In 2015, IIR estimated that 17% of the electricity produced worldwide is consumed for cooling applications.

A UN report says that synthetics refrigerants could account for up to 20% of emissions and hamper efforts to curb climate changes.
From 2005 to 2015, the Internet traffic volume became 60 times bigger

Internet traffic requires data center that requires cooling

High efficiency cooling technologies are multiple. But most of them requires more and more components with more and more risk of failures and leaks

Today, data traffic, with it’s exponential growth, represents a big threat against climate changes
Presented by; Marc-André Lesmerises,ing
Founder Carnot Refrigeration.

UNEP- Sustainable Technologies for stationary Air Conditioning Workshop
1 Feb 2017
Nevada, USA
« Simplicity is the ultimate sophistication.... »
– Leonardo da Vinci
Synthetic molecules are not digested by nature...

Chlorofluorocarbons (CFCs) contain Carbon and some combination of Fluorine and Chlorine atoms.

Hydrochlorofluorocarbons (HCFCs) contain Hydrogen, Chlorine, Fluorine, and Carbon atoms.

Hydrofluorocarbons (HFCs) contain Hydrogen, Fluorine, and Carbon (no chlorine).

Hydrofluoroolefin (HFOs) contain Hydrogen, Fluorine, and Carbon...

http://cdiac.ornl.gov/pns/cfcinfo.html
CO2 is a bio-degradable refrigerant...
HFCs are among the most potent greenhouse gases emitted around the world".
- Catherine McKenna, Canada’s Minister of Environment and Climate Change.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage Reduction from Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>10</td>
</tr>
<tr>
<td>2024</td>
<td>35</td>
</tr>
<tr>
<td>2030</td>
<td>70</td>
</tr>
<tr>
<td>2036</td>
<td>85</td>
</tr>
</tbody>
</table>

Table 1: Canada’s HFC consumption phase-down — Percentage reduction from baseline (2011-2013)
CO2 is a well documented energy efficient refrigerant for several industry sectors.

https://www.youtube.com/watch?v=mMFkChrQeh8
Largest communication company in Canada.

Thousands of Computer Room Air Conditionning units (CRAC) that use R22 as refrigerant.

Their goals were numerous;
reduce their GHG emission
reduce their energy consumption.
easy to put in place.
Long lasting permanent solution
Existing cooling strategy for Data Center and server room.
Aquilon™ (Natural Refrigerant CRAC units)
Capacities: 15TR (52 kW) → 45 TR (158 kW)
« Simplicity is the ultimate sophistication.... »
– Leonardo da Vinci

Around 24 C .... 30 psi for 1 C of temperature differential.
CO₂ ADVANTAGES: Rain Cycle Free-Cooling™

CO₂ RAIN CYCLE IN VARIOUS NORTH AMERICAN CITIES

- Montréal
- New York
- San Francisco
- Seattle
- Toronto

UNEPA United Nations Environment Programme

Carnot Refrigeration
CO₂ ADVANTAGES: Rain Cycle Free-Cooling™

Results:

After 3 years of concept demonstration,

ROI < 1 year

150 000kwh save per site

Reduce the GWP from 99.9%
Other example of CO2 use with success.

Ice Rinks

Before

After
Other exemple of CO2 use with succes.
Wineries
Reduces Maintenance:

**CO2 piping can run in the building**
- No Water
- No pumps
- No chemical water treatment
CO2 as a refrigerant is energy efficient.

Results from trials comparing a natural refrigerant system to a traditional HFC system.

Comparing to a traditional HFC system, the use of a natural refrigerant system enables:

- Greenhouse Gas Emissions: -62%
- Installation Cost Reductions: Up to -15%
- Electrical Energy Usage: Up to -15%
- Heating Gas Savings: Up to 20%
Some of our Customers

- Sobeys
- Longo's
- ROGERS
- Loblaws
- Thrifty Foods
- Auchan
- Wegmans
- Longueuil
- Metro
- Costco Wholesale
- Courchesne Larose
- Delhaize
- Ahold
- Bell
- United Nations Environment Programme
- TLP
- Ville de Rivière-du-Loup
- Whole Foods Market
- Carnot Refrigeration
Our awards

Reliable and Efficient

“ASHRAE Best Technology Award” – Institutional Existing Building 2015
“ASHRAE Best Technology Award” – Industrial facility 2010
“EPA Best of the Best Prize” – First CO2 transcritical design in USA 2013
Thank you