

VOLUNTARY CODE OF PRACTICE FOR HFC AND PFC FIRE PROTECTION AGENTS

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Abstract - In partnership with the U.S. Environmental Protection Agency, four major associations representing the fire protection industry recently announced their commitment to a voluntary code of practice to minimize unnecessary emissions of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), greenhouse gases used as fire protection agents. This paper discusses the reasons for the development of a voluntary code of practice and outlines the emission reduction strategies it promotes.

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. Technical experts have stated that HFCs are essential substitutes for the replacement of Halon 1301 in fire protection applications.¹ 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. The Kyoto Protocol calls for the aggregate emissions of the six gases to be reduced to an average of 5% below 1990 levels in developed countries in the 2008-2012 timeframe.

The six gases in the basket are: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), sulfur hexafluoride (SF₆), HFCs, and PFCs. 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.

¹ October 1999 report of the Montreal Protocol Technical and Economic Assessment Panel

The use of HFCs and PFCs in fire and explosion protection applications is considered, on the whole, to be essentially non-emissive, except for their rare use in the suppression of explosions or fires. Currently, emissions of these agents from modern, properly maintained equipment is estimated at less than 3% per year of the installed bank².

Fire Protection and Environmental Protection - The U.S. fire protection industry fully supports the goal of eliminating 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 (VCOP) that is intended to focus the industry's efforts on minimizing emissions of HFC and PFC fire protection agents.

Endorsing Organizations - With the support of the U.S. Environmental Protection Agency, the four major fire protection associations described below have agreed to distribute the Voluntary Code of Practice to their members and encourage each member to voluntarily follow the emission reduction strategies.

Fire Equipment Manufacturers Association (FEMA) - The Fire Equipment Manufacturers' Association is a not for profit international trade association whose members work together to educate the public about fire prevention to save lives and reduce property damage. Member companies manufacture top quality fire protection products such as portable fire extinguishers, fire hose systems, fire suppression systems, and related interior equipment -- all necessary components of a complete and balanced fire protection plan.

Fire Suppression Systems Association (FSSA) - The Fire Suppression Systems Association is a not-for-profit trade association drawing members internationally. FSSA is a unique blend of designer/installers, manufacturers and suppliers working together to share ideas and strategies for the benefit of the fire suppression systems industry. FSSA members are dedicated to the highest level of safety, reliability and effectiveness of special hazards fire suppression. The mission of FSSA is to promote the use of, and be the leading recognized authority on, special hazard fire protection systems; employing existing and new technologies to safeguard people, high-value assets and the environment.

Halon Alternatives Research Corporation (HARC) - The Halon Alternatives Research Corporation is a private, not-for-profit corporation formed in 1989 to promote the development and approval of environmentally acceptable halon alternatives. HARC serves as a facilitating organization and information clearinghouse on issues related to halon replacement, halon recycling, and halon regulation. Our members include alternative agent manufacturers, equipment manufacturers, distributors, installers, end-users, and other special interest groups such as approval agencies and standards organizations.

² Global Comparative Analysis of HFC and Alternative Technologies for Refrigeration, Air Conditioning, Foam, Solvent, Aerosol Propellant, and Fire Protection Applications, Arthur D. Little Report, March 2002

National Association of Fire Equipment Distributors (NAFED) - The National Association of Fire Equipment Distributors (NAFED) is a forty-year-old establishment that was formed to enhance professional and technical competence within the fire equipment distribution industry. A professional association of over one thousand companies with members through out North America, and around the globe, NAFED has developed products and services that have not only become vital to its members, but to the entire fire equipment industry at large. All members of NAFED are dedicated to raising the standards of the fire equipment industry through education, legislation, cooperative efforts with industry associates, and through professionalism when addressing issues of fire prevention and protection.

U.S. Environmental Protection Agency (EPA) - Title VI of the Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to develop and implement regulations and programs to protect the stratospheric ozone layer. Major elements of EPA's program include regulations to end production and import of ozone-depleting substances (ODSs), including halons; a set of requirements banning intentional venting of ODSs, minimizing their unnecessary emissions, and maximizing their recycling; labeling requirements; and establishment of the Significant New Alternatives Policy (SNAP) program to identify alternatives to ODSs, including halons, and to publish lists of acceptable and unacceptable substitutes based on an evaluation of human health and environmental effects. Since the 1994 ban on production and import of halons, EPA has worked closely with the fire protection industry to support their transition from ozone-depleting halons. Starting in 1994, EPA also began working on voluntary industry initiatives to reduce emissions from greenhouse gases including HFCs and PFCs.

Emission Reduction Strategies

Regulations and Standards

1. Follow applicable U.S. government regulations on sale, use, storage, and transportation (see Appendix 1).
2. Follow applicable industry standards on the installation, design, and maintenance of extinguishers and fire suppression systems (see Appendix 2).

Emissions

3. Minimize emissions during storage, handling, and transfer.
 - A. Recover and recycle agents during servicing.
 - B. Adopt maintenance practices that reduce leakage as much as is technically feasible.
 - C. Recover these agents after the end of the equipment's useful life and either recycle or destroy them.

Equipment

4. Use leak-resistant storage equipment in conformance with Underwriters Laboratories Standard 2166, Underwriters Laboratories Standard 2129, or equivalent.
5. Minimize false discharges by using approved detection, actuation, and control systems as required by NFPA Standard 2001 and by supporting research to develop more efficient detection technologies and methods.
6. Ensure that extinguishers and fire suppression systems are inspected and maintained regularly as required by NFPA Standard 10, NFPA Standard 2001, and other local codes.

Discharge Testing

7. Limit the discharge of agent for system testing to that which is essential to meet safety or performance requirements or is required by regulation or the authority having jurisdiction.
8. Limit the discharge of agent for training to that which is essential to meet safety or performance requirements or is required by regulation or the authority having jurisdiction.
9. Support the revision of regulations to eliminate requirements for discharge testing and provide needed assistance to authorities having jurisdiction, especially in those cases where such testing is mandated by local regulations that are outdated or otherwise unnecessary.

Decommissioning, Servicing and Disposal

10. Prohibit the venting or release into the environment of agent from extinguishers or fire suppression systems at time of decommissioning or servicing and recover agent for recycling, reprocessing, or disposal in accordance with approved methods.
 - A. Recover the agent from the fire protection system in conjunction with testing or servicing.
 - B. Destroy or recycle the agent for later use.
 - C. Minimize emissions during recycling.
 - D. Operate and maintain recovery and recycling equipment in strict accordance to manufacturer specifications.
 - E. Ensure that there is no cross-contamination and that appropriate purity is achieved.

Technician Training

11. Ensure that technicians who test, maintain, service, repair or dispose of HFC or PFC-containing equipment are trained regarding responsible use to minimize unnecessary emissions.

12. Include the following topics in the training:

- A. Explanation of why training is required (trained technicians prevent emissions).
- B. Overview of environmental concerns with HFCs and PFCs (long atmospheric lifetimes, high GWP).
- C. Review of relevant regulations or standards concerning HFCs and PFCs (EPA, NFPA, UL).
- D. Specific technical instruction relevant to individual facilities (manufacturer manuals, training materials, references and resources available to technicians).

Communications and Outreach

13. Support transfer of technologies and information designed to minimize emissions to governmental and private institutions in other countries, especially developing nations.

Recordkeeping and Reporting

14. Coordinate the development of a verifiable data tracking system on the emissions of HFCs across the U.S. fire protection industry.

HFC Emissions Estimating Program (HEEP)³ - 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 outlined above 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.

³ Senecal, Joseph A., "Program for Estimating Emissions of HFCs and PFCs by the Fire Protection Industry," Proceedings of the Halon Options Technical Working Conference, Albuquerque, NM, April 30 - May 2, 2002

- “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. The number of reporting parties is estimated at fewer than 50 in the US.
- 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.

Additional data will likely be requested from reporting parties that will help distinguish between agent discharged unintentionally and that discharged to extinguish a fire. Historical, but largely anecdotal evidence, suggests that most discharges of gaseous fire suppression systems are due to accidental release. Estimating the quantity accidentally released will aid industry in improving its systems and procedures to reduce the likelihood of future releases. In this manner the goals of the VCOP can be realized.

Applicable Government Regulations

Environmental Protection Agency

The following summarizes key EPA regulations relating to halon and halon substitutes:

- 40 CFR Part 82, Subpart A – Production and Consumption Controls
- 40 CFR Part 82, Subpart E – The Labeling of Products Using Ozone-Depleting Substances
- 40 CFR Part 82, Subpart G – Significant New Alternatives Policy (SNAP) Program
- 40 CFR Part 82, Subpart H – Halon Emissions Reduction

Section 612 of the Clean Air Act established EPA’s SNAP program with a mandate to identify alternatives to ozone-depleting substances, including halons, and to publish lists of acceptable and unacceptable substitutes. In order to assess and compare the overall risks to human health and the environment posed by the use of substitutes to ODSs, SNAP considers a wide range of health and environmental factors including toxicity, ozone-depletion potential, global warming potential, atmospheric lifetime, flammability, human exposure, and environmental fate and transport.

Department of Transportation

49 CFR Part 178, Subpart C, Specifications for Cylinders

Outlines the requirements for manufacturing, testing, and marking of cylinders (containers) used for the transportation of hazardous materials. Specification cylinders (those packagings that

carry a DOT specification number) listed in Subpart C include the following specification numbers: 3A and 3AX, 3AA and 3AAX, 3B, 3BN, 3E, 3HT, 3T, 3AL, 4DS, 4B, 4BA, 4D, 4B240ET, 4AA480, 4L, 4DA, 8, 8AL, 4BW, 39, and 4E. Details on these specifications can be found in Part 178.35 through 178.68 of the DOT 49 CFR.

Applicable Industry Standards and Specifications

NFPA 2001 Standard for Clean Agent Fire Extinguishing Systems - Contains design, installation, inspection, test, and use information on halocarbon and inert gas total flooding clean agent fire extinguishing systems.

NFPA 10 Standard for Portable Fire Extinguishers - The provisions of this standard apply to the selection, installation, inspection, maintenance, and testing of portable extinguishing equipment.

Underwriters Laboratories, Inc. (UL), Standard 1093 - Standard for Halogenated Agent Fire Extinguishers - These requirements cover the construction and performance, exclusive of performance during fire tests, of portable halon type fire extinguishers intended to be utilized in accordance with the Standard for Portable Fire Extinguishers, NFPA 10.

Underwriters Laboratories, Inc. (UL), Standard 2129 - Standard for Halocarbon Clean Agent Fire Extinguishers - These requirements cover the construction and performance, exclusive of performance during fire tests, of portable halocarbon clean agent fire extinguishers intended to be utilized in accordance with the Standard for Portable Fire Extinguishers, NFPA 10.

Underwriters Laboratories, Inc. (UL), Standard 2166 - Standard for Halocarbon Clean Agent Extinguishing System Units - These requirements cover the construction and operation of halocarbon clean agent fire extinguishing system units intended to be installed, inspected, tested, and maintained in accordance with the Standard on Clean Agent Fire Extinguishing Systems, NFPA 2001.