



Business Case for
Natural Refrigerants

JUNE 10-11, 2024

WASHINGTON D.C.





Full Product Line Conversion From HFOs To Low Charge R-290 Variable-Speed Technology

EMBRACO | STRUCTURAL

#GoNatRefs



ATMO Summit

Full Product Line Conversion
from HFOs to low charge R-290
Variable-Speed Technology

Nidec

Global Appliance

embraco

Nidec

We are Nidec Global Appliance,
a global partner for home and
commercial appliances industries



HQs: Joinville
(Brazil) and
Pordenone (Italy).



12,000+
employees.



80+ countries served by
our products.



12 manufacturing
plants and 4 business
offices across 9
countries.



7 R&D Centers
worldwide and
500+ engineers.



Annual production
capacity of **80 million**
motors and
compressors.

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ATMO Summit

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Variable-Speed Technology

Structural Concepts®

DELIVERING FRESH. ALWAYS.™

Since 1972, setting the standard for the most innovative, turnkey refrigerated and heated food display solutions in the market.



HQ: Muskegon, MI



500+ Employees



Three manufacturing
facilities, Muskegon, MI



Over 8 certified service
and installation
technicians



R&D Center: Muskegon, MI



Serving 8 different
market segments in
North America

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Regulatory Landscape

- EPA limiting GWP to 150 from Jan 1st, 2025;
- Outstanding EPA SNAP Rule 26 (charge above 150g);
- Proposed DOE targets for 2027;

Market Need

- Portfolio Standardization;
- Future Proof portfolio;

Proposed Solution

**Single and Multi-Circuit systems
using less than 150g of R290.**



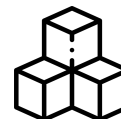
Variable
Speed

+



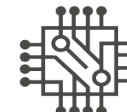
Efficiency

+



Modularity

+



Future Proof

+



Low Charge

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How did Embraco approached the **Modularity Challenge**

	Reference		New Standard	
Offering compressor & Cooling System Units with a Wide Range of Cooling Capacity	38 Compressors 9 condensing coils Up to 4 condensing fans			Only 2 Variable Speed Condensing Units - UFMFT406U 1/2 HP - UFMFT415U 1 ¼ HP
Migration to Dual Voltage Models	115V	220V	>	115-220V
Reduction of Refrigerants	R-449A 27 Models	R-513A 11 models	>	R-290 All models
Condensing Unit Design	External additional components installation with a more complex supply chain management.		>	Flexible Design Condensed Water Solutions Max Height (11 in) Evaporative Drain Pan Equalizing Spout High Water Holding Capacity 1.3 GAL / Surface (In 2) High Temperature Material (Polypropylene + Fiberglass)
Integration by Electronics	Not well synchronized variable speed compressors.		>	 Embraco Sync bringing 12% more efficiency to multi circuit variable speed compressor operation.

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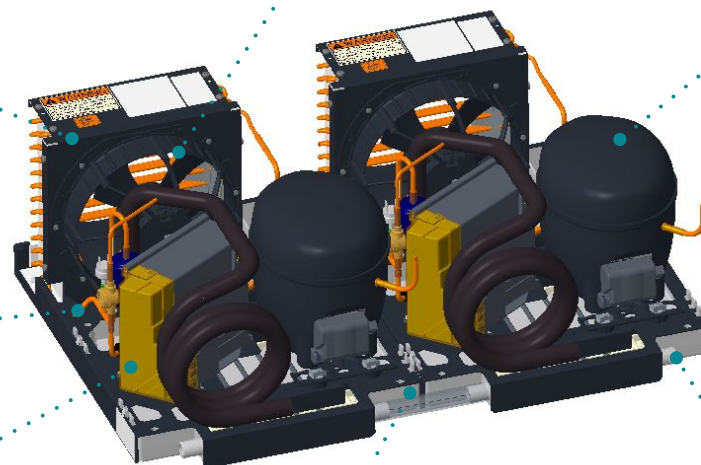
> 3-5 row condenser
and 9 in fan blades
reducing restrictions
on MBP application

> ECM Fan Motor
for all units

> Snap-on
attachment to
compressor

> 5 NTC/DI Probes
Monitoring 5
Thermal or Digital Inputs

> Hot-loop
supported by clamps
to prevent vibrations



> Inverter for a
efficient variable
speed control

> Non-structural / removable
polypropylene + fiberglass
evaporative tray

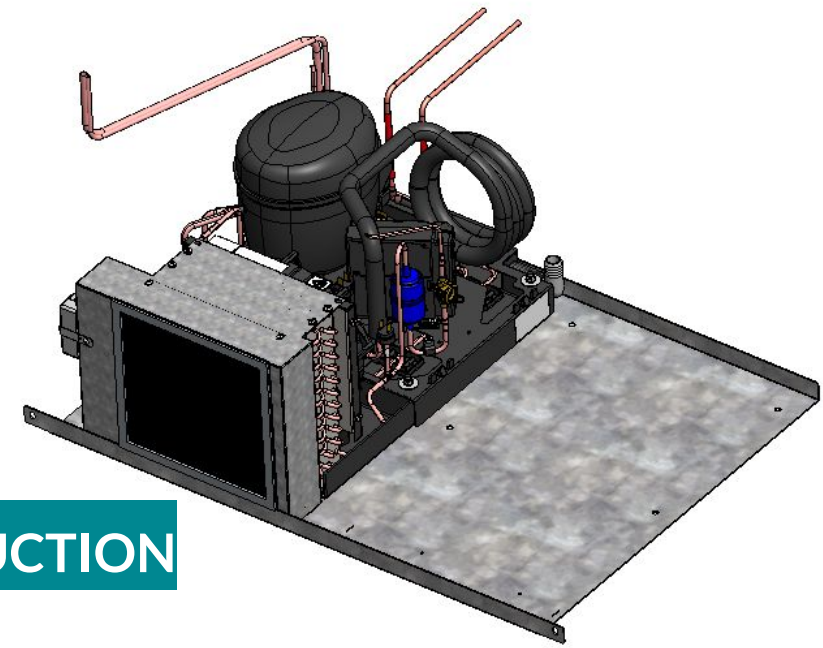
> Structural
metal rail



> Controls two
Condensing Units
simultaneously

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Single Circuit Modular System

53% REDUCTION
OF ENERGY CONSUMPTION

Daily Energy Consumption
(kWh/day)

10.45
kWh/24h

4.90
kWh/24h



Baseline



Embraco +
Structural

55% REDUCTION
OF IMPACT

TEWI
(kg CO₂)

20,218
kg CO₂

9,086
kg CO₂

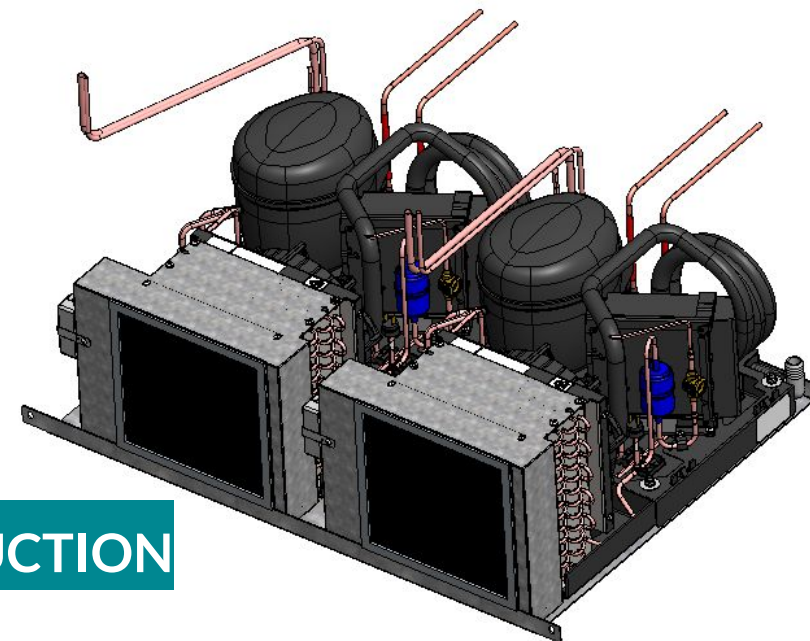


Baseline



Embraco +
Structural



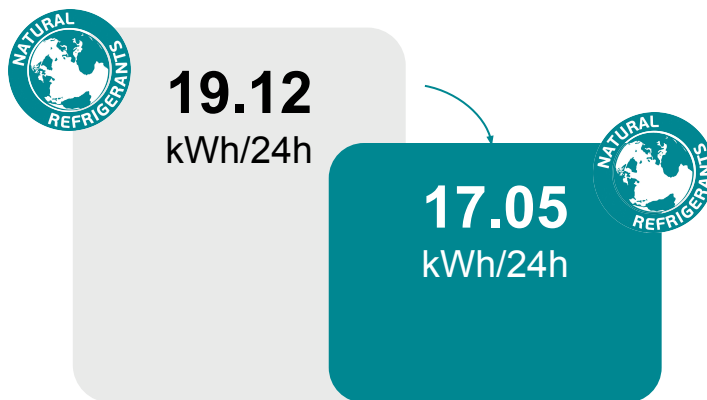


Dual Circuit Modular System



11% REDUCTION
OF ENERGY CONSUMPTION

Daily Energy Consumption
(kWh/day)



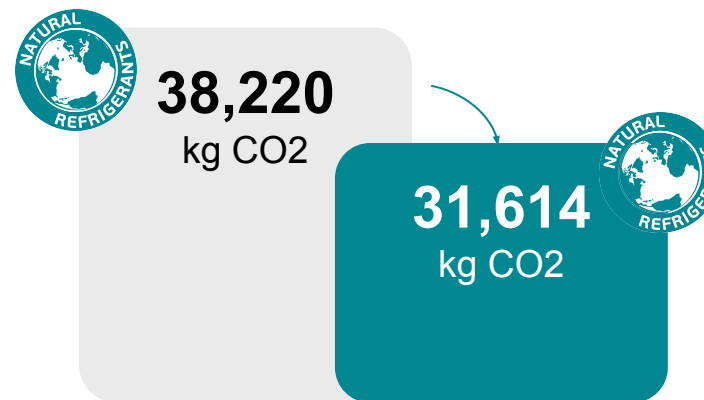
Baseline



Embraco +
Structural

17% REDUCTION
OF IMPACT

TEWI
(kg CO₂)



Baseline



Embraco +
Structural

Dual Circuit Modular System > **12.5% REDUCTION** OF ENERGY CONSUMPTION



CASE STUDY PARAMETERS

Self-Service Multi-Purpose Island

- Capacity (Dimensions): 4x8 feet
 External dimensions (in): 40-5/8" (height) x 75" (width) x 45-3/4" (depth)
 Test conditions:
- Ambient temperature: 75.2°F
 - Rel. Humidity: 55%
 - Condensing Unit: 2 x UFMFT415U
 - Refrigerant: R-290



20.98
kWh/24h



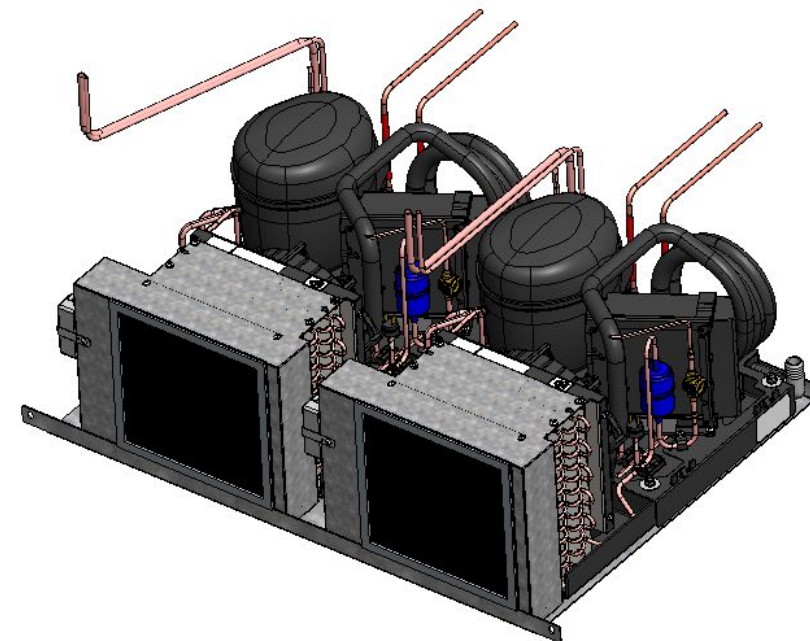
18.19
kWh/24h



Reference
Controller



embraco
SYNC



-22% considering DOE 2026
targets for energy consumption.

Packages average temp between
33 °F and 35.6 °F

NOTE 1: Integrated average T should be 38+/- 2 °F [3.3 °C +/- 1.1 °C]

NOTE 2 **: The energy consumption could be further reduced by increasing the set point.

Overall Results - R-290 Product line-up

> **Less Implementation Time**

Modular system has cut implementation timing down dramatically.

> **Flexibility**

Variable speed condensing units allowed for much more flexibility in design.

≈ 400 custom condensing units down to <20

> **R-290 Migration**

Yearly usage of R-513A (21,300 lbs) and R-449A (20,000 lbs) soon to be ≈ 8,000 lbs of R-290.

> **TEWI**

Anticipated TEWI reduction of >33% across portfolio.





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Thank you
for listening!

