



Business Case for Natural Refrigerants

June 12-14, 2018 – Long Beach



The Long Road to CO2

Or, "How did we get here?"





A short look in the rear view mirror

HCS has 12 facilities in operation

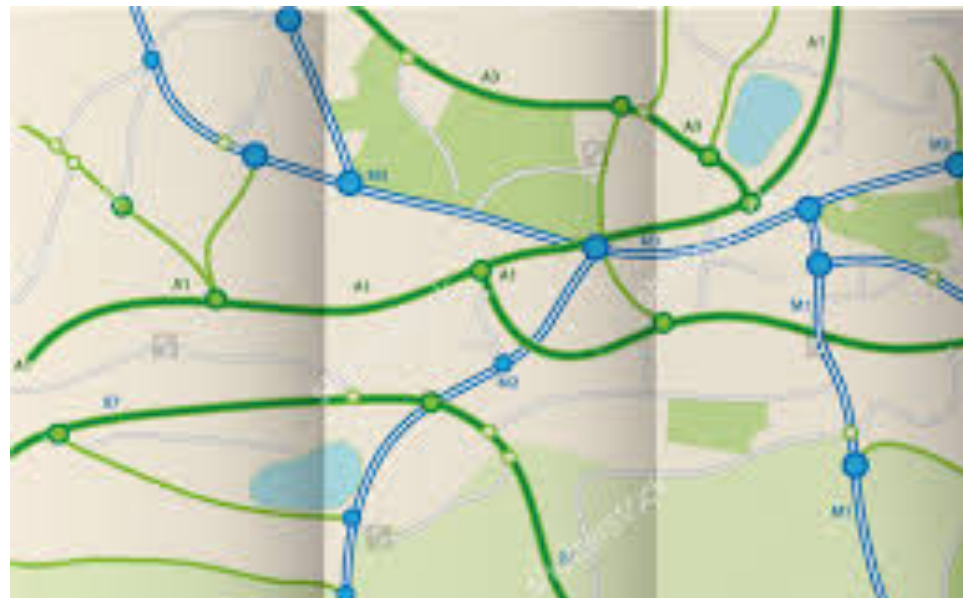
- 10 refrigerated with NH3
- 2 refrigerated with HFC/HCFC

Last year I spoke at this conference about ammonia charge reduction

- Focus on NH3 charge per ton reduction on our the last four construction projects
- Our most recent design: 3300# of NH3 to refrigerate over 6,000,000 cubic feet of space, our most efficient system, operating below 0.3Kwh/cubic foot/year

Continuous improvement, What can we do next time we build?

- Could we go from Low Charge...to...No Charge?



How do we get there? (Mapping out a route)

Step I - Identify the destination

- Elimination of or reduction in NH₃ inventory below its Threshold Planning Quantity (500lbs.)

Step II – Select possible routes

- Trans-critical CO₂?
- Packaged NH₃?
- Synthetic Refrigerant?

Step III - Comparative analysis of routes versus our “normal” route

- Advantages
- Disadvantages
- “Deal Killers”

Setting off on of the Journey

Features to compare

- Refrigeration System First Cost
- Facility Construction costs
- Construction schedule effects
- Energy Efficiency
- Utility Costs
- O&M costs
- Scalability(future)
- Long Term Reliability





“Roadside Attractions”

Things learned along the journey:

Metric	CO2	Central Low Charge NH3
System Cost	\$534k Less	More
Building Costs	Approximately \$300k Less	More
Construction schedule	5-6 Weeks Saved	5-6 weeks extra needed
Efficiency	Less Electricity (46,000kwh/yr.)	More Electricity
Utilities	Less water & Sewer	More water & Sewer
O&M	Less Costly	More Costly
Water Treatment	No Water Treatment	Water Treatment Necessary
Reliability	Very Reliable	Very Reliable

Construction Ahead!

- Decision based on research and investigation
- Executive team support & trust “We hadn’t done a lot of things before we did them the first time”
- Installing Contractor & Supplier commitments
- General Contractor Education



A few Bumps in the road

Construction/O&M Considerations

- Structural design for roof loads
- Pipe routing
- Insulation
- Mounting location (roof)
- Altitudes-Elevations of equipment
- Ancillary Equipment siting
- Subcontractor unfamiliarity
- New construction methods (Orbital welding)
- Relatively young technology



Are we there yet?

- Started up in early June
- Pulldown Underway now
- First product coming in late June
- Actual energy use TBD
- Long term viability
- Local service & support
- Training
- Stay Tuned!

• Questions?





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sphere

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Thank you very much!

