



ATMO sphere





EMBRACO PLUG N' COOL
A SUPERMARKET CASE STUDY

Embraco



Present in
80 countries



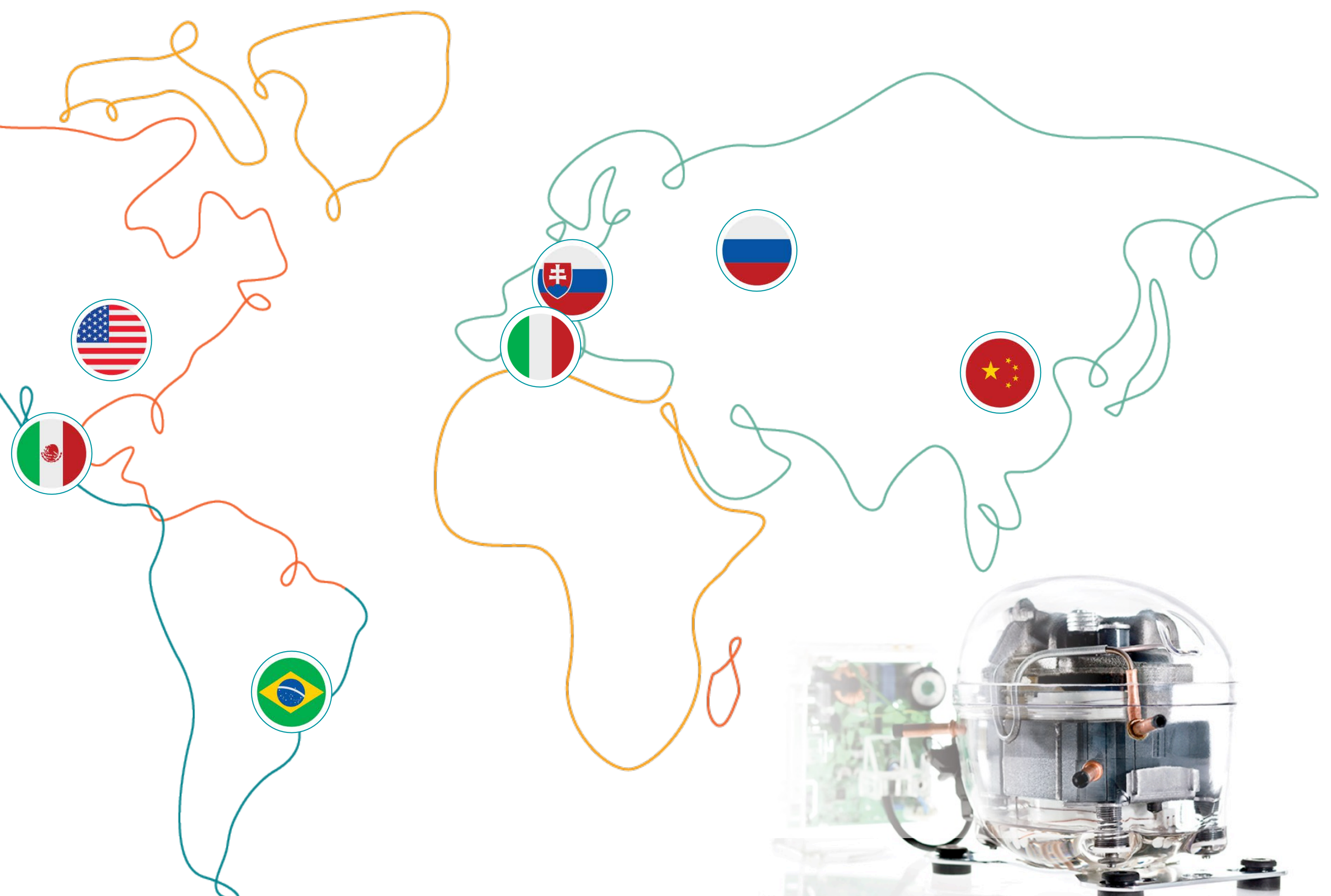
More than
11,000
employees



8 business units



Production capacity:
40 million
compressors/year



MORE THAN 20 YEARS GLOBAL LEADER IN NATURAL REFRIGERANTS



EMBRACO PLUG N' COOL

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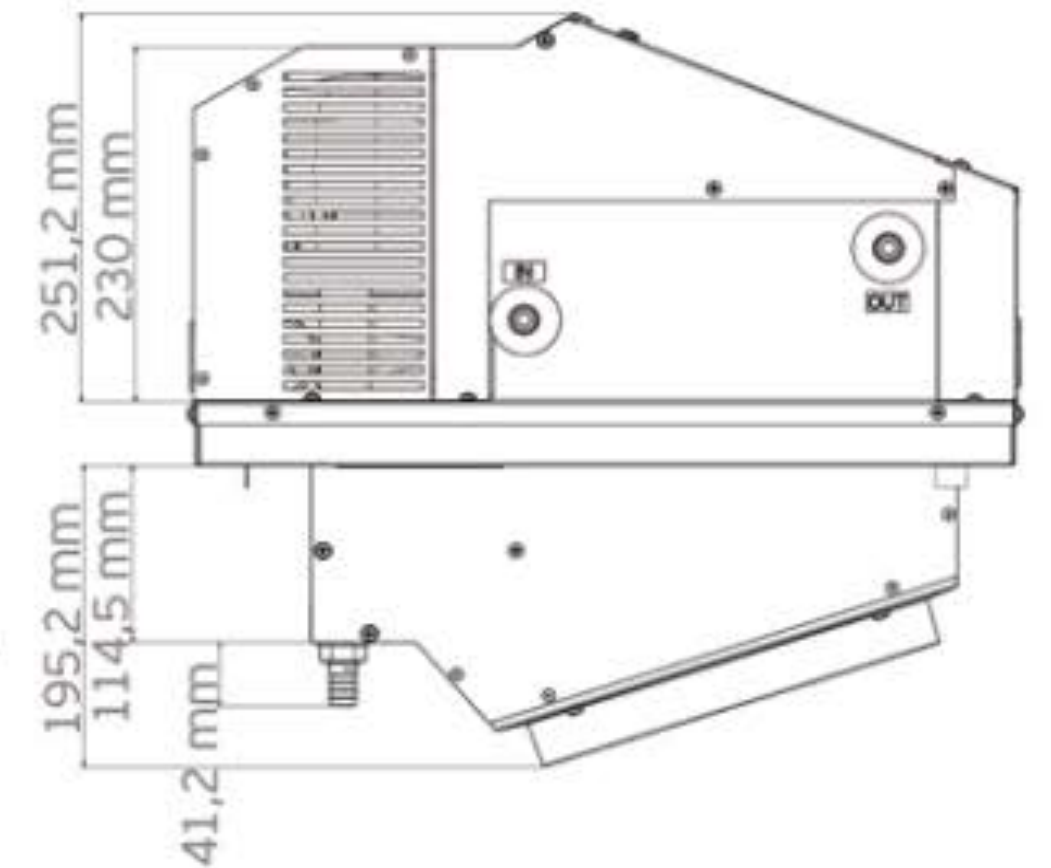
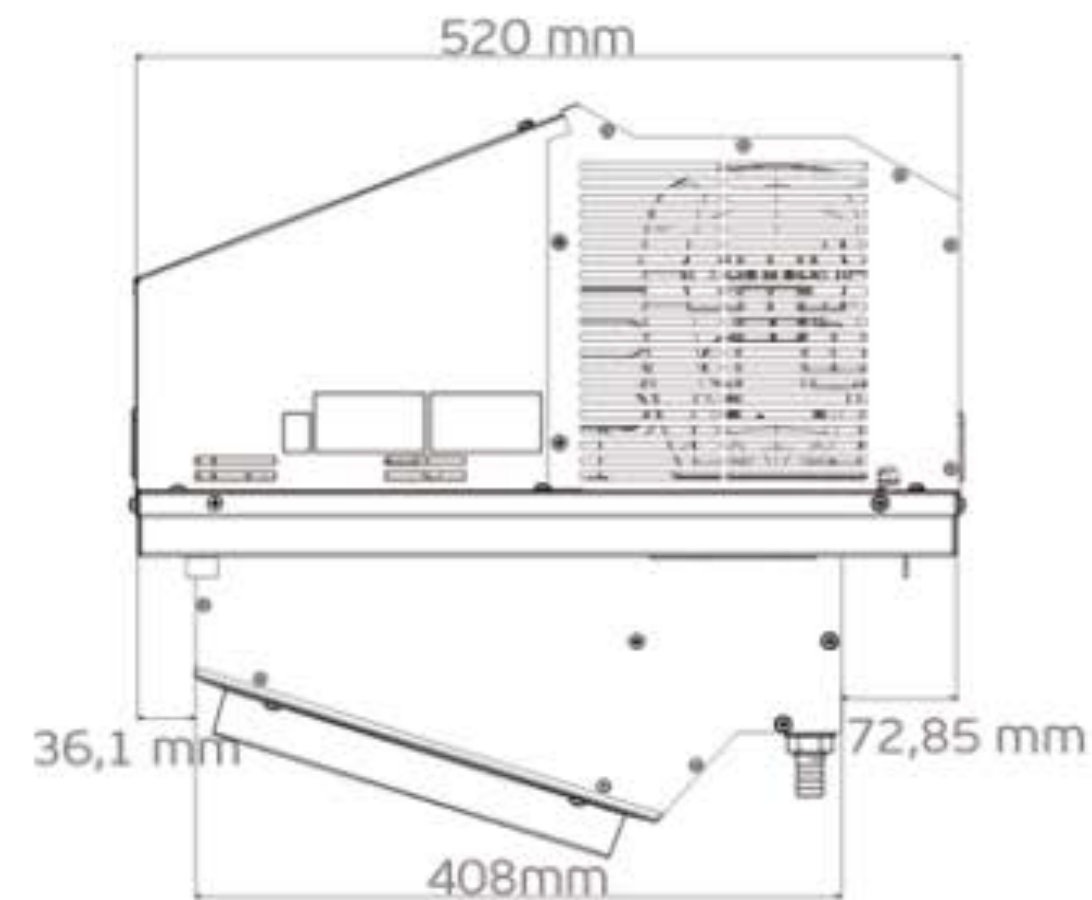
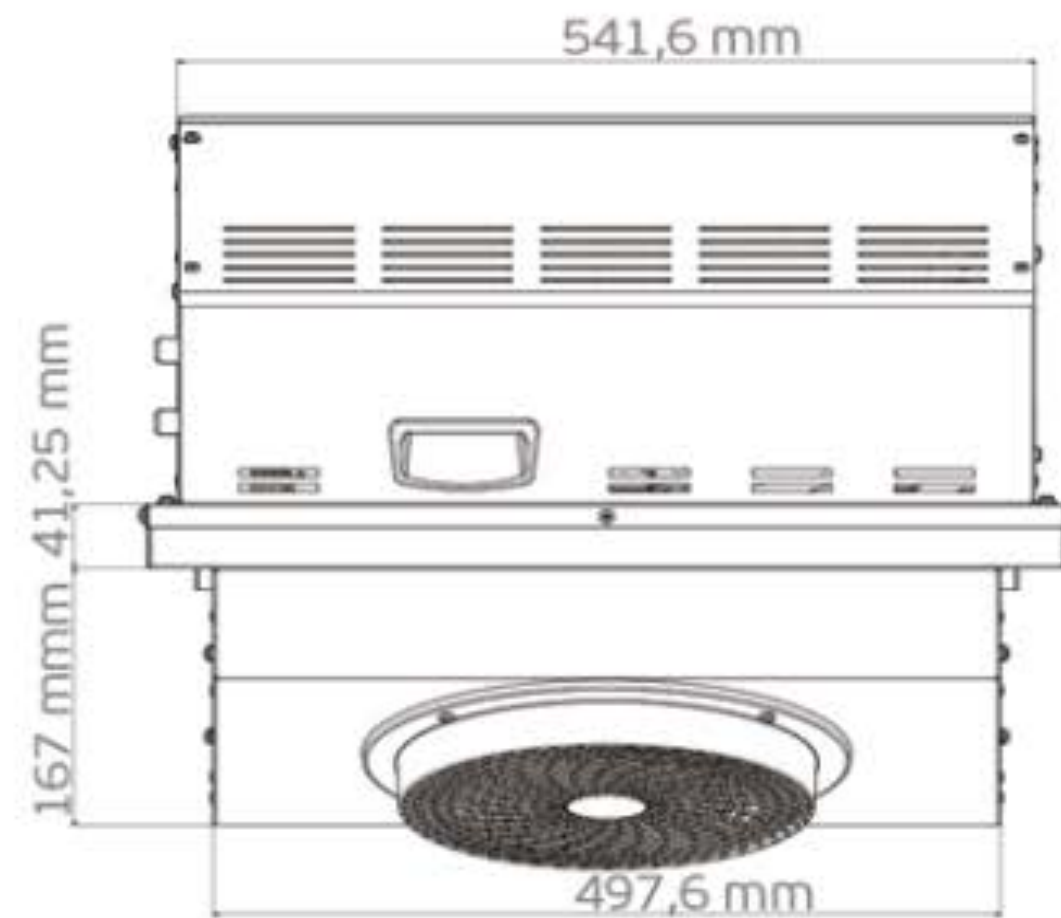
Cooling type: **AIR**

Refrigerant	Model	HP	Voltage/Frequency	Motor Type	Application	Internal cabinet temperature (°C)	Ambient temperature (°C)	Performance data (60Hz)		Weight (kg)
								Capacity (W)	Efficiency (W/W)	
R290	SFU160UAX	1/2	220 V/60 Hz	CSIR	MBP	5	35	734	1,5	26
R290	SFMFT413U	3/4	220 V/50-60 Hz	Inverter	MBP	5	35	959	1,7	26

External Views

Model: SFU160UAX

Cooling Type: AIR





About Mig Supermarket:

A family owned supermarket chain with **7 stores** and 4 distribution centers

Located in the south of Brazil

More than 40 years of tradition

In a 1600 m² store, **Mig** decided to retrofit its refrigerated area with environmentally-friendly cabinets.



“When you install a green solution, it is less impactful on the environment. When a company has this consciousness, it reflects on to the consumers’ perception, which impact on business”
– **Josué Cesar Miguel, co-owner of Mig Group**



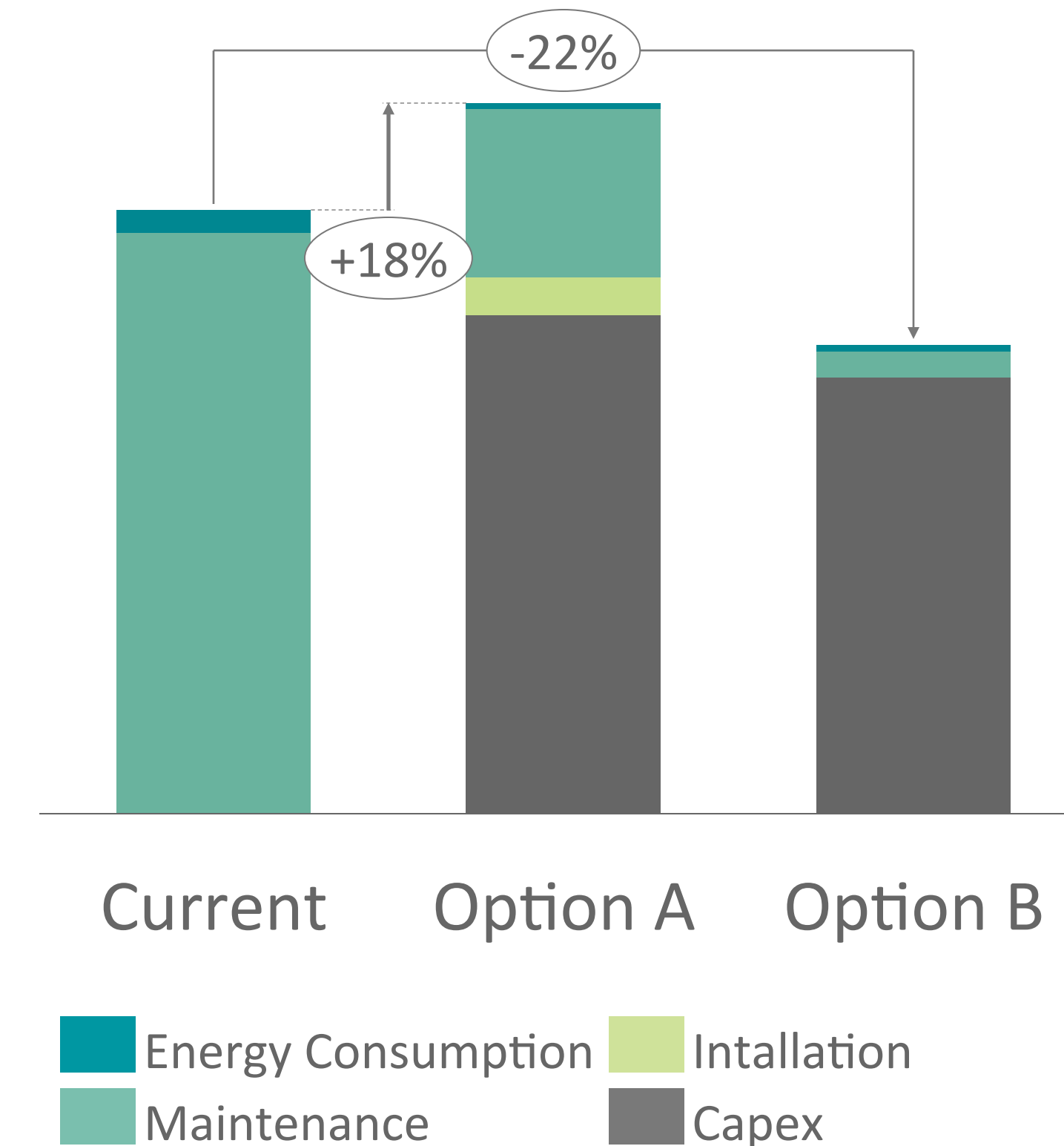
MIG Grocery Store Requirements

Qualitative Analysis

Needs	<i>Solution Config. Refrigerant</i>	Current Semi-herm. R22	Option A Semi-herm. CO2	Option B Plug n' Cool R290
Improve store's aesthetics new stores = more sales		✗	✓	✓
Be greener		✗	✓	✓
Increase merchandizing area desirable		✗	✗	✓

Financial Viability

Total cost on the next 5 years*



Embraco Plug n' Cool Air Cooled Was The Chosen Option

How it was:

Reach-ins and islands **without doors**,
with remote refrigeration



The solution:

Eletrofrio "Green Line" cabinets **with doors**,
refrigerated by Embraco **Plug n' Cool**





	REMOTE SYSTEM	PLUG N'COOL
Number of compressors	2	26
Refrigerant	R22	R290
Technology	Semi-hermetic	Hermetic reciprocating
Energy Consumption* <i>kWh/day</i>	425	270
Display Area (<i>m²</i>)	58	73
Doors	No	Yes

* Energy calculation considering only refrigeration system.

Results

Food Preservation



Improved food preservation

Due to the doors and the Plug n' Cool mechanism, an important improvement in food preservation was perceived by the end-user. Not only the products can last longer on the shelves, but also the supermarket can provide a better experience to their customers.



“We are now using this self-contained refrigeration system, and also doors. So, we perceived a significant increase in the quality of the cold inside the cabinet.

- Josué Miguel explains.

Results

Heat and Noise Perception

“We feared that migrating to a self-contained refrigeration solution would **increase the heat inside the store and increase the noise as well...**



...but thanks to the air flow and the position of the Plug n' Cool system on top of the equipment, **this didn't happen.**”

– Josué Miguel



Results

Installation Process



Installation time
up to **70% faster**



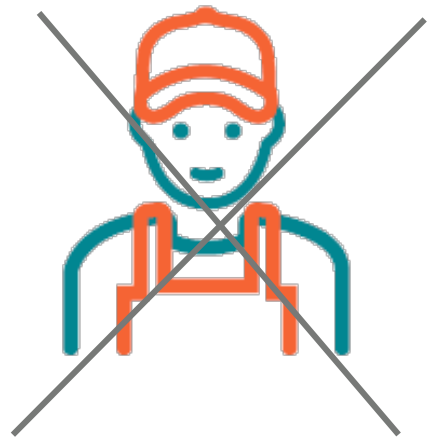
No need of **specialized labor**

Results

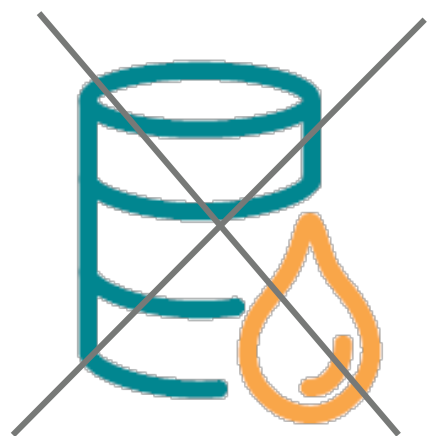
Maintenance costs



No gas Leak



No need of labor (specialized technicians)



No oil management



Possible saving of
\$ 2400/month
(Australian Dollars)

Results

Total Cost of Ownership



\$ 300k possible **maintenance** savings in 1 year
(Australian Dollars)



37% less energy consumption



Payback in **4 years***



35 %
reduction of
TCO*

*Considering only maintenance and energy consumption costs.



Results

Environmental Impact

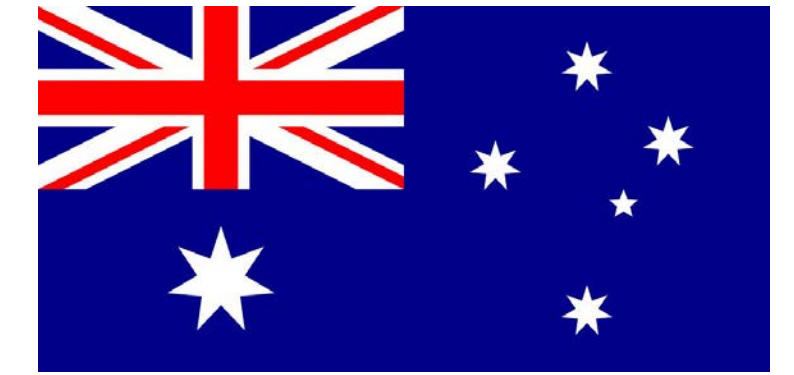
TEWI (Total Equivalent Warming Impact) is a measurement of the total CO2 emissions from an equipment during its operating lifetime.



	REMOTE SYSTEM	CABINET WITH P&C
GWP - Global Warming Potential	1760	3
L - Leakage rate (kg/year)	80	0.08
N - Life time (years)	10	10
M - Refrigerant charge (kg)	400	3.3
a - Recycling factor (%)	0	0
E - Energy consumption (kWh/year)	155,287	98,392
β - Emission from energy gen. (kgCO2/kWh)	0.064	0.064
TEWI (ton)	2211	63

~97%
of reduction on
the environmental
impact due to
CO2 emissions

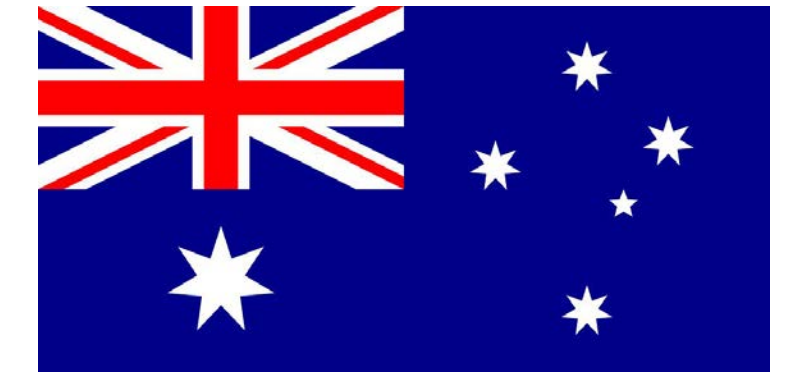
$$TEWI = GWP \cdot L \cdot n + GWP \cdot m \cdot (1 - a) + n \cdot E \cdot \beta$$



Plug & Cool in Australia

Safety Concerns

- Plug & Cool uses a very low propane charge for each circuit (below 150g), millions of similar systems installed worldwide have shown an excellent safety record since 20 years
- Commercial refrigeration systems with hydrocarbons have to follow safety rules as described in IEC60335-2-89
- Australia is part of an international effort with IEC sub-committee SC 61C, to raise single sealed system charge limits while keeping the same safety level of 150g systems
- Local legislation update and service technician trainings to deal with flammable refrigerants should be a priority for all stakeholders to address climate change issues



Plug & Cool in Australia

Conclusions:

- **R290 Plug n'Cool solution offers a safe and environmentally friendly alternative to centralized supermarket refrigeration systems**
- **Use of doors in supermarket display cabinets reduce substantially the thermal load and consequently the energy consumption**
- **Plug n'Cool by minimizing installation and maintenance costs reduces total cost of ownership and offers significant redundancy**
- **Further improvements in efficiency are possible using variable capacity compressors and with higher refrigerant charge allowance can reduce the initial investment**



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Thank you very much!

