

# Emerson Cold Chain Solutions For The Dairy Industry



**COPELAND™**

  
**EMERSON™**

# About Emerson

Emerson is the world's leading provider of heating, ventilation, air conditioning and refrigeration solutions for residential, commercial and industrial applications, supporting the industry with advanced technology, technical support and training services.

For more than 80 years, we have been introducing innovative technology to the market, from the first semi-hermetic and hermetic compressors in the 1940s and 1950s, the high efficiency Discus™ semi-hermetic, air conditioning and heating scroll compressors in the 1980s and 1990s, to the new Stream semi-hermetic and the digital scroll compressor technology of today.

Based on this, we have developed an unequalled range of solutions for the refrigeration and air conditioning markets.

In recent years, we have become a major solution provider to the air conditioning and refrigeration industry. Our range of Copeland™ brand products addresses the diverse needs of all of these markets. With scrolls and semi-hermetic compressors available for all main refrigerants, equipped with smart electronics and capable of modulation, Emerson has taken compressor technology to new heights.

## Core Offerings

### Air Conditioning

Technologies that deliver high-quality, reliable and energy efficient HVAC solutions for commercial & residential applications



### Food Services

Proven refrigeration solutions to protect and safeguard food and the environment



### Cold Chain

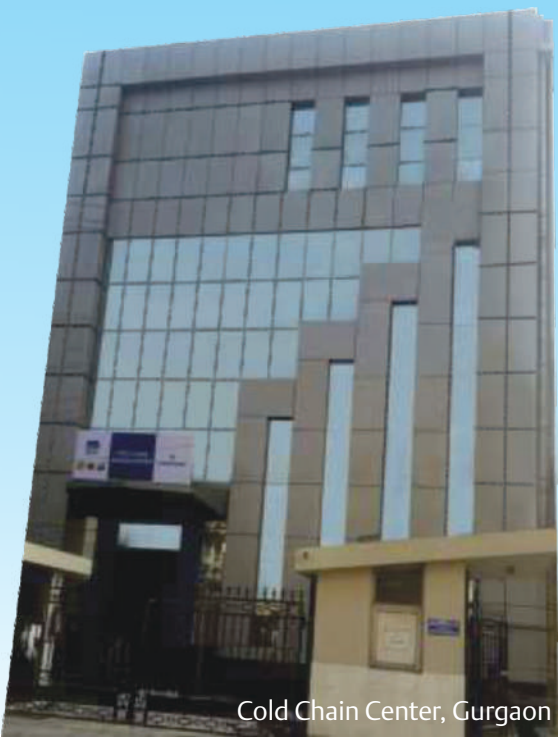
Emerson revolutionizes how food is kept cold and safe as it is transported from farm to fork.



### Sanitary Heating

Emerson heat pumps provide high reliability and performance for delivering hot water solutions





Cold Chain Center, Gurgaon



# Emerson Cold Chain Centers

Cold Chain & Distribution Center, Chakan

## Driving India's Cold Chain Industry Into The Future

A strong cold chain infrastructure is vital to make the step change required to reducing food wastage in India. There is a growing need to adopt energy efficient technologies to offset power shortages and to scale up the Cold Chain Infrastructure in the country.

In an effort to instill best practices and promote the usage of efficient technologies in the cold chain sector, Emerson has developed a state-of-the-art Cold Chain Centre of Excellence at Chakan, Pune which has rapidly risen to be recognized as the hub of cold chain solutions in India.

For North India, Emerson has developed a similar facility at Gurgaon. The center offers a wide range of services and

solutions which includes Project Design Services, Training & Education and a Semi-Hermetic Service Center.

## 360° Offerings For India Cold Chain Industry

The 'Emerson Cold Chain & Distribution Center' has created a new benchmark with its 360° offerings in the cold chain industry. It showcases a wide range of technology and service solutions for the industry, including custom-built products like condensing units and compressor racks suited for the harsh India climate, as well as value added services like project design & educational services.

### Objectives

- To design and manufacture energy efficient products tailored for the India market
- To support the cold chain market by offering project design consultation, ensuring efficient and optimal equipment selection
- To educate the India cold chain industry on best design & operating practices, leveraging energy efficient technologies, system operating guidelines
- To deliver world-class service and technical after sales support to partners in the refrigeration industry
- Continued industry stewardship in the development of standards for cold chain and transport solutions

## Project Design Services

Refrigeration Solutions For Optimal Design Of Cold Storage Facilities



Building a world class refrigerated cold storage requires a solid understanding of the technical principles and thorough refrigeration system design storage practices knowledge. The Emerson Project Design Team is a highly specialized and experienced team of design engineers who assist contractors, dealers and end-users, ensuring that cold chain projects are optimally designed and the right refrigeration equipment is selected.

Emerson Provides -

- Detailed Heat Load Calculation based on type of commodity stored & cold storage operation
- Full selection of Refrigeration Equipment to achieve Optimal Design & Improved Energy Efficiency
- Advanced Solutions with Networking, Communications & Monitoring Integrated Solutions for CA Cold Rooms, Humidity Controlled Cold Rooms, Ripening Chambers.

## On-site Project Commissioning Support

Flexible Assistance For Successful Project Execution



Emerson's potent technical know-how, talented engineering staff, design expertise ensures we can actively support you at the installation and execution stage.

Whether you're starting a new cold storage plant or fitting advanced refrigeration units, Emerson's proven streamlined project execution will identify and help reduce installation and operational risks, ensuring a safe, timely start-up. After

your start-up is complete, our certified technicians issue a comprehensive report that includes all diagnostics and data-driven recommendations for ongoing proactive maintenance planning and promoting asset life cycle management to maximize uptime and output.

## Training and Education

Promoting Energy Efficient Technologies, Best Practices & Increasing Awareness Levels Across Cold Chain



In an effort to instil best practices and promote the usage of green energy efficient technologies in the cold chain sector, we have launched the 'Educational Services Program' which is 'Free Of Cost'. Our world class 'Cold Chain Training Facility' features:

- Dedicated Training Classroom with Live Equipment & Products In Action
- Training Modules covering wide range of topics from

Refrigeration Fundamentals, System Troubleshooting to advanced topics Like Cold Room Design based on Customer Requirements

- Live Freezer and Chiller Cold Rooms
- 'Live Refrigeration System Training Simulator' Hands-on Training for Technicians and users of Refrigeration System Design, Installation and Commissioning Techniques.

## Semi-Hermetic Service and Scroll Tear Down Analysis Center

End-To-End Repair & Test Facility, Local Spare Parts Availability



Built on global standards, the Scroll Tear Down Analysis center has the capability of providing root cause analysis for 2-30 HP models. Customers can avail of- complete analysis setup for the entire range of semi-hermetic/scroll models, complete overhaul of electrical and mechanical components and functional testing, local availability of genuine Copeland parts,

Emerson is the only manufacturer with a full-fledged test facility for semi-hermetic compressors in India. The service centre is equipped with state-of-the-art test equipment to ensure flawless operation of semi-hermetic compressors after repair. The test results are evaluated against Emerson standards to ensure that the compressor passes all the standards qualification criteria for re-use.

# Emerson Solutions For Dairy

Produce High-quality Products, Minimize Food Waste, And Meet Increasing Regulations With Technologies That Drive Profitability & Energy Efficiency

The demand for dairy products is growing globally. The result is that dairy plants are striving to improve the quality of their products and the efficiency of their processes - both to remain competitive as well as to maximize profitability. All this while ensuring the highest level of safety.

Dairy is one of the most regulated industries, requiring different modes of refrigeration at various stages of milk processing along with dairy value-added products like curd, cheese, butter etc. Maintaining precise temperature for each step of milk processing is crucial for product quality.

Milk quality is not just judged on its fat content but also on its microbiological count. Rapid cooling right after milking remains the most reliable way to control microbiological count; maintaining milk flavor, quality and safety. A substantial amount of electricity is used each year to power refrigeration equipment for various applications like blast freezers, ice cream hardening, curd chilling from large to small scale dairies. Refrigeration typically consumes 25-30% of a dairy facility's electricity usage.

At various stages in the processing of Milk & value-added products, refrigeration plays an important role:

- Milk must be cooled to 4°C within three hours of milking. The milk tank then needs to be maintained at 4°C to avoid spoilage.
- Process chilling at dairies requires contaminant-free, chilled temperature.

- Specialized cold chain facilities like Blast Chilling, Hardening, Chilling etc. designed for specific refrigeration processes are critical to ensure the quality/long term storage of value added products.
- Transportation & Holding Cold Storages for Milk and Value-added products require continuous temperature control from source to retail distribution.

## Emerson Expertise at work

Emerson works with several dairy end users, helping them achieve critical temperature and storage requirements for different applications. The Emerson Project Design Team is a highly specialized and experienced team of design engineers who assist dairy end-users, ensuring that cold chain projects are optimally designed and the right refrigeration equipment is selected. They leverage Emerson's full range of condensing units in Reciprocating, Scroll & Semi-Hermetic Technologies from 1 to 250HP, that are specifically designed for various applications like curd chilling, ice cream hardening etc. They have also been extensively used by dairy clients for bulk milk tank cooling, ice cream hardening, curd chilling etc. applications in India.

Emerson's energy efficient condensing units coupled with advanced monitoring solutions for maintaining precise temperature have ensured both product quality and minimization of food wastage in dairies.



# Emerson Offers The Widest Range Of Products & Technologies Ranging From 1 - 250 HP For Dairy Industry

## Emerson Cold Chain & Distribution Center



Air-Cooled Semi-Hermetic CDU  
1-40 HP



2-Stage Semi-Hermetic CDU  
15-30 HP



Water-Cooled Scroll CDU  
2-6 HP



Water Cooled Scroll CDU  
(Shell & Tube Condenser)  
2 To 15 HP



Water-Cooled  
Semi-Hermetic CDU  
0.7-50 HP



Reciprocating Outdoor CDU  
1-6 HP



Scroll CDU  
With Vapor Injection  
7.5-20 HP



Transport Refrigeration CDU  
1.5 To 6HP



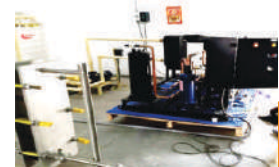
Multi-Compressor Pack  
10-250 HP



Air-Cooled Scroll CDU  
2-7.5 HP



Scroll Indoor/Outdoor CDU  
2-15 HP



Rapid/Instant Milk Chilling Units  
(Customized)

# Emerson Solutions For Varied Dairy Applications



# Milk Chilling – Bulk Milk Chilling



## How BMC Helps The Dairy Farmer?

- Immediate cooling of milk at collection centers prevents spoilage from high ambient temperatures
- Maintains milk taste
- Improves shelf life; reducing bacteria levels and fermentation

## Industry Practices – BMC

- Product Incoming Temp: 34°C
- Final Product Temp: 3-4°C
- Milk Collection 60% Morning, 40% Evening
- Evaporating Temp: -1°C
- Pull Down Time: 3 hrs
- Tank PUF Thickness: 80-100 mm
- Tank Material: SS 304/316L



## Illustrative Example:

- BMC Size: 3000L
- Two Milking A Day
- Tank Duly Insulated
- Rating Ambient as per IS 32 / Designed for 46° C Ambient
- Heat Load as per Two Milking & 3 hrs. Pull down :18.4kW

### Solution 1: Reciprocating CDU

- Technology: Reciprocating Compressor
- Product Model: KHR553MQE \* 2 Nos.
- Refrigerant: R 22
- Capacity: 10.4 kW /Unit
- Design COP: 2.73

### Solution 2: Scroll CDU

- Technology: Scroll Compressor
- Product Model: KHZ538MQE \* 2 Nos.
- Refrigerant: R 404A
- Capacity: 11.1 kW/Unit
- COP: 3.0

## Related Emerson Components:

- Expansion Valve ● Dixell Controller

## Typical Application Sizes & Emerson Product Selection:

BMC Capacity (Ltrs)	R22 Air Cooled Condensing Units		BMC Capacity (Ltrs)	R404A
	Reciprocating	Scroll		Scroll
200	KHJ513PAE	-	500	KHZ515MQL
500	KHR522MAE	KHZ515MQE	1000	KHZ521MQL
1000	KHR536MQE	KHZ521MQE	1500	KHZ538MQL
1500	KHR553MQE	KHZ538MQE	2000	KHZ521MQL*2
2000	KHR536MQE*2	KHZ521MQE*2	3000	KHZ538MQL*2
3000	KHR553MQE*2	KHZ538MQE*2	4000	KHZ545MAL*2
4000	KHR572MQE*2	KHZ545MAE*2	5000	KHZ548MAL*2
5000		KHZ548MAE*2		

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# Milk Chilling – Instant Cooling with IBT

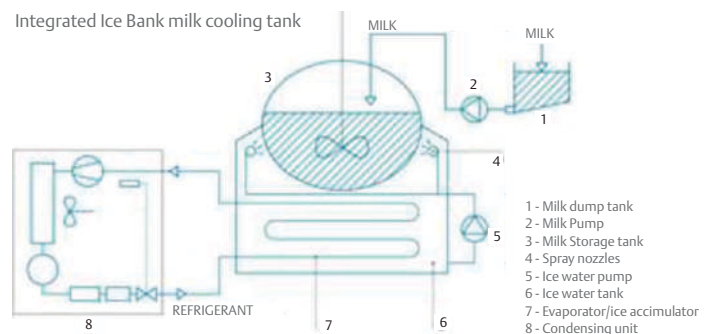
## How IBT Helps Milk Cooling

- Mainly used for bulk transfer; cost effective & compact solution
- Maintains quality of milk
- Suitable for areas lacking continuous energy/power
- Usage of IBT at night & ice bank during day, ensures higher efficiency

## Industry Practices – IBT

- Product Incoming Temp: 34°C
- Final Product Temp: 3-4°C
- Evaporating Temp: -1°C
- IBT Time: 14-16 hrs
- Tank PUF Thickness: 80-100 mm
- Tank Material: SS 304/316L

Integrated Ice Bank milk cooling tank



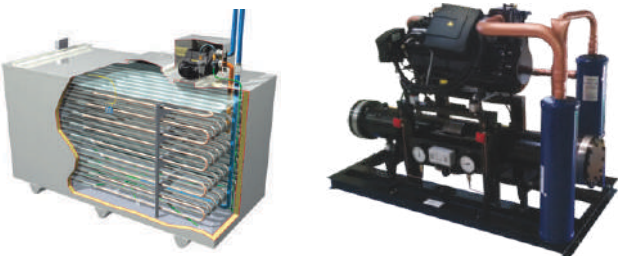
- 1 - Milk dump tank
- 2 - Milk Pump
- 3 - Milk Storage tank
- 4 - Spray nozzles
- 5 - Ice water pump
- 6 - Ice water tank
- 7 - Evaporator/ice accumulator
- 8 - Condensing unit

## Illustrative Example:

- Product Incoming Temp: 30°C , FINAL Product Temp: 3-5°C
- Evaporating Temp: -1°C / -10°C
- IBT Time: 14-16 hrs, TANK PUF Thickness: 80-100 mm
- Heat Load: For 10K IBT : 28 kW.

### Solution 1: Scroll CDU

- Technology: Scroll Compressor
- Product Model: KHZ576 \* 2 Nos.
- Refrigerant: R 404A
- Capacity: 18 kW /Mc
- Design COP: 2.43



### Solution 2: Water Cooled Semi-Hermetic CDU

- Technology: Semi-Hermetic Recip
- Product Model: EWC-D3SS150-E \* 1
- Refrigerant: R 404A
- Capacity: 30 KW
- COP: 2.1

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Thermostats

## General Application Sizes & Emerson Product Selection:

IBT (Ltrs)	kW	Unit
2500	7	KHZ 548 X 1NOS., KHR572PQE-DX, R-22 X1 NO.
5000	15	KHZ 595 X 1 NO.
10000	28	KHZ576 X 2 NOS.
20000	56	WATER COOLED: EWC-D3SS150-E X 2 Nos.



# Blast Chilling – Curd: Method I

## How Blast Chilling Helps The Dairy?

- Curd is chilled after the incubation process gets completed
- Maintains quality of curd throughout the season
- Adapts to the varied India climate
- Quick chilling increases the product quality

## Industry Practices – Blast Chilling

- Product Incoming Temp: 45-55°C
- Final Product Temp: 10-15°C
- Room Temp: -5°C
- Evaporating Temp: -10°C
- Pull Down Time: 3-4 hrs
- PUF Thickness: 100-120 mm



### Illustrative Example:

- Loading of Curd : 2500 kg / batch
- Incoming Temp of Curd : 40 ~ 45°C
- Chilling up to 10°C
- Pull Down Time : 2.5 hrs.
- Heat Load : 43 kW
- Recommended Room Size : 20 FT X 10 FT X 12 FT (H) with 100mm PUF
- Evaporative Temp : -10°C

#### Solution 1: Stream Semi-Hermetic CDU

- Technology: Stream Compressor
- Product Model: Z12-6MK 35K
- Refrigerant: R 404A
- Capacity: 44 kW
- COP: 1.75

#### Solution 2: Standard Semi-Hermetic CDU

- Technology: Standard Semi-Hermetic Compressor
- Product Model: Z12-6 SJ-400X
- Refrigerant: R 404A
- Capacity: 49 kW
- COP: 1.58

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Options for Scroll Rack

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Product Loading / Batch [Kgs]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
2000	15 x 10 x 12H	36	Z9-4MI-30X	TJR-9 S	XR06CX/ XR70CX
2500	20 x 10 x 12H	43	Z12-4MK-35X	TJR-12 S	
4000	20 x 14 x 15H	70	Z9-4MI-30X * 2	TJR-9 S* 2	
5000	24 x 16 x 15H	86	Z12-4MK-35X * 2	TJR-12 S* 2	

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## Blast Chilling – Curd: Method II

### How Blast Chilling Helps The Dairy?

- Curd is chilled after the incubation process gets completed
- Maintains quality of curd throughout the season
- Adapts to the varied India climate
- Quick Chilling Increases Product Quality
- Chills to room temperature at a faster rate, followed by cooling in a storage room

### Industry Practices – Blast Chilling

- Product Incoming Temp: 42°C
- Final Product Temp: 18-20°C
- Room Temp: 5°C
- Evaporating Temp: 0°C
- Pull Down Time: 1 hr
- PUF Thickness: 100 mm



### Illustrative Example:

- Load in kg of Curd : 2000 kg / batch
- Incoming Temp of Curd : 40 ~ 45°C
- Chilling up to 18°C
- Pull Down Time : 1Hrs.
- Heat Load : 56 kW ,
- Recommended Room Size : 15 FT X 10 FT X 12 FT (H) with 100mm PUF
- Evaporative Temp : 0°C

#### Solution 1: Semi-Hermetic CDU

- Technology: Stream Semi-Hermetic Compressor
- Product Model: Z9-4MJ-33X
- Refrigerant: R 404A
- Capacity: 57 kW
- COP: 2.18

#### Solution 2: Scroll CDU

- Technology: Scroll
- Product Model: KHZ611 \*2 Nos.
- Refrigerant: R 404A
- Capacity: 58 kW
- COP: 2.15

### Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Options for water cooled

### General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Product Loading / Batch [Kgs]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
1000	10 x 10 x 10H	30	W9-3SS-150X	TJL-9 S	XR02CX / XR30CX
2000	15 x 10 x 12H	56	Z9-4MJ-33X	TER-16 S	
3000	20 x 10 x 12H	84	Z9-4MA-22X * 2	TJR-12 S* 2	
4000	20 x 14 x 15H	110	Z9-4MJ-33X * 2	TER-16 S* 2	



# Milk Pouches Holding Chamber

## Advantages Of Holding Chamber For The Dairy?

- Milk Pouches are in pre-cooled condition
- Maintains temperature of pouch, thus quality of milk
- Arrests bacteria growth
- Cools up to 2°C, taking care of distribution loss

## Industry Practices – Milk Pouches Holding

- Product Incoming Temp: 4°C
- Final Product Temp: 2°C
- Room Temp: 2°C
- Evaporating Temp: -3°C
- Pull Down Time: 4 hrs
- PUF Thickness: 80-100 mm



### Illustrative Example:

- Quantity of Milk Pouch to be stored : 10000L (500ml \* 20000 Pouches)
- Incoming Temp of Milk Pouch : 4°C
- Chilling up to 2°C
- Pull Down Time : 4~5 Hrs.
- Heat Load : 21 kW
- Recommended Room Size : 20 FT X 10 FT X 12 FT (H) with 100mm PUF
- Evaporative Temp : -3°C

#### Solution 1: Scroll CDU

- Technology: Scroll
- Product Model: KHZ548PQL \* 2 Nos.
- Refrigerant: R 404A
- Capacity: 21 kW
- COP: 1.5

#### Solution 2: ZX Scroll CDU

- Technology: Scroll
- Fully Loaded ZX series
- Product Model: ZX060 E \* 2 Nos.
- Refrigerant: R 404A
- Capacity: 22 kW
- COP: 2.11

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Product Loading / Batch [LPD]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
10000	20 x 15 x 12H	21	KHZ548PQL * 2	TIE-SW, TIO-006 * 2	XR02CX / XR30CX
20000	26 x 20 x 15H	38	KHZ576PQL * 2	TCLE-4 1/2 S * 2	
25000	26 x 24 x 15H	47	KHZ595PAL * 2	TCLE-7 S * 2	
30000	30 x 24 x 15H	55	KHZ611PAL * 2	TCLE-8 S * 2	

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# Ice-Cream Hardening Chambers

## Benefits Of Ice Cream Hardening

- Freezes Ice Creams Upto -20°C
- Maintains Freshness, Quality & Taste of Ice Cream
- Ensures Smoother Texture Of Ice Cream; Easy To Transport
- Better Ice Cream Consistency Irrespective Of Shape
- Allows Dairy's To Offer Customized Shapes

## Industry Practices – Hardening

- Product Incoming Temp: -5°C
- Final Product Temp: -20°C
- Room Temp: -35°C
- Evaporating Temp: -40°C
- Pull Down Time: 6 hrs
- PUF Thickness: 150 mm



### Illustrative Example:

- Ice Cream Qty to be Harden : 500Kg
- Incoming Temp of Ice Cream from IQF: 0 ~ -5°C
- Freezing up to -15 ~ 18 °C
- Pull Down Time : 6 hrs.
- Heat Load : 9 kW
- Recommended Room Size : 10 FT X 10 FT X 10 FT (H) with 150mm PUF
- Evaporative Temp : -35 ~ -40 °C

### Solution 1: CDU

- Technology: CDU with Scroll Technology
- Product Model: KHZ559LVL-TFD-300
- Refrigerant: R 404A
- Capacity: 9.5 kW (at-40)
- COP: 1.1

### Solution 2: Semi-Hermetic CDU

- Technology: 2-Stage Semi-Hermetic CDU
- Product Model : Z9-6TA-150X-SUB
- Refrigerant: R 404A
- Capacity: 11 kW (at -40)

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Variable speed CDU's for smaller capacity

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

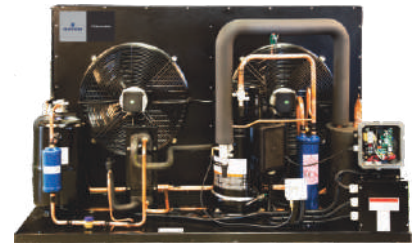
Product Loading / Batch [Kgs]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
500	8 x 8 x 10H	8.2	KHZ 559 LVL	TCL-7 S	XR70CX / XR75CX
1000	10 x 10 x 10H	15.6	Z12-6TJ-250X SUB	TJR-9 S	
1500	14 x 10 x 12H	23.0	Z9-6TA-150X SUB * 2	TJL-9 S * 2	
2000	17 x 13 x 12H	30,5	Z12-6TJ-250X SUB * 2	TJR-9 S * 2	



# Ice-Cream Holding Storages

## Why Ice-Cream Needs To Be Stored At Desired Temperature?

- Ice -Cream to be stored below  $<-18^{\circ}\text{C}$  To Maintain Quality/Freshness Of Ice Cream
- Prevents Ice Crystal Formation
- Maintains Shape, Texture & Taste of Ice Cream
- Arrests Bacteria Growth



## Industry Practices – Holding

- Product Incoming Temp:  $18^{\circ}\text{C}$
- Final Product Temp:  $22^{\circ}\text{C}$
- Room Temp:  $25^{\circ}\text{C}$
- Evaporating Temp:  $-27^{\circ}\text{C}$
- Pull Down Time: 12 hrs
- PUF Thickness: 120 mm

### Illustrative Example:

- Ice Cream Qty to stored : 100 MT
- Incoming Temp of Ice Cream from IQF:  $-15 \sim -18^{\circ}\text{C}$
- Freezing up to  $-18 \sim -20^{\circ}\text{C}$
- Pull Down Time : 12 hrs.
- Heat Load : 24.7 kW
- Recommended Room Size : 55 FT X 35 FT X 22 FT (H) with 150mm PUF
- Evaporative Temp :  $-27^{\circ}\text{C}$

### Solution 1: KHZLVL Scroll CDU

- Technology: Scroll With Vapor Injection Technology
- Product Model: KHZ550LVL \*2 Nos.
- Refrigerant: R 404A
- Capacity: 14.04 kW
- COP: 1.36

### Solution 2: Semi-Hermetic CDU

- Technology: Semi-Hermetic Reciprocating Technology
- Product Model: W11-4SF-100X \*2 Nos.
- Refrigerant: R 404A
- Capacity: 10.36 kW
- COP: 1.13

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Variable speed CDU's for smaller capacity

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Storage Capacity [MT]	Daily Loading [Kgs]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
25.0	2500 Kgs	34 x 26 x 12H	10.6	ZXL050BE * 2	TIE-SW, TIO-005 *2	XR06CX / XR70CX
50.0	5000 Kgs	44 x 30 x 12H	15.2	ZXL075BE * 2	TCLE-3 S *2	
100.0	10000 Kgs	55 x 34 x 22H	24.7	KHZ550LVL * 2	TCLE-4-1/2 S *2	
150.0	15000 Kgs	64 x 38 x 22H	38.8	KHZ559LVL * 2	TCLE-7 S *2	

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# Butter Milk Storing Chambers

## Why Butter Milk Needs Storage In Cold Chamber?

- Butter Milk is extremely sensitive to oxidation making it spoil quickly
- Buttermilk is produced by adding lactic acid bacteria to pasteurized skimmed milk.
- Directly control aerobic count
- Terminates the production of acid.
- When the buttermilk has been bottled, it must be stored at 4°C. If stored at given temperature, the buttermilk will have a shelf life up to 2-3 weeks.
- Prevents growth of pathogenic microorganisms, if the buttermilk is kept cool.



## Industry Practices – Hardening

- Product Incoming Temp: -28°C
- Final Product Temp: 5°C
- Room Temp: 4°C
- Evaporating Temp: -1°C
- Pull Down Time: 12 hrs
- PUF Thickness: 80 mm

### Illustrative Example:

- Qty of Butter Milk to be cooled & Stored: 50000L
- Daily Loading: 10000L
- Incoming Temp: 28°C
- Chilling up to 5°C
- Pull Down Time: 12 hrs.
- Heat Load: 37 kW
- Recommended Room Size: 34 FT X 20 FT X 12 FT (H) with 100mm PUF
- Evaporative Temp: -1°C

### Solution 1: Scroll CDU

- Technology: Scroll Technology
- Product Model: KHZ566PQL \* 2
- Refrigerant: R 404A
- Capacity: 19 kW \* 2 Nos.
- COP: 2.40

### Solution 2: Semi-Hermetic CDU

- Technology: Semi-Hermetic Technology
- Product Model: Z9-4SH-250X
- Refrigerant: R 404A
- Capacity: 40kW
- COP: 1.84

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Storage Capacity [LTR]	Daily Loading [LPD]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Controllers
20,000	4,000	20 x 15 x 10H	15.7	KHZ529PQL * 2	AAE-2-1/4 S	XR02CX / XR30CX
30,000	6,000	30 x 15 x 10H	22.9	KHZ545PQL * 2	AAE-3-1/2 S	
50,000	10,000	34 x 20 x 12H	36.8	KHZ566PQL * 2	TCLE-4-1/2 S * 2	
100,000	15,000	40 x 25 x 15H	54.7	KHZ611PQL * 2	TCLE-8 S * 2	



# Paneer Chilling Chambers

## Why Paneer Chilling Is Required?

- Paneer is a highly perishable product.
- Freshness of paneer remains intact only for 3 days at refrigerated temperature
- Paneer Chilling Extends its shelf life to 30 days
- Use of packaging significantly increased the shelf life of paneer.
- Normally, paneer blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions.



## Industry Practices – Holding

- Product Incoming Temp: 20°C
- Final Product Temp: 2°C
- Room Temp: 0°C
- Evaporating Temp: -5°C
- Pull Down Time: 12 hrs
- PUF Thickness: 100 mm

### Illustrative Example:

- Qty of Paneer to be cooled & Stored: 25MT
- Daily Loading: 2.5MT
- Incoming Temp: 20°C
- Chilling up to 2~5°C
- Pull Down Time: 12 hrs.
- Heat Load: 11 kW
- Recommended Room Size: 30 FT X 20 FT X 12 FT (H) with 100mm PUF
- Evaporative Temp: -5°C

### Solution 1: Scroll CDU

- Technology: Scroll
- Product Model: KHZ521PQL \* 2 Nos.
- Refrigerant: R 404A
- Capacity: 5.5kW \* 2 Nos.
- COP: 1.8

### Solution 2: Scroll CDU

- Technology: Scroll
- Product Model: KHZ545PQL
- Refrigerant: R 404A
- Capacity: 11 kW
- COP: 2.1

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Storage Capacity [MT]	Daily Loading [Kgs]	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Controllers
25.0	2500	30 x 20 x 12H	11.6 kW	KHZ521PQL * 2	AAE-2 S	XR02CX /XR30CX
50.0	5000	42 x 30 x 12H	18.8 kW	KHZ538PQL * 2	AAE-2-1/2 S	
100.0	10000	50 x 34 x 15H	34.5 kW	KHZ566PQL * 2	TCLE-4-1/2 S *2	
150.0	15000	55 x 40 x 15H	46.4 kW	KHZ595PAL * 2	TCLE-7 S *2	

Disclaimer : Results shown is only for comparison and illustrative purpose only. The assumptions and data used for heat load calculation can vary depending on the site conditions. Emerson cannot be held responsible for any errors, omissions or misrepresentations in the data represented. For detailed solutions and customized offering, please get in touch with your Emerson representative.

# Butter Hardening Chambers



## How Butter Hardening Helps?

- Butter is a moderately perishable product. For fresh butter; it is recommended to keep frozen until use.
- For long-term storage, it is still safest to store butter wrapped or covered in the refrigerator
- Normally, butter blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions



## Industry Practices – Hardening

- Product Incoming Temp: 5°C
- Final Product Temp: -20°C
- Room Temp: 22°C
- Evaporating Temp: -35°C
- Pull Down Time: 8 hrs
- PUF Thickness: 150 mm

### Illustrative Example:

- Qty of Paneer to be cooled & Stored: 500Kgs
- Daily Loading:/Batch 500 kgs
- Incoming Temp: 5°C
- Freezing up to -20°C
- Pull Down Time: 8 hrs.
- Heat Load: 5 kW
- Recommended Room Size: 8FT X 10 FT X 10 FT (H) with 150mm PUFF
- Evaporative Temp: -35°C

### Solution 1: ZXL CDU Series

- Technology: Scroll with Vapor Injection Technology
- Product Model: ZXL075EB
- Refrigerant: R 404A
- Capacity: 5.5 kW
- COP: 2.1

### Solution 2: CDU

- Technology: Semi-Hermetic Reciprocating
- Product Model: V6-3SS-100X \* 1 No.
- Refrigerant: R 404A
- Capacity: 5.5 kW
- COP: 1.4

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Product Loading/Batch	Chamber Size [Feet] Required	Refrigeration Capacity [kW]	Emerson CDU Model	Dixell Digital Controllers
500 Kgs	8 x 8 x 8 H	5.0	V6-3SS-100X	XR70CX / XR75CX
1000 Kgs	8 x 10 x 10 H	9.7	W9-4ST-200X	
2000 Kgs	14 x 10 x 12 H	18	Z9-6TH-200X-SUB	
3000 Kgs	17 x 13 x 12 H	28	Z9-6TA-150X-SUB*2	
5000 Kgs	20 x 15 x 15 H	38	Z12-6TJ-250X-SUB*2	

# Butter Holding Storages

## How Freezing Helps?

- For fresh butter; it is recommended to keep frozen until use.
- For long-term storage, it is still safest to store butter wrapped or covered.
- Normally, butter blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions



## Industry Practices – Holding

- Product Incoming Temp: -18°C
- Final Product Temp: -20°C
- Room Temp: -22°C
- Evaporating Temp: -25°C
- Pull Down Time: 12 hrs
- PUF Thickness: 150 mm

### Illustrative Example:

- Qty of Butter to be & Stored: 20000Kg (10% loading)
- Daily Loading:/Batch 2MT
- Incoming Temp: -18°C
- Freezing up to -20°C
- Pull Down Time: 12 hrs.
- Heat Load: 7.9 kW
- Recommended Room Size: 34FT X 20 FT X 12 FT (H) with 150mm PUF
- Evaporative Temp: -25°C

#### Solution 1: KHZLVL Scroll CDU

- Technology: Scroll with Vapour Injection Technology
- Product Model: KHZ526LVL \* 1 No.
- Refrigerant: R 404A
- Capacity: 8 kW
- COP: 1.48

#### Solution 2: Scroll CDU

- Technology: Scroll Technology
- Product Model: ZXL075EB
- Refrigerant: R 404A
- Capacity: 8.08
- COP: 1.4

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

## General Application Sizes & Emerson Product Selection: Refrigerant: R404A

Storage Capacity [In MT]	Daily Loading [Kgs]	Chamber Size (Feet) Required	Refrigeration Capacity [kW]	Emerson CDU Model	Expansion Valve	Dixell Digital Controllers
20.0	2000	34 x 20 x 12H	7.9	KHZ526LVL	TCLE - 3 S	XR06CX / XR70CX
50.0	5000	38 x 30 x 12H	12.5	KHZ550LVL	TCLE - 4-1/2 S	
100.0	10000	50 x 34 x 15H	18.8	KHZ536LVL * 2	TCLE - 4-1/2 S*2	
200.0	20000	55 x 40 x 22H	32.7	KHZ559LVL * 2	TCLE - 7 S*2	

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## Cheese Chilling

### Why Cheese Chilling Is Required?

- Cheese is a moderately perishable product; For Fresh Cheese it is recommended to cool it during processing
- Cheese is cooled to maintain its texture.
- Normally, cheese blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions



### Industry Practices – Cheese Chilling

- Product Incoming Temp: 12°C
- Final Product Temp: 2-4°C
- Room Temp: 0°C
- Evaporating Temp: -2°C
- Pull Down Time: 4-6 hrs
- PUF Thickness: 80 mm

#### Illustrative Example:

- Qty of Cheese Chilled: 5000Kg
- Incoming Temp: 12°C
- Chilling up to 2~4 -C
- Pull Down Time: 4~6 Hrs.
- Heat Load: 23 kW
- Recommended Room Size: 14FT X 14 FT X 10 FT (H) with 80mm PUF
- Evaporative Temp: -2°C

#### Solution 1: Scroll CDU

- Technology: Scroll Technology
- Model: KHZ548PQL \*2 No.
- Refrigerant: R 404A
- Capacity: 11.6\*2 kW
- COP: 1.6

#### Solution 2: Scroll CDU

- Technology: Scroll Technology
- Product Model: KHZ595PAL-DX \*1 No.
- Refrigerant: R 404A
- Capacity: 23.5kW
- COP: 1.5

### Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

# Cheese Storages

## Why Cheese Storage Is Needed In Cold Room Chillers?

- Cheese is a moderately perishable product; Cheese is cooled to maintain its texture.
- Normally, cheese blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions

## Industry Practices – Cheese Storage

- Product Incoming Temp: 5°C
- Final Product Temp: 2-4°C
- Room Temp: 0°C
- Evaporating Temp: -2°C
- Pull Down Time: 20-22 hrs
- PUF Thickness: 80 mm



### Illustrative Example:

- Qty of Cheese Chilled: 15000Kg
- Incoming Temp: 5°C
- Chilling up to 2~4 -°C
- Pull Down Time: 20~22 Hrs.
- Heat Load: 12 kW
- Recommended Room Size: 20FT X 20 FT X 12 FT (H) with 80mm PUF
- Evaporative Temp: -2°C

#### Solution 1: Scroll CDU

- Technology: Scroll Technology
- Product Model: KHZ558PQL-EX
- Refrigerant: R 404A
- Capacity: 11.6 kW
- COP: 1.72

#### Solution 2: Scroll CDU

- Technology: Scroll Technology
- Product Model: KHZ526PQL-EX \*2 No.
- Refrigerant: R 404A
- Type : ODU
- Capacity: 6 kW \*2 Nos.
- COP: 1.62

## Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's



## Shrikhand Storage

### Shrikhand Storage:

- Shrikhand is a semi soft sweet & sour whole milk product
- It is stored for long term preservation of quality & taste

### Industry Practices – Shrikhand Storage

- Product Incoming Temp: 5°C
- Final Product Temp: 0°C
- Room Temp: -2°C
- Evaporating Temp: -5°C
- Pull Down Time: 20-22 hrs
- PUF Thickness: 80 mm



### Illustrative Example:

- Qty of Shrikhand to be stored: 10000Kg
- Incoming Temp: 5°C
- Chilling up to 0°C
- Pull Down Time: 20~22 hrs.
- Heat Load: 7 kW
- Recommended Room Size: 15FT X 15 FT X 10 FT (H) with 80mm PUF
- Evaporative Temp: -5°C

#### Solution 1: Scroll CDU

- Technology: Scroll Technology
- Model: KHZ538PQL-EX
- Refrigerant: R 404A
- Capacity: 9 kW
- COP: 2.26

#### Solution 2: Reciprocating CDU

- Technology: Reciprocating Technology
- Product Model: KHR552PQE-DX \* 1 No.
- Refrigerant: R22
- Type: ODU
- Capacity: 8.5kW
- COP: 2.1

### Related Emerson Components:

- Expansion Valve
- Dixell Controller
- Digital CDU's

# Successful projects

We have successfully provided refrigeration systems for dairy projects across the country. These have been designed and manufactured by Emerson's trained engineers who bring to bear a world of global experience to the country.

### Application : Blast Chiller - Curd Processing



- Stream S/H Model: Air Cooled CDU 4MK-35X\* 2Nos
- Room Temp.: -5 °C
- Refrigerant: R404A
- Location: Mumbai

Product : Air-Cooled Stream Condensing Unit

### Application : Ice Candy Manufacturing

- 1 No (LA50-40E) Air-cooled CDU
- Evaporating Temperature: -23 °C
- Refrigerant: R404A
- Location: Mumbai



Product : L Series Semi-Hermetic Compressors

### Application : Cold Room for Dairy Products



- 4 Nos (W9-3SS-150X)
- Evaporating Temperature: 4 °C
- Refrigerant: R404A
- Location: Chennai

Product : Air-Cooled Stream Condensing Units



### Application : Cold Rooms and Deep Freeze Units



- Model: 6 Nos \* V6-4ML-15X Semi-Hermetic CDU (Ice Cream Deep Freeze)
- 2 Nos \* Z9-6TJ-250X 2-Stage CDU (Ice Cream Hardening)
- 3 Nos \* KHZ529PQE (Anterooms)
- 2 Nos \* KHZ548PQL (Paneer & Other Products)
- Evaporating Temp.: -32 °C (Ice Cream Deep Freeze)
- -36 °C (Ice Cream Hardening)
- -5 °C (Paneer Storage)
- Refrigerant: R404A
- Location: Chennai

### Product : Semi-Hermetic & Scroll Condensing Units

### Application : Freezer Rooms

- 3 Nos (6MI-40X) Condensing Units
- Room Temperature: -25 °C
- Refrigerant: R404A
- Location: Dindigul



### Product : Stream Compressors

### Application : Cold Room For Medium Temp Application (+2 C)



- Type Of CDU: Air-cooled CDU (2 Units For One Cold Room) With Stream Compressor 4MK-35X
- Room Temperature: +2 °C
- Refrigerant: R404A
- Location: Mumbai

### Product : Air-Cooled Semi-Hermetic CDUs

## Application : Milk Chilling



- Water Cooled Semi-Hermetic Condensing Unit Model: EWC-4MK35X-A 13-4 \* 2 Nos (Med Temp)
- Milk Temperature:
  - 2 To 4 °C For Milk Chilling Purpose
- Refrigerant: R404A
- Location: Baramati

Product : Water Cooled Semi-Hermetic Condensing Units

## Application : Milk Chilling

- Stream Model: 6MI-40X-AWM D/D \* 1 Nos (Med Temp)
- Milk Temperature:
  - 2 To 4 °C For Milk Chilling Purpose
- Refrigerant: R404A
- Location: Ranchi



Product : Stream Compressor

## Application : Butter Storage & Butter Quick Chilling



- Model: KHZ536LVL \* 2 Pcs & KHZ576PQL \* 1 Pc
- Room Temperature: -20° C
- Refrigerant: R404A
- Location: Baramati

Product : KHZ\* LVL Scroll Condensing Units With Vapor Injection

### Application : Dairy Cold Storage



- Model: EWC-6SL250X \* 2 Pcs, EWC-ZB Series (12-15HP)\* 19 Pcs, EWC-6ST320X \* 3 Pcs
- Room Temperature: -20° C
- Refrigerant: R404A
- Location: Bhatinda

### Product : Water Cooled Semi-Hermetic/ Scroll Condensing Units

### Application : Ice Cream Cold Storage

- Model: KHZ550LVL \* 3 Pcs
- Room Temperature: -25° C
- Refrigerant: R404A
- Location: Mangalore



### Product : KHZ \* LVL Scroll Condensing Units With Vapor Injection

### Application : Instant Milk Chilling



- Model: 35HP Semi-Hermetic Compressor
- Evaporating Temperature: -5°C
- Refrigerant: R404A
- Location: Gujarat

### Product : Stream Semi-Hermetic Compressor

### Application : Blast Chilling & Butter Storage



- Model: KHZ536LVL \* 2 Pcs, 30HP Semi-CDU \* 1 Pc
- Evaporating Temperature: -10° C
- Refrigerant: R404A
- Location: Vashi

Product : KHZ \* LVL Scroll Condensing Units With Vapor Injection/ Semi-Hermetic CDUs

### Application : Ice Cream Storage

- Model: ZXL050E \* 2 Pcs
- Room Temperature: -25° C
- Refrigerant: R404A
- Location: Ahmedabad



Product : Next Generation Scroll Condensing Units With Diagnostics

### Application : Water Chilling For Dairy Application



- Model: 15HP Semi-Hermetic Compressor Based Chiller
- Evaporating Temperature: 0° C
- Refrigerant: R404A
- Location: Jalgaon

Product : Customized Semi-Hermetic Based Chilling Unit

### Application : Ice Cream Storage



- Model: EWC-4MF013X-A8-4 \* 3 Pcs
- Room Temperature: -25° C
- Refrigerant: R404A
- Location: Vadodara

**Product : Water Cooled Semi-Hermetic Condensing Unit**

### Application : Ice Cream Candy Machine

- Model: 10HP Semi-Hermetic Compressor Based Chiller
- Evaporating Temperature: -28°C
- Refrigerant: R404A
- Location: Mehsana



**Product : Semi-Hermetic Compressor**

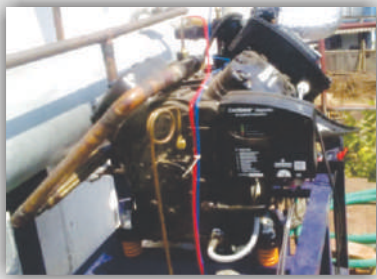
### Application : Instant Milk Chilling



- Model: EWC-4MK35X-A 13-4 \* 2 Pcs
- Chilled Water Temperature: 2-4 deg C
- Refrigerant: R404A
- Location: Baramati

**Product : Water Cooled Semi-Hermetic CDUs**

### Application : Ice Candy Manufacturing

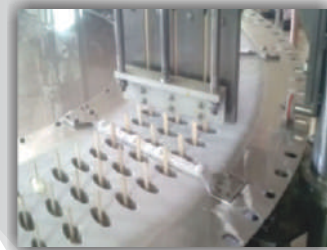


- Machine With A Capacity Of 2000 Candies/hr Using Brine Chiller
- 1 Nos \* 4MM1- 20X For LT System With Water Cooled Condenser
- Evaporating Temperature: -30 °C
- Refrigerant: R404A
- Location: Mumbai

Product : Stream Semi-Hermetic Compressors

### Application : Low Temp. Application for Ice Cream Candy Machine

- Stream S/H Model: 6 THW-200E SUB (2 Nos.) With Water-Cooled Condenser
- Evaporating Temperature: -43 °C
- Refrigerant: R404A
- Location: Kochi



Product : Water-Cooled 2 Stage Semi-Hermetic Condensing Units

### Application : Ice Cream Plant



- Semi-Hermetic Condensing Unit Model: EWC-4MF13X-A8-4 \* 3 pcs.
- Room Temperature:
  - -25 °C Product Temperature
- Refrigerant: R404A
- Location: Bhopal

Product : Water Cooled Semi-Hermetic Condensing Units

### Application : Ice Cream Plant



- Scroll Condensing Units (5-8HP) \* 9Nos
- Semi-Hermetic Units (13-40HP)\* 8Nos
- Room Temperature:
  - -25 °C Product Temperature
  - 2 To 4 °C For Chillers
- Refrigerant: R404A
- Location: Ludhiana

Product : Scroll/ Semi-Hermetic Condensing Units

# Flow Controls and Monitoring Systems

# Electronics

## Emerson Dixell™ Controllers For Cold Room

### Parametric Controllers

- Hot Key for quick and easy Parameter Programming
- Instant visibility of machine status via Display Icons
- Innovative Suction Pressure Management of Rack Compressors
- Management of Anti – Sweat Heaters
- TTL or RS485 serial connection for Monitoring Systems
- Standard Communication Protocol ModBUS-RTU
- Dynamic setpoint – supermarket applications

### Programmable Controllers

- Complete communication integrated solution, with WEB Server, ModBUS, and BACNET MS / TP & TCP-IP
- 80MB Memory for Alarm Management
- LINUX Operating System with ISaGRAF internal website
- UL approved

### XWEB A Web Based Server With Linux OS – Supervisor & Monitoring System

- Better commissioning with Real Time Data Graphs
- Faster HACCP printout reports with a few clicks
- Up to 1 year temperature recording
- Possibility to modify the parameters of the connected devices remotely
- CRO for Compressor Rack Optimization





# Cargo solutions

## Comprehensive Cold Chain Monitoring Solutions



Temperature, humidity monitoring and location tracking to ensure freshest and safest food reaches the consumer. Serving all segments of the perishable supply chain

- Data loggers – small form, lightweight & environment-friendly
- GO PDF, time & temperature in PDF format download
- GO NFC, time & temperature data through mobile device
- GO Real-time tracker, real-time location & temperature

# Flow Controls

## Emerson Valves, Controls & System Protectors

- Thermal and electronic expansion valves
- Pressure transmitters and controls
- Rack, display case, condensing unit and fan-speed controllers
- Superheat and cold room controllers
- Oil management devices
- Suction accumulators
- System protectors and moisture indicators

### Features & Benefits

- Best-in-class mechanical and electronic controls
- Application includes HFC, HCFC, CFC and CO2
- Wide operating range
- Hermetic and field serviceable options



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