

ISCEON Refrigerants

HVACR Educators & Trainers Conf

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Agenda

- **R-22 Outlook – Business As Usual No Longer An Option !**
- **“Carbon Tax” on HFC**
- **Why retrofitting now makes sense**
- **ISCEON MO99 compressor approval**
- **Air conditioning retrofits**
- **The Retrofit Procedure**
- **Next Generation Refrigerants**

Two Independent Refrigerant Legislative Actions

2010

~2012

2015

2020

2032

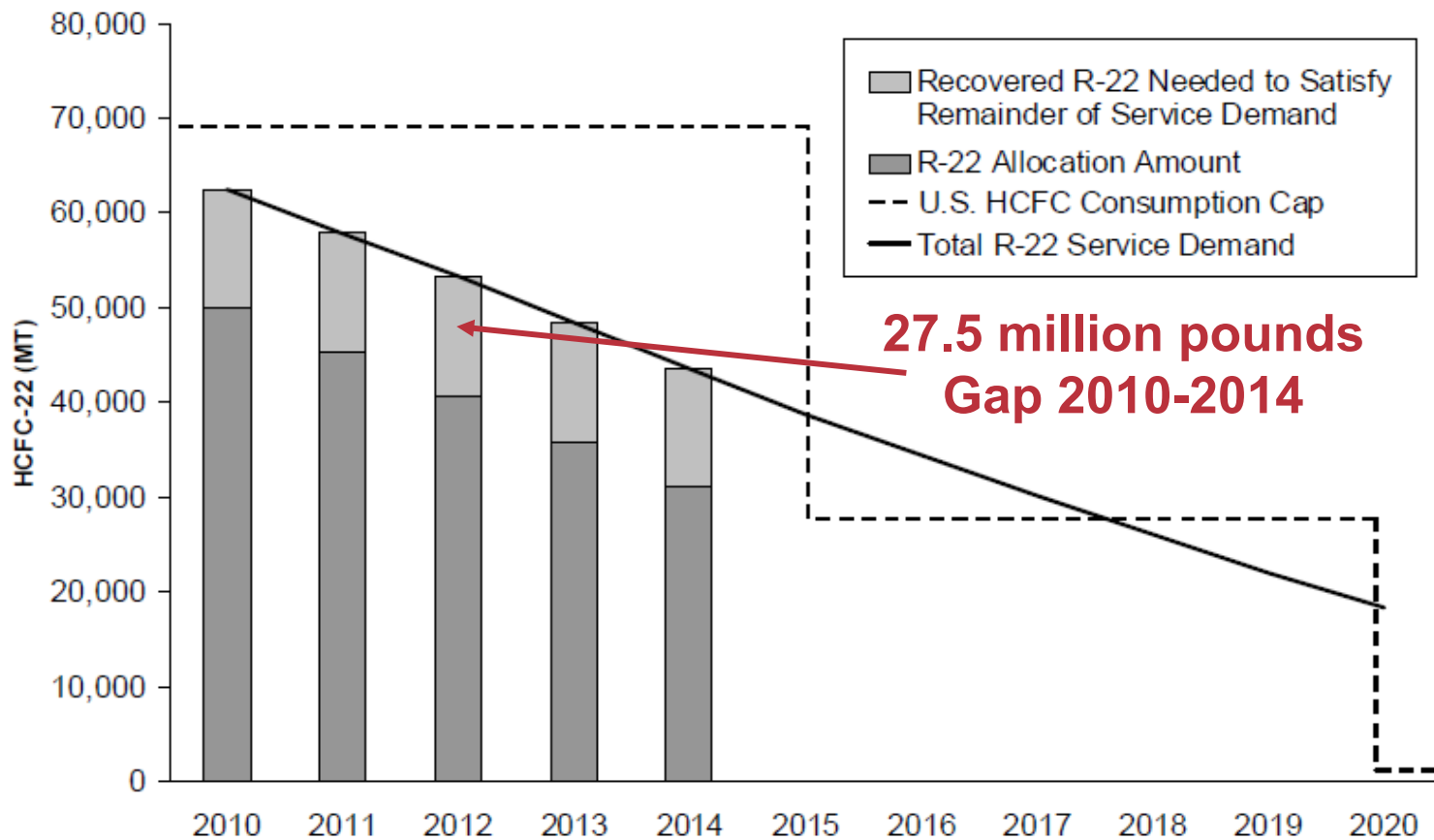
U.S. Clean Air Act
HCFC-22 is Going Away

Pending Climate Change Legislation
HFC Phase down

There are two separate legislative actions impacting the HVAC industry

R-22 Allocations vs Projected Demand

Figure ES-1: Total Projected R-22 Servicing Demand and EPA's 2010-2014 Allocations of HCFC-22^a



^a U.S. HCFC consumption cap expressed in R-22 un-weighted metric tons (calculated using an ODP of 0.055 for HCFC-22).

From "The U.S. Phaseout of HCFCs: Projected Servicing Needs in the U.S. Air Conditioning and Refrigeration Sector" Final Report prepared for U.S. EPA

R-22 Outlook

December 15, 2009 EPA issues Final Rule for HCFC-22 allowances

Business as usual is no longer an option

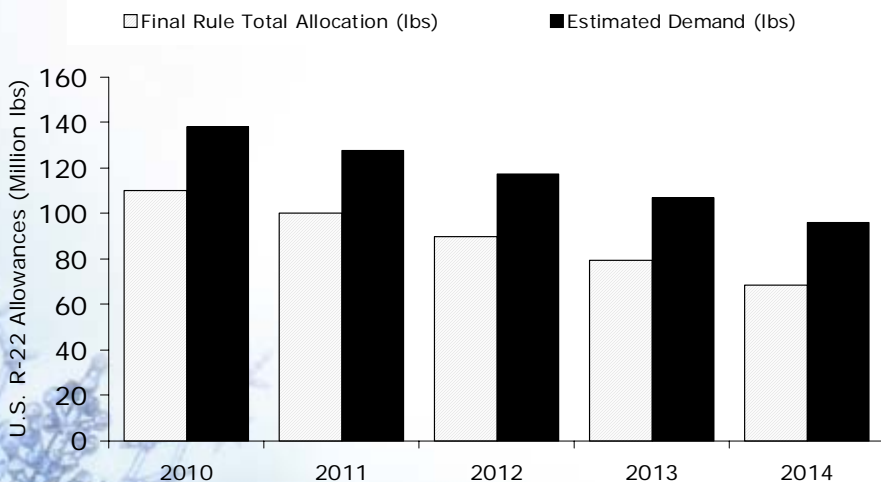
Behavior change in R-22 use is required to avoid shortages

- Reclaim needs to increase from 7% to 20% to meet expected demand

27.5 Million pounds annual R-22 supply shortfall 2010 thru 2014

138 Million Pound Difference Between Allowances and Estimated Demand 2009 - 2014

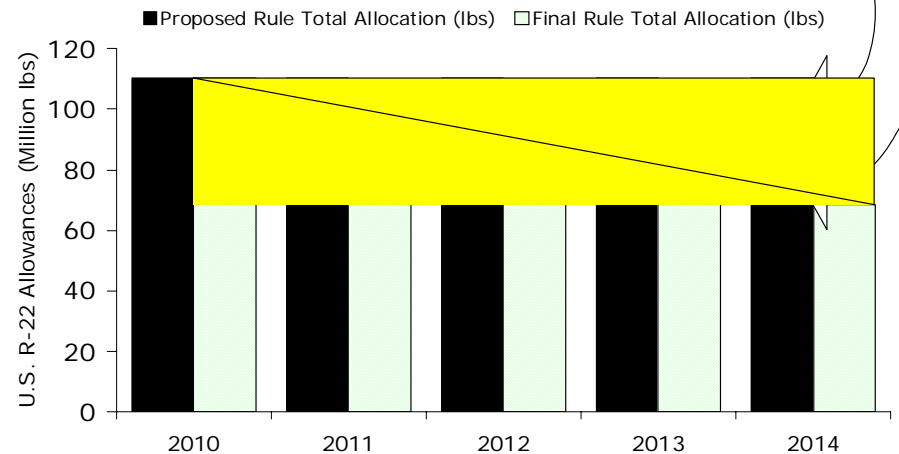
Federal Register: December 15, 2009*



*Adjustments to the Allowance System for Controlling HCFC Production, Import and Export: Final Rule: R-22 refrigerant need will need to be made up by improved service practices, reclaim & retrofits to zero ozone depleting substances.

103 Million Pounds of Virgin R-22 Removed From U.S. Market 2010 - 2014

Federal Register: December 15, 2009*



*Adjustments to the Allowance System for Controlling HCFC Production, Import and Export: Final Rule: R-22 refrigerant need will need to be made up by improved service practices, reclaim & retrofits to zero ozone depleting substances.

“Carbon Tax” on HFC

HFC Refrigerants likely to be cost effective long term cooling products:

CO₂ is a waste product and will likely be regulated

HFC refrigerants are produced for societal benefit

All variations of climate legislation put HFC refrigerants out of the broad carbon basket

Only modest “carbon equivalent” fees for HFCs

HFC legislation likely to look like:

A reduction schedule that will allow a smooth transition away from HCFCs in the near term;

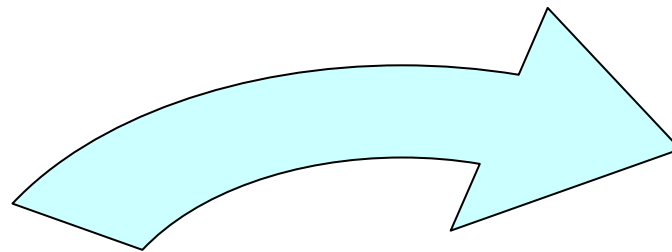
Longer term, time to develop and deploy next generation, low-GWP refrigerant options for stationary applications (e.g. 1234yf)

Future of HFCs

- **Increase in regulations impacting HFCs is very likely**
- **DuPont is committed to:**
 - **Continue to work with key stakeholders**
 - **Provide leadership in the development of more environmentally sustainable, efficient and cost-effective solutions**
- **Policymakers have recognized the unique performance characteristics of HFCs**
- **Proposed regulations would control HFCs separately from the other greenhouse gases and allow time for an orderly transition to more environmentally sustainable alternatives**
- **HFCs are an important part of transition from HCFCs**

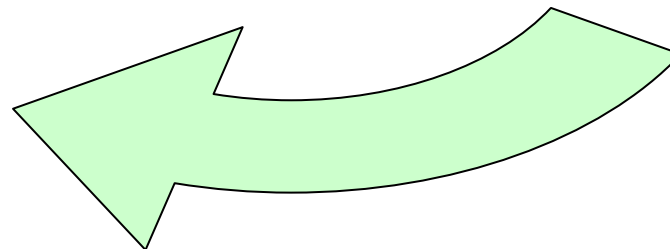
Why retrofitting now makes sense

The R-22 in your equipment is an increasingly valuable asset
Use R-22 wisely to prepare your business for the future



**Use HFC retrofits
to get more R-22**

**Service equipment
with R-22**



Which retrofit refrigerant and why?

HFC Replacements for R-22

Benefits*

Tradeoffs*

417, 422

Use mineral oil

Dissimilar
pressure enthalpy
characteristics

Capacity loss

407, 427

Similar pressure
enthalpy as R-22

Incompatible with
existing mineral oil

POE oil scours &
plugs systems

438 (MO99)

Similar pressure
enthalpy as R-22

Slight capacity loss

Use mineral oil

*For most systems. See retrofit guidelines before using.

ISCEON MO99 compressor approval

The Copeland Brand Product team has approved ISCEON MO99 for use in Supermarket applications using Discus Brand compressors

See 93-11 document located at www.emerson.com

DuPont working with major compressor manufacturers on opportunities to help industry through the HCFC-22 transition

Air conditioning retrofits

Removing compressors to change to POE oil is expensive and time consuming



Eliminate the Pain of Oil Change with The Quick Switch™.

Contractors like DuPont® have taught us what you in this to change to POE oil from mineral oil. Removing the compressor, dumping the oil, adding POE oil and repeating the process is the recommended way to ensure a quality HVAC retrofit. This procedure adds one or more hours to a retrofit to pay for an R-32 retrofit. That's why we have introduced the Quick Switch™ to replace R-32™, DuPont™ GC600A™ and 90/10™ refrigerants. GC600A™ contains a similar R-32 pressure-enthalpy characteristics with mineral oil compatibility in a unique HVAC system that can be used to replace R-32 or mineral oil charge of an open system. The features include the lowest cost retrofit option available to replace R-32. Replaced R-32 refrigerant is not available for use. According to the EPA, starting in 2020, R-32 supply is reduced by 90% with a ramp down over four years through 2024. Protect your business and be a pioneer now.

*This system is for retrofit applications only. It is not intended for use in new installations. Always use proper safety practices when working with refrigerants. See the technical data sheet for more information.

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The retrofit procedure

STEP 1:



Review DuPont™ ISCEON® MO99™ retrofit guidelines, available on isceon.com.

STEP 2:



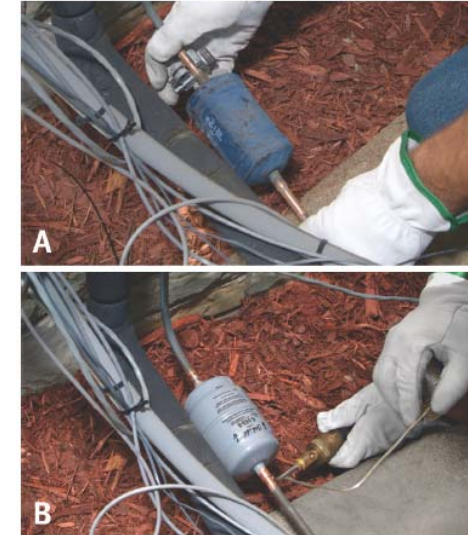
Check baseline performance of R-22 system.

STEP 3:



Remove R-22 refrigerant from the system.

STEP 4:



Remove old filter drier and replace with a new filter drier.

STEP 5:



Replace Schrader valve core seals.

STEP 6:



Pull vacuum on the system.

STEP 7:



Charge system with DuPont™ ISCEON® MO99™ and check system performance.

STEP 8:

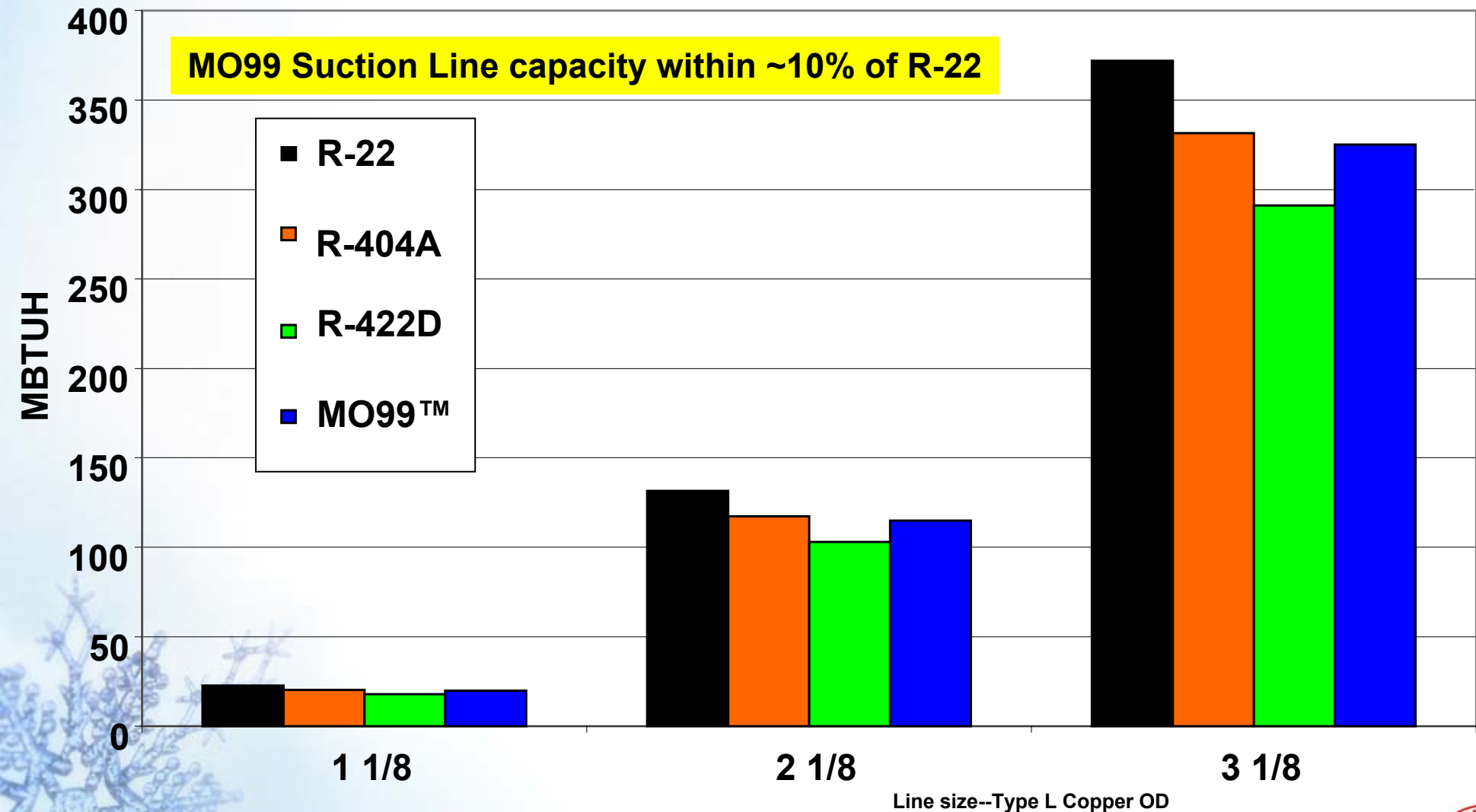


Add the DuPont™ ISCEON® MO99™ label and you're done!

Technical charts

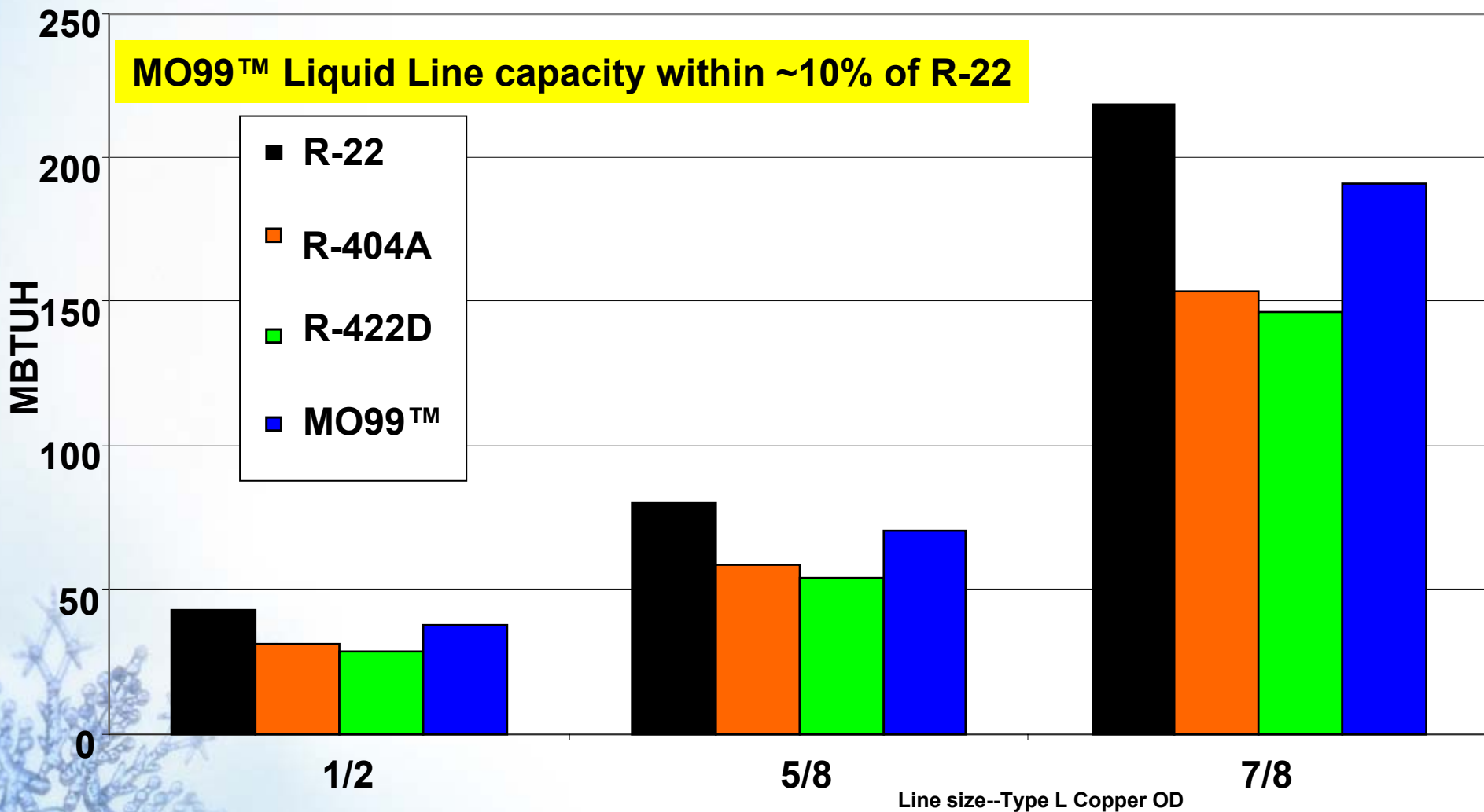
Suction line capacity

Suction Line Capacities @ 20 SST, 105 SDT
for $\Delta T = 0.5$ deg F per 100 ft



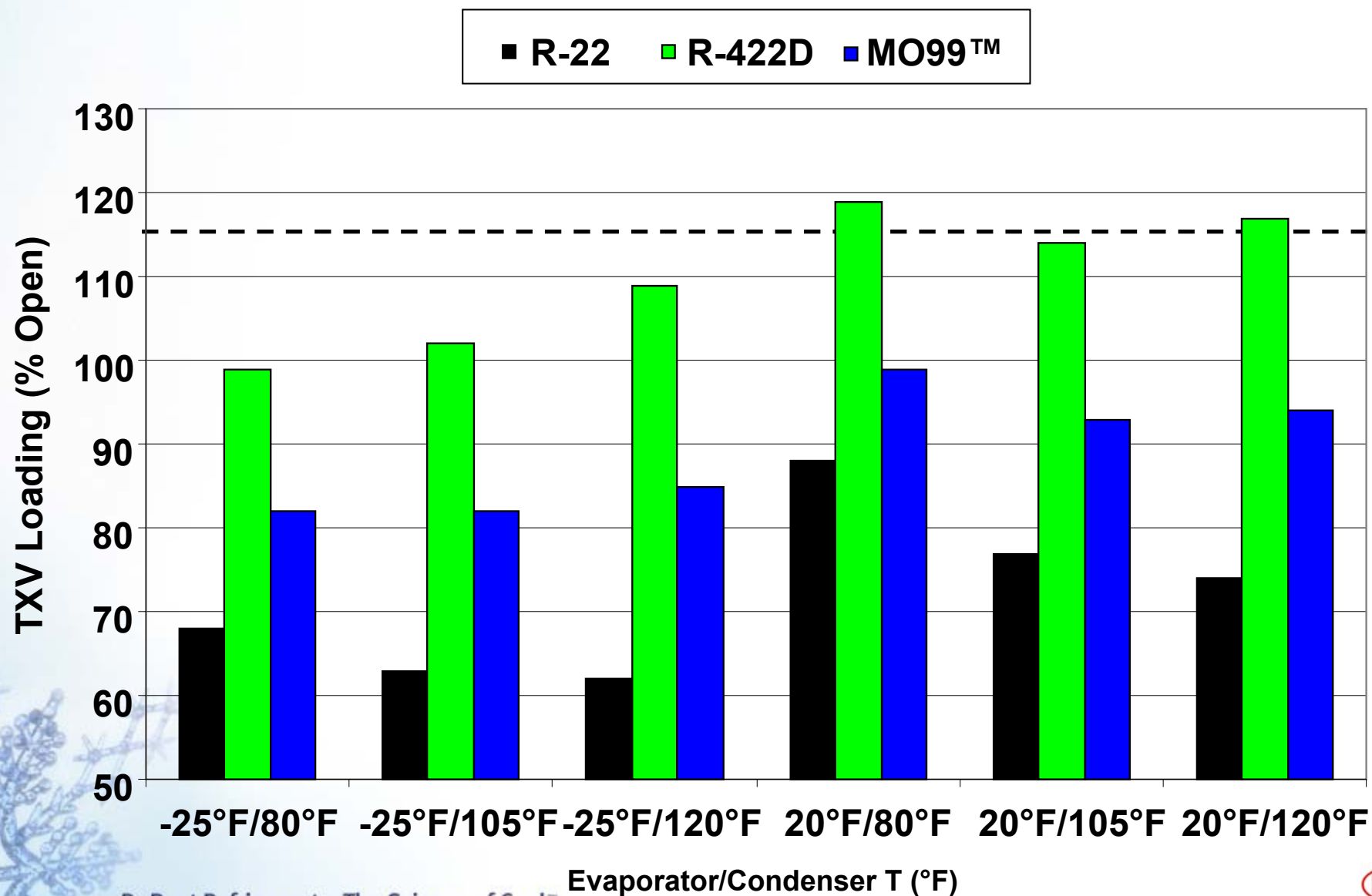
Liquid line capacities

Liquid Line Capacities @ 20 SST, 105 SDT
for $\Delta T = 1$ deg F per 100 ft



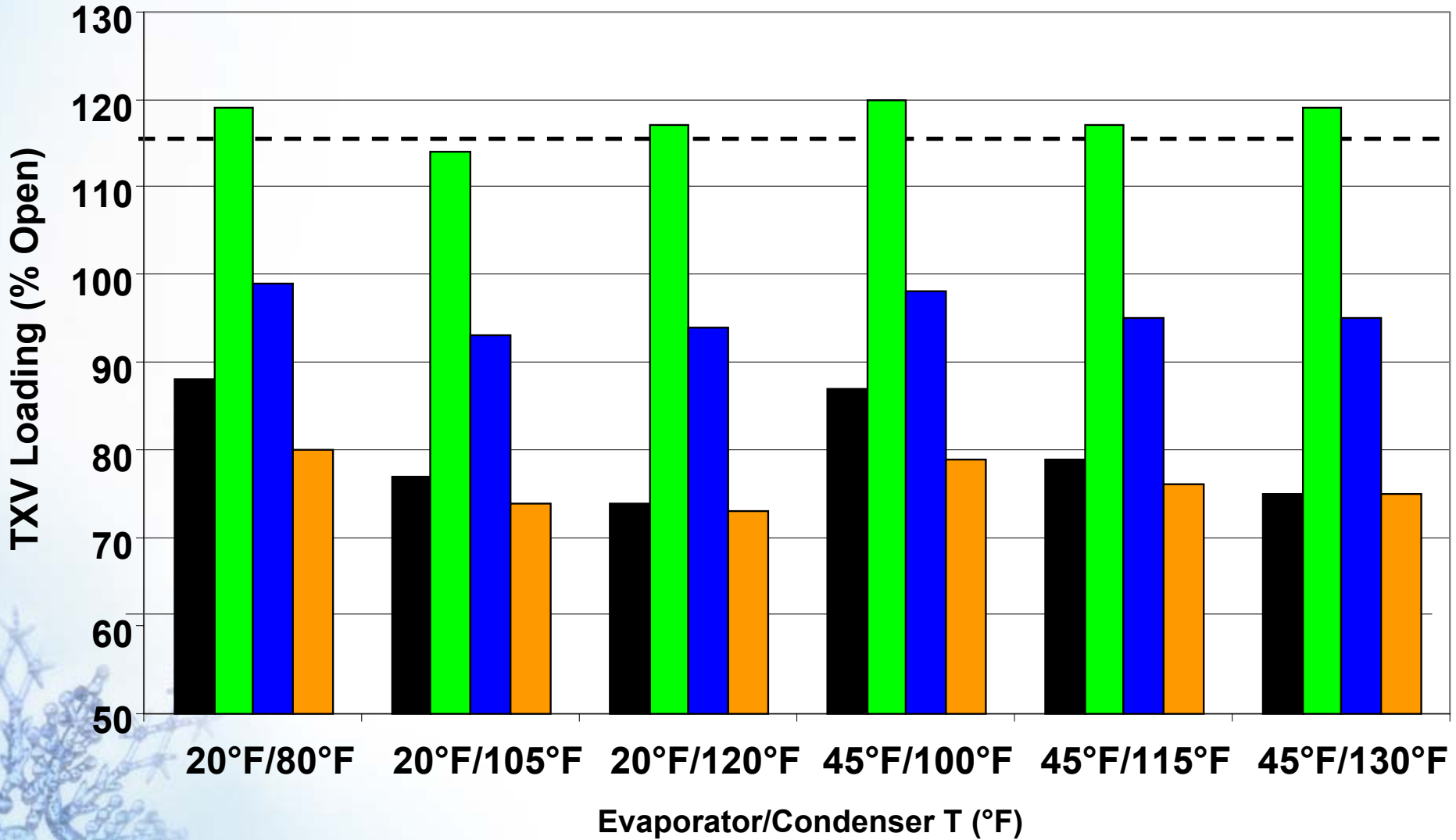
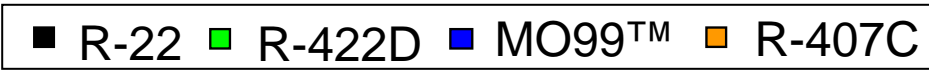
TXV loading for Refrigeration

TXV Loading @ 10°F Liquid Subcool



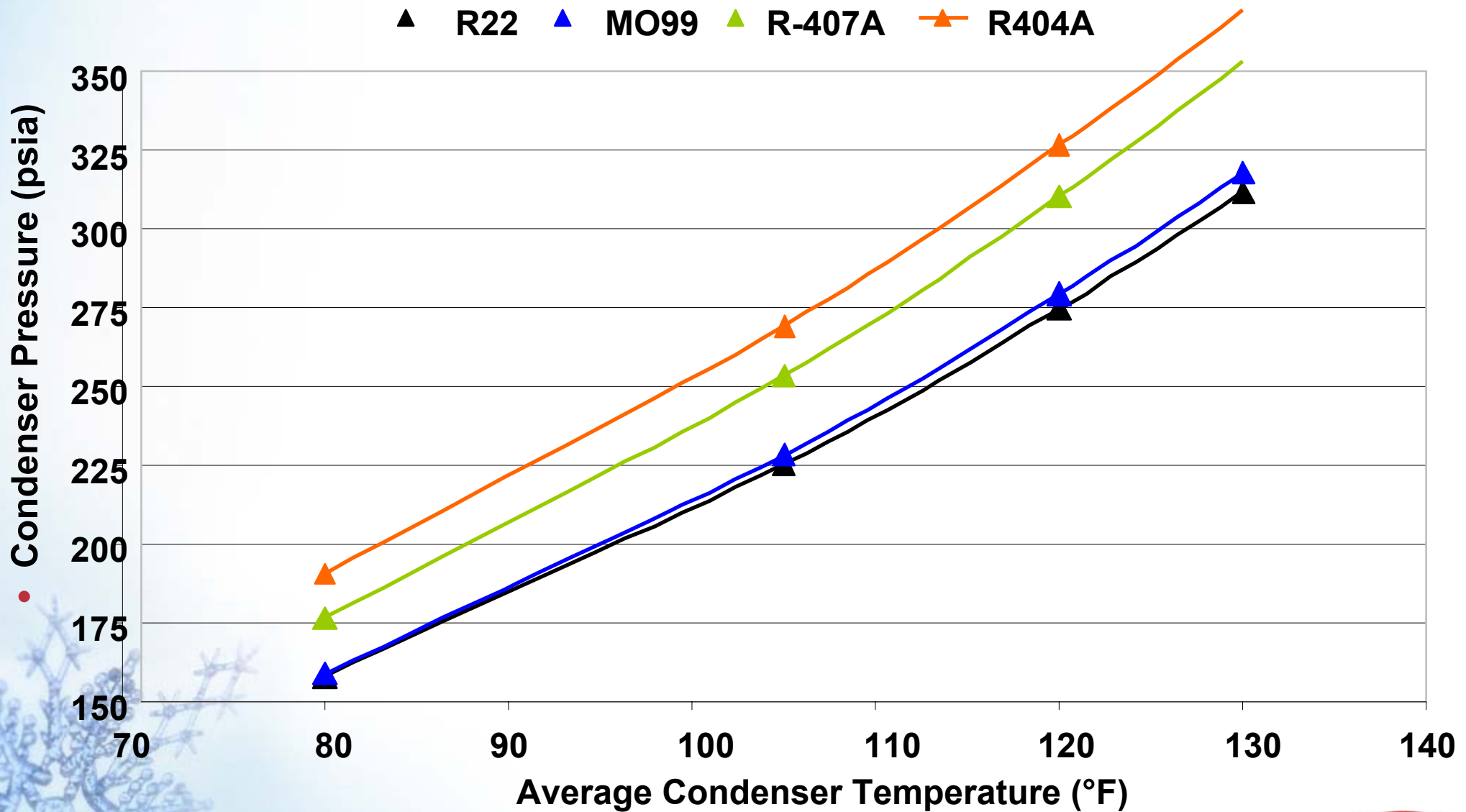
TXV loading for AC

TXV Loading @ 10°F Liquid Subcool

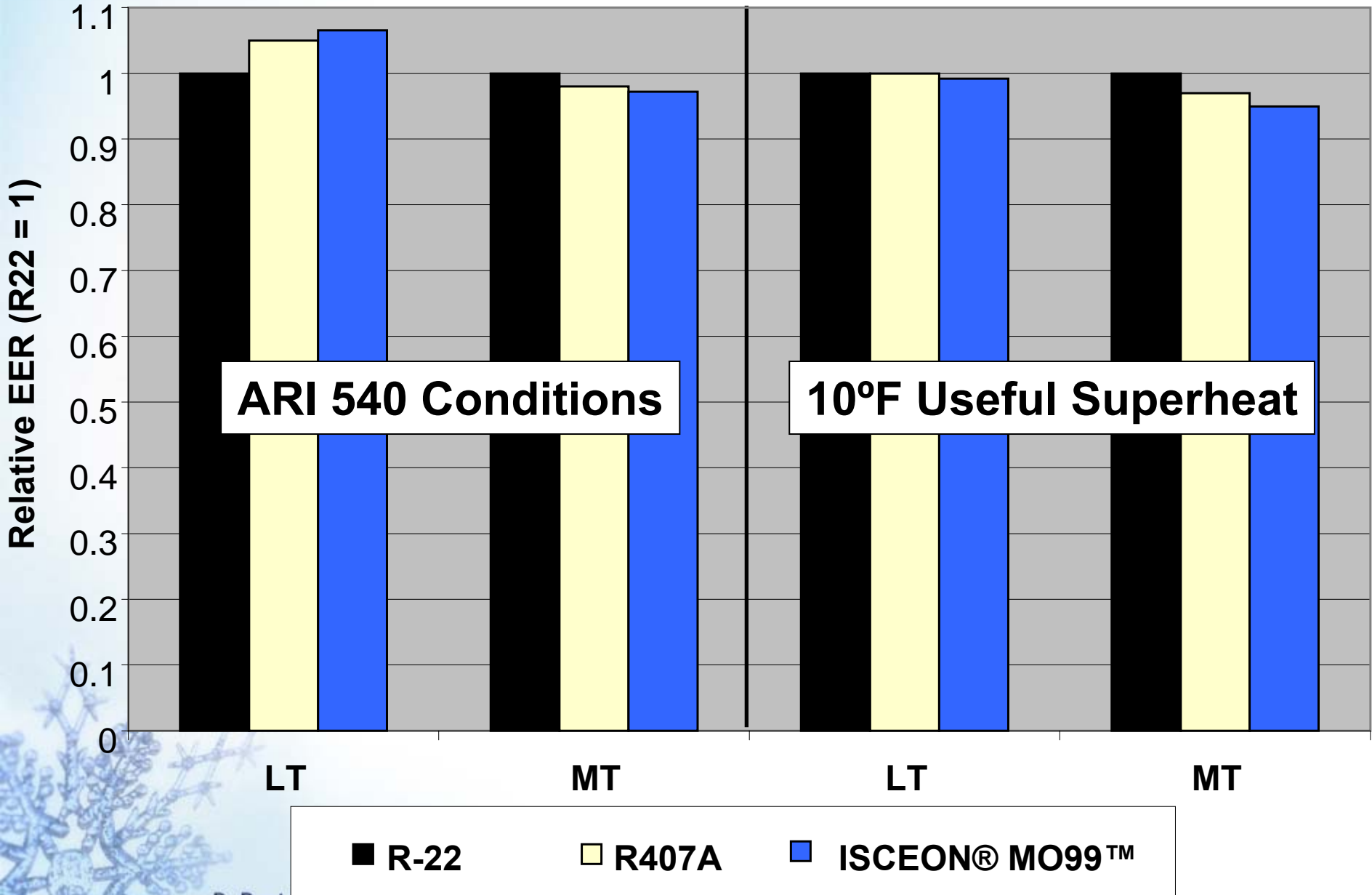


Condenser Pressure vs Condenser Temperature

(based on 20°F Evaporator, 10°F subcooling)

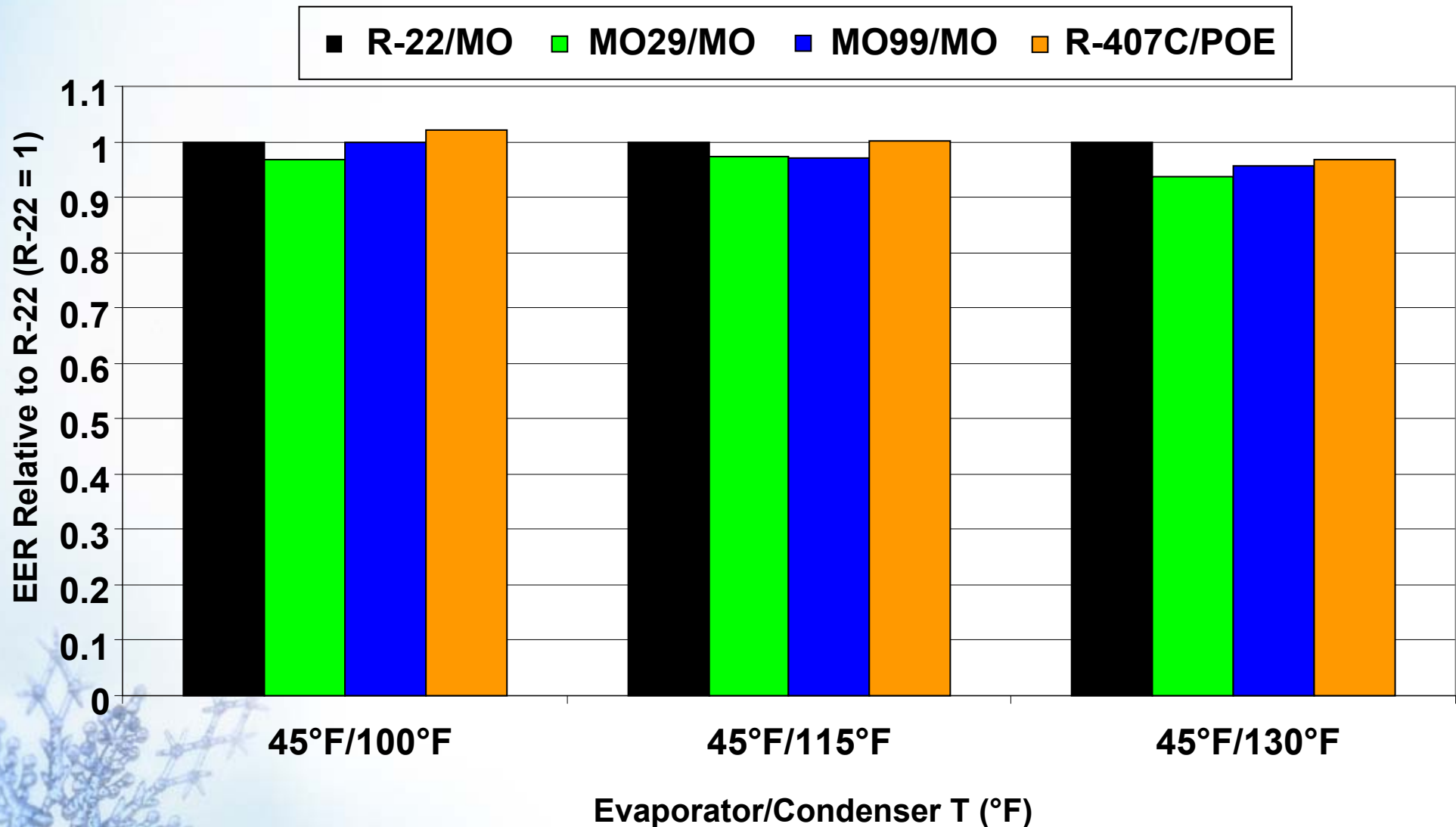


EER Comparison - Refrigeration

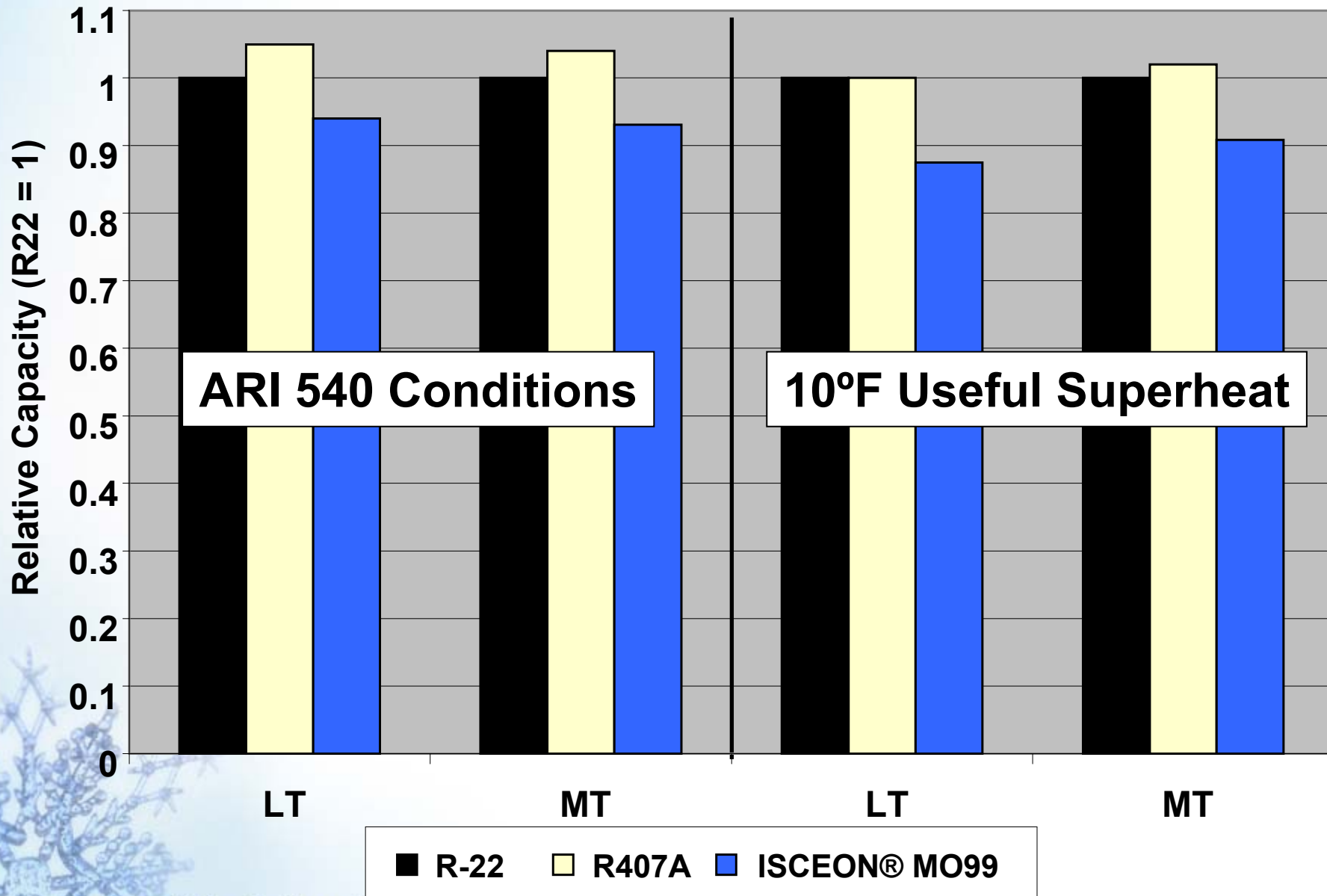


Compressor EER - AC Conditions

HT Calorimeter Data @ 15°F Subcool from Avg Cond T, 65°F Suction T
Copeland Discus® Compressor



Capacity Comparison - Refrigeration

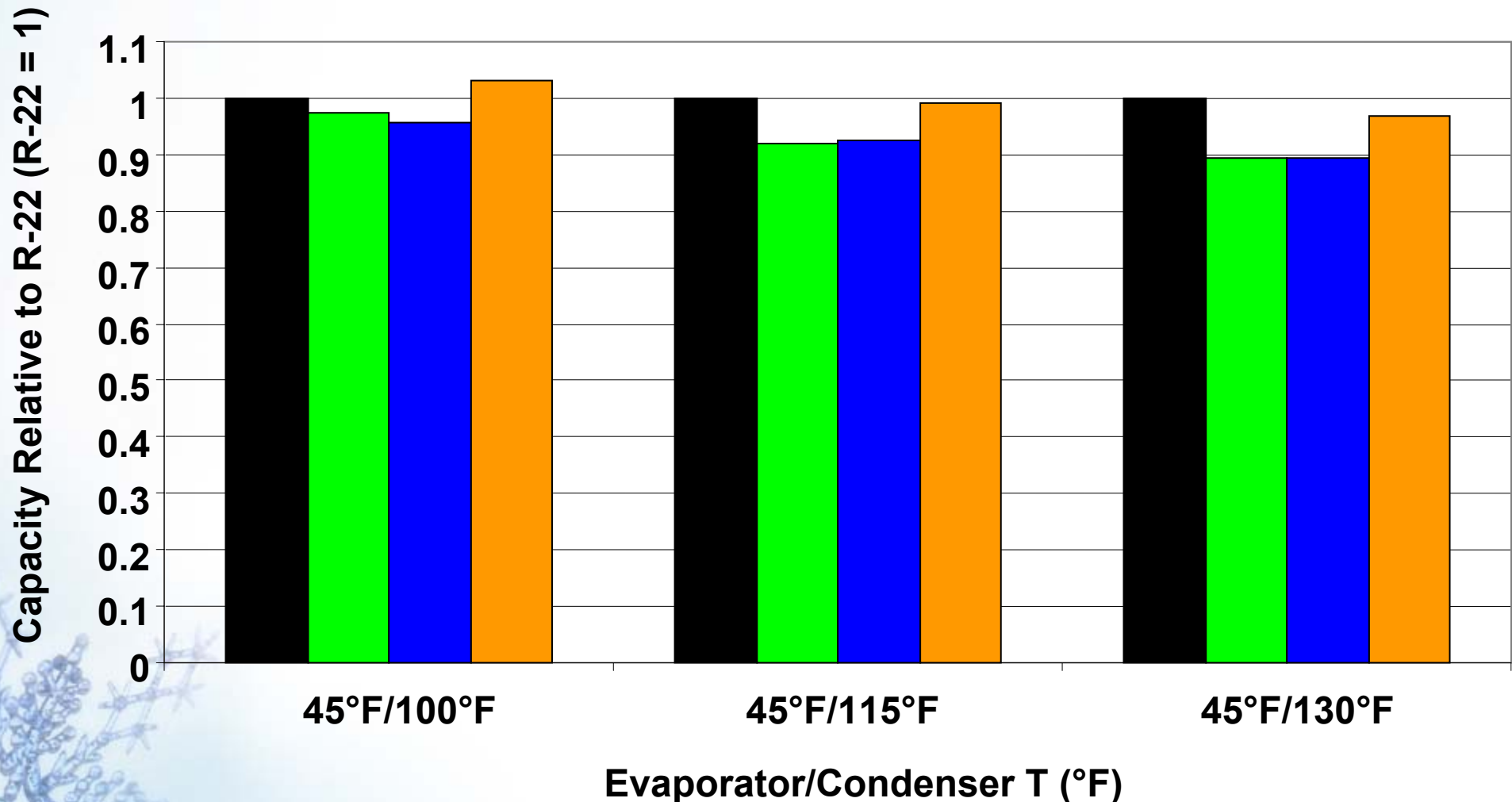


Compressor Capacity - AC Conditions

HT Calorimeter Data @ 15°F Subcool from Avg Cond T, 65°F Suction T

Copeland Discus® Compressor

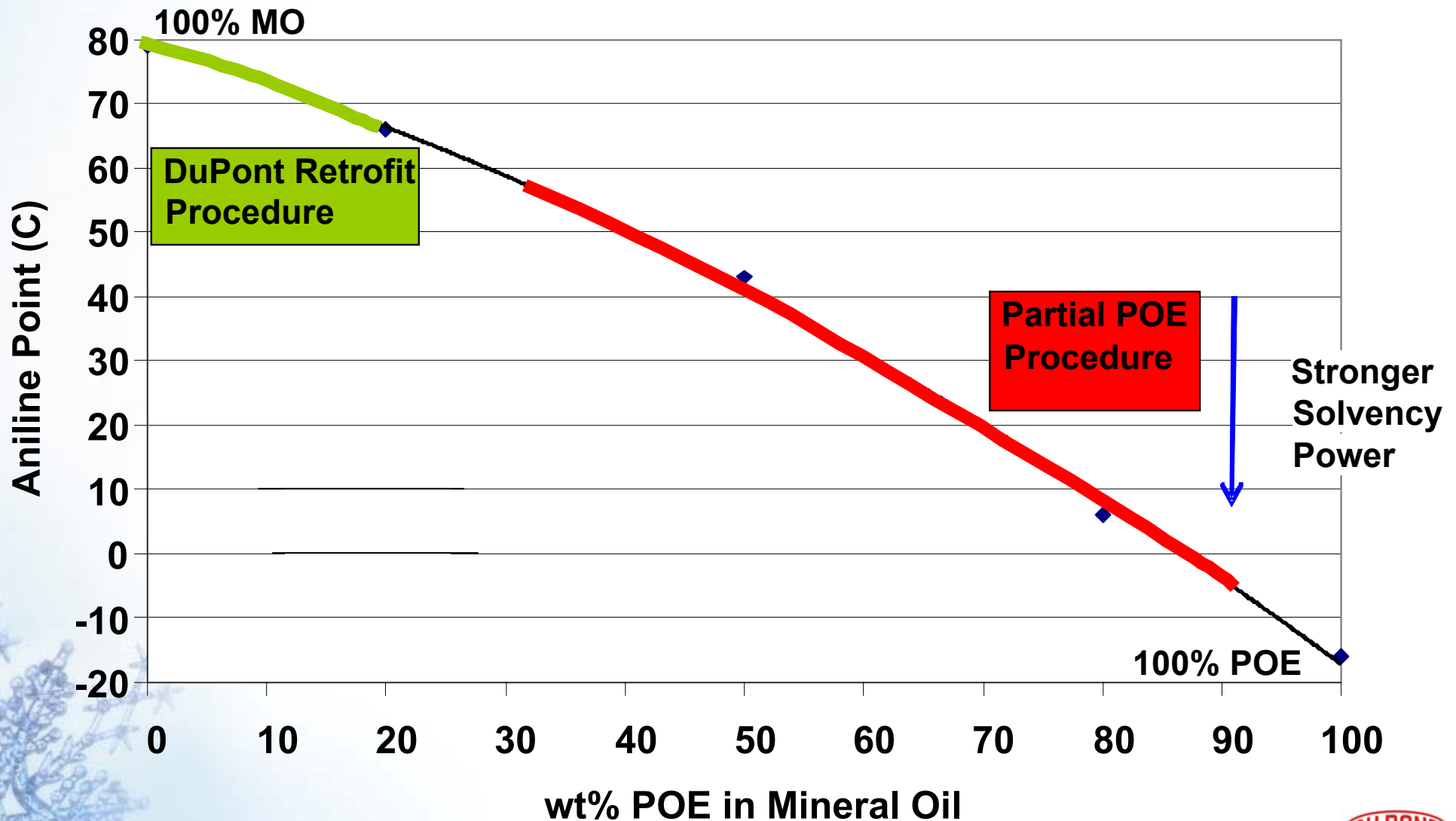
■ R-22/MO ■ MO29/MO ■ MO99/MO ■ R-407C/POE



POE Oil

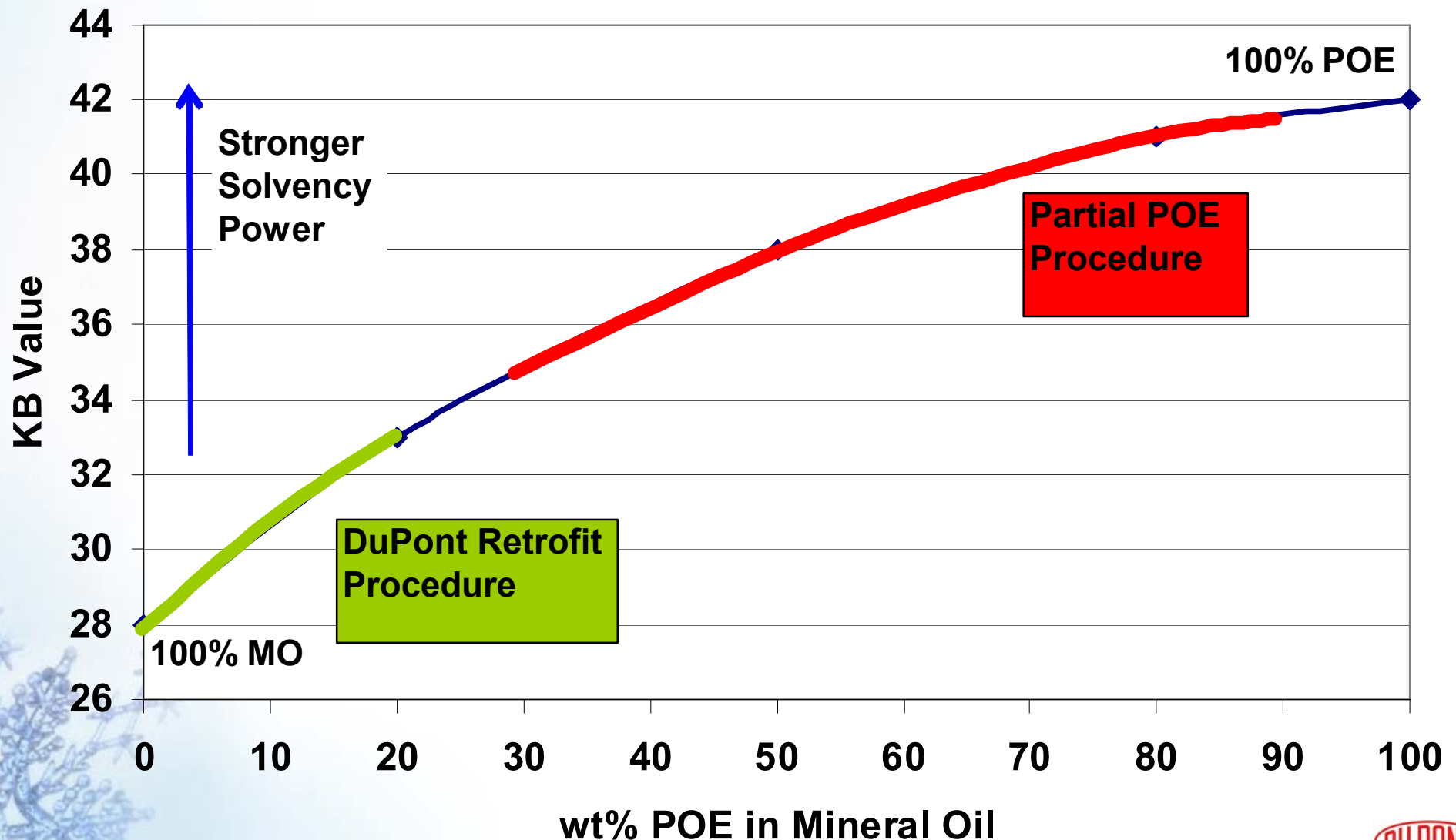
Aniline Point Test (ASTM-D611-07) – test for relevant solvency power of oils/petroleum products. Lower aniline point temperature indicates stronger solvency power.

Aniline Points for MO/POE Mixtures

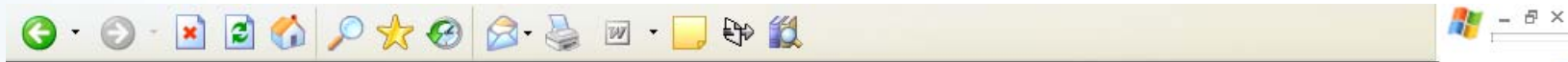


Kauri-butanol test (ASTM-D1133-09) – test for relevant solvency power of solvents. Higher KB value indicates stronger solvency power.

Kauri-Butanol Values for MO/POE Mixtures



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ISCEON® refrigerants

R-22 is Going Away

In 2010, U.S. R-22 demand will exceed allowed virgin R-22 supply by 27.5 million pounds. This projection is based upon the latest EPA demand projections and recent proposed allowance rule. The next significant hydrochlorofluorocarbon (HCFC) stepdown will occur on January 1, 2010, as a result of the more aggressive phasedown of HCFCs agreed to under the Montreal Protocol.

» [R-22 Outlook](#)

Retrofitting to HFC refrigerants, such as ISCEON®, and away from R-22 puts your business in a position to avoid expected R-22 supply shortages, pricing volatility and labor shortages, and can even provide you with a low-cost supply of R-22.

R-22 Price May Be Volatile

Since January of 2003, the price of R-22 in the U.S. market has increased by more than 500%, and the supply reductions created by ongoing regulations are likely to continue to influence R-22 price in the future.

Recovered or Reclaimed R-22 can be used to offset future supply and price volatility

After retrofitting, recovered or reclaimed R-22 can be re-used to offset future R-22 service refrigerant costs.

Which R-22 replacement refrigerant is right for you?

» [Learn More](#)

New

- [R-22 Retrofits During Service Calls](#)
An Opportunity for Contractors
- [Register to view the ISCEON® refrigerants new product video](#)
Listen to DuPont technical experts explain why ISCEON® MO99™ is the quick switch

Distributor Branch Display



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- [Executive Bios](#)
- [The Business Case](#)
Top 6 reasons why making the move now from R-22 makes good business sense
- [Contact the ISCEON® Team](#)
- [Global DuPont Refrigerants](#)
- [Refrigerant Reclaim Program](#)
- [Where to Buy](#)

www.isceon.com

DuPont™ ISCEON® refrigerants :: HFC Retrofit Options for Direct Expansion Systems - Microsoft Internet Explorer

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Address http://www2.dupont.com/ISCEON/en_US/products/index.html

ISCEON® MO59 (R-417A)
 ISCEON® MO49Plus™ (R-437A)
 ISCEON® MO29™ (R-422D)

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DuPont™ ISCEON® HFC Retrofit Options for Direct Expansion Systems			
HCFC Refrigerant Being Phased Out	Low-Temp Refrigeration	Medium-Temp Refrigeration	Air Conditioning
R-22	ISCEON® MO99™ ¹ ISCEON® MO29™	ISCEON® MO99™ ¹ ISCEON® MO29™	ISCEON® MO99™ ¹
MP39, MP66, R-409A	ISCEON® MO49Plus™	ISCEON® MO49Plus™	ISCEON® MO49Plus™
HP80, HP81, R-408A	ISCEON® MO79™	ISCEON® MO79™	
	(1) ISCEON® MO99™ combines R-22 pressure-enthalpy characteristics with mineral oil compatibility; comparable efficiency and slightly lower capacity versus R-22; no TXV change.	(1) ISCEON® MO99™ combines R-22 pressure-enthalpy characteristics with mineral oil compatibility; comparable efficiency and slightly lower capacity versus R-22; no TXV change.	(1) ISCEON® MO99™ combines R-22 pressure-enthalpy characteristics with mineral oil compatibility; comparable efficiency and slightly lower capacity versus R-22; no TXV change.
	(2) ISCEON® MO29 has higher efficiency and capacity versus R-22; mineral oil compatible; TXV changes not likely; engineering assessment recommended.	(2) ISCEON® MO29 has comparable efficiency and lower capacity versus R-22; mineral oil compatible; TXV changes not likely; engineering assessment recommended.	(2) ISCEON® MO49Plus™ has comparable capacity and slightly lower efficiency than MP39 and R-409A. ISCEON® MO49Plus™ has lower capacity and efficiency versus MP66; mineral oil compatible; TXV changes not likely.
	(3) ISCEON® MO49Plus™ has comparable efficiency and capacity versus MP39 and R-409A; ISCEON® MO49Plus™ has comparable efficiency and	(3) ISCEON® MO49Plus™ has comparable efficiency and capacity versus MP39 and R-409A; ISCEON® MO49Plus™ has comparable efficiency and	

start | DuPont™ ISCEON® r... | Microsoft PowerPoint ... | 9:44 AM

Next Generation Refrigerants

- DuPont is playing a leadership role
- ***HFO-1234yf*** Refrigerant
 - GWP = 4 (134a = 1430)
 - 100% global convergence to replace R-134a in mobile air conditioning (MAC)
 - Commercialize for MAC late 2011 to meet EU F-Gas R-134a phase-out
- ***Stationary A/C and R applications – R-404A, 410A, 134a***
 - Basic R&D and product development underway for new equipment applications
 - Expected timing:
 - Depends on final HFC Regulations – still developing

ISCEON® Refrigerants provide the best option for replacing R-22 in existing equipment

Questions...

