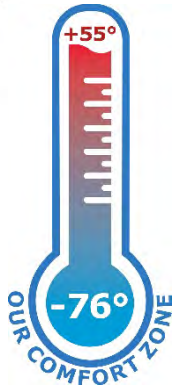


Why is KOOLJET Different?



KoolJet is a Manufacturer of Cooling Technologies for Produce, Meats and Pharmaceuticals. We Focus on Cold-Chain Methods and Equipment.

- Customer Obsession – We Listen
- Passion for Invention and Innovation
- Commitment to Excellence
- Long-Term Strategic Thinking
- People Come First!



Based in Canada, Customers Worldwide



Authorities in Food-Processing and Agricultural Cooling Technologies

Factors of Deterioration



HEAT AFFECTS ALL OF THE FACTORS OF HARVEST VALUE LOSS

- **Respiration Rate** – Transpiration uses up plant resources. Get it Cool and Keep it Cool.
- **Water Loss** – Control Relative Humidity and Gas Exchange. Water Loss is cumulative.
- **Physical Damage** – Assure proper handling and eliminate handling processes
- **Microbial and Pathogens** – Affected by heat, water and surface cuts
- **Ethylene Presence** – Assure proper air-flow and mix sensitive products correctly

HEAT DIRECTLY AFFECTS THE COST OF LOSS

- Studies show average of **19-20%** of total value is **LOST** from farm to table.
- Heat affects Loss Of Water, Appearance and Sellable Weight
 - Senescence, Water Loss, Shriveling, Rot, Browning, Necrosis, Poor Flavor and Texture
 - Represents loss in value invested, including processing infrastructure and profit

Cold-chain gaps have a cumulative effect on deterioration rate

Losses appear when products are transferred to warmer atmosphere.

Every 10 degrees increases plant respiration rate by 2 to 3 times.

Effective Cold-Chain Technology



- **TEMPERATURE**

- Field-Heat Pull-Down Rate
- Holding Temperature

- **RELATIVE HUMIDITY**

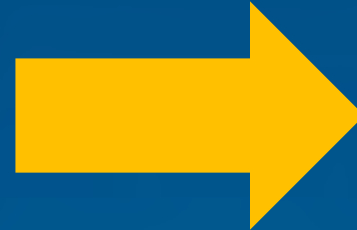
- Adding and Removing Vapor

- **AIR MOVEMENT**

- Precise Delta-T across the Product
- Ethylene Balance

- **O₂ and CO₂ BALANCE**

- Facilitate Respiration Gas Exchange
- Eliminate O₂ buildup



- **SELLABLE SHELF LIFE**

- Size, Weight and Appearance
- Color, shrivel, crispness

- **RETAINED NUTRITION**

- 80% nutrition retained

- **REDUCED RETAILER SCRAP**

- Reduced decay rate

- **MARKET REPUTATION**

- Known for quality in the home
- Ability to store more days

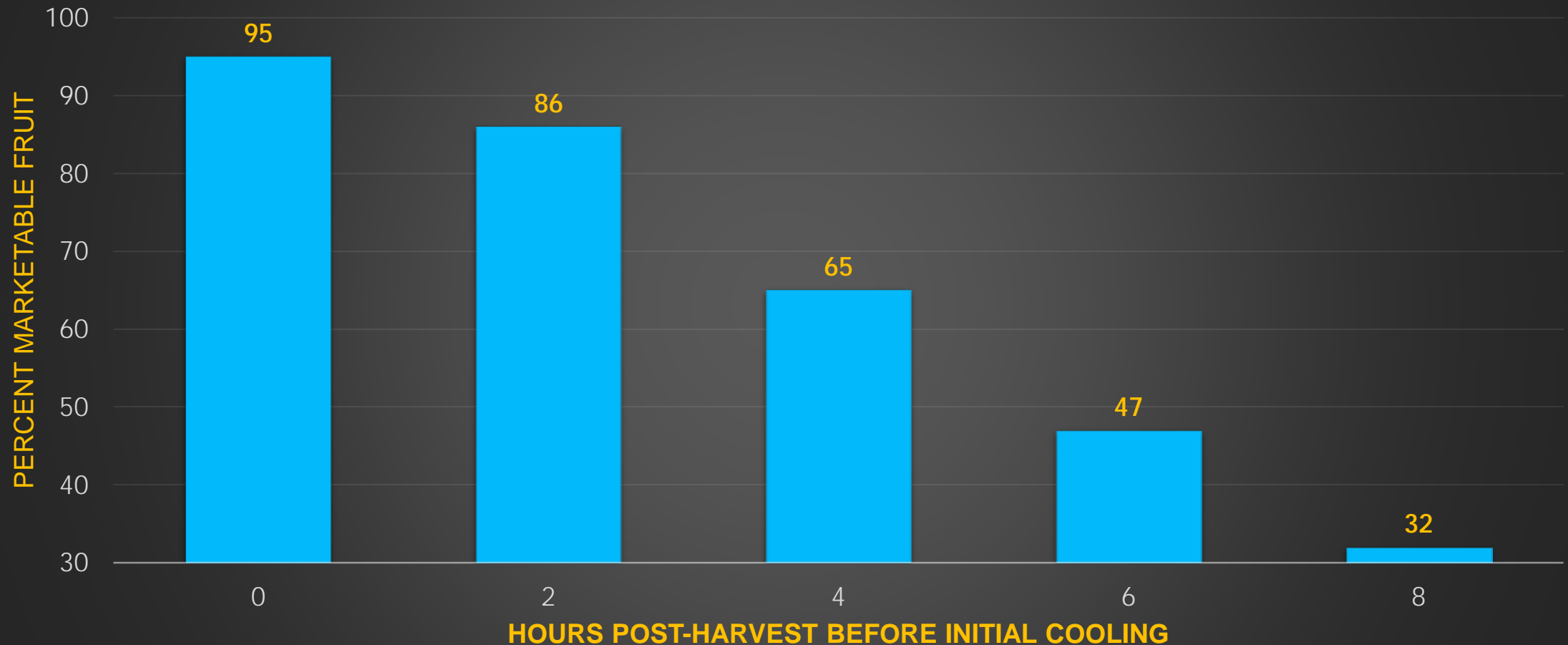
ALLOWS FARMER TO HARVEST AT THE OPTIMUM TIME FOR THE BEST CONSUMER EXPERIENCE

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The High Cost of Cooling Delay

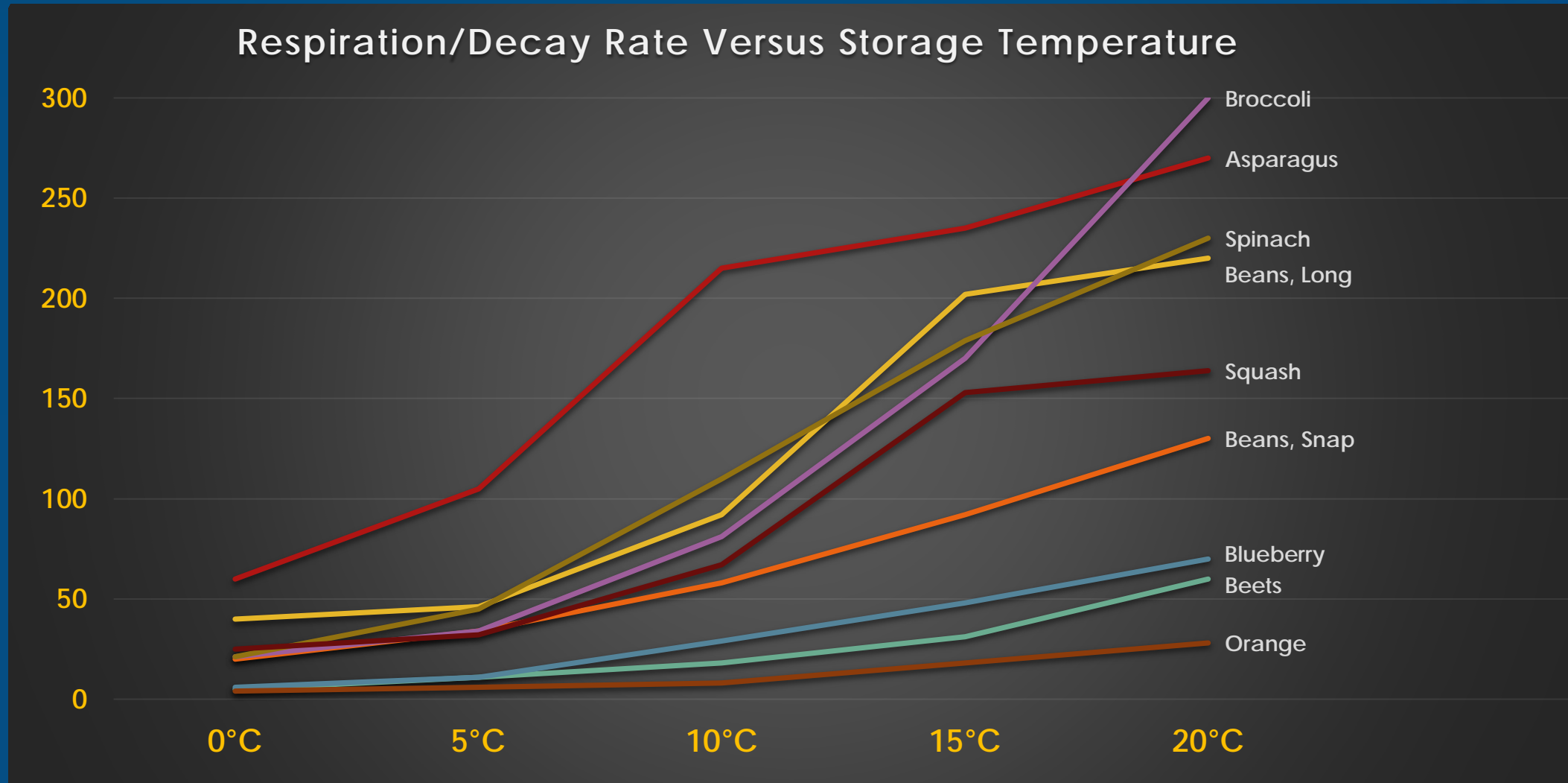


Predicted Impact of Delay Hours Before First Cooling - Strawberries



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Cold-Storage Requirements

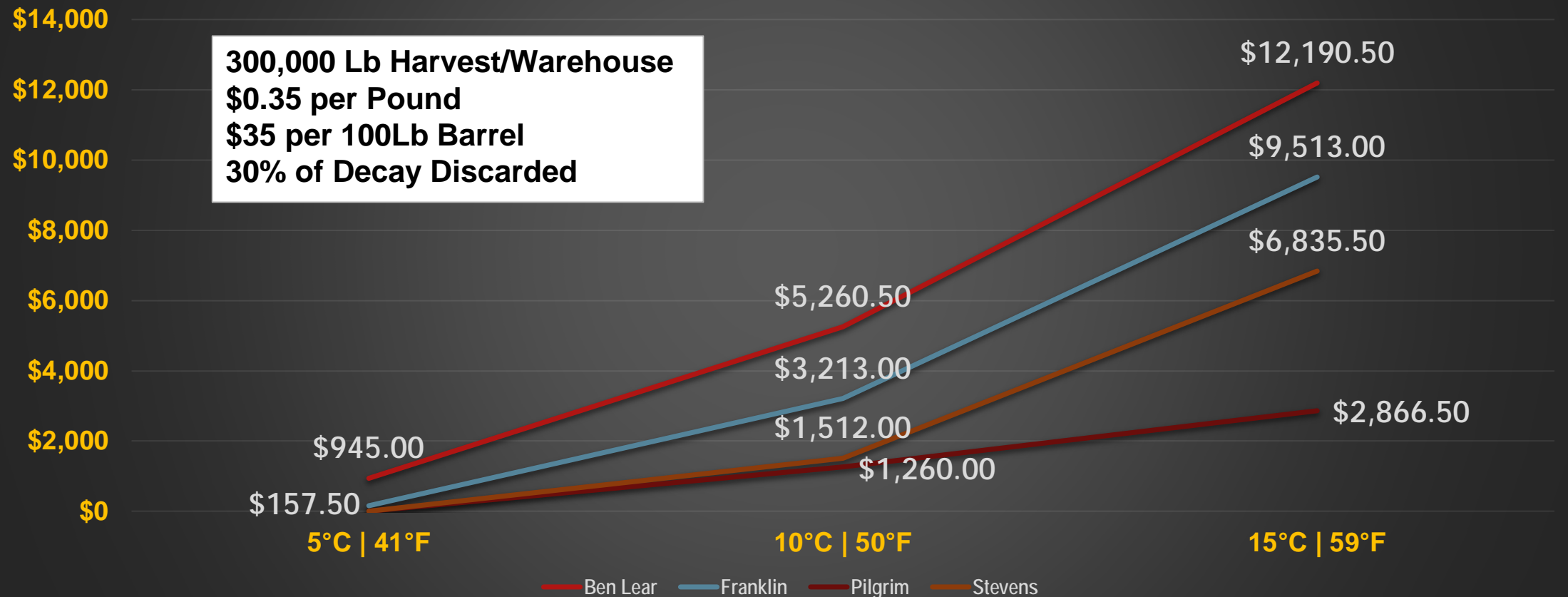


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Decay - Holding Time and Temp



Dollar Cost of LOST Commodities Cranberries - After **THREE** Months



Five Common Cooling Methods



Room Cooling 20-100 hours	Forced Air Cooling 1-10 hours	Hydrocooling 0.1-1 hour	Flake Ice Cooling 0.1-0.3 hours	Vacuum Cooling 0.3-2 hours
Artichoke, Banana, Dry Beans, Beet, Cabbage, Cactus, Cassava, Coconut, Garlic, Ginger, Horseradish, Kumquat, Lime, Lemon, Melons, Onion, Orange, Cucumber, Pineapple, Potato, Pumpkin, Radish, Sweet Potato, Turnip, Watermelon	Avocado, Banana, Berries, Brussel Sprouts, Cassava, Coconut, Cucumber, Eggplant, Fig, Ginger, Grape, Guava, Kiwi, Lima Bea, Mango, Melons, Mushroom, Okra, Orange, Papaya, Passion Fruit, Bell Pepper, Pumpkin, Snap Beans, Snow Peas, Summer Squash, Tangerine, Tomato	Artichoke, Asparagus, Beet, Endive, Broccoli, Brussel Sprouts, Cantaloupe, Cauliflower, Carrot, Celery, Cucumber, Eggplant, Escarole, Kiwi, Leek, Lima Beans, Orange, Parsley, Peas, Pomegranate, Spinach, Sweet Corn, Watercress	Endive, Broccoli, Brussel Sprouts, Carrot, Cauliflower, Cabbage, Escarole, Leek, Lettuce, Lima Beans, Green Onion, Spinach, Snap Peas, Snow Peas, Sweet Corn, Watercress	Endive, Broccoli, Brussel Sprouts, Carrot, Cauliflower, Cabbage, Escarole, Leek, Lettuce, Lima Beans, Mushroom, Snap Peas, Snow Peas, Swiss Chard, Watercress

“Recirculated water must be constantly sanitized to minimize accumulation of decay-causing pathogens.” Thompson et al. 1998

Common Storage Temperatures



Produce Type	0-2°C 32-36°F	4-7°F 40-45°F	7-10°C 45-50°F	13-18°C 55-65°F
Vegetables Not ethylene sensitive	Alfalfa, Artichoke, Bean Sprouts, Beet, Radicchio, Shallot, Sweet Corn, Chard, Turnip, Watercress		Calabaza, Haricot Vert, Bell Pepper	Cassava, Jicama, Sweet Potato, Taro, Yam, Tomato, ripe
Fruits & Melons Low ethylene sensitive	Cherry, Blackberry, Blueberry, Coconut, Current, Date, Grape	Cactus Pear, Kumquat, Olive, Pomegranate, Tamarind, Tangerine	Tangelo, Casaba, Cranberry, Grapefruit, Lemon, Lime, Pineapple	Breadfruit, Canisteco, Grapefruit CA,
Fruits & Melons Ethylene Producing	Apple, Apricot, Ripe Avocado, Cantaloupe, Cut Fruits, Kiwi, Nectarine, Pear, Plum, Prune, Quince	Feijoa, Guava, Honeydew, Persian Melon	Unriope, Crenshaw Melon, Passion Fruit, Sugar Apple	Banana, Jackfruit, Mango, Mangosteen, Plantain, Sapote
Dry Vegetables	Dry Onion, Garlic			Ginger, Pumpkin, Squash
Vegetables Ethylene sensitive	Arugula, Asparagus, Endive, Broccoli, Cabbage, Carrot, Cauliflower, Celery, Chard, Onion, Mushroom	Snap Beans, Cactus, Fava Bean, Lima Bean, Potato, Peas	Basil, Cucumber, Eggplant, Kiwano, Chile Pepper, Tomatillo, Watermelon	Early Crop Potato, Mature Green Tomato

Ethylene sensitive Vegetables should not be mixed with Ethylene producing Fruits during transportation and storage.

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Dedicated Cold-Chain Solutions



HYDROCOOLING SYSTEMS
BLAST-FREEZERS
FORCED AIR SYSTEMS
TUNNEL COOLING
COLD-CHAIN MODULES
COLD-STORAGE ROOMS
WINERY CHILLING SYSTEMS
MODULAR SYSTEMS
PUMPING STATIONS
HEAT TRANSFER SKIDS



Wine Tanks with Jackets and manifold

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Advantages - Customer Focused



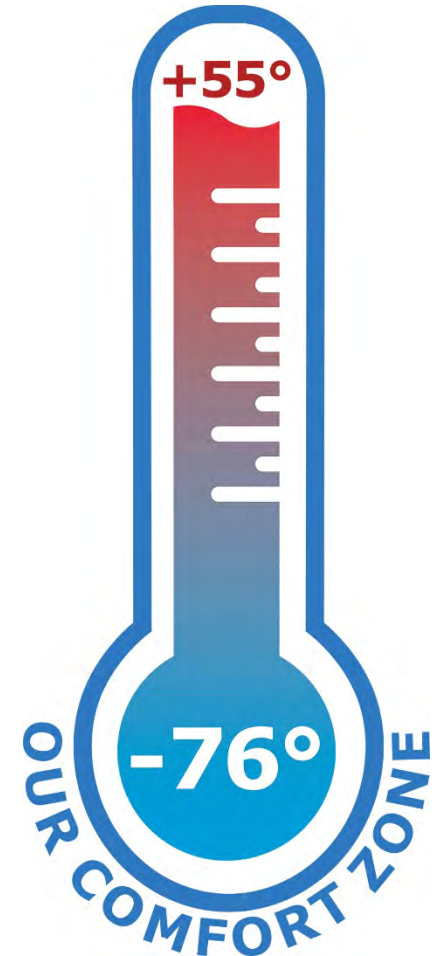
FLEXIBILITY TO MEET YOUR NEEDS – From 55° to MINUS 76° F
While we have standards that keep costs low, we are not limited in design. We listen. learn and respond with exactly the right solution.

ALL FOUR CRITICAL INGREDIENTS ARE COVERED with KOOLJET
USDA, UN, UC Davis and other emphasize tight control over Temperature, Humidity, Gas Exchange and Proper Respiration

EASY TO INSTALL AND RELOCATE – PLUG and PLAY
Our designs make it simple. Unitized or split designs are available. Cut into your wall, lift the unit into place and connect it to power.

LOWER COST TO OPERATE – Effective and Efficient
Multiple-circuits, efficient compressors and fans, FREE-COOLING modes, shorter pipe runs, while using the least possible energy.

MUCH EASIER TO MAINTAIN – Accessible and Reliable
Modern engineered designs allow customers to diagnose and remedy problems quickly. Self-contained, access, great support.



Advantages - Cooling Modes



COMMODITY COOLING REQUIRES THREE COOLING MODES

RAPID COOLING MODE

The most important and demanding on system designs. Refrigeration Systems including fans and coils must be sized to meet this critical cooling mode.

SLOW STAGED COOLING MODE

As critical Field Heat is removed, the system should be staged to operate at lower energy. Some commodities require staged slow cooling control - x degrees per day.

MAINTENANCE COOLING MODE

Maintenance Cooling Mode is designed to significantly reduce energy requirements and keep commodities properly cooled and the gas exchange controlled.

Advantages - Full Coil Surface Use



Innovative air movement channels cool across the FULL surface of the coils.

By pulling air across the entire coil instead of pushing air through a venturi.

This results in a conservation of refrigeration energy while delivering superior air flow and even air temperatures into the space, saving you money.



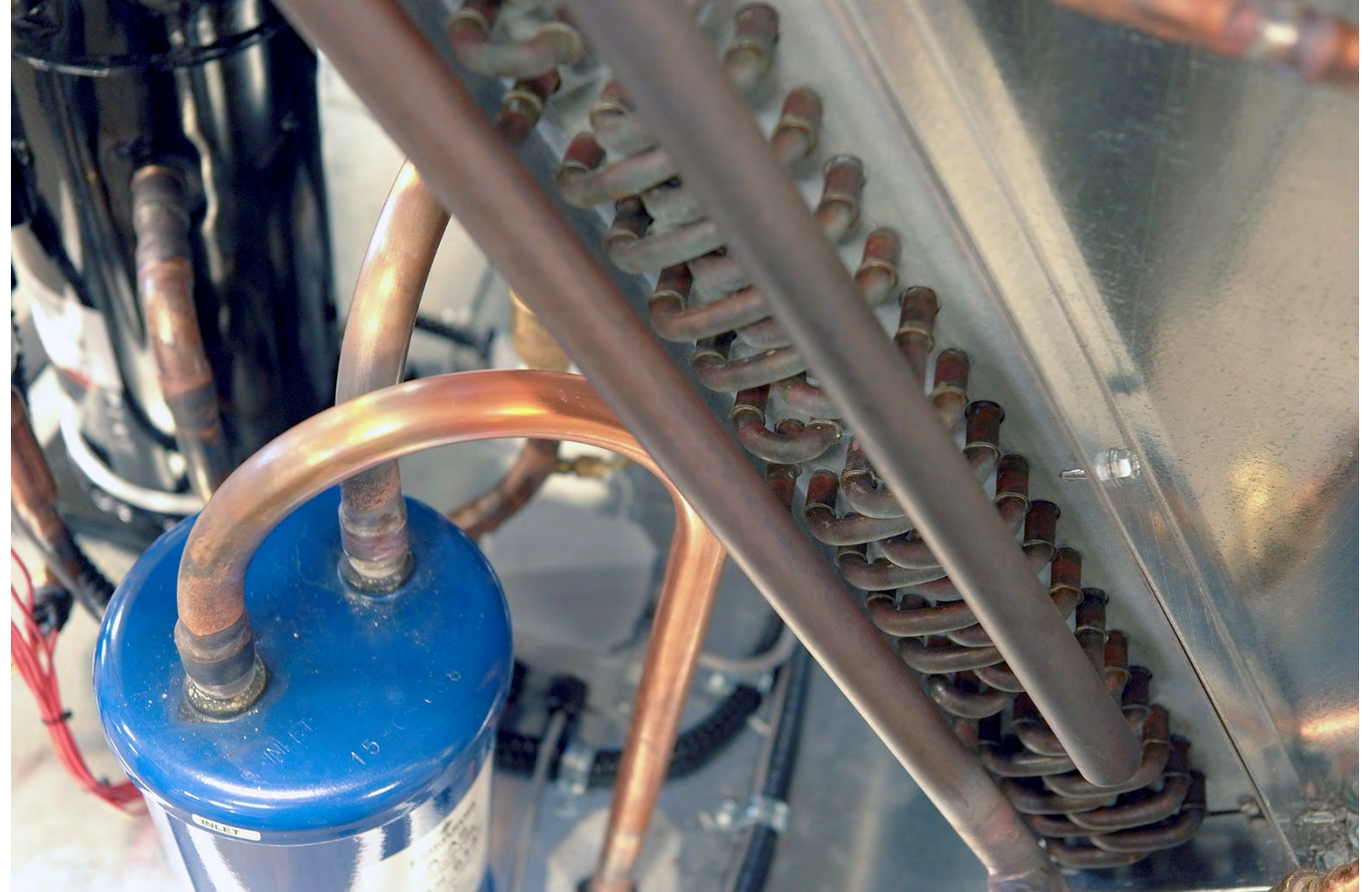
Advantages - Interleaved Circuits



KoolJet pioneered the use of Dual-Kool Technology.

We design the coils so each refrigerant circuit shares the same fin array. Therefore even with one circuit off, the remaining circuit has all of the coil surface available.

This results in substantial energy efficiency at part load



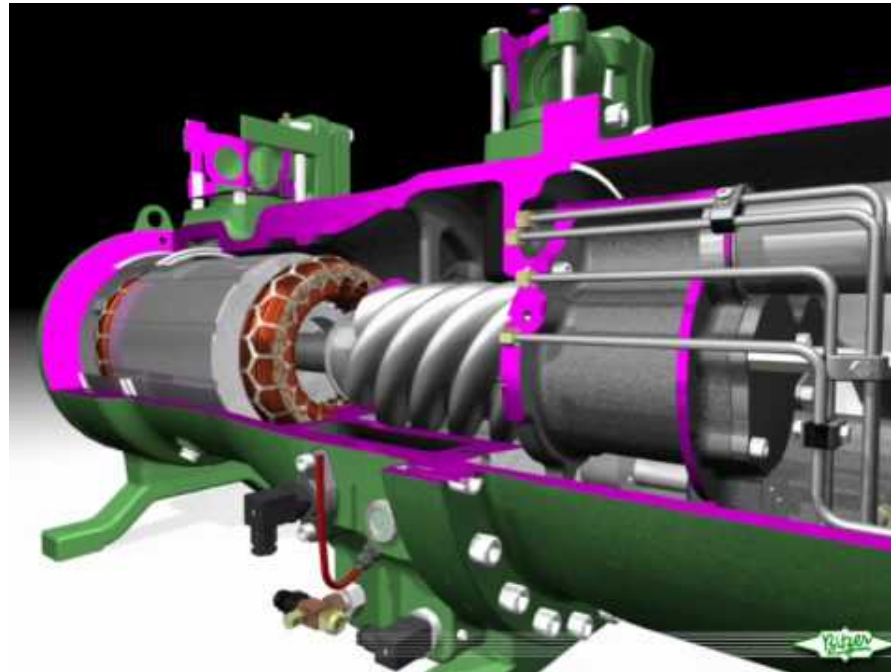
Advantages - Compressor Choice



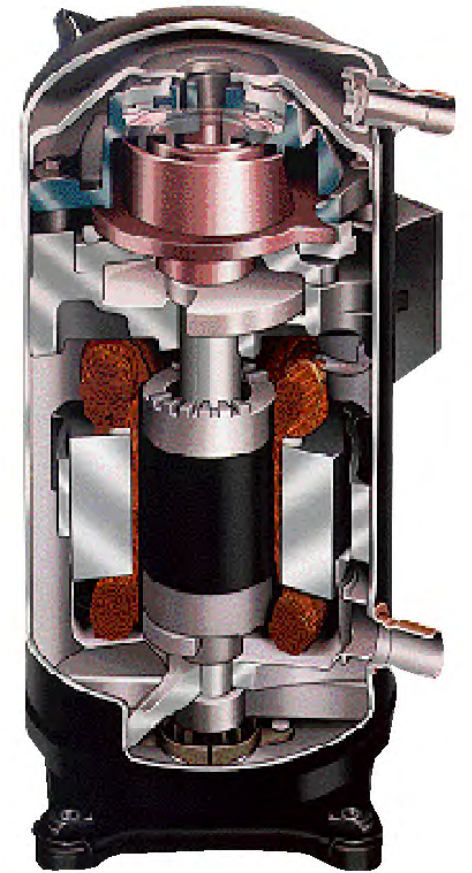
Cooling perishables is not like comfort cooling. Working at extreme temperatures requires the right refrigerant and the right compressor.

KoolJet has extensive experience with vegetables, fruits, fish, meats and pharmaceuticals.

From +55 to MINUS 76° F



Bitzer Screw Compressor



Scroll Compressor

Advantages - Humidity Control



KoolJet equipment is engineered to exacting performance standards to assure that correct Relative Humidity is maintained and Product Water Loss is minimized.



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Advantages - High Efficiency Fans



Optimized for the lower temperature, higher air flow Food Refrigeration sector, these EC fans provide high performance and efficiency with very quiet operation.



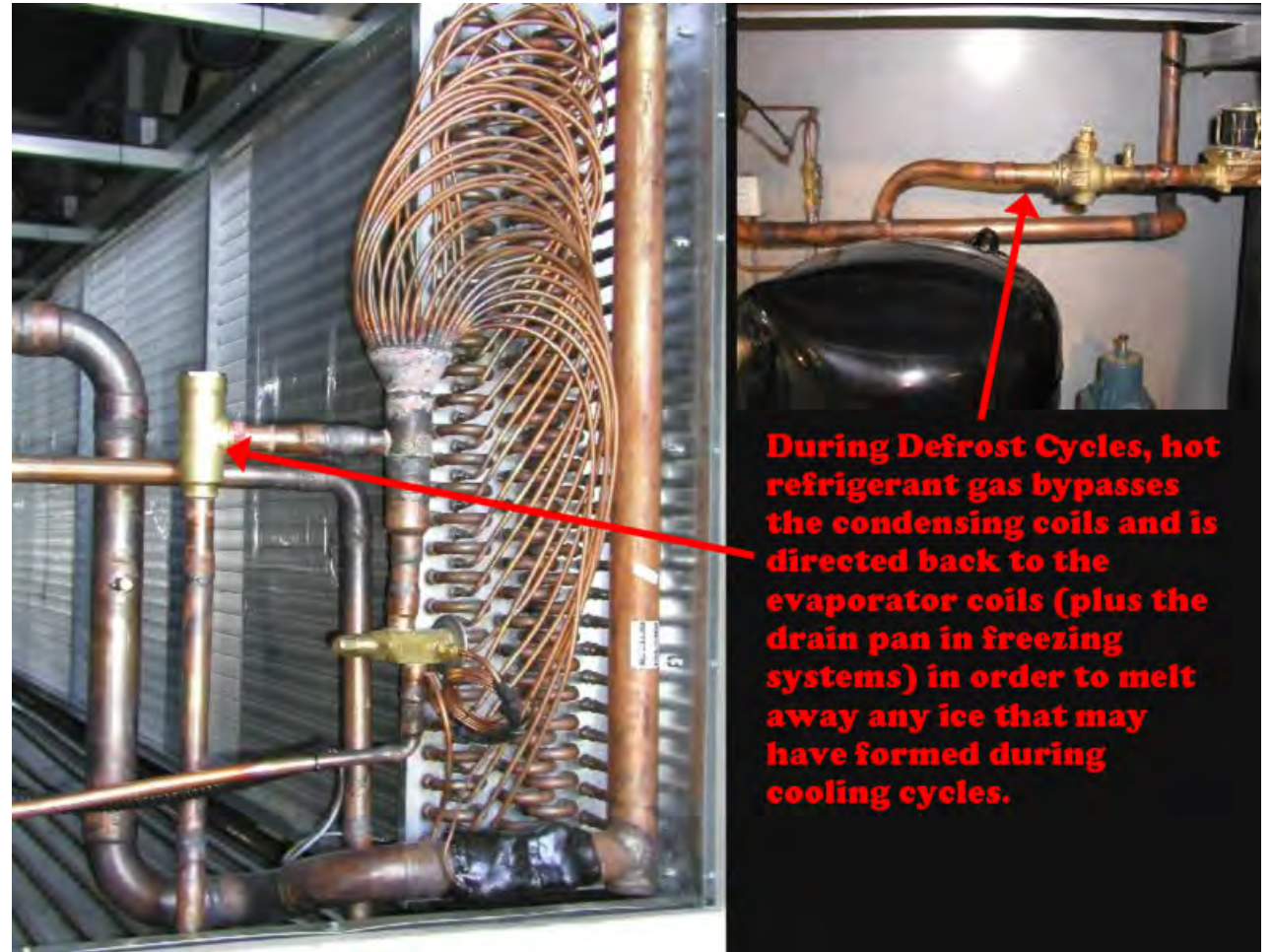
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Advantages - Rapid Defrost Cycle



Direct Hot-Gas Defrost allows significantly shorter defrost cycles which are necessary for proper cooling and storage of perishables.

Built in sensors and controls automatically provide consistent storage area temperatures.



During Defrost Cycles, hot refrigerant gas bypasses the condensing coils and is directed back to the evaporator coils (plus the drain pan in freezing systems) in order to melt away any ice that may have formed during cooling cycles.

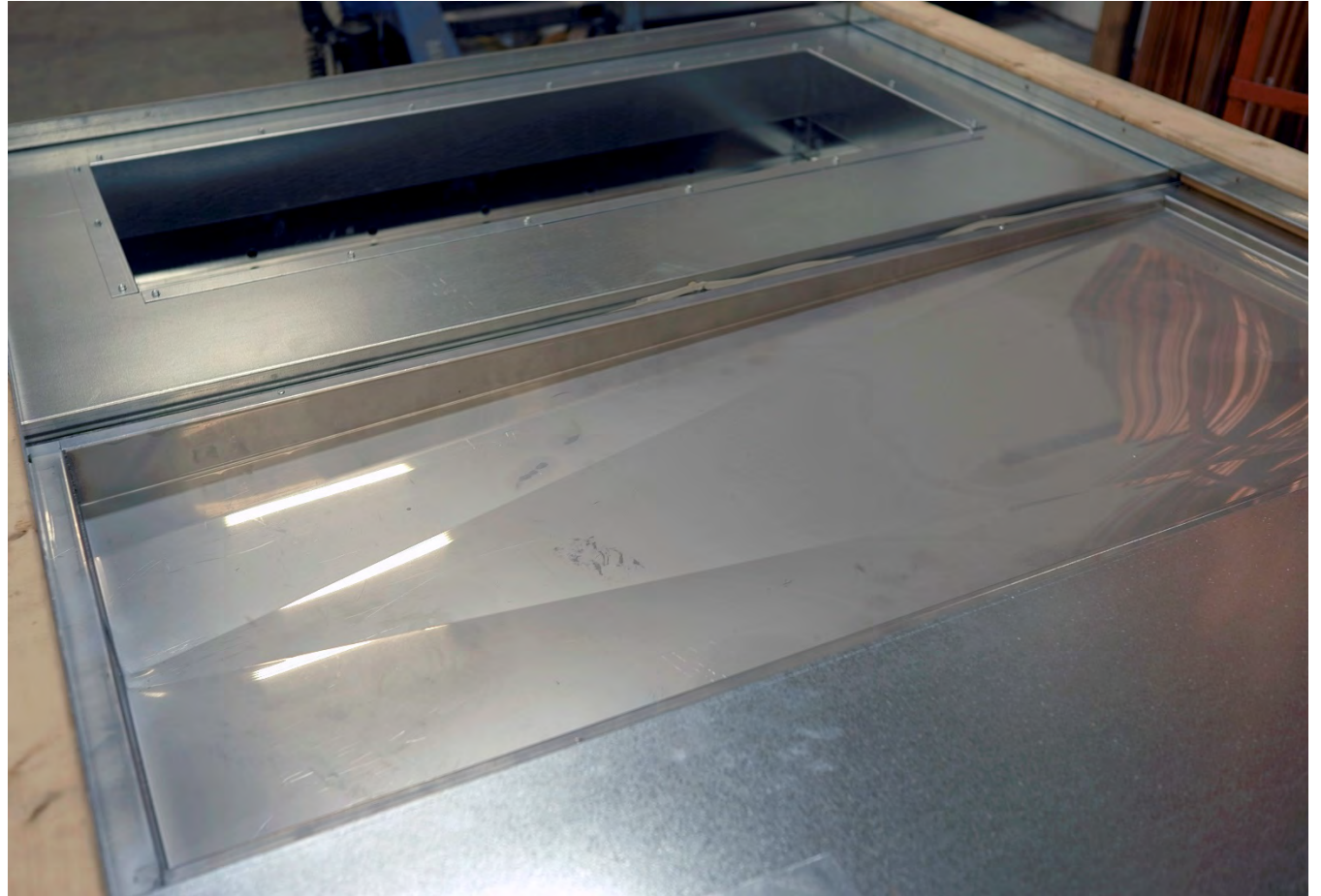
Advantages - Built-In Drain System



Stainless-Steel Drain

Installed below the entire Evaporator coil area and effectively drains away any condensation that occurs.

This vital feature prevents the cost to field-build something that may not be as effective, and is already self-contained.



Advantages - Built for Perishables



Rigid Steel Construction
with insulation foam for
use in low temperatures

Easy-Release Panels for
rapid access and cleaning

Leak-Free Rubber Seals
preserves system energy
efficiency and air flow



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Advantages - Long-Throw Fans



KoolJet Fans are selected to perform correctly in your particular environment.

Our mutual objective is to move the right amount of air evenly through the product at the distance needed.

We have air movement designs to provide more than 100 feet of throw into the cooling space.

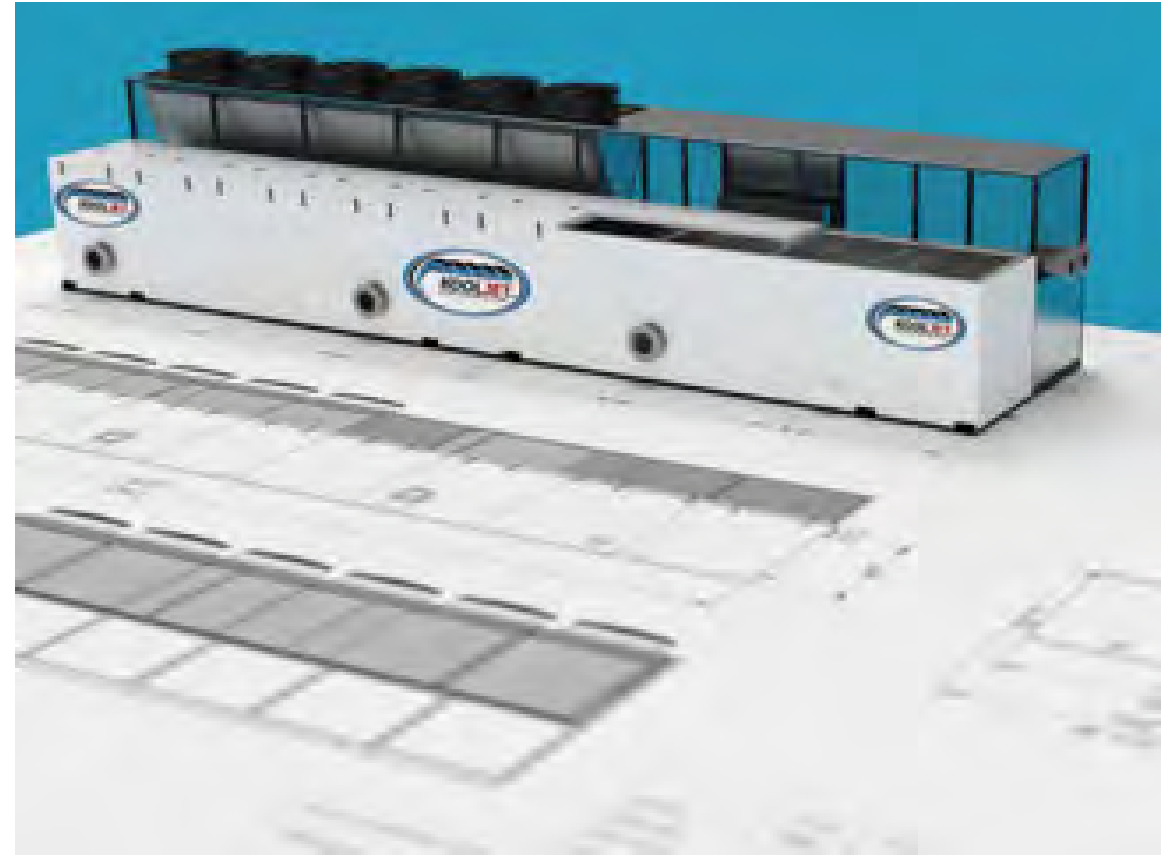


Advantages - Customizable



Our diverse experience in cooling and freezing foods and other commodities has resulted in low cost, plug-and-play equipment standards.

KoolJet welcomes the opportunity to work with customers and provide exactly the right equipment for the application, regardless of size or type of approach.



Advantages - Easy PLC Controls



PLC controls are highly reliable

Easy to use Touch-Screen

Provides assured functions, alarms, and easier diagnostics

Optional remote connections for owners and service techs

Enables precise control of air flow and temperature response.



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Advantages - One-Piece Design



GREATLY Simplified Installation

Through-the-**Wall** Designs
and
Through-the-**Door** Designs
and
Through-the-**Roof** Designs

Reduced Refrigerant Charge

100% Factory Tested



**PLUG
AND
PLAY**

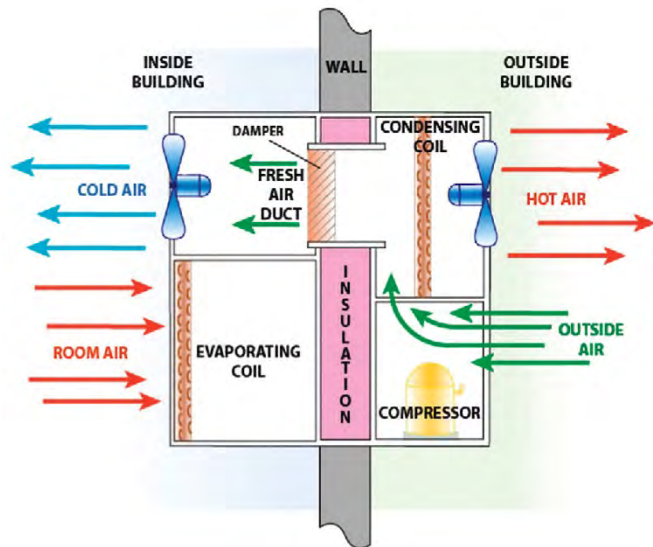


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Advantages - Free-Cooling Experts



Automatic sensors, actuators and louvered vents enable **Free-Cooling** anytime ambient temperatures permit.



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Common Cold-Chain Approaches



HYDROCOOLING and FORCED-AIR COOLING



- Cost-Effective Flexible Approach
- Engineered for Agricultural Use
- Effective Field-Heat Removal
- Effective Gas Exchange Air Volume
- Energy Efficient Modular Designs
- Designed for Easy Installation



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Rapid Hydro-Cooling of Field Heat



- Chillers and Complete Systems. Central and Portable
- Includes High-Volume Pumping and Debris Strainers
- Easy Access for Cleaning and Service



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Tunnel Cooling Designs



- Tunnel Cooling is a process for rapid cooling of bins stacked with the top and ends covered with a tarp, leaving the sides open for directed air movement.
- Large dedicated fans for each tunnel "draw" the refrigerated cold room air through the product bins.
- Cooling times are much shorter than forced-air cooling.
- Facilitates cooling plane tissues
- Provides direct cooling with greater efficiency than forced air.



Blast Freezers - Down to -76 F!



Ultra-Low Temperature

Freezer systems maintain a working temperature of -4°F (-20°C). If necessary, the building set-point can be lowered to -22°F (-30°C).

KoolJet has designs for storage temps down to MINUS 76°

Stops Bacteria

Blast Freezers are designed for rapid freezing of product. Rapid freezing helps prevent bacteria in food produce.



Independent Circuits

- Increases System Reliability
- Increases Operating Cost Efficiency – 30%
- Provides Some Capacity Redundancy
- Full Redundancy is available

Easy Through-the-Wall Cooling



Simple Single-Piece Installation

Self-Contained Cold-Storage Cooling
Modern Design and Easy to Service
No Exposed Refrigerant Piping



Compact one-piece design requires substantially less refrigerant than conventional split systems.

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Easy Through-the-Door Cooling

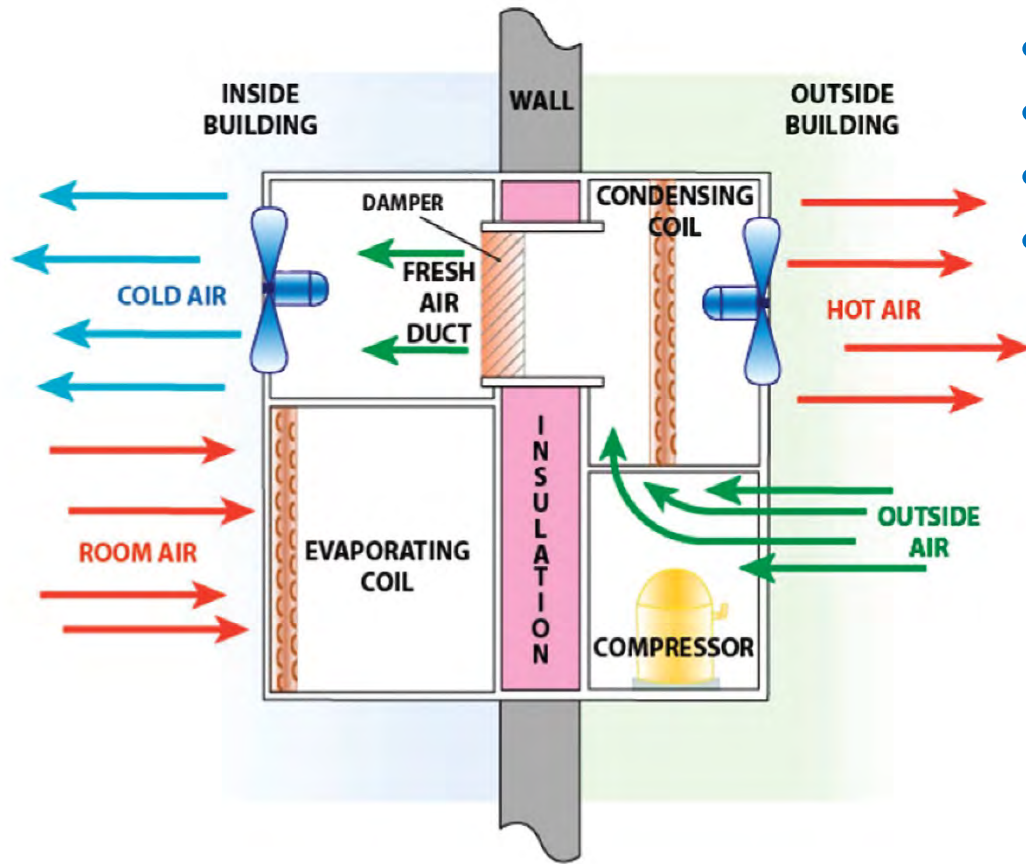


Unitized Split Refrigeration System

- Effective, Reliable Through-the-Wall or Door System.
- GREATLY Simplified installation and service access.
- NO field assembly needed – Save Thousands!
- Powerful and Energy-Efficient Fan Cooling.
- System minimizes the moisture loss from the product and maximizes product shelf life.
- Axial fans include deep venturi for higher air-throw.
- Evaporator coil is designed for ultra-high humidity.
- Panel-mounted disconnect saves electrical install cost.
- Very simple and quick to relocate if needed.
- Dual-circuit designs effect rapid pull-down and holding temps at maximum energy efficiency.
- Premium components for maximum uptime.
- Variable speed condenser fans match ambient conditions to save energy cost.

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Cold-Storage with FREE-COOLING



- Fully Automatic Free-Cooling Operation
- Allows Outside-Air to Assist Mechanical Cooling
- Self-Contained Through-the-Wall System
- Designed for Agricultural Temperatures and Flows
- Energy Efficient Engineering

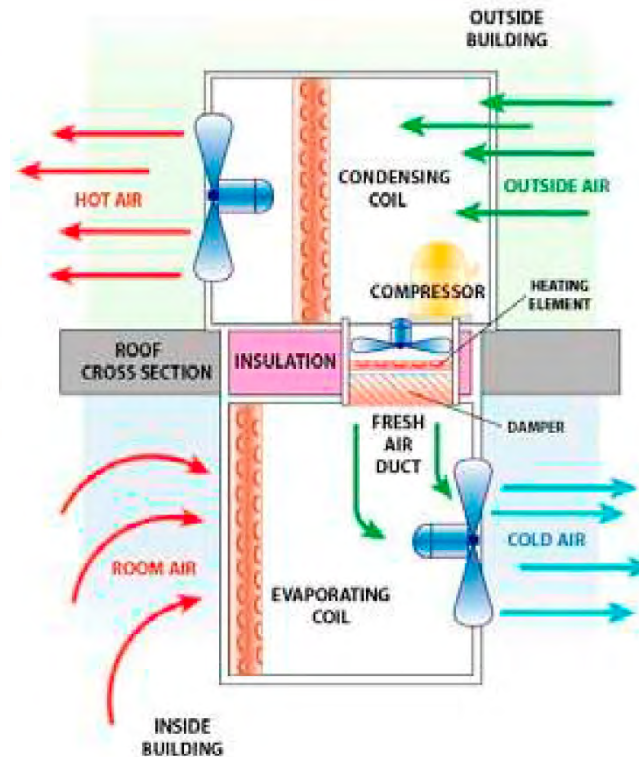


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Rooftop Mounted Systems



Self-Contained Rooftop-Mounted Cold-Room Systems



Authorities in Food-Processing and Agricultural Cooling Technologies

Vacuum Cooling Refrigeration



Vacuum Cooling reduces the barometric pressure of a sealed chamber with porous-leaf produce inside. Oil-free vacuum blowers are used.

Reduction of pressure causes water in the plant tissues to boil off, converting water to vapor and requiring latent heat, which it pulls from the product tissues, thereby cooling it.

This is rapid cooling but causes moisture loss.

The refrigeration system is specially designed to condense and remove water vapor given off during the process.



Wine Production Chiller Systems



- Wine Chillers and Pumping Systems for cooling winery process tanks
- Designed to serve wine tank farms at different temperatures and intervals
- The fermentation process can be stopped at any desired temperature
- KoolJet systems are effective for cold stabilization wine processing
- When tank temperatures are reached, KoolJet stages refrigeration compressors, saving up to 40% in energy!



Wine Tanks with Jackets and manifold

Application Requirements



Lower Temperature Operation in High-Humidity

Fresh Fruits and Vegetables - 0 to 5°C

Frozen Foods and Meats – Down to -75°F

Pharmaceuticals – Low-temp processes and holding
Requirement for Frost and Condensation Control

Most Critical Initial Pull-Down to Holding Temp

Removal of “Field-Heat” immediately slows deterioration

Affects freshness and nutrition. Retailer shelf-life doubles

Air Volume Through Product Not Around Bins

Requirement for Higher Reliability and Up-Time

Multiple Circuit Designs – Reliability and Energy Savings

Full Redundancy of Capacity Options

Premium-Grade Component Requirements

Built for Frequent Cleaning and Access for Service



Advantages are Designed-In



Compressors – Scroll and Semi-Hermetic. Suction and discharge line, liquid and hot gas lines are sized for oil entrapment and minimum pressure drop.

Dual Independent Circuits – Provides Rapid Pull-Down and Energy-Efficient Holding Mode.

Refrigerant – R134a and R-404a are common for Agriculture. 100% pump-down in Receivers.

Evaporator Coils – Oversized with wide fin-spacing. Flat fins facilitate frost removal.

PLC controls – Provides ultimate user experience with system control, reliability and diagnostics.



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Superior Refrigeration Components



Programmable Logic Controller - PLC replaces many electromechanical devices and makes equipment more compact and intelligent. Capable of controlling 16 compressors. Displays for various rooms can be shown.

Electronic Defrost Timers - replaces bulky mechanical timers. This controller is a substitute for timer clock, defrost termination thermostat, room thermostat and defrost termination thermostat.

Electronic Expansion Valves – EXVs are used instead of TX thermostatic expansion valves. These are capable of maintaining superheat more closely which eliminates liquid slugging and increases the efficiency of the system.

Electronic Pressure Cut Outs – More reliable than the mechanical cut outs.

Electronic Speed Controllers - Vary condenser fan speed according to the ambient temperature, savings tremendous amounts of electrical energy as fan speed is automatically decreased.

Electronic Evaporator & Condenser Pressure Controllers - Maximize the reliability of the system.

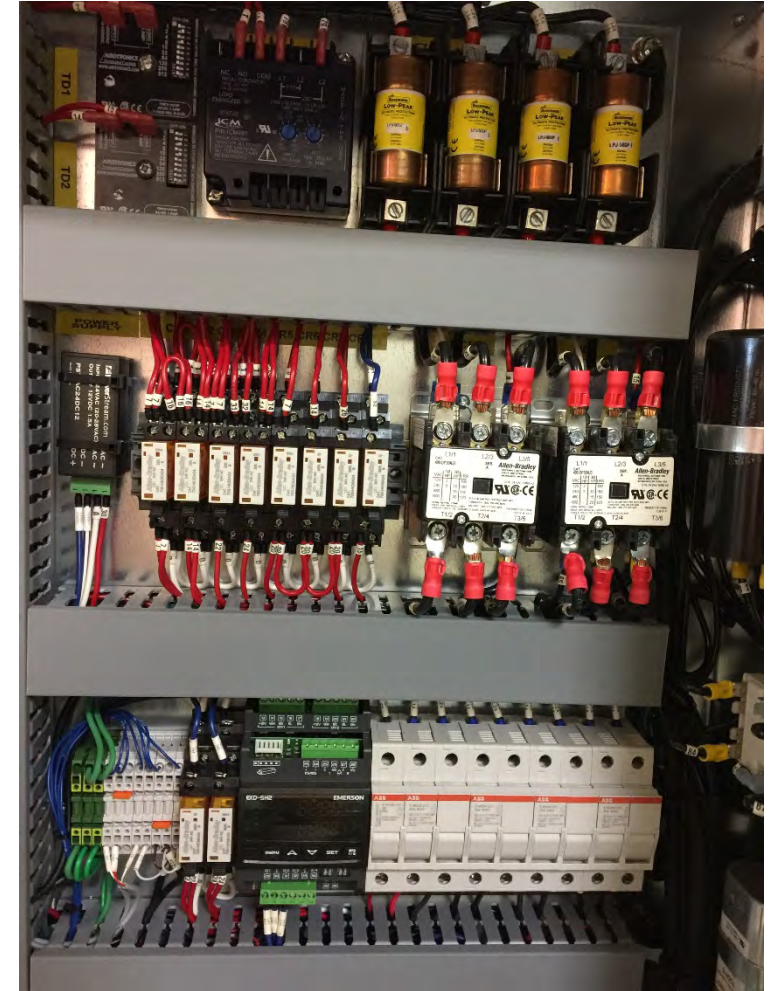
Microprocessor - based room thermostats and temperature controllers. Electronic temperature controllers are more accurate and can provide better control on room conditions.

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Controls and Wiring Methods



- All electrical panels are NEMA-4 for outdoors and indoor humidity protection. All panels include a mounted disconnect switch.
- Components like fuses, holders, contactors, relays, timers are all premium grade.
- PLC with touch-screen user interface, operation and diagnostics
- All wires are tagged according to wiring diagrams and inside wire-ways.
- Systems can be equipped for remote control and monitoring and alerting.



Defrost Cycle and Hot-Gas Bypass



- The hot gas from the compressor is dumped into the side port of the evaporator, downstream of the TX valve.
- Suction accumulators are selected to insure the complete liquid boil out during the hot gas defrost cycle.
- Hot gas first enters the drain pan then through the check valve and finally to the evaporator.
- Frost build-up is reduced by special coil fins design and spacing.



The Refrigeration Coils



High quality aluminum fins are expanded into copper tubing can be HERESITE coated for corrosion resistance.

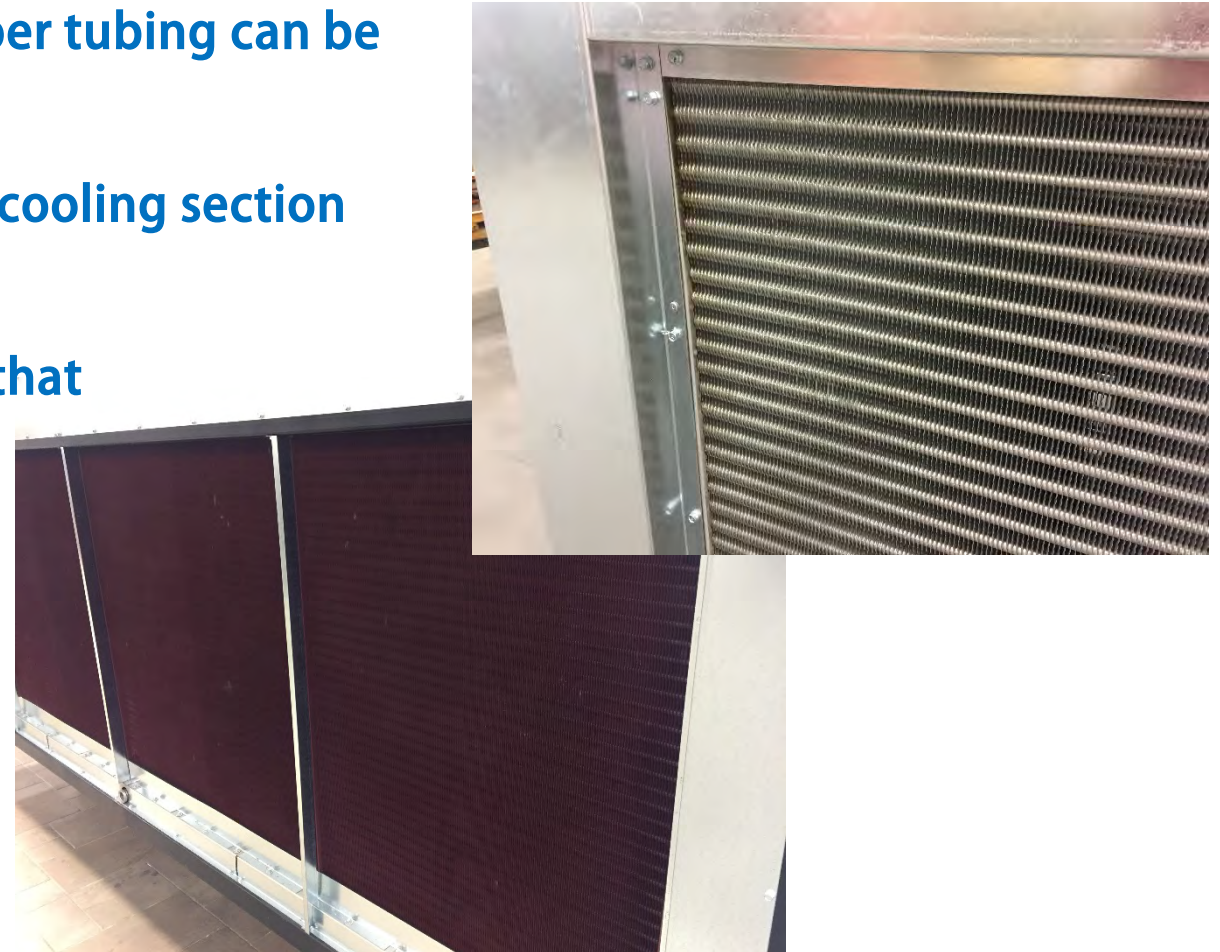
Condensers can be equipped with a dedicated sub-cooling section for added capacity and/or energy efficiency.

Condenser fan motors have Variable-Speed Drives that conserve enormous energy at part loads.

Evaporator coil are designed specifically for high-humidity conditions.

Evaporator coils are oversized and control air delta-t to minimize product moisture loss

Hydrocooling DX evaporator tube-bundles are installed directly in the water stream.



Fans and Venturi for Air Throw



Cold-Storage requires air to flow through produce, not around bins.

Objective is to quickly remove field heat to reduce produce respiration and decay.

Robust air movement in the space requires high capacity axial fans with a tall venturi for maximum air-throw.

Fans for freezing applications are rated for ultra-low temperature.

Variable-speed fan motors reduce energy when conditions permits.



Advantages - Customer Focused



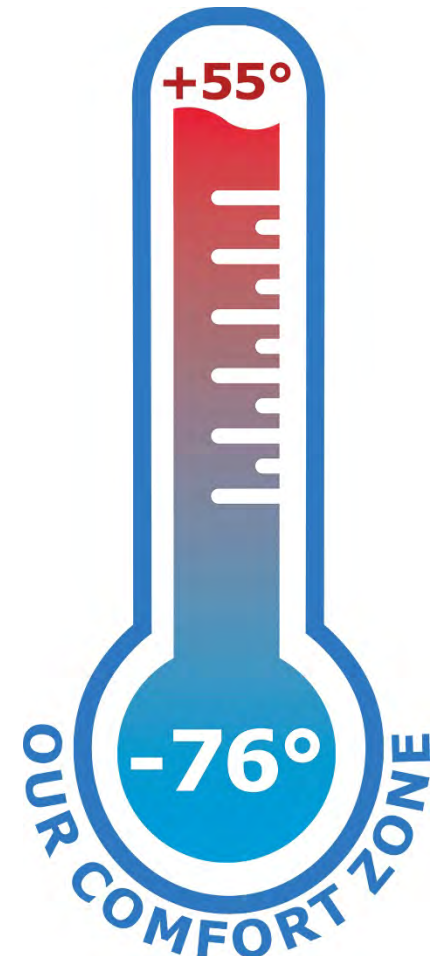
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QUESTIONS?



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