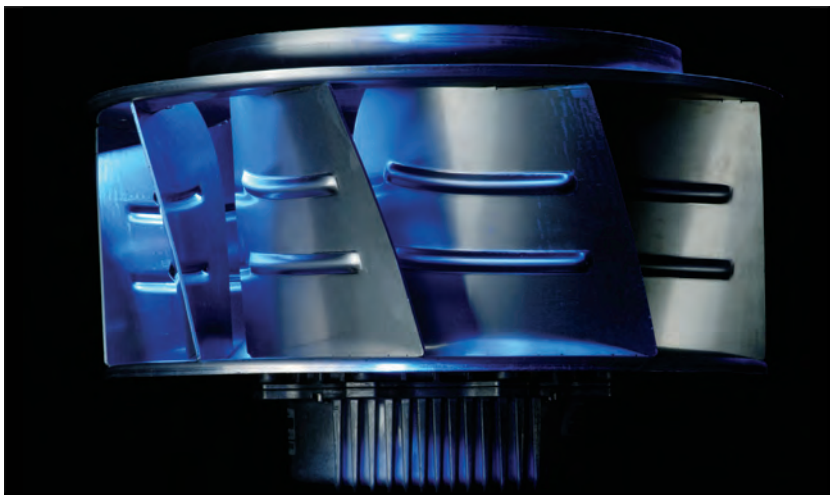


Retrofit & Conditioning

Ultrasonic Humidification | Retrofit - EC Fans, Controller | Replacement CRAH

Ultrasonic Humidification & EC Fan Retrofit Kit

Products and Services

Our Mission is to be the premier provider of energy efficient temperature and humidity control solutions for mission critical applications.

Your Trusted Partner

global provider of innovative data center cooling solutions and services.

Cooling Technology Leader

is the technology leader, providing cooling solutions and services for mission critical applications. This is accomplished through the design and manufacture of highly energy efficient temperature and humidity control equipment for commercial and industrial applications.

Energy efficiency is at the core of every product - including our HQ/Factory's 950 kW solar array.

Pre-Engineered

products are available in a variety of configurations and options based on our factory designed and tested components and modules. We can also provide a custom touch to adapt our products to meet your specific needs.

Breadth and Depth

With more than 20 years of expertise in controls, economizers, and mission critical solutions, offers the largest portfolio to fill any and all precision cooling needs.

Designed and Manufactured in the U.S.A.

While some products are merely assembled in America, is proud to research, design, manufacture, test and support our advanced cooling technologies in our Frederick, MD facility. products meet the requirements of:

- Buy America Act

Product Support

- Factory Authorized Warranty Inspection/Start-up
- Basic Product Familiarization
- BMS/Communication Services
- Commissioning Assistance
- Owner Training

Planned Service:

- Preventative Maintenance Contracts

DATA CENTER RESOURCES

Benefits Summary & Comparisons

Ultrasonic Humidifiers

- Provides precise static electricity & product quality control at a minimal operating cost
- 93% less energy consumption than electric steam
- 90% smaller droplet than nozzles
- Meets California Energy Commission Title 24 - 2013

Design Attributes	Electric Steam Canister	Infrared	High Pressure Nozzle	Ultrasonic
Energy Consumption, kW per 100 lbs of vapor	33	43	0.3	2.4
Average Droplet Size, microns	1	NA	10-15	1
Feed Water Required	Raw	Raw	Raw or Demi	Demi
Routine Maintenance Location	Local	Local	Remote	Remote
Variable Control Type	Analog	NA	Step	Pulse Width Modulation
Command to Action Time	2 minutes	3 minutes	1 Minute	Instant
Flush Cycle Requirement	Regular	Regular	On Startup	Periodic (optional)
Evaporative Cooling	No	No	Yes	Yes
Electric Utility Rebate Programs	No	No	Yes	Yes
100% Evaporation in Duct/AHU or Commercial Direct Room Application	Yes	Yes	No	Yes
Complete Packaged Air Handling Humidifier/Water Treatment Systems	No	No	No	Yes

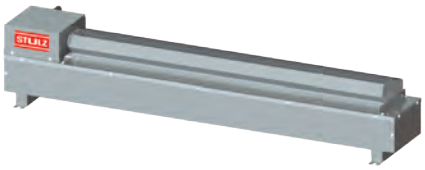
EC Fan Retrofit Kit

- Improves overall performance of existing data center air conditioning equipment
- Eliminates maintenance & housekeeping associated with belt driven blower systems
- Enjoy energy savings of 20% at constant speed and up to 60% at variable speed
- Easy installation by a qualified HVAC technician

Design Attributes	VFD Only	Under Floor ECM Blowers	CyberMOD
Can be installed in or under existing CRAHs and CRACs	●	●	●
Is easy to install in the field with the unit in place	●		●
Replaces centrifugal fans and eliminates belt & dust		●	●
Eliminates static regain requirement		●	●
Reduces turbulence under floor			●
Eliminates DC to AC VFD conversion losses: 15%+		●	●
Provides drive redundancy with independent fan motors		●	●
Increases motor life by removing harmonic speed limits and bearing effects		●	●
Achieves lowest fan noise			●
Eliminates need to relocate infrastructure under floor	●		●
Optimized blower performance with testing			●
Uses advanced controls with multiple analog input and outputs for various cooling / fan speed strategies			●

Ultrasonic Humidifier

State-of-the-art humidification for mission critical applications and any environment where clean, efficient, and precise humidity control is required.



DRH - Direct Room Humidifier	
Wall or Shelf Mounted Units	
lbs/hr	4.4 - 17.6
kg / hr	2.0 - 8.0

DAH - Ducted Air Humidifier	
Duct and Air Handling Mounted Module	
lbs/hr	5.3 - 39.6
kg / hr	2.4 - 18.0

93%
energy savings

Why Humidify?

Today's high tech environments require meticulous control of humidity to eliminate static electricity, ensure quality manufacturing processes, preserve precious documents and works of art and provide comfort while adhering to Indoor Air Quality standards. The specific reasons to humidify are as numerous as the applications, but the purpose is common across the board: to eliminate problems that can damage products, ruin buildings, or jeopardize health.

Indoor Air Quality affects man and machine, and both operate best at optimum environmental conditions.

Applications

- Data Centers / Telecomm
- Libraries / Museums
- High Tech Manufacturing
- Printing / Duplication
- Food & Beverage
- Agriculture / Tobacco
- Health Care Facilities
- Laboratories
- Commercial Offices

Design

- Multiple piezoelectric transducers immersed in a water bed impart high frequency oscillation
- Alternating pressure and vacuum causes cavitation and production of very fine water mist
- Average 1 micron diameter water droplets evaporate quickly in a room or moving air stream
- All wetted surfaces are constructed of non-corrosive materials including plastic and stainless steel
- Distributed power to the piezoelectric transducers is 48 Volts, AC or DC depending on application
- Internal humidifier safeties include low and high water level switches and high temperature cutout

Performance

- Adiabatic humidification process requires less than 10% of the energy required to boil water into steam
- Evaporative cooling - improves efficiency of high sensible heat applications such as data centers
- All specifications and selections include mixed bed deionization water treatment systems by Culligan
- 100% of the demineralized water in the humidifier may be utilized and does not require a flush cycle
- Extremely low operational expense equates to very short term Return on Investment (ROI)

Controls

- Ultra-Series Proportional controls are engineered for single or multiple humidifier systems
- Utilizes Microprocessor Controller for integrated operation of up to 16 humidifiers per zone
- Ultra-Series control boxes enclose up to 8 power supplies each, providing power and control distribution
- Proportional analog output from microprocessor converted to Pulse Width Modulation at humidifiers
- Monitors and communicates various system functions and alarms including water quality via integrated control and/or optional BMS

Energy Analysis

Ultrasonic Humidifier needs only 7% of the power required by an electric steam humidifier. Assuming a humidification requirement or 20 lbs/hr., a DAH-16 has a power requirement of 0.495 kW at 21.1 lbs/hr. Using a comparable capacity steam type humidifier, the power requirement is 6.8 kW at 20 lbs/hr, which is an energy premium of approximately 93%.

In a typical application, the yearly humidification requirement is approximately 2500-3000hrs.ROIistypically1-2yearsversesSteamorInfrared.

At a $0.08 per KWH utility rate:

Ultrasonic yearly **power requirement**.....= 3,000 hrs x 0.495 kW
= 1,485 kWH

Yearly electrical **energy cost**..... = 1,485 x $0.08/kWH
= $118.80

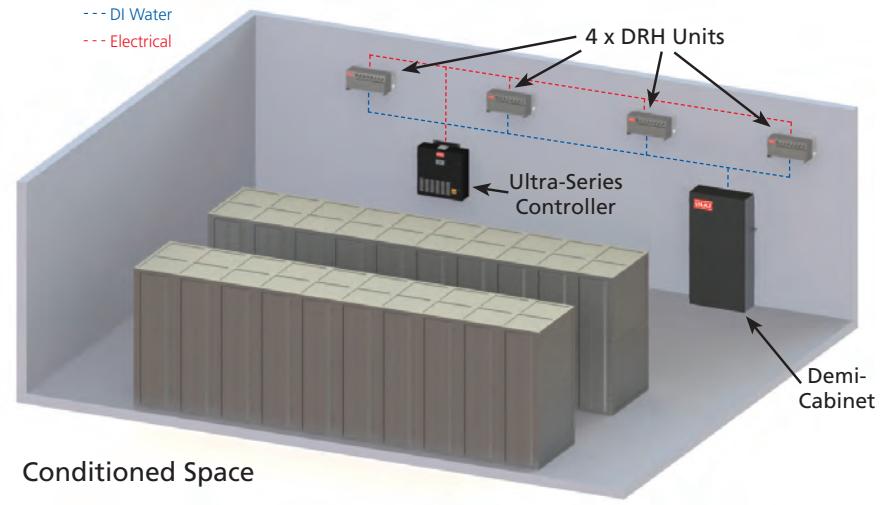
Steam electrode yearly **power requirement**... = 3,000 hrs x 6.8 kW
= 20,400 kWH

Yearly electrical **energy cost**.....= 20,400 kWH x $0.08/kWH
= $1,632

Yearly electrical energy savings.....= $1,513.20

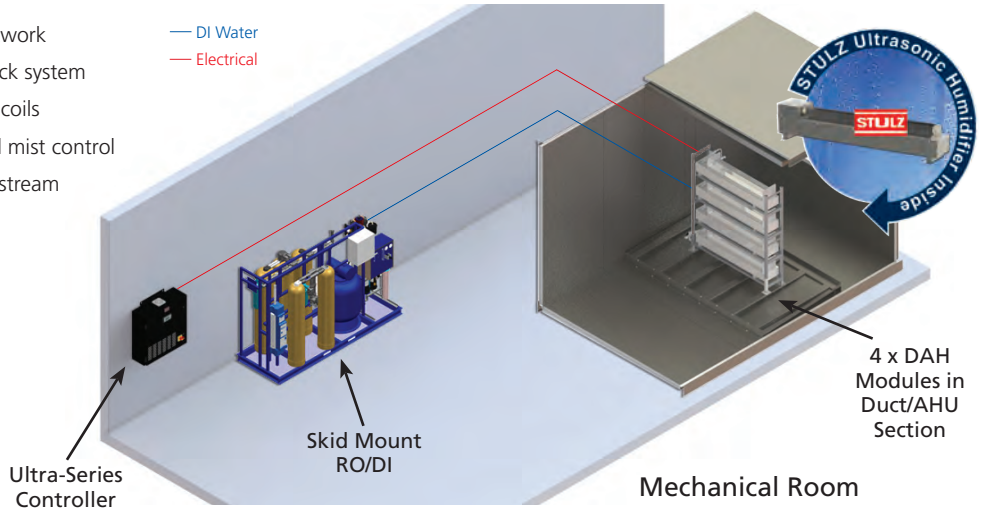
DRH - Direct Room Humidifier

- Mounts below the ceiling in a conditioned space
- On wall or column with factory furnished mounts
- Suspended from above in open space
- Integral blower and washable filter
- Absorption distance determined by RH of room



DAH - Ducted Air Humidifier

- Mounts in moving air stream of AHU or ductwork
- Multiple humidifiers assembled on factory rack system
- Air velocity design similar to heating/cooling coils
- Factory accessories for optimized airflow and mist control
- Absorption distance determined by RH of airstream



Water Treatment

by Culligan

Mixed Bed Deionization (DI) provides high purity water quality specified for Ultrasonic Humidification Systems

- Portable Exchange Deionizers (PEDI) and total water systems serviced by 700+ Culligan dealerships throughout North America
- RO/DI by Culligan assures third party certification of industry standards and complete end-to-end solutions from a single source

Demi-Cabinet

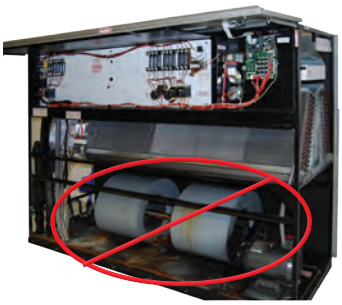
- Demi-Cabinet enclosures for unitary RO and/or DI applied to small capacity and light commercial humidifier applications

Skid Mount RO/DI

- Culligan High Purity Reverse Osmosis (RO) plant preconditioner for large capacity humidifier applications
- CHP-250 to 8000 GPD RO/DI packages include prefiltration, storage, repressurization, UV sterilization, monitoring and start-up

CyberMOD

Easy-to-install, variable speed EC Fan Retrofit Kit replaces belt drive DWDI blowers for clean, efficient upgrade to legacy mission critical CRAH and CRAC units.



Eliminate the inefficient centrifugal blowers

CyberMOD Installed

20-60%* **fan energy savings**

Why Retrofit?

With energy efficiency and cost of ownership at the forefront of data center operations, retrofit options provide a cost savings opportunity with a short ROI. Data Center owners can save money and extend the life of existing equipment by installing an EC Fan Retrofit Kit to existing CRAH or CRAC units that contain fixed speed centrifugal blowers.

Applies to:

- Liebert
- Data Aire
- Compu-Aire
- Airflow
- ATS

*Savings estimate is derived from actual performance test results of (1) Liebert model FH740C with 10 hp forward curved centrifugal fan vs. (1) Liebert model FH740C modified with the EC Fan retrofit kit, against 0.3" of external static pressure. Results may vary.

Application

- Extend the life, improve efficiency & reliability of existing systems
- 2- and 3-fan configurations available
- No changes required to the primary electric or piping

Design

- Welded aluminum construction
- Provides superior air distribution
- Built-in fan redundancy
- Easy installation

Operation

- Quiet Operation (low vibration, no inverter whine)
- Low maintenance (no belts to adjust, no belt dust, no greasing)

Performance

- Energy-saving advantages: 20% by replacing the fans only, at full flow
- Up to 60% when allowing additional control options, partial load operation
- EC Fans operate at lower speeds, lower energy, even airflow
- Fast ROI - typically within 2-4 years and qualifies for utility rebates
- EC Fans consume less energy, therefore higher net cooling capacity
- EC Fans provide optimized under-floor pressure and balanced airflow

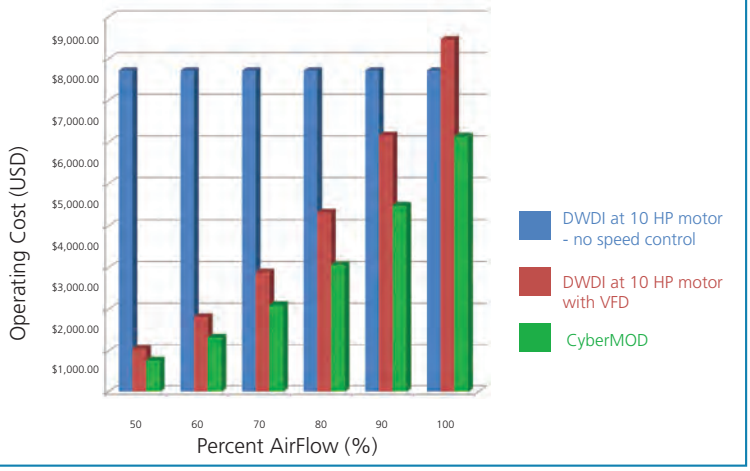
Controls

- E^2 controller ties directly to or replaces existing controller
- Fan speed control is independent of CW valve control operation
- Update existing control options (under-floor pressure control; return or supply air
- temperature control; independent fan and valve control)
- Communicates with BMS - optional

Energy Analysis

Operating Cost Per Year (per unit basis)

Based on actual test data



Replacement CRAH

Direct drop-in chilled water, high capacity CRAH replaces inefficient legacy units providing instant energy savings and improved performance.

Replacement CRAH	
CW	
kW	76 - 124
BTU/hr	261,000 - 423,000
Tons	21 - 35
CFM	12,500 - 18,600

40-60%* **total energy savings**

Why Replace?

For existing data center owners who need to replace old, unreliable CRAHs quickly and efficienty, provides a low cost/high efficiency replacement.

- Uses existing floor stands, electrical and piping connections
- Lowers maintenance costs
- Provides advanced communication and control capabilities
- Lowers operating costs

Applies to:

- Liebert FH 422C
- Liebert FH 529C
- Liebert FH 600C
- Liebert FH 740C

*Savings estimate is derived from actual performance test results of (1) CCD-1805 CWE-LR vs. (1) Liebert model FH740C, at 16,500 cfm, against 0.3" of external static pressure. Results may vary.

Application

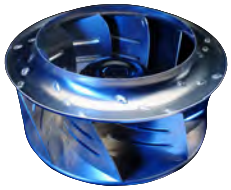
- All the benefits of Mission Critical Design
- cabinet and unique design features allow a direct drop-in replacement
- No modification to existing piping mains, primary electric, or floorstand

Performance

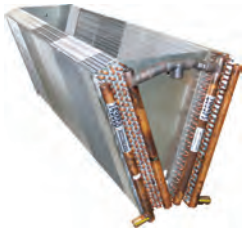
- V-Coil arrangement
- Energy savings advantages:
  - Up to 40% simply by replacing the CRAH
  - Savings of 50% and beyond can be achieved using advanced controls
- Increased air volume at maximum fan speed
- EC Fans operate at lower speeds, lower energy, even airflow
- EC Fans consume less energy, therefore higher net cooling capacity
- EC Fans provide optimized under-floor pressure and balanced airflow
- Fast ROI; qualifies for utility rebates

Controls

- The E^2 controller will allow communication with all major BMS/BAS systems
- Update existing control options (under-floor pressure control; return or supply air temperature control; independent fan and valve control)



EC Fan Technology



V-Coil Technology

Controller Retrofit

Retrofit kits and authorized installation services are available for legacy chilled water units with C6000 controllers and select competitor units. E^2 controllers can be quickly retrofitted and are an excellent way to unify disparate controller platforms and gain tighter control by adding dew point control/under-floor static pressure capabilities. The E^2 controller improves BMS communications by eliminating outdated and unnecessary gateways while increasing read/write capability.

Microprocessor

Large Bezel with Touchscreen