NATURAL REFRIGERANTS & GREEN COOLING TECHNOLOGY

Market Opportunities of Natural Refrigerants in the Thai Industry

Natural Refrigerants are used worldwide in the following appliances:

- R600a is used in domestic refrigerators.
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- R290 and CO₂ are used in commercial refrigerators and freezers.
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- R290 and CO₂ are used in commercial refrigerators and freezers.
- R600a is used in domestic refrigerators.
- R290 is used in air conditioners and heat pumps.

Some natural refrigerants are toxic (Ammonia) or flammable (Hydrocarbons), which demand stringent safety measures. Proper training for technicians ensures the safety of using natural refrigerants.

For more information on the project, visit www.racnama.org

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Safe Handling of Natural Refrigerants

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Natural Refrigerant Use in Cooling Appliances

courtesy of Shecco Atmosphere Conferences (2017-18)

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Safe Handling of Natural Refrigerants

- Some natural refrigerants are toxic (Ammonia) or flammable (Hydrocarbons).
- Using them is safe if done according to best-practice industry standards.
- A proper training for technicians ensures the safety of using natural refrigerants.

Source / แหล่งที่มา: Shecco Atmosphere Conferences (2017-18)
Refrigerants | การทำงานของตัวเรือน

Refrigerants are substances used in the refrigeration cycle of refrigeration and air-conditioning (RAC) equipment. They undergo phase changes and thereby absorb and remove heat from the space to be cooled, and then release that heat elsewhere.

In 2016, the Kigali Amendment to the Montreal Protocol was reached with the aim to limit the use of Hydrofluorocarbons (HFCs) with high global warming potential (GWP). This means that HFCs consumption in Thailand will be frozen from 2024 onwards and phased down to 20% between 2029-2045.

In refrigeration, some refrigerants have good thermodynamic properties and are used in the refrigeration cycle. Refrigerants are classified as natural and synthetic. Natural refrigerants naturally occur in the environment and are environmentally-friendly, while synthetic refrigerants are man-made and are used in air-conditioning, refrigeration, and air-separating processes.

Natural Refrigerants & Their Benefits

**Natural Refrigerants**

- **Advantages**
  - Lower energy consumption
  - Higher energy efficiency
  - Reduced emission
  - Higher energy efficiency

- **Disadvantages**
  - More expensive technology
  - Limited application in refrigeration systems
  - Can be toxic
  - Need special equipment to reclaim refrigerants from appliances
  - Limited use due to environmental impact

**Synthetic Refrigerants**

- **Advantages**
  - Can be toxic
  - Recyclable materials are expensive and complicated

- **Disadvantages**
  - Limited application in refrigeration systems
  - Need special equipment to reclaim refrigerants from appliances
  - High GWP
  - Need incineration at high temperatures and decomposition disposal

Comparing the GWP of Each Refrigerant

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>GWP</th>
<th>ODP</th>
<th>DOMESTIC &amp; COMMERCIAL REFRIGERATOR</th>
<th>AIR-CONDITIONING</th>
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<tr>
<td>R12</td>
<td>HFC</td>
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<td>3,922</td>
<td>2,088</td>
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<td>R404A</td>
<td>1,430</td>
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<td>R134a</td>
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<td>675</td>
<td>1,774</td>
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</tr>
<tr>
<td>R600a</td>
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<td></td>
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<tr>
<td>R290</td>
<td></td>
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</table>

**GWP** (Global Warming Potential): the abilities of different greenhouse gases to trap heat in the atmosphere.

**ODP** (Ozone Depleting Potential): the amount of degradation to the ozone layer, using CFC-11 as a reference (ODP = 1).

For example, R600a has the GWP of 3 comparing to 1 of CO2, and the ODP of 0.

- **Synthetic refrigerants**
  - HCFCs (Hydrochlorofluorocarbons)
  - HFCs (Hydrofluorocarbons)
  - HFOs (Hydrofluoroolefins)

- **Natural refrigerants**
  - Water and Air
  - Carbon dioxide
  - Ammonia

**Environmental-Friendly**

- Refrigerants do not deplete the ozone layer nor substantially contribute to global warming.
- With zero ozone depleting potential (ODP) and ultra-low GWP, natural refrigerants have preferable thermodynamic property.
- The refrigerant can be recycled in the system.

**Direct Emissions: Reducing Environmental Impact**

- Reducing emission from the use of substances

**Indirect Emissions: Reducing Energy Use**

- Reduce energy consumption
- Increase energy efficiency
- Reduce emission