Helmer Scientific, Inc
Governor’s Pollution Prevention Award
Helmer & EMBRACO FMX COMPRESSOR FOR A BETTER WORLD
Overview

Helmer Scientific

Privately owned

+250 employees

Medical Device Design and Manufacturing

Medical-grade cold storage for lab, pharmacy, and Blood bank

Specialized Blood Bank storage and processing equipment

• FDA Regulated GMP Facility located in Noblesville, IN.

• >100,000 installed devices across over 130 countries

• ISO-13485 Certified
CHALLENGES FOR OEMS

Medical Refrigerator & Freezers
CHALLENGES FOR OEMS

Medical Refrigerator & Freezers

- Temperature Stability
- Quality & Reliability
- Energy Efficiency
- Noise
CHALLENGES FOR END USERS
Medical Refrigerators and Freezers
CHALLENGES FOR END USERS

Medical Refrigerator & Freezers

Temperature Stability
Maintain tight temperature control

Quality & Reliability
Safeguard clinical samples and products

Energy Efficiency/Sustainability
Lower total cost of ownership

Serviceability
Reduce cost and downtime
HELMERS’S CHALLENGES

Case study
HELMER’S CHALLENGES

Case Study

01. Drive Continuous Improvement of performance & quality
   Customer delight & competitive differentiation

02. Address regulatory drivers
   Transition from high GWP refrigerants & reduce energy consumption

03. Enhance value while managing costs
   Remain cost effective with new technology

04. Meet evolving customer requirements
   Includes decreasing noise level / sound power for installations near staff & patient care areas
LEADING INNOVATION

HOW WE WORK TOGETHER?

- Evolving global environmental regulations
- Need a reliable solution with a short time to market
- Embraco FMX platform was able to address all the needs in a record
- Aggressive targets on "noise" reduction
- By delivering the whole condensing unit, Embraco enabled Helmer to speed up its time to market
WHAT CHANGES DID WE MAKE TO REDUCE ENERGY CONSUMPTION?

01 CHANGE COMPRESSOR

- Capacity down 15% of 306 Btu/h
- EER up 75% from 3.19 to 5.60
- Displacement up 6% from 3.76 cc
- Weight down 37% from 16.7 lb

FMXA4C

02 CHANGE FAN

- R134a

03 CABINET CHANGES

- R600a

*At ASHRAE LBP

Quiet and Efficient EC Fan Motor
## Helmer Case Study

### Competitor

<table>
<thead>
<tr>
<th>Metric</th>
<th>FMXA4C</th>
<th>R600a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R134a</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge (g)</td>
<td>128</td>
<td>60</td>
</tr>
<tr>
<td>Energy consumption kWh/day</td>
<td>2.40</td>
<td>1.09</td>
</tr>
<tr>
<td>% of Energy Star Allowance</td>
<td>54%</td>
<td>25%</td>
</tr>
<tr>
<td>4.42 kWh/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound Power dB(A)</td>
<td>59</td>
<td>45</td>
</tr>
<tr>
<td>Pull down time (Mins)</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>Temperature Uniformity (°C)</td>
<td>1.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Temperature Stability (°C)</td>
<td>2.5</td>
<td>0.6</td>
</tr>
<tr>
<td>(Door openings)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TEWI** - It is defined as sum of the direct emissions and indirect emissions (energy use) of greenhouse gases.

### Direct

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>Cabinet with FMX</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP - Global Warming Potential</td>
<td>1430</td>
<td>3</td>
</tr>
<tr>
<td>L - Annual leakage rate (kg/year)</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>N - Life of equipment</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>M - Charge (kg) (1-recycling factor)</td>
<td>0.128</td>
<td>0.060</td>
</tr>
</tbody>
</table>

### Indirect

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>Cabinet with FMX</th>
</tr>
</thead>
<tbody>
<tr>
<td>α - Recycling Factor</td>
<td>0.95</td>
<td>0</td>
</tr>
<tr>
<td>E - Energy consumption (kWh/year)</td>
<td>876</td>
<td>298</td>
</tr>
<tr>
<td>β - Emission from energy generation (kg CO2/kWh)</td>
<td>0.508</td>
<td>0.508</td>
</tr>
</tbody>
</table>

### TEWI (T)

\[
\text{TEWI} = \text{GWP} \cdot L \cdot N + \text{GWP} \cdot M \cdot (1-\alpha) + N \cdot E \cdot \beta
\]

**TEWI** = 4.50

**Cabinet with FMX** = 2.02

55% of reduction on the environmental impact due to CO2 emissions.
If the market were to convert 1,000 cabinets for this technology, the savings in carbon emissions generated by the new equipment are equivalent to:

- **CO₂ emissions from**
  - Annual energy consumption of 268 Homes (Saves $33,445 per year)

- **Greenhouse gas emissions from**
  - 278,947 gallons of gasoline consumed
  - 6,075,980 miles driven by an average passenger vehicle

Source: EPA greenhouse equivalency calculator
Helmer GX Solutions are >60% more efficient than limits allowed by ENERGY STAR®

- ENERGY STAR compared to GX Solutions by Refrigerator Size:

  - Undercounter Refrigerator (iLR105-GX)
  - Single Door Upright Refrigerator (iLR125-GX)
  - Double Door Upright Refrigerator (iLR156-GX)

<table>
<thead>
<tr>
<th>Undercounter Refrigerator (iLR105-GX)</th>
<th>Single Door Upright Refrigerator (iLR125-GX)</th>
<th>Double Door Upright Refrigerator (iLR156-GX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5cf limit</td>
<td>25cf limit</td>
<td>56cf limit</td>
</tr>
<tr>
<td>GX Solution 61% more efficient</td>
<td>GX Solution 68% more efficient</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

Thermoelectric Technology

• **Current Product**
  • Condensing Unit - Reciprocal Compressor
  • Evaporator - Round Tube Plate Fin
  • Refrigerant – 134A HFC

• **Redesigned Product**
  • Condensing/Evaporator Unit - Thermoelectric & Round Tube Plate Fin
  • Evaporator – combined with condenser
  • Refrigerant – CO2 (Natural Refrigerant)

• **Energy Consumption:**
  • Current Product: 11.25 kWh/day
  • Redesigned Product: 1.91 kWh/day
  • 83% Reduction energy
The Bottom Line

The estimated annual energy savings across the entire installed base of product is *$1,377,028.*

*Note: Power is rated at the National Average of $.12 per kilowatt hour.

<table>
<thead>
<tr>
<th>Refrigerant Charge (lbs)</th>
<th>3882 lbs/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2 Equivalent (lbs CO2/Unit)</td>
<td>5420 tons/yr</td>
</tr>
<tr>
<td>Energy (kWh/day)</td>
<td>31439 kWh/day</td>
</tr>
<tr>
<td>HFC Elimination</td>
<td>5300 lbs/yr</td>
</tr>
<tr>
<td>Raw Material Reduction</td>
<td>71 tons/yr</td>
</tr>
</tbody>
</table>

The attached shows the annual impact of the next generation GX product based on 2018 sales volume.
Thank you