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**Emerson's Natural Refrigerant-based Solutions For
Developing Markets In Asia**
Sep, 2017

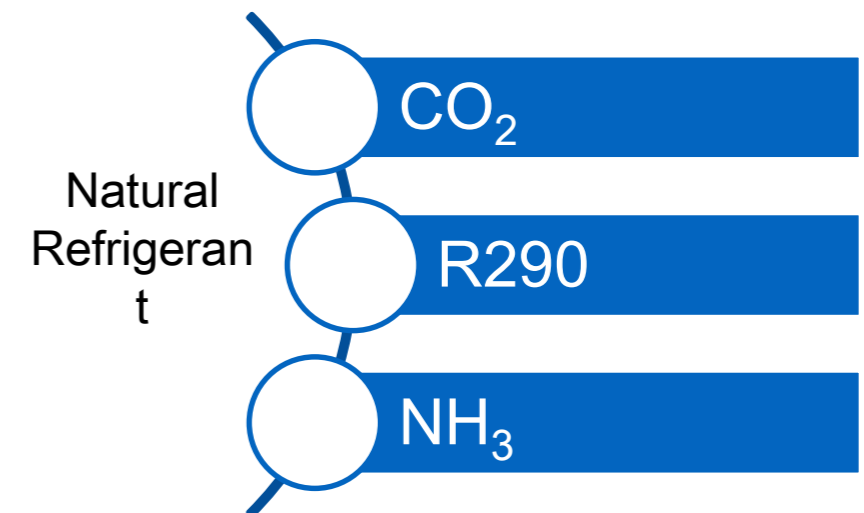
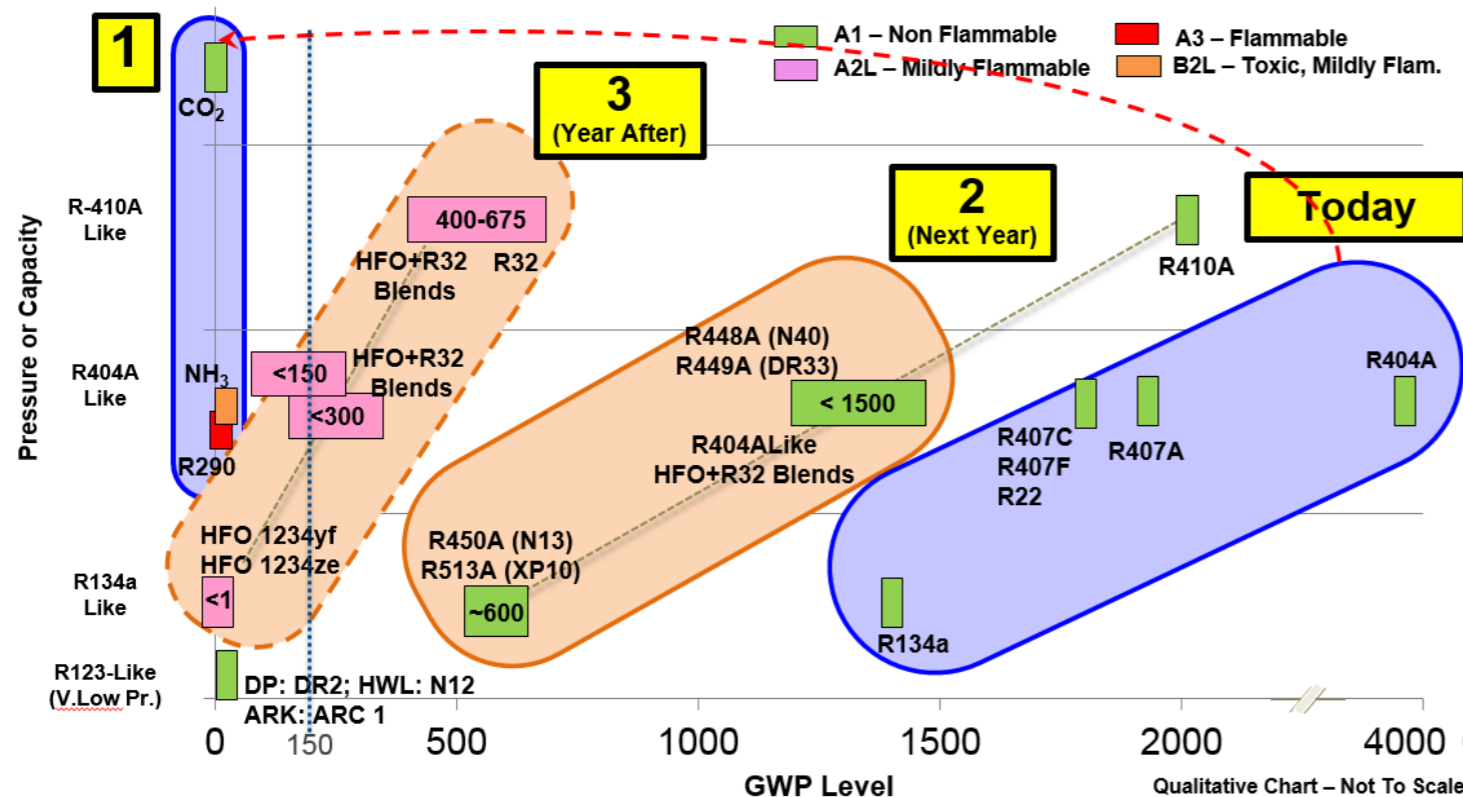


Speeding HFC Phase Down With Kigali

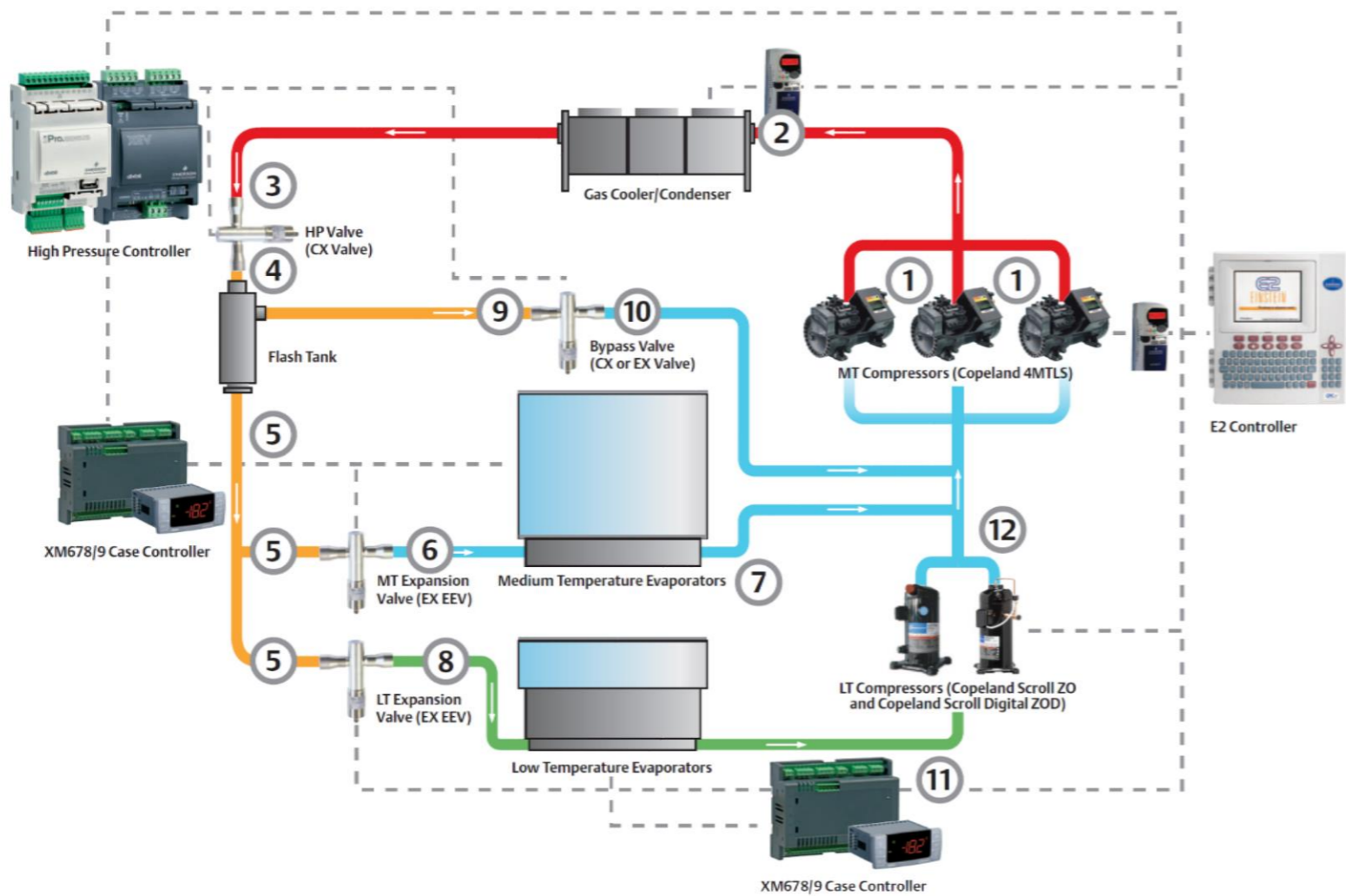
	A5 parties (developing countries) - Group 1	A5 parties (developing countries) - Group 2	Non-A5 parties (developed countries)
Baseline formula	Average HFC consumption levels for 2020-2022 + 65% of hydrochlorofluorocarbon (HCFC) baseline	Average HFC consumption levels for 2024-2026 + 65% of HCFC baseline	Average HFC consumption levels for 2011-2013 + 15% of HCFC baseline*
Freeze	2024	2028	-
1st step	2029 – 10%	2032 – 10%	2019 – 10%
2nd step	2035 – 30%	2037 – 20%	2024 – 40%
3rd step	2040 – 50%	2042 – 30%	2029 – 70%
4th step			2034 – 80%
Plateau	2045 – 80%	2047 – 85%	2036 – 85%



Kigali Amendment @ Oct 2016, Rwanda



Emerson CO2 Integrated Solution



Emerson Offering

- Centralized controller
- Distributed Controller
- Transcritical Compressors
- Subcritical Compressors, Semi & Scroll
- Oil Level Controls
- Compressor VFD
- Condenser Motor VFD
- High Pressure Controller
- Bypass Valve Controller
- High Pressure Valves
- Case Controllers
- Electronic Expansion Valves
- System Protectors
- Pressure Transducers
- Leak Detection

Emerson CO₂ Solution In Global

Emerson Has Proven Field Booster Experience In USA
Making CO₂ Trans Critical Work In Atlanta ADVANTOR




- Dunwoody Sprouts location runs on an Advantors - Hill Phoenix transcritical booster system that entirely eliminates the use of HFCs
- Complete Supermarket CO2 Booster For Supermarket Store / Georgia based
- Gas cooler controlled by Dixell iProCO2D
- Dixell XM600 controllers for Cold Rooms and Cases - 30 TN @ 20 LT
- Supermarket Booster & C-Stores Express
- Fully Use Of CondSense

Emerson Has Proven Field Experience With Scroll In Europe In Canada







Systems LMP Pack For Sobey's, IA

Replacing Down Transcritical Compressors With Copeland AMTLB15

Megrol & Guinness (Quebec, Canada)

Emerson Has Proven Field Booster Experience In Europe

- CO2 Booster For Express Stores / Small Footprint
- Serial & Digital Technology Allow Cold Containment
- 2 x Stream = 2 x Scroll
- Serial Production With 100 Installed C-Stores
- Supermarket Booster & C-Stores Express
- Fully Use Of CondSense
- 60Bar StandStill (Use of TIC)
- Now In Serial Production With 40 Installed Stores
- One site Running In US
- Running in an ICA Pinboode store in Sweden
- Solution with two oil separator
- 2 x Scroll = 3 x Stream
- One Stream compressor used for AC purposes

Estimate 200 Systems Running With Emerson CO2 Solutions

TESCO COOP EDEKA ICA Sainsbury's MORRISON'S

Emerson Has Proven Field Cascade Experience In Europe





- CREA
- COZUM
- ZANOTTI
- Italy
- Istanbul
- Spain
- France
- Hungary
- Holland

TESCO Auchan METRO Intermarche EROSKI

United States and Canada
Trans Critical System & Sub Critical System

Europe
Trans Critical System & Sub Critical System

China
In Promotion
Demo Project In 2016



Emerson Has Proven Field Cascade Experience In America's & Australia





Various Other Applications

R134a CO2

R134a CO2 with Digitec Technology

Woolworths Australia R134a Stream - CO2 Serial (Digital)

IGA Australia

IGA Australia

IGA Australia

Heatcraft/Kirby CO2/R134a pack for IGA

Australia & New Zealand
Sub Critical System

CO₂ Demo Project In China

Homeful Supermarket Retrofit

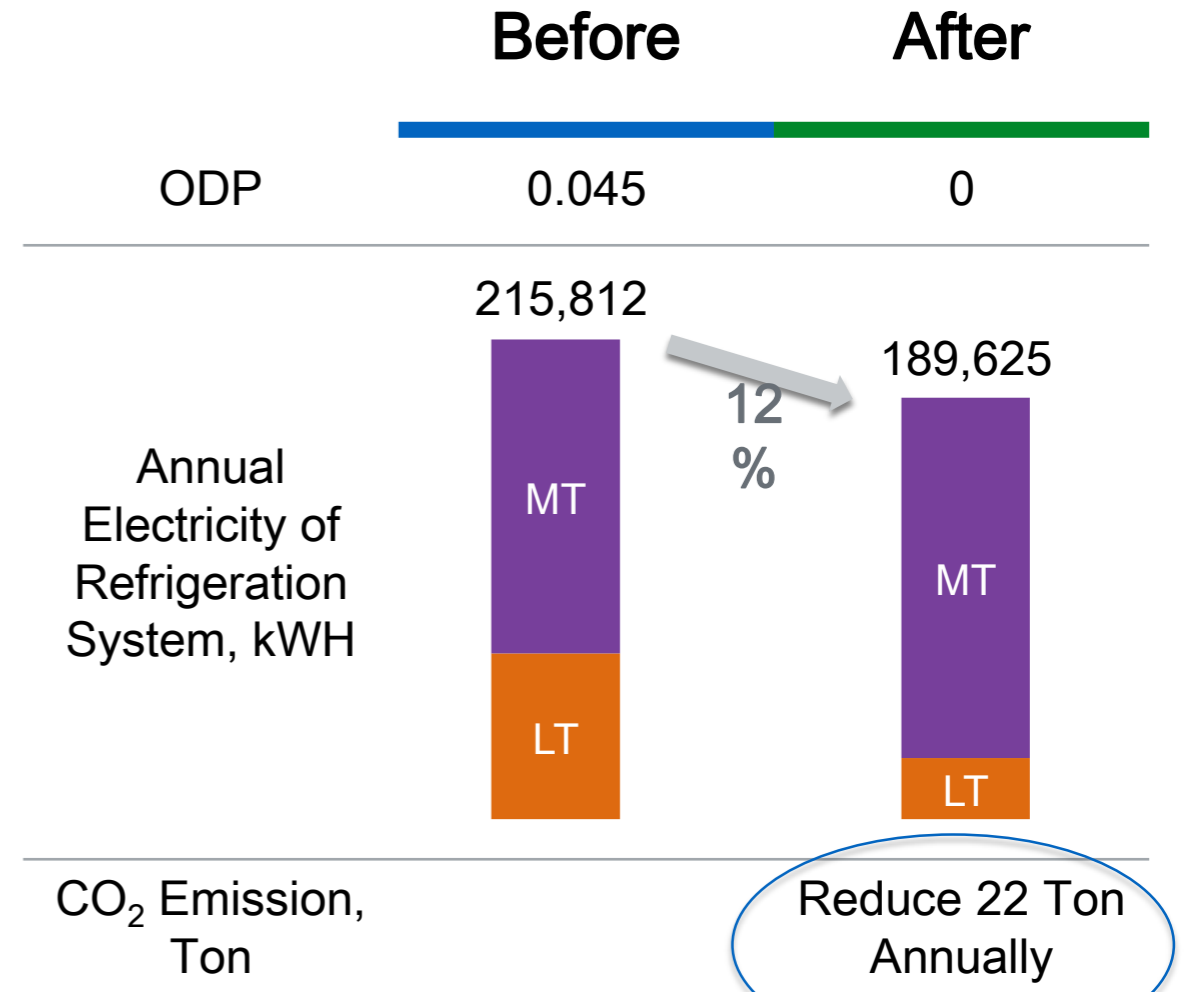
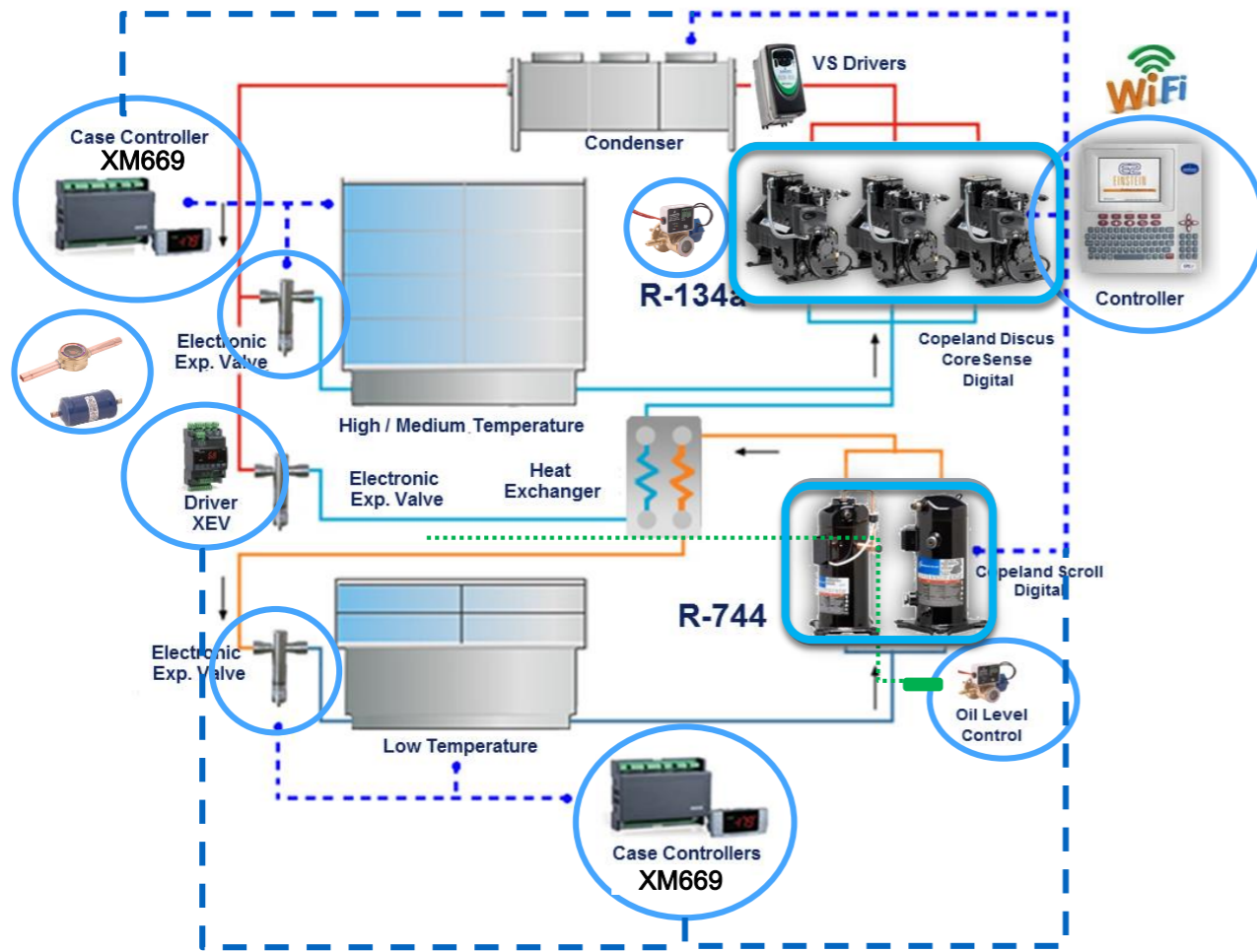


- Lead by China Ministry of Environmental Protection
- Support from China Chain Store & Franchise Association
- Emerson Integrated Solution & Technical Strength
- End User Awareness of Green Store Concept
- OEM/Contractor Deep Engagement
- On Site Technical Support for Start Up & Commissioning



CO₂ Demo Project In China

R134a/CO₂ Cascade System:
Emerson Solution with Compressors, Electronics, Flow Parts & Oil Management, in Intelligent Store Architecture

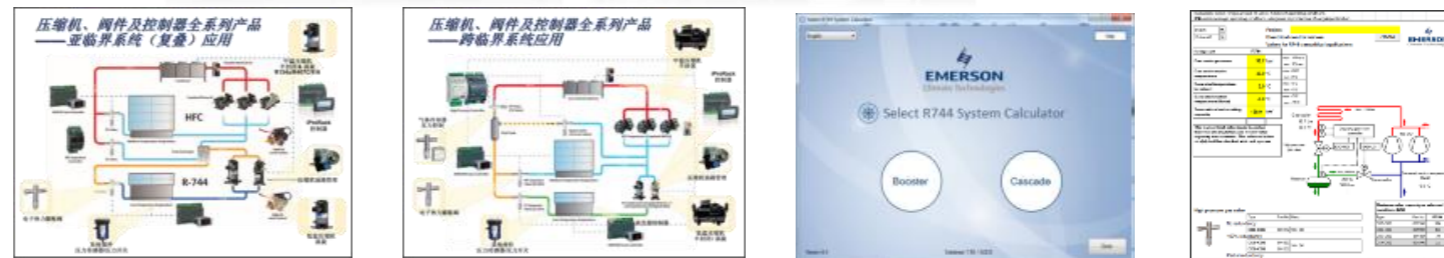


Emerson's Unique Support To Demo Project

❖ *Education & Training*



❖ *Optimum Design On Specific Application*



❖ *Data Monitoring & Analysis*



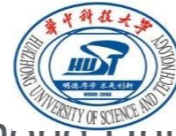
❖ *CO₂ Industry Communication*



R290 Study In Air Source Water Heat Pump



Shanghai Jiao
Tong University



Huazhong University of
Science And
Technology

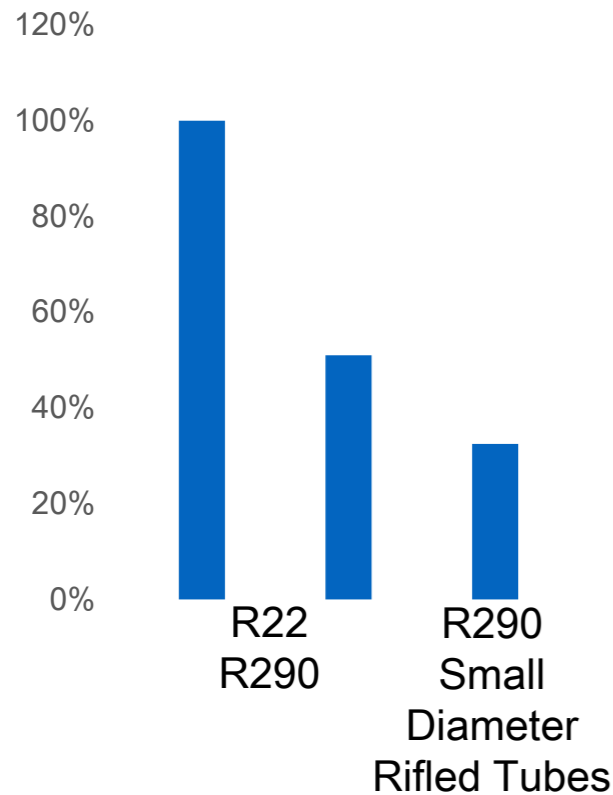


中华人民共和国环境保护部
Ministry of Environmental Protection of the People's Republic of China

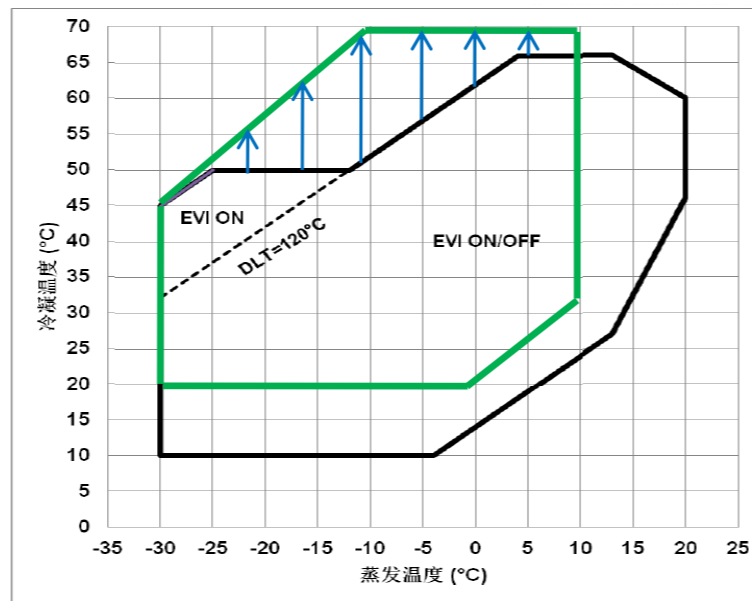
China Ministry of
Environmental Protection



Refrigerant Charge



Operating Envelope



Capacity & Efficiency

		R22	R290
Cooling	Capacity	100%	92%
	COP	100%	110%
Heating	Capacity	100%	~105%
	COP	100%	110~130%

Studies Continuing:

- Micro Channel Condenser
- Material Compatability with R290
- Flameproof & Explosion Proof Design
- R290 Expansion Device Study
- Variable Speed

NH₃ Project – Efficient Ice Plant In Thailand

1) Tube Ice Station

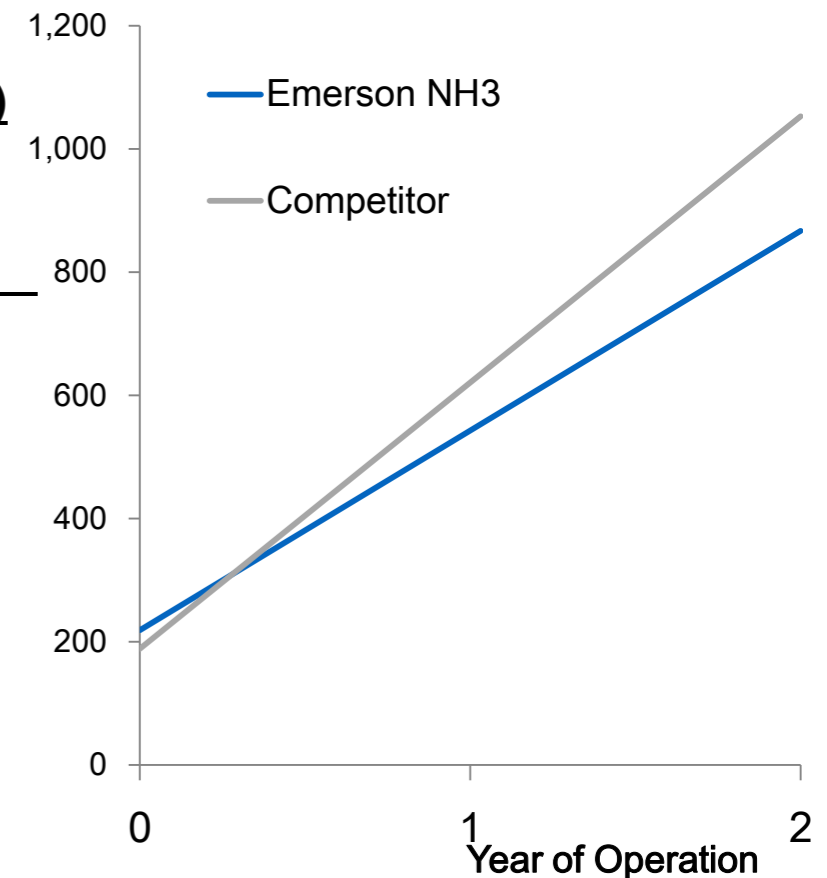
Example:

Existing Requirement = Produce 40 tons of ice at 10 hrs operation

	<u>Brand</u>	<u>(Tons/day)</u>	<u>Model</u>	<u>Qty</u>	<u>Total Motor (hp)</u>
<u>Existing</u>	Competition	80	XXX	2	500
<u>Proposal</u>	VILTER	100	4516XL	1	300

High Efficient Vilter™ Screw

Lifecycle Cost (\$K)
(Initial + Electricity)



1 Electricity cost saving

$$\begin{aligned}
 &= \text{hp} \times 0.746\text{kw} \times 360 \text{ days} \times 10\text{hr per day} \times 2.4 \text{ THB} \\
 &= 200 \times 0.746\text{kw} \times 360 \text{ days} \times 10\text{hr per day} \times 2.4 \text{ THB} \\
 &= \mathbf{1,289,088 \text{ THB/year}}
 \end{aligned}$$

2 Overhaul cost saving

$$\begin{aligned}
 &\text{Existing overhaul @ 10,000 \text{ \â } 200,000 \text{ THB per unit} \\
 &= 200,000 \text{ THB} \times 2 \text{ units} = 400,000 \text{ THB @ 2.7 yr} \\
 &= \mathbf{148,148 \text{ THB per year}}
 \end{aligned}$$

But No Overhaul cost for Vilter.

$$\text{Total Saving per year} = 1,289,088 + 148,148 = \mathbf{1,437,236 \text{ THB}}$$

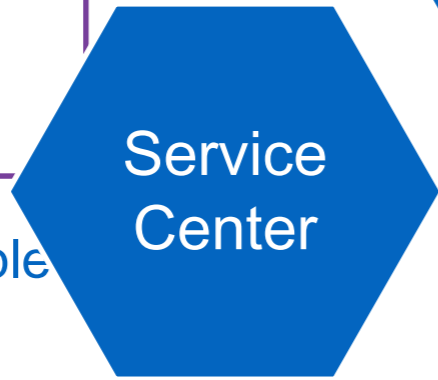
2) Block Ice Station Case Study ;

Plant size: 2,400 Blocks @ 200kg/Block 65", **300,000 THB Saving With 0.3 Years on ROI**



Emerson Support In Southeast & China

- Troubleshooting
- Diagnose
- Compressor Teardown
- Repair S/H Compressor
- Tests For Analysis
- Spare Parts Available



- Skilled Engineers Supporting on:
- *Product Information*
 - *Replacement*
 - *Cross Reference*
 - *Selection and Sizing*
 - *Troubleshooting*
 - *Site Visits and Audits*



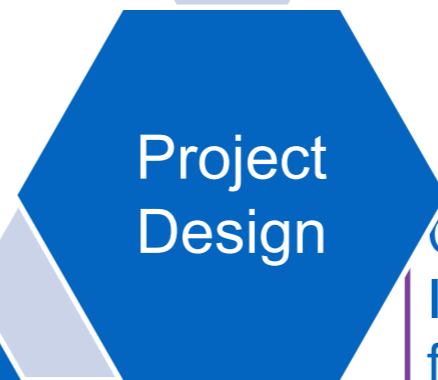
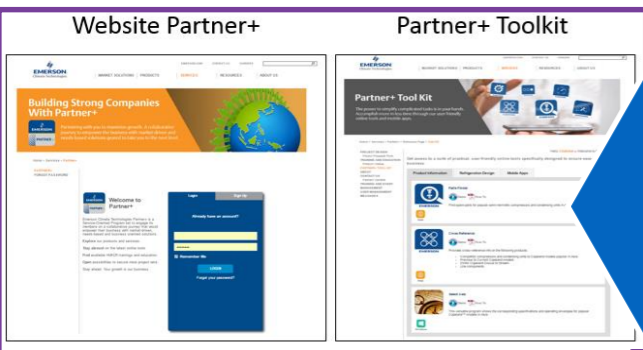
Product Training



Hands On Training



Academy Training

- Customized and Integrated Solutions for Project Designs:
- *Heatload Calculation*
 - *Piping Sizing*
 - *Component Selection*
 - *Installation Guide*



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Thank you very much!

