Responsible Appliance Disposal Program

RAD

EPA

Recover

Recycle

Reclaim

2008 Annual Report

EPA's Responsible Appliance Disposal (RAD) Program is a voluntary partnership program that began in October 2006 to help protect the ozone layer and reduce emissions of greenhouse gases. The RAD Program recognizes partners that ensure the disposal of refrigerant-containing appliances using the best environmental practices available. The RAD Program invites utilities, municipalities, retailers, manufacturers, universities, and other qualifying organizations to become partners.

Overview

Through the RAD Program, partners reduce emissions of ozone-depleting substances (ODS) and greenhouse gases (GHGs) by recovering appliance foam and refrigerant.They also prevent the release of hazardous materials, as well as save landfill space and energy by recycling durable materials (eliminating the need to produce virgin materials). RAD partners achieve these benefits by using best practices to dispose of appliances; namely, they ensure that:

- Refrigerant is recovered and reclaimed or destroyed;
- Insulation foam is recovered and destroyed, or the blowing agent is recovered and reclaimed;
- Metals, plastic, and glass are recycled; and
- Polychlorinated biphenyls (PCBs), mercury, and used oil are recovered and properly disposed of.

In addition, certain RAD partners also reduce energy consumption by encouraging appliance owners to permanently retire old, inefficient units. For example, many utility partners offer a monetary reward for the pick-up of old, working refrigerators/freezers.

The RAD Program results presented in this annual report are for calendar year 2008.

The Need for the RAD Program

It is estimated that 9 million refrigerators/ freezers, 4.5 million air-conditioning units, and 800 thousand dehumidifiers were disposed of in the United States in 2008.

Because these appliances contain ozone-depleting substances (ODS), greenhouse gases (GHGs), hazardous substances, and recyclable materials, their proper disposal is critical for environmental and human health. Prior to disposal or recycling of appliances, federal law requires that (1) all refrigerant be recovered, and (2) universal waste (e.g., mercury), used oil, and PCBs be properly managed and stored. However, the laws do not require the recovery of appliance foam, which represents a significant source of ODS and GHG emissions.

Characteristics of Gases Used as Refrigerants and Foam-Blowing Agents in Appliances

Compound	Global Warming Potential (GWP)*	Ozone Depletion Potential (ODP)	Predominant Use in Appliances
CO_2	1	0	–
CFC-11	4,750	1	Foam
CFC-12	10,890	1	Refrigerant
HCFC-22	1,810	0.055	Refrigerant
HCFC-141b	725	0.11	Foam
HFC-134a	1,300	0	Refrigerant

* GWP calculations for HFCs are based on the 100-year direct GWPs provided in the Intergovernmental Panel on Climate Change Second Assessment Report (1995). GWPs for CFCs and HCFCs are based on the 100-year direct GWPs provided in *The 2006 Assessment of the Scientific Assessment Panel* of the United Nations Environment Programme's Ozone Secretariat

RAD Partners

Sixteen partners reported their accomplishments for the RAD Program from January 1, 2008 through December 31, 2008:

1. Austin Energy (TX)
2. Burbank Water & Power (CA)
3. City of Palo Alto (CA)
4. Commonwealth Edison (IL)
5. Fort Collins (CO)
6. Nevada Power & Sierra Pacific Power (NV)
7. Pacific Gas & Electric (CA)
8. PacifiCorp (ID, UT, WA)
9. PNM (NM)
10. Sacramento Municipal Utility District (CA)
11. Salt River Project (AZ)
12. San Diego Gas & Electric (CA)
13. Snohomish Public Utility District (WA)
14. Southern California Edison (CA)
15. Wisconsin Public Service (WI)
16. Sears Home Services (Nationwide)

Results

In 2008, the RAD Program's 16 partners collected and processed a total of 505,956 refrigerant-containing appliances, including:

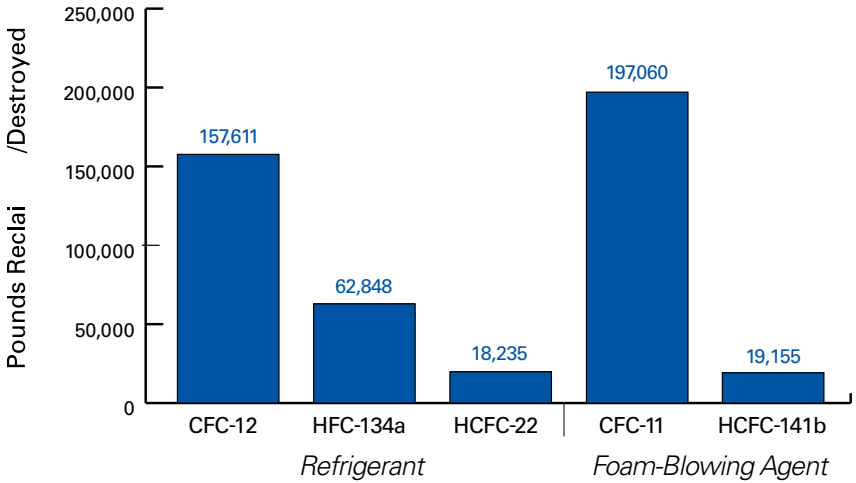
- 418,223 refrigerators/freezers;
- 81,592 stand-alone freezers;
- 5,608 air-conditioning units; and
- 533 dehumidifiers.

By disposing of these units using the best available practices, RAD partners have helped protect the ozone layer, reduce GHG emissions, reduce energy use, and increase recycling. The benefits of these practices are described in the following pages.

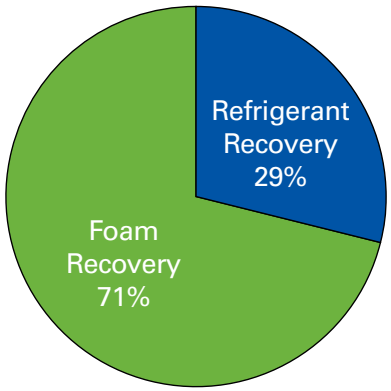
"Partnering with the RAD Program ensures that we are using the best environmental practices available, which is important to us as well as our customers."

–Bobbi Fey, Wisconsin Energy Conservation Corporation Program Manager for the Wisconsin Public Service Co. Appliance Turn-In Program

Refrigerants and Foam-Blowing Agents Reclaimed or Destroyed by RAD Partners in 2008



Typical Emissions of Ozone-Depleting Substances Avoided by Proper Disposal of Pre-1995 Refrigerators



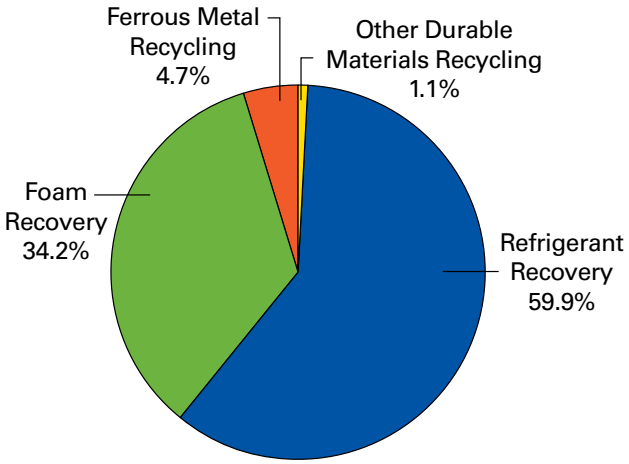
Significant ozone benefits are realized through the recovery of foam, as more than twice as much ODS foam-blowing agent is recoverable as ODS refrigerant.

Stratospheric Ozone Benefits

RAD partners not only reduce emissions of ozone-depleting substances by recovering and reclaiming or destroying refrigerant, but they recover and reclaim or destroy foam-blowing agents, which also deplete the ozone layer.

Partners recover foam from appliances manually or by using an automated system, and then reclaim or destroy the blowing agent. Foam destruction is typically performed using municipal solid waste incinerators (e.g., waste to energy facilities) or rotary kiln incinerators. On average, utility partners recovered 0.37 lbs. of refrigerant and 0.87 lbs. of foam-blowing agent from each refrigerator/freezer. Across all equipment types, RAD partners recovered a total of 175,847 lbs. of CFC and HCFC refrigerant, and 216,215 lbs. of CFC and HCFC foam-blowing agent. By avoiding the release of this refrigerant and foam-blowing agent into the environment, an estimated 153 ODP-weighted metric tons were avoided during 2008.

Greenhouse Gas Emissions Avoided by Responsible Appliance Disposal



RAD partners disposed of 505,956 appliances in 2008; this resulted in 1.25 $MMTCO_2e$* greenhouse gas emission reductions, equivalent to approximately:

Source: EPA's Greenhouse Gas Equivalency Calculator.
Available at www.epa.gov/cleanenergy/energy-resources/calculator.html.

* This does not include GHG emission reductions associated with early appliance retirement.

Climate Benefits

CFCs, HCFCs, and HFCs contained in appliances are all potent greenhouse gases.

In fact, these refrigerants and blowing agents have direct global warming potentials (GWPs) up to 10,890—meaning that they are up to 10,890 times more effective at trapping heat than carbon dioxide (CO_2) on an equal mass basis. Therefore, recovering these compounds, even in small quantities, can result in significant climate benefits. In addition, the recycling of durable materials from appliances prevents indirect GHG emissions associated with the generation of electricity, which would have otherwise been needed to produce virgin materials.

During 2008, RAD partners achieved the reduction of 1.25 million metric tons of carbon dioxide equivalent ($MMTCO_2e$), which is equivalent to approximately 229,000 passenger car emissions for one year. Of this, 59.9% can be attributed to reclaiming or destroying refrigerant, 34.2% to reclaiming or destroying foam-blowing agents, and 5.9% to recycling durable materials. Additional climate benefits are realized through energy savings detailed on the next page.

Energy Savings

For utilities, appliance recycling programs can be an important component of a successful Demand Side Management program.

Replacing old, inefficient refrigerated appliances reduces the amount of electricity needed to power them and, therefore, the amount of indirect GHG emissions released. In 2008, appliance recycling programs operated by the 15 RAD utility partners covered a territory of 18.9 million households, representing approximately 15% of U.S. households. In total, RAD utility partners reduced energy use by over 2.3 billion kilowatt hours (kWh) by removing old refrigerators, freezers, air conditioners, and dehumidifiers from the grid. These energy savings translate to climate benefits of approximately 1.48 MMTCO$_2$e, and are estimated to have saved consumers $283 million.

- *Replacing an inefficient, 20-year-old refrigerator with one that has earned the government's ENERGY STAR® label will save a household roughly 700 kWh/year or more—or about $70/year.**
- *If a secondary refrigerator (e.g., in a basement or garage) is removed and not replaced, households can save about 1,200 kWh/year, or roughly $120/year.**

* Actual energy and costs savings will vary by equipment model and region. These estimates are conservative and are based on national averages (www.energystar.gov, http://www.eia.doe.gov/emeu/recs).

Other Environmental Benefits

In 2008, RAD partners further protected the environment by keeping recyclable materials out of landfills and ensuring the proper handling of hazardous waste, as shown below:

Materials prevented from going to a landfill

- 72.6 million pounds of ferrous metals;
- 2.0 million pounds of non-ferrous metals;
- 9.8 million pounds of plastic;
- 1.6 million pounds of glass; and
- 1.1 million pounds of rubber.

Toxic or hazardous materials properly handled

- 1.2 million pounds of used oil;
- 8,191 pounds of PCB-containing capacitors; and
- 5,902 pounds of mercury-containing components.

If improperly handled, used oil can leak into groundwater and major waterways and pollute drinking water sources. In addition to used oil, appliances may contain toxic chemicals and heavy metals—namely polychlorinated biphenyls (PCBs) from capacitors and mercury from thermostatic switches. PCBs are regulated by EPA as toxic substances; they may cause cancer and liver damage, and can have negative impacts on the neurological development of children, the human reproductive system, the immune system, and the endocrine system. Mercury is toxic and causes a variety of adverse health effects, including tremors, headaches, respiratory failure, reproductive and developmental abnormalities, and potentially, cancers.

Partner Recognition

In return for their efforts, RAD partners receive public recognition and technical support from the U.S. EPA.

For example, in October 2007, EPA held a launch event to induct the first retail partner to the RAD Program. EPA has also issued several press releases publicly recognizing new partners. All partners are listed on the RAD website along with links to each partner's website. Partners are also given the opportunity to provide case studies of their programs to showcase on the RAD website. In addition, partners may use the RAD logo on their websites and other outreach materials.

Maximizing RAD Benefits: The Opportunity Is Now!

Of all refrigerant-containing appliances, those that contain CFC refrigerant and/or foam pose the greatest threats to the stratospheric ozone layer and climate systems.

Therefore, it is critical that efforts to properly dispose of appliances be undertaken today, before the full stock of CFC appliances is retired, and this opportunity to avoid harmful emissions is lost.

Ensuring the proper disposal of older appliances through the RAD Program is a priority, but the importance of the program will continue for years to come. Even new units being produced today contain high-GWP refrigerants and foam-blowing agents that will lead to increased concentrations of greenhouse gases if they are not properly handled at end of life.

Additional Information

To learn more, contact:

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