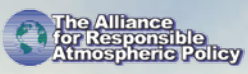
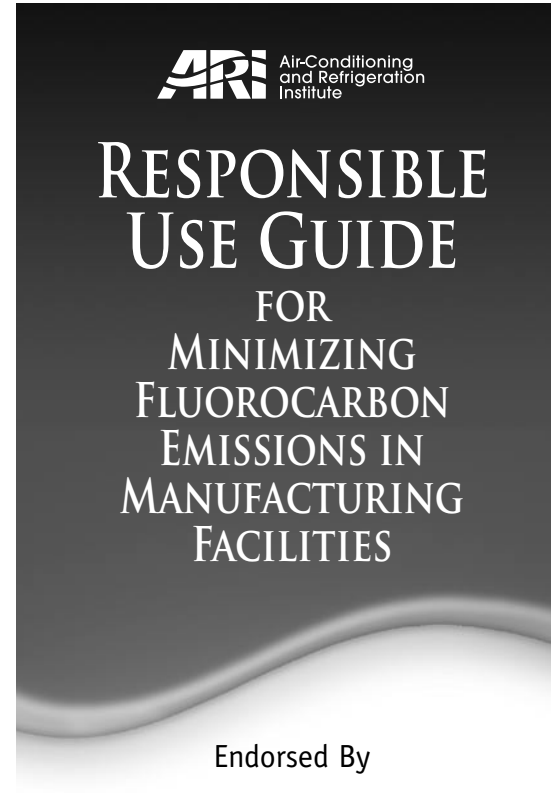
Environmental Initiatives

Air-Conditioning and Refrigeration Institute

Responsible Use Guide for Minimizing Fluorocarbon Emissions in Manufacturing Facilities





Responsible Use Guide for Minimizing Fluorocarbon Emissions in Manufacturing Facilities

Endorsed By

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS

HEATING, REFRIGERATION AND AIR CONDITIONING INSTITUTE OF CANADA

INTERNATIONAL COUNCIL OF AIR-CONDITIONING & REFRIGERATION MANUFACTURERS' ASSOCIATIONS

REFRIGERANTS AUSTRALIA

THE ALLIANCE FOR RESPONSIBLE ATMOSPHERIC POLICY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

The information in this guide is based, in part, on a survey of the industry's plant facilities. The survey, sent to members of the Air-Conditioning and Refrigeration Institute (ARI), included not only HVACR equipment manufacturers but also refrigerant manufacturers. This guide relates specifically to fluorocarbons but many of the practices should be used for other refrigerants.

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Volume Three: January 2007

Preface and Scope

The heating, ventilation, air conditioning, and refrigeration (HVACR) industry is committed to providing conditioned warm and cool air and refrigeration to improve the world's quality of life, health, and productivity. The HVACR industry believes that a clean environment promotes well-being, and it is committed to carrying out its business in a sustainable fashion, including minimizing emissions and continuing to contribute to both climate and ozone protection. This includes the responsible use of refrigerants, especially fluorocarbons, which allow HVACR equipment to fulfill its important roles.

The HVACR industry has a proud history of environmentally responsible use of refrigerants and it continues to improve an already good record of handling refrigerants. A 2005 industry survey showed that in the past ten years industry has made substantial expenditures to control refrigerant emissions; over 70 percent of respondents have reduced emissions between 25 and 75 percent. Over 50 percent of respondents have built new facilities with a zero emissions goal.

The *Responsible Use Guide for Minimizing Fluorocarbon Emissions in Manufacturing Facilities* is one part of an evolving partnership between the U.S. Environmental Protection Agency (EPA) and ARI to minimize refrigerant emissions. The information in this publication relating to the manufacturing of residential and commercial

equipment is intended for use in every HVACR or related facility where refrigerants are either produced, used, stored, or transported. It may not be practical to implement all of these practices in every facility because of unique circumstances in some facilities; however, they are recommended to be used wherever possible. The examples given herein of some current practices are for illustrative purposes, and are not intended to imply that they are the only methods to minimize fluorocarbon emissions.

The information is provided to encourage refrigerant containment and environmental protection. This information is intended to be used, and typically is most successfully used, as part of a comprehensive program which includes design optimization, preventive maintenance, training, leak detection and testing, and recovery and reclamation. Successful implementation of these recommendations will not only reduce emissions, but can conserve refrigerant supply. ARI recognizes that these recommendations should result in measurable emissions reductions, but this guide does not contain specific quantification methods.

None of the information contained herein is intended to supersede any applicable government regulations for storage, use, or handling of fluorocarbons, such as those contained in the U.S. Clean Air Act. In addition to following all applicable government regulations, factories should follow all applicable industry standards for safety, design, installation, operation, and maintenance of the following equipment: chemical blending tanks, holding tanks, dispensing equipment, and ventilation.

Section 1:

Refrigerant Recovery

Refrigerant recovery is any process which removes and recovers refrigerants from a system for reuse, recycling, reclamation, or proper disposal.

A. Recovery equipment should be available to all qualified (licensed, certified, or otherwise qualified) personnel in both manufacturing and testing laboratories.

B. All personnel using recovery equipment should be properly trained on applicable equipment and refrigerants.

C. Recovered refrigerant should be either reused, recycled, reclaimed, or destroyed and appropriate records kept.

SECTION 2:

Operational Practices for Manufacturing, Laboratories, and Plant Air Conditioning Systems

This applies to both products developed at the plant and the plant's operations.

A. All process storage and plant air conditioning lines should be designed and installed to prevent both gradual and sudden refrigerant emissions.

Examples:

- braze and weld process and storage lines where possible
- install plant air conditioning lines and systems to prevent damage to piping and allow easy access for maintenance, repair, and recovery of refrigerants
- protect or conceal piping where practicable

B. Use a process to detect and measure refrigerant loss during manufacturing.

Examples:

- maintain mass balance or plant inventory measurements
- measure actual emissions where feasible and cost effective

C. Valves, seals, pumps, tanks, piping, etc. should be designed specifically to prevent refrigerant emissions.

Examples:

- use low emitting valves or seal caps
- use appropriately located isolation valves
- recover refrigerant samples

D. Preventive maintenance should be used to ensure responsible practices and effectiveness of refrigerant handling equipment.

Examples:

- routine maintenance practices which include emptying lines and using recovery and/or disposal lines to prevent emissions
- remove air or inert gases from systems before filling with refrigerant
- ensure all associated instrumentation is properly calibrated

E. Practices and equipment should be designed to minimize refrigerant loss during equipment charging/start-up.

Examples:

- pressurize equipment and verify that pressure is held upon delivery
- protect vulnerable components from shipping damage

F. Laboratory practices should limit emissions.

Examples:

- recover, recycle, and dispose of laboratory refrigerant samples as appropriate
- ensure personnel are trained and/or certified in safe handling and use of refrigerants
- refrigeration and air conditioning test models should be assembled and used with minimal or no emissions. Options include:
  - ➤ assemble test models using a nitrogen purge for copper refrigerant piping to prevent refrigerant circulation or plugging
  - ➤ check for test model leakage prior to refrigerant charging
  - ➤ monitor test models for leaks during testing

Section 3:

Waste Handling

Waste handling is the recovery, collection, and disposal of wastes (solid, liquid, or gas) containing fluorocarbons.

A. Waste refrigerants should be recovered and recycled if possible. Proper disposal, by incineration or other approved method, should be used when recycling is impractical.

B. Waste-containing refrigerants (including refrigerant oils) should be disposed of in an approved manner.

C. All waste handling equipment should be kept in proper working order and appropriate leak monitoring systems should be in place.

Section 4:

Storage

This applies to the storage of refrigerants in either bulk tanks or cylinders in the manufacturing facility.

All refrigerants must be stored in pressure vessels which comply with applicable federal, state, and local laws and regulations.

Section 5:

Equipment Shipment & Transportation

This applies to the relocation of finished equipment from manufacturing facilities to installation or warehouse sites.

A. Equipment charged with refrigerant should have initial and arrival pressures noted to determine any leakage. Any reported leakage should be followed-up with an internal quality assurance process, including corrective action if required.

   Example:

   - the equipment data plate should be clearly marked as a fully charged system, and should include weight of system charge, refrigerant type, and date of manufacture

B. Equipment not charged with refrigerant should be shipped with inert gas to ensure system integrity, with initial and arrival pressures noted to determine any

leakage. Any reported leakage should be followed-up with an internal quality assurance process, including corrective action if required.

C. Packaging should be designed to minimize refrigerant loss during shipping.

   Examples:

   - bracing, restraining, or clamping all equipment components subject to loading or unloading and/or transit vibration
   - appropriate shipping tests to prevent piping damage from vibration or contact with other system components

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