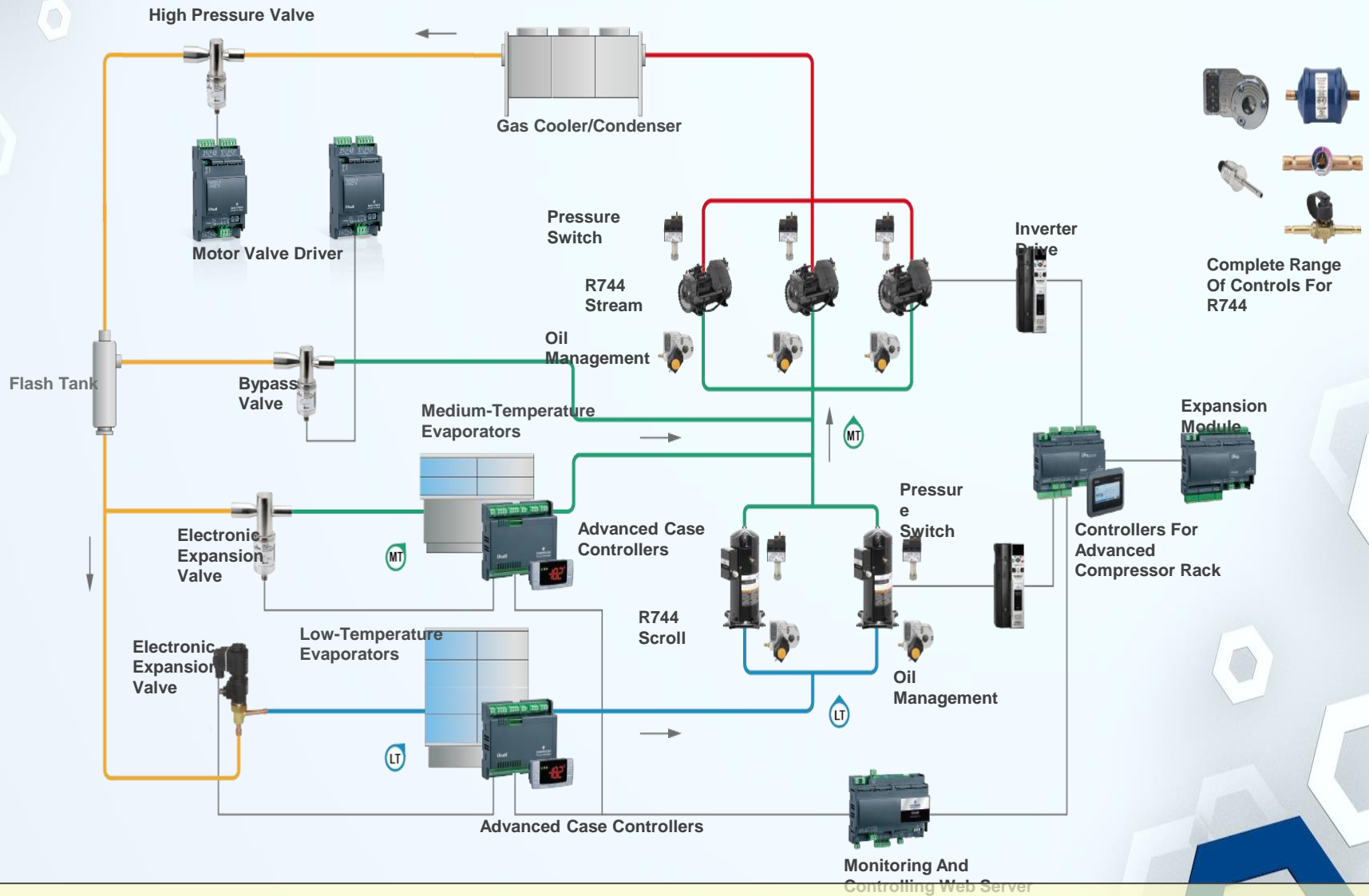


The Helix Innovation Center, providing infrastructure to enable natural refrigerants adoption

Haruyuki Kaeriyama
Senior Application Manager
Emerson Climate Technologies
Tokyo, Japan



Solutions For Refrigeration With CO₂ (R744)



300+ Sites With Various Types Of Emerson Solutions Globally

Refrigeration Industry Is Going Through Major Transitions

Refrigerants

- Natural – CO₂, Propane, NH₃
- Low GWP Alternatives
- Self Contained Systems
- Secondary Fluid Systems
- Leak Detection

Robust Food Safety

- Predictive Diagnostics
- Supervisory System
- Wireless
- Big Data
- Food Safety Transparency

Emerging markets

- Scroll, Screw Transitions
- HCFC Transition
- Multiple Compressor Racks
- Expanding Large Refrigeration
- Transport Refrigeration

Efficiency

- Modulation, EC Fan
- Parallel Compression
- Ejector System
- Scheduling & Floating Suction
- Glass Door

Lot Of Changes Are Happening

Just In Refrigerants There Are Multiple Factors Influencing The Choice

Regulations

**Investment
Cost**

**Operational
Cost**

Safety

**System
Architecture**

**Components
Availability**


**Consumer
Perception**

**Technician
Competency**

**Life Cycle
Maintenance**

Can We Provide A Infrastructure To Better Support These Transitions?

The Helix Overview

\$35 
MILLION
TOTAL INVESTMENT
OVER FIVE YEAR PERIOD

3 **INDUSTRY**
learning labs
to host up to
600 visitors and
trainees per year 

Located on University of
Dayton campus, part of
30 YEAR 
GLOBAL
PARTNERSHIP

Employ 
35
STAFF
PEOPLE
OVER FIVE YEAR PERIOD

5 **SIMULATED**

REAL-WORLD
environments

NEARLY **40,000**

square foot
FACILITY

Designed for Collaboration and Teaming

To foster an environment for academia and industry Stakeholders collaboration. Is dedicated to advancing research and education in heating, ventilation, air conditioning, and refrigeration technologies



Facility Grand Opening
Organization In Place
Facilities Up & Running
Natural Refrigerant Events

April 2016



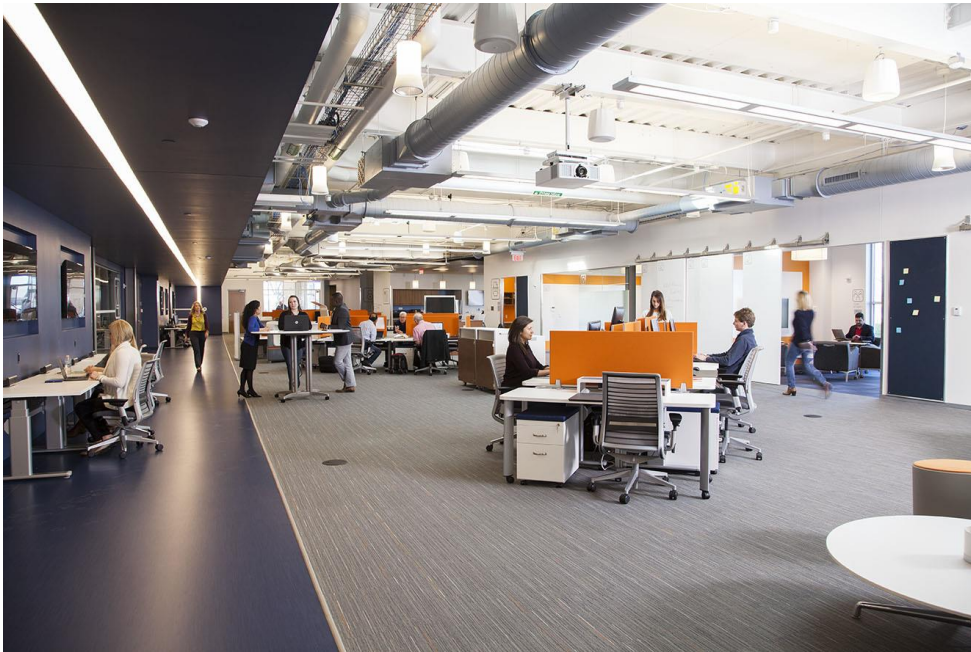
Over 20





Features

- 2,00 sq. m. home
 - Fully operational kitchen & bathrooms
 - Two complete air conditioning systems
 - Environmentally controlled chamber
- Temperature: -32 to 52 °C
Humidity: 20 to 90%



Features

- 3,100 sq. m. commercial building
- Low flow fixtures enable reduction in water usage
- Energy monitoring
- Reflective roofing materials which negate surrounding temperature impact
- 211 tons of construction waste diverted from landfills
- Environmentally controlled chamber
 - Temperature: -30°C to 50°C
 - Humidity: 20 to 90%



Features

- 140 sq. m., fully functional, high-density kitchen
- Capacity to serve 150 meals
- Independent temperature and humidity control
- Remote condensing equipment can be located in environment chamber
- Environmentally controlled chamber
Temperature: -30 to 52 °C
Humidity: 20 to 90%



Features

- CO₂ Transcritical refrigeration system
- 230 sq.m. Supermarket / C-store
- Independent humidity and temperature control
- Remote condenser located in environment chamber
- Environmentally controlled chamber
 - Temperature: --30 to 52 °C
 - Humidity: 20 to 90%
- Full System Integration; Refrigeration & HVAC

Training

Natural Refrigerants



WEBINAR



R-744 & R-717 Training

- End Users, Contractors, Colleges, Consultants, Wholesalers, Utilities, Energy Managers, Internal Staff
- Types: (R744, R717, R290)
 - In Class Theory
 - Webinars
 - Hands On
- Industry Stewardship
 - Handbooks
 - “Did You Know” Social Media
- Training Centers Located Globally
 - U.S., Canada, Latin America, Europe, Australia, India, China..

Helix Collaboration Methodology, 9 Steps

Problem Discovery

1. Objective:

CONVERGE ON A
CHALLENGE OR
CHALLENGES

2. Participants

GOVT. POLICY MAKERS
ACADEMIA
END USERS
CONSULTANTS
INSTALLATION & SERVICE
PERSONAL

3. Type Of Collaboration

ON SITE, DAYTON OHIO

Ideas Convergence

4. Understand

ECO SYSTEM,
OPPURTUNITY, JOBS,
OUTCOMES, CONSTRAINTS

5. Participants

FORM A CORE TEAM
BASED ON STEP 3 & 4

6. Type Of Collaboration

JOINT REVIEWS &
FEEDBACK

Realization

7. Create & Partner

PARTNER WITH A
PROVEN IDEA

8. Participants

GOVT. POLICY MAKERS
ACADEMIA
END USERS
CONSULTANTS
INSTALLATION & SERVICE
PERSONAL

9. Type Of Collaboration

ON SITE, JAPAN

Proposed CO2 testing at Helix;

STEP 1, CONVERGE ON A CHALLENGE; impact of the various system strategies In CO2 Transcritical System

Proposed Test Plan In Helix

Testing Order	Strategy	Refrigeration System	Store Level
1	Baseline Simple Booster	X	
2	Adiabatic Gas Cooler	X	
3	Parallel Compression	X	
4	Mechanical Sub-Cooling	X	
5	Vapor Ejectors and Parallel Compression	X	
6	Heat Reclamation for Hot Water		X
7	Heat Reclamation for Hot Water + Space Heating		X
8	Air Conditioning and Parallel Compression (TBD)		X
9	Liquid Ejectors & Parallel Compression (TBD)	X	
10	Integrated System (TBD)		X

1. Will Help Industry To Have One More Data Point On A Controlled Store Environment
2. Runs At Real Store Environment with Back To Back Test For Higher Confidence On Results
3. Will Help To Clearly Identify Change on Each System Strategy

Opportunity To collaborate