

The Air Conditioning, Heating and Refrigeration NEWS

A PUBLICATION OF BUSINESS NEWS PUBLISHING CO. (BNP)

Copyright 1998

P.O. BOX 2600, TROY, MI 48007

Humidifiers: It pays to install them right the first time

When steam humidifiers are installed properly, it's a win-win-win outcome. The installing contractor wins, the service contractor wins, and most importantly, the owner of the facility being humidified wins.

BY JON K. BINGAMAN, ARMSTRONG INTERNATIONAL, INC.

This article will focus on installation recommendations for four basic types of industrial-commercial humidifiers: direct steam-injection separator types; specially designed direct steam-injection steam grid systems; steam-to-steam types; and self-contained electronic steam-generating types.

In addition, specific installation points will be offered for each individual type.

Humidification

WHY YOU SHOULD KEEP READING

If you're the installing contractor, proper installation of humidifiers will help ensure a smoother, trouble-free start-up. Furthermore, it will help reduce the bottom line cost for the job.

Generally speaking, the installing contractor is responsible for the performance of equipment for at least one year. When the humidifier is not performing to the user's expectation, it's this contractor who is called.

Correcting the situation can be expensive when post-installation repiping is required. So, doing it right the first time reduces callbacks and improves job profitability.

If you're the service contractor, it's in your best interest to have equipment functioning as intended from the

start. Steam humidifiers not installed properly will lead to less than satisfactory performance.

One possible problem is liquid fall-out in the ducts that may result in damage to equipment. In addition, when servicing the system, it's more profitable when the units are performing up

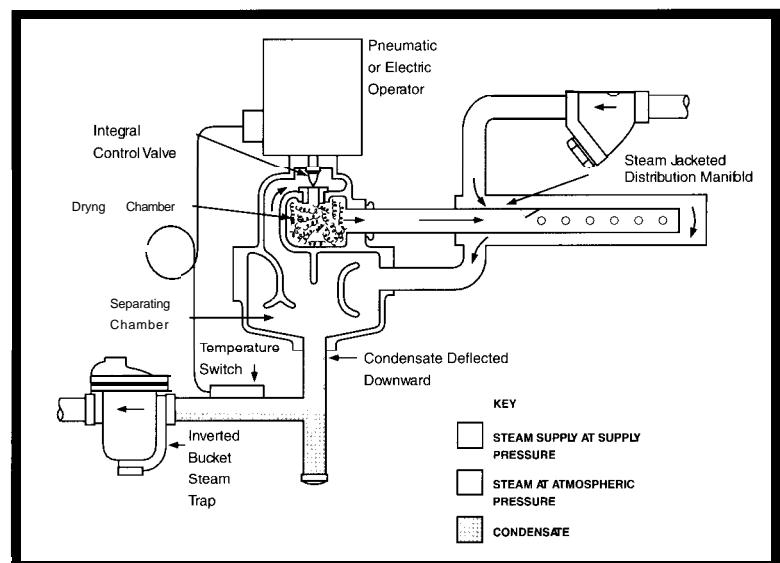


Figure 1. Condensate from the steam separator-type humidifier must be drained promptly. The ability to lift or discharge condensate into a pressurized return is dependent on supply steam pressure.

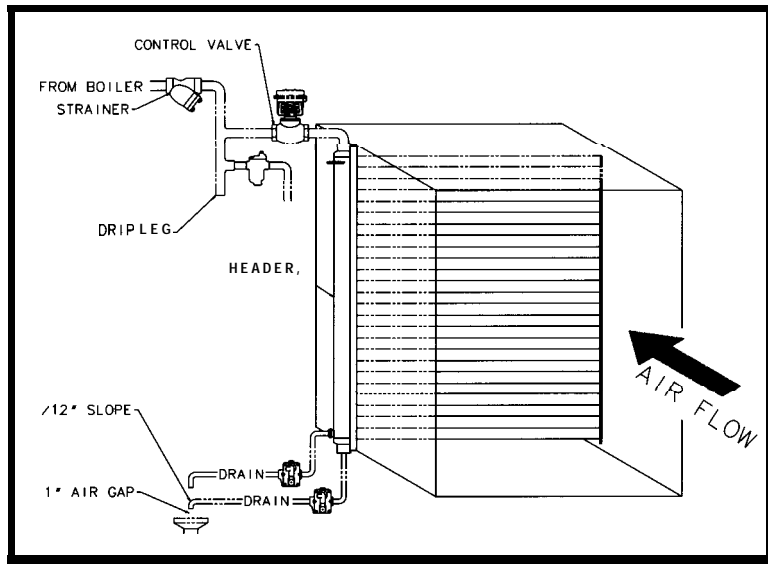


Figure 2. Because the control valve is ahead of the system header, there is no way to install a temperature switch between the header steam trap and the control valve. With minimal pressure differential across the trap, condensate discharged from the trap must be drained by gravity or pumped to an overhead return system.

momentarily condenses to a visible vapor. The length of this vapor trail, or non-wetting distance, is influenced by airflow velocity, duct air temperature, final duct relative humidity, and the amount of steam introduced into the system.

You do not want the visible vapor to impinge on obstacles or system components and cause moisture to drop out of the airflow.

Humidistat location: Without addressing specific types of humidistats, it is important to understand where they will be placed. It is most common to place the humidistat in the room being humidified. However, it may be better to place it in the return air duct, where it can sense the average of the room(s) feeding the return.

Typically, each humidifier would require a separate controlling humidistat. If the humidistat is in the room, it should be located where there is good air circulation, but not excessive air movement.

Never install the humidistat right next to or on the humidifier, and never right at the room air discharge point. Avoid locations susceptible to drafts (next to a door or window), cold outside walls, or localized heat sources (coffee makers, paper copiers, etc.).

How the humidistat communicates to the humidifier is important also. Is it hard wired or connected by a

to expectations.

The building owner wants an efficient system to deliver accurate control of relative humidity. Furthermore, he/she wants a system that has a long and dependable service life.

Installing and service contractors have one key objective: to please the owner. Quality installation of steam humidifiers, then, is often driven by competition. Those who do a good job will have the competitive advantage and have the repeat business.

Those who don't, won't.

condensation; and

- Use of energy-efficient steam traps.

Furthermore, most direct steam-injection units operate in systems using a pressure-reducing valve ahead of the humidifier to bring the pressure down to 10 to 15 psig, a common hvac steam pressure range that also helps reduce noise from the humidifier.

Dispersion tube location: As steam near 212°F is released from the dispersion tube into an air-handling system with lower-temperature air, the steam

COMMON CONSIDERATIONS

Regardless of the type of steam humidifier to be installed, a number of common considerations must be addressed. First and foremost, it is essential to have quality steam that equates to dry steam or steam free of water droplets.

To achieve a dry steam discharge from direct steam-injection separator and steam grid types, one must follow good standard piping principles for steam. This means:

- Properly sized and trapped steam mains;
- Steam take-off piping from the top of the main;
- Proper size and pitch of pipes;
- Use of in-line strainers;
- Insulation of pipes;
- Installation of drip legs to collect

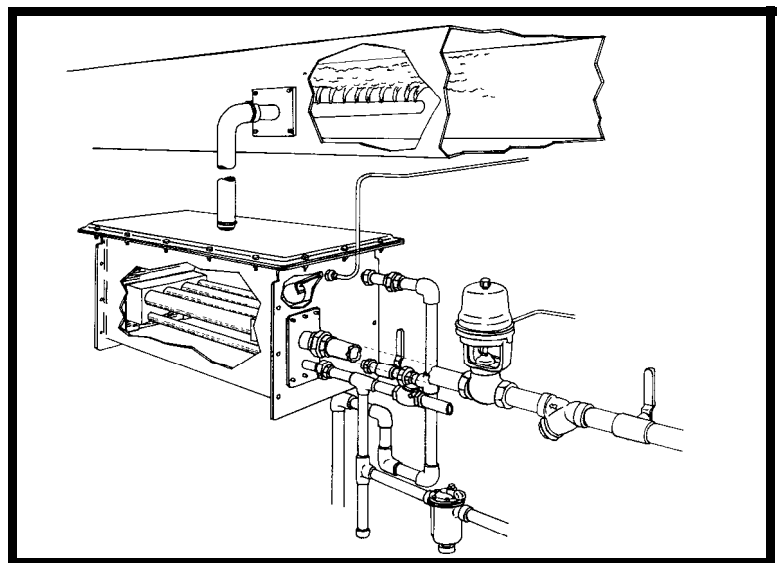


Figure 3. Location and proper piping is critical for steam-to-steam humidifiers. An accessible drain is needed because this reboiler is equipped with overflow piping and if tap water is used, the unit must be periodically drained for cleaning. Condensate from the steam trap cannot be lifted or discharged to a pressurized return.

pneumatic control? Response time of the humidifier and humidistat will affect humidity control. Always follow the manufacturer's recommendations.

— **Auxiliary controls:** Two other control devices are important for ensuring quality performance. Downstream of the humidifier, there should be a high-limit humidistat located outside the vapor trail but before any obstructions.

Never install the humidistat right next to or on the humidifier, and never right at the room air discharge point.

This will shut down the humidifier in the case of high duct relative humidity. It is typically set at 70% to 90% rh, and is especially important if duct air is cooler than room air. Without it, duct air could become saturated and "rain" could occur in the duct.

The second control device is an air-proving or fan-interlock switch that cuts off the humidifier when air is not moving through the air-handling system.

This is critical in facilities where the air systems are designed to periodically shut down, on weekends for example. Without the switch, the humidifier may continue to discharge steam into the duct and with zero air movement, the saturated air could likely "rain" in the duct.

More sophisticated sensing systems are now available for controlling humidifiers. Included are multiple sensors (one in the room and one in the return air duct), to feed information to the controller that controls the steam flow. This controller can factor other conditions, such as variable air flow and outdoor air, into the equation.

SPECIFIC HUMIDIFIERS

Direct steam injection/separator humidifier: By design, these units separate water droplets from steam. However, if a large slug of condensate reaches the humidifier, it may "spit" water into the airstream.

— Proper steam piping practices must be followed. (See Figure 1.) Avoid discharging the condensate to an overhead riser or a pressurized return sys-

tem. Insufficient pressure to elevate condensate will result in flooding.

Maintenance must always be an installation consideration. Since humidifiers require regular inspection, the units must be placed in an accessible location. Sometimes the units are placed over suspended ceilings, which are hard to reach and therefore, less frequently checked. It is

recommended that units be located in a mechanical room or similar location where they are visible and can be checked easily.

A temperature switch should be located in the condensate drain line prior to the steam trap, to prohibit the humidifier valve from opening during a warm-up period following a shut down.

If the humidifier is flooded with water, the temp switch will override the humidistat's call for humidity and keep the control valve closed until the condensate (near steam) temperature is approximately 205°. The temp switch

may be either electric or pneumatic.

Steam grid system direct injection: The major difference with this type is that the control valve is located prior to the grid itself. Therefore, the steam pressure in the header and dispersion tubes is near atmospheric.

It must be drained by gravity pitch or pumped. Because the control valve is ahead of the grid of dispersion tubes, there is no way to install a temp switch between the steam trap and control valve. (See Figure 2.)

These multi-tube units have much shorter vapor trails, but the location of the unit is still important. Nothing can interfere with the airflow in the vapor trail wetting distance, which may be as short as 18 in. An even velocity profile across the grid face area is critical to proper operation.

Steam-to-steam humidifiers: Essentially this type humidifier is a steam/water shell-and-tube heat exchanger or reboiler. Steam from the boiler heats tap or purified water, producing steam that is injected into the air-handling system.

These units are quite large and heavy; therefore, location is very important. It must be in an area where it is easily accessible.

The distance between the unit and the dispersion tubes should be as

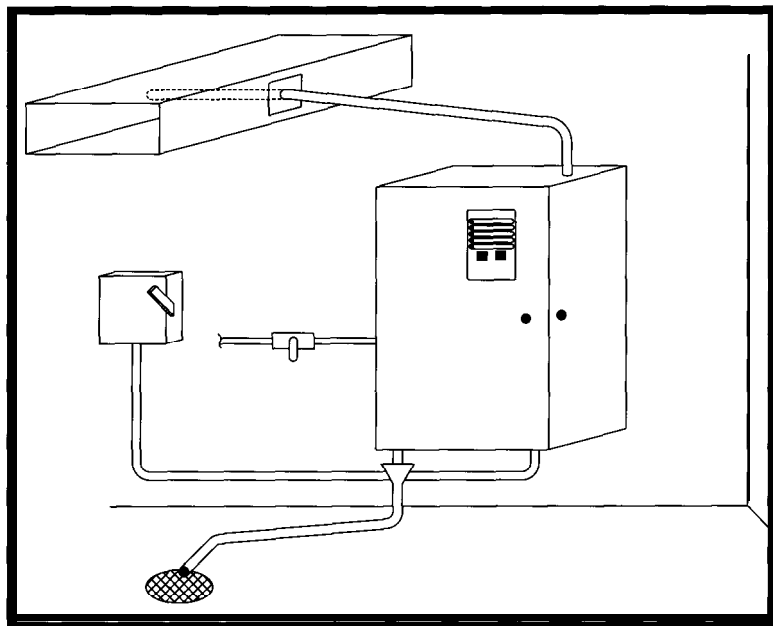


Figure 4. Self-contained electronic humidifiers should be placed in a highly visible location near a drain because periodic blowdown is required. This further means that piping must be properly sized and pitched so as not to restrict the operation of the blowdown valve. Steam piping to the duct must be kept short with a minimum number of restrictions.

*Generally speaking, the installing contractor is responsible for the performance of equipment for at least one year. When the humidifier is not performing to the **user's** expectation, it's this contractor who is called.*

short as possible (preferably less than 40 ft) to minimize condensate in the supply line. The steam supply line(s) to the dispersion should be insulated.

The control valve modulates steam pressure to the heat exchanger, so condensate cannot be elevated or discharged to a pressured return unless a pump is used. A vacuum breaker should be located between the heat exchanger and steam trap to allow drainage when the control valve closes.

Location also is important because tank drainage piping is required. The water temperature typically must be cooled before discharging to drain. The unit must be periodically drained for blowdown or cleaning; access for either is a major factor if tap water is used. (See Figure 3.)

Self-contained electronic humidifiers: It's been found that the degree of customer satisfaction with these units has a lot to do with how they were installed.

To start with, a quality water supply is a big factor. The units must be easily accessible to clean or replace the steam-generating tank. A regular maintenance schedule should be

established for cleaning.

Use of an ionic bed-type humidifier will dramatically reduce the amount of cleaning required. (See "Humidification and the serviceability factor" in the February 23, 1998 issue of *The News*.)

Units must be placed in a visible location as a reminder to frequently check the humidifier. If it's out of sight, in a closet or above the suspended ceiling, it's likely to be out of mind. Periodic blowdown of the unit is needed and, therefore, it must be located near a drain. (See Figure 4.) Furthermore, the piping must be properly sized and pitched so as not to restrict operation of the blowdown valve.

Place the unit as close as possible to the duct and minimize piping (length, elbows, or other flow restrictions) to the duct. The longer the pipe from the humidifier to the duct, the more back pressure will build up, which may influence operation.

SATISFACTION (NEARLY) GUARANTEED

In summary, proper installation of humidifiers will save frequent nuisance

calls, time, and money for the installing and service contractors. In the end, it all boils down to ensuring a more satisfied user.

To accomplish this winning combination, pay close attention to the following:

- Pipe properly to ensure dry steam is delivered to and from the humidifier with proper pipe size, pitch, and trapping.

- Locate the humidifier as close as possible to the air duct, using as few elbows and connections as possible.

- Properly locate the dispersion tubes within the duct to allow an ample vapor trail or non-wetting distance upstream and downstream.

- Locate the controlling humidistat properly in room or return air duct.

- Install a high-humidity limit switch in the supply air duct downstream of the humidifier, plus an air-proving interlock switch.

- Do not attempt to elevate condensate with low or modulating steam pressure.

- Ensure accessibility of the unit for service and maintenance.

- Provide for draining and over flow of water in steam-to-steam and self-contained electronic humidifiers.

Jon Bingaman is sales manager of huac products at Armstrong International, Inc., a manufacturer of steam specialty equipment, including humidifiers. The company may be reached at 816 Maple St., Three Rivers, Mich. 49093; 616-273-1415; 616-279-5728 (fax).

Reprinted from

The Air Conditioning, Heating and Refrigeration
NEWS

P.O. BOX 2600, TROY, MI 48007

Copyright 1998