

Aeration Design and Friction Loss Calculations

Equipment: Sweetwater AQ9 compressor
1 hp 220 v rotary vane
Maximum pressure 10 psi
Rated @ 10.1 cfm at 10 psi

Various tubing lengths, from 500 feet to 1,500 feet
Great Lakes ALAGL6 diffusers - rated at 6 cfm each

Question: What size tubing may I use?

Answer: Depends on the length, diameter and cfm's.

Here is the formula:

1. Figure the depth you want to aerate. For Lake Mohegan, it's generally 15 feet, sometimes a little more. For every 27.68 inches of depth, you use 1 psi to force the air downward. Remember, your compressor only has 10 psi maximum, so that's a design parameter.

For 15 feet of depth, you use 6.5 psi (15 times 12, divided by 27.68)

You only have 3.5 psi to play with now.

2. Now figure the psi in "friction loss," i.e. based on the diameter of the tubing you want to use, and its length from the compressor to the diffuser heads.

Here is the table, showing equivalent inches of water per 100 feet of pipe. (This is the same method you used in figuring 1 psi for every 27.68 inches of water.)

Nominal Diameter	.5	.75	1.00	2.00
10 cfm	67.0	17.0	5.3	--
20 cfm	--	--	19.0	--
50 cfm	--	--	--	3.6

So, for every 100 feet of ½ inch pipe at 10 cfm, add 67 inches of water, which is 2.4 psi (67 divided by 27.68). For every 100 feet of ¾ inch tubing, add .6 psi. (So, the ½ inch probably should not be used for runs longer than 200 feet, and the ¾ inch probably should not be used for runs longer than 500 feet).

In our context, we are putting 10 cfm through (mostly) 1 inch pipe. For 1,000 feet of 1 inch pipe, at 10 cfm, we are using only 1.9 cfm. (10 times 5.3 divided by 27.68).

Therefore, we can use a 10 psi compressor, at 10 cfm, with 1,000 feet of 1 inch tubing, quite comfortably. 2,000 feet (3.8 psi) might be pushing it.

We should also allow a little cushion, for kinks in the pipe, and back-flow valves, which slightly add to the necessary psi.