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DEVELOPMENT AND TRANSFER OF TECHNOLOGY

WAYS AND MEANS OF LIMITING EMISSIONS OF HYDROFLUOROCARBONS AND PERFLUOROCARBONS

Submissions from Parties and intergovernmental organizations

Note by the secretariat

Addendum

1. In addition to the submissions contained in document FCCC/SBSTA/1999/MISC.6, one further submission has been received.

2. In accordance with the procedure for miscellaneous documents, this submission* is attached and is reproduced in the language in which it was received and without formal editing.

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PAPER NO. 1: JAPAN

WAYS AND MEANS OF LIMITING EMISSIONS OF HFCS, PFCS AND SF_6 PURSUANT TO DECISION 13/CP.4

Contributed by
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Title: Promotion of Measures to limit HFC,PFC and $_{SF6}$ Emission in Japan

Type: Policy and measure, voluntary agreement

Category:
By-product emissions; Refrigeration, domestic; Refrigeration, commercial; Refrigeration, industrial; Refrigeration, air conditioning and heat pumps (air cooled systems); Refrigeration, air conditioning (water chillers); Refrigeration, mobile air conditioning; Foam, other; Aerosols, industrial; Solvents, electronics cleaning; Solvents, other; Semiconductors manufacturing; Electrical insulation

Gases affected:
HFC-23, HFC-32, HFC-41, HFC-125, HFC-134, HFC-134a, HFC-152a, HFC-143, HFC-143a, HFC-227ea, HFC-236fa, HFC-245ca, HFC-43-10mee, Other HFCs, CF_4, C_2F_6, C_3F_8, C_4F_{10}, c-C_4F_8, C_5F_{12}, C_6F_{14}, Other PFCs, SF_6

General description:
This is the voluntary action plan to limit HFC, PFC and SF_6 emissions by industrial organization.

Impacts on ozone depletion:

Impacts on global warming:
VOLUNTARY EMISSION REDUCTION ACTION PLAN BY INDUSTRIAL ORGANIZATION

(million GWPt:CO_2 equivalent)

(1) Production of HFC, PFC and SF_6

(1995:22.9 →Estimated Emission 2010:9.2 (BAU 25.8))

Summary
Each corporation that manufactures HFCs, PFCs and SF_6 will:

- determine a voluntary management target for the control of emissions of each gas, and cooperate to attain that goal, and
- in order to attain the voluntary management target, do its best to use to the utmost the emission control technology available, based on a voluntary action plan, and take appropriate measures for changes in the manufacturing process, use of substitute substances, reduction of the amount of HFCs, etc. contained in products, etc.

More specifically, the following measures for emission control of HFCs, etc. will be promoted.

Specific Measures
- More closed systems in manufacturing plants, etc.: reduced of leakage, recovery, and recycling
- Reduction of HFC-23 produced in the manufacturing process of HCFC-22
- Recovery, use and destruction of HFC-23
- Prevention of leakage during the gas cylinder filling, during transport
- Appropriate processing of gas remaining in returnable cylinders
- Establishment of a system of recycling and destruction of recovered gas, with the support of the industries that use the gas
- Development of substitute substances for HFCs, PFCs and SF_6
- Other additional measures available in future

(2) Foam Blowing Agent

(1995:0.5 →Estimated Emission 2010:8.6 (BAU 9.7))

Summary
It is planned to gradually use from the year 2000 substitute blowing agents for insulation, such as HFC-245fa, etc. in place of CFCs used formerly, and substances currently in use, such as HCFC-141b and HCFC-142b.
Moreover, blowing agents with a low rate of heat conductivity, low toxicity and low flammability which can be put into use and which is equivalent to HFC-245fa, etc., in these terms do not yet exist.
Therefore, the foam and insulation industries promote the following specific measures, for the purpose of controlling HFCs emission from blowing agents for insulation, whose use can be estimated to increase in the future, aiming at promoting energy saving.

Specific Measures
- Reduction of leakage during filling of products
- R&D on reduction of use of blowing agents for insulation
- Increase of the rate of production, by improvements in manufacturing technology.
- Development of alternative technology such as transfer to not-in-kind insulating materials with low GWP (water, hydrocarbon, liquid CO_2, etc.)

(3) Aerosol

(1995:1.4 →Estimated Emission 2010:2.3 (BAU 3.3))

Summary

The use of HFC-134a, which is used for aerosols, as a substitute for CFC-12, etc., began in the early 1990s. Moreover, its uses are, for considerably more limited areas than CFC-12.

Each corporation in the aerosol industry will:
- Set a voluntary management target for emission control, on a voluntary basis, and strive to achieve it
- In order to achieve the voluntary management target, work towards greater use of emission control technology available at the present time, based on a voluntary action plan.

More specifically, we will promote the following measures for HFC emission control.

Specific Measures
- Prevention of leakage during product filling (recovery of gas inside the pipes at the time of changing manufactured products, control of the amount of leakage when the gas is divided up, control of the incidence of defective products during manufacture)
- Mixture of non-fluoride gas for some uses
- Development of alternative technology for transfer to use of not-in-kind products with low GWP, etc.

(4) Mobile Air Conditioning

(1995:0.6 →Estimated Emission 2010:4.0 (BAU 7.6))

Summary

The use of HFC-134a, mobile air conditioner refrigerants, as a substitute substances for CFC-12, began using mostly since 1993.
For recovery of HFC-134a when used as a refrigerants:
- As part of the disposal of used automobiles, and based on the established concept of the recovery and destruction system for CFC-12 currently in operation, sales operators, equipment businesses, dismantling businesses, etc. will build up a system for recovery, transport and filling while installing refinery and disposal facilities for the re-use of the recovered HFC-134a.

Concerning the operation of the system, the following specific measures for HFC emission control will be promoted, to ensure a smooth progress, with the cooperation of the government and related industries.

Specific Measures
- Prevention of leakage during filling of mobile air conditioners
- Prevention of leakage during use of mobile air conditioners
- Development of mobile air conditioning systems with less leakage during use
- Establishment of a system for recovery, recycling and destruction of refrigerants in disposed mobile air conditioners
- Development of mobile air conditioners with reduced refrigerants

(5) Domestic Air Conditioning

(1995:0.0 →Estimated Emission 2010:1.3 (BAU 2.5))

Summary

Since the spring of 1998, HFC-type mixed refrigerants for domestic air conditioners (mostly HFC-410A) have been used as substitute substances for HCFC-22 used up till then in all different kinds of machines.
Domestic air conditioners can be expected to make a great improvement in energy efficiency, through the "top runner method" based on the amendment of the Law Concerning the Rational Use of Energy. That means that an increased amount at the time of refrigerants filling is inevitable. Taking this into account, the following specific measures for HFC emission control will be promoted.

Specific Measures
- Prevention of leakage during original filling
- Prevention of leakage during installation, use, repair and servicing
- Establishment of a system for recovery, recycling and destruction of refrigerants from disposed equipment
- Development of products with small amounts of refrigerants filling
- Development of not-in-kind refrigerants with low GWP

(6) Commercial Refrigerator and Air Conditioning

(1995:0.0 →Estimated Emission 2010:1.1 (BAU 2.1))

Summary

Use of HFC compound refrigerants (mainly R407C, R404A, R507A) in commercial refrigeration units, as CFC and HCFC substitute substances, started in the spring of 1998.
There are two points to consider regarding commercial refrigeration units - the indirect effect of CO_2 emissions caused by energy consumption and the direct effect of refrigerants gas emissions into the atmosphere. The following specific measures is to constrain HFC emissions:

Specific Measures
- Preventing leakage when the units are filled and preventing over-filling
- Preventing leakage when the units are installed, used, repaired or serviced
- Establishing a system of recovery, recycling and disposal of refrigerants from disposed units
- Development of low volume refrigerants filling devices.
- Development of and extending application range of non-fluoride refrigerants units
- Development of low GWP refrigerants units

(7) Domestic Refrigerator

(1995:0.0 →Estimated Emission 2010:0.3 (BAU 0.7))

Summary

HFC-134a has been used as the substitute refrigerants for CFC-12 in domestic refrigerators since 1993. HFC-245fa, along with other substitutes such as cyclopentane foam, is expected to replace HCFC-141b, which is currently in use.

Refrigerators use a little less than one fifth of all the electricity consumed in the homes. The LCA Assessment (a comprehensive assessment of CO_2 emissions from the production and use of the product until its disposal) shows that 95% of total CO_2 emissions from refrigerators are caused by generating electricity needed to run them. For this reason, the most effective measures to reduce CO_2 emissions from domestic refrigerators is to reduce the amount of electricity they consume. So, considering total energy efficiency, the most effective way to constrain HFC emissions from refrigerants and insulating foam in domestic refrigerators is as follows:

Specific Measures

- Prevention of leakage during manufacturing of product
- Prevention of leakage while in use and while repairing.
- Establishing a system for recovering, recycling and destruction of refrigerants from disposed products
- Development of recovery technology and establishment of a recovery/destruction system for gas that remains in insulating material contained in the disposed equipment.
- Expanding use of low GWP for refrigerators and non-fluoride insulating foam
- Development of and conversion to products that do not use refrigerants, and products that use low GWP, non-fluoride (hydrocarbon) refrigerants

(8) Cleaning of Electronic Parts

(1995:7.0 →Estimated Emission 2010:3.0 (BAU 11.5))

Summary

PFCs are used as CFC substitutes for cleaning or printing electronic circuit boards, hybrid ICs and other precisely manufactured components. It is also used for airtight and shock durability tests.

There are three points to consider together regarding cleaning of electronic parts- that companies using PFCs are small-and medium-sized, that conversion to PFC substitutes requires the efforts of not only electronic component manufactures but also chemical manufacturers producing cleaning agents and electronic component users ,and that the use of PFCs is the norm for electronic component airtight tests. Taking these into account,the following specific measures will be promoted to constrain emissions.

Specific Measures

Provided that a suitable substitute is developed and that it can be adopted technically and economically and a stable supply can be ensured, emissions will be reduced by at least 60% from 1995 levels by 2010.

- Prevention of leakage while in use (development and propagation of closed cleaning systems)

- Development and propagation of cleaning systems that do not use PFC
- Conversion to a PFC substitute

(9) Production of Semiconductor and Cleaning of Electronic Devices

(1995:5.2 →Estimated Emission 2010:12.0 (BAU 22.7))

Summary

PFCs and SF_6 are used as cleaning agents for removal of CVD chamber adhesives and also as plasma etching gas during the manufacture of semi-conductors and liquid crystal display devices.

In April 1997 the industry as a whole released the "Voluntary Action Statement Concerning PFC Gases in the Electronic Device Manufacturing Industry." At the same time, activities such as international cooperation at the World Semi-Conductor Conference (WSC) will be promoted to make global common specific measures. Furthermore, the "PFC Countermeasure Committee" (provisional name) will be set up within the Electronic Industries Association of Japan, which aims to establish standards for emission control efficiency and methods to measure emission amounts. Specific Measures will be pursued in conjunction with related industries.

Specific Measures

The following specific measures will be combined to attain these goals: Regarding the old production lines ,Emission factor will be estimated to decrease by 10% or more from 1995 levels by 2010. Regarding the new lines, a 70% or more reduction will be aimed at.

- Efficient use of gas in the manufacturing process
- Research and development of substitute gases and systems for PFCs and SF_6
- Development and promotion of systems for recovery, recycling and destruction of exhaust

(10) Insulating and Arc-extinguishing Gas

(1995:11.0 →Estimated Emission 2010:1.6 (BAU 14.1))

Summary

The superior dielectric, arc-extinguishing characteristics, and safety of SF_6 make it an important contributor to the miniaturization of electrical machines, indeed it is essential for a stable supply of electricity. By using gas, for example, the surface area of equipment installed permanently in a 500kV sub station can be reduced by over 90%, considerably lessening the burden on the established environment.

Although research for gas substitutes has been proceeding for some time, as yet an effective substitute substance and technology has not been developed. Due to this, the following specific measures for SF_6 emission control will be promoted:

Specific Measures

- Prevention of leakage during manufacturing
- Prevention of leakage during machine inspections
- Establishment of a system for recovery and recycling from disposed equipment
- Development of insulating devices which use less SF_6