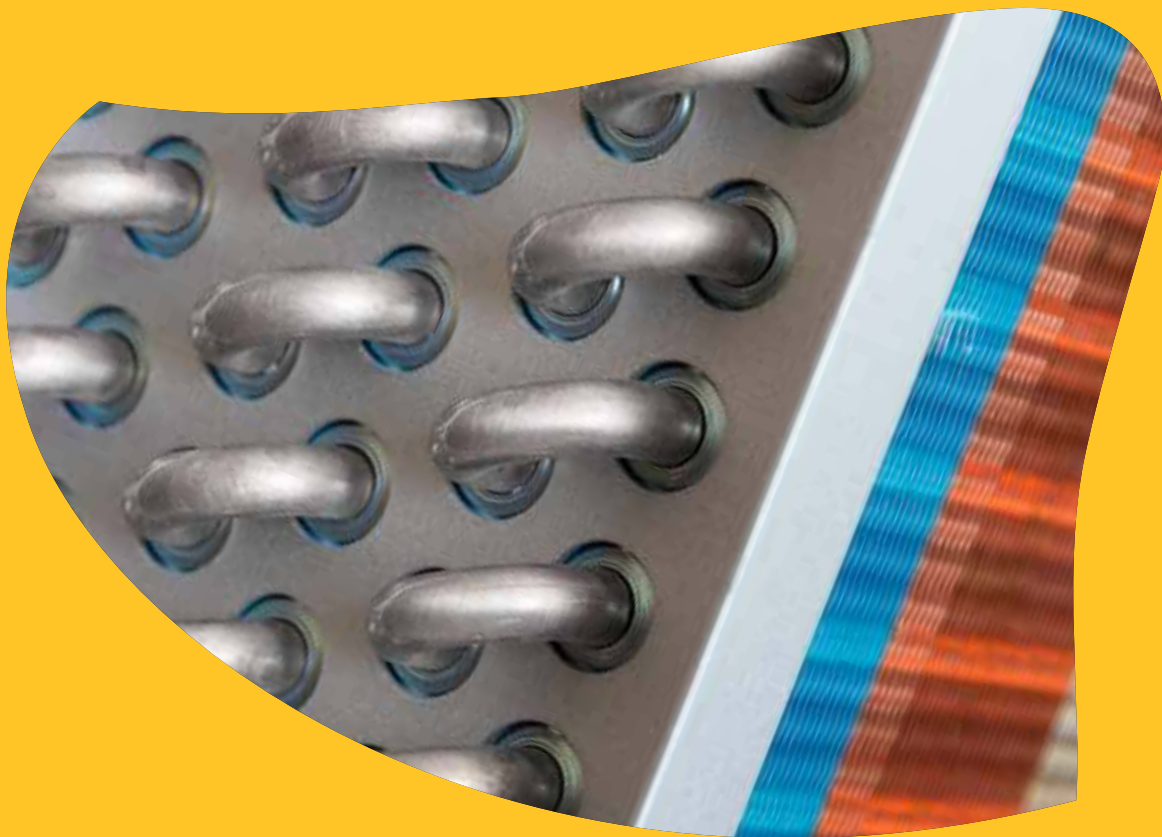


CONDENSERS

# FACS Adiabatic Condensers

Up to 90% water savings possible by using water only as needed - based on ambient temperatures and system demand



**Frick**<sup>®</sup>  
INDUSTRIAL REFRIGERATION

# FACS Adiabatic Condenser

SAFELY, EFFICIENTLY, MINIMIZE WATER USAGE

## Water Management

### Wet When You Need It, And Dry When You Don't

Efficient heat rejection is an economic success factor in any industry, particularly in refrigeration, air-conditioning, process cooling and data center applications.

Water consumption is an ever increasing important criterion for choosing equipment in addition to the footprint, low investment, low operating costs and low noise emission. The growing scarcity of water and rising costs of water inspire us to offer eco-friendly products to help minimize natural resource consumption.

The Frick FACS adiabatic condenser utilizes the latest in heat transfer and controls technology. By using water only on peak days, the FACS typically reduces water consumption 60% to 90% versus a conventional water cooled system and reduces peak energy demand versus an air cooled system. Wet when you need it and dry when you don't, this system combines the reliability and ease of use of an air cooled condenser with system efficiencies associated with evaporative cooling equipment.

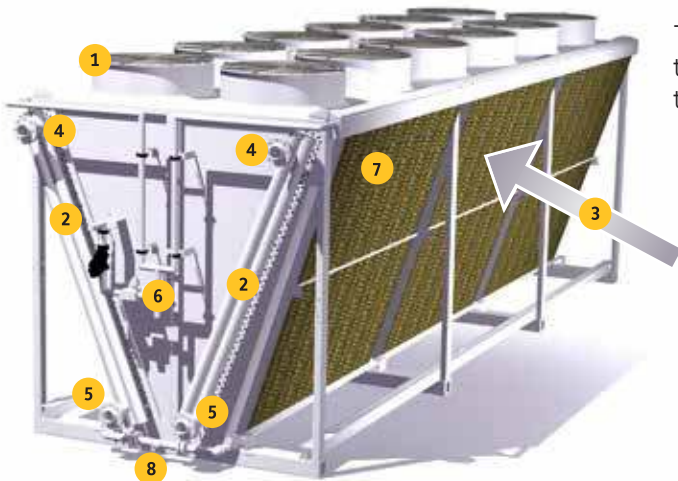
The delivery system utilizes water management and cooling pads to maximize adiabatic efficiency, minimize water consumption and safely manage water usage. In addition to the ease of operation, the elimination of water treatment systems is possible. The coils remain dry and effective water management helps to mitigate the proliferation of Legionella, pneumophila and associated illness.

FACS adiabatic condensers offer an energy efficient solution that provides significant water savings relative to water cooled equipment by using water only when ambient temperatures and system demand require it.

### Adiabatic Operating Principle: Wet or Dry Operation

Efficient FACS adiabatic condensers with hydroBLU™ Technology can be operated either wet or dry. Both modes provide excellent performance with a small footprint and low operating costs.

The cooling limit (the theoretically best possible condensing temperature/pressure for the system) is tied to the wet bulb temperature of the ambient air.

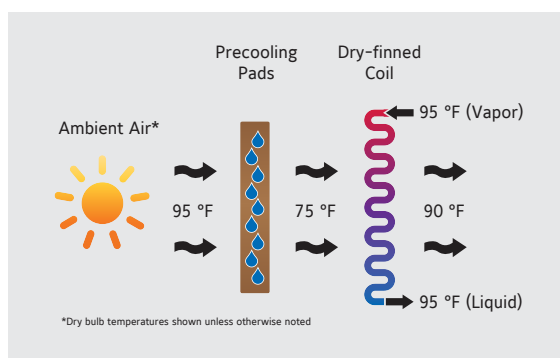


- |   |                              |
|---|------------------------------|
| 1. EC motor/Fan unit<br>(Air discharge) | 5. Liquid refrigerant outlet |
| 2. Dry, finned heat exchanger           | 6. Water distribution inlet  |
| 3. Air flow                             | 7. Pre-cooling pad           |
| 4. Vapor refrigerant inlet              | 8. Water outlet (Drain)      |



## Thermal Efficiency

### Increased Thermal Performance, Lowers Total Cost of Ownership



At peak ambient temperatures, the air entering the finned heat exchanger is pre-cooled by wetted cooling pads to a temperature approaching the wet bulb temperature, without aerosol formation and without applying water to the finned surface.

The pre-cooling process maintains the required condensing temperatures at peak ambient conditions. The adiabatic process significantly increases the thermal efficiency of the condenser with minimal water usage.

The increased thermal performance at peak ambient conditions lowers the total cost of ownership. The reduction in compressor energy usage permits higher COP's, with a significantly reduced footprint.

Evaporative condensers use water as the evaporative cooling source throughout the year. The adiabatic alternative only uses water at peak ambient conditions thereby significantly reducing or eliminating water usage, water treatment, chemicals, sewage and the costs associated with each.

### Technical Data

Dimensions (approx. range)	4'2" - 40' (L) x 4'4" - 8'6" (W) x 5'9" - 9'5" (H)
Operating Weight (approx.)	1,000 - 18,000 lbs
Heat Exchanger Design	Floating coil principle
Certification and Marks	Quality standard ISO 9001 UL, ETL, CRN, and ASME U Stamp upon request
Transport/Delivery	<ul style="list-style-type: none"><li>• Delivered assembled</li><li>• Lifting lugs allow for simple unloading and rigging</li><li>• Plastic wrapped to protect against inclement weather</li></ul>
Safety	<ul style="list-style-type: none"><li>• Operational reliability and leak prevention thanks to the floating coil principle.</li><li>• Minimize the possibility of Legionella due to zero aerosol formation.</li><li>• No stagnant water accumulation as water distribution system is one through.</li></ul>
Maintenance	Minimal maintenance, typically zero water treatment requirements, zero chemicals.
Installation	<ul style="list-style-type: none"><li>• Small footprint, high capacity</li><li>• Integrated factory installed controls</li></ul>

# FACS Adiabatic Condenser

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## Intelligent Control of Fan Speed and Wetting

- Water conserved by volume control
- Very low energy consumption using Electronically Commutated (EC) motors/fans
- Very low water consumption with a high dry operation switchpoint

## Optimal Adiabatic Cooling Delivery System

- Maximum adiabatic efficiency
- Plume-free
- No water circulation
- System checked for aerosol output
- Automatic draining
- Dry cooling coil
- No spraying
- No water treatment required in most cases

## Multifunctional Use of Humidification Pads

- Easily removable for additional dry operation capacity
- Reliable adiabatic-cooling delivery system
- Protects coil from dirt and debris

## Integrated, Intelligent Control

- Wired ready to use
- EC motors with a built-in fan speed controller
- Motor Management step controller for fan cycling

## Installation

- Easily rigged by crane thanks to easily accessible lifting lugs
- Quick and easy installation
- Optimal distribution of forces
- Rigid structure, resistant to deflection





### Dry Operation

- With no wetting of the unit, it operates like a conventional finned dry condenser
- Energy is dissipated to the ambient air via convection

### Wet Operation

- For high ambient temperatures and/or during higher cooling loads
- The condensing temperature can be brought down below the ambient dry bulb temperature, even without directly wetting the heat exchangers
- Air is adiabatically cooled and then energy dissipated by convection

### Minimal Number of Support Feet

- High level of static stability
- Reduced installation costs

### High Power Density

- "V" construction
- Optimized shipping dimensions

### Ease of Use

- Maintenance free motors
- Easy access for cleaning
- Easily removable pads

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### Materials of Construction

- Standard stainless steel tubes
- Standard aluminum fins
- Optional epoxy coating
- Various tubeside circuit options
- Various fin spacings available

### Maximum Capacity Range

- Capacity range from 5 - 350 tons for a single unit
- Multitude of sizes to match application



# FACS Adiabatic Condenser

SAFELY, EFFICIENTLY, MINIMIZE WATER USAGE

## Intelligent Control Saves Operating Costs

### Functional and Adaptive Control Strategy

The efficient operation of adiabatic condensers depends very much on the intelligence and strategy of their functional control. The FACS provides two operating modes: **Energy Priority Mode** to maximize energy savings and **Water Priority Mode** to maximize water savings. The built-in control continually monitors all the significant parameters and automatically adapts the operating mode to the current system requirements. This guarantees a smooth and efficient unit operation and compliance with the predicted consumption values.

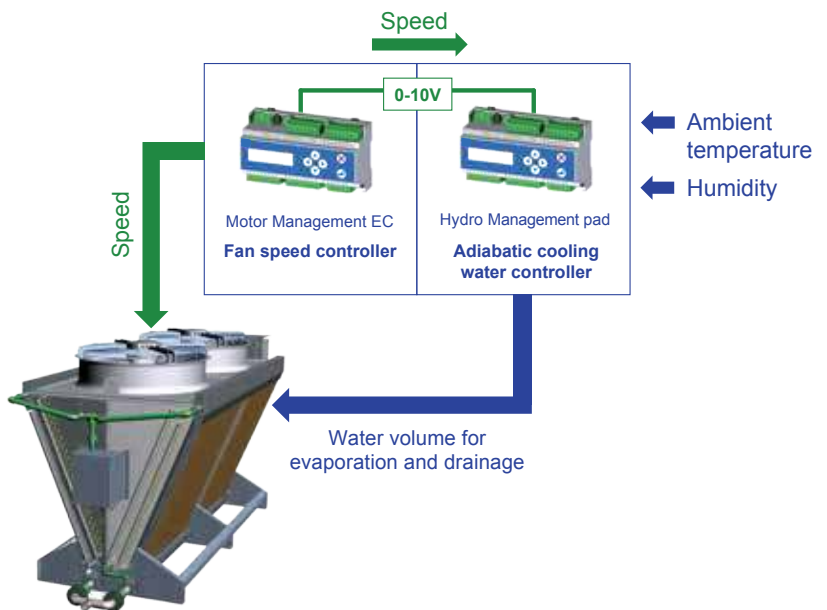
The Hydro Management and Motor Management are designed as programmable logic controllers and allow for:

- Control the desired condensing temperature/pressure
- Water distribution management
- Output of operational and fault signalling
- Communication with building management systems



### Controller Benefits

- Optimized operation of individual units
- Parameters can easily be set for ideal use in a variety of applications
- Low operating costs
- Easy to install, supplied ready for connection
- Compact, adaptable and expandable upon installation.



### Motor Management: Enhance Energy Efficiency

The condenser units use EC fan motor management to enhance energy efficiency. The chart rates some of the EC fan motor management features versus a traditional AC fan condenser.

	Energy Efficiency	Controller	Investment
Adiabatic condenser with AC Fans	Speed controller ● ○ ○ ○	Precision ● ● ○ ○ Noise ● ● ○ ○	Investment costs ● ● ● ● Service life ● ● ● ○
EC Fans Maximum efficiency.	Speed controller ● ● ● ●	Precision ● ● ● ● Noise ● ● ● ●	Investment costs ● ● ○ ○ Service life ● ● ● ●

● ○ ○ ○ NOT SO GOOD      ● ● ● ● VERY GOOD



## Evaporative vs. Adiabatic Analysis

Cost Savings Example Evaluating Water and Electrical Consumption  
Location: Binghamton, NY

### Adiabatic in Water Priority Mode

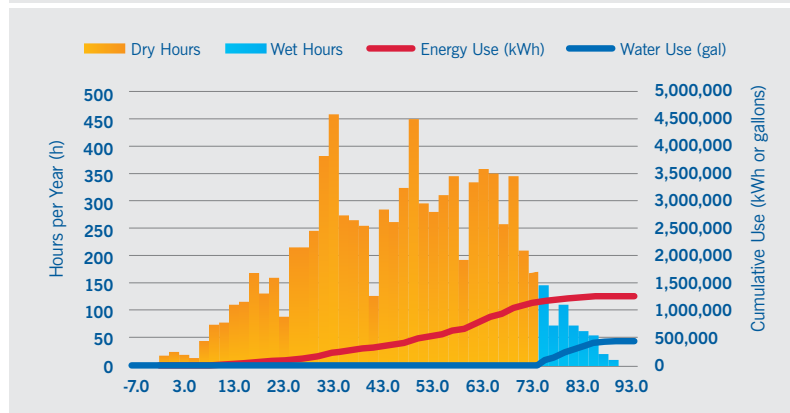
400 Ton System

Annual water and energy cost:

Adiabatic: \$173,000

Evaporative: \$205,000

### Annual Usage: Adiabatic in Water Priority Mode



### Annual Usage: Evaporative Condenser

Power and Water Rates:

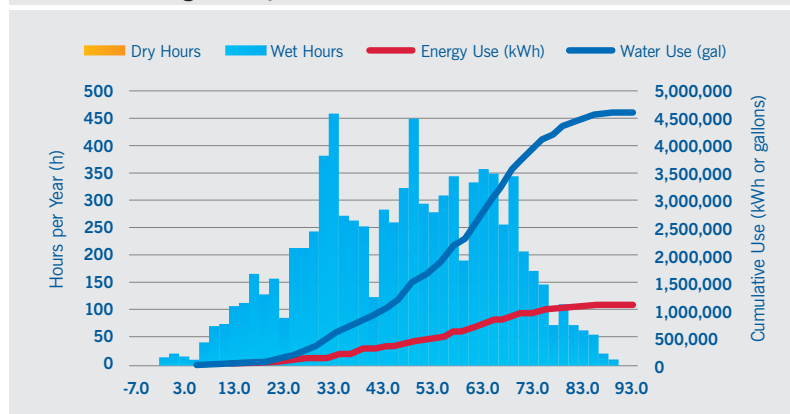
Electricity rate \$0.10 \$ / kWh

Demand charge \$11.00 \$ / kW / mo.

Water & sewage \$8.00 \$ / kgal

Water treatment \$4.00 \$ / kgal

### Annual Usage: Evaporative Condenser



## Water Conservation

### Increased Thermal Performance, Lowers Total Cost of Ownership

Employing evaporative cooled equipment for heat rejection, while energy efficient and compact, requires consuming large amounts of water. Almost half of the water consumed by a typical grocery store in California is for evaporative cooling.

Using a Frick FACS adiabatic condenser can reduce water consumption by 60% to 90%. As our society struggles with drought and rapidly rising water and sewage costs, becoming conscientious stewards of our natural resources is increasingly important.

# Single Source Industrial Refrigeration Solutions !

Heat Exchangers



Packaged Equipment



Hygienic Air Units



Vessels



Controls



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Condensers



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Form 140.300-SG1 (2018-06)  
 Supersedes: 140.300-SG1 (2017-02)  
 Subject to change without notice  
 Published in USA • 06/18 • PDF

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