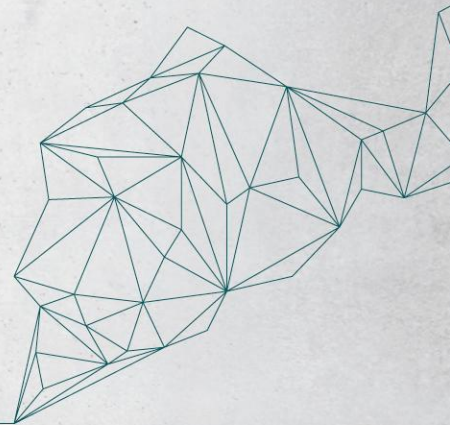


# Embraco Variable Speed Compressors with Smart Drop-in control solution

**Pirovano, Gilmar**

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**CONNECTING  
EXPERTS.**



## WHO WE ARE

***Nidec***  
Global Appliance



## About us

# We are part of Nidec Corporation



Founded in 1973



HQ: Kyoto,  
Japan



**330+**  
Companies



Mergers & Acquisitions (M&A) are the  
driving power behind growth.  
*So far, there have been over 60  
M&As.*



**40+**  
Countries



**\$1 B**  
2019 Group Operating Profit



**120,000**  
Employees Worldwide



**\$14.4 B**  
2019 Group Turnover



**Shigenobu Nagamori**

Founder, Chairman of  
the Board & CEO  
at Kyoto HQ

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



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



**14** manufacturing plants and 4 business offices across 9 countries.



**9 R&D Centers** worldwide and **600+ engineers**.



**15,000+** employees.



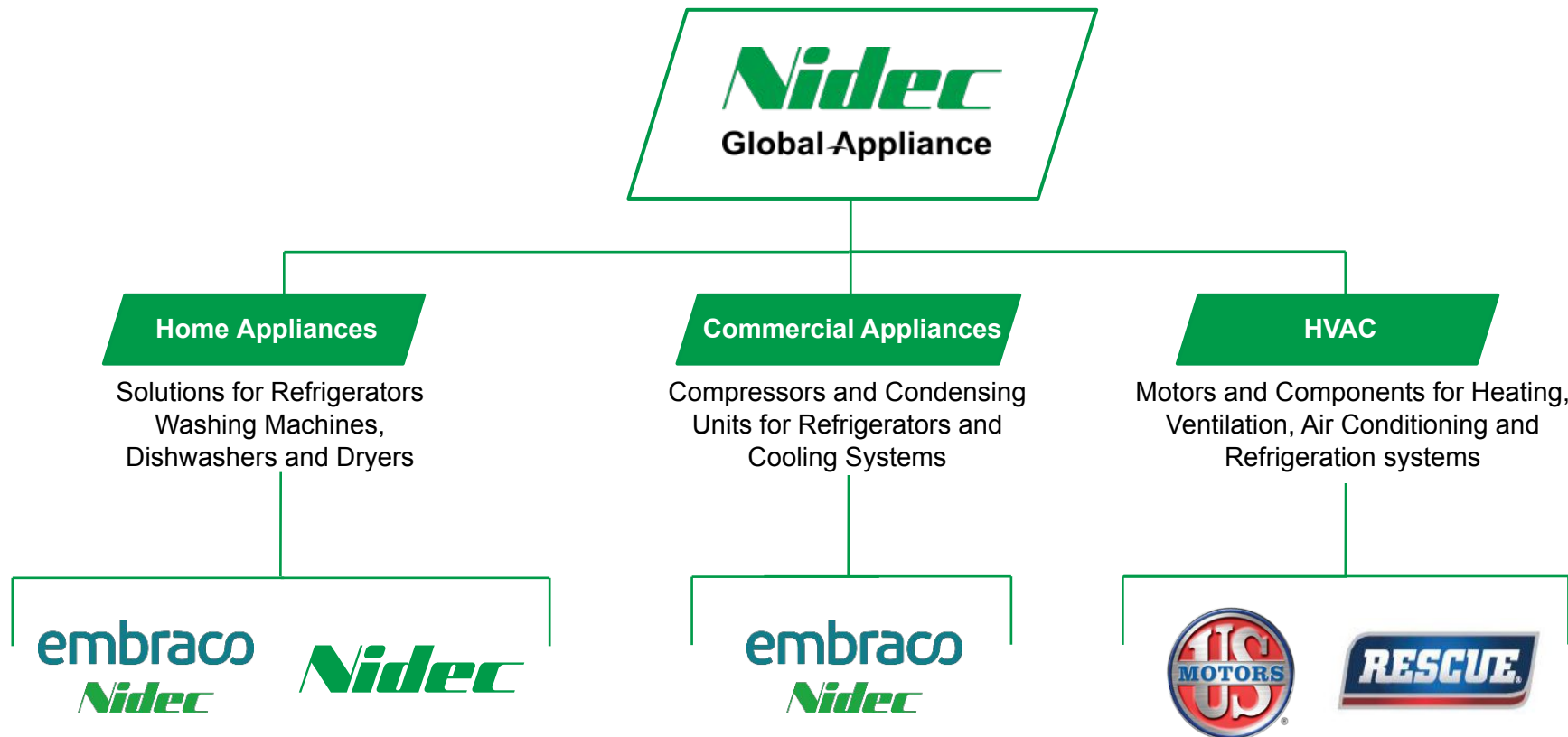
Annual production combined capacity of **70 million** motors and compressors.



**80+ countries** served by our products.



# Our brands portfolio



# Embraco portfolio - Meet our solutions per application

CHILLVENTA  
eSPECIAL



**Merchandiser**



**Food service | food retail**



**Medical**

**Fixed Speed**



EM



EH



NE



EM



EH



NE



NT



NJ



SCROLL



NE



NT



NJ

**Variable Speed**



FMX



FMF



FMX



VES



FMF



VNE



FMX



FMF



VNE

**Condensing Units / systems**



Cond. Unit



Cond. Unit



Plug n' cool



Sliding



Bioma



Cond. Unit

**RECIPROCATING: 2-38CC | SCROLL: 2-13HP AVAILABLE FOR LBP, MBP, HBP APPLICATIONS**



# Embraco Variable Speed Compressors with Smart Drop-in control solution





## **GLOBAL TRENDS & CHALLENGES IN THE COMMERCIAL REFRIGERATION**



## **WHY HYDROCARBONS?**



## **WHY VARIABLE SPEED & SMART DROP-IN**



## **CASE STUDIES**



## **WHO WE ARE**

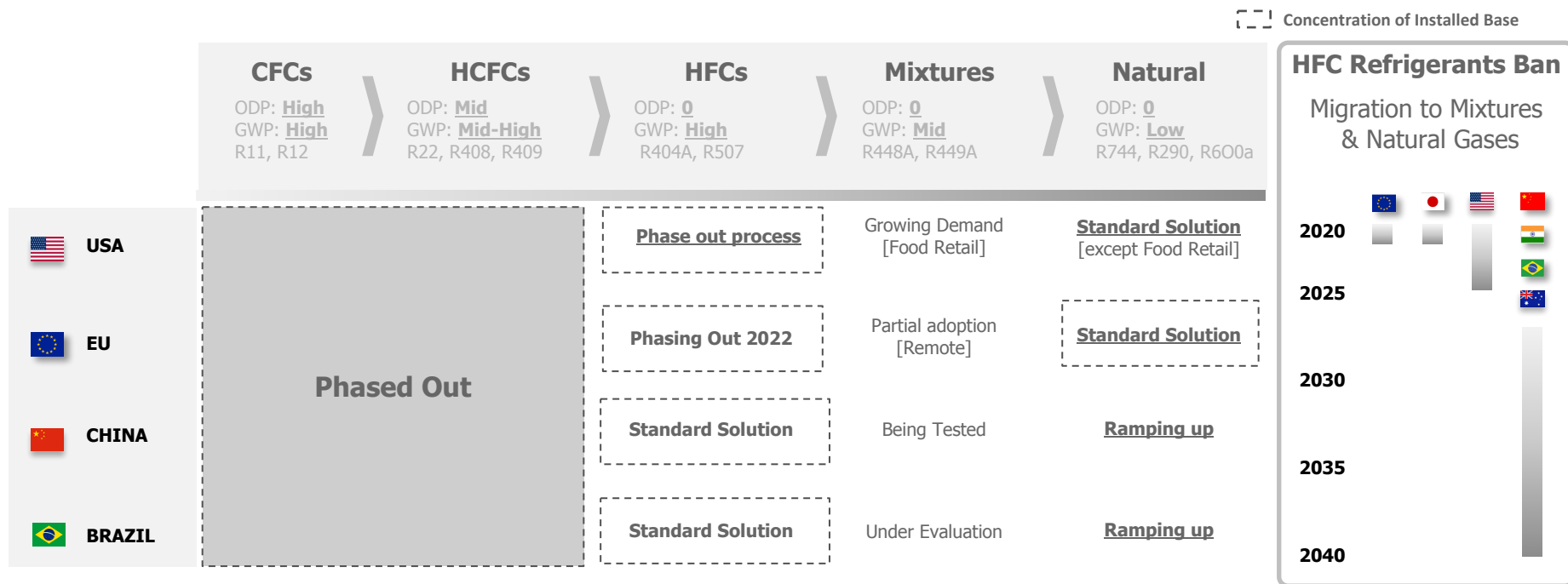




# WHY HYDROCARBONS?

CHILLVENTA  
eSPECIAL

REGULATIONS AND GLOBAL TRADE ARE DRIVING CHANGES IN MEDIUM AND LONG TERM EVERYWHERE



**NATURAL REFRIGERANTS ARE CONSOLIDATED AS A FUTURE PROOF SOLUTION**

**FEW GROUPS OF APPLICATIONS STILL NEEDING CHARGE INCREASE TO UNLOCK ITS MASSIVE USE**



## WHY HYDROCARBONS?

CHILLVENTA  
eSPECIAL

REGULATIONS AND GLOBAL TRADE ARE DRIVING CHANGES IN MEDIUM AND LONG TERM EVERYWHERE

	HIGH GWP HFCs	LOW GWP HFCs	HC's
SAFETY CLASS	<b>A1</b> [Not flammable]	<b>A2L</b> [Mildly flammable]	<b>A3</b> [Flammable]
ENVIRONMENTAL IMPACT	Highest	Low	Lowest
REFRIGERANT COST	Best	Highest	Low
COMPRESSOR WORKING CONDITIONS	Toughest	Higher	Best
FEATURES FOR SAFETY	No	Yes	Yes
SYSTEM EFFICIENCY	Standard	Improved	Best
CHARGE LIMIT [GLOBAL PERSPECTIVE]	No	150 g [5.3 oz]*	150 g [5.3 oz]*



**Hydrocarbons are the most cost-effective solution to meet F-Gas regulations**

\*Pending adoption of higher charge with local agencies

**Besides the positive aspects of new A2L refrigerants, all tests done in our labs shows that performance-wise it's at the best equivalent to R290, while R290 is the best for compressor's working conditions [reliability]**
























**WHY VARIABLE SPEED &  
SMART DROP-IN  
DRIVERS?**



## WHY VARIABLE SPEED & SMART DROP-IN

SEVERAL 'EFFICIENCY INCREASE' SOLUTIONS ALREADY ADOPTED... VARIABLE SPEED IS THE NEXT VIABLE ONE

	SINGLE SPEED	SINGLE SPEED	VARIABLE SPEED [Frequency or Serial Controlled]	VARIABLE SPEED [Smart Drop In - SDI]
REFRIGERANT	A1 [R404A & R134a]	A3 [Hydrocarbons]	A3 [Hydrocarbons]	A3 [Hydrocarbons]
SYSTEM EFFICIENCY	Baseline	Better 	Much better 	Much better 
OPERATING RANGE	Baseline	Equal 	Much better 	Much better 
TEMPERATURE CONTROL	Baseline	Equal 	Better 	Much better 
NOISE AND VIBRATION	Baseline	Equal 	Much better 	Much better 
ENVIRONMENTAL IMPACT	Baseline	Better 	Much better 	Much better 
APPLICATION DEVELOPMENT LEAD TIME	Baseline	Equal 	Much worse 	Worse 
OVERALL SYSTEM COSTS	Baseline	Higher 	Much higher 	Higher 

New generation of drivers significantly **reducing development lead-time**, keeping existing thermostats for single-speed, but **delivering high performance** equivalent to a frequency controlled on variable speed, **without the added cost**



## **CASE STUDIES WITH SMART DROP-IN DRIVERS' VARIABLE SPEED COMPRESSORS**



## CASE STUDIES

CHILLVENTA  
eSPECIAL

### BEVERAGE MERCHANDISER COMPARATIVE TESTS

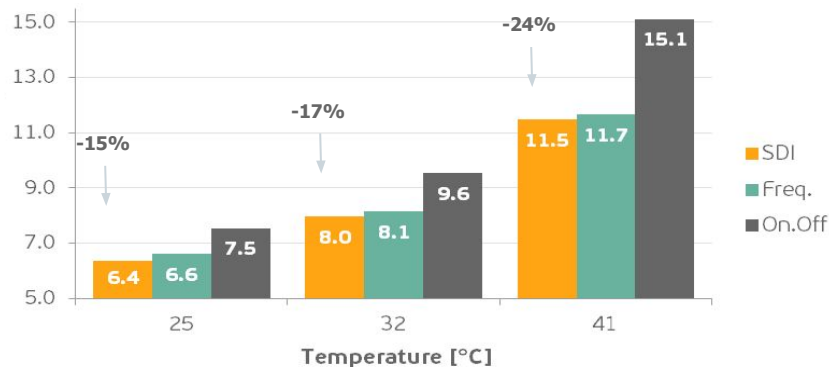
#### Application Specification



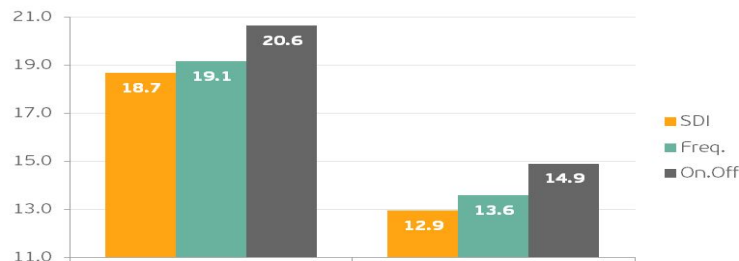
<b>Application</b>	Beer Cooler (R290 original)
<b>Size</b>	572 L / 20,2 ft <sup>3</sup>
<b>Evaporator</b>	Tube-fin (37 W fan)
<b>Condenser</b>	Tube-fin (45 W fan)
<b>Defrost</b>	Heater 350 W
<b>Door Heater</b>	100 W
<b>Door Switch</b>	No

Test Name	Hardware Configuration	Optimization
On-off	EM2X3134U [compressor] [original thermostat]	OEM original
SDI	FMFT406U [compressor] [original thermostat]	Controller: original <b>SDI: 1 parameter</b>
Freq	FMFT406U [compressor] [Freq. control optimized to the application]	Controller: <b>3 parameters</b>

#### Energy Consumption (KWh/day)



#### Time to reach -2C



Smart Drop-in Variable Speed reduced application's energy consumption up to 24% using OEM original thermostat and settings with **only 1 SDI parameter been adjusted**



## CASE STUDIES

### UPRIGHT FREEZER COMPARATIVE TESTS

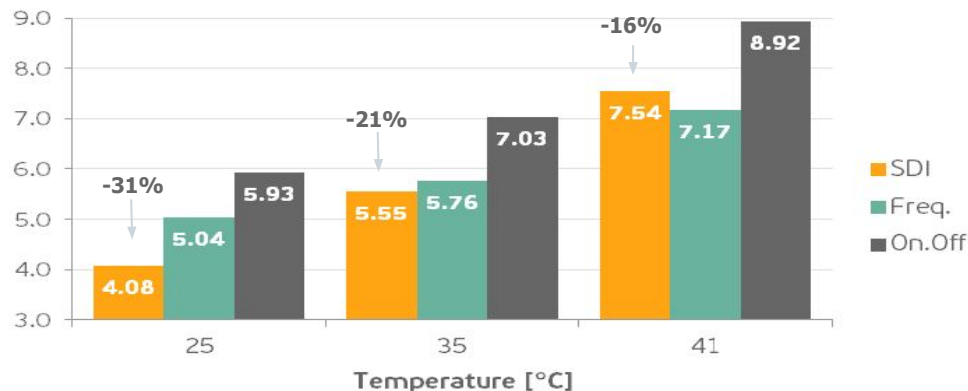
#### Application Specification



<b>Application</b>	Vertical Freezer(R290 original)
<b>Size</b>	464 L / 16,4 ft <sup>3</sup>
<b>Evaporator</b>	Tube-fin (15 W fan)
<b>Condenser</b>	Tube-fin (25 W fan)
<b>Defrost</b>	Hot gas (3 min 700 W)
<b>Door / frame Heater</b>	45 W
<b>Door Switch</b>	No

Test Name	Hardware Configuration	Optimization
On-off	<b>NEU2168U</b> [compressor] [original thermostat]	<b>OEM original</b>
SDI	<b>FMFT413U</b> [compressor] [original thermostat]	Controller: original <b>SDI: 1 parameter</b>
Freq	<b>FMFT413U</b> [compressor] [Freq. control optimized to the application]	Controller: <b>3 parameters</b>

#### Energy Consumption (KWh/day)



Smart Drop-in Variable Speed reduced application's energy consumption up to 31% using OEM original thermostat and settings with **only 1 SDI parameter been adjusted**



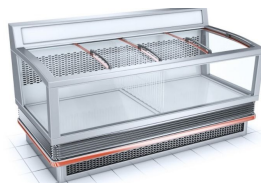


## CASE STUDIES

CHILLVENTA  
eSPECIAL

### REFRIGERATED ISLAND COMPARATIVE TESTS

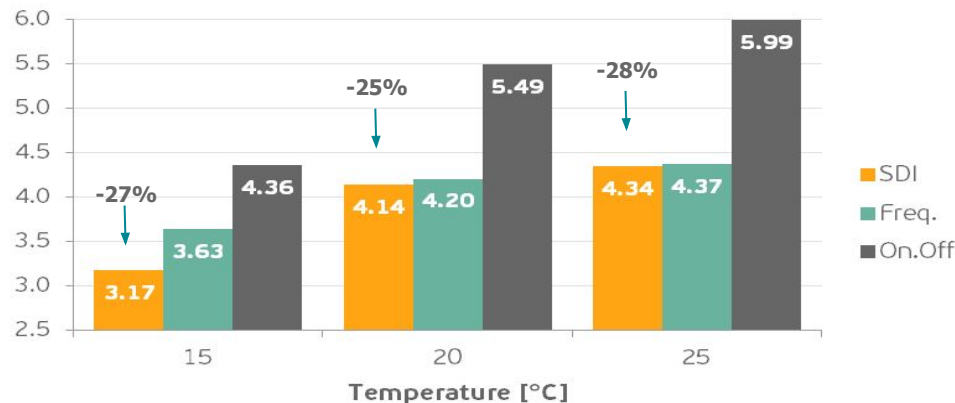
#### Application Specification



<b>Application</b>	Horizontal Freezer (R290 original)
<b>Size</b>	2.5m / 8.2 ft (1130 L / 40 ft <sup>3</sup> )
<b>Evaporator</b>	Skin (no fan)
<b>Condenser</b>	Wire on Tube + Skin-condenser (25 W fan)
<b>Defrost</b>	Hot gas (30 min 700 W)
<b>Groove Heater</b>	10 W
<b>Lights LED</b>	14W

Test Name	Hardware Configuration	Optimization
On-off	NEU2168U [compressor] [original thermostat]	OEM original
SDI	FMFT413U [compressor] [original thermostat]	Controller: original SDI: 1 parameter
Freq	FMFT413U [compressor] [Freq. control optimized to the application]	Controller: 3 parameters

#### Energy Consumption (KWh/day)



Smart Drop-in Variable Speed reduced application's energy consumption up to 28% using OEM original thermostat and settings with **only 1 SDI parameter been adjusted**



## CONCLUSIONS

SMART DROP-IN UNVEILED A REAL SIMPLE AND EFFECTIVE WAY TO DEVELOP VARIABLE SPEED APPLICATIONS

- 1) Sooner or later new regulations will require next level of energy efficiency increase worldwide
- 2) Hydrocarbons are a cost-efficient future-proof solution, but the next efficiency level may require new technologies
- 3) Several solutions like ECM fan, LED and Low-E glasses were already adopted for efficiency gains
- 4) Variable Speed compressors are cost-efficient to deal with poor power grid in some developing countries, and
- 5) The next efficiency leap will come with the adoption of variable speed compressors
- 6) Hydrocarbons Variable Speed compressors' adoption will be the final future-proof solution for the next decades

Smart Drop-in driver **enables high-performance** with existing thermostats, **avoiding further costs**

**Thank you for listening.**

**Pirovano, Gilmar**

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# Q&A