**Non-CO₂ Greenhouse Gases:** High-GWP Gases

**Source/Sectors:** Substitution of ODS/Cold Storage Warehouse

**Technology:** HFC secondary loop systems (C.1.1.6.4)

**Description of the Technology:**
Better equipment design and store layout can lead to a reduction in the amount of refrigerant needed for a given amount of product cooling, hence reduce emissions of HFCs. Secondary loop systems segregate refrigerant-containing equipment to a separate and centralized location, and use a benign fluid to transfer heat from the food display cases. Thus, by centralizing refrigerants to one or a few locations, the technology allows systems to have lower leak rates and operate at reduced charges (IEA, 2003; USEPA, 2006b). It also allows economical installation of leak-detection equipment to alert system operators when HFC refrigerant emissions occur (US Climate Change, 2005).

The system has great benefits in that it requires less maintenance, has more efficient defrost, and longer shelf life than direct expansion, the conventional systems (IEA, 2003; USEPA, 2001).

**Effectiveness:** Good

**Implementability:** Applicable to all regions; easy to operate and maintain (IEA, 2003)

**Reliability:** Good

**Maturity:** Well developed technologically

**Environmental Benefits:** HFCs emission reduction

**Cost Effectiveness:**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Lifetime (yrs)</th>
<th>MP (%)</th>
<th>RE (%)</th>
<th>TA (%)</th>
<th>Capital cost</th>
<th>Annual cost</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFC secondary loop systems¹</td>
<td>20</td>
<td>10-20</td>
<td>100</td>
<td>11-31</td>
<td>$30.93</td>
<td>$12.89</td>
<td>$1.58</td>
</tr>
</tbody>
</table>

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US$/MTCO₂-Eq.


**Industry Acceptance Level:** EPA has carried out a test for this system; various manufacturers are also conducting their own proprietary research. Its potential market penetration is high, for this technical option can be introduced to newly constructed storages and/or retrofitted storages (US Climate Change, 2005; USEPA, 2001).

**Limitations:** The system is especially effective for low-temperature (e.g., frozen foods) systems; however, the number of these systems is very limited.

**Sources of Information:**


