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business case

natural refrigerants

June 16 & 17, 2016 - Chicago

The Right Natural Refrigerant System
for Your Industrial Project

Sam Gladis - CIMCO Refrigeration

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Contractors Panel

Who We Are

- Specialists in industrial and recreational systems
- Founded in 1913
- Joined Toromont in 1969
- Established in USA in 2005

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**North America's Largest
Industrial Refrigeration Contractor**

Industrial Refrigeration

- **Applications**
- **Refrigerants**
- **Technology Advancements**

Government Regulations

Environmental Concerns

Alternatives Developed

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Industrial Refrigeration - Applications

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- **Food & Beverage**
- **Warehouse / Distribution**
- **Chemical / Petrochemical**
- **Recreation**



Industrial Refrigeration - Refrigerants

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- **Ammonia - Predominant**
Pumped Liquid Overfeed
Flooded
- **Propane - Occasional**
- **Synthetic - Rare**



Industrial Refrigeration - Technology

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- **High Pressure Compressors**
- **DX Evaporator**
- **Adiabatic Condensing**

**Advancements
through Ingenuity**

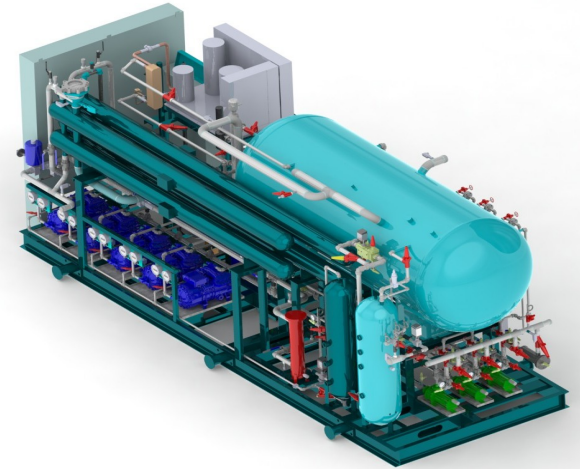


Government Regulations & Environmental Concerns

- **Increased Pressure on Ammonia Users**
- **Implementation of PSM**
- **ODP / GWP**
- **Phase-Out of Synthetic Refrigerants**

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Change is Inevitable

Alternatives

- Low Charge Ammonia
 - Self-Contained - Glycol or DX**
 - Close-Coupled w/ DX & Adiabatic**
- CO₂/Ammonia
 - CO₂ Brine/Ammonia**
 - CO₂ Cascade/Ammonia**
 - CO₂ Cascade/Brine/Ammonia**
- CO₂ Transcritical

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Solutions are Plentiful

Solutions Analysis



SYSTEM	<u>Ammonia</u>			<u>NH3/CO2</u>			<u>CO2</u>		
	Conventional Field Constructed (baseline)	Self-Contained Glycol	Self-Contained DX	Close-Coupled w/DX and Adiabatic Condensers	Brine	Cascade	Brine / Cascade	Transcritical	Transcritical w/ heat Recovery
Ammonia Charge	High	Low	Low	Low	Low	Low	Low	Low	Low
Capital Cost	Low	High	High	High	Low	Low	Low	Low	Low
Operating Cost	Low	High	Low	Low	Low	Low	Low	Low	Low
Maintenance Cost	Low	High	Low	Low	Low	Low	Low	Low	Low



Change Comes with a Price

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Thank You!