

# White Paper

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## Jacketed Steam Tubes vs. Absorption Manifolds – Out with the Old

When comparing steam distribution technologies we have options to look at. First and foremost the short absorption manifold named the SAM-e. The concept is simple, form a grid and maximize the amount nozzles injecting steam throughout the grid. This in turn will give you the smallest amount of steam possible coming out of each nozzle thus the shortest absorption distance possible. The SAM-e is the preferred steam grid by air handling manufacturers.

Second we look at steam jacketed tubes. Again the concept is simple, by wrapping the steam tube carrying the steam to be injected into the air with steam you effectively eliminate or reduce the condensate forming in the steam injection tube. The other benefit to this method of steam injection is that you maximize your capacity meaning the steam to be injected into the air doesn't lose steam to condensate on its way to the air stream.

However when comparing the Steam Jacketed distributors to the Short Absorption Manifold the Steam Jacketed distributors fall short for many reasons. The first is efficiency. In the paragraph above the benefits are mentioned about steam jacketing your distribution tubes however this comes at a cost, literally. In the diagram below you will see that a steam jacketed system uses two separate steam sources. One being the injection steam and the other being the jacketing steam. The injection steam has no losses because the jacketing steam heats the injection steam tube but what about the jacketing steam? It effectively removes condensate from the injection steam however the jacketing steam is 100% sacrificial.

The second reason is heat loss into the air stream. If a jacketed steam distributor is being used you must consider what will happen to the air that passes through it because more change occurs than the humidity level. Heat transfer is a function of temperature, the heat transfer capabilities of a material, and the exposed material or surface area. Because jacketing a tube increases its surface area more heat transfer will occur then if just the steam tube is used. Consider these factors; Stainless steels heat transfer capabilities, increase surface area, temperatures of 212 °F or greater depending on steam pressure supplied. You will experience heat gain that will vary depending on your system configuration. You may be thinking you can utilize this heat and in few cases you can but you can't rely on it because the humidifier will turn off and on based on the humidity signal not a demand for heat. So it is an uncontrollable heat source in the air system.

There is insulation available to prevent this heat transfer however insulated tubes have to be install with the steam nozzles facing downstream in order to prevent condensate from build on the outside of the insulation. This creates a much longer absorption as seen in the diagrams for the next example.

The third reason is absorption distance. Jacketed steam distributors have fewer steam injection points on the steam tube and also inject the steam at a much higher pressure than a short absorption manifold. Thus the steam is injected at a much higher capacity and velocity per injection point. This in turn creates a longer steam plum and absorption distance. See the example below.

Component	Standard Absorption Distances
Livesteam Distributors (LS1)	7.38 ft
Short Absorption Manifold (3 in. spacing)	1.74 ft
Short Absorption Manifold (6 in. spacing)	1.96 ft
Short Absorption Manifold (9 in. spacing)	2.19 ft
Short Absorption Manifold (12 in. spacing)	2.41 ft

**Example produced using Nortec H.E.L.P selection software.**

Component	Standard Absorption Distances
Livesteam Distributors (LS1)	11.25 ft
Short Absorption Manifold (3 in. spacing)	1.74 ft
Short Absorption Manifold (6 in. spacing)	1.96 ft
Short Absorption Manifold (9 in. spacing)	2.19 ft
Short Absorption Manifold (12 in. spacing)	2.41 ft

**Both diagrams use the same entering and leaving condition. This diagram however is showing the absorption if insulated jacketed tubes are used.**

In comparison to a short absorption manifold jacketed tubes can't compete when absorption distance in questioned.

The forth reason is installation. A typical short absorption manifold installation lasts roughly 20 minutes and can be performed by anyone. The manifold assembly is like a simple puzzle. A jacket system deals with steam under pressure thus a licensed plumber will be needed and much more time. All connections

have to be connected using threaded pipe and sealed using a sealant. Also a separator is required with a jacketed system a short absorption header has separation built in to the header. The installation is much more timely and expensive.

Let's now look at what the Short Absorption Manifold or SAM-e can provide in comparison to jacketing tubing. As mentioned earlier the SAM-e obtains its short absorption characteristics by utilizing multiple nozzle or steam injection points. For each injection point you're dividing the total capacity of the system by a larger number. The smaller the amount of steam per nozzle, the shorter the absorption.

The SAM-e steam tubes come in four different capacities, however the length of the steam tubes are the same regardless of capacity. Example: if you have a 60" x 60" duct requiring 100lbs/hr of steam you would select the same length of tube that you would for a 60" x 60" duct requiring 300 lbs/hr of steam. You would simply select a high capacity steam tube to meet the higher load requirement. This is important for condensate reasons. Because condensate forms on a surface increasing the length of the tube would increase the condensate forming. By just adding more nozzles we limit condensate losses.

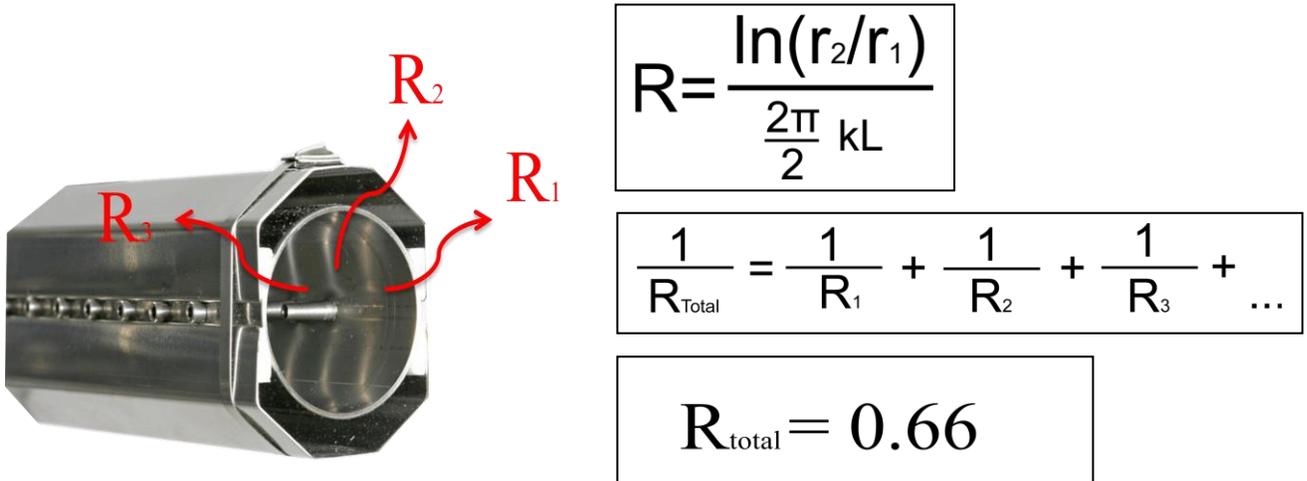
The SAM-e goes further to guarantee condensate free steam enters the air stream. The nozzle itself takes steam from the center of the steam tube. Since condensate forms on a surface this limits potential condensate from entering the air. Also built into the SAM-e header is a steam separator baffle to remove any droplets traveling with the steam.



**Cross Section of Insulated SAM-e Tube**

Now it is true that condensate will form in the SAM-e. However, how does this compare to jacketed tubing? Jacketed tubing provides condensate free steam yes however the jacketing steam is 100% sacrificial. So depending on your configuration you could be losing 50% plus of the steam provided to the humidifier. This is far from an economical use of expensive utilities.

To reduce condensate to minimal levels with SAM-e we've engineered stainless steel air gap insulation. A simple yet extremely effective method to prevent condensate losses, and heat transfer from occurring. See the diagram below showing the insulated "R" value of the insulation. Feel free to compare this "r" value to our competitor's offering.



Within the newsletter you can also find attached White Papers with our testing results for the insulation. After reviewing the white papers you will clearly see that there isn't a situation where a jacketed distributor isn't bested by a SAM-e performance wise and efficiency wise. 35 years ago the jacketed tube improved upon and even older design. But now it time to move on to a new, and better design. Out with the old, in with the new!

# Why Nortec Humidity?

Nortec Humidity specializes in the design and production of superior humidification systems. We create the most appropriate solutions to meet your specific needs in the most efficient and cost effective way. To this end, we draw upon our extensive experience to develop an ever growing range of products manufactured to our stringent ISO 9001:2000 certified quality standards that will provide our customers with maximum reliability, minimum maintenance and a choice of energy sources.

When you choose Nortec Humidity, you are choosing the company that has built a reputation for superior quality humidification systems. Only with Nortec Humidity can you select a system operating with electrode steam, subsonic air nozzles, high pressure nozzles, steam injection, steam exchange, or gas-fired technology.

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