High Pressure Fog Cooling in North Carolina

U. L. Patterson, Jr., Shelby, North Carolina

*Ed.Note: This is a part of a paper presented at the 1956 Pennsylvania State Florists Conference and is reprinted from Penn. Flower Growers Bul. 69.

We first began working with high pressure cooling over three years ago. We were looking primarily for a way to cool greenhouses. We put in an installation of 63,000 square feet with a high pressure ten horse power pump of a type never before used on high pressure fog. The results from this preliminary test were highly satisfactory. We found that we could cool greenhouses equal to, and below outside official shade temperature.

An additional find was the fact that we had a highly efficient and automatic means of controlling humidity in greenhouses on a year-round basis. This was especially beneficial on roses. The problem of mildew on roses can be done away with, as we have done in Shelby. The problem of spider is greatly reduced due to the higher humidities maintained in greenhouses.

Humidity falls into the same classification as ventilation or heat in as much as it must be used and controlled with the same amount of thought that you would use in controlling some of these other factors. There have been instances where high pressure fog has been used on roses having black spot. Under these conditions black spot should be cleared up before an installation of this sort.

We have used high pressure mist as a means of humidifying during the winter months, even on such flowering crops as carnations, and chrysanthemums. It stands to reason, that you can not use the same settings on your humidistats in winter as summer because of different climatic conditions. Controls play a very important part of a highly efficient cooling system, no matter what the type. For propagation it is possible to use timers because a propagation house will have more constant conditions. But certainly you would not control your heat with a timer and therefore run steam into a greenhouse on a set schedule whether it was needed or not. The same principal holds true with humidifying. At the end of our first year we found that we had an excellent means of humidifying and a comparatively good means of cooling greenhouses, yet we felt it was as efficient as could be. The one drawback as we could see it was the volume of air flowing into the greenhouses from natural ventilating sources. To supplement this we added fans to two groups of houses equipped with high pressure fog. We found that with this addition we could use higher humidity settings without encountering botrytis. These groups of houses were set up, one pulling air from side to side, the other gable end to gable end. Both gave good results, but in our case the set up using fans, and high pressure fog, pulling from gable end to gable end, was the best. This is due to a build-up of velocity on a longer pull. We installed eight hygrometers. These were put in each of the two high pressure fog houses with fans, high pressure fog houses without fans, houses cooled with fan and pad equipment, and check houses without any means of cooling, and outside in the shade. Their position in the greenhouse was the same in all cases, located as near the center as possible. I have selected here, first, the five hottest days in the month of May, recorded at 1:00 p. m.; These are average figures:

Outside	90.4°	Fan & pad houses	83.6°
Check houses	94.2°	Fan & mist	80.8°

The relative humidity recording of the same time was as follows:

Outside	48.6%	Fan & pad	64.4%
Check houses	74.6%	Fan & mist	75.2%

Wet bulb recording:

Outside	75.0°	Fan & Pad	75.0°
Check house	78.6°	Fan & mist	75.4°

Results from these averages for the month of May with fan and pad cooling showed that we were able to drop the temperature 10.6° below check houses. With fan and mist we received a drop of 13.°. Before continuing with these averages, it must be clearly understood that these recordings were made in the center of houses, at the point of entrance on fan and pad cooled houses, the temperature was equivalent to fan and mist cooled houses. At the point of exit there was approximately a 3° increase, giving a heat rise across the fan and pad cooled houses of approximately 6°. After very extensive checks we find there is no heat rise in crossing houses cooled with fans and mist, but instead on occasion we have found an additional one degree drop on point of exit.

Second: Month of June temperatures:

Outside	94.2°	Fan and pad	86.6°
Check houses	104.6°	Fan and mist	85.0°
Relative humidity:			
Outside	43.0%	Fan and pad	70.0%
Check houses	33.0%	Fan and mist	80.6%

Wet bulb temperature:

Outside	76.0°	Fan and pad	78.8°
Check houses	81.4°	Fan and mist	80.6°

At this point we have a temperature difference between check houses and fan and pad cooled houses of 17.8° and a difference between check, and fan and mist of 19.6°. At this point can be seen the trend with increase in outside temperature, more benefit is received in cooling.

Third: Month of July

Outside	91.6°	Fan and pad	88.0°
Check houses	99.2°	Fan and mist	77.8°

Relative humidity:

Outside	56.0%	Fan and pad	69.2%
Check houses	53.6%	Fan and mist	80.0%

Wet bulb

Outside	78.6°	Fan and pad	79.6°
Check houses	32.2°	Fan and mist	76.6°

Here we see a change. The days averaged out during the month of July, have a substantial increase in outside relative humidity. This brought the following results, a difference between check houses, and fan and pad cooled houses of 11.2°. A difference between check houses, and fan and mist houses of 21.4°. We feel that this helps to answer the question so many people have asked about the different environmental conditions that exist between the east and the west. To obtain these figures that I have given you, 9,648 readings were made and recorded during the past three month period. The question arises – "Why, under the same environmental conditions could one system out perform another?" The answer to this can be found in the fact that in cooling these houses, all conditions were the same with the exception that in one instance high pressure mist was used to supply a means of wetting the air, where in the second, aspen pads were used. The principal here only differs in the fact that with pad cooling air is pulled across a tremendous evaporative surface and then pulled through the greenhouse with no further wetting. With high pressure mist there is a continual process of wetting and drying of air as it passes through the greenhouse.

Your editor,
W D Holley