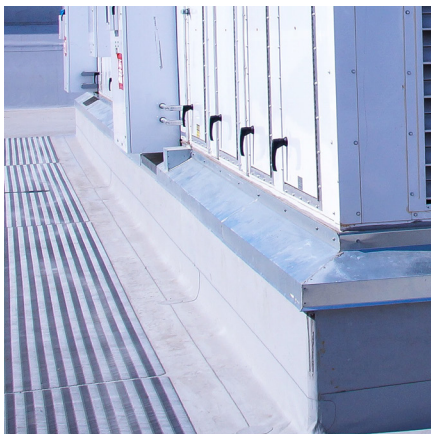
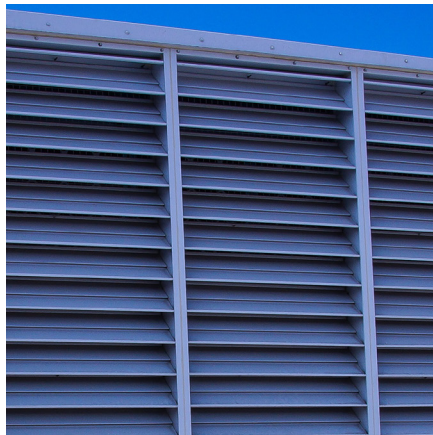


An Engineer's Guide to  
**Selecting and  
Integrating the Right  
Humidification System  
for Your AHU Project**



## EXECUTIVE SUMMARY

Proper humidification is essential for maintaining environmental control in a wide range of applications, from commercial buildings and hospitals to data centers and cleanrooms. However, specifying a humidification system is often a challenge for engineers due to the infrequency of such projects and the complexity involved in equipment selection, integration, and performance modeling.

This eBook, based on a five-part webinar series by DriSteem, is a comprehensive guide for AHU OEM engineers and system designers who need to confidently and competently design humidification systems. It offers foundational knowledge and practical insights covering:

- The importance of defining project-specific humidity control objectives
- How to perform accurate load calculations based on airflow, climate conditions, and humidity targets
- When to choose isothermal (steam-based) versus adiabatic (water-based) systems
- Steam generation options when a boiler is not available, including electric and gas systems
- Strategies for optimal equipment placement, piping design, and moisture management
- How to use DriCalc® sizing and selection software to streamline selection, ensure proper sizing, and coordinate mechanical integration

Whether you are aiming to improve comfort, protect sensitive materials, or meet stringent process requirements, this guide equips you with the knowledge and tools to make informed decisions.

With actionable advice and real-world examples, it's an indispensable resource for reducing design risk and elevating project outcomes.



## WHY CHOOSE DRISTEEM?

DriSteem delivers proven performance, energy efficiency, and seamless integration for AHU designs. With deep application expertise, innovative technologies, and global infrastructure—including local support and fast shipping—we make it easy to specify and deliver high-performance humidification solutions anywhere in the world.

## HOW TO GET STARTED WITH HUMIDIFICATION

When humidification systems come up in AHU design, it often creates a moment of pause. Engineers understand the importance of maintaining appropriate humidity levels for occupant comfort, material preservation, and specialized processes. Yet because humidification isn't frequently specified, even seasoned professionals may find themselves brushing up on fundamentals each time a new project arises.

That's where this guide comes in. Based on DriSteem's five-part educational webinar series, this eBook compiles expert insights from Application Engineer David Baird and Vertical Marketing Manager Kory Kinney. It's designed to reduce uncertainty, improve system design confidence, and minimize back-and-forth with internal sales teams by providing a clear, cohesive reference.

If you're new to humidification or looking for a refresher, this guide covers foundational principles, technology selection, integration best practices, and helpful tools to optimize your next AHU project.



For AHU manufacturers, value means more than performance – it's about design flexibility, shorter section lengths, easy installation, and fast delivery.

That's where DriSteem delivers.

## CHAPTER 1: FUNDAMENTALS OF HUMIDIFICATION

Before selecting equipment, it's essential to understand why humidification is needed in your specific project. Applications range from museum preservation to healthcare, industrial processing, and comfort control in commercial spaces. Each of these goals requires a unique approach to moisture control, influencing every step of your system design.

Humidity affects human health, electrostatic discharge (ESD) events, wood stability, paper production, data center performance, and more. Therefore, knowing the intended outcome of humidification—whether maintaining tight tolerances in a cleanroom or simply improving comfort in an office—determines the appropriate system capacity and control strategy.

The design process begins with collecting key project inputs:

- **Airflow volume:** Typically measured in CFM; essential for load calculation
- **Outdoor and return air conditions:** Particularly important in climates with dry winters or large air exchange volumes
- **Target relative humidity (RH) or absolute moisture content:** Determined by the needs of people, materials, or processes
- **Available utilities:** Electricity, boiler steam, natural gas, or treated water sources

Once these variables are known, engineers can determine how much moisture must be added to the system. This is done using a mass balance calculation, comparing the starting and target moisture content across the air volume. Using tools like psychrometric charts or digital calculators can simplify this.

Rule of thumb: For comfort applications, assume 2–3 pounds per hour of moisture required for every 100 CFM of outdoor air. In process-critical environments, a more rigorous calculation is recommended.



### WHY DO YOUR CUSTOMERS CARE ABOUT HUMIDITY CONTROL?

Maintaining proper relative humidity (RH) improves overall building operations, supports energy efficiency goals, and enhances indoor air quality. It is essential for protecting system performance and process reliability, and it's becoming a growing priority for your customers.

## CHAPTER 2: ISOTHERMAL HUMIDIFICATION (STEAM-BASED)

Isothermal systems are among the most common humidification methods used in commercial and industrial applications. These systems add moisture in the form of steam, which is created using an external energy source and then injected into the airstream. Because the steam is already in vapor form, there is minimal impact on air temperature, making this an efficient method for precise humidity control.

### When to Use Isothermal

Isothermal humidification is ideal when:

- Tight RH control is needed (e.g.,  $\pm 2\%$ )
- Clean vapor delivery is critical (e.g., hospitals, museums, laboratories)
- There is an existing boiler system to leverage
- The goal is to avoid significant cooling effects from moisture introduction

### Dispersion Design

Placement is key to achieving good absorption and avoiding condensation. Best practices include:

- **After the heating coil:** To ensure the air has capacity to absorb moisture
- **Before the cooling coil (if present):** Allows any residual condensation to drain safely
- **In straight duct runs or centralized AHU sections:** Where airflow is evenly distributed



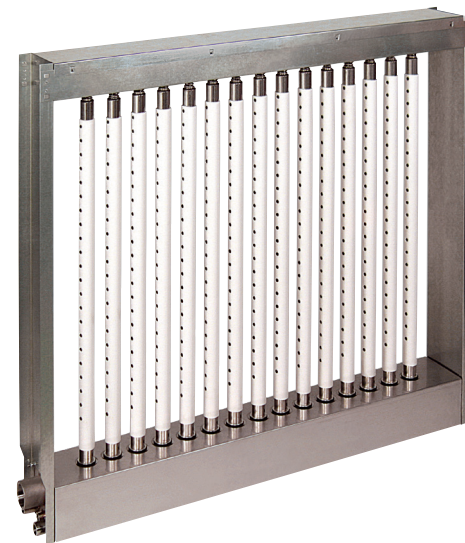
Steam humidification remains a proven solution for achieving precise relative humidity (RH) control, ensuring long-term reliability, and delivering energy-efficient performance in air handling unit (AHU) systems.

Non-wetting distance is the downstream space required for steam to fully absorb into the air. This varies based on RH, temperature, and steam dispersion type. DriSteem's Ultra-sorb® panels, for example, are designed to minimize non-wetting distance and maximize efficiency by offering multiple contact points across the airstream.

Blank-off panels and baffles may be used to direct all airflow through the dispersion assembly. This reduces bypass and improves uniformity of moisture addition but may introduce slight pressure drops.

Advantages of DriSteem Dispersion Solutions:

- Custom panel sizing for different AHU profiles
- Factory-assembled frames for simplified installation
- Models suited to high-capacity or tight space installations
- Guaranteed short non-wetting distances allowing more compact AHU design



DriSteem Ultra-sorb® XV  
Steam Dispersion Panel



DriSteem Ultra-sorb® MP  
Steam Dispersion Panel

### WHY CHOOSE ULTRA-SORB® STEAM DISPERSION PANELS ?

DriSteem's Ultra-sorb® steam dispersion panels make steam humidification an even more effective solution for AHU systems—delivering precise RH control, dependable performance, and long-term energy efficiency. With rapid absorption, a compact design, and reduced operational costs, Ultra-sorb® panels support efficient system layouts and extend equipment life.

## CHAPTER 3: ADIABATIC HUMIDIFICATION (WATER-BASED)

Adiabatic humidification introduces water droplets directly into the air. The energy required to evaporate these droplets is drawn from the airstream, resulting in simultaneous humidification and cooling. This dual effect can be beneficial in hot or process-heavy environments.

### Benefits and Applications

Adiabatic systems are ideal for:

- Energy-efficient humidification in data centers or factories
- Pre-cooling air before mechanical chillers to reduce energy costs
- Spaces with waste heat from industrial equipment
- Areas with access to purified water sources (RO or DI)

### Technology Options

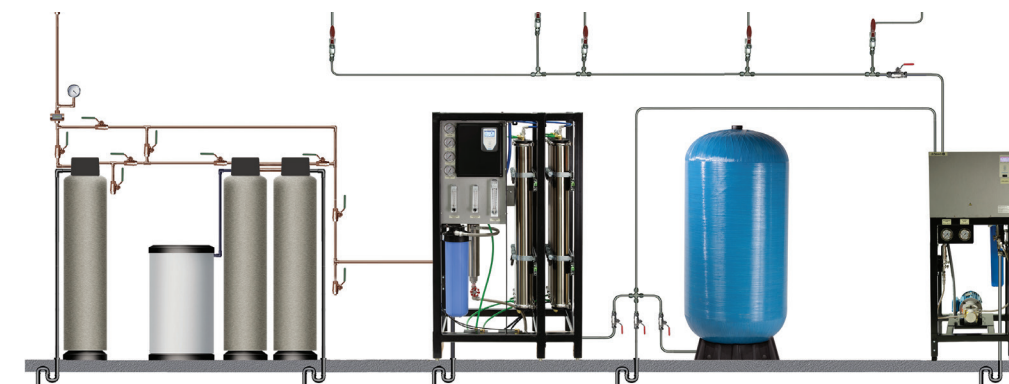
- **High-pressure atomizing nozzles:** Pressurize water through small orifices
- **Ultrasonic:** Vibrate water to create fine mist

### Design Considerations

Because evaporation is not immediate, adiabatic systems require longer downstream space for moisture absorption—typically several feet. They must also incorporate:

- Drain pans beneath wetted sections
- Mist eliminators to trap carryover droplets
- Stainless steel or corrosion-resistant materials in wetted zones

Proper water quality is essential to prevent mineral scaling and equipment failure. DriSteem recommends RO/DI water for adiabatic equipment. Controls should monitor RH closely to avoid over-saturation, which could lead to condensation or microbial growth.



DriSteem Adiabatic System with Water Treatment

DriSteem's high-pressure atomizing systems provide precise humidity control with far less energy use than isothermal options—helping customers cut emissions, reduce costs, and meet decarbonization goals.

## CHAPTER 4: STEAM GENERATION METHODS

When direct boiler steam is unavailable, standalone steam generators offer an excellent alternative. Choosing the right technology depends on control precision, maintenance preferences, and available utilities.

### Generation Technologies

- **Electric Resistive Units:** Use submerged heating elements. Offer tight modulation and quick response.
- **Electrode Humidifiers:** Pass current through conductive water to create steam. Require less upfront maintenance but have lower precision.
- **Gas-Fired Humidifiers:** Ideal for high-output needs. More efficient than electric for large loads, especially in areas with inexpensive natural gas.
- **Steam-to-Steam Systems:** Use boiler energy via a heat exchanger to create clean, separate steam for dispersion.

### Installation Considerations

- Place generators as close to the dispersion point as possible to minimize condensate loss.
- Use insulated piping pitched toward drains or the generator tank.
- Choose appropriate piping materials—copper, stainless, or steam hose depending on capacity.
- Plan for condensate traps and drainage to ensure safe and effective system operation.

DriSteem systems are available in indoor and outdoor configurations. Roof-mounted enclosures offer space-saving benefits and simplify installation in tight mechanical rooms.



DriSteem RTS® Electric Resistive Humidifier



DriSteem GTS® LX Gas-fired Humidifier



DriSteem XT Electrode Humidifier

## CHOOSING THE RIGHT STEAM SOURCE

For applications requiring humidification, choosing the right steam source is a critical part of AHU design. Electric, gas-fired, steam-to-steam, and boiler steam options each offer distinct advantages and trade-offs that impact system layout, energy use, control strategy, and long-term maintenance.

## CHAPTER 5: DRICALC® SELECTION SOFTWARE

DriCalc® sizing and selection software simplifies humidifier design and coordination. It consolidates load calculations, product selection, system layout, and performance evaluation into one seamless workflow.

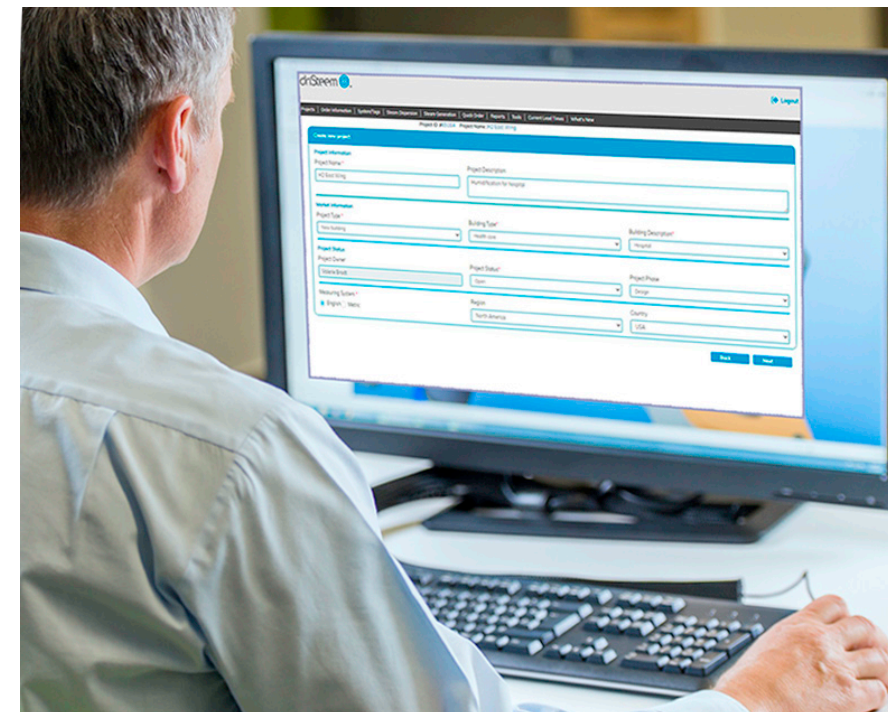
### Key Features

- **Guided data input:** CFM, temperature, RH, water quality, utilities
- **Load calculation tools:** Automate psychrometric math and system sizing
- **Performance modeling:** See how changes affect non-wetting distance, pressure drop, and absorption efficiency
- **Design visualization:** Coordinate with BIM/Revit files, access CAD models, and generate custom installation drawings

### DriCalc also allows users to:

- Create multiple AHU systems within one project
- Export submittals for mechanical contractors or consultants
- Receive system-specific product recommendations matched to site requirements

Whether you're blanking off airflow or letting it bypass the dispersion panel, DriCalc models the exact trade-offs—giving you confidence in both performance and cost.



DriSteem offers the tools, support, and expertise you need to integrate high-performance humidification into your AHU configurations—quickly, efficiently, and with full engineering confidence.

## NEXT STEPS

Humidification may not be your everyday design task—but when it arises, it's essential to get it right. With a foundational understanding of how and why to humidify, awareness of both isothermal and adiabatic methods, and a grasp of steam generation and delivery principles, engineers can make smart, effective system decisions.

Add in DriCalc to streamline planning and specification, and you've got everything you need to reduce design time, improve communication with internal stakeholders, and deliver an optimized AHU project.

Whether you're humidifying a sensitive process, protecting materials, or ensuring year-round comfort, DriSteem is here to help you succeed.

Go to [www.dristeem.com/find-a-rep](http://www.dristeem.com/find-a-rep) to find your local DriSteem representative. They are ready to provide more information about DriSteem products and how to proceed with project planning.



## EXPERT SUPPORT FOR YOUR HUMIDIFICATION STRATEGY

Humidity control is a critical part of AHU design, and every project comes with its own set of challenges. Whether you're working with tight RH tolerances, energy efficiency goals, or limited section space, DriSteem's experts are here to help.

## RESOURCES

### BIM Files and Documentation

Got to [BIMObject.com](http://BIMObject.com) or [SpecifiedBy.com](http://SpecifiedBy.com) for detailed models for all DriSteem humidifiers and steam dispersion panels, making it easy to incorporate them into system layouts, ensure compatibility, and support efficient, collaborative design

### Sizing and Selection Software

Sign up for DriCalc and start designing your next humidification system with confidence. Visit [www.dristeem.com](http://www.dristeem.com) to access selection software, download technical resources, and explore additional learning modules.

### Humidity University

Go to DriSteem's online [Humidity University](#) for on-demand webinars, technical white papers, and case studies that explain key design considerations, system options, and performance outcomes in real-world applications.

### Online Training Courses

Learn about DriSteem, why humidification is important, where it is commonly applied, and how to start a humidifier application by determining a humidification load and technologies available with our [online training courses](#). The interactive format allows you to learn at your own pace, anywhere, at any time.

### Video Library

Explore DriSteem's [Video Library](#) for practical insights and expert guidance on integrating humidification into your designs. From product overviews to technical demonstrations, these videos highlight performance advantages, installation tips, and key considerations for selecting the right humidification solution.

For over 60 years, DriSteem has set the standard for reliable, high-performance humidification

We collaborate with AHU manufacturers, engineers, and facility managers around the world to deliver precise humidity control in the most demanding environments.



### **DRI-STEEM Corporation**

a subsidiary of Research Products Corporation

DriSteem U.S. operations are  
ISO 9001:2015 certified

U.S. Headquarters:  
14949 Technology Drive  
Eden Prairie, MN 55344  
800-328-4447 or 952-949-2415  
952-229-3200 (fax)

Europe, Middle East, Asia Pacific  
+32 11 82 35 95  
sales.europe@dristeem.com

Continuous product improvement is a policy of DriSteem; therefore, product features and specifications are subject to change without notice.

DriSteem, DriCalc, RTS, Rapid-sorb, Ultra-sorb, and Vapor-logic are registered trademarks of Research Products Corporation and are filed for trademark registration in Canada and the European community.

Product and corporate names used in this document may be trademarks or registered trademarks. They are used for explanation only without intent to infringe.

© 2025 Research Products Corporation



### **Expect quality from the industry leader**

Since 1965, DriSteem has been leading the industry with creative and reliable humidification solutions. Our focus on ease of ownership is evident in the construction of DriSteem products. DriSteem leads the industry with a Two-year Limited Warranty and optional extended warranty.

For more information:  
[www.dristeem.com](http://www.dristeem.com)  
sales@dristeem.com

For the most recent product information visit our website:  
[www.dristeem.com](http://www.dristeem.com)