulation creates explosive gas mixture

- effects of static electricity

* No other practical alternatives:

Applicable where the alternative solution would present significant operational issues as a problem (difficult to reach places)

* No other economic alternatives:

Applicable where alternative products would be too expensive or only available in very limited quantities.

* No other environmentally acceptable alternative:

Applicable where new demands are made for products currently on the market

with respect to their impact on the environment.

The objective of the Code of Practice is the environmentally responsible use of HFCs in aerosols; application should fit within these 4 demands.

Example: as for certain industrial products a non-flammable formulation is a key requirement. If substitute propellants do not put the user's health at risk the ODP reducing propellant is in favour.

Proposed Policies and Measures

Specific measures are suggested:

* Monitoring and reporting of emissions at an EU level

* Implementation of a voluntary or negotiated agreement with the aerosol industry.

* Creation of an agreed list of currently known "critical" uses.

But: "Critical use" needs definition

* On-going development of alternatives, including new propellants or NIK delivery systems

Eu vs National Action

Technical aerosols are heavily traded within the EU and also imported from and exported to the outside world. To avoid potential distortions of the internal market, action on European level is the only justifiable action level.

7 EXIBA / ISOPA / EPFA

Draft Proposal for Voluntary Action on HFC for European Insulation Foams* Industry

THE INDUSTRY

The European Insulation Foam Industry comprises 4 generic sectors namely :

Polyurethane/polyisocyanurate
Polystyrene*
Polyolefin (e.g. polyethylene and polypropylene)
Phenolic.

The polystyrene foam sector is split into Extruded (XPS) and Expanded (EPS).

*The EPS Committee of APME and EUMEPS as trade associations representing the expanded polystyrene foam industry are not included in this document, since HFC are not used in EPS. Similarly the polyolefin foam industry in Europe does not use HFC as blowing agents

OVERALL POSITION ON HFC

The 3 sectors actually, or in the near future using HFC are committed to R+D programmes with the goal of minimising such use in the long-term, whilst maintaining insulation performance. In many cases HFC are essential to ensure a smooth phase-out of HCFC.

SECTOR SITUATIONS

Polyurethane/polyisocyanurate Sector

Currently, only very small quantities of HFC (HFC 134a) are used by the polyurethane foam industry (excluding One Component Foam). Demand will increase as HCFCs are phased out in the period 2003/2004.

HFCs are only expected to be used for:

Technical reasons – to obtain best foam flammability performance and best insulation values

Safety reasons – for safety during, for example, the processing of spray and block foams

Economic reasons – for SMEs where the conversion costs to hydrocarbons are prohibitive.

Extruded Polystyrene Sector

In contrast to PU/PIR, the XPS sector has long since identified the HFC products to be used namely HFC 134a/152a. Both are commercially available and and officially registered (EINECS/ EILINCS) .

XPS using HFC has been available commercially in Sweden since 1996.

HFC will be used not only by smaller producers because the initial investment necessary to convert out of HCFC is acceptable but also by most producers wishing to serve the traditional requirements of certain geographical markets and applications.

Phenolic Foam Sector

The arguments for using HFCs in phenolic foam are basically the same as those set out for the polyurethane and polyisocyanurate sectors. However, since phenolic foam is primarily sold on the basis of its excellent insulation values and unique fire performance, the technical justifications are even more pronounced.

The main applications for phenolic foam are in wall lining and in roofs, where the product is often used in exposed form. In addition, there is a major market for phenolic foam as pipe insulation in public and commercial buildings. In each of these applications, blowing agent selection is a significant factor, although it becomes less so when the products are contained behind plasterboard and other inorganic substrates.

The most likely HFC blowing agents for phenolic foams will be HFC-245fa or HFC-365mfc.

INDUSTRY REPRESENTATION

ISOPA

Polyurethane rigid foams are used in a wide range of applications and, consequently, no single association represents all the applications. However, it is important to realise as in the past, in the case of the voluntary agreements on CFC use, the association representing the isocyanate producers (ISOPA) can act as an effective umbrella organisation, co-ordinate activities of the foam makers and effectively generate statistics for the whole industry. ISOPA has a total of seven members, four of whom (BASF, Bayer, Dow and Huntsman) are involved in rigid foams.

EXIBA

The European XPS industry is organised in the trade association, Exiba, which has 11 EU member companies representing some 90% of the production capacity in the EU. There are 5 other producers in Finland, Spain, Italy and Greece which are not members of Exiba.

EPFA

There are three significant block foam manufacturers and two laminate producers in Europe. These are all represented, along with the various raw material suppliers by the European Phenolic Foam Association (EPFA). It is estimated that the Association covers in excess of 80% of the total resin consumption for phenolic insulation foams in Europe. Floral foams are not included within the auspices of the EPFA.

COMMITMENT

European Foam Plastic Insulation Industry as represented by ISOPA (BING), EXIBA and EPFA which, anticipating the phase-out of HCFC as blowing agents via implementation of Regulation 2037/2000 EEC and their subsequent partial replacement by HFC, recognising that HFCs are listed in the basket of gases controlled under the Kyoto Protocol, the emissions of which are to be limited, commit to undertake separately and jointly the voluntary actions when using HFC as listed in the paragraphs below :

to report annually to the Commission of the European Communities the consumption in the European Union in tonnes of each HFC used by sector (polyurethane/polyisocyanurate ; extruded polystyrene ; phenolic) by 31 March of the following year, starting with 2003 data.

to report annually to the Commission the aggregated emissions of such HFC from the production sites in the EU expressed in tonnes CO₂ equivalent by 31 March of the following year (for the 1st time for polyurethane in 2004, XPS in 2003, phenolic 2005).

to provide the Commission with a calculated estimate for the whole insulation foam industry of the annual HFC emissions expressed in tonnes CO₂ equivalent from product installed in the EU from 01 January 2004 onwards. The emission models are developed by industry and accepted as representative for the individual sector and are state-of-the-art.

to urgently examine the technical possibilities of reducing HFC emissions from production sites and to install state-of-the-art technology as soon as proven technically and economically feasible, whereby each individual producer is responsible for the identification, development and installation of such technology.

to report annually to the Commission on the status of such technology.

to co-operate with the Commission, national and local authorities, to communicate to the construction industry and building owners that construction site and demolition waste of insulation foam containing HFC should be properly disposed of. The preferred method of disposal is by incineration, by mixing at appropriate rates with municipal solid waste in MSWI. (Montreal Protocol approved Ozone Depleting Substances destruction technology)

Additionally each sector commits separately to the following targets by 2010:

PU/PIR*

By 2005, plant emissions will not exceed [2,0] million tonnes CO₂ equivalent
By 2010, plant emissions will not exceed [1,5] million tonnes CO₂ equivalent.

* calculated using GWP of 820

XPS**

By 2005, plant emissions will not exceed [4] million tonnes CO₂ equivalent.
By 2010, plant emissions will not exceed [2] million tonnes CO₂ equivalent.

**calculated using GWP of 1,300 and 140 respectively at 100-year horizon for HFC 134a and 152a. Should the official GWP values change then the targets will be adjusted accordingly.

Phenolic*

By 2005, plant emissions will not exceed [0.25] million tonnes CO₂ equivalent.
By 2010, plant emissions will not exceed [0,25], [0.40] million tonnes CO₂ equivalent.

* calculated using GWP of 820

This voluntary action programme will be reviewed with the Commission periodically [every 2 years] for the first time in 2005.

Once this voluntary action programme has been implemented it will be rendered null and void should the Commission or any Member State propose legislation at EU or national level which goes further than the measures listed in the paragraphs above.

This does not exclude that such voluntary actions cannot be taken at Member State level with similar or reduced scope.

ISOPA

EXIBA

EPFA

8 IPAC

IPAC

INTERNATIONAL PHARMACEUTICAL AEROSOL CONSORTIUM

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*TO: EUROPEAN CLIMATE CHANGE PROGRAMME
(ATTENTION: NORBERT THEIHS)*

The International Pharmaceutical Aerosol Consortium (IPAC) submits these comments to the Industry Working Group on fluorinated gases under the European Climate Change Programme for consideration in preparation of its final report.

IPAC is a group of companies that manufacture a variety of drug delivery systems, including metered dose inhalers (MDIs), dry powder inhalers (DPIs), nebulisers, and oral tablets, and is committed to research and development of medical aerosols for use in a range of patient applications. IPAC has participated in the ECCP process and made a detailed presentation on HFC MDIs at the 19 September meeting of the Working Group. Since that time, the Working Group issued its Interim Report and several stakeholders have submitted comments that address various sectors, including the MDI. IPAC appreciates the opportunity to participate further in this collaborative process. This paper provides responses to suggested policy proposals and additional input on several issues relevant to the MDI sector. It should be read together with IPAC's prior submissions. When discussing the MDI sector, the specific objectives of the Fluorinated Gases Working Group should be kept in mind, namely identification of the applications most amenable to common and co-ordinated policies, and elaboration of a proposal for cost-effective instruments for the investigated applications.

OVERVIEW

The reformulation effort for phasing out CFCs in MDIs, as mandated under the Montreal Protocol, has proven to be a very challenging undertaking. MDIs are the only use still considered as essential under the Montreal Protocol. It is recognised that phase-out of ozone depleting

substances should not be jeopardised by measures taken to curb HFC emissions in the climate change context.¹ This is particularly relevant for the MDI sector, which has yet to complete the transition out of CFCs.

Because of the many issues associated with the use of HFC-MDIs (ongoing transition out of CFCs, long development time for alternatives, unpredictability of outcomes of ongoing research, patient/physician relationships, responsibility of physicians for prescribing decisions, and characteristics of respiratory diseases), it is important and appropriate to involve all stakeholders (Health Ministries, Environment Ministries, industry, physicians and patients) before measures are taken which might affect this issue.

IPAC recognises the need to address climate change issues and is committed to efforts to reduce HFC emissions where technically feasible and safe from a patient health perspective. Therefore, IPAC is considering several measures that could be implemented in the short term, including: (1) a consistent system to monitor and verify HFC emissions; (2) minimisation of HFC emissions during manufacture of MDIs; (3) recovery of HFCs from MDIs rejected during manufacture; (4) commitment to research and development on alternative therapy options/delivery systems; and (5) progression of the CFC phase-out and promotion of alternative delivery systems.

POTENTIAL MEASURES

Once the transition from CFC MDIs is complete, MDIs will still represent a very small percentage of HFC emissions. IPAC proposes below a number of measures which could provide assurances that MDI emissions can be monitored and limited in a responsible manner that protects patient care.

Monitoring and Verification of Emissions

Emissions Incidental to Manufacturing Process

In recent years, MDI manufacturers have implemented substantial improvements to reduce emissions incidental to the manufacturing process and have achieved low leakage rates. IPAC is committed to reducing these emissions even further, as technically feasible. IPAC could also implement procedures to monitor and report these emissions. Such reporting could occur on a national level.

Emissions During Use of MDIs

IPAC supports the concept of an EU-wide system to monitor and verify HFC emissions from MDIs. Since HFC MDIs are non-stationary sources of emissions, tracking emissions on a national level is challenging, and national

emissions data would be unreliable to a certain extent. Certain factors complicate the MDI emission calculation on the Member State level, such as imports and exports, the movement of MDI products between Member States, and the limited availability of comprehensive sales data. In order to facilitate discussion, the following three types of data are described below: (1) production data, by site of manufacture; (2) company sales figures; and (3) commercial market research data.

IPAC companies could track emissions by providing data on the number of MDI units manufactured at each production facility in Europe. The primary drawback of using production figures to estimate emissions is that they do not provide accurate data about the country of emission or the timing of emission. For example, a batch of MDIs produced at a company's European manufacturing facility may be shipped to several different countries inside (and outside) of the EU before emission occurs. Identifying the country of emission from production figures is further limited by the fact that MDI shipments are frequently sent to a wholesaler who then distributes product to individual retailers in several Member States. For example, MDIs sold to a wholesaler in Spain will then be further distributed for sale in Belgium, the UK, Germany and the Netherlands, as well as in Spain itself. Production figures, therefore, would only be useful to estimate emissions on an EU-wide basis, and product exported outside of the EU would need to be accounted for in the calculation.

A second data source is company product sales figures. Pharmaceutical companies will, for management reporting, generally account for the sales of MDI units in each Member State and could use these numbers to estimate MDI emissions on a country by country basis, *i.e.*, number of units sold per year multiplied by average amount of propellant in each unit. However, the same issues identified for reporting emissions from production sites (parallel trade and movement of goods by wholesalers) apply to this method of reporting, albeit to a lesser extent, so this method would not give completely accurate data, but rather an estimate only.

The third possible approach, is the use of commercial market research data, based on either sales data or prescriptions. The latter could in certain instances provide more accurate data on the national level. Such information may be obtained from a number of companies, usually by subscription. The market research companies track and record sales and marketing data at the retail level. This data does not always include the sale of products to hospitals or the supply of product samples. Depending on the company from which the commercial data is purchased it may not be available for all Member States. Data based on prescriptions is extrapolated from a statistically significant percentage of prescriptions. The main barrier for using commercially purchased data is that most market research companies will apply contractual restraints, and subscribing companies could be forbidden

from distributing the data in the public domain. However, in those countries where these data are available, national governments could potentially subscribe to the service.

IPAC will continue to explore possible data sources and looks forward to further discussions with the Commission on this issue.

Recovery of HFCs from Reject MDIs

“Reject” MDIs refer to products that fail to meet company quality standards and are rejected during the quality control process. It is possible to remove and recycleⁱⁱ and/or safely destroy the HFCs contained within reject MDIs thereby avoiding release to the atmosphere.ⁱⁱⁱ IPAC companies will consider measures to recover or recycle HFCs from reject MDIs at EU manufacturing sites.

Progression of CFC Phase-Out and Promotion of Currently Available Alternative Delivery Systems

IPAC is committed to the phase-out of CFC MDIs. The effort to reformulate MDIs with HFCs took close to a decade, and is not yet complete for several important drug substances. To progress the transition, it will be important for IPAC companies to continue to implement strategies to ensure a smooth transition for patients moving from CFC MDIs to CFC-free products and to work with health and environment officials to ease the transition. Obtaining appropriate regulatory approvals of CFC-free products is a major focus for companies at this time. IPAC commits actively to pursue the transition to CFC-free products and is mindful that a successful transition will result in a significant global warming benefit. The projected date for the completion of the phase out of CFC MDIs in the EU is 2005, making Europe a leader in the timely phase out of CFCs. In other developed and developing countries, production of CFC MDIs will likely continue beyond 2005.

IPAC companies manufacture and are committed to the active promotion of alternative drug delivery systems such as DPIs, nebulisers and oral therapies. These non-propellant systems are used to varying degrees across Europe. For the DPI and oral therapies current trends indicate that their growth rate is faster than that of the MDI in Europe.^{iv}

Commitment to Research and Development of Alternative Therapy Options

Substantial R&D efforts are well underway for additional non-propellant technologies, for example those using mechanical or electronic technologies to produce the aerosol, such as metered liquid inhalers. Metered liquid inhalers utilise mechanical energy to direct two opposing jets to

aerosolise on impaction. Actuation of the device releases a soft mist aerosol of medication. While the timeline for development of new products is lengthy, the pharmaceutical industry is largely driven by the innovation of new technologies, and these efforts will certainly continue. The objective when developing a drug delivery system is to achieve the highest possible medical outcomes of safety, efficacy and compliance. HFC MDIs currently meet these goals, and industry is working to develop additional therapeutically beneficial technologies.

RESPONSE TO PROPOSALS

Since IPAC's last submission, a few additional proposals have been made in the context of the ECCP process. These proposals are addressed below.

Transition Framework Similar to CFC MDIs

It has been suggested that a transition framework similar to the EU's transition strategy for phasing out CFC MDIs could be adapted to cover HFCs. IPAC agrees that the CFC transition is instructive when considering the HFC MDI. However, implementation of a similar transition framework for HFC MDIs at this time is unworkable in practice, and would also be inconsistent with the Kyoto Protocol. The Kyoto Protocol encourages the reduction in emissions of six greenhouse gases (with different targets for each Member State) rather than requiring a production ban like the Montreal Protocol. Imposing a transition framework on HFC MDIs when the CFC transition is still underway would be counterproductive and could significantly slow the transition from CFC MDIs, thereby resulting in greater environmental harm. It would also be impractical and thus not cost-effective for Member States.

Proposal to Increase DPI Market Share

One stakeholder has proposed that it is possible to increase DPI market share to 80-90%. The primary basis for this proposal is the fact that DPIs account for approximately 80% of the market share in Sweden. However, the experience of only one country, with unique circumstances does not accurately reflect the reality of the situation in Europe.^v DPI market share varies widely across the EU. For example, it is 16% in Germany, 40-50% in the Netherlands, and 6% in Italy.^{vi} The total market share for DPIs in the EU is just 15%.^{vii} The market for DPIs is growing at a significant rate, and some estimates indicate that it could naturally increase to 50% over the long-term.^{viii}

There are notable limitations to the acceptance of DPIs. The fact that effective use of DPIs depends on a patient's inspiratory effort alone makes them inappropriate for some patients, particularly young children, the elderly, and those with severe respiratory disease. While companies manufacturing DPIs

will continue strongly to promote these products, ultimately it is the physician's decision which therapeutic regimen is most appropriate for each individual patient, taking into account factors such as a patient's age, but also the individual's own circumstances, which may be difficult to categorise by membership of a particular sub-population. IPAC believes that any interference with the patient/physician relationship in terms of mandating certain therapeutic regimens for patients, would be inappropriate, and would cause problems for, and meet resistance from patients and healthcare providers.

The cost differential between DPIs and MDIs has also been raised during the ECCP process. Pricing of pharmaceutical products is a complex issue, which requires a detailed and sophisticated analysis. Both MDIs and DPIs are available in a wide range of dose sizes and, therefore, care must be used when comparing prices. Relevant pricing data is not readily available in every Member State. It can generally be stated that DPIs tend to be priced significantly higher than MDIs, primarily for generic products which represent a substantial part of the market. If cost-effective policy decisions are to be based in part on pricing differentials, it is important to obtain reliable data from the Member States and to adopt a uniform methodology for cost comparisons.

Obtaining a market share of 90% in all Member States, even if possible, would require extraordinary measures at a substantial cost and would raise significant issues regarding patient healthcare^{ix}, and the priorities of individual Member States' healthcare systems. IPAC believes that such proactive measures are unwarranted, considering that DPI market share is expected to significantly increase over the next several years without any external policy instruments.

EU-Wide Informational Campaign Promoting DPIs

It has been suggested that an EU-wide informational campaign detailing the environmental effects of HFC MDIs and promoting DPIs could result in emissions reductions. Formulating and implementing an EU campaign could be difficult in light of differing medical cultures and individual circumstances within each Member State. IPAC wishes to emphasise that this sector currently engages in extensive efforts to promote DPIs and will do so in the future.

Product Inserts

The Member States have expressed an interest in considering, in consultation with health ministries, an EU decision that would require enclosure of a leaflet with MDIs detailing the environmental effects of HFCs. IPAC cannot agree with the proposal for product inserts, in light of potential risks to patient health. Such inserts could undermine patients' confidence in their medication, thereby discouraging proper use of medication and decreasing compliance. Patients are not necessarily in a position to effectively evaluate environmental risks versus health benefits. The purpose of such an insert, presumably, would be to encourage patients to use an HFC-free alternative. However, in the case of MDIs, unlike other consumer products, patients rely on their physician to prescribe the specific medication to best treat their symptoms and are generally not in a position to "choose" an alternative. This is particularly true if the physician believes a DPI is not suitable for a patient's needs.

Implementation of an EU-wide decision on this issue could be difficult as pharmaceutical inserts are highly regulated and often controlled at the national level by individual health ministries. Current promotional practices are successful in advertising alternative devices to physicians and patients.

CONCLUSION

IPAC's recommendations to reduce emissions during manufacture, recover HFCs from reject MDIs, promote the CFC phase-out and alternative delivery systems, and continue research and development of new drug delivery systems represent a contribution to reduce HFC emissions from the MDI sector and are consistent with the objectives of the ECCP's Working Group on fluorinated gases. IPAC is eager to work productively with the Commission on these efforts and would be happy to discuss these issues further.

Endnotes

ⁱ Interim Report of ECCP Working Group 5 at 13-14 (November 2000).

ⁱⁱ HFCs recovered from reject MDIs cannot be recycled into medical products because of safety requirements and good manufacturing practices, but can be recycled for use in other applications or safely destroyed using approved technologies.

ⁱⁱⁱ According to the Enviro March study, this measure could result in a potential savings of .3 metric tonnes of HFC. *Study on the Use of HFCS for Metered Dose Inhalers in the European Union*, ENVIROS MARCH at 20 (September 2000).

^{iv} ENVIROS MARCH at 10.

^v The Swedish market for DPIs is recognised as being a “very individual market for DPIs,” and the high market share is largely due to nearly a decade of extensive marketing by a local Swedish manufacturer, coupled with very early action on CFC MDIs by the Swedish government. “Similar marketing campaigns in other countries have not achieved such levels of DPI market penetration.” ENVIROS MARCH at 15, 40.

^{vi} ENVIROS MARCH at 38.

^{vii} *Id.*

^{viii} *Id.*

^{ix} *Id.* At 33-36.