



The Future of Commercial Refrigeration

Opteon™ XP & Opteon™ XL

www.opteon.com

Agenda

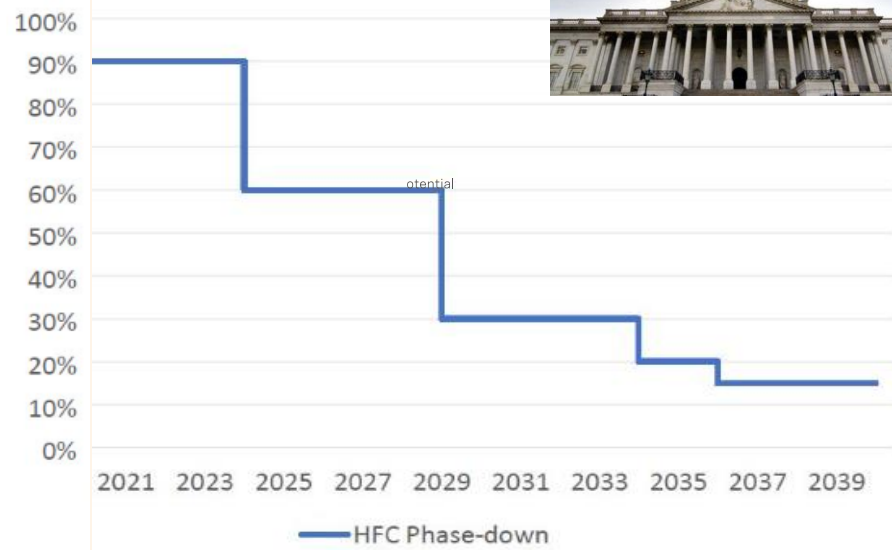


Regulations are Driving Change

US Regulatory Activity requiring refrigerants with low Global Warming Potential (GWP)



American Innovation and Manufacturing (AIM) Act



California Air Resource Board (CARB)

Count

31

397

430

760

900

107

774

325

985



Reliable



Compatible



Cost Effective




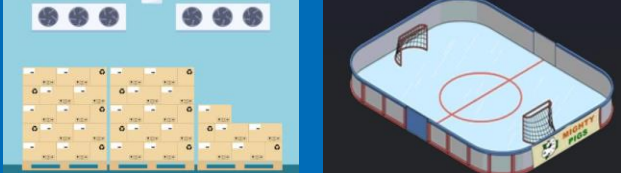

Field Tested and Proven



Sustainable

* GWP Limits for specific applications are also present in the rulemaking

Next Generation Solutions – Opteon™ Refrigerants

Applications	Temperature Profile	Installed Base	Immediate Replacement Options	Next Generation
			*New Equipment and Retrofits	*New Equipment Only
	Medium Temp	R-134a (GWP:1430)	Opteon™ XP10 (R-513A) (GWP:631)	Opteon™ XL10 (R-1234yf) (GWP: 4)
	Low Temp	R-22 (GWP: 1760) R-404A/ R-507A (GWP: 3943/3985) R-407A (GWP: 1923) R-407F (GWP: 1596) R-422D (GWP: 2473)	Opteon™ XP40 (R-449A) (GWP: 1397)	Opteon™ XL20 / XL40 (R-454C / R-454A) (GWP: 148 / 239)
	Medium Temp & Low Temp	R-404A (GWP: 3922)	Opteon™ XP44 (R-452A) (GWP: 2141)	Opteon™ XL20 / XL40 (R-454C / R-454A) (GWP: 148 / 239)

Notes:

- ¹ Opteon™ XP20 and Opteon™ XL blends are not yet fully commercial in all regions.
- GWP values noted are based on IPCC 4th Assessment Report

Benefits of Retrofit & Next Gen Solutions



- ✓ 67% reduction GWP vs R-404A / R-507
- ✓ 5%-12% energy savings vs. R-404A / R-507
- ✓ Readily available and OEM approved

- ✓ 56% reduction GWP vs R-134a
- ✓ Azeotrope with zero glide
- ✓ Readily available and OEM approved

- ✓ Low and Ultra low GWP
- ✓ Successfully adopted in the EU in the EU
- ✓ The preferred choice of major retail brands in the EU

Total Cost of ownership of HFOs

Wave Refrigeration Case Study:

Compared seven alternative refrigeration technologies in two different store architectures at two different European locations with moderate (UK) and high (Spain) ambient conditions.

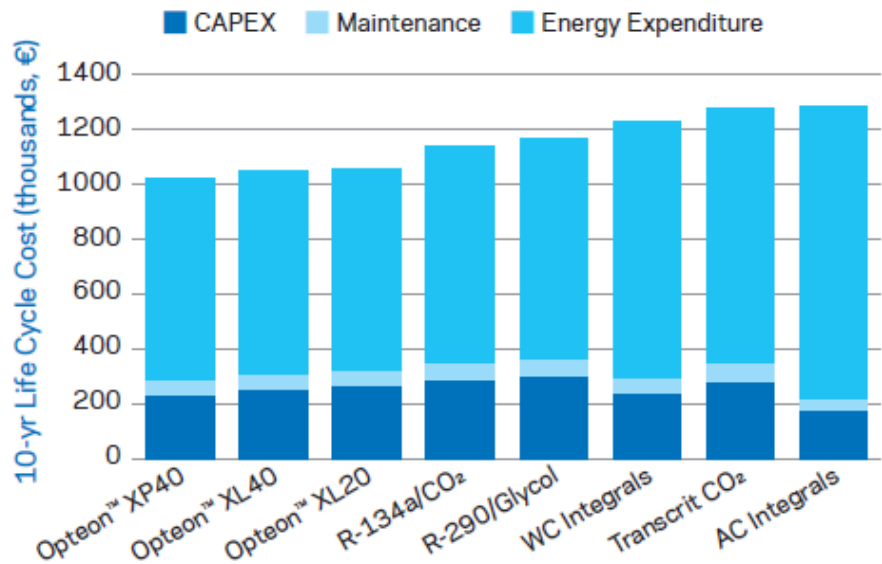


Figure 3: 10-yr Life Cycle Costs (€) for Various Technologies for a Standard Supermarket in Sevilla, Spain

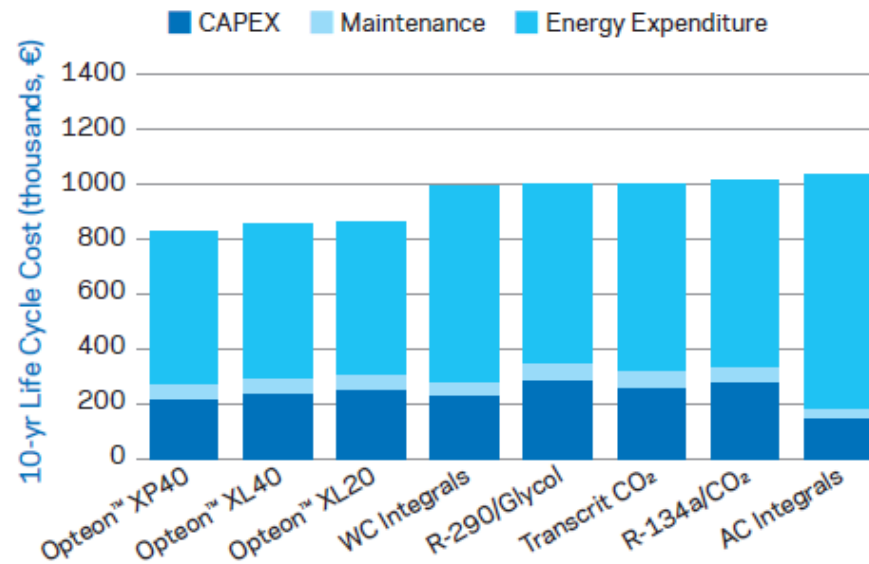


Figure 4: 10-yr Life Cycle Costs (€) for Various Technologies for a Standard Supermarket in Leicester, UK

**Opteon™ refrigeration systems had lower 10-yr Life Cycle Costs than R-290 and CO₂ technologies*

Emissions – Standard Store Format

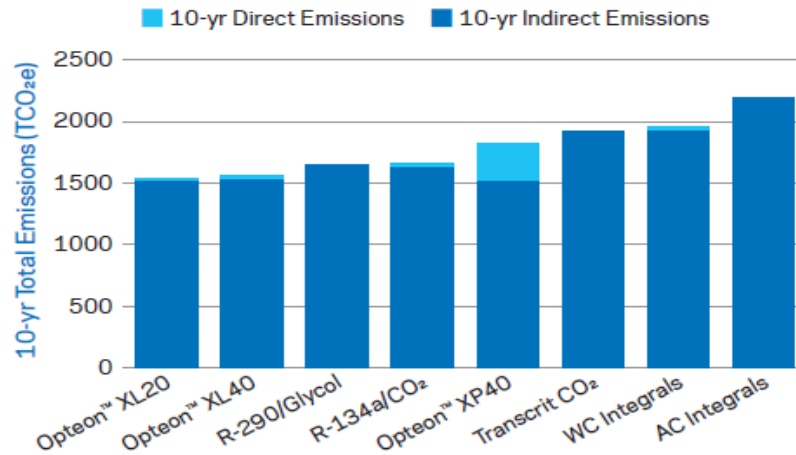


Figure 7: Total Emissions as TCO_{2e} for Various Technologies for a Standard Supermarket in Sevilla, Spain

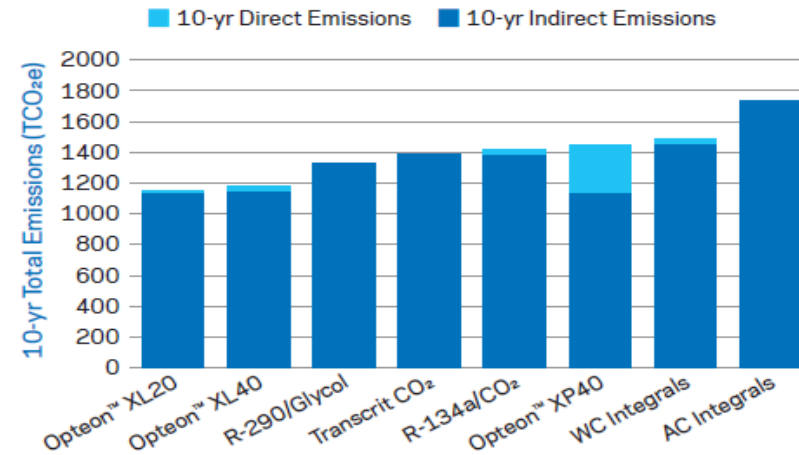


Figure 8: Total Emissions as TCO_{2e} for Various Technologies for a Standard Supermarket in Leicester, UK

Technology	No. of MT Systems	No. of LT Systems	Design Ambient		Daytime/Nighttime MT Loads (kW)				Condenser ΔT (K)		Minimum Condensing Temperature (°C)	
			Sevilla	Leicester	Sevilla		Leicester		MT	LT	MT	LT
					Day	Night	Day	Night				
Opteon™ XL40	4	2	42 °C	32 °C	142	105	142	105	10	8	20	20
Opteon™ XL20	4	2	42 °C	32 °C	142	105	142	105	10	8	20	20
R290/Glycol	1-2	10-15	42 °C	32 °C	183	146	183	146	10	-	10	-
R134a/CO ₂	1-2	1-2	42 °C	32 °C	183	146	183	146	10	-	20	-
Opteon™ XP40	1-2	1-2	42 °C	32 °C	142	105	142	105	10	8	20	20
Transcrit CO ₂ FGB	1-2	1-2	42 °C	32 °C	142	105	142	105				
WC Integrals (500g Limit)	30-35	10-15	42 °C	32 °C	142	105	142	105	18	15	18	20
AC Integrals (500g Limit)	30-35	10-15	25 °C	20 °C	160	118	142	105	15	15	35	35

Think Beyond GWP!

Energy consumption **dominates** total emissions. Opteon™ systems had lower total emissions than R-290 and CO₂ refrigeration systems.

Conclusion

- The price and availability of higher GWP products could change as we progress through the phase down.
- Opteon™ XP40 and Opteon™ XP10 are viable lower GWP refrigerants for existing and new commercial refrigeration systems.
- Opteon™ XL refrigerants are available today for OEM sampling and will be commercially available in the US in the next couple of years.
- It is important to take a holistic view when considering the various commercial refrigeration systems available.

Opt
for better



Opteon™
Refrigerants

For more information, go to
[**OPTEON™ - COMMERCIAL REFRIGERATION**](#)

February 3, 2022

