

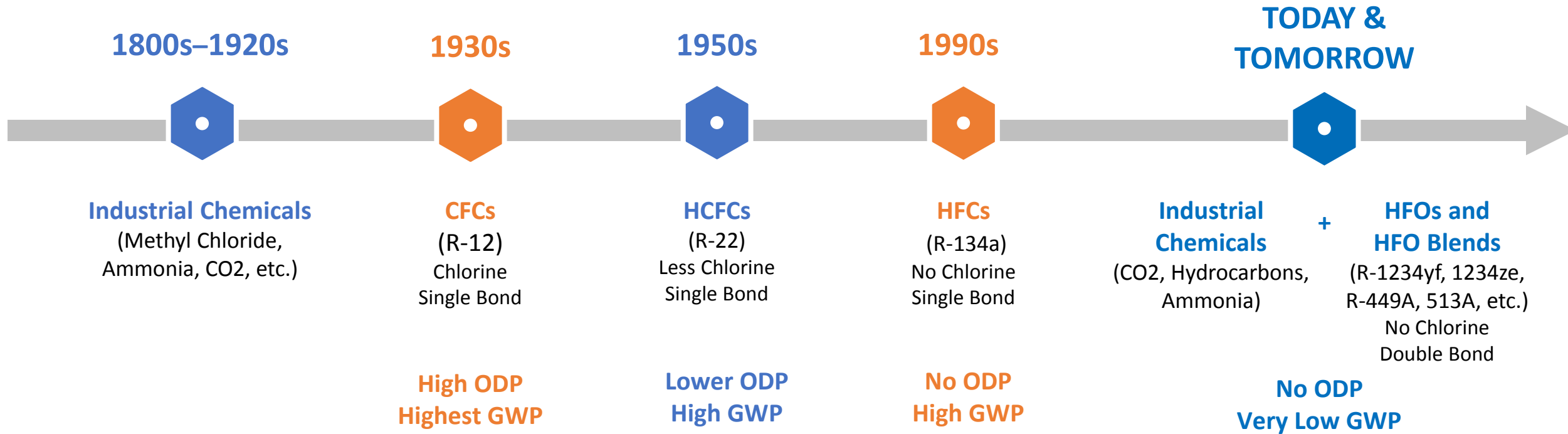


# The Era of Low GWP Refrigerants

AAPT Seminar  
Taipei, Taiwan

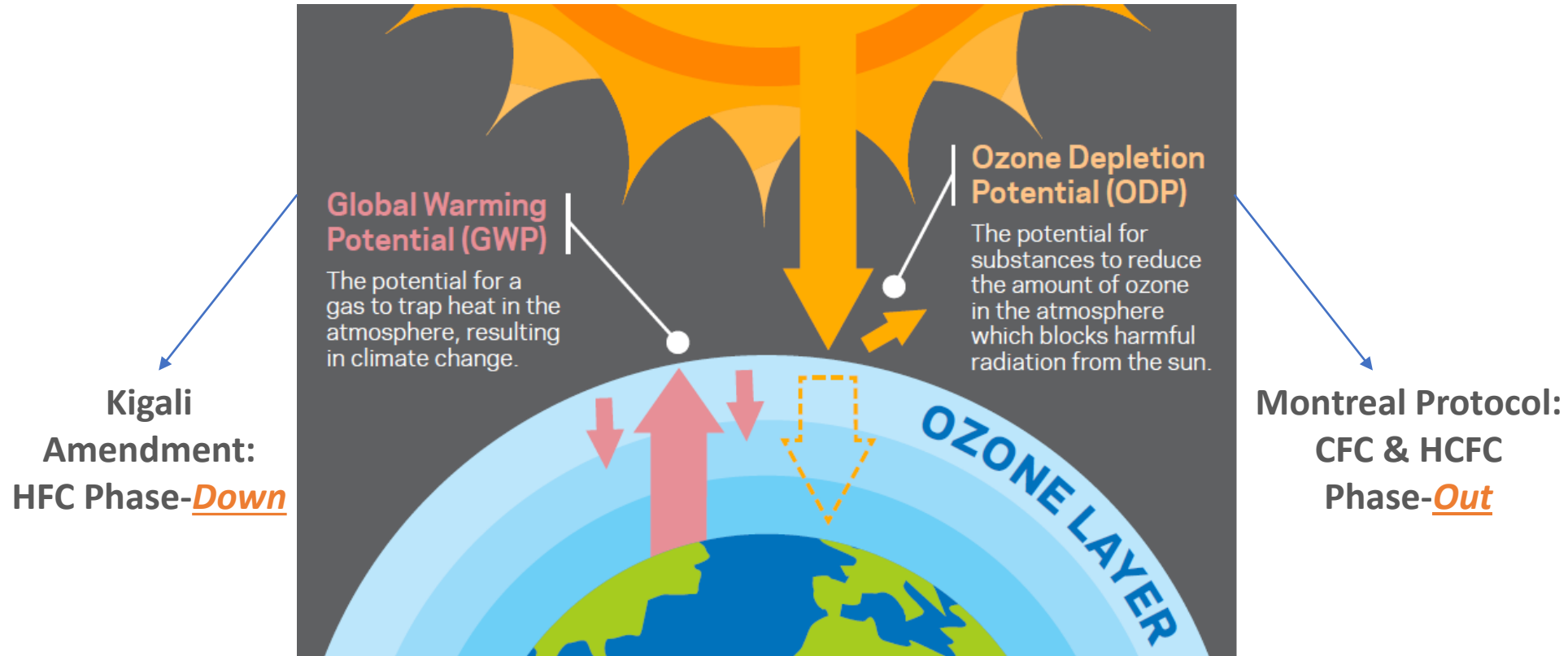
In Bae Lee  
Regional Marketing Manager, AP  
The Chemours Company  
May 2019

# Evolution of Refrigerant Technology



***Selection of Refrigerants for the Future Will Need to Balance Performance (Capacity and Efficiency), Safety and Sustainability, and Total Cost of System Ownership***

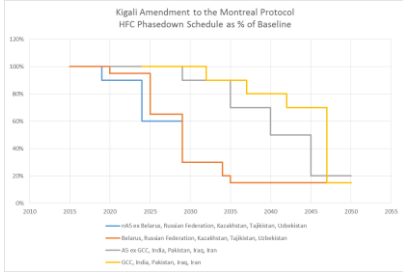
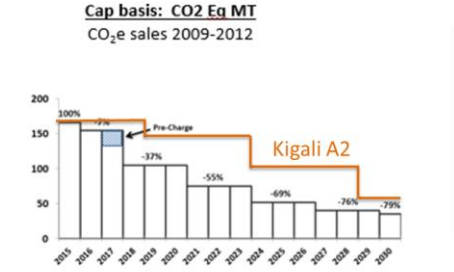
# Introduction – Regulations Driving Change








## Regional Regulations Connected with GWP Phase-Down:

- European F-gas
- Australia:
- Canada: HFC Phase-Down
- Japan: METI Material Conversion Limits
- US: State-level HFC Reg. activity & Federal Review (SNAP, etc.)

# Regulations over the World

Territory	Regulation	Remarks																																																							
<p><b>Global</b> <b>(Kigali Amendment)</b></p>	 <table border="1"> <thead> <tr> <th></th> <th>A5 Group 1</th> <th>A5 Group 2</th> <th>A2 Group</th> <th>A2 Exceptions</th> </tr> </thead> <tbody> <tr> <td>HFC baseline</td> <td>2020-2022</td> <td>2024-2026</td> <td>2011-2013</td> <td>2011-2013</td> </tr> <tr> <td>Formula</td> <td colspan="4">Average HFC consumption during baseline plus HCFC Contribution</td> </tr> <tr> <td>HCFC</td> <td>65% baseline</td> <td>65% baseline</td> <td>15% baseline</td> <td>25% baseline</td> </tr> <tr> <td>Freeze</td> <td>2024</td> <td>2028</td> <td>-</td> <td>-</td> </tr> <tr> <td>1<sup>st</sup> step</td> <td>2029 - 10%</td> <td>2032 - 10%</td> <td>2019 - 10%</td> <td>2020 - 5%</td> </tr> <tr> <td>2<sup>nd</sup> step</td> <td>2035 - 30%</td> <td>2037 - 20%</td> <td>2024 - 40%</td> <td>2025 - 35%</td> </tr> <tr> <td>3<sup>rd</sup> step</td> <td>2040 - 50%</td> <td>2042 - 30%</td> <td>2029 - 70%</td> <td>2029 - 70%</td> </tr> <tr> <td>4<sup>th</sup> step</td> <td>-</td> <td>-</td> <td>2034 - 80%</td> <td>2034 - 80%</td> </tr> <tr> <td>Plateau</td> <td>2045 - 80%</td> <td>2047 - 85%</td> <td>2036 - 85%</td> <td>-</td> </tr> <tr> <td></td> <td>A5 countries excluding Group 2 countries</td> <td>GCC, India, Pakistan, Iraq, Iran</td> <td>A2 countries excluding A2 Exceptions</td> <td>Belarus, Uzbekistan, Russian Federation, Kazakhstan, Tajikistan</td> </tr> </tbody> </table>		A5 Group 1	A5 Group 2	A2 Group	A2 Exceptions	HFC baseline	2020-2022	2024-2026	2011-2013	2011-2013	Formula	Average HFC consumption during baseline plus HCFC Contribution				HCFC	65% baseline	65% baseline	15% baseline	25% baseline	Freeze	2024	2028	-	-	1 <sup>st</sup> step	2029 - 10%	2032 - 10%	2019 - 10%	2020 - 5%	2 <sup>nd</sup> step	2035 - 30%	2037 - 20%	2024 - 40%	2025 - 35%	3 <sup>rd</sup> step	2040 - 50%	2042 - 30%	2029 - 70%	2029 - 70%	4 <sup>th</sup> step	-	-	2034 - 80%	2034 - 80%	Plateau	2045 - 80%	2047 - 85%	2036 - 85%	-		A5 countries excluding Group 2 countries	GCC, India, Pakistan, Iraq, Iran	A2 countries excluding A2 Exceptions	Belarus, Uzbekistan, Russian Federation, Kazakhstan, Tajikistan	<ul style="list-style-type: none"> <li>• Cap &amp; Phasedown</li> <li>• A2: in Place</li> <li>• A5: 2024/2028</li> </ul>
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<p><b>Regional</b> <b>(EU F-gas Regulation)</b></p>	<p>Cap basis: CO<sub>2</sub> Eq MT CO<sub>2</sub>e sales 2009-2012</p>  <p><b>Equipment Ban:</b></p> <ul style="list-style-type: none"> <li>• 2015: HFC ≥ 150; refrigerators/freezers – foam &amp; refrigerant</li> <li>• 2015: HFC ≥ 2500; commercial refri/freezers</li> <li>• 2020: HFC ≥ 2500; stationary refrigeration</li> <li>• HFC ≥ 150; movable room air conditioners</li> <li>• 2020: HFC ≥ 150; XPS FOAM</li> <li>• 2022: HFC ≥ 150; commercial refrigerators/freezers</li> <li>• 2023: HFC ≥ 150; PU FOAM</li> <li>• 2025: HFC ≥ 750; single split air conditioners</li> </ul> <p><b>Service Ban:</b></p> <ul style="list-style-type: none"> <li>• 2020: Prohibit Service and maintenance of refrigeration equipment with a min charge size of 40 tonnes CO<sub>2</sub>-equivalent with refrigerants ≥ 2500 GWP</li> </ul>	<ul style="list-style-type: none"> <li>• Cap &amp; Phasedown + GWP limit per application</li> <li>• More aggressive than Kigali</li> <li>• Inclusive of pre-charge</li> <li>• Quota transaction</li> </ul>																																																							
<p><b>Country</b></p>	<p><b>United States</b> <b>Canada/Japan</b> <b>Australia</b></p>	<ul style="list-style-type: none"> <li>• US Climate Alliance/CARB</li> <li>• Kigali + GWP limit</li> <li>• HFC Quota(stricter than Kigali)</li> </ul>																																																							

# Chemours Refrigerant Technology Roadmap

			Non-flammable (XP Series) Class 1		Mildly Flammable (XL Series) Class 2L	
Current	GWP	Application	Product	GWP	Product	GWP
HFC-134a	1300 (1430)		<b>XP10</b> (R-513A)	573 (631)	<b>XL10</b> (R-1234yf)	< 1 (4)
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HCFC-22	1760 (1810)		<b>XP20</b> (R-449C)	1146 (1251)	<b>XL20</b> (R-454C)	146 (148)
HCFC-123	79 (77)		<b>XP30</b> (R-514A)	2 (7)		
			<b>MZ</b> (R-1336mzz(Z))	2 (9)		

Note: GWP values AR5 (AR4)

# Opteon™ XP10 (R-513A)

— *Replaces R-134a* —



**ASHRAE #:** R-513A

**Blend Components:** R-1234yf/134a

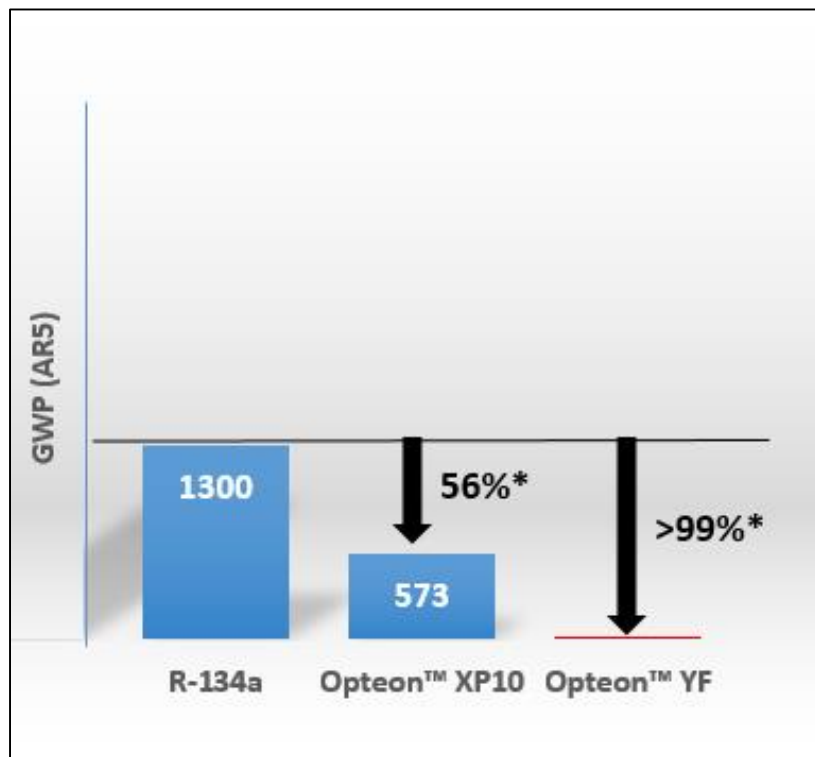
**Blend Composition:** 56/44

## Optimal Balance of Properties

- ✓ Meets regulatory requirements
  - Non-ozone depleting
  - SNAP listed; 56% lower GWP vs. R-134a
- ✓ Azeotropic Blend
  - No temperature glide
- ✓ Extends life of existing equipment
  - Compatible with installed base
  - Improved capacity w/ comparable energy efficiency
- ✓ Non-flammable, Non-toxic (A1)
- ✓ Commercially available & OEM Approved
  - Emerson, Bitzer, & Tecumseh Approved
  - Selected by Major Chiller OEMs Trane, JCI, Smardt

# R-134a to Opteon™ XP10 Performance Considerations

R-134a-like Refrigerants



ASHRAE #	Medium Temperature Refrigeration <sup>1</sup>		A/C Chiller Conditions <sup>2</sup>	
	R-134a	XP10 (R-513A)	R-134a	XP10 (R-513A)
Relative Capacity	1.00	1.04	1.00	1.02
Relative COP	1.00	1.00	1.00	0.98
Relative Mass Flow	1.00	1.15	1.00	0.94
Suction Pressure (kPa)	99	122	343	374
Discharge Pressure (kPa)	917	965	957	1010
Discharge Temp (°C)	80	73	48	44

<sup>1</sup>MT Conditions: -10°C Evap/40°C Cond/4K Subcool/10K Superheat, 70% Compressor Efficiency

<sup>2</sup>A/C Chiller Conditions: 4.44°C Evap/37.78°C Cond/ No Subcool/No Superheat, 75% Compressor Efficiency

# Opteon™ XP10 (R-513A) – Market Adoption in Chillers



## Ingersoll Rand Introduces the EcoWise™ Portfolio of Products as Step to Achieve its Global Climate Commitment

*Davidson, N.C., January 26, 2015* – Ingersoll Rand (NYSE:IR), a world leader in creating comfortable, sustainable and efficient environments, is pleased to announce another milestone in achieving its climate commitment, a roadmap to significantly reduce the environmental impact from its operations and product portfolio by 2030.

Trane Sintesis™ air-cooled chiller is energy efficient and quiet, and offers customers the choice of operating with a next generation, low GWP refrigerant – [Opteon™ XP10 \(R-513A\)](#) or with R-134a. Product will be available in North America and Latin America with next generation refrigerant option in June 2015.



## Johnson Controls Advances Environmental Sustainability with Chiller Platforms Compatible with Low GWP Refrigerants

*MILWAUKEE – (Jan. 20, 2016)* – [Johnson Controls](#) is advancing its [White House Council on Environmental Quality commitment](#) by enhancing HFC product lines to be fully compatible with the non-flammable, low-GWP refrigerant – Opteon™ XP10 (R-513A), manufactured by The Chemours Company. York centrifugal and screw chillers ranging from 125 to 6,000 tons (440 to 21,100 kW) are compatible with R-513A.



## Carrier AquaEdge® 19XR, 23XR and AquaForce® 30XV and XA Chillers are Available With Lower Global Warming Refrigerant Solutions

*CHARLOTTE, N.C. - Feb. 9, 2018* - Legacy R-134a as well as the newer R-513A refrigerants are both supported in Carrier chillers. As part of Carrier's commitment to delivering a comprehensive commercial product line that supports the drive for lower global warming refrigerant solutions, [Carrier AquaEdge® 19XR water-cooled centrifugal chillers, 23XR water-cooled screw chillers and AquaForce® 30XV/XA air-cooled screw chillers are compatible with both R-134a as well as lower global warming potential \(GWP\) option R-513A.](#)

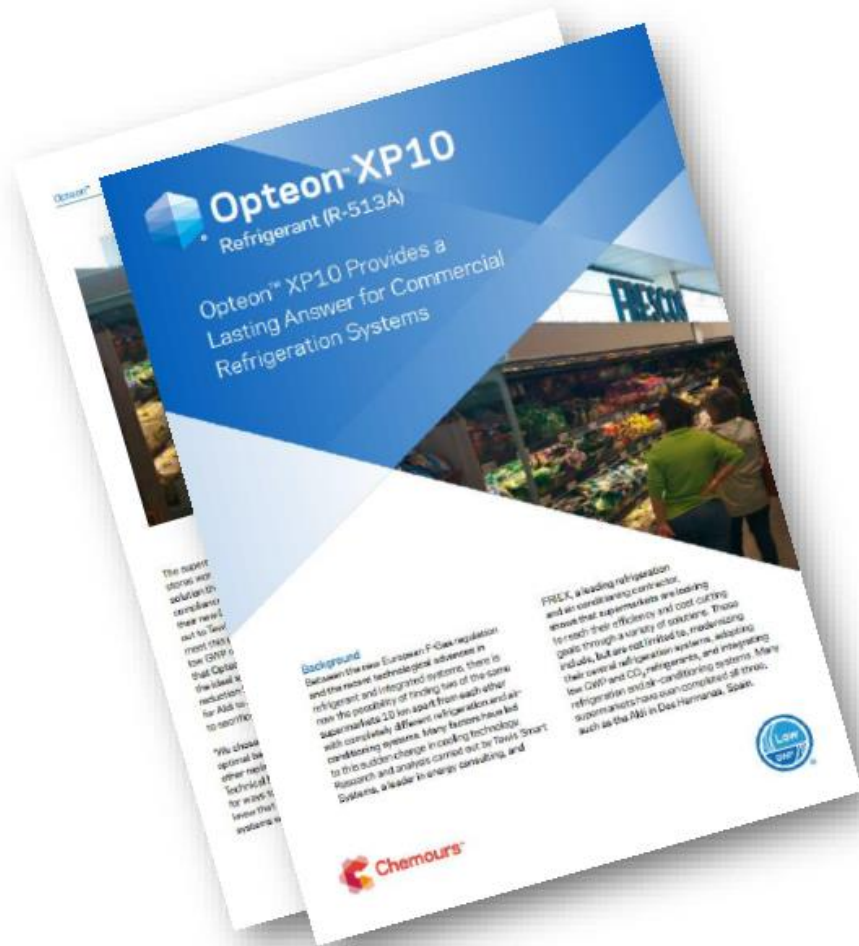


## Chemours™ Opteon™ XP10 Refrigerant Specified by Dunham-Bush for DCLCG Series Of High-Efficiency Direct-Driven VFD Water Cooled Centrifugal Chiller

*WILMINGTON, Del., April. 11, 2017* – Chemours Fluorochemicals (Chemours) today announced the selection of [Opteon™ XP10 \(R-513A\)](#) low global warming potential (GWP) refrigerant by [Dunham-Bush](#) for use in its [DCLCG Series Of High-Efficiency Direct-Driven VFD Water Cooled Centrifugal Chiller](#) for the Asia Pacific market.



# Successful Installation of CO<sub>2</sub> Cascade with Opteon™ XP10 (R-513A) in Spain



## Case Study – Aldi’s Store in Dos Hermanas, Spain

**“We chose Opteon™ XP10, because it offered the optimal balance of properties when compared to other [134a] options.”**

- Javier Atencia, Technical Manager, Tewis Smart Solutions







(Energy Consultant for Aldi)

**“The ease of installation was similar to any other previous refrigerant technology, which allowed for us to set up the system without inconveniencing the customer.”**

- Juan Carlos Izqueirido, Technical Manager FRIEX

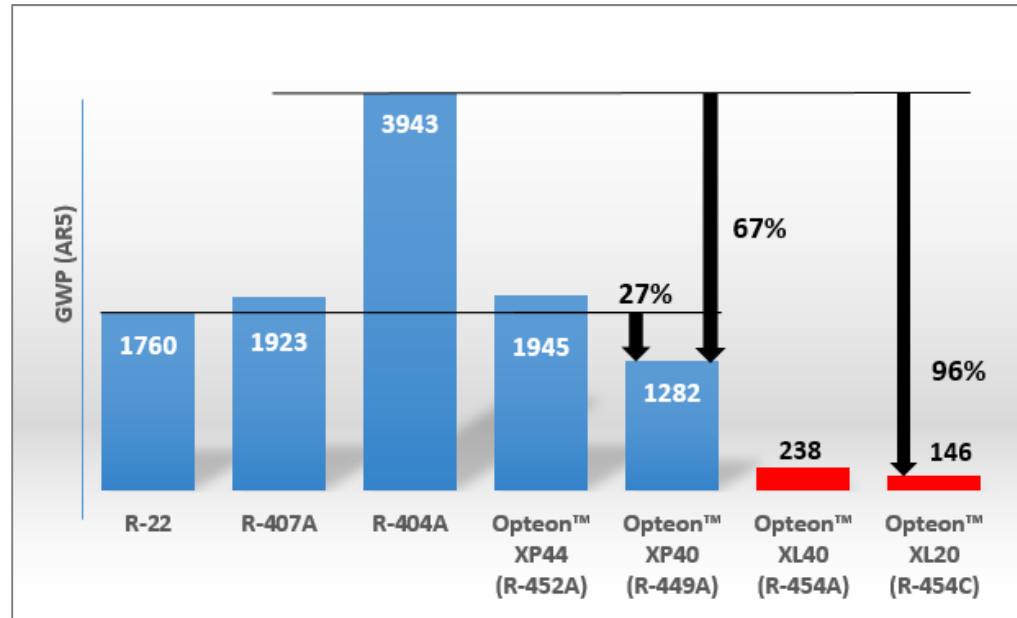
(Mechanical Contractor)

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Note: GWP values AR5 (AR4)

# A2L R-404A Alternatives with Very Low GWP



ASHRAE Designation	R-32	R-125	R-143a	R-1234yf	R-134a	Safety Rating	GWP (AR5)
R-404A	-----	44	52	-----	4	A1	3943
R-449A	24.3	24.7	-----	25.3	25.7	A1	1282
R-452A	11	59	-----	30	-----	A1	1945
R-454A	65	-----	-----	65	-----	A2L	238
R-454C	21.5	-----	-----	78.5	-----	A2L	146

# Performance of Opteon™ XL40 and XL20 in Refrigeration

## Low Temperature Refrigeration

	R-404A	XL40 (R-454A)	XL20 (R-454C)
GWP AR4 (AR5)	3922 (3943)	239 (238)	148 (146)
Capacity vs. R-404A	-	+8%	-11%
COP vs. R-404A	-	+6%	+6%
Evap Glide [K]	0.4	4.4	5.1
T Discharge [°C]	65.7	86.9	76.6
P Discharge [kPa]	1612	1625	1404

Thermodynamic cycle model results for Low Temperature Refrigeration:  
 -32°C Avg Evap/ 35°C Avg Cond/ 5.6 K Subcool/ 5.6K Superheat, 70% Comp. Efficiency

## Medium Temperature Refrigeration

	R-404A	XL40 (R-454A)	XL20 (R-454C)
GWP AR4 (AR5)	3922 (3943)	239 (238)	148 (146)
Capacity vs. R-404A	-	+6%	-9%
COP vs. R-404A	-	+3%	+4%
Evap Glide [K]	0.8	4.8	6.0
T Discharge [°C]	53.8	66.4	61.1
P Discharge [kPa]	1612	1625	1404

Thermodynamic cycle model results for Medium Temperature Refrigeration:  
 -6.7°C Avg Evap/ 35°C Avg Cond/ 5.6 K Subcool/ 5.6K Superheat, 70% Comp. Efficiency

# Performance Results

	R-404A	R-454A (XL40)	R-454C (XL20)
Pull Down @ 23.9 C (min)	2.0	2.8	3.8
Pull Down @ 32.2 C (min)	5.1	5.1	15.6
Energy Consumption @ 23.9 C (kWhr/day)	25.70	25.70	26.93
Relative to 404A (%)	100.0%	100.0%	104.8%
Energy Consumption @ 32.2 C (kWh/day)	34.17	32.12	35.54
Relative to 404A (%)	100.0%	94.0%	104.0%
Compressor Run Time @ 23.9 C (%)	43.20	45.86	55.31
Compressor Run Time @ 32.2 C (%)	65.44	62.56	81.43

- ***Energy consumption up to 6% lower with XL40 (R-454A) vs R-404A***
- ***Energy consumption about 4% higher with XL20 (R-454C) vs. R-404A***

# Field Case Study of Opteon™ XL40 (R-454A) Success in UK

## CONDENSING UNITS FOR COLD STORAGE: ULTRA LOW GWP OPTeon™ XL40

### New Installation: Low Temp Refrigeration

- **A2L with GWP 239**
- **Compliant with Local (UK) Regulations**
  - Charge size: 23kg
  - Machine room located outside
  - Cold storage
  - Risk Assessment Completed Prior to Installation
- **Capacity & Energy Performance**
  - Reliable Operation for > 1 year
  - Performance monitored & compared with theoretical performance of R-404A & R-407F under same operating conditions.






**STRONG ENERGY  
PERFORMANCE!**

**WINNER**



# Chemours Refrigerant Technology Roadmap



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Note: GWP values AR5 (AR4)



# <750 GWP R-410A replacements in A/C

Air Conditioning	R-410A	R-32	XL55 (R-452B)	XL41 (R-454B)	XL40 (R-454A)	R-22	XL20 (R-454C)
GWP AR4 (AR5)	2088 (1924)	675 (677)	698 (676)	466 (467)	239 (238)	1810 (1760)	148 (146)
Capacity vs. R-410A	-	+7%	-3%	-4%	-23%	-32%	-33%
COP vs. R-410A	-	+1%	+1%	+1%	+3%	+6%	+5%
Evap Glide [K]	0.1	0	1	1	5	0	6
T Discharge [°C]	82	98	86	87	77.4	85	73.2
P Discharge [kPa]	2802	2802	2663	2631	2131	1775	1842

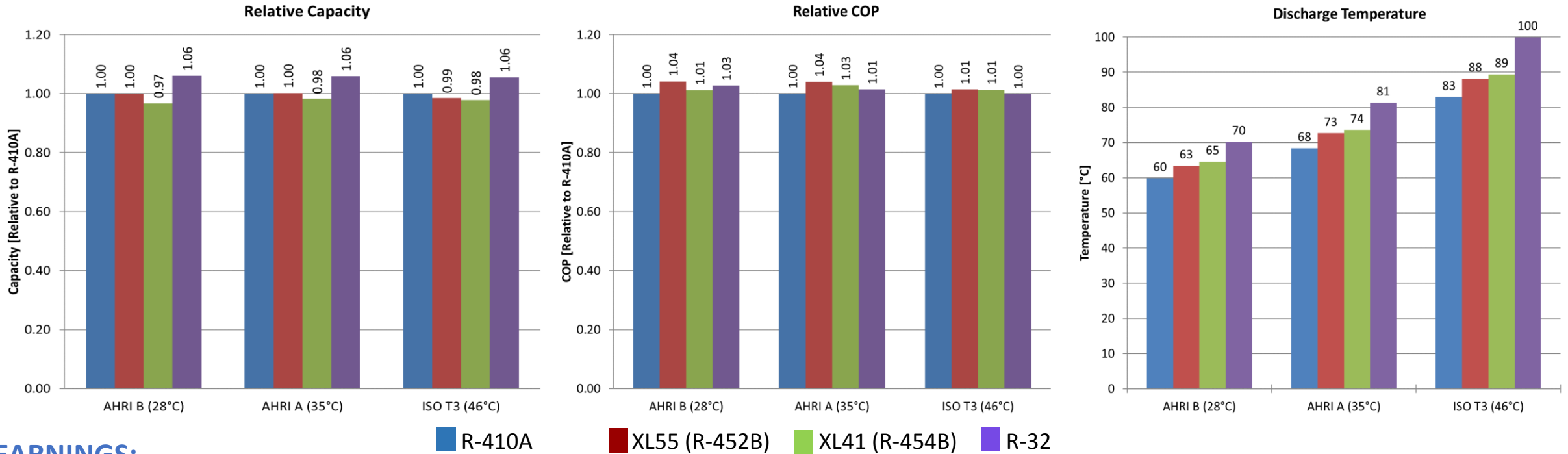
- Opteon™ XL41 provides the lowest GWP alternative to R-410A with comparable performance, minimizing need to re-design 410A equipment platform!
- Ultra-low GWP (<150) could be reached, with performance comparable to R-22, but higher glide
- All products shown are ASHRAE Class A2L: Low Toxicity, Mildly Flammable

Thermodynamic cycle model results for A/C Conditions:  
 10.0°C Avg Evap/ 46.1°C Avg Cond/ 8.3 K Subcool/11.1K Superheat, 70% Compressor Efficiency



# System testing – comparing lower GWP R-410A alternatives

**“Soft Optimized” Performance Tests:** Off-the-shelf 8.8 kW, 16 SEER ducted split AC/HP system in environmental chamber  
 Scroll compressor with POE lubricant; Replaced OEM TXV with EEV to match R-410A superheat



## LEARNINGS:

- ✓ Design Compatible 2L options exist to closely match R-410A Capacity & Improve COP
- ✓ R-452B & R-454B are closer discharge temperature match to R-410A
- ✓ Discharge temperature mitigation may be required for R-32

# Increasing market adoption of Opteon™ XL41 (R-454B)

- R-454B Selected by Carrier for NA Ducted Residential & Light Commercial Products, announced December 2018
- Selected by Johnson Controls for YORK® YLAA Scroll Chiller in Europe, announced October 2018

## Carrier Introduces Puron Advance™: The Next Generation Refrigerant for Ducted Residential, Light Commercial Products in North America

INDIANAPOLIS - Dec. 19, 2018

Carrier, in collaboration with The Chemours Company, will offer Puron Advance (R-454B) to meet UN Montreal Protocol Kigali Amendment regulations

Keeping with its long history of leading environmental responsibility, Carrier is offering the refrigerant of the future. After extensive tests and evaluations, Carrier has selected Puron Advance commercially as Puron Advance™, as its primary lower Global Warming Potential (GWP) refrigerant for all of its ducted residential and light commercial packaged solutions. Puron Advance, which is offered in these Carrier products beginning in 2023, is expected to help meet the new regulations. Carrier will select the best-suited refrigerant for other Carrier products in the future. Carrier is a business, a world leader in high-technology heating, air-conditioning and energy solutions, a leading global provider of innovative HVAC, refrigeration, fire, security and building solutions of United Technologies Corp. (NYSE: UTX).

Carrier has been working with The Chemours Company, a global leader in specialty chemicals, who will produce and distribute the new refrigerant in North America. Puron Advance refrigerant was selected as the best solution to meet the industry's need for improving performance, safety, and longevity, based on the United States Environmental Protection Agency's down plan for HFCs. Carrier has worked closely with regulators and industry partners to ensure regulations that will help ensure the safe use of R-454B.

"Carrier is committed to the environment by providing efficient, reliable and safe products. Puron Advance refrigerant is the next logical step in the evolution of Carrier's ducted Residential HVAC, Carrier. "We carefully studied all alternatives and the environmental impact for this product category. Innovation and technology will continue to lead the way with the evolution of refrigerants of the future."

Data Sheet

**YORK® YLAA Scroll Chiller**  
with low-GWP R-454B



**Leading the transition to the next generation of low-GWP refrigerants**

Johnson Controls continues to take a leadership role in the transition to the next generation of low global warming potential (GWP) refrigerants with the announcement of R-454B available on the YLAA scroll chiller platform from 390 to 520 kW cooling capacity.

The YORK® YLAA air-cooled chiller is an environmental leader delivering outstanding efficiency for all air-conditioning applications. YLAA chillers are self-contained cooling solutions that are light-weight and compact for convenient installation and have a wide range of accessories and options including factory packaged variable speed pumps, Johnson Controls Smart Connected Chillers intelligent performance monitoring, and low sound packages.

**Why adopt the R-454B?**

- ▶ Transitioning to low-GWP refrigerants is mandated by F-Gas regulations with the goal of reducing greenhouse gases.
- ▶ R-454B has the lowest-GWP and is most aligned with F-Gas goals and refrigerant quota costs.
- ▶ F-Gas regulations have caused a significant shift in refrigerant pricing, whether purchased in EU or imported. By moving to low-GWP R-454B, the YORK® YLAA is prepared for the future as F-Gas quotas continue to drive costs up.
- ▶ Same capacity and higher efficiency than R-410A.

**About R-454B refrigerant**

R-454B is a low-GWP HFO refrigerant to replace R-410A in positive displacement, direct expansion air-conditioning, heat pump and chiller applications. R-454B is the lowest GWP replacement for R-410A and provides similar properties and operating performance without major modifications to the equipment design. While all commercially viable replacements for R-410A are classified as flammable, R-454B has a lower burn velocity than R-32 and has the mild flammable and low toxicity ASHRAE classification of A2L.

**YLAA product features**

- ▶ SCROLL COMPRESSORS
- ▶ MICROCHANNEL CONDENSER
- ▶ EER UP TO 3.3 (EUROVENT CLASS A)
- ▶ LOW SOUND OPERATION
- ▶ SINGLE POINT ELECTRICAL CONNECTION
- ▶ OPTIONAL PUMP PACKAGES
- ▶ OPTIONAL HEAT RECOVERY TO 60°C
- ▶ AMBIENT OPERATION FROM -35°C TO 53°C
- ▶ CHILLED WATER SUPPLY FROM -12°C TO 15°C






	R-410A	R-454B	R-32
Composition	R-125 & R-125	R-32 & R-1234yf	R-32
GWP (eq)	2088	476	677
Safety Classification	A1	A2L	A2L
Capacity	300	300	304
IL COP	300	303	305
SEER	300	300	301
Burn Velocity (m/s)	—	0.7	0.3

For more information ▶ [www.york.com/en/europe](http://www.york.com/en/europe)

YORK® YLAA SCROLL CHILLER WITH LOW-GWP R-454B

Johnson Controls

# Chemours Refrigerant Technology Roadmap

			Non-flammable (XP Series) Class 1		Mildly Flammable (XL Series) Class 2L	
Current	GWP	Application	Product	GWP	Product	GWP
HFC-134a	1300 (1430)		<b>XP10</b> (R-513A)	573 (631)	<b>XL10</b> (R-1234yf)	< 1 (4)
HFC-404A	3943 (3922)		<b>XP40</b> (R-449A)	1282 (1397)	<b>XL40</b> (R-454A)	238 (239)
			<b>XP44</b> (R-452A)	1945 (2140)	<b>XL20</b> (R-454C)	146 (148)
HFC-410A	1924 (2088)		<b>XP41</b> (R-463A)	1377 (1494)	<b>XL41</b> (R-454B)	467 (466)
					<b>XL55</b> (R-452B)	676 (698)
HCFC-22	1760 (1810)		<b>XP20</b> (R-449C)	1146 (1251)	<b>XL20</b> (R-454C)	146 (148)
HCFC-123	79 (77)		<b>XP30</b> (R-514A)	2 (7)		
			<b>MZ</b> (R-1336mzz(Z))	2 (9)		

Note: GWP values AR5 (AR4)

The Global Forum for Advanced Climate Technologies (globalFACT) promotes education, awareness, and policies that support the important role of new-generation, low- and reduced-global warming potential (GWP) advanced climate technologies in protecting the environment, while meeting the rapidly increasing demand for safe alternatives.

## Who is involved in globalFACT?

globalFACT is a non-profit membership organization comprised of the world's leaders in advanced climate technologies.

## What are Advanced Climate Technologies?

Advanced climate technologies include new-generation HFOs and blends, and select HFCs with lower GWP compared to previous products. These solutions for refrigerants, propellants, and blowing agents significantly reduce total climate impact, and maintain or improve energy efficiency, affordability, and flexibility to enable use for a wide variety of applications and climates.

*News, White Paper, Forum, Product, Options, Cost Calculator and more* <https://www.globalfact.org>

# Cost & Efficiency Calculator

Country	City	Refrigerant	Medium Temperature Load (%)	Electricity Emissions (kg CO <sub>2</sub> eq/kWh)	Leak Rate (%)	Electricity Cost (\$/kWh)	Charge Size (Kilograms)	Store Size (Thousands of m <sup>3</sup> )	Electricity Cost Per Annum	Emissions
TAIWAN	TAIPEI	R-404A, GWP ~4000	70	0.4	12	0.08	900	4	77,949 US\$	745 t CO <sub>2</sub> e
TAIWAN	TAIPEI	HFO BLEND, GWP ~1300	70	0.4	12	0.08	900	4	75,030 US\$	492 t CO <sub>2</sub> e
TAIWAN	TAIPEI	CO2 BOOSTER, GWP = 1	70	0.4	12	0.08	900	4	102,309 US\$	512 t CO <sub>2</sub> e

Label	Value	Unit
ELECTRICITY COST (US) FOR REFRIGERANT EQUIPMENT OPERATION	77,949 US\$	US\$
TOTAL EMISSIONS (METRIC TONNES OF CO <sub>2</sub> EQ YEAR)	745 t CO <sub>2</sub> e	t CO <sub>2</sub> e
	<b>Total</b>	<b>Equivalent</b>

Label	Value	Unit
ELECTRICITY COST (US) FOR REFRIGERANT EQUIPMENT OPERATION	75,030 US\$	US\$
TOTAL EMISSIONS (METRIC TONNES OF CO <sub>2</sub> EQ YEAR)	492 t CO <sub>2</sub> e	t CO <sub>2</sub> e
	<b>Total</b>	<b>Equivalent</b>

Label	Value	Unit
ELECTRICITY COST (US) FOR REFRIGERANT EQUIPMENT OPERATION	102,309 US\$	US\$
TOTAL EMISSIONS (METRIC TONNES OF CO <sub>2</sub> EQ YEAR)	512 t CO <sub>2</sub> e	t CO <sub>2</sub> e
	<b>Total</b>	<b>Equivalent</b>

**Thank you!**