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REPORT OF THE HFC EMISSIONS ESTIMATING PROGRAM

2002 AND 2003 DATA COLLECTION

Introduction

Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) have been commercialized as replacements for ozone-depleting substances such as chlorofluorocarbons (CFCs) and halons. The development of these chemicals for use in fire and explosion suppression applications has been instrumental in achieving the accelerated halon production phaseout mandated by the Montreal Protocol on Substances that Deplete the Ozone Layer. At the same time, the use of these classes of chemicals carries with it some environmental concern and, therefore, the need to minimize emissions.

While HFCs and PFCs are not ozone-depleting substances, they have been identified by the Intergovernmental Panel on Climate Change as potent greenhouse gases with long atmospheric lifetimes and are part of the basket of six gases included in the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Emissions of SF₆, HFCs and PFCs currently represent less than 3% of total greenhouse gas emissions. Emissions of HFCs and PFCs from fire protection are estimated at less than 1% of total HFC and PFC emissions from all sources. Nevertheless, because of their significant atmospheric impacts once released, careful management of these gases is an essential component of U.S. climate protection and stratospheric ozone goals.

Fire Protection and Environmental Protection

The U.S. fire protection industry fully supports the goal of minimizing non-fire emissions of fire protection agents, and is committed to continuing to contribute to both ozone layer and climate change protection. The overriding concern of the fire protection industry, however, is the reduction of risk to people and property from the threat of fire through the use of products and systems proven to be effective. With the aim of ensuring that both of these goals are achieved, the fire protection industry has developed a voluntary code of practice that is intended to focus the industry's efforts on minimizing emissions of HFC and PFC fire protection agents.

The Voluntary Code of Practice for the Reduction of Emissions of HFC & PFC Fire Protection Agents (VCOP) is a partnership of the U.S. Environmental Protection Agency (EPA), Fire Equipment Manufacturers Association (FEMA), Fire Suppression Systems Association (FSSA), Halon Alternatives Research Corporation (HARC) and National Association of Fire Equipment Distributors (NAFED). Since its was launched in March 2003, this program includes twenty-two partner companies, representing fire equipment manufacturers and distributors throughout the U.S. that are working to meet the goals of the VCOP through training, education, and reporting on HFC and PFC uses. This innovative partnership serves as an important model for national and international voluntary industry efforts in other sectors, such as mobile air-conditioning and the refrigeration, committed to achieving responsible use of HFC and PFC alternatives for ozone-depleting substances.

HFC Emissions Estimating Program (HEEP)

Accurate, credible recordkeeping and reporting is central to meeting the goals of the Voluntary Code of Practice (VCOP). Successful implementation of the elements of the VCOP must necessarily rely on a verifiable baseline of HFC emissions. The HFC Emissions Estimating Program (HEEP) provides a format to help industry minimize emissions by setting benchmarks, by providing the incentives to make improvements to current standards and practices, by documenting the industry's commitment to safety and responsible use, and by providing data to support these substitutes for halon systems. The essential elements of the HEEP are as follows:

- Collection and submission of data from reporting parties in industry that are in a position to make relevant measurement.
- Not all fire equipment companies need to be reporting parties in order for data collection to be substantially complete. Only the following need be reporting parties:
 - Equipment manufacturers or distributors that perform 1st Fill of original equipment and also recharge equipment.
 - Agent suppliers or equipment manufacturers that sell to distributors that only perform recharge.
- "Emission" for the purposes of the HEEP is defined as the quantity of agent sold for the purpose of "recharge" of fire suppression containers. This approach is deemed reasonable as recharge is only required after agent has been discharged, emitted, from equipment.
- Distributors who recharge cylinders but do not fill original equipment – most distributors – do not need to report as their agent use would be reported by their supplier.
- An independent 3rd Party will collect industry reports of emissions by agent type, convert the values to equivalent emissions of carbon dioxide, and report only aggregate results annually back to industry.

Data Collection Effort

In August 2002 a survey was distributed to a list of companies previously identified as possible reporting parties and to the members of FEMA, FSSA, HARC, and NAFED. The purpose of the survey was to identify all of the companies in the U.S. that were likely to be HEEP reporting parties based on the criteria outlined above. By distributing the survey to the members of the four major fire protection associations, it was felt that all of the appropriate companies would be reached. Based on the response to the survey and additional input from industry experts, a final list of 24 reporting parties was identified.

In March 2003 and June 2004, a guidance letter and data collection form were sent to the 24 reporting parties asking for pounds of HFC/PFC fire protection agents sold for recharge in 2002 and 2003, respectively. A list of the agents for which data was requested along with the global warming potentials (GWPs) used to calculate carbon dioxide (CO₂) equivalence for each agent are shown below.

HFC / PFC Chemical ASHRAE Designation	Global Warming Potential (GWP)
HFC 23	11,700
PFC 14	6,500
HFC 125	2,800
HFC 134a	1,300
HFC 227ea	2,900
HFC 236fa	6,300
PFC 3-1-10	7,000

Results

Data for 2002 was reported by 22 of the 24 companies originally identified as reporting parties. Data was reported for five gases: HFC-23, HFC-125, HFC-236fa, HFC-227ea, and PFC 3-1-10. The data for each agent was multiplied by its GWP and converted to CO₂ equivalents. The CO₂ equivalents for each agent were then combined.

Based on the results of final HEEP reporting, 1,165,818,500 pounds of CO₂ equivalent emissions of the above 5 agents were sold for recharge in the United States in 2002 by the 22 reporting companies. If you convert this number from CO₂ equivalents to carbon equivalents, it is equal to approximately 0.14 million metric tons of carbon equivalent (MMTCE).

Data for 2003 was reported by 18 of the 22 companies that reported data for 2002. Data was reported for five gases: HFC-23, HFC-125, HFC-236fa, HFC-227ea, and PFC 3-1-10.

Based on the results of final HEEP reporting, 1,075,252,400 pounds of CO₂ equivalent emissions of the above 5 agents were sold for recharge in the United States in 2003 by the 18 reporting companies. If you convert this number from CO₂ equivalents to carbon equivalents, it is equal to approximately 0.13 million metric tons of carbon equivalent (MMTCE).

In order to put these numbers in perspective, they can be compared to estimates of emissions from other applications and to estimates of emissions of HFC/PFC fire protection agents based on modeling. The EPA vintaging model is a source for estimating emissions of greenhouse gases used as substitutes for ozone depleting substances. It tracks chemical consumption and emissions by making detailed calculations in over 40 end-uses of the quantity of equipment or products sold, serviced, and retired each year, what chemical(s) are being used, and the amount of chemical required to manufacture and/or maintain the equipment.

Estimates of emissions of HFCs/PFCs for fire protection from the EPA vintaging model are 0.25 MMTCE in 2002 and 0.28 MMTCE in 2003. EPA estimates of emissions for other applications are as follows: 22.0 MMTCE from refrigeration and air conditioning in 2003, 8.3 MMTCE from HCFC-22 production in 1999, and 2.7 MMTCE from aluminum smelting in 1999.

Discussion

In order to better compare the 2002 and 2003 data, the data can be adjusted to account for the difference in the number of companies that reported in 2002 and 2003. If the 2002 totals for the 4 missing companies are added to the 2003 totals of the 18 reporting companies, it equals 1,202,139,000 pounds of CO₂ equivalent emissions. If the 2002 data for the four companies that did not report in 2003 is subtracted, it equals 1,038,931,900 pounds of CO₂ equivalent emissions.

- 2002 data = 1,165,818,500 pounds (0.144 MMTCE)
- 2003 adjusted data = 1,202,139,000 pounds (0.148 MMTCE)
- 2002 adjusted data = 1,038,931,900 pounds (0.128 MMTCE)
- 2003 data = 1,075,252,400 pounds (0.133 MMTCE)

Either way that you adjust the data, it shows a very slight increase in emissions between 2002 and 2003.

In setting up this program the hope was that over time emissions of HFCs and PFCs from fire protection uses would decrease with the implementation by the industry of the Voluntary Code of Practice. Interpretation of the year-to-year emissions data, however, should consider the fact that the total amount of agent contained in fire extinguishing systems increases annually. Thus, if the emission rate (amount discharged annually per quantity of installed base) were constant then the year-to-year gross emissions amount would be expected to increase. A modest reduction in emission rate, reflecting an improvement in industry practices, might well be hidden by the effects of an increase in the size of the installed base.

Another consideration when analyzing this data is that the mix of agents that are being sold for fire protection is changing. Because the data for each agent is multiplied by its GWP and the GWP of each of these agents is different, the total number of pounds of all agents that are released could decrease but the total CO₂ equivalent emissions could increase if more agents with higher GWPs are being emitted than in previous years.

Data on the global bank of HFCs and PFCs used in fire protection are available from recent international reports and studies. Future reporting through HEEP will consider emissions within the context of this growing bank and implications, if any, of significant shifts in the market's choice of these agents.

Conclusions

- The HFC Emissions Estimating Program (HEEP), which was devised to develop fire industry emissions data, has been successfully launched.
- Successful continuation of HEEP seems likely based on industry responses.
- The two years of emissions data collected thus far are consistent and reflect somewhat lower GHG emissions rates than originally expected.
- Overall, the HEEP process appears to serving its intended purposes.