

Emerson Cold Chain Solutions

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Our technologies such as digital modulation, enhanced vapor injection, sound reduction, and integrated compressor electronics help reduce lifecycle costs and ensure longer equipment life.



Commercial & Residential Solutions

Key Initiatives

ENERGY EFFICIENCY & SUSTAINABILITY

We've designed our innovative Copeland[™] compressors to help air conditioning and refrigeration OEMs reach new levels of efficiency and navigate a fast-evolving, global regulatory landscape.

HUMAN HEALTH & COMFORT

Our climate control and temperature monitoring technologies help ensure the safe transport and storage of critical vaccines and pharmaceuticals; and provide people with greater climate control of their indoor spaces at home and work.

FOOD QUALITY & SAFETY

Our Copeland[™] and Lumity[™] cold chain solutions provide the food industry with sustainable refrigeration technologies, in-transit cargo tracking and onsite temperature management; our InSinkErator[™] disposers enable convenient, hygienic and sustainable food waste management for homes and foodservice settings.

INFRASTRUCTURE MANAGEMENT, PRODUCTIVITY & SAFETY

Our RIDGID[™], Greenlee[™] and Klauke[™] brands provide professionals and do-it-yourselfers with quality, safetyminded mechanical, electrical and plumbing tools and digital features for both new construction and maintenance tasks.

SKILLED TRADES

Emerson is investing in education and training initiatives to help address today's shortage of workers in skilled trades and to develop the workforce of the future.



Reducing Food Loss/Waste & Improving Food Safety Is Critical For The Society

About half of global food loss and waste happens upstream, before products arrive at retailers' stores or warehouses.



Global food loss and waste, by value chain step,¹% of total production

Reported in primary crops for crops, carcass weight for meat, live weight equivalent for fish, and total production leaving manufacturer for processed commodities. ²Postharvest handling and storage.

Source: Food and Agriculture Organization of the United Nations; press search

McKinsey & Company

Source: https://www.mckinsev.com

Highlights:

- 33-40% of world's food is wasted annually
- One in Nine people in the world is suffering from hunger; ~800 million people
- Water consumption linked to food loss & waste amounts to approx. 1/4th of the world's freshwater supply
- loss and waste constitute 8% of the global

Emerson's Cold Chain Solutions Offer

- Best-in-class Energy Efficiency
- Higher Reliability
- Lower Life-Cycle Costs
- Low GWP Refrigerants
- Lower Sound
- Food Temperature Monitoring & Tracking

 Greenhouse-gas (GHG) emissions from food total, or ~4 times those of the aviation industry

Lower Space with both outdoor & indoor units

Emerson Presence in Cold Chain

Cold Chain Emerson Business	Farm (Supplier)	Refrigerated Truck/Trailer	Processing Facility	Refrigerated Container Transport	Distribution Center	Refrigerated Truck/Trailer	Food Retail
Refrigeration Compression	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
Refrigerant Leak Detection	\bigcirc		\bigcirc		\bigcirc		\bigcirc
Case & Lighting Controls			\bigcirc		\bigcirc		\bigcirc
Food Waste Disposal							\bigcirc
Facility Remote Monitoring & Control	\odot	\bigcirc	\odot	\odot	\odot	\odot	\odot
Shipping Container Monitoring				\odot			
Food Pallet Cargo Tracking	\odot	\odot	\odot	\odot	\odot	\bigcirc	\bigcirc
Food Tracking	\odot				\odot	\odot	\bigcirc

Refrigeration

Electronics& Solutions

InSinkerator

Transport Solutions Cargo Solutions

Cooper Atkins



Trends & Dynamics Impacting Refrigeration Space









IoT & Connectivity

• Real-time data tracking and integration to complete view of the value chain becoming



Shortage of Skilled Labor • Shift towards Plug & Play

Refrigeration Scroll Product Portfolio, 2~40 HP Range

	HP	2	2.5	3	3.5	4	5	6	6.5	7.5	8	9	10	11	15	17	
Medium	ZB*KQ/E	15K	19K	21K	26K	29K	38K	45K	48K	57K	58K	66K	76K	95K	114K		
Scroll	ZBD*KQ/E (Digital)		21K		29K	38K	45K	48K	57K							
			53	F		63 <i>F</i>											
	ZSI*KQ/E	06K	08K	09K	11K	14K	15K	18K		21K	50Hz or	nly					
Low		_															
Temp	ZF*KQE	06K	08K	09K	11K	13K	15K	18K		25K		28K	31K	41K	49K	54K	
Scroll	ZFI*KQE					20K	23K	26K		36K		39K	50K	59K	68K		
	ZFJ*KQE (Digital)					20K		26K		36K							
							50 5			50 5		00 F		70 5		705	
Variable							53F			53F		63F		70F		70F	
Speed	ZBW/ZFW						30			38		50		62		80	











96K 122K 140K

In development

Planned

Large Ref Scroll (LCS)

Condensing Units (CDU) & Rack Portfolio





Expanding CDU & Rack Product Range



Semi-hermetic Rack (EMP Series)

80 120 140 160 180 200



ZX CDU Portfolio







Copeland Scroll Compressors

Emerson Confidential



Our Core Technologies Applied on Scroll Compressor







Copeland Scroll™ Compressor

Principles And Characteristics



- Better Liquid Handling
- Greater Efficiency



Copeland Scroll™ Compressor

Principles And Characteristics





Copeland Scroll™ Compressor

Principles And Characteristics



- Better Liquid Handling
- Greater Efficiency
- Unmatched Reliability



Copeland Scroll Design

Scroll Requires Fewer Parts To Compress Gas







Liquid Injection ZF06KQE – ZF54KQE



Vapor Injection



Enhanced Vapor Injection (EVI) Technology

EVI Advantages:

- Delivers larger capacity and higher COP through an Economizer cycle by sub-cooling the liquid
- The vapor injection to mid of Scroll, cooling down the compressor with lower DLT & increases mass flow
- Cost and Energy Advantage Smaller compressor can achieve the same capacity and higher COP as a larger none EVI compressor



EVI Scroll increases capacity by 40% & efficiency by 15% on average at the low temperature rating conditions





Emerson Products are Designed for Best-In-Class Efficiency Reduce Operating Cost Need to Control Equipment Running Cost



Higher Efficiency Product Promotes Better Return on Investment (ROI)



Lower Life Cycle – Low Temp. Example (Te :-32 °C, Tc : 45 °C, SGR : 18.3 °C)

Compressor	SH Recip. 40 HP	ZFI122KQE	
Capacity (kW)	28.2	29.2	
СОР	1.3	1.5	
Power (kW)	20.9	19.5	
COP Comparison	Baseline	111%	
Annual Operating Cost	Baseline	-US	

Assumptions

Electrical Charge (\$/kWh)

Operating Hrs (Hrs/day)

*= Electrical Charge (\$/kWh)*Operating Hours/Yr*Input Power (kW)* Compressor Capacity Delta





0.11

Semi-To-Scroll Thailand Project Example

Regional Chicken Factory in Northeast Thailand

Scroll Solution

- Emerson's ZXD090 = 3 Pcs + ZXLD120 = 1 Pc
- OEM Partner built indoor unit 22 HP (with ZB150)

Product Value

Energy Savings
Lower Sound

⊘ Reliability





Indoor Unit with ZB150

ZXLD120





Large Refrigeration Scroll In Condensing Unit





Large Refrigeration Scroll In Rack System



6* ZB220 Rack In China



4* ZB220 Rack In South Africa





5* ZFI122 Rack In Thailand





4* ZFI122 Scroll Rack In Korea



ZFI Scroll Rack In Korea

5* ZB130 Rack In China

ZX Condensing Units Successful Projects

China | Provincial Immunization and Cold Storage Construction Project of Center for Disease Control and Prevention

Expanded cold chain capacity, fast construction and installation of cold storage facilities to help National Immunization Program achieve goal of inoculating 90% of 35 million at township level

Emerson and Contractor completed installation and deployment of 215 MT (2°C to 8°C) and 72 LT (-25°C to -20°C) cold storage facilities in three months

Emerson Solution: Copeland[™] ZX Condensing Units

- Copeland scroll compressors' proven reliability coupled with advanced electronics and diagnostics for greatly enhanced dependability.
- For redundancy, each facility kept a spare ZX condensing unit as back up.
- Emerson has supplied ~400 units since the implementation of this project

Customer Feedback:

All cold storage facilities that use Emerson units comply with relevant standards for vaccine storage. For almost a year after the completion of construction. Emerson units have exhibited high performance with zero failure, ensuring reliable operation of refrigeration systems and guaranteeing vaccine safety.





Indonesia | Providing a Restaurant Chain's Refrigeration System with Efficiency and Reliability

Emerson and Fascool Refrigeration partnered to provide a restaurant chain with an effective refrigeration system

- Design and build LT and MT cold storage rooms for 6 outlets in Jakarta and Subarava.
- Maintain the freshness of perishables while reducing energy costs.
- Have an easily serviceable and maintained refrigeration system, avoiding costly system downtimes

Emerson Solution: Copeland[™] ZXD and ZXL Condensing Units

Copeland ZXD units for outlets that required MT cooling for new cold rooms and Copeland ZXL units for LT rooms needing upgrades.

Results:

- Cold room temperatures are now more accurately maintained, reducing food wastage by sustaining appropriate food handling temperatures.
- By improving kitchen operations, the chain restaurant can now maintain high quality service for its patrons.



Advanced Control



Fan Speed Controller & Condense





MT Application Compressor Performance Comparison (Te: -8 °C, Tc: 48 °C, 22kW)

Compressor	SH Recip. 15 HP	ZB114KQE	ZFI50KQE
Capacity (kW)	22.1	24.5	24.0
СОР	2.04	1.81	2.41
Power (kW)	10.83	13.55	9.93
COP Comparison	Baseline	89%	118%
Annual Operating Cost	Baseline	USD 1,006	-USD 1,219

Assumptions

Electrical Charge (\$/kWh)	0.11
Operating Hrs (Hrs/day)	18

* = Electrical Charge (\$/kWh) * Operating Hrs/Yr * Input Power Delta (KW) * Compressor Capacity Delta









ZFI Scr	oll Copeland	S-Series Copeland				
Model	Capacity In kW	COP	Model	Capacity In kW	COP	Re
ZFI26KQE-TFD	8.52	1.72	D2SK-65	7.85	1.42	
ZFI36KQE-TFD	10.75	1.79	D3SC-75X	8.75	1.41	
R404A @ Evaporating Te	mp -25°C, Conder	ising Temp				

38°C & Return Gas Temp 18.3°C



COP

Scroll Vs ciprocating

17%

21%











Additional subcooling in HX will increase the refrigeration effect (by reducing the temperature of the liquid from TLI to TLO)





DIGITAL CONTROL COLD CHAIN SOLUTION SAPTURA WIDJAYANTO









DIGITAL CONTROL COLD CHAIN SOLUTIONs

TRANSPORT & DELIVERY









Dixel



food safety excellence across our industry and commitment to serve safe and quality food to customers in every single market, each and every day with Continuous temperature monitoring systems from Farmers, Processors, Distribution Center's and end customer

- Temperature Control
 - Compressor Output
 - Fan Output
 - Defrost Output
 - Sensor Room & Defrost
 - Buzzer & Alarm Output
 - High & Low Temperature Alarm
 - RTC (Real Time Clock for Defrost Schedule)
 - Door Status
 - Build In RS485 to communicate with monitoring system

Monitoring system

- Real Time temperature Monitoring
- Notify High & Low Temperature Alarm
- Reporting Table & Graphic (Excel & PNG)
- Comply with Hazard Analysis and Critical Control Point (HACCP) Report







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Dixell



75(emperature 'Contro

- High & Low Alarm
- Sensor Room & Defrost
- Compressor Output
- Fan Output
- Defrost Output
- Buzzer & Alarm Output
- RTC (Real Time Clock for Defrost Schedule)
- Door Status
- Ready with RS485 to communicate with monitoring system













Buzzer







XWEB MONITORING SYSTEM





Administrator				
	Adran	oed Filter		
eb		T Advanced Filter	Criste Criste	🗸 Apply
Mas BL 17:28	D	Device	Alarm	Duration
	1016	RS1-051 Cella Surgelati 31	Porta Aperta	09/03/2018 08:52 - 09/03/2018 09:10
_	1015	RS1-033 Cella Latticini 13	Porta Aperta	23/02/2018 13:20 - 23/02/2018 13:27
	1014	RS1-032 Cella Ortohutta 12	Porta Aperta	12/02/2018 20:29 - 13/02/2018 07:33
	1013	RS1-020 Murale IV Gamma	High Value Pb1	17/12/2017 11:41 - 18/12/2017 10:32
	1012	RS1-032 Cella Ortohutta 12	Porta Aperta	15/12/2017 20:38 - 15/12/2017 22:22
	1011	RS1-033 Cella Latticini 13	Porta Aperta	0512/2017 13:15 - 05/12/2017 14:32
	1010	RS1-041 Annadio Surgelati 21 Sx	No-Link	01/09/2017 09:00 - 01/09/2017 11:52
	1009	RS1-062 Elettromeccanico TN	No-Link	01/09/2017 08:59 - 01/09/2017 11:52
	1008	RS1-019 Murale Latticini Dx	No-Link	01/09/2017 08:59 - 01/09/2017 09:00
	1007	RS1-011 Mur. Basso LS	No-Link	01/09/2017 08:58 - 01/09/2017 08:59
	1008	RS1-017 Tradiz. Cami 7	No-Link	01/09/2017 08:57 - 01/09/2017 11:52
	1005	RS1-041 Armadio Surgelati 21 Sx	No-Link	01/08/2017 08:58 - 01/08/2017 08:58
	1004	RS1-061 Eletromeccanico BT	No-Link	01/09/2017 08:55 - 01/09/2017 08:56
ayes -	1003	RS1-016 Murale Basso Cami 6	No-Link	01/09/2017 08:53 - 01/09/2017 08:57
	1002	RS1-032 Cella Ortofrutta 12	No-Link	01/09/2017 08:53 - 01/09/2017 08:55











102-001 040	IGY METER
Current R	26.6 Amp
Current S	0 Amp
Current T	0 Amp
Energy Tot	335 kWh
Freq	50 Hertz
PF_Sum	0.886
Voltage L-L	220 Volt
Voltage L-N	221 Volt
RAMETER	PORTING



Hotel, Kitchen & Restaurant Solution















The TPM Value are shown below :					
1% - 14%	Fresh Frying Oil				
14% - 18%	Oil Little Used				
18% - 22%	Oil Used but not Exhausted				
22% - 24%	Oil Heavily Used				
≥ 25% or ≥ 27%	Oil Used and to be changed				

1. Total Polar Materials (TPM)

A method used determine the degradation of frying oil. Total Polar Material (TPM) refers to all products present in frying oil due to oxidation processes, including Free Fatty Acid (FFA), products of low molecular weight decomposition and polymerized substances. The EU has adopted a value 25% to 27% as their acceptable upper limit for fats and oils.













CONCLUSION

• We are ready deliver our total solution

GRARY









