

Non-CO₂ Greenhouse Gases: High-GWP Gases

Source/Sectors: Substitution of ODS/End-uses of Consumer Products and Specialty Products

Technology: VOC propellants (C.1.2.2.2)

Description of the Technology:

VOC propellants that can be used in consumer products are usually mixtures of propane, butane, and isobutene. Dimethyl ether is another alternative (IEA, 2003; USEPA, 2001). The most attractive point of this option is its affordability; the disadvantages are the flammability and VOC emission (USEPA, 2006b).

Effectiveness: Good

Implementability: Good

Reliability: Good option for some sectors.

Maturity: Currently, it is the primary propellant in the non-MDI aerosol market (USEPA, 2001). Due to flammability and VOC concerns, further market penetration is very limited; it is assumed to share the market by only 10% (USEPA, 2006b).

Environmental Benefits: HFCs emission reduction

Cost Effectiveness:

Technology	Lifetime (yrs)	MP (%)	RE (%)	TA (%)	Capital cost	Annual cost	Benefits
VOC propellants ¹	10	10	100	40	\$0.44	-\$5.60	\$0.00

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US\$/MT_{CO₂-Eq.}
1: USEPA (2001), IEA (2003), & USEPA (2004)

Industry Acceptance Level: Since the CFCs were banned in the US, many consumer products manufacturers including spray deodorants and hair sprays markets have adopted either hydrocarbon propellants or NIK substitutes (IEA, 2003).

Limitations: Flammability and VOC emissions are of major risks. Thus, the feasibility of this option may be limited; it is assumed to abate only half of HFC-134a emissions (IEA, 2003).

Sources of Information:

1. California Energy Commission (2005) "Emission Reduction Opportunities for Non-CO₂ Greenhouse Gases in California", a report prepared by ICF Consulting for California Energy Commissions, CEC-500-2005-121, July 2005.
2. California Energy Commission (2006) "Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004", final staff report, December 22, 2006.
3. D. Little (1999) "Global Comparative Analysis of HFC and Alternative Technologies for Refrigeration, Air Conditioning, Foam, Solvent, Aerosol Propellant and Fire Protection Applications", by J. Dieckmann and H. Magid, A.D. Little, Cambridge, reference number 49468, United Kingdom, August 1999.

4. International Energy Agency (2001) "Abatement of Emissions of Other Greenhouse Gases - Engineered Chemicals", Report Number PH3/35, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, February 2001.
5. International Energy Agency (2003) "Building the Cost Curves for the Industrial Sources of Non-CO₂ Greenhouse Gases", Report Number PH4/25, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, October 2003.
6. March Consulting Group (1999) "UK Emissions of HFCs, PFCs, and SF₆ and Potential Emission Reduction Options: Final Report", Commissioned by the Department of the Environment, Transport and the Regions, United Kingdom, January 1999.
7. U.S. Climate Change Technology Program (2005) "Technology Options for the Near and Long Term", U.S. Department of Energy, <http://www.climatechange.gov/index.htm>, August 2005.
8. U.S. Environmental Protection Agency (2001) "U.S. High GWP Gas Emissions 1990 – 2010: Inventories, Projections, and Opportunities", Office of Air and Radiation, U.S. Environmental Protection Agency, EPA 000-F-97-000, June 2001.
9. U.S. Environmental Protection Agency (2004) "Analysis of Cost to Abate Ozone-depleting Substitute Emissions", Office of Air and Radiation, U.S. Environmental Protection Agency, EPA 430-R-04-006, June 2004.
10. U.S. Environmental Protection Agency (2006a) "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 to 2004" Office of Atmospheric Programs, United States Environmental Protection Agency, EPA-430-R-06-002, June 2006
11. U.S. Environmental Protection Agency (2006b) "Global Mitigation of Non-CO₂ Greenhouse Gas Emissions and Sinks: 1990 to 2004" Office of Atmospheric Programs, United States Environmental Protection Agency, EPA-430-R-06-005, June 2006.
12. UNEP - United Nations Environment Programme (1999a) "The Implications to the Montreal Protocol of the Inclusion of HFCs, and PFCs in the Kyoto Protocol", HFC and PFC Task Force of the Technology and Economic Assessment Panel, New York, October 1999.
13. UNEP - United Nations Environment Programme (1999b) "Report of the Solvents, Coatings, and Adhesive Technical Options Committee (STOC): 1998 Assessment", Ozone Secretariat, April 1999.
14. UNEP - United Nations Environment Programme (2002) "Report of the Aerosols, Sterilants, Miscellaneous Uses and Carbon Tetrachloride: 2002 Assessment", Technical Options Committee, United Nations Environment Programme.