

The logo for AMERICA, consisting of a green square with a white curved line at the bottom, and the word "AMERICA" in white, sans-serif font inside the square.

ATMO the Business Case
sphere **natural refrigerants**

June 12-13 2012 | Washington DC

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Group Sales & Marketing Director
Star Refrigeration Ltd



Customer Challenges

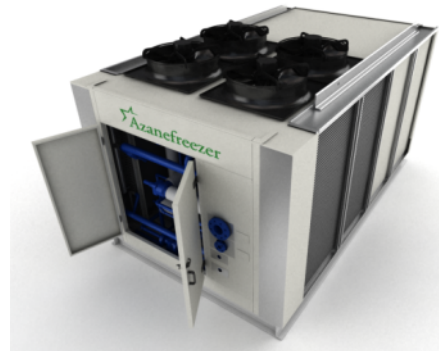


HCFC phase out/HFC phase down

Corporate and social responsibility

Energy consumption

Capital cost



Ammonia Challenges



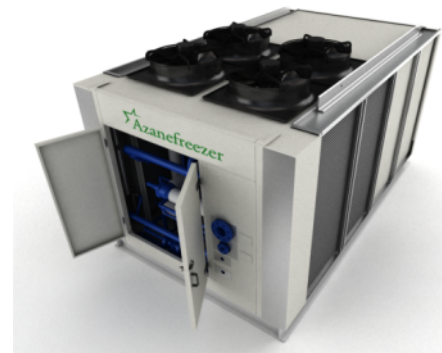
Regulation – OSHA, EPA, USDOT...

Refrigerant Charge - <10,000lb

Health & Safety - PSM

Technology

Education



Packaged Ammonia Concept



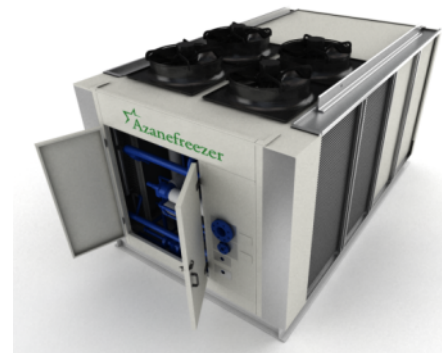
Totally natural fluid

Low charge

Plug and play

Factory packaged and tested

Optimised energy efficiency



Case Study 1: Cold Storage

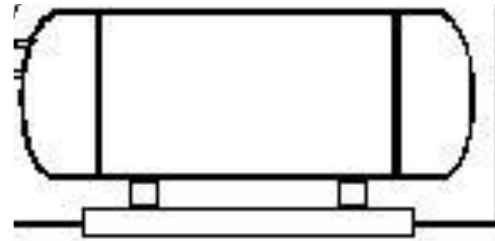


Case Study 1: Cold Storage

Customer	Soup & Sauce Manufacturer
Project type	R22 phase out
Application:	Cold Storage
Store size:	10,764ft ²
Store temperature:	-13°F
Cooling Load:	36TR
Solution:	1 x Azanefreezer
Charge:	522lb



Low Pressure Receiver



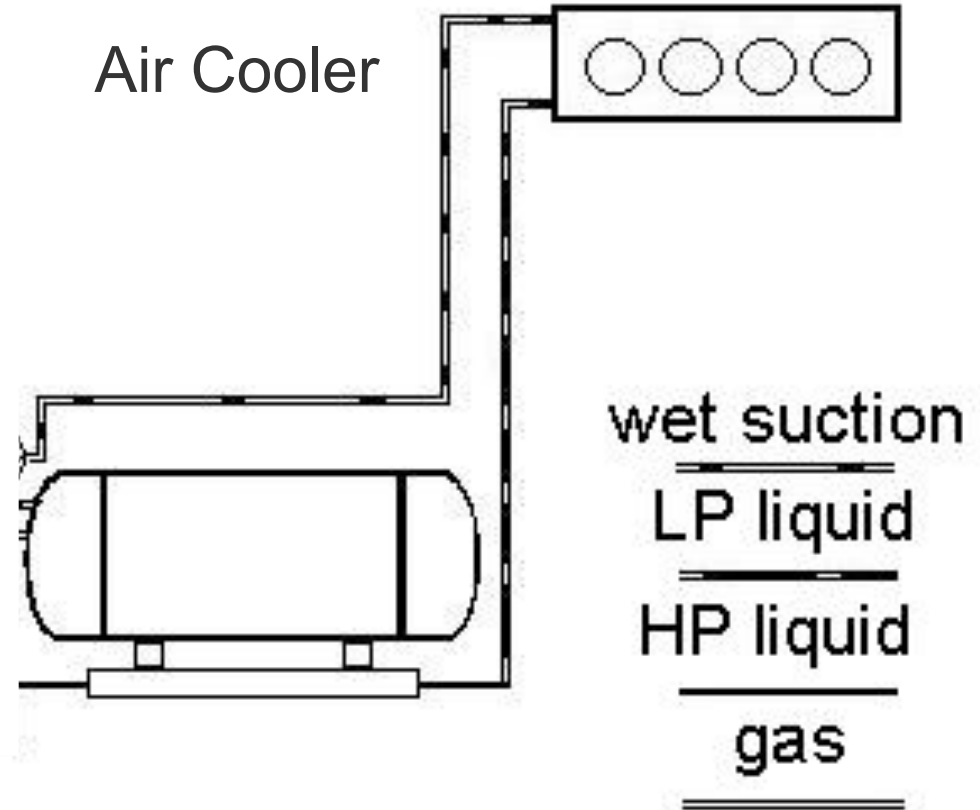
wet suction

LP liquid

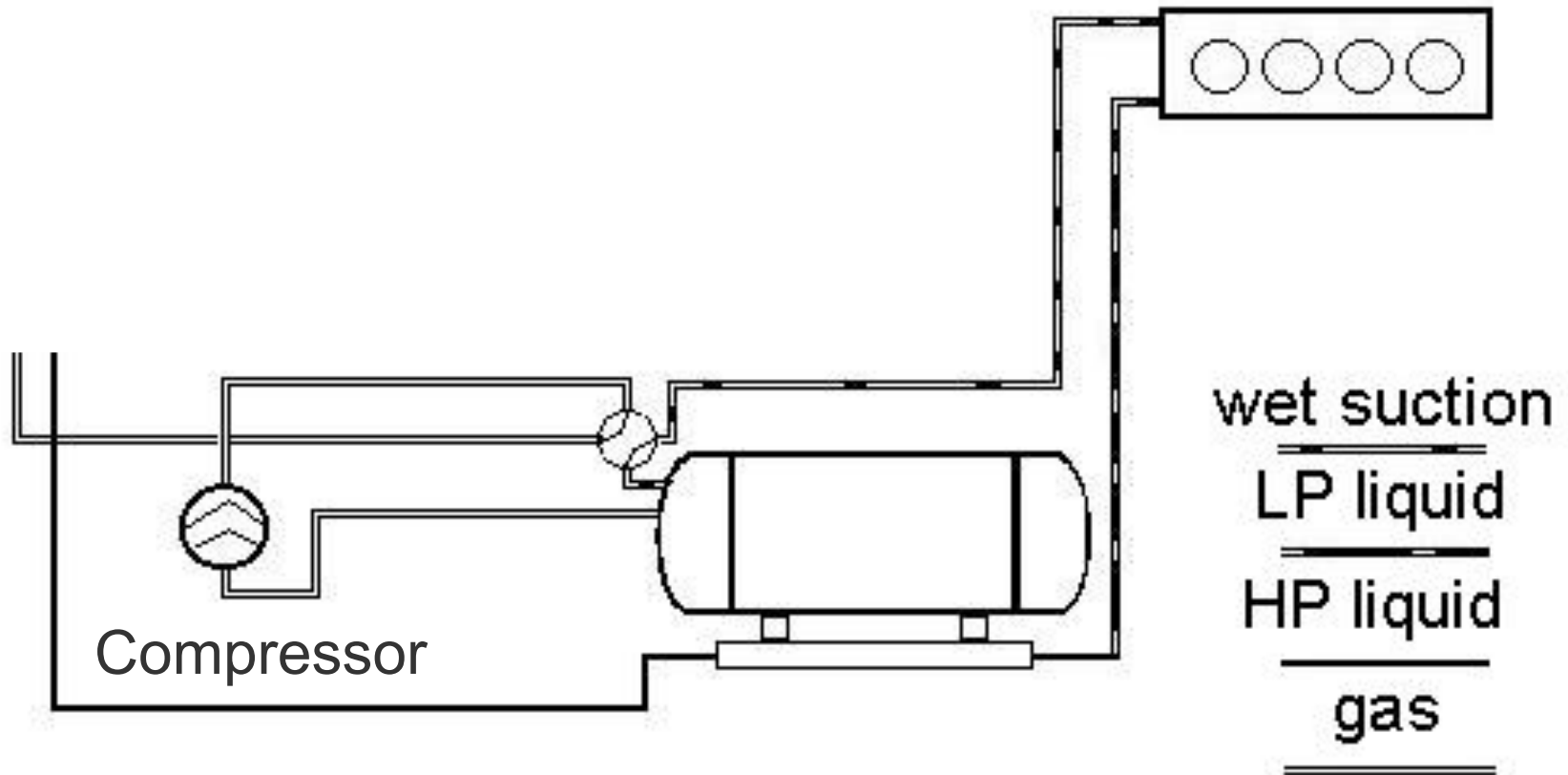
HP liquid

gas

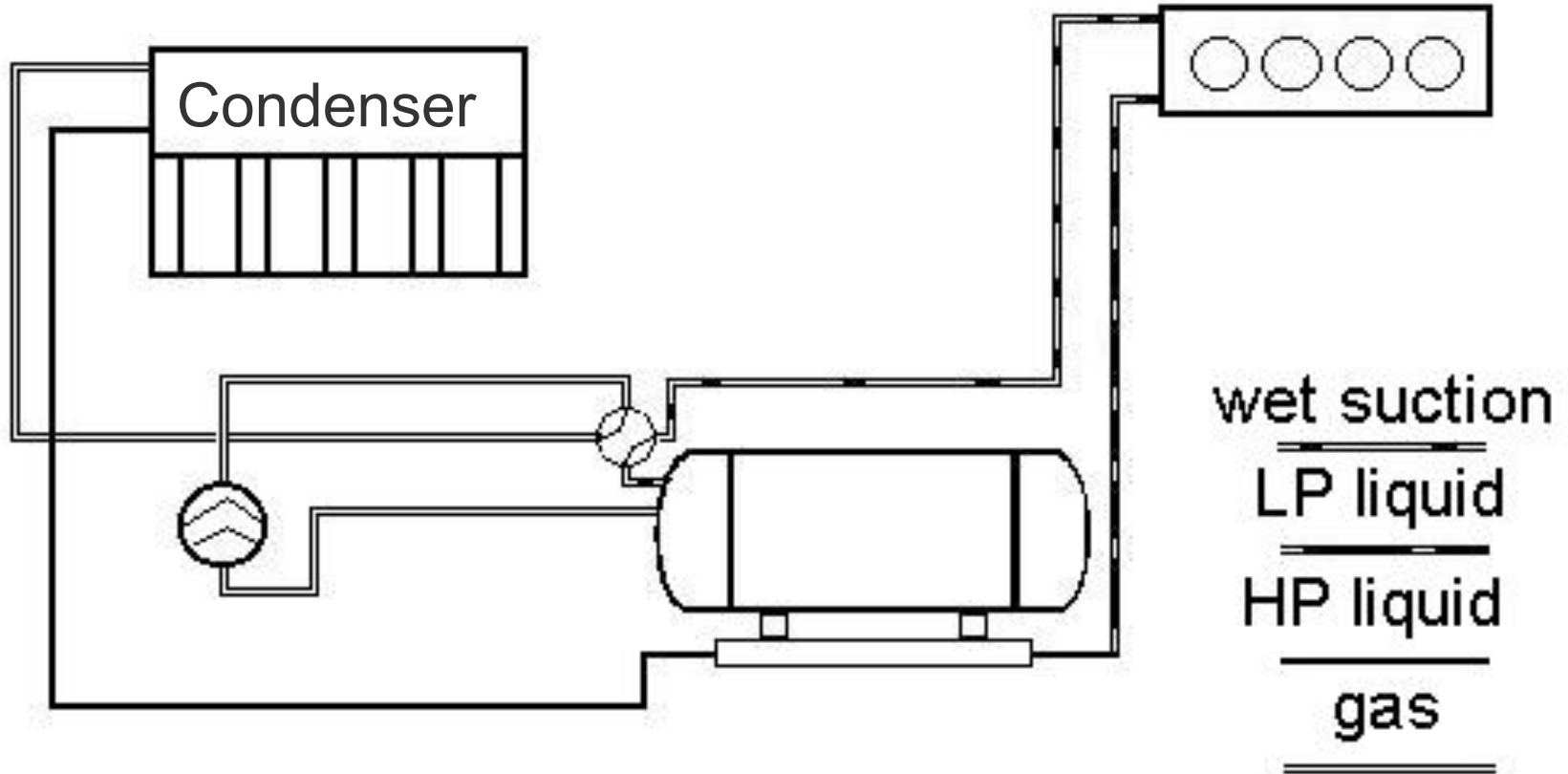
Innovation: Low Charge, Low Pressure Ammonia



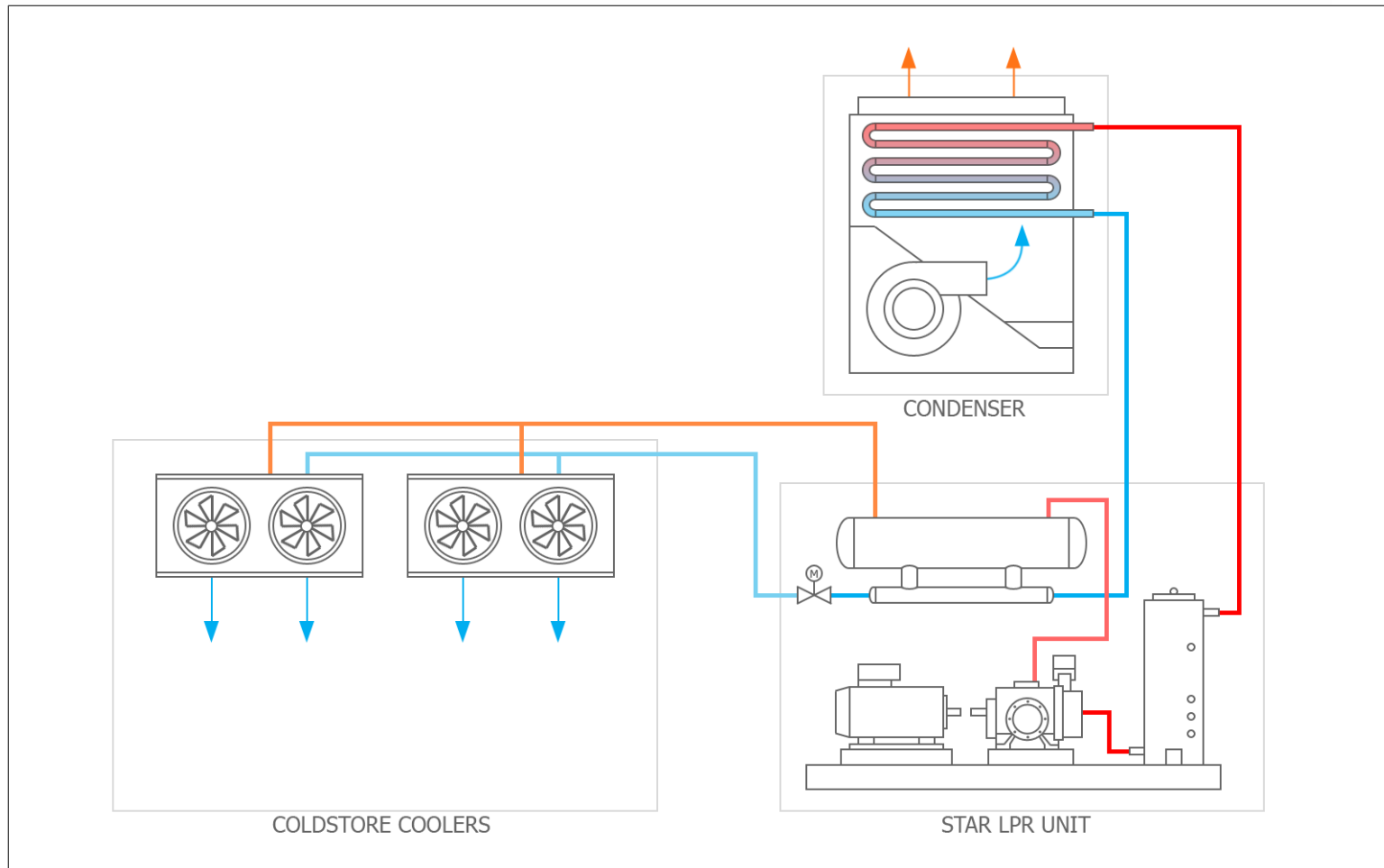
Innovation: Low Charge, Low Pressure Ammonia



Innovation: Low Charge, Low Pressure Ammonia



Innovation: Low Charge, Low Pressure Ammonia



Innovation: Reverse Cycle Defrost

Single 4-way ball valve

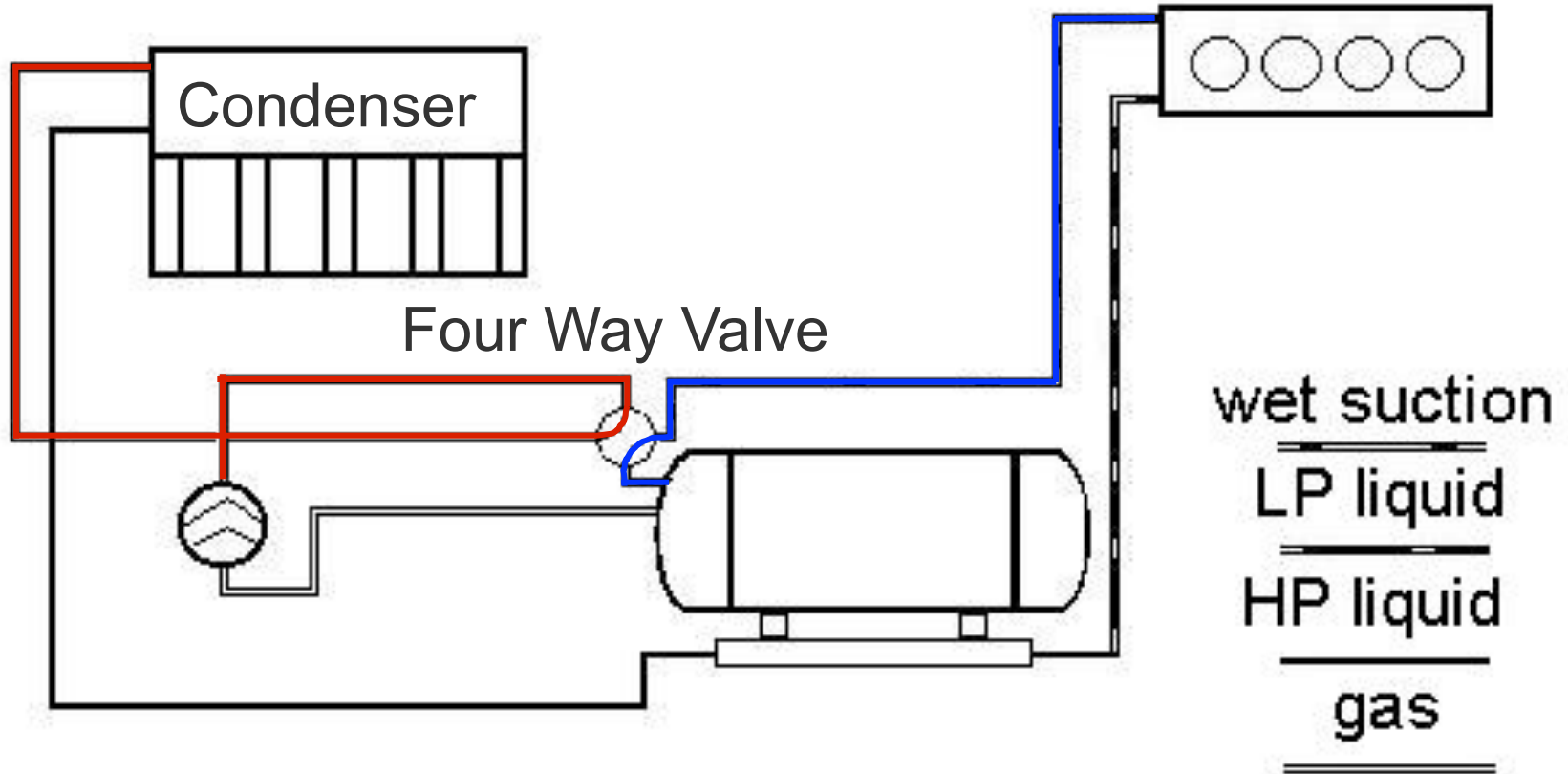
Reverses plant operation

Electrically actuated

Rapid defrost



Innovation: Reverse Cycle Defrost



Innovation: Aluminum Coil



Metal	Density lb/ft ³	Thermal Conductivity Btu/h ft ² °F
Aluminum	165	117
Carbon Steel	489	26
Zinc	440	65
Stainless Steel	501	9.4



CONDENSER

- High efficiency air-cooled condenser
- Built in acoustic housing
- EC fans

Energy and Cost Comparison



System	Suction Temperature	Running Cost (vs pump circ)	Capital Cost (vs pump circ)	Refrigerant Charge
Pumped Circulation	-27.4°F	0%	0%	746lb
DX (HFC)	-31.0°F	+20%	-25%	500lb
LPR	-23.8°F	-5%	-15%	522lb

Based on -13°F store temperature

Case Study 2: Food Production

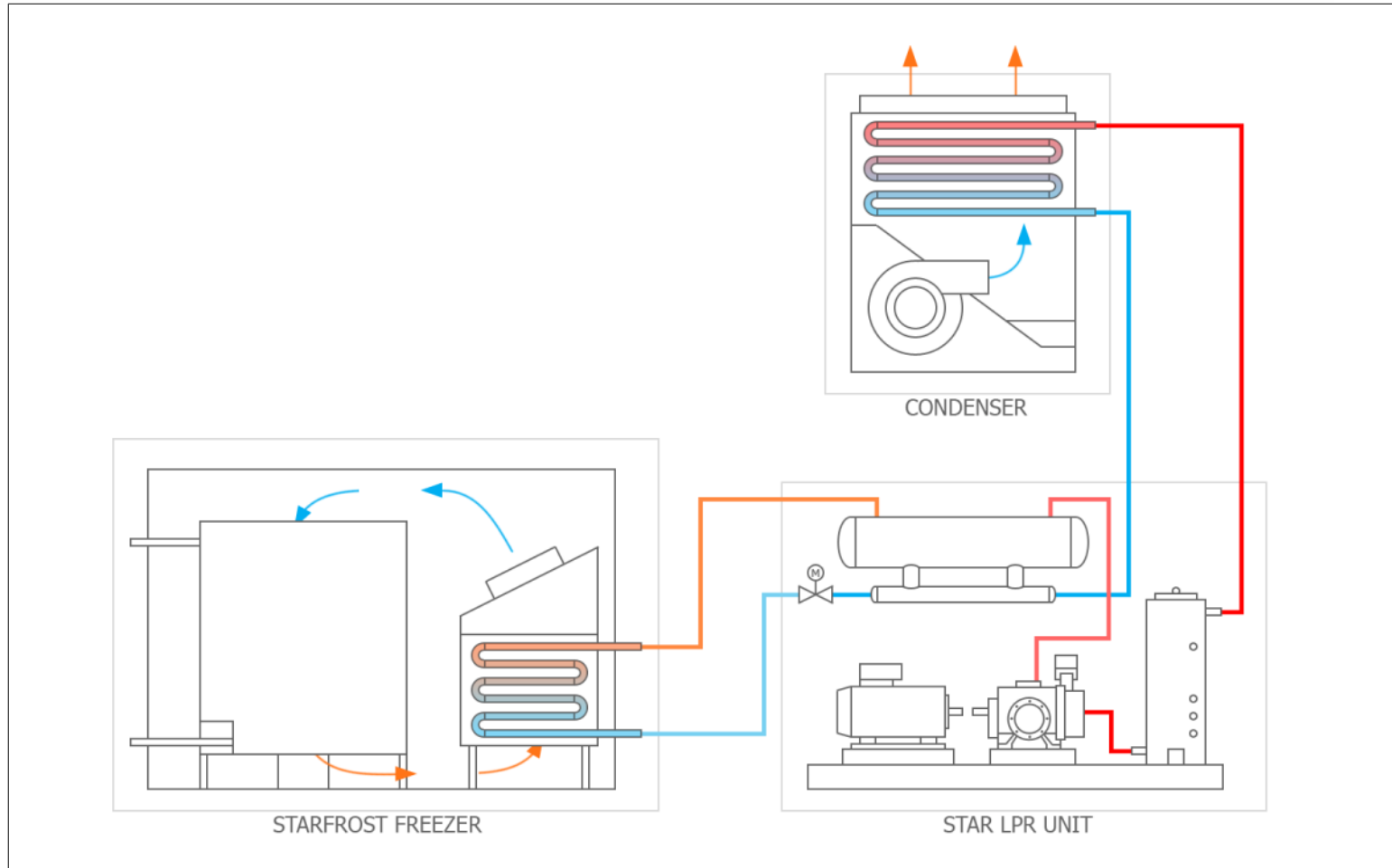


Case Study 2: Food Production

Customer	Bakery
Project type	Factory extension
Application:	Spiral Freezer
Product throughput	4,000 lb/hr
Evaporation temperature	-40°F
Cooling Capacity:	56 TR
Equipment :	1 x Glacier
Charge:	838 lb

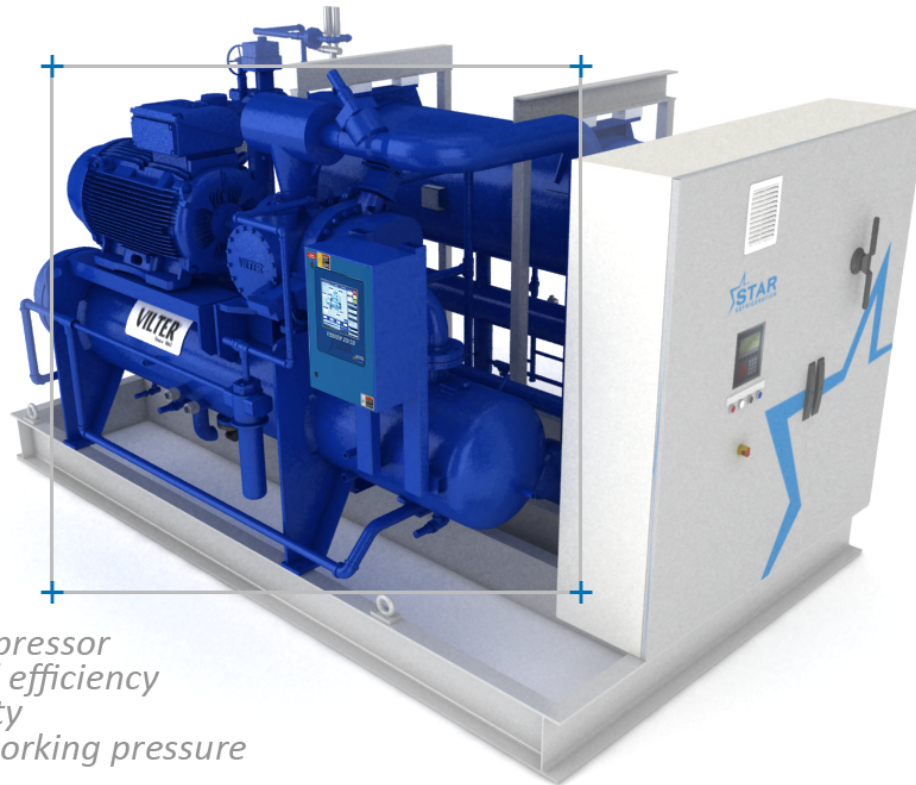


Innovation - LPR



Innovation - Aluminum Coil and RCD





VILTER PACK

- *Single screw compressor*
- *Leading part load efficiency*
- *Extended warranty*
- *High maximum working pressure*

Energy and Cost Comparison



System	Suction Temperature	Running Cost (vs pump circ)	Capital Cost (vs pump circ)	Refrigerant Charge
Pumped Circulation	-43.6°F	0%	0%	2,222lb
DX (HFC)	-47.2°F	+20%	-25%	891lb
LPR	-41.5°F	-5%	-15%	838lb

Based on -29.2°F air temperature

Case Study 3: HVAC

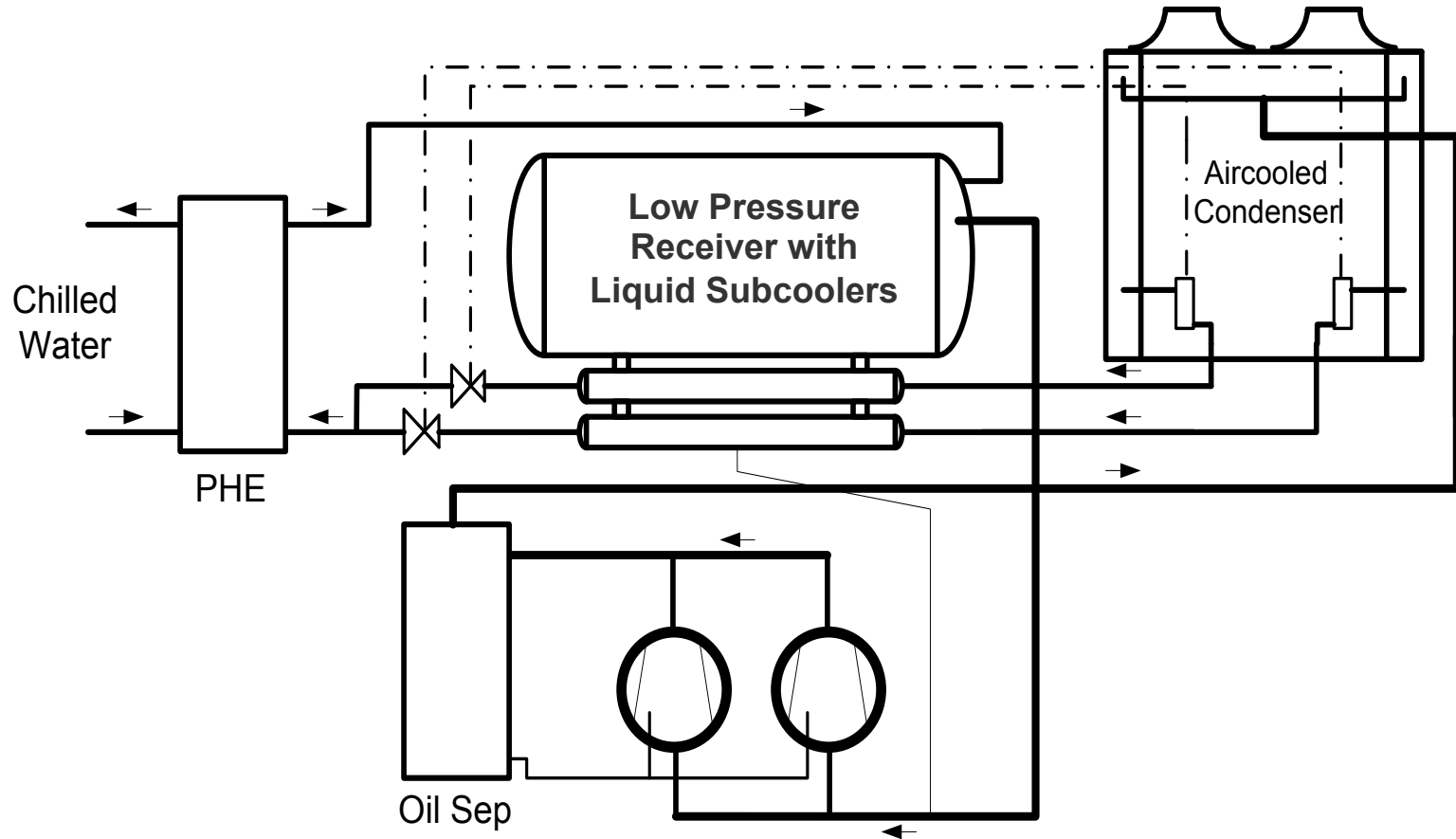


Case Study 3: HVAC

Customer	Retail
Project Type	New store
Application:	Retail Store HVAC
Secondary fluid:	+42.8°F
Cooling Capacity:	160TR
Equipment	1 x Azanechiller
Charge:	353lb

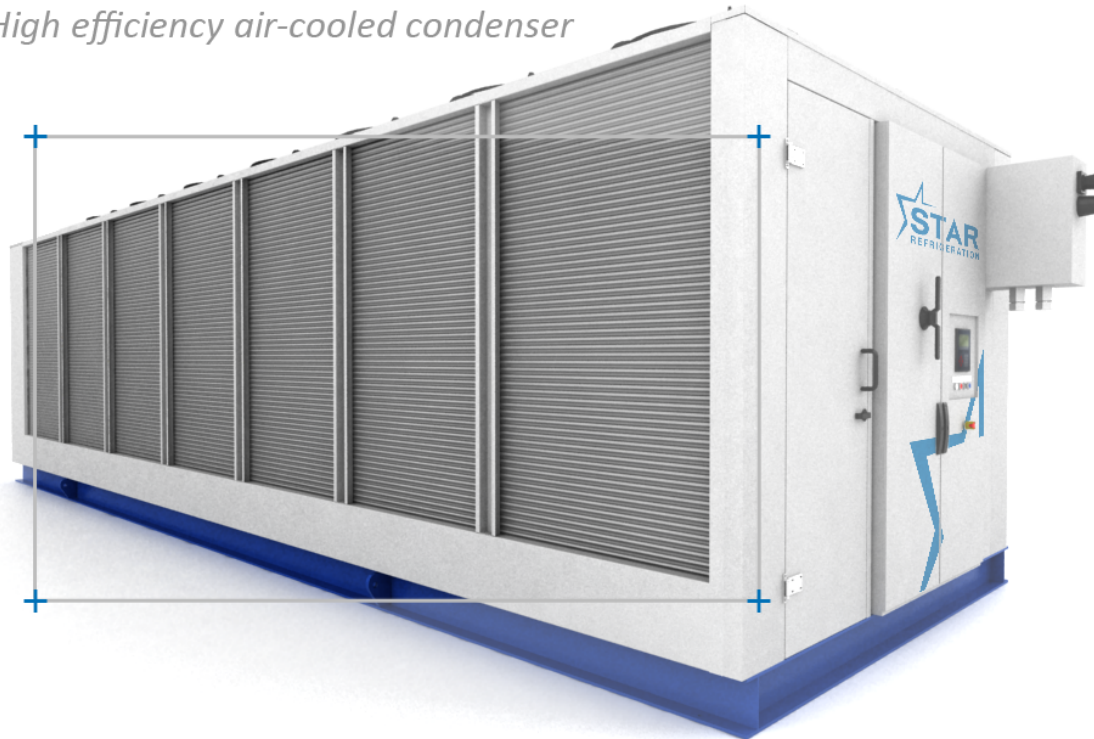


Packaged Ammonia Chiller



CONDENSER

- High efficiency air-cooled condenser



Energy and Cost Comparison



System	Suction Temperature	Running Cost (vs DX)	Capital Cost (vs DX)	Refrigerant Charge
DX (HFC)	33.8°F	0%	0%	360lb
LPR	35.6°F	-24%	200%	353lb

Based on 42.8°F water temperature

- Packaged ammonia systems help reduce
 - Cost
 - Charge
- 50% to 75% reduction in charge possible
- 20% to 25% reduction in energy consumption
- Wide range of applications
 - Cold storage
 - Food manufacturing
 - HVAC
 - Process cooling

