Non-CO₂ Greenhouse Gases: High-GWP Gases

Source/Sectors: Substitution of ODS/Industrial Process Refrigeration

Technology: Alternative systems (C.1.1.8.2)

Description of the Technology:
Alternative systems use CO₂, ammonia, hydrocarbons or a combination of these as refrigerants in place of HFC refrigerants for industrial process refrigeration applications. These systems are comparatively new but have high energy-efficiency potential. Although studies are underway, experts believe that the systems can be further improved, for both low and medium temperature refrigeration, by adapting better system designs (IEA, 2003).

Effectiveness: Good

Implementability: Potentially applicable to all regions

Reliability: Early stage of development; safety concerns associated with this option remain.

Maturity: Many new technologies designed to use these alternative refrigerants are currently at the stage of experimental tests and design improvements (IEA, 2003). Some CO₂ systems are commercialized and in use (IEA, 2003).

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>Alternative systems¹</td>
<td>15</td>
<td>-</td>
<td>100</td>
<td>2-9</td>
<td>$188.10</td>
<td>-$1.41</td>
<td>$2.76</td>
</tr>
</tbody>
</table>

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US$/MT_{CO₂-eq.}

Industry Acceptance Level: A growing number of applications are adopting such alternative systems in many countries, especially in Europe.

Limitations: There are many uncertainties remain due to the immaturity of these alternatives such as: safety, cost of designing, total cost performance, purchasing equipment, potential loss of operational efficiency and indirect emission impacts, refrigerant containment, long-term reliability, and compressor performance (IEA, 2003).

Sources of Information:


