

**Aeration System  
Sizing and Budgeting  
Revised April 15, 2003**

**1. Which is more economical to operate, a 1 hp or a 2 hp compressor?**

I compared the Aquatic Ecosystems AQ9 (1 hp that we currently use) and the AQ20 (2 hp). Each compressor is 220 v single phase. The 1 hp weighs 63 pounds; the 2 hp weighs 95 pounds. I can barely handle the 1 hp; I will definitely need some help with the 2 hp. On the plus side, it will be more difficult for the locals to steal the 2 hp.

AQ9                      1 hp 110 v @ 7.4 amps = 814 watts @ \$.15 per Kwh = \$.12/hour  
10.1 cfm at 8 psi = a cost of \$.19 per 1,000 cubic feet of air  
Annual electricity = \$432 per year  
Assumes 150 days of operation (May 1 to Sept. 30)

AQ20                     2 hp 230 v @ 7.6 amps = 1,748 watts @ \$.15 Kwh = \$.25/hour  
17.9 cfm at 8 psi = a cost of \$.23 per 1,000 cubic feet of air  
Annual electricity = \$900 per year

If we run 16 AQ9's versus an equivalent number of AQ20's all year (as per my plan), we get the following:

AQ9                      16 times \$432 = \$6,900 annual electricity

AQ20                     To get the "equivalent" number of AQ20's, I calculated how many AQ20's would be needed to generate the same number of cfm of air as 16 AQ9's, i.e.161 cfm. This would be nine AQ20's.

9 times \$900 = \$8,100 annual electricity

Conclusion: it appears we save \$1,200 a year in electric by staying with the AQ9's.

**2. Which costs more to buy, two AQ9's or one AQ20?**

Two AQ9's, fully equipped, cost      \$1,766 for 20.2 cfm

One AQ20, fully equipped, costs      \$1,589 for 17.9 cfm

Conclusion: there is no significant savings either way.

**3. What parts do we need for an AQ9 compressor?**

Pressure gauge ABG15 @ \$20.85

Muffler AQ16 @ \$41.25

Pressure relief valve AQ12 @ \$21.00

Note: I do not recommend using a multi valve outlet system like we now have; the four outlets are unnecessary. In practice, we run one hose off each compressor. This saves about \$150 per compressor, and this saving is included in the above costs.

Total parts for AQ9 = \$83.10

#### 4. What's the cost of tubing?

I priced 1 inch I.D. braid reinforced flexible PVC tubing at several Internet sites.

I called three local plumbing supply houses and Home Depot.

Here are the best prices:

Vendor and model	price quoted	cost for 5,000 feet
Enco model 505-0565	\$1.22/foot	\$6,100
Omega Engineering TYRP-15161-50	\$88/50 feet	\$8,800
PEP Plastic Pepco 980 (8005-0360)	\$314.40/50 feet	\$31,440
Dynamic Aqua Supply (Can.) PVCBH1	\$372 U.S./200 feet	\$9,300

#### 5. What is the optimal diffuser assembly?

We currently use the ALAGL6 @\$125 order 6 minimum)

For replacement air stones, I recommend ALR30 @\$11.80 (order 25 minimum) because it's 12 inch, and will slightly overlap the plastic underlay sheet.

#### 6. What is the optimal aeration set-up?

Because of the high cost of the tubing – over \$500 for a single run of 500 feet – I recommend running “tee” lines. Each compressor, when using the low friction loss 1 inch I.D. tubing, should be able to support two diffusers, up to a 500 foot run. We would run the line out about 500 feet, then “tee” off two equal lines of 50 feet each. That way, one AQ9 will oxygenate 200 linear feet.

Each air stone is rated at 1 cfm optimally, that is, if we put more air into it, the bubbles simply get bigger. We want to keep the bubbles small yet maximize air flow. For an

AQ9 putting out 11.8 cfm at 5 psi, and assuming minimal friction loss, we could support two diffuser assemblies (6 air stones each, for 6 cfms per diffuser assembly). Even with a little friction loss, we would still get about 5 cfm per diffuser assembly, quite respectable.

Perhaps we can try slightly different set-ups in different areas of the lake and measure the dissolved oxygen impacts, various radii from the diffusers. It may be that a single diffuser at 10 cfm aerates a greater radius than two diffusers at 5 cfm each, but I don't know.