

# Case Studies



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# EM R290 Series

Highest efficiency full line up on-off



## CHANGES MADE TO MEET DOE CASE STUDY

1 New compressor

2 New refrigerant

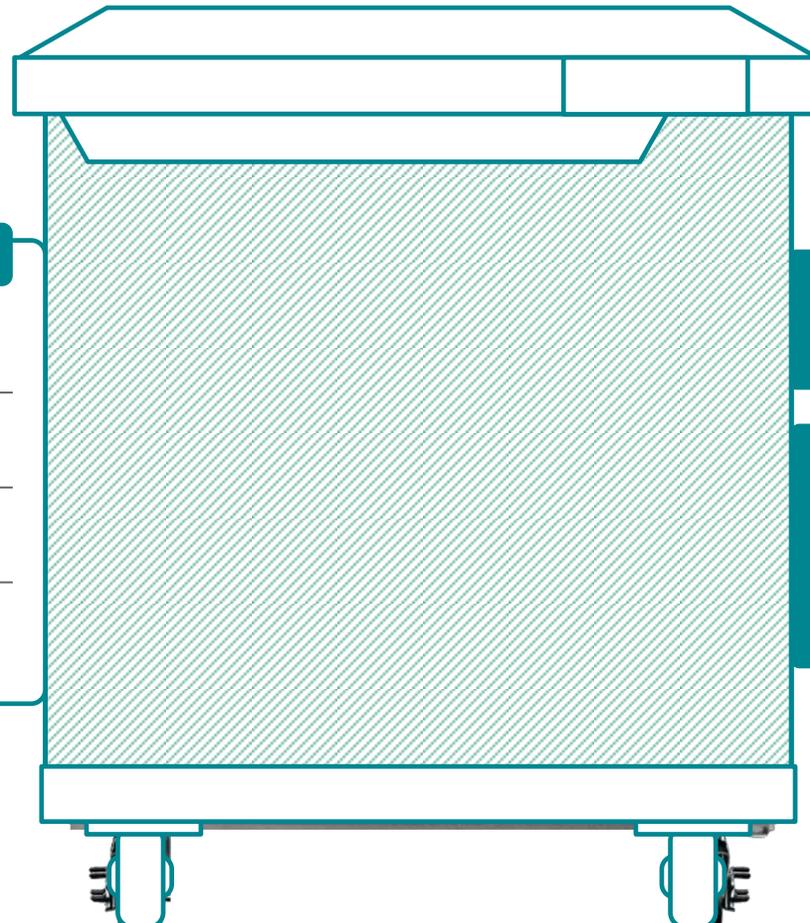
3 Changes to expansion device



FFU130HAX

EMC3130U

Capacity <i>W</i>	367	↑	432
Efficiency <i>W/W</i>	1.41	↑	1.70
Displacement <i>cc</i>	10.61	↓	6.92
Weight <i>lb</i>	25	↓	17



R134a >>> R290

Minimal changes on  
the cabinet design

Case Study  
**Results**



**FFU130HAX R-134a**

**EMC3130U R-290**

	Refrigerant	R-134a		Refrigerant	R-290
	Charge	370g		Charge	90g
	Energy consumption <i>kW/24hrs</i>	3.2		Energy consumption <i>kW/24hrs</i>	2.19
✗	DOE Allowance <i>2.79 kW/24hrs</i>	115%		DOE Allowance <i>2.79 kW/24hrs</i>	78%
✗	E-Star Allowance <i>2.25 kW/24hrs</i>	142%		E-Star Allowance <i>2.25 kW/24hrs</i>	97%

REDUCTION OF 32%



# PLUG N' COOL

A New and complete solution in commercial refrigeration



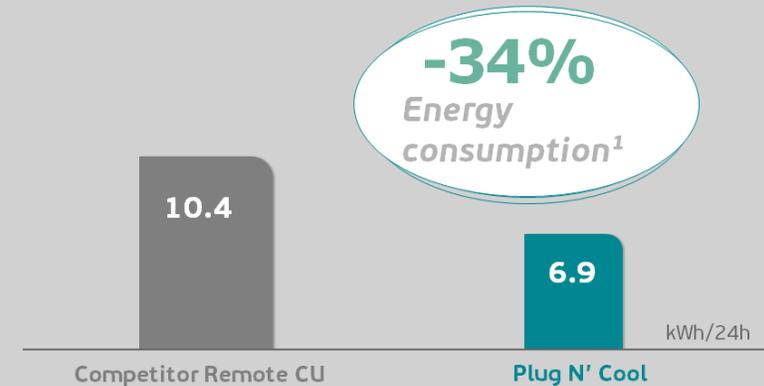
- Simple and Fast Maintenance
- Store layout flexibility
- Natural Refrigerant solution
- Lower total cost of ownership
  - Negligible Refrigerant Leakage
  - Low energy consumption
  - Low maintenance and Replacement Cost
- Internal space increase

## Case Study

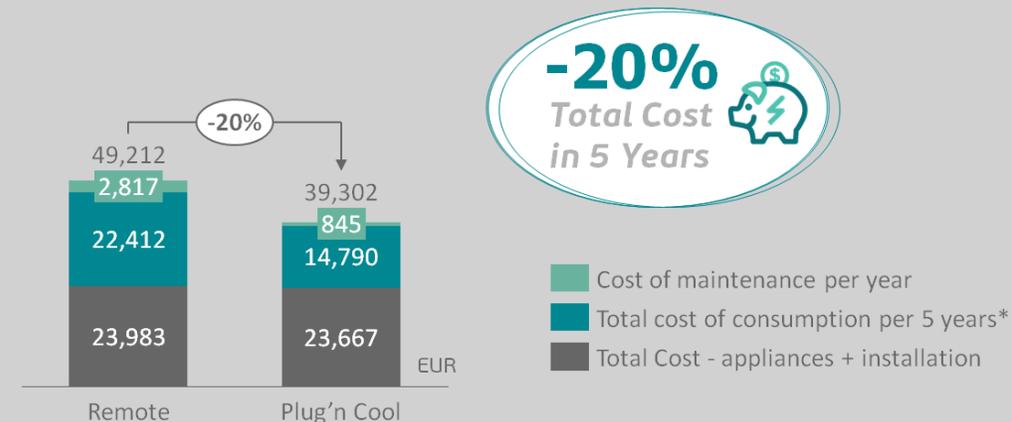
### End-User Requirements:

- Reduce Costs
- Easy/quick maintenance
- Better usage of space
- Natural Refrigerant

### Energy Consumption



### Financial Viability



# FMF Series

Highest efficiency with Natural Refrigerants



- Most efficient Natural Refrigerant compressor
- Fast Cooling time
- Low Noise and Vibrations
- Broad voltage range

Perfect for Undercounters and Reach-in Applications

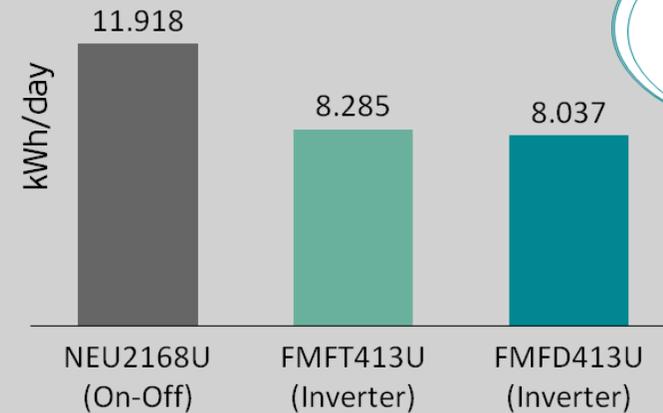


## Case Study

### End-User Requirements:

- Low energy consumption
- Low temperature variation
- Capacity to work perfectly even with voltage fluctuations
- Low noise

### Energy Consumption



**-33%**  
Energy  
Consumption

**61%**  
of reduction on  
the environmental impact due  
to CO2 emissions



# Embraco Smart Drop-in



**The right tool to leverage migration from fixed to variable speed technology**

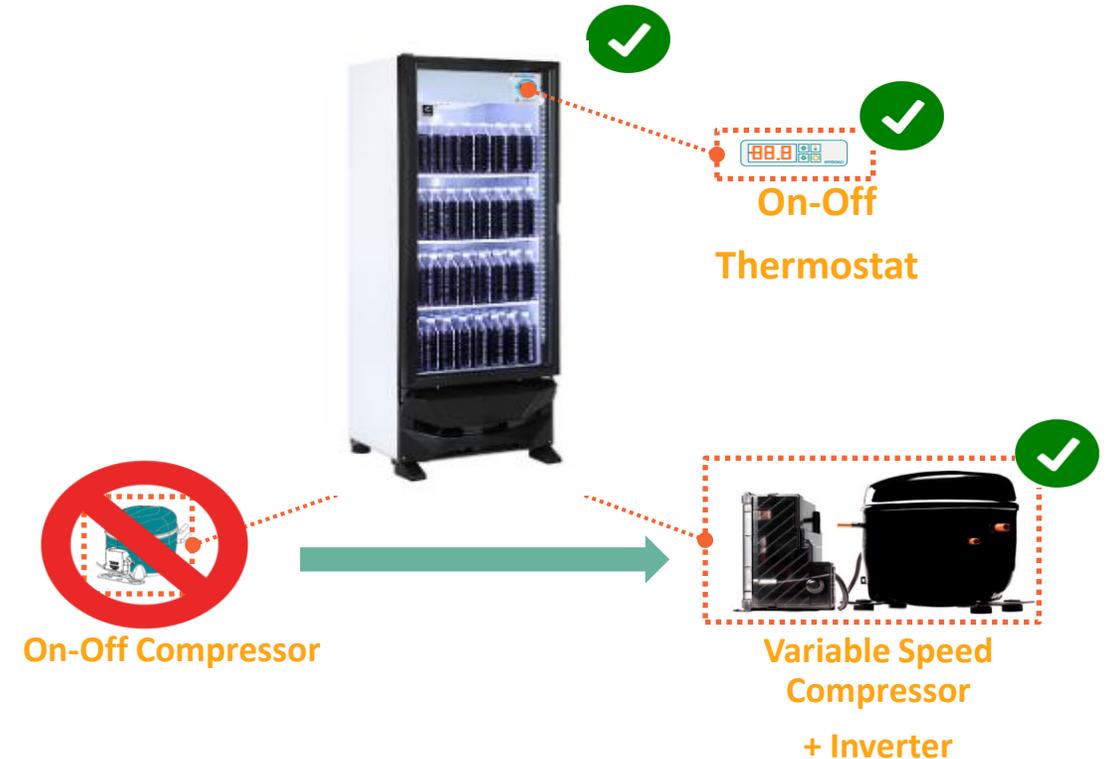


Tests in application to evaluate the Smart Drop In (SDI) solution performance compared to alternative technologies.

# What's Smart Drop-in

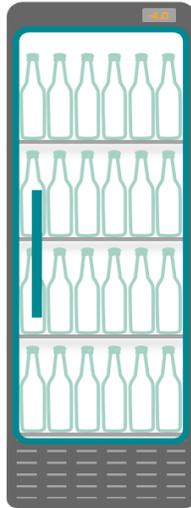
Smart Drop-in is a solution to deploy **Variable Speed Compressors** with On-Off Thermostats.

- Easy replacement of On-Off compressor
- Easy development of new applications - only 1 parameter can fit many application sizes and for energy optimization
- No need of high-priced thermostats for some applications.
- Fast reaction to Thermal Load variation Optimization for Climate Class Ranges



# Beer Cooler: application overview

application Spec.



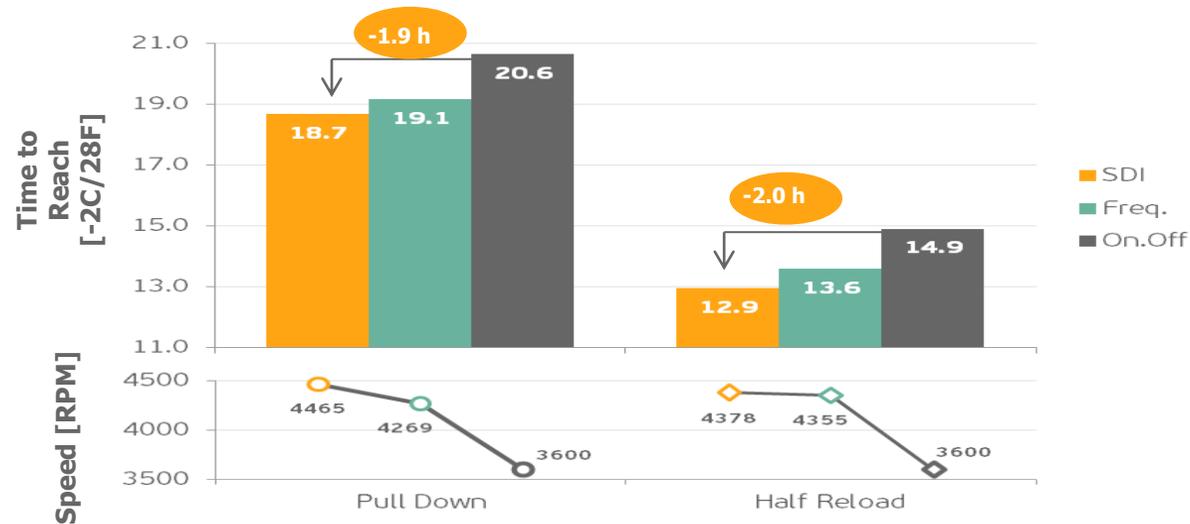
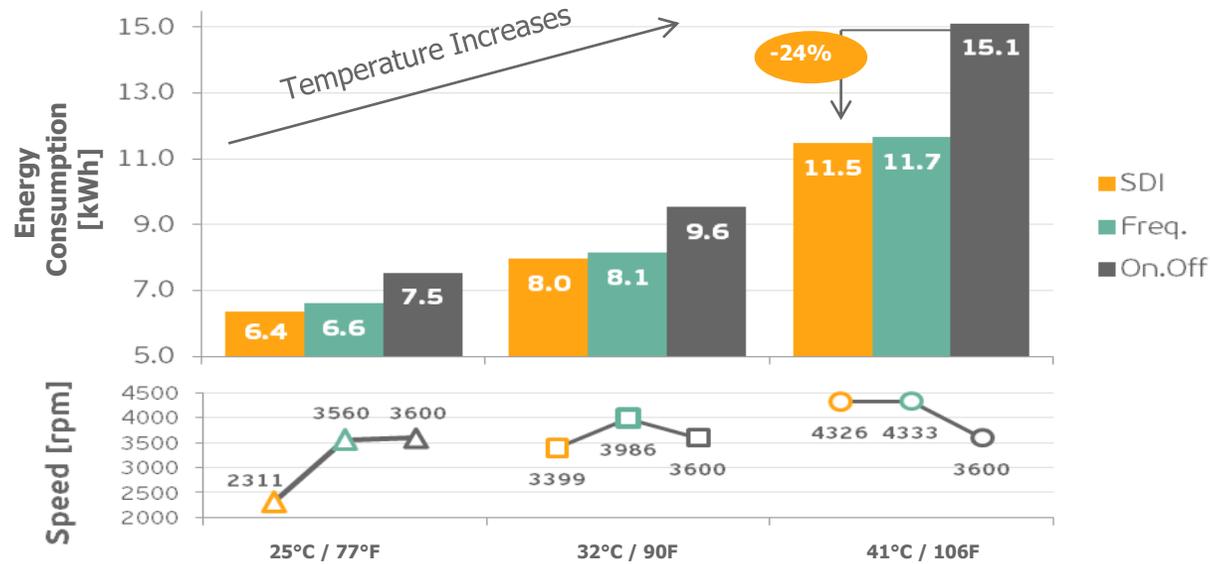
<b>Application</b>	Beer Cooler (R290 original)
<b>Size</b>	572 L / 20,2 ft <sup>3</sup>
<b>Evaporator</b>	Tube-fin (37 W fan)
<b>Condenser</b>	Tube-fin (45 W fan)
<b>Defrost</b>	Heater 350 W
<b>Door. Resistance</b>	100 W
<b>Door Sensor</b>	No

Test Configuration

Test Configuration	EM2X3134U	FMFT406U	On-off controller OEM Original	VCC Controller 10 days optimization	Smart Drop-in 4 days optimization
On-off					
Freq.					
SDI					

← OEM original set

# Beer Cooler: comparative results



## Energy consumption improvement

- Reduction up to 24% vs. On-Off and slightly better than frequency controller
- VCC + Smart drop in adjusting speed according to ambient condition

## Gains beyond energy consumption

- Faster pull down and shorter half reload recovery time (up to 2 hour less)

## Easy to use and robust control logic

- Results achieved with only one parameter optimization, additional parameters can be adjusted for more benefits
- No pin defrost used

# Vertical Freezer: application overview

application Spec.



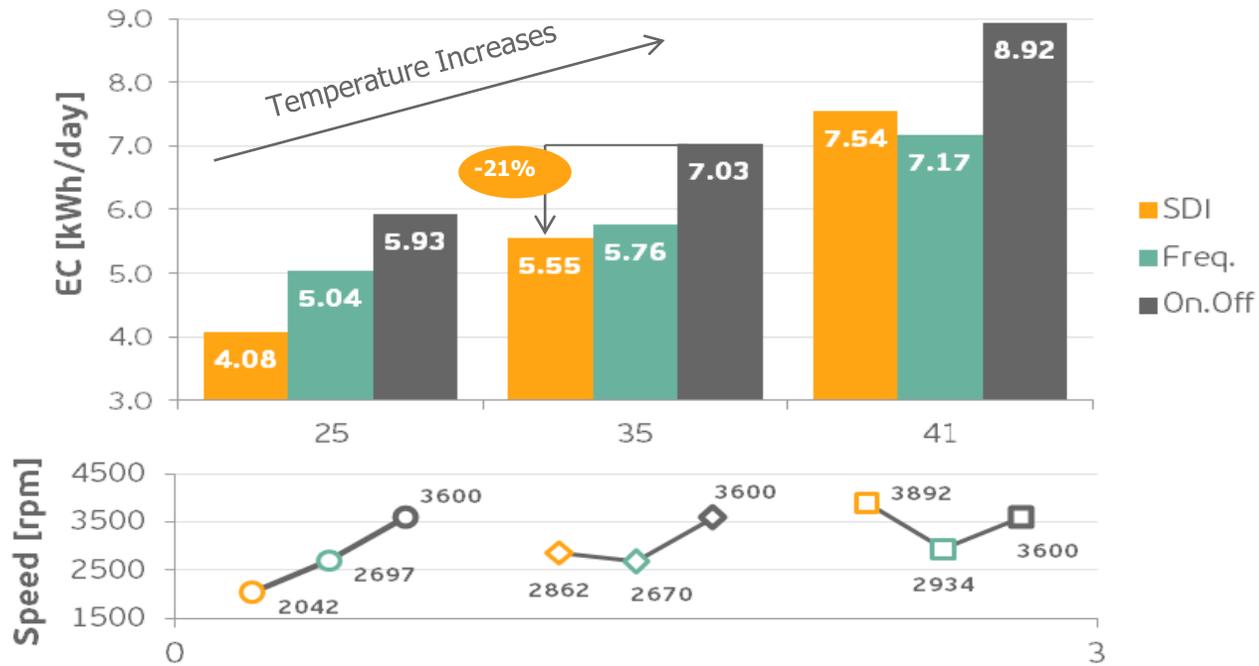
<b>Application</b>	Vertical Freezer (R290 original)
<b>Size</b>	464 L / 16,4 ft <sup>3</sup>
<b>Evaporator</b>	Tube-fin (15 W fan)
<b>Condenser</b>	Tube-fin (25 W fan)
<b>Defrost</b>	Hot gas (3 min 700 W)
<b>Door. Resistance</b>	45 W
<b>Door Sensor</b>	Yes

Test Configuration

Test Configuration	NEU2168U	FMFT413U	On-off controller	VCC Controller 10 days optimization	Smart Drop-in 4 days optimization
On.off					
Freq.					
SDI					

← OEM original set

# Vertical Freezer: comparative results



## Energy consumption improvement

- Reduction up to 31% vs. On-Off and slightly better than frequency controller
- VCC + Smart drop in adjusting speed according to ambient condition (2000 to 3900 RPM)

## Easy to use and robust control logic

- Results achieved with only one parameter optimization, additional parameters can be adjusted for more benefits
- No pin defrost used

***Nidec***

**Global Appliance**