Non-CO_2 Greenhouse Gases: High-GWP Gases

Source/Sectors: Substitution of ODS/Fire-Fighting Sector

Technology: Water mist systems (C.1.5.1)

Description of the Technology:
Water mist system is different from the traditional water-spray systems or conventional sprinklers in that it uses special nozzles that designed to produce very tiny droplets under low, medium, or high pressure; consequently, it reduces significant amount of water required to extinguish fires (IEA, 2003; UNEP, 2001).

Effectiveness: Good

Implementability: Theoretically, water mist system can be used in all Class B (fuel) hazards, under an appropriate temperature condition (USEPA, 2001) and are currently in use for storage and machinery spaces, shipboard accommodation, combustion turbine enclosures, light and ordinary hazard sprinkler applications, and flammable and combustible liquid machinery (UNEP, 2001).

Reliability: Several technical hurdles are to be solved so that this technological option can attain a wide market penetration.

Maturity: The technology is commercially available but still under research in order to extend its applicability to a wider degree (IEA, 2003).

Environmental Benefits: HFCs emission reduction

Cost Effectiveness:

Technology	Lifetime (yrs)	MP (%)	RE (%)	TA (%)	Capital cost	Annual cost	Benefits
Water mist systems[1]	10	50	100	1-4	-$35.71	$0.00	$0.00

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US$/$MT_{CO2\text{-}Eq.}$
1: USEPA (2001), IEA (2003), USEPA (2004), & UNEP (2002)

Industry Acceptance Level: Because of the high potentiality, this option is expected to develop further; researchers have been positive about overcoming the technological challenges.

Limitations: Thus far, technical applicability is limited to fire extinguishing applications that already have good fire test protocols based on empirically tested system performance (IEA, 2003).

Sources of Information:

1. California Energy Commission (2005) "Emission Reduction Opportunities for Non-CO_2 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-CO_2 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 SF_6 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.climatetechnology.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-CO_2 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.