



### State of the Industry

CO2 Booster as a Mainstream Technology

Presenter: Dustan Atkinson







<u>US EPA – GreenChill program; Corporate awareness; European initiatives</u> All driving retailers to low charge, low GWP, and low leak rate system designs – 2016/17 Phase out of R404A & R507 adopted by the US-EPA

#### Legislation



#### Record Keeping / Annual Registration fee

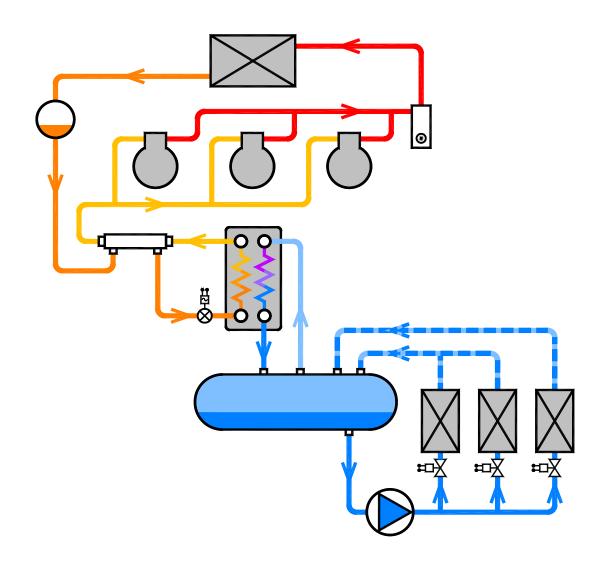
- Started in 2012 for systems >2000 lbs \$370/year; 2014
   (>200 lbs) \$170; 2016 (>50 lbs) \$0
- CARB planning incentives for low GWP technologies
- CARB announced HFC phase out more stringent than EU

#### New Refrigerant Blends

- R448 and 449 Released for installations in US and Canada.
  US EPA SNAP approved July 2015
- Opportunity cost projection 2-3 x cost of 404A; GWP still not very low

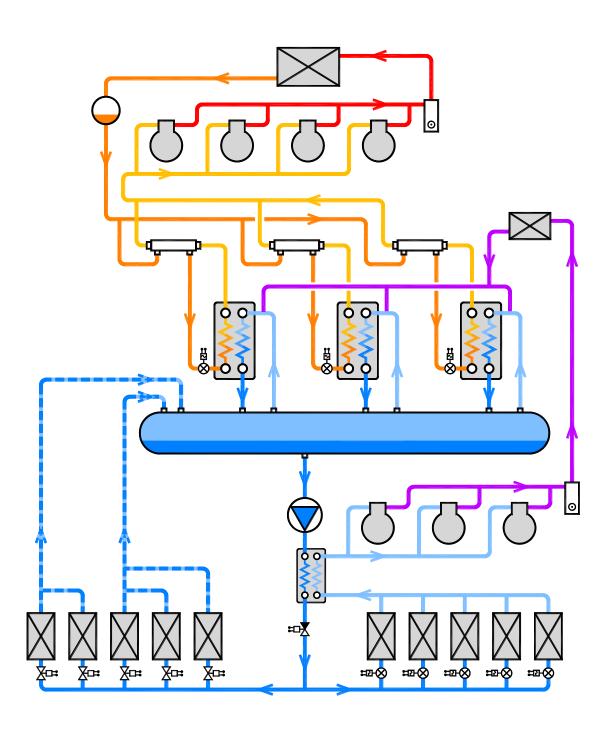






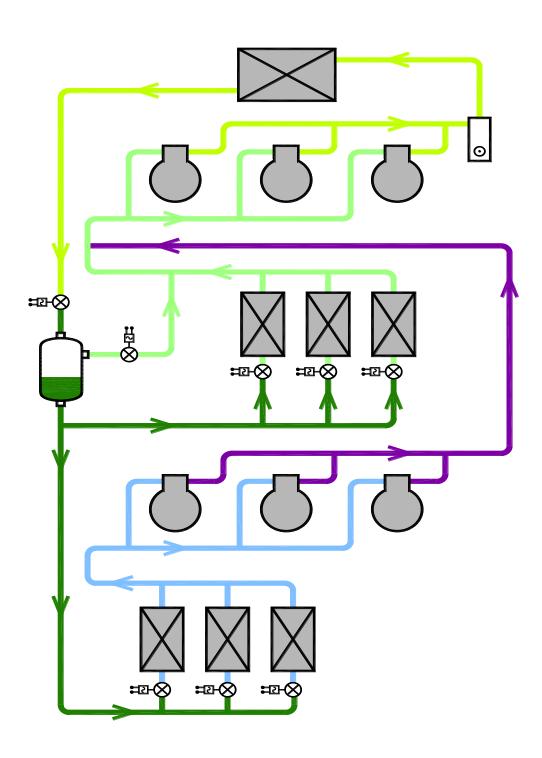
SNMT2/ SNLT2
Secondary CO2

HFC or NH3
Primary Only



**SNMT2LX**CO2 CASCADE SYSTEM

HFC or NH3
Primary Only

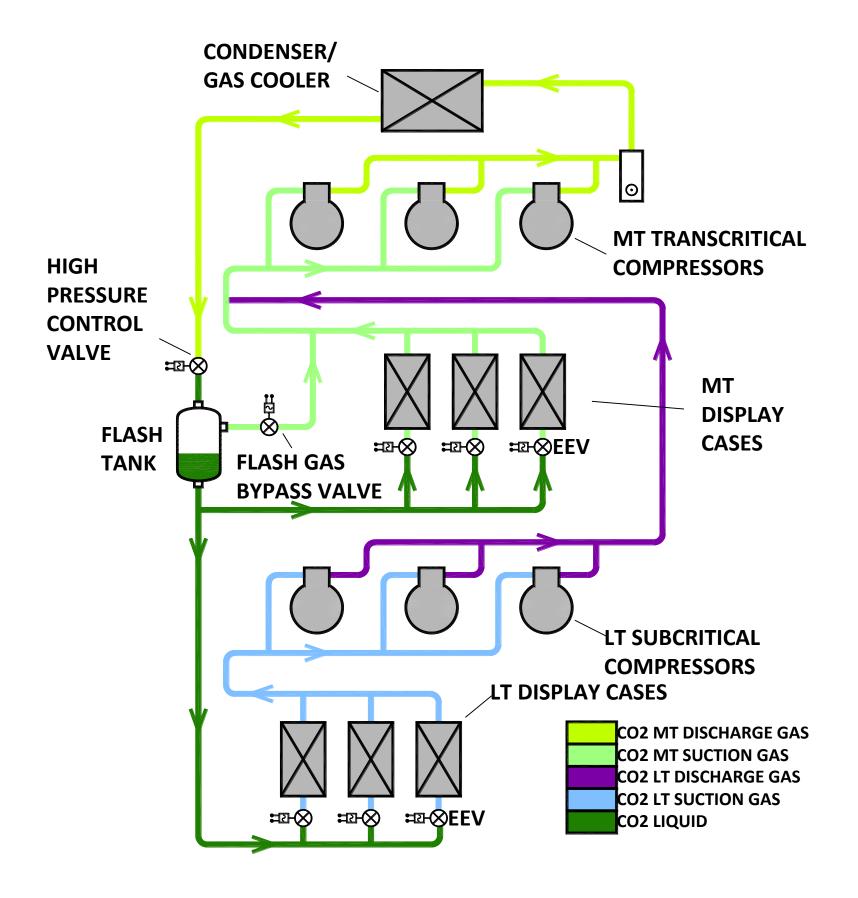




**HFC FREE** 



#### Design



#### Benefits

- HFC-Free System, CO2-Only
- CO2 is a Natural Refrigerant, GWP=1
- FUTURE PROOF Refrigeration System
- High quality Heat Reclaim opportunities
- Simple Oil Management System
- Efficient compressors proven in thousands of installations
- Electronic Expansion Valves in all cases
- Familiar components to HFC DX systems
- Low-temp system very similar to current cascade system





#### **Measureable Savings**

#### Save on ...

- **Start-up refrigerant charge**
- **Refrigeration installation**
- **Electrical installation**
- **Case performance with EEV's**
- Energy

#### **Intangible Benefits**

- ✓ Future HFC retrofit cost avoidance
- ✓ Relief from leak & recordkeeping requirements
- ✓ Savings PM program w/ lower cost refrigerant
- ✓ Better quality product w/ better case controls
- **✓** Impact on social responsibility

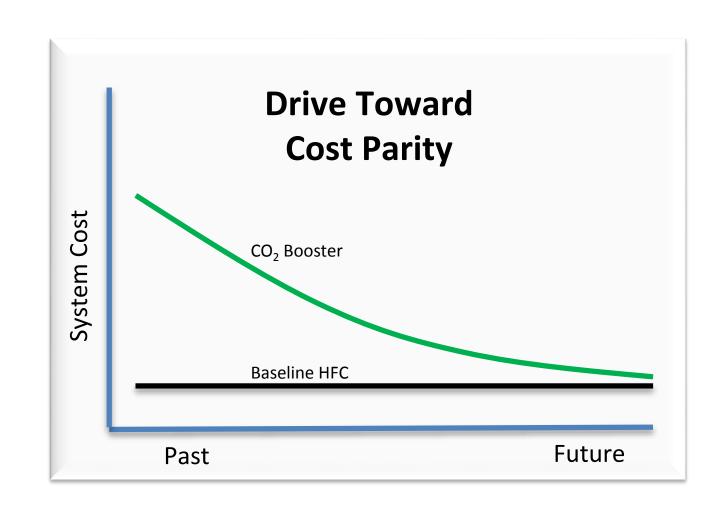


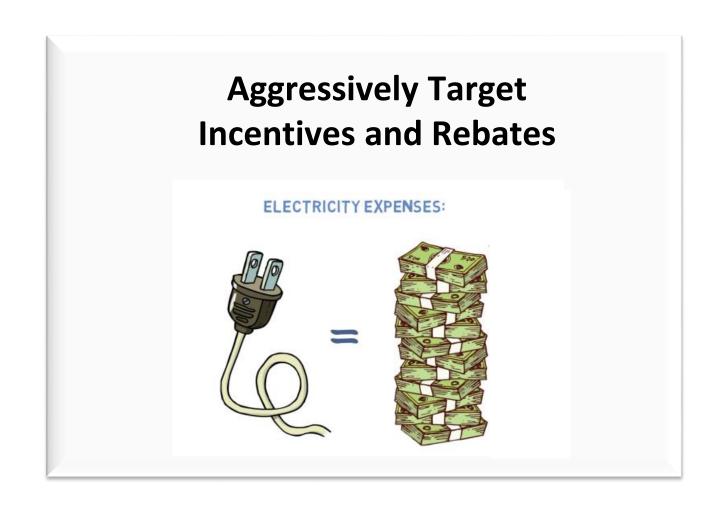
#### **Challenges**

- ✓ Capital cost of the equipment
- ✓ Technician availability
- ✓ Energy evaluation
- ✓ Understanding the ROI and impact on **Total Cost of Ownership**
- ✓ Refrigerant management



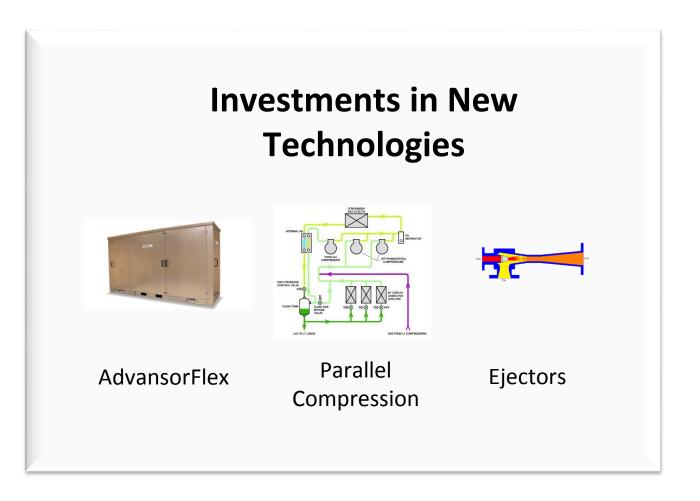
















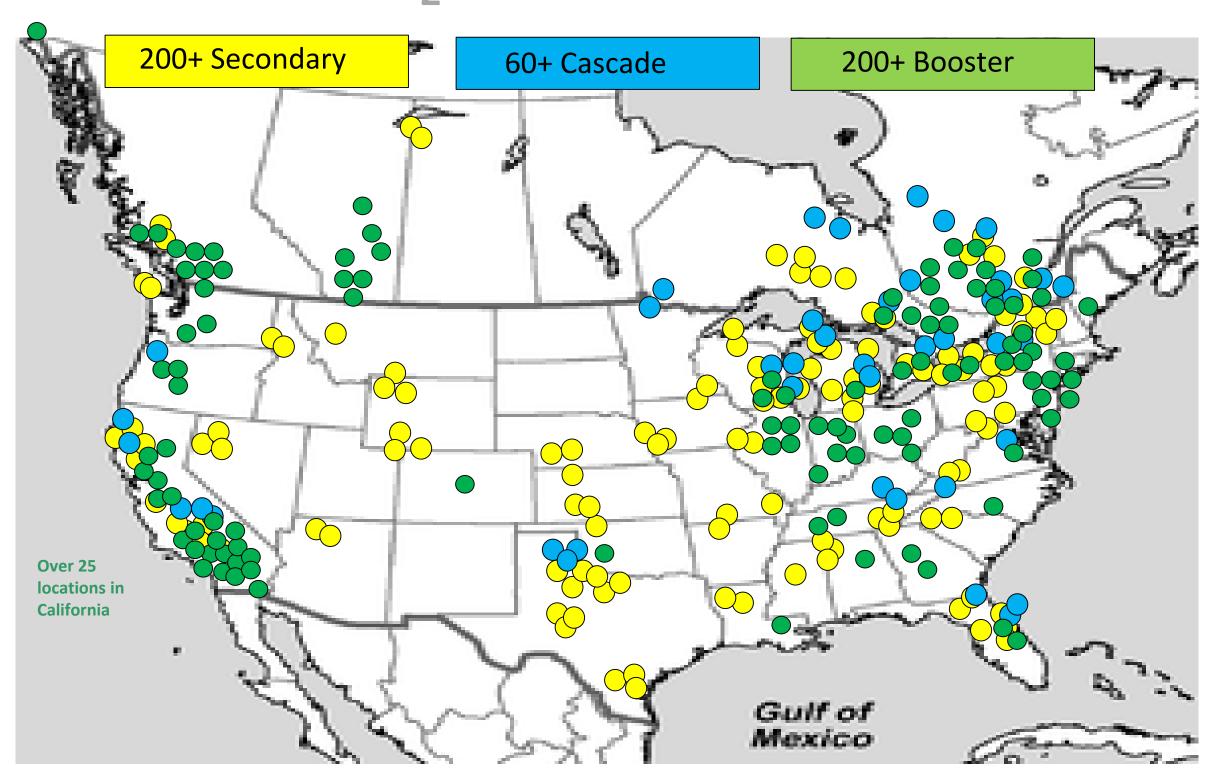
# **Evolution of CO<sub>2</sub> Technology Applications**

CO2 Secondary (pumped) Systems
2006 - Low (2007) and Medium (2010) Temperature
Over 200 Installation in North America

CO2 Cascade (subcritical) Systems
Low temperature (2008)
Over 60 Installation in North America

CO2 Booster (transcritical) Systems
Low & Medium temperature (2012)
Over 200 Installations in North America
Over 1000 in Europe

#### CO<sub>2</sub> Booster Stores



# One refrigerant. So many benefits.

# PART OF THE SECOND NATURE FAMILY BY HILLPHOENIX

# Leading CO<sub>2</sub> technology for refrigeration.

- 100% environmentally friendly · non-toxic, inflammable
- no ozone depletion no global warming impact
- low noise
   single refrigerant
   low cost of installation
- low cost of maintenance · compact design
- easy installation easy service
- low energy consumption
- future-proof solution

Fresh thinking.
Responsible solutions.





business case

## natural refrigerants

June 16 & 17, 2016 - Chicago

Thank you very much!