

HUMIDIFICATION DESIGN GUIDELINE



INTRODUCTION

Condair is a world leader in the humidification industry with a wide array of isothermal and adiabatic humidification and cooling solutions. With a wide array of humidification and cooling technologies, Condair and Advanced Thermal Solutions can provide the right system for your application.

Below is an introductory summary of the two main types of humidification followed by a complete summary of the different types of solutions that Condair offers along with features, benefits, and when best to apply each one.

| ISOTHERMAL VS. ADIABATIC

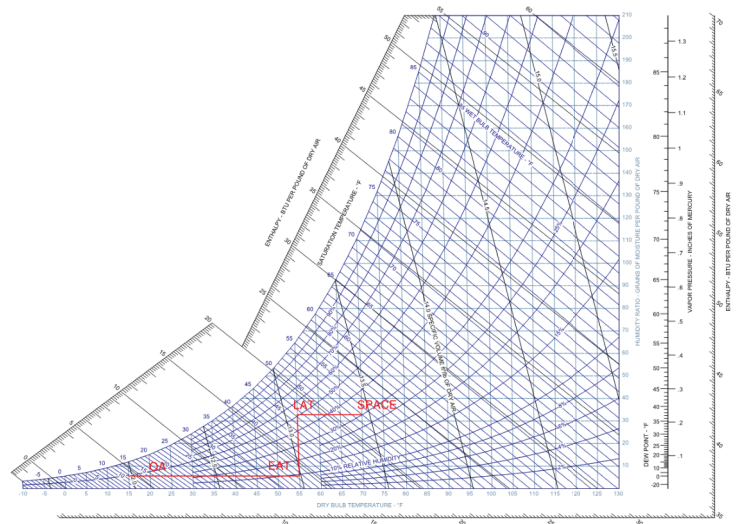
Humidification systems are generally grouped into two types of technologies, adiabatic or isothermal. Each type of system has its benefits and drawbacks and there are applications where one is more suited than the other and vice versa.

Isothermal generally involves injecting steam into the air stream or directly into the conditioned space. The steam needed for this type of system can come from a variety of energy sources; including centralized house steam, steam to steam generators, gas-fired steam generators, or electrical (resistive or electrode) steam generators.

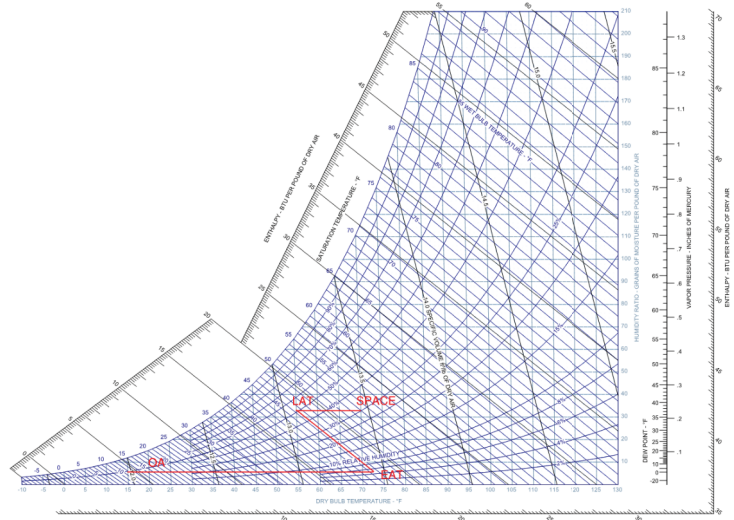
Adiabatic humidification is accomplished by the air stream absorbing water particles which simultaneously cools and humidifies the air stream. This can be accomplished by injecting purified ultra-fine water particles directly in the air stream or passing the air over an evaporative media.

The psychrometric processes for both isothermal and adiabatic humidification are shown to the right. As the charts show, adiabatic humidification has the added effect of cooling the air stream which can be useful in scenarios with higher return air temperatures and percentages (i.e. free cooling). However, in low ambient 100% OA conditions, the required EAT for the humidifier can be substantially higher than the AHU leaving air temperature which requires oversizing of preheat coils.

For both types of systems, the energy required to evaporate the water into the air stream is roughly the same. For isothermal applications, the energy is expended at the steam source whether it's a localized generator or centralized clean steam system. For adiabatic applications, the energy is expended at the preheat coil to bring the air temperature up the required absorption temperature.



ISOTHERMAL



ADIABATIC

GS SERIES: GAS FIRED HUMIDIFIER

The continuously rising costs associated with electrical power have created an ever-growing demand for gas-fired technology which provides a very cost effective and environmentally friendly option with regards to humidification. The Condair GS gas-powered steam humidification system is a fully condensing and efficiency-leading humidifier combining eco friendliness with cutting edge technology.

APPLICATION:

- Gas (or Propane) service readily available
- Reduced electrical load compared to other technologies
- Owner concerned with efficiency and long term utility costs

FEATURES:

- True condensing high efficiency
- 316 S.S. heat treated heat exchanger
- Hygienic steam production from boiling
- Compact footprint, mounting options
- Integrated controller
- California low NOx emission levels
- Large cleanout port

BENEFITS:

- Operation and installation savings
- Corrosion resistance for increase life cycle
- Easy retrofit, replacements
- Easy-to-use touchscreen controls with built in troubleshooting
- BMS connectivity
- Meets requirements of the SCAQMD
- Easy maintenance



EL SERIES: ELECTRODE HUMIDIFIER

The EL series electrode humidifier ensures reliable steam production from potable water without additional water treatment. Electrode steam humidifiers are a simple and reliable humidification system for in-duct or direct room humidification. Straight forward maintenance keeps downtime to a minimum and maintains humidity control.

APPLICATION:

- Low first cost
- Extremely efficient but high electrical load
- Simple to maintain
- Potable water

FEATURES:

- Electrode technology
- Replaceable cylinder with auto adaptive technology
- Seismic certification standard
- Wrap around cabinet design
- Integrated controller
- Indoor and outdoor enclosures

BENEFITS:

- Highly accepted and reliable
- Highest efficiency of all technologies
- Optimizes steam production
- Minimizes water use, maximizes cylinder life
- Easy maintenance with disposable cylinder
- Zero side clearance, ideal for tight spaces.
- Programmable touchscreen with standard Modbus, BACnet IP/MSTP



RS SERIES: RESISTIVE ELEMENT HUMIDIFIER

The RS series resistive element humidifier uses electrical power to generate steam and offers the highest accuracy and performance for humidity critical applications. The RS-Series humidifier can utilize potable or DI/RO water. For potable water applications, the unique scale collector tank option collects minerals and is easily removed for disposal of scale.

APPLICATION:

- Tight humidity control requirements (+/- 1% RH)
- Extremely efficient but high electrical load
- Simple to maintain
- Use with potable, RO, or DI water



FEATURES:

- Resistive element technology
- Scale management system
- High precision SSR controller
- Cold pool technology
- Integrated controller
- Indoor and outdoor enclosures

BENEFITS:

- Boiling ensures clean, sterile steam production
- Long maintenance intervals
- High steam output accuracy +/- 1% RH
- Reduced scale buildup
- extended lifespan of heating elements, tanks, and drain pump

SE SERIES: STEAM TO STEAM GENERATOR

The SE series steam exchange humidifier generates clean, hygienic steam utilizing the facility steam boiler system. By running the facility steam supply through a 316 stainless steel heat exchanger, fresh water is turned into clean humidifier steam which prevents any boiler treatment chemicals from affecting the facility's air quality.

APPLICATION:

- Existing steam heating system
- Not feasible to install a centralized clean steam system
- Electric or gas not feasible



FEATURES:

- 316 S.S. heat treated heat exchanger
- Completely packaged unit
- Indoor and outdoor enclosures
- Large, accessible clean out ports
- Built in drain water cooler
- Cabinet height and width is same for all unit sizes

BENEFITS:

- Clean, atmospheric steam with either potable, RO, or DI water
- Easy installation and maintenance
- Reduces drain water to 140°F
- All unit sizes fit through 32" door

DL SERIES: HYBRID HUMIDIFIER

The DL series hybrid humidification system combines the advantages of atomization and evaporation. The humidifying water is atomized by molecular atomizing nozzles at low pressure. The atomizing nozzles have an adjustable spray and are optimally distributed over the entire cross-section of the device. The evaporative media captures the droplets downstream and allows for re-evaporation.

APPLICATION:

- High water efficiency
- Hospital grade hygiene performance
- Use with RO/DI water - pair with ML pump skid with reverse osmosis option if no centralized RO system is available.



FEATURES:

- Hybrid technology
- Silver ion dosing for hygiene
- No wear ceramic media
- 24" unit foot print (direction of airflow)
- Up to 31 stages of control

BENEFITS:

- Extremely high water efficiency
- Most hygienic adiabatic humidification solution
- No media replacement required
- Ideal for limited space retrofit applications
- Precise control

ME SERIES: EVAPORATIVE MEDIA

The ME series humidification system functions by supplying water to the top of the evaporative module via a self-contained hydraulic unit. The water is absorbed by the air stream as it drains down the media. Exterior mounting of the hydraulic unit enables the majority of service work to be carried out without having to shut down the air handling unit.

APPLICATION:

- Data Centers,
- Potable water, DI, or RO water
- Adiabatic cooling to reduce cooling coil load and increase economizer operation which reduces chiller demand in shoulder seasons

FEATURES:

- Polyester media option
- Individual pumps per stage
- Hydraulic molded with BioMaster additive
- Submerged UV light in basin
- Free adiabatic cooling



BENEFITS:

- No risk of loose fibers
- Prevents microbial growth
- Continuously sterilizes recirculated water and drain pan
- Reduce mechanical cooling costs.

HP SERIES: HIGH PRESSURE ATOMIZING HUMIDIFIER

The HP series high pressure humidification system generates an extremely fine spray of water droplets using precision impeller type high pressure nozzles. The nozzle manifold design ensures that the spray is uniform and absorbed over a short distance. Pairing with the ML pump module to supply high-pressure water to the nozzles eliminates the need for a compressed air system.

APPLICATION:

- Serve multiple AHUs with a single pump station
- Integrated RO/DI solution
- Adiabatic cooling to reduce cooling coil load and increase economizer operation

FEATURES:

- Tailored capacities and sizes for project specific needs (26 - 6600 lb/hr)
- Precise control +/- 2% RH accuracy
- Stainless steel, water lubricated, direct drive pumps
- Free adiabatic cooling

BENEFITS:

- Modular / flexible mounting pieces to fit any duct or casing need
- Redundant pump skid option available
- Free adiabatic cooling
- Long lasting components, low maintenance



US SERIES: ULTRASONIC HUMIDIFIER

The Condair US-Series ultrasonic humidifier uses piezoelectric transducers operating at 1.7 MHz to generate an ultra-fine (1 - 3 micron) mist which is distributed directly to the space. Unlike isothermal technologies, the humidifying water is not boiled which results in some of the lowest energy input humidification on the market - decreasing direct energy costs by 90%.

APPLICATION:

- Small in-space loads
- Capacities from 7 lbs/hr up to 40 lbs/hr in single unit
- Simple installation
- Use with RO/DI water. External RO treatment option available.



FEATURES:

- UV light and MERV-12 intake air filtration
- Stainless steel chemically polished water tank
- High quality TiN (Titanium Nitrate) coated transducers - operational lifetime of 10,000 hours
- Automatic flushing in operation and standby modes
- On/off or demand control
- Direct or remote mounted blower pack

BENEFITS:

- Low energy consumption (~33W per lb/hr)
- Adiabatic cooling effect of the ultra-fine mist
- Fast start up
- Precise control +/- 1% RH
- Compact
- Easy to install

AF SERIES: COMPRESSED AIR HUMIDIFIER

The Condair AF-Series compressed air nozzle humidifier uses advanced nozzle technology to inject droplets of water directly into the space. Available as either a packaged wall or ceiling system or as a modular engineered system using individual nozzles.

APPLICATION:

- Direct fogging applications such as manufacturing, automotive, printing, woodworking, textiles, paint booths, concrete curing, warehouse, and storage.
- Requires electrical power, water, and compressed air.



FEATURES:

- Vacuum system automatically stops water flow if air pressure drops.
- Nozzle design ensures equal output across all nozzles
- Programmable timer for self-cleaning
- Flexible nozzle mounting options
- 316 SS components
- Water particle size of 3 - 10 microns

BENEFITS:

- Low maintenance
- Scalable system from single controller
- Energy efficient
- Adiabatic cooling effect

ML SERIES: HIGH PRESSURE ATOMIZING SYSTEM

The ML series high pressure atomizing direct room humidification system atomizes water into micro fine particles for easy absorption. All distribution modules can be combined in one or more rooms depending on space, room configuration, type or production, and similar factors.

APPLICATION:

- Manufacturing and production areas
- Open spaces
- High racking, explosion-proof, and dusty environments
- Future expansion



FEATURES:

- Stainless steel nozzles
- Fan modules available to increase distribution
- Accommodates ceiling heights from 12 to 24 and higher depending on module selection

BENEFITS:

- Atomizes water into micro fine particles
- 100% of sprayed water is absorbed and evaporated.
- Ultra hygienic

ML SERIES: PUMP STATION

The Condair ML Series pump station is designed to provide consistent high pressure 1000 PSI water for fine atomization type humidification systems. One pump skid can be sized to serve multiple different zones and systems. Standard units include UV light and particle filtration with a wide array of additional filtration options.

APPLICATION:

- Pair with ML series, DL series, and HP series humidification systems.

FEATURES:

- UV light and intake air filtration
- Temperature and pressure safeties
- Corrosion resistant materials
- Water lubricated stainless steel pumps
- Optional water treatment options
 - Water softening
 - Chlorine filtration
 - Microbiological and bacteria filter
 - Reverse osmosis
 - Ion exchange



BENEFITS

- Water lubricated pumps have long maintenance intervals
- Turn-key assembly on self-contained skid. (Additional filtration may be separate)
- Direct coupled pumps - no belts
- True N-1 (or N+2, N+3) redundancy available for entire systems or pumps

AM SERIES: SHORT ABSORPTION MANIFOLD

The Condair AM steam absorption manifold (SAM-e and mini SAME-e) is for use where short steam absorption distance is critical. Steam distribution takes place via distributor tubes with integrated nozzles which extend into the center of the distribution tube ensuring only condensate-free steam is released. Condensate drains out of the distribution tubes through the header, eliminating the need for jacketed tubes.

APPLICATION:

- AHU or duct mounted
- Atmospheric steam
- Pressurized steam source with Condair LS Series
- Absorption distance critical

FEATURES:

- Stainless steel construction
- Insulated tubes and headers optional
- Adjustable mounting frame for easy installation
- Inlet adapters available to tie multiple generators to a single manifold
- Size ranges from 12”w x 8”h to 144”w x 144”h

BENEFITS:

- Precise and accurate humidity control
- Multiple tube spacing options available to meet absorption distance requirements
- Minimal pressure drop (0.02” wc at 1000 FPM using 6” tube spacing)



AS SERIES: ATMOSPHERIC STEAM DISTRIBUTOR

The Condair AS Series atmospheric steam distributor allows for direct introduction of atmospheric steam into a duct system or Air Handling Unit.

APPLICATION:

- AHU or duct mounted
- Atmospheric steam
- Longer absorption distances

FEATURES:

- Adjustable for vertical or horizontal flow applications
- Stainless steel construction
- Integral condensate return

BENEFITS:

- Designed for use with any Condair steam generator (EL, RS, GS, or SE)
- Multiple tubes can be utilized for design flexibility



LS SERIES: PRESSURE STEAM HUMIDIFIER

The Condair LS Series pressure steam humidifiers deliver reliable humidity from the facility steam source to a stainless steel steam jacketed dispersion tube or an AM series short absorption manifold.

APPLICATION:

- Existing pressurized steam source (2psi to 50psi)



FEATURES:

- Stainless steel or bronze valves and trim available
- Actuator, strainers, and traps included.

BENEFITS:

- Suitable for boilers operating on DI, RO, or potable water
- Steam jacketed tube prevents “spitting”
- Precise humidity control
- Cost effective system

CONTROLS

Condair can supply control technology suited for any type of humidifier application including residential, commercial and industrial environments. Designed to provide clear information regarding humidifiers and their operating conditions, they allow for users to quickly input preferred functions and maintain system operations.

CONTROL TYPES:

- On/Off
- Modulating
- Integrated Controller



DEVICES:

- Modulating room or duct humidistat
- On/OFF humidistat (room or duct)
- Air proving switches
- High limit switches

BAS INTERFACE

- Modbus
- BACnet MS/TP
- BACnet IP
- Lonworks