TrilliumSeries™ Condenser

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BAC AUSTRALIA

The TrilliumSeries™ Condenser

The TrilliumSeries™ Condenser uses a patented Dry-Coil Adiabatic™ Design that saves energy, reduces refrigerant charge, and lowers operating costs. With the use of proprietary logic and EcoFlex controls, the On-Demand Adiabatic™ Pre-Cooler uses water only on the hottest days to maintain condensing temperatures that typical air cooled technology cannot achieve. **Because of this, the TrilliumSeries™ Condenser is the lowest total cost of ownership product for supermarket refrigeration systems.**

The TrilliumSeries™ Condenser

REDUCES SYSTEM ENERGY

- Up to 35% annual system energy reduction
- Up to 42.9% peak energy reduction
- Direct drive VSEC motor minimize fan energy required

REDUCES WATER CONSUMPTION

- Water is used only when the ambient temperature requires it
- Water from the unit can be used for irrigation
- Water monitoring package minimizes water use

REDUCES INSTALLATION COST

- 60% lower refrigerant charge
- Reduces overall system size by operating at lower condensing temperatures

NEEDS MINIMAL MAINTENANCE

- Takes same time as air cooled
- No water treatment required
- On-Demand Adiabatic™ Pre-Cooler Media can be replaced in ½ hour
- Easily spray off coated coils

PROVIDES LONG TERM RELIABILITY

- UL Approved Unit
- Coated Microchannel coils tested per ASTM G85-A4 for 3000+ hours
- Industrial grade Type 304 Stainless Steel and an exclusive Thermosetting Hybrid Polymer coating on all structural panels

The following chart compares the TrilliumSeries™ Condenser to air cooled and evaporative equipment for both new construction and replacement projects. The TrilliumSeries™ Condenser has an advantage in many categories versus either the air cooled and evaporative equipment. For more detailed information on each topic, please go to the page listed.

Benefits of the TrilliumSeries™ Condenser		Page	New Construction		Replacement	
			TrilliumSeries™ Condenser	Air Cooled	TrilliumSeries™ Condenser	Air Cooled
Energy Savings	Reduces monthly energy bill	3-4	✓		✓	
	Reduces peak demand	4	✓		✓	
	Built in energy tracking	5	✓	✓	✓	✓
Water Savings	Reduces water use	6	✓		✓	
	Water use monitoring	6	✓		✓	
	Reduces monthly water bill	6	✓		✓	
Installation Savings	Significantly reduces refrigerant charge	7	✓		✓	
	Saves space	3	✓		✓	
	Reduces weight	3	✓		✓	
Other Benefits	Maintenance	7	✓	✓	✓	✓
	Long term reliability	7	✓	✓	✓	✓
	Shrinks size of the rack	3	✓			
	Increases system capacity	3			✓	
	Transcritical CO_2 systems	12-14	✓	✓[1]	✓	✓[1]

NOTES:

1. Air cooled gas coolers can be used for transcritical CO_2 applications in only certain climates (see **Page 12**).

The TrilliumSeries™ Condenser has the advantage!

Benefits

Ownership Benefits

In a variety of climate conditions, the TrilliumSeries™ Condenser provides the lowest total cost of ownership compared to air cooled units.

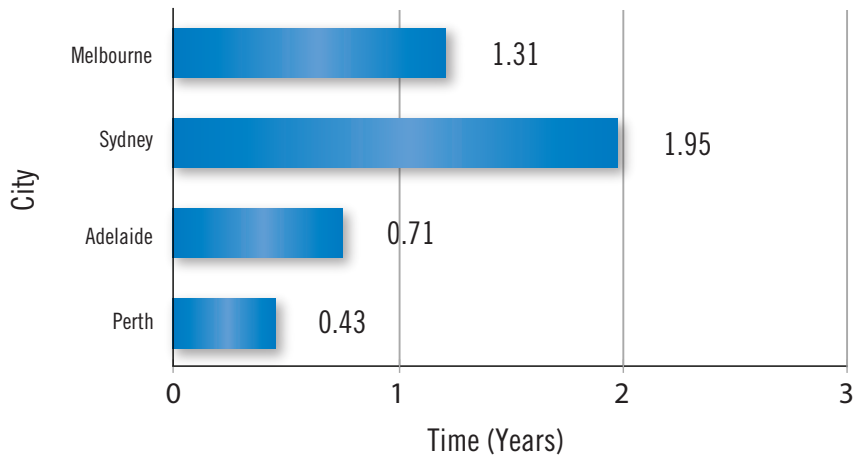
INSTALLATION ADVANTAGES

- 60% lower refrigerant charge
- Compact and lighter in weight
- Single point electrical connection
- Direct drive VSEC motors and Whisper Quiet Fans are standard
- For new stores, reduces overall system size by operating at lower condensing temperatures
- For refrigeration upgrades, increases system capacity without changing out expensive racks

ECONOMIC ADVANTAGES

- Attractive payback time frames
- Lower total cost of ownership

Average Payback Period by City vs. EC Dry Condenser



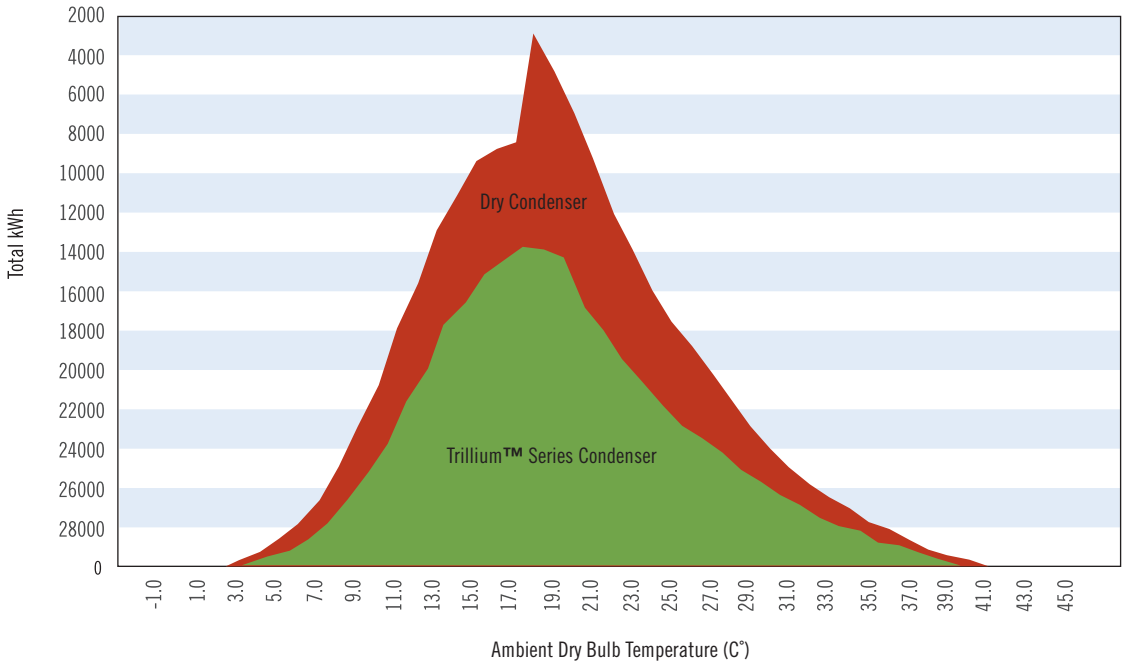
NOTES:

1. Average payback periods based on current analyses performed. Specific payback periods vary. Utility prices (electricity, water, etc) vary by state and system details vary by job.

System Energy Savings Reduce Monthly Energy Bills

- Reduced condensing temperatures
- Less compressor work
- Direct drive VSEC motors minimize fan energy required

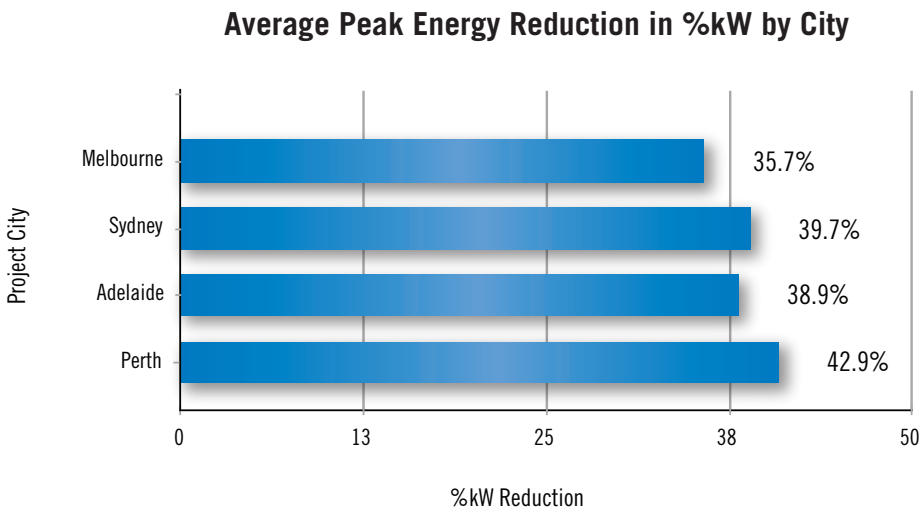
Annual 35% System Energy Reduction for Perth, WA



Benefits

Peak Energy Savings

- Up to 42.9% peak energy reduction compared to air cooled units by operating compressors at significantly lower condensing temperatures
  - Peak energy is more expensive than off peak energy
  - Reduces peak demand charges

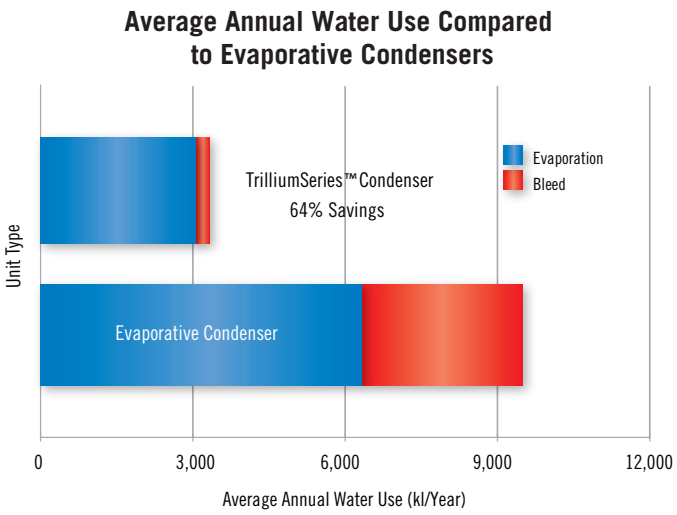


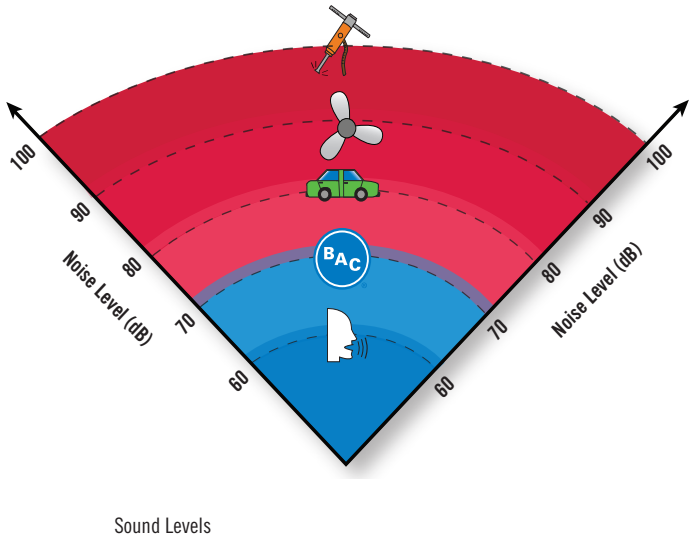
Optional Built-in Energy Tracking / Alarms

- Optional alarms for the fans, pumps and valves reduce high head pressure instances
- Optional energy monitoring maintains efficient operation over the life of the product

On-Demand Adiabatic™ Pre-Cooler

- Water is used ONLY when the ambient temperature requires it
  - Water spray saturates and cleans the On-Demand Adiabatic™ Pre-Cooler media of any dust and debris
- No water treatment is required
- Free draining prevents stagnant water
  - Water from the drain and overflow can be used for irrigation or other non-potable uses
- **CONTROLS OPTIONS**
  - **WATER QUALITY SENSOR** (OPTION) – Flushes the sump based on a factory preset conductivity level to minimize water use.
  - **WATER MONITORING** (OPTION) – This option monitors the amount of purged water and maintains efficient operation over the life of the product.





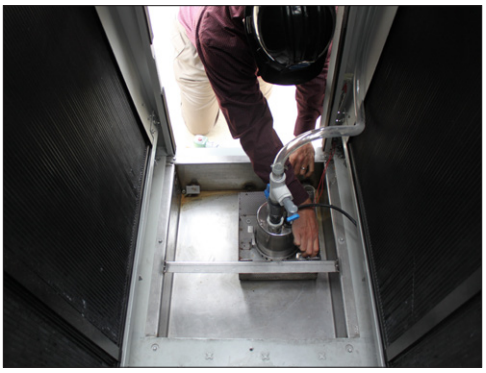
Low Sound

- Whisper Quiet Fans are standard
- Direct drive VSEC fan motors vary the fan speed eliminating sudden starts and stops

Benefits

Easy Maintenance

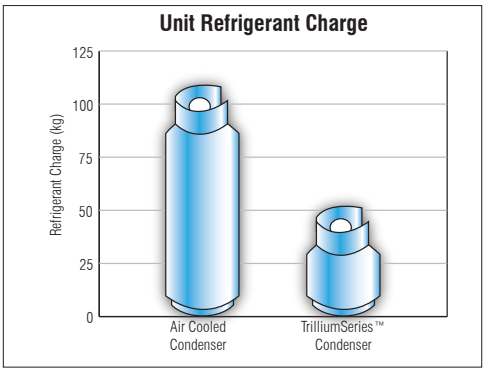
- Requires the same time to maintain as an air cooled condenser
- Water treatment is not required
  - Water is turned on only when ambient temperature requires it
  - Water spray saturates and cleans the On-Demand Adiabatic™ Pre-Cooler media of any dust and debris
- On-Demand Adiabatic™ Pre-Cooler media acts as a filter to prevent debris from reaching the microchannel
  - Can be removed without tools for easy coil inspection
- Clean-out ports on both ends of water distribution header facilitate easy cleaning
- The EcoFlex Controls maintain a clean sump
- Pump and strainer are easily accessible from the access hatch



Easy Access to Pump and Strainer

Charge Reduction

- 60% less charge than comparable air cooled condensers
- Lowers greenhouse gas emissions of the supermarket refrigeration system



Charge Reduction

Peace of Mind

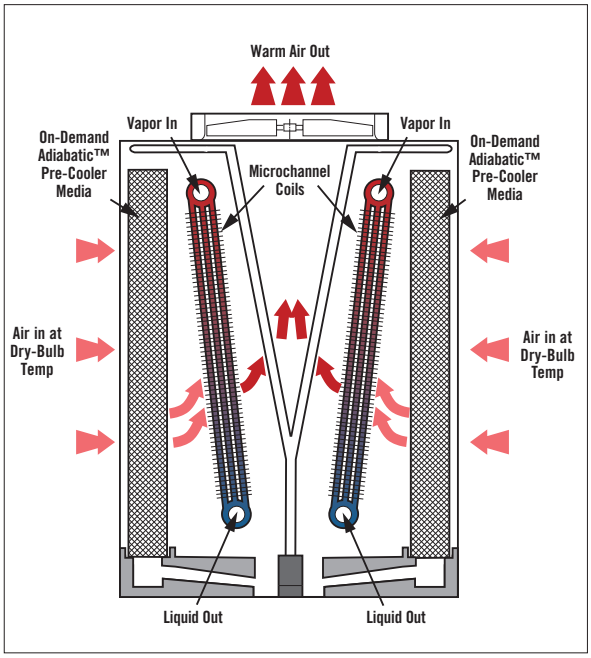
- All units are equipped with state of the art EcoFlex controls, On-Demand Adiabatic™ Pre-Cooler, and daily automatic sump clean out
- Critical components are stocked and ship within 24-hours
- Manual discrete spray system (water bypass) standard
- Durable materials of construction extend the life of the unit
- Sump and drain pans drain freely
- Ability to switch fans from automatic to manual fan override in case of control signal loss
- Access hatch sensor shuts off the fan when the hatch is opened
- UL Approved unit
- Coated microchannel independently tested per G85-A4 for 3,000+ hours

Discrete Spray System

Modes of Operation

Dry Mode

When the ambient air is below the set point, the unit runs as a dry cooler to save water and energy. The ambient air condenses the refrigerant in the microchannel coils which is then returned to the system.



Dry Mode Operation

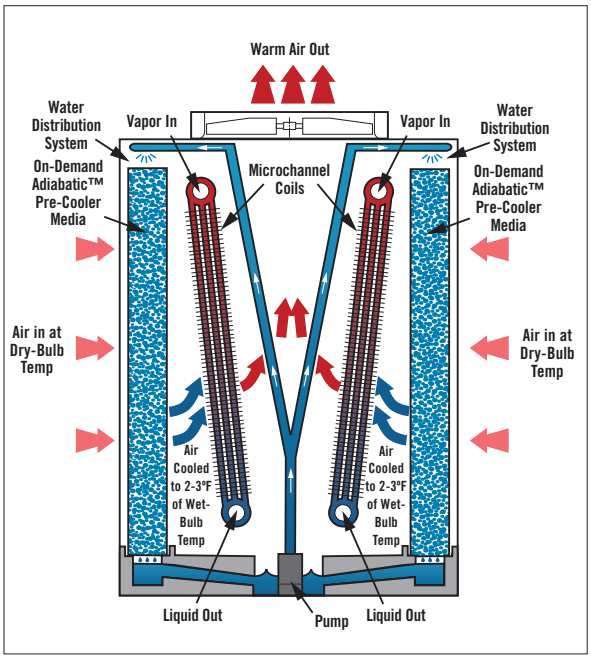
On-Demand Adiabatic™ Pre-Cooler Mode

When the unit is in On-Demand Adiabatic™ Pre-Cooler mode, water is evenly sprayed over the highly efficient media. The air is humidified as it passes through the media, cooling temperatures down to 1-2ºC above wet-bulb temperature. Such substantial depression of the dry bulb temperature results in a major increase in dry cooling capacity.

The cooler air passes over the microchannel and condenses the refrigerant in the microchannel which is then returned to the system. In the sump there is an industrial duty pump that recirculates the water. Part of the distributed water is evaporated, while the excess water assists in rinsing the On-Demand Adiabatic™ Pre-Cooler media. The EcoFlex Controls determine when the water is purged from the sump.

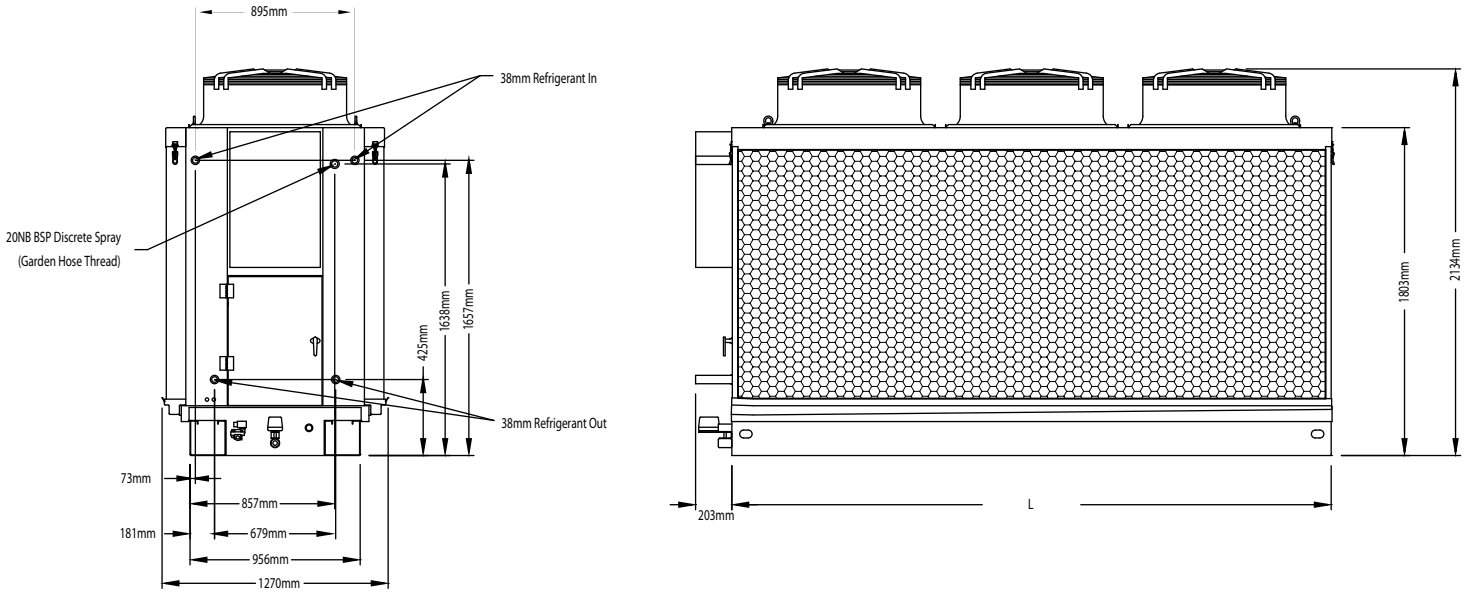
ON-DEMAND ADIABATIC™ PRE-COOLER OPERATION MODES
There are three different ways to optimize unit operation.

- **Standard Logic (Default):** The controller will start the Pre-Cooler Mode at a preset outside air temperature to increase the unit's capacity and efficiency.
- **Water Saver Logic:** The controller will optimize the unit's dry efficiency and only use water when the conditions require the extra cooling capacity. Pre-Cooler Mode will be initiated only when the outside air temperature is above the switch point and the fans are running at 90% or above for over 60 seconds. This mode will recheck conditions every two hours.
- **Energy Saver Logic:** The controller will optimize its sequence so that the least amount of energy is consumed to meet the present load of the unit. Pre-Cooler Mode will be initiated at 5.5 degrees below the switch point and if the fan speed is above 35%.



On-Demand Adiabatic™ Pre-Cooler Mode

Engineering Data



Model	Fan Qty	Base Heat Rejection (kW)[1]	Motor kW	Pump kW	Airflow (m³/s)	Total Unit FLA at 460V	Unit Length (L)	Shipping Weight (kg)	Operating Weight (kg)
TSDC-033-3	1	115	2.2	0.25	7.03	4.4	1591	580	660
TSDC-058-6.2	2	205	4.6	0.25	13.21	8.9	2403	790	880
TSDC-085-9.6	3	301	7.2	0.25	19.54	13.0	3366	1040	1150
TSDC-116-12.4	4	412	9.2	0.25	26.43	20.6	4953	1450	1610

NOTES:

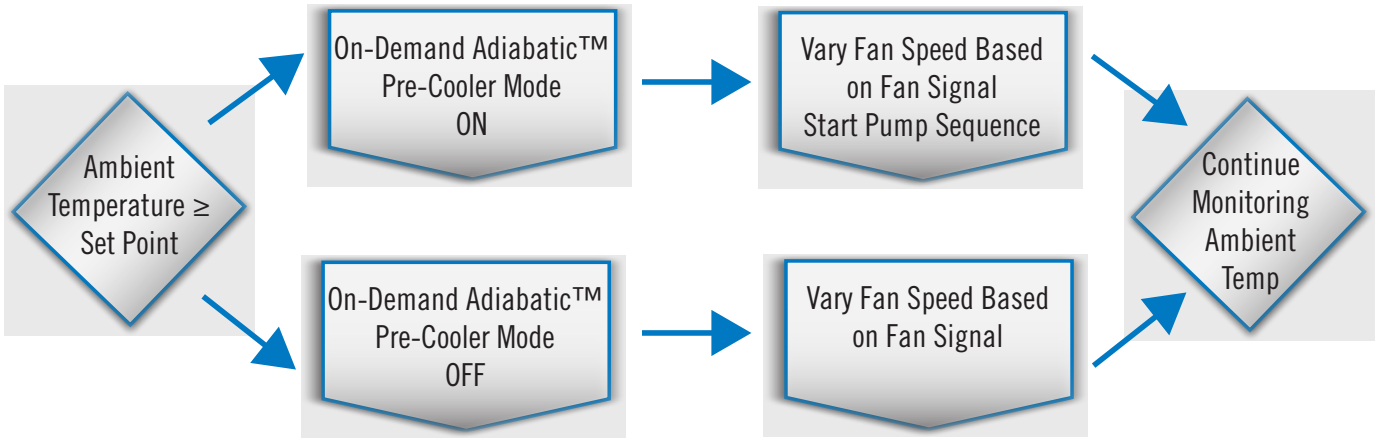
1. Base Heat Rejection (kW) is based on R-134a 32°C dry-bulb/24.5°C wet-bulb and 40.5°C condensing temperature.
2. The water make-up connection is 20NB. The water drain connection is 32NB. The water overflow connection is 40NB.
3. All threaded connections are NPT unless noted otherwise

Do not use for construction. Refer to factory certified dimensions. This catalogue includes data current at the time of publication, which should be reconfirmed at the time of purchase. Up-to-date information can be found at **www.BaltimoreAircoil.com.au**

EcoFlex Controls

The TrilliumSeries™ Condenser is furnished standard with state of the art EcoFlex Controls that provide efficient year round performance. Each unit is shipped with custom controls logic that reduces energy consumption and optimizes water usage. The system is pre-programmed and ready to operate upon arrival from the factory.

Controls Logic

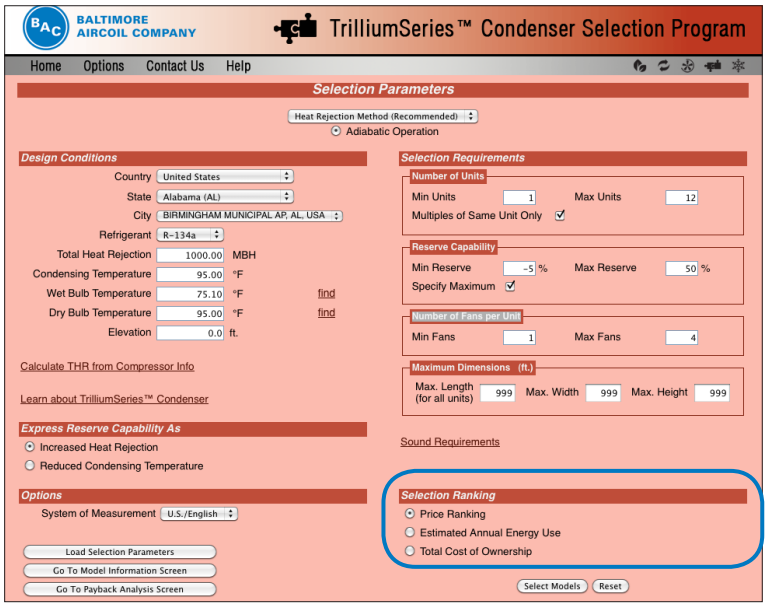


EcoFlex Controls Logic Features

- **ENERGY MONITORING** – Measures the energy use of the TrilliumSeries™ Condenser and verifies efficient operation over the life of the equipment.
- **WATER MONITORING** – Measures the water use and maintains efficient operation of the unit.
- **ALARMS** – Signals provided for fans, pumps, or valves to reduce instances of high system head pressure.
- **COMMUNICATIONS CARDS** – Allows for seamless integration over Modbus and BACnet to monitor all system components in a single location.

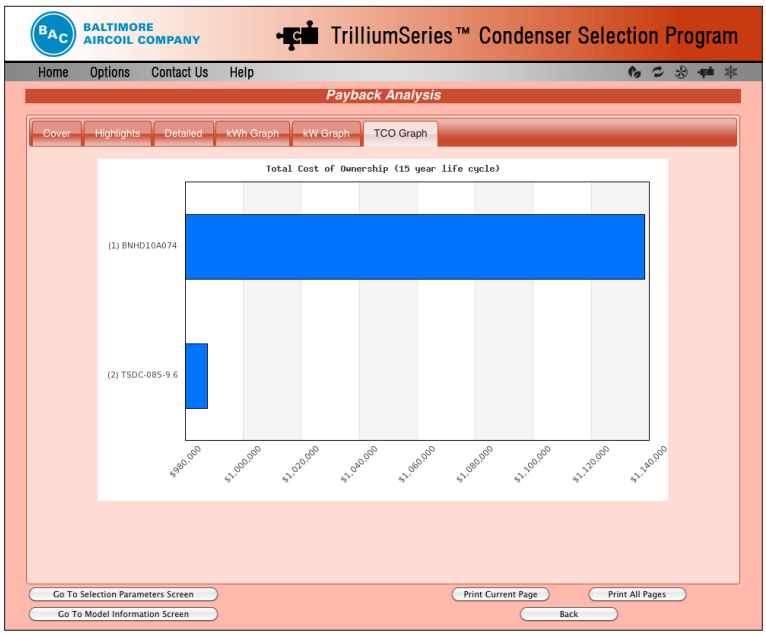
Selection and Payback Analysis Software

The TrilliumSeries™ Condenser program allows you to select the optimum unit based on ASHRAE design conditions and weather profile by bin data that are pre-populated by city and state.



Selection

You can select the product based on estimated annual energy use, total cost of ownership over 15 years of operation, and first cost.



Comparison

Example of total cost of ownership compared to an equally sized air cooled condenser with staged fans based on energy, water, refrigerant use, and other annual operating costs such as maintenance.

The total cost of ownership of the TrilliumSeries™ Condenser is substantially less than an air cooled condenser with staged fans.

TrilliumSeries™ Condenser for Transcritical CO_2 Applications

The TrilliumSeries™ Condenser empowers transcritical CO_2 applications throughout Australia.

There are many benefits of CO_2 refrigeration systems including:

- **NO REGULATORY LIABILITY OR RESTRICTIONS**
- **NO EXPENSIVE FUTURE RETROFITS DUE TO REFRIGERANT PHASE OUT**
- **REDUCED SYSTEM CARBON FOOTPRINT WITH GLOBAL WARMING POTENTIAL OF "1" AND OZONE DEPLETING POTENTIAL OF "0"**
- **LOW INSTALLED COST DUE TO LOWER REFRIGERANT CHARGE**

With an estimated 2,885 European food retail stores using CO_2 transcritical refrigeration systems, their application is constantly expanding to other countries including Australia and New Zealand. Energy efficient, economical refrigeration systems are normally limited to colder climates due to the limitations of air cooled gas coolers.

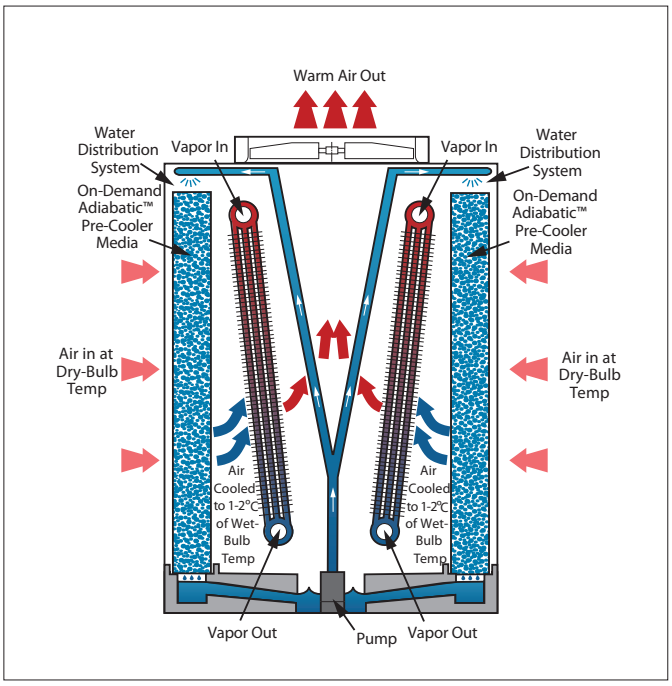
Climate Limitation of CO_2 Systems with Air Cooled Condensers

TrilliumSeries™ Condenser Expands CO_2 Applications

However, by using the TrilliumSeries™ Condenser's unique adiabatic design, it is possible to eliminate their restrictions due to warmer climates and save additional energy in cooler ones.

TrilliumSeries™ Condenser Transcritical CO_2 Benefits:

- LOWER TOTAL COST OF OWNERSHIP
- REDUCED COMPRESSOR WORK
- HIGH EFFICIENCY VSEC MOTORS
- NO WATER TREATMENT
- INTELLIGENT CONTROLS
- LOWER OPERATING PRESSURE



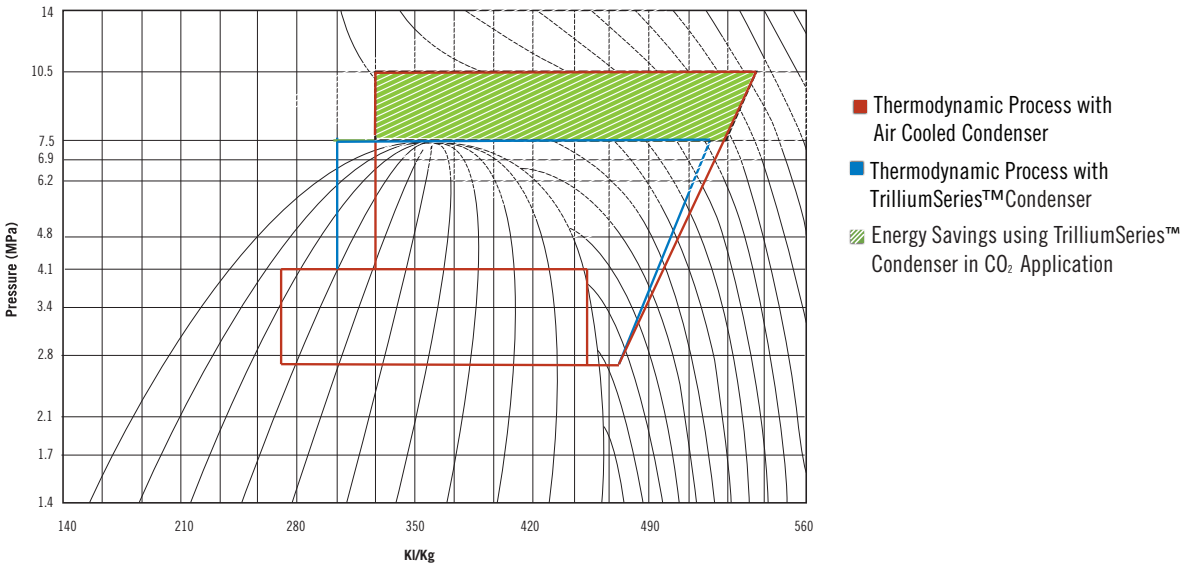
On-Demand Adiabatic™ Pre-Cooler Mode

Example

The critical point of CO_2 is 31°C which means that the system is a condenser in subcritical mode when the high side is below 31°C and is a gas cooler in transcritical mode above 31°C.

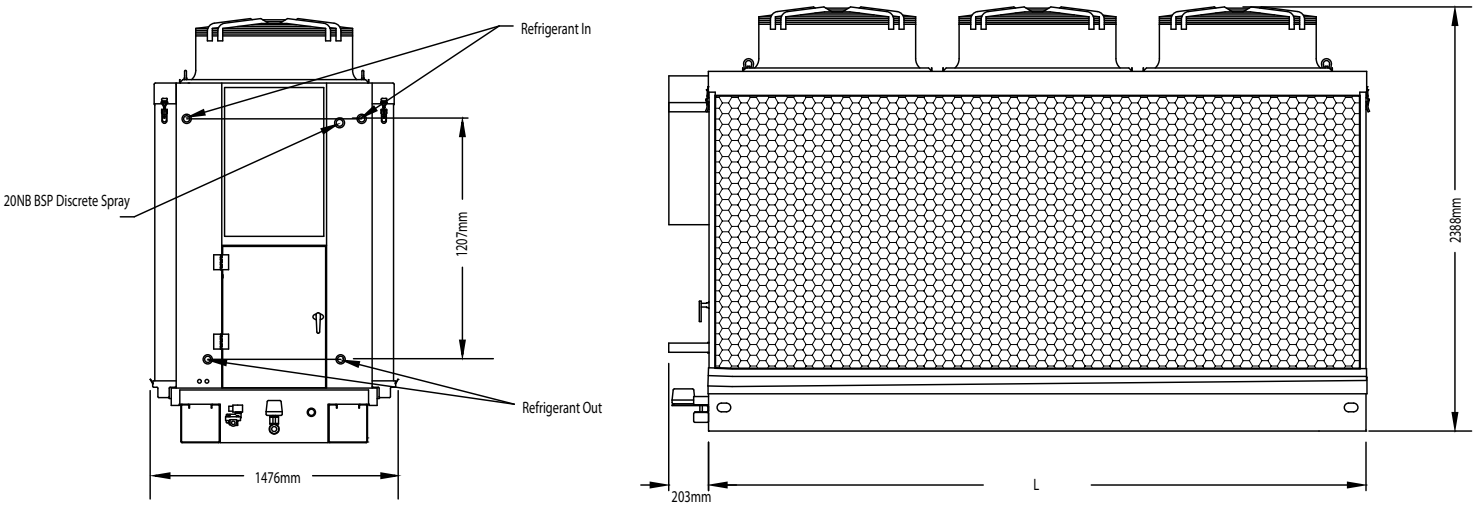
Condenser Type	Air Cooled	TrilliumSeries™ Condenser
Summer Conditions	35°C Dry Bulb	35°C Dry Bulb/24°C Wet Bulb
Air Temp to the Condenser	35°C	25.5°C to 26.5°C
Gas Temperature	110°C in, 40.5°C out	80°C in, 30.5°C out
Gas Pressure	10.5 MPa	7.5MPa

The TrilliumSeries™ Condenser allows energy efficient operation of CO_2 transcritical systems throughout the Australia and New Zealand by reducing the refrigerant temperature from 40.5°C to 30.5°C.



Using the TrilliumSeries™ Condenser drastically reduces your direct and indirect carbon emissions while making energy efficient designs possible in any climate!

Engineering Data for CO_2 Applications



Model	Fan Qty	Base Heat Rejection (kW)	Motor kW	Airflow (m³/s)	Pump kW	Unit FLA at 460V	Unit Length (L)	Shipping Weight (kg)	Operating Weight (kg)
TSDC-C02-044-3	1	155	2.2	7.17	0.19	4.4	1600	750	830
TSDC-C02-077-6.2	2	243	4.5	13.59	0.19	8.2	2413	1050	1150
TSDC-C02-112-9.6	3	394	7.2	20.10	0.19	13	3378	1350	1470
TSDC-C02-152-12.4	4	542	8.9	27.14	0.19	16.2	4750	1790	1950

NOTE:

1. Base Heat Rejection (kW) is based on R-744 93°C CO_2 gas cooling with 32°C dry-bulb/24.5°C wet-bulb ambient.

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