



# *Climate Friendly Solutions for Refrigerants*

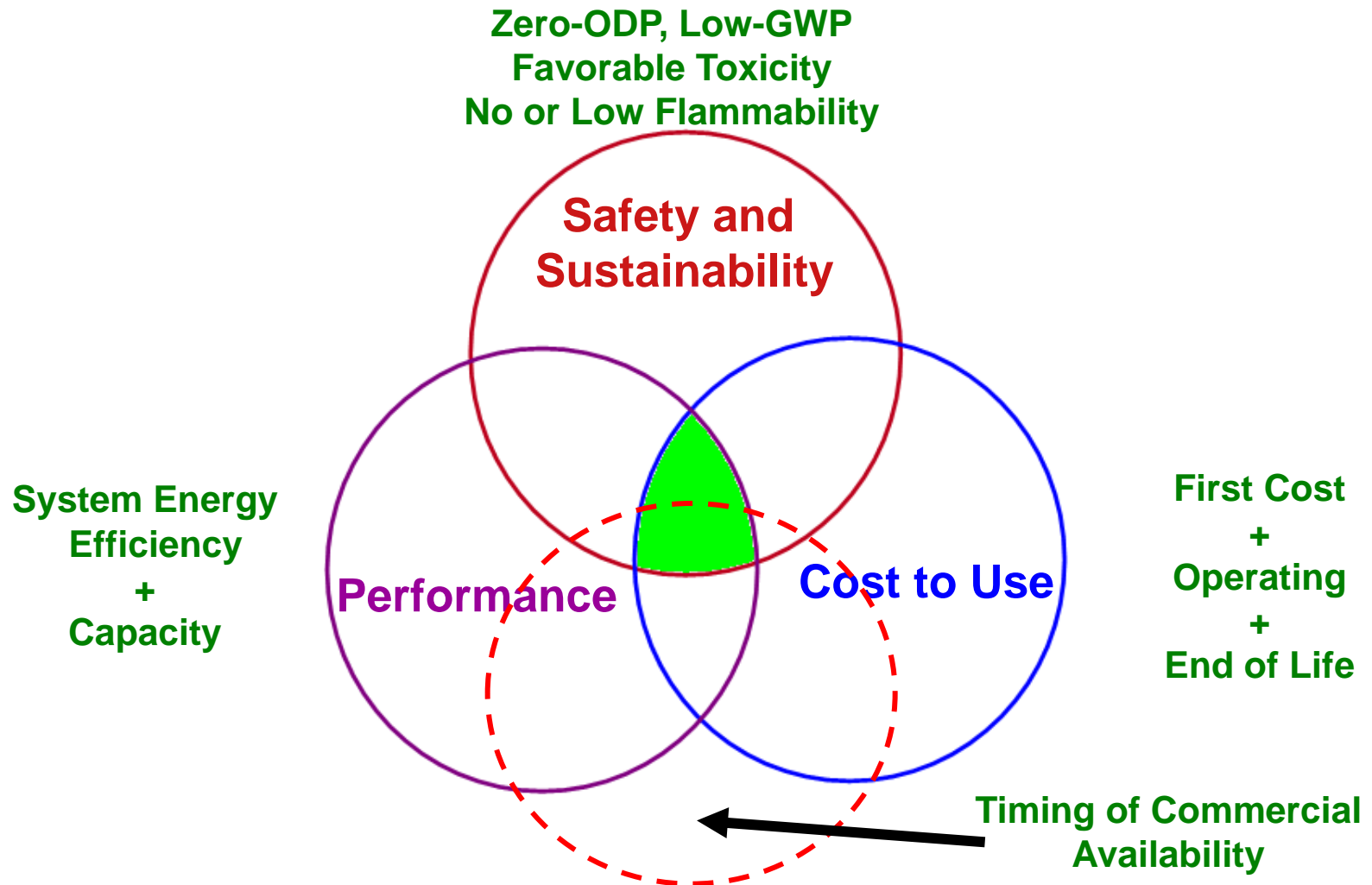
**CRAA/UNEP Ozone2Climate Industry Roundtable 2014**  
**Shanghai, China**  
**9 April, 2015**

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**Global Business and Marketing Manager**  
**DuPont Fluorochemicals**



# Ozone2Climate Alternative Selection

## Optimal Balance of Properties for each Application



# Exceeding Regulatory Requirements Meeting Environmental Challenges

**CFCs**



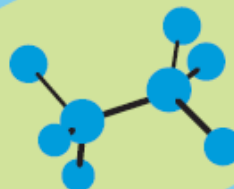
High ODP  
High GWP

**HCFCs**



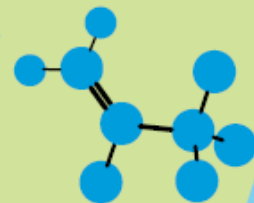
Low ODP  
High GWP

**HFCs**



Zero ODP  
High GWP

**HFOs**



Zero ODP  
Very Low GWP

ODP = Ozone Depletion Potential  
GWP = Global Warming Potential

## Optimal Balance of Properties

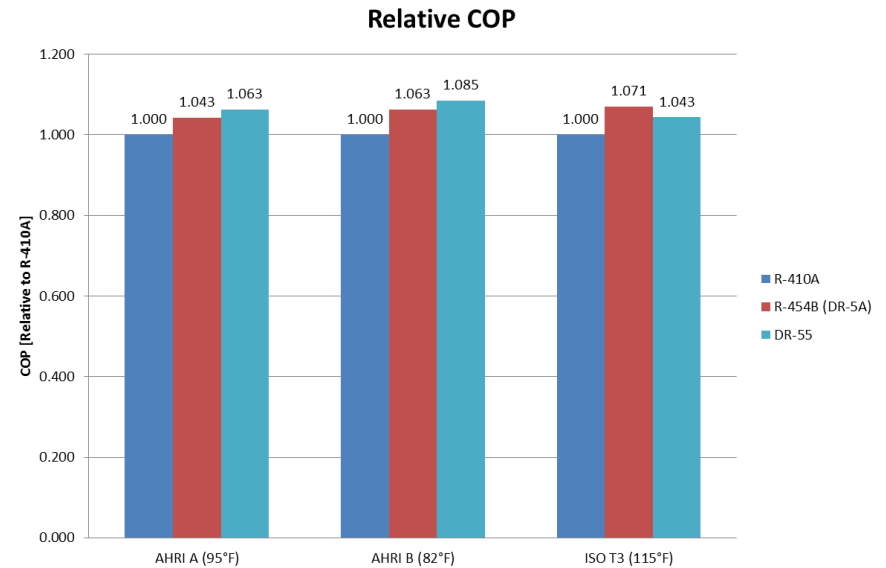


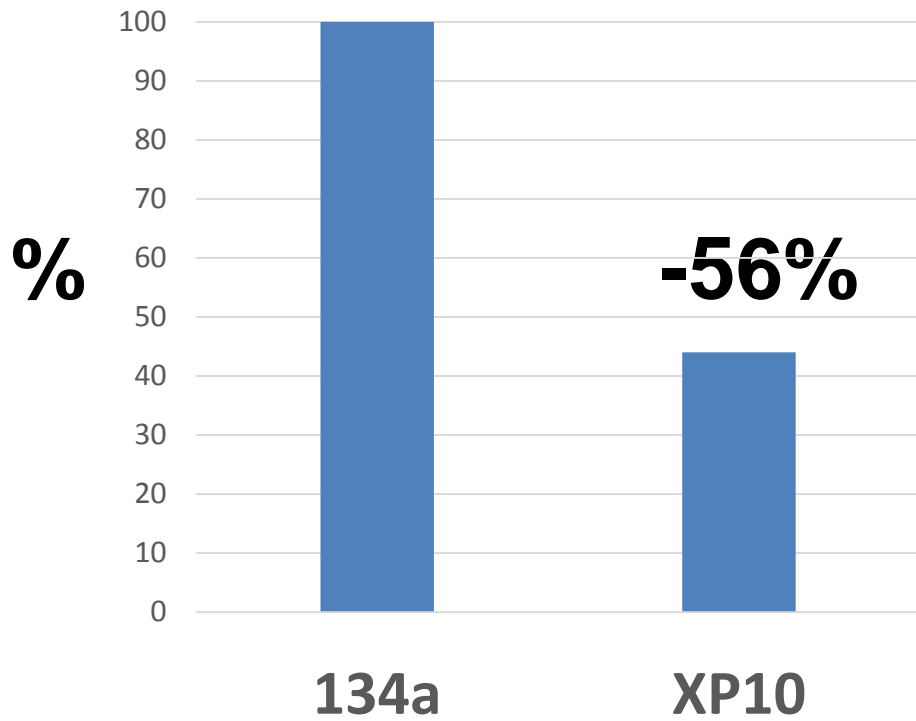
Notes: GWP values AR5  
"DR" pre-commercial

		Lower GWP Leading Options			
		Nonflammable Class 1		Mildly Flammable Class 2L	
<u>Current</u>	<u>GWP</u>	<u>Name</u>	<u>GWP</u>	<u>Name</u>	<u>GWP</u>
HFC-134a	1300	(R-513A) XP10	573	YF	1
		DR-14A	387		
HFC-404A	3943	(R-449A) XP40	1282	DR-7	244
		(R-452A) XP44	1945		
HFC-410A	1924			(R-454B) DR-5A	461
				DR-55	680
HCFC-22	1760	DR-93	1153	DR-3	146
HCFC-123	79	(R-1336mzz(Z)) DR-2	2		

## Drop-in test in R-410A Residential AC Unit

- Improved performance
- ~ 70% GWP reduction
- 2L flammable
- DR-5A: R-454B, lowest GWP (460)
- DR-55: Improved safety





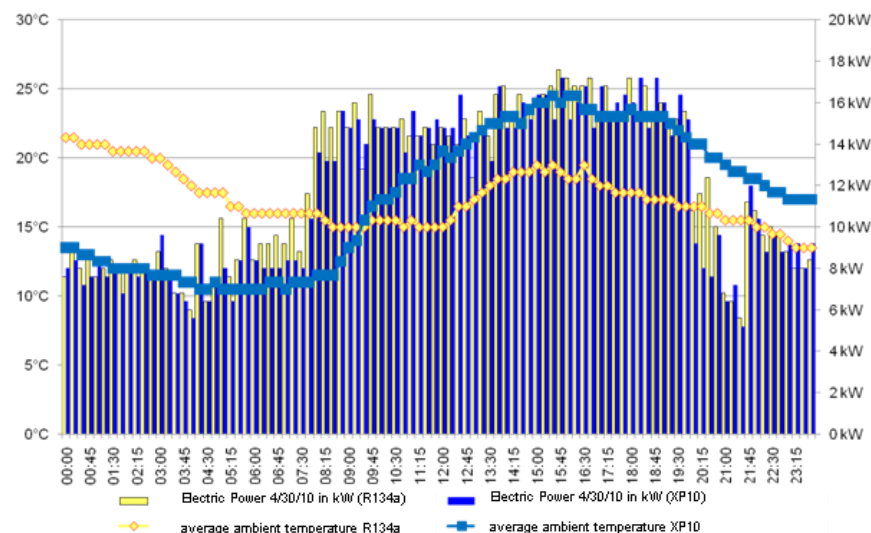
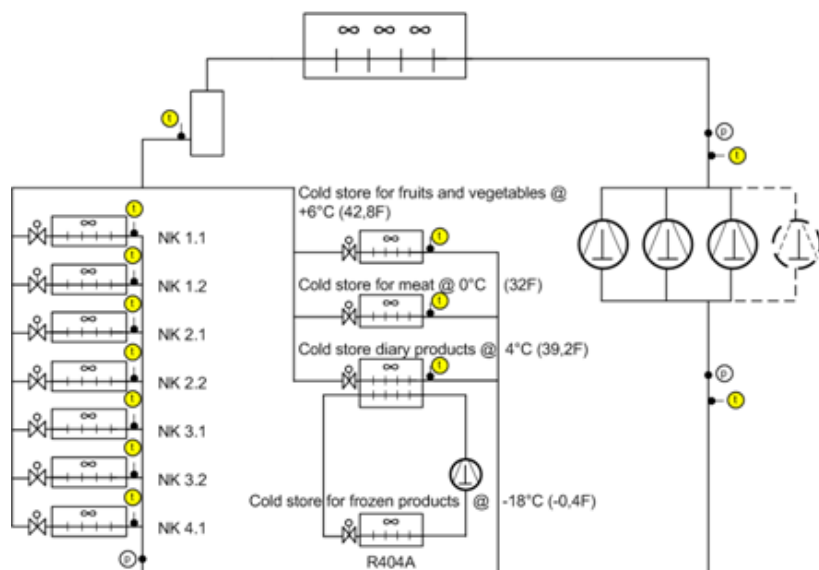
## *(R-513A) XP10*

- ❑ R-134a replacement; new and retrofit
- ❑ Azeotrope
- ❑ Best for chillers and refrigeration

# (R-513A) - Opteon® XP10

## German Discount Supermarket Field Test R-134a Converted to Opteon® XP10

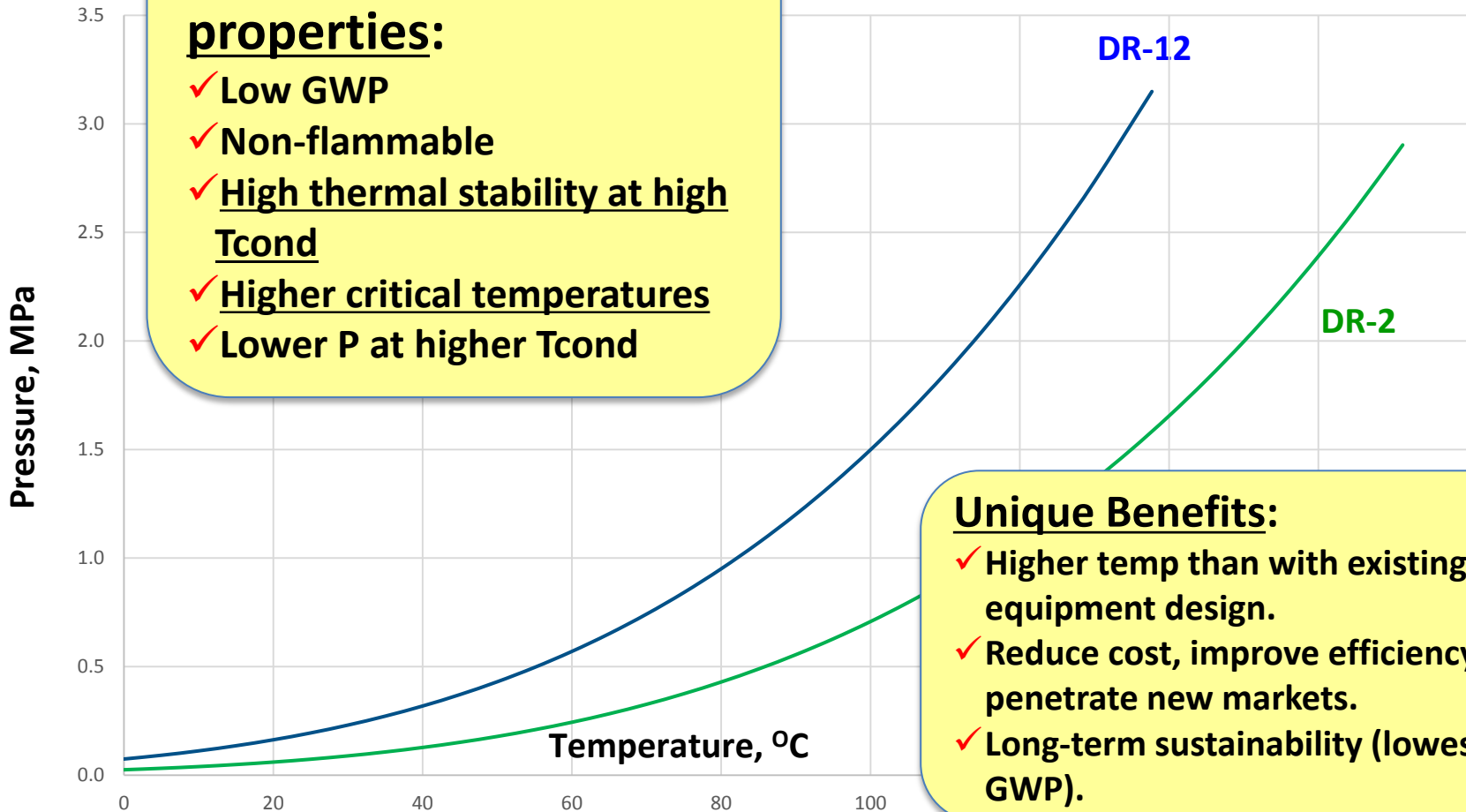
- Easy transition from R-134a
- ASHRAE R-513A, safety class A1
- **56% lower GWP**
- **Improved energy performance**
  - **>3% vs R-134a**



# Fluid Innovations for Waste Heat Recovery

## Unique combination of properties:

- ✓ Low GWP
- ✓ Non-flammable
- ✓ High thermal stability at high  $T_{cond}$
- ✓ Higher critical temperatures
- ✓ Lower P at higher  $T_{cond}$



## Unique Benefits:

- ✓ Higher temp than with existing equipment design.
- ✓ Reduce cost, improve efficiency, penetrate new markets.
- ✓ Long-term sustainability (lowest GWP).

	DR-12	DR-2
$T_{cr}$ °C	137.7	171.3
GWP (AR5)	9	1



# Summary

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## **1. *Ozone2Climate alternative selection***

- **Optimal balance of properties for each application**

## **2. *HFO Technology***

- **Deliver lower GWP + reduced energy use**
- **Part of the long-term solution**



# Thank You

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