COLORADO FLOWER GROWERS ASSOCIATION

Bulletin 319 | Edited by David E. Hartley | January 1977

WHAT HAPPENS TO HEATING PIPE PAINTED ALUMINUM?

Joe J. Hanan

It is not unusual to find in many greenhouses the heating pipe painted aluminum for aesthetic purposes. Unfortunately, this practice, in addition to being expensive, will reduce heat transfer by at least 15 percent, and perhaps as much as 20 percent. In other greenhouses, growers may install galvanized pipe in order to increase the life of the pipe. Again, unfortunately, galvanized pipe may have a 15 to 20 percent lower efficiency. In other words, the grower should figure on an additional 20 percent surface area in order to achieve equal BTU supply if he employs galvanized or aluminum-painted pipe. Plain black iron, rusty pipe, or pipe painted a flat black will have about equal heat transfer, and efficiency of aluminum-painted pipe may be increased by repainting it a flat black.

Methods

In the first trial, four lengths of new, 1-1/2 inch diameter, black pipe were arranged as shown in Fig. 1. Distances between the pipe were 24 inches. An inexpensive, bellows-type condensate trap was utilized. Condensate was collected for 4, 30 minute periods, then the pipes rearranged, and the condensate measured for another series of 4, 30 minute periods. This was continued until all pipes had been rotated to each position in order to eliminate variation due to position. After the first series, the pipes painted aluminum and flat black were repainted to the other paint, and the series run again.

Rusty, 1-1/2 inch pipe was not available, so comparisons were made between a new, 2-inch diameter length and a rusty 2-inch pipe. In this case, the pipe positions were switched. The rusty pipe was cleaned and painted a flat black for another trial.

Results

Tables 1 through 3 present the results. In the first trial, there were significant differences of up to 19% between the galvanized and aluminum pipes and the new black and flat

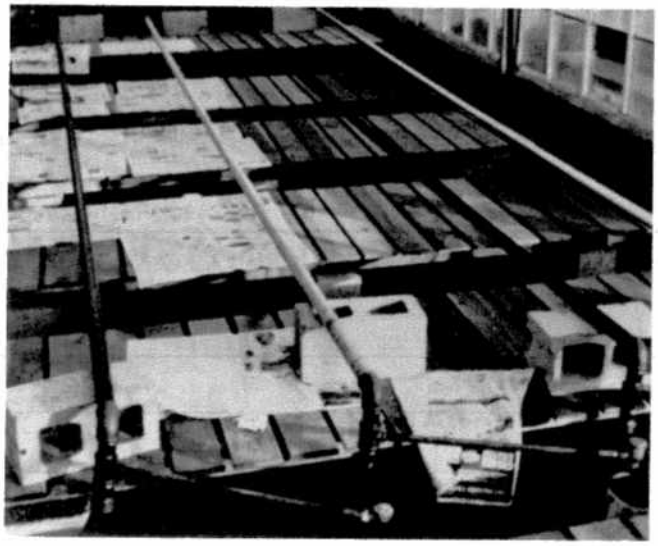

Fig. 1: Arrangement of heating pipe for measuring heat transfer as a function of external surface

Table 1. Condensate return from 1-1/2 inch diameter, 21-foot heating pipes with different external surfaces. Boiler pressure 9 to 11 psi.

External Surface	Milliliters condensate per lineal foot in 30 minutes	Calculated BTU/hour* per foot
1. Untouched, new black iron:	88.3	388
2. Galvanized pipe:	71.8	316
3. Black pipe painted a flat black	87.8	386
4. Black pipe painted aluminum:	72.0	316
Difference required for significance	15.4	

* 1 pound water ∼ 1000 BTU.

Table 2: Condensate return from 1-1/2 inch diameter, 21-foot heating pipes, where those pipes initially painted flat black and aluminum were repainted the opposite color. Boiler pressure 9 to 11 psi.

External Surface	Milliliters condensate per lineal foot in 30 minutes	Calculated BTU/hour* per foot
1. Untouched, new black iron:	80.1	352
2. Galvanized pipe:	69.4	305
3. Black pipe initially painted aluminum then repainted to a flat black:	75.8	333
4. Black pipe initially painted flat black then repainted with aluminum	67.9	299
Values not significantly different		

*1 pound water ∼ 1000 BTU

black pipes. The BTU per hr. was calculated on the basis of 1000 BTU per pound of condensate. Due to considerable variability, the second trial had no significant differences, but the trends remained the same. The aluminum pipe, when repainted flat black, approached efficiency of new black pipe. Rusty pipe was no different from new black pipe, and repainting it made no significant difference (Table 3).

Table 3: Condensate return from 2-inch diameter, 21-foot heating pipe with different external surfaces. Boiler pressure 9 to 11 psi.

External Surface	Millilters condensate per lineal foot in 30 minutes.	Calculated BTU/hour* per foot
1. Untouched, new black iron	112.1	493
2. Completely rusty iron pipe	113.2	498
3. Untouched, new black iron	115.2	506
4. Rusty iron pipe, cleaned, and repainted a flat black	114.6	504
No values significantly different		

*1 pound water ∼ 1000 BTU

Summary

The results seem fairly clear, although an engineer would not consider this experiment as particularly "precise" or "accurate". In addition to paying more for galvanized pipe, a grower must buy more. Not only is painting pipe an expensive procedure, aluminum paint seriously reduces heat transfer — which could lead to difficulty in temperature control in cases where radiation surface area is on the borderline. If pipe must be painted for longevity and appearance, then a flat black paint should be selected.