

Retrofit High-efficiency Tube Option

Energy-saving option for Ultra-sorb® and Rapid-sorb®

Retrofit high-efficiency tubes save energy

DRI-STEEM's retrofit high-efficiency dispersion tubes with polyvinylidene fluoride (PVDF) insulation reduce wasted energy by up to 85% by reducing downstream heat gain and condensate production. High-efficiency tubes are available as a retrofit for existing installations.

Steam releases heat as it condenses

Ultra-sorb and Rapid-sorb dispersion assemblies disperse steam into airstreams substantially cooler than the steam. This cool air flowing across uninsulated hot dispersion tubes causes some steam inside the tubes to condense. Steam gives up heat as it condenses. This heat passes easily through uninsulated dispersion tubes into the airstream, increasing downstream air temperature. The amount of condensate produced is directly proportional to downstream air heat gain.

Unwanted downstream heat gain wastes resources

- **Every gallon (8.33 pounds) of condensate produced wastes about 8,000 Btus** — the energy originally used to change that water into steam.
- **Heat added to downstream air increases the cooling load** in applications that humidify and cool simultaneously, wasting energy cooling the unnecessarily heated air.
- **Unnecessary condensate production can cause a humidification system to not meet set point** when steam expected to meet the humidification load becomes condensate. This can require specifying a higher-capacity steam generator.
- **Condensate sent to a drain wastes water and water treatment chemicals** (e.g., softened water, deionized or reverse-osmosis treated water, water treated with boiler chemicals). Note that not all humidification systems return condensate to the steam generator.

Excellent payback possibilities

Retrofit high-efficiency tubes will pay for themselves quickly—usually less than two years. Contact DRI-STEEM at 800-328-4447 or your local DRI-STEEM representative for a payback analysis.

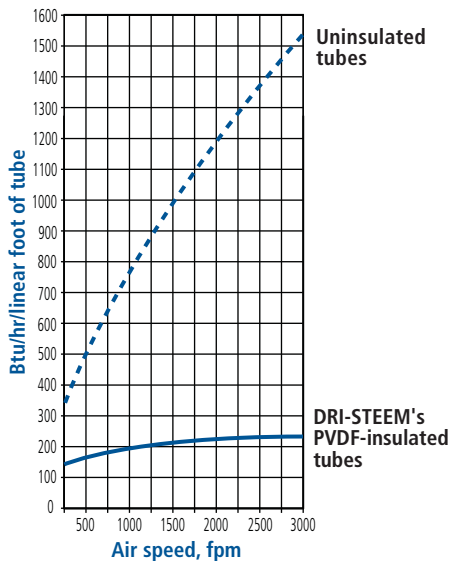


DRI-STEEM[®]
The humidification experts

Retrofit high-efficiency tubes reduce dispersion tube heat loss

Dispersion tube heat loss vs. airspeed

Heat loss vs. air speed at 50 °F for a 3" o.c. tube bank, 1½" dia. stainless steel tubes with 212 °F internal wall temperature

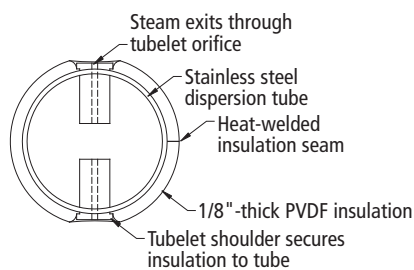


Notes:

- Heat loss calculations based on the following references: Zhukauskas, A. 1987. *Convective Heat Transfer in Cross Flow*. In S. Kakac, R.K. Shah, and W. Ang, eds. *Handbook of Single-Phase Convective Heat Transfer*. New York: John Wiley & Sons, pp. 6.1-6.45.
- PVDF insulation on tube is 1/8" thick and has a thermal conductivity of 0.0185 Btu/hr-ft²-F.

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High-efficiency dispersion tube cross section



The PVDF insulation on high-efficiency dispersion tubes allows up to an 85% reduction in wasted energy by significantly reducing airstream heat gain and condensate production. The energy savings can yield payback in less than one year.

DRI-STEEM co-developed PVDF insulation for humidification applications when no available material could provide significant insulating results, withstand the environmental challenges of steam humidification, and meet strict plenum requirements.

Advanced insulation meets stringent requirements

PVDF is an advanced material commonly used in chemical, semiconductor, medical, defense, and aerospace industries and has the following characteristics:

- **Approved for use in plenums:** Flame spread/smoke developed values are 0/0, exceeding UL 723 (ASTM E84) requirement of 25/50.
- **Rated for high-temperature operation:** Rated for 300 °F (149 °C) continuous operation.
- **Closed-cell structure will not absorb water or support microbial growth.**
- **Will not shift or slip on tubes:** Advanced manufacturing process ensures insulation attaches securely to tubes.
- **Odor free:** virtually no measurable outgassing.
- **Resistant to UV light.**
- **Rugged and durable:** No particle erosion per ASTM C1071 erosion resistance test; does not contain fiberglass.

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The performance you expect from DRI-STEEM

Of course, the real test of high-efficiency tubes is performance:

- **High-efficiency tubes reduce airstream heat gain and condensate production by up to 85% compared to uninsulated tubes** — regardless of load or airstream temperature.
- **Condensate reduction correlates directly to energy savings.** Every pound of condensate that does not drain from the dispersion assembly saves about 1,000 Btus — the amount of energy required to boil a pound of water into steam.
- **Condensate reduction allows using smaller steam generators.** With a higher percentage of generated steam meeting the humidification load rather than draining from the dispersion assembly as condensate, steam generators can be downsized in many cases.
- **Adding PVDF insulation to dispersion tubes causes no excessive airflow pressure drop** — the dense, closed-cell insulation provides exceptionally high performance at 1/8" thickness.
- **Energy savings provides product payback in less than one year** for electric humidification systems, and in about 1½ years for natural gas systems.

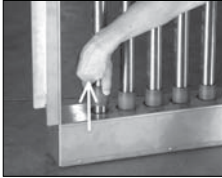
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Retrofitting is just a few easy steps

Ultra-sorb

Remove uninsulated tubes when cool to the touch

Slide the slip couplings off the condensate header far enough to reveal the ends of the dispersion tubes.



Swing the dispersion tubes away from the condensate header, and pull the dispersion tubes and slip couplings off the supply header.

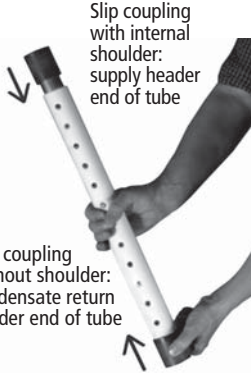


Remove the dispersion tubes, and make sure nothing loose falls into the header.

Install high-efficiency tubes

NOTE: High-efficiency retrofit tubes are shipped with replacement slip couplings.

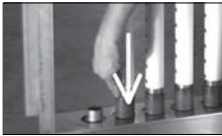
Install the new slip couplings on the high-efficiency dispersion tubes as shown.



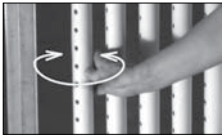
Connect the dispersion tubes to the supply header with the shouldered slip coupling. Push and twist each dispersion tube until the shoulder bottoms out, then connect the dispersion tubes to the condensate return header with the other slip couplings.



Push the non-shouldered slip couplings against the stop disks on the condensate return header.



Rotate the dispersion tubes to point the tubelets perpendicular to the airflow.



Rapid-sorb

Remove uninsulated tubes when cool to the touch

Remove the bolts that fasten the L-bracket or Z-bracket to the duct.



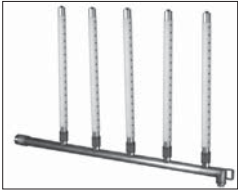
Remove the bracket, and pull the tubes off the header.



Install high-efficiency tubes

NOTE: High-efficiency retrofit tubes are shipped with replacement couplings and a new L-bracket.

Install the high-efficiency tubes on the header.



Install the L-bracket, making sure its flange is upstream of the dispersion tubes.



Rotate the dispersion tubes to point the tubelets perpendicular to the airflow.



Fasten the bracket to the duct.

L-bracket, (shown with airflow from left)



Z-bracket (older systems)



Retrofit high-efficiency tubes are engineered for existing dispersion systems

For more information

Ultra-sorb dispersion assemblies are shipped with a comprehensive manual. Refer to it for assembly, parts, installation, troubleshooting, piping, maintenance, performance, and warranty information.

Rapid-sorb dispersion assemblies are shipped with installation instructions. See the Rapid-sorb section of the manual shipped with your humidifier.

WARNING!

Steam humidification systems have extremely hot surfaces. To avoid burns, allow humidifier, steam pipes, and dispersion assembly to cool before touching any part of the system.

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An ISO 9001:2000 certified corporation

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

For the most recent product information, visit the literature section of our web site, www.dristeem.com

Ultra-sorb is covered by the following Patents, with additional patents pending: United States Patent numbers 5,126,080; 5,277,849; 5,372,753; 5,376,312; 5,543,090

DRI-STEEM, Rapid-sorb, and Ultra-sorb are registered trademarks of DRI-STEEM Corporation and are filed for trademark registration in Canada and the European community.

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Form No. High-Eff-Tube-Retrofit-0408

Ordering is easy

To order DRI-STEEM retrofit high-efficiency tubes, fill out the form below and contact your local DRI-STEEM representative for pricing and ordering information. Retrofit tubes will be engineered for your specific system.

Ultra-sorb								
Tag	Serial #	Header in/out	Tube count	SS type	Tube length	Tubelet spacing	Orifice size	LV/LH

Rapid-sorb										
Tag	Serial #	Header in/out	Tube count	SS type	Tube length	Tubelet spacing	Orifice size	System width	Z/L bracket	Tube dia.

- **Header in/out:** header inside or outside of duct
- **Tube count:** total number of tubes in the system
- **SS type:** 304 or 316 stainless steel
- **LV/LH (Ultra-sorb only):** LH = vertical tubes; LH = horizontal tubes
- **Z/L bracket (Rapid-sorb only):** shape of bracket at non-header end of dispersion tubes

See **Measuring diagram** below for tips on obtaining the remaining specifications:

- **Tube dia:** (Rapid-sorb only): outside diameter of dispersion tube, either 1.5" or 2.0" (all Ultra-sorb are 1.5")
- **Tube length:** total, end-to-end tube measurement (remove a tube to measure it)
- **Tubelet spacing:** centerline distance from one tubelet to the next along tube
- **Orifice size:** tubelet orifice diameter (clean away scale, use drill bit as gauge, check multiple tubelets to verify which size)
- **System width (Rapid-sorb only):** outside dimension (inches), left-most to right-most tube

Measuring diagram

Tube length measurement is the same for Ultra-sorb and Rapid-sorb (remove a tube to measure it).

