AQUA CONTROL, INC. SPECIFICATIONS

AERATORS AND DECORATIVE FOUNTAINS
SPECIFICATIONS: ELECTRICAL AND GENERAL, AND BASIC SYSTEM PRICES

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HP	(1) VOLTS	PHASE	(2) AMPS	(3)breaker/ fuse/OL	(4)Max ft. #12 cable	(4)Max ft. #10 cable	(5)Min water depth, inch	Ship wt. lbs.
½	115	1	12	20	160	250	24	50
½	230	1	6	20	650	1020	24	50
1	230	1	10	20	400	630	30	60
1	208,230	3	5	15	690	1080	30	60
1	460	3	2.5	6	3670	5770	30	60
2	230	1	13	20	250	390	40	70
2	208,230	3	9	20	390	610	40	70
2	460	3	4	15	2070	3270	40	70
3	230	1	17	20	190	300	50	90
3	208,230	3	11	20	290	470	50	90
3	460	3	5	20	1600	2520	50	90

Note: 5 HP single stage units are available only as aerator fountains
5 HP two stage units are available as aerator fountains or decorative fountains

									(6) Number of pump stages	
									one	two
5	230	1	27	30	n/a	180	60	125	X	X
5	208,230	3	20	30	170	280	60	125	X	X
5	460	3	9	20	950	1500	60	125	X	X
Lights	115V 3 x 400 watt	1	10	15	400	630	n/a	20		
	115V 3 x 250 watt	1	7	15	480	760	n/a	15		

(X) over for explanations and additional information

Accessories, options and replacement parts
Aqua control gives YOU the option to select the extras YOU need, no forced choices.

Electrical Controls and Accessories
Single phase motors are supplied with a control box only, and DO NOT include a control panel or other control equipment, such as switches, overloads, timers, or GFI. All units MUST use GFI for safety. See following. Over for more details.
If you have an existing control panel or wish to create your own control system you need nothing else
Pump Control Panel for 1 or 3, 208/230V, includes: outdoor box, breaker, GFI, timer, and contractor or starter
Control Panel as above but ready for lights, adds: light breaker, GFI, timer
Control Panel for lights only, for retrofit of lights after the purchase, includes: raintight box, breaker, GFI, timer, relay
Single phase GFI/breaker with indoor box, used where unit will run continuously or be manually controlled
Single phase GFI/breaker with outdoor box, used where unit will run continuously or be manually controlled
Control panels for 460 V, 3 phase
Transformer for converting 208 V single phase to 230 V, if needed, without box; 1/2 -HP/3HP/5HP
Electric Cable
No cable is supplied with the unit. Select the cable required based on HP and length, allow for the drop into the water and back straight up to the unit. Measure carefully. Add some for safety and possible further relocation. Cable purchased from Aqua Control with pump INCLUDES the underwater terminal kit INSTALLED.
4 wire #12 cable for motors, heaviest duty, double insulated, color coded, includes grounding wire
4 wire #10 cable for motors, heaviest duty, double insulated, color coded, includes grounding wire
3 wire #12 cable for lights, heaviest duty, double insulated, color coded, includes grounding wire
3 wire #10 cable for lights, heaviest duty, double insulated, color coded, includes grounding wire
Replacement underwater cable terminal kit with ground clamp
Replacement underwater cable terminal kit
Repair cable splice kit for joining or repairing cable, uses self sealing shrink tubing
Light Package
No electrical controls included. See above for electrical control options.
Lights for aerator fountains, 3 incandescent flood lights, 8” diameter, 400 watts each, 2000 hour rated life
Lights for high narrow fountains, 3 halogen medium beam lights, 4” diameter, 250 watts each, 4000 hour rated life, includes red and blue lens covers
Light sub assemblies, one light, either type, complete and ready to attach, max of 6 per unit
Colored snap on lens assortment for 8” lights, 4 colors, red, green, blue, or amber
Individual colored snap on lens for, 8” lights, 400 watts
Individual colored snap on lens for, 8” lights, 300 watts or 500 watts
Replacement halogen light bulb, for 4” lights, 250 watts

Miscellaneous Optional Accessories and Attachments

Suction screen, 1/2" mesh, stainless steel, 8" diameter x 18" long, use to keep fish, frogs, and turtles out of unit. Not usually recommended where filamentous algae is often present since algae that would harmlessly go thru will clog the screen.

Auger with mooring eye for use in sandy or muddy banks or bottoms, 15" or 30", each

Replacement spray plate for decorative fountain, provides conical, geyser, or combined spray pattern

Lower tube lengthened so that any standard suction can be up to 60" deep without extension tube

Extension suction tubes, 8" PVC with with stainless steel fasteners, any length to 6 feet, multiples to any depth, ea

Flow straightener for decorative fountains, increases height and diameter 20-30% but reduces pattern fullness

Parts for conversion from standard aerator fountain to decorative fountain or vice versa

Special float required for planned future light installation. A credit will be given when the light package is ordered.

Special spray patterns

Important Notes to Specifications

(1) 208 volts, 230 volt single phase motors may be run with 208 volts service with the use of a buck-boost transformer (see accessory information and pricing); or by increasing the wire size by two sizes, from #12 to #10 for example, if the service voltage is not in the low end of the range. The transformer is inexpensive and is the preferred solution. Other voltages and 50 cycle motors are available, contact the factory.

(2) Amps are the actual running amps. If lights are also installed on a single phase system and are powered through the same breaker that powers the motor then the breaker should be increased in size by 10 amps.

(3) Three phase motors require motor starters and quick trip overloads sized or set to the amps rating. The listed fuse/breaker rating is the size FUSE/BREAKER to use before the motor starter. Three phase power control equipment is not included. See control panel options.

(4) Cable lengths are based on consuming a maximum of 5% of the voltage from the main power source to the controls and on to the motor. If the supply voltage never falls below the nominal voltage rating, 230 V for example, these lengths can be increased by 50%.

(5) Minimum water depth allows only a minimum of 6" of clearance from the bottom of the pond to the suction tube.

(6) Two Stage Pumps provide double the spray pattern height and 1/2 the volume. Two stage decorative fountains can achieve 60' in height. And the two stage aerator gusher pattern 23' in height. This feature is only available in 5 HP.

ADDITIONAL INFORMATION

WARRANTY: All Aqua Control products are warranted for 1 year against defects in materials or workmanship.

SHIPPING: All Aqua Control products can be and normally are shipped by US ground.

ELECTRICAL SAFETY: A GFI (Ground Fault Interrupter) is included in all control panels, for optional single phase GFI/breakers, and in the optional light control. A GFI is intended to provide human protection and is designed to prevent a serious shock in most circumstances, even in the event of direct contact with the full voltage. **It is imperative for people's safety and to meet electrical codes that a GFI be installed.**

UNDERWATER ELECTRICAL CONNECTION: Each unit has a stub motor lead with a special plug attached. An underwater connector kit is included that the user attaches to the electrical cable and to which the plug attaches making a waterproof connection. When the cable is purchased from Aqua Control the connector kit is attached at the factory at no charge. A ground lug is attached to the connector and when properly wired the motor is grounded for safety.

MOTOR CONTROLS: A special control box is required for all single phase motors and is included at no extra cost. This control box can be installed outdoors. This is not a control panel, it simply contains the components necessary to run the motor that are normally housed inside non submersible motors. An overload breaker/switch and GFI are still required for a minimum control system. An optional control panel is strongly recommended for economy, convenience, and safety unless there is an existing suitable control panel or expert electrician's wish to build their own.

A control box is not required for three phase motors, but an overload breaker/switch, GFI, and three phase motor starter with overload is required. Starters, breaker/switch, and GFI are supplied with a control panel along with a timer and, again, is strongly recommended as with single phase. Three phase, 230 V power must have a normal 115V to ground for the control panel circuit and optionally for lights. If the system has a floating or isolated ground, or is 460V, please contact the factory.

ELECTRICAL CABLE: All motors require 4 wire cable. The single phase motors require 3 wires because of the special control boxes, plus a ground wire. Three phase motors also require 4 wires, 3 wires plus a ground wire. Aqua Control sells only the highest quality double insulated, color coded, 4 wire, 12 gauge or heavier, deep well submersible cable that has proven excellent for this application. Light kits require 3 wires, 2 wires plus ground, also available from Aqua Control in the same highest quality cable.

OPTIONS AND ACCESSORIES

Spray Plates: Decorative fountain spray patterns can be easily and economically changed to produce many different patterns by simply adjusting or replacing the spray plate. The two basic spray patterns are the geyser and the conical. Special spray patterns for the Aerator/Fountain are also available. Consult the factory for the many options.

Intake Depth: The depth of the water intake for each unit is in the table. Maximizing the suction depth is always desirable . The standard Aqua Control design provides deep suction as listed. If the lake is deep and a deeper intake up to 60". If a greater depth is needed than an extension tube(s) should be added to provide suction to virtually any depth to circulate the entire lake. Always consult the factory regarding the added weight from the extension tube to insure that the unit properly floats the greater weight.

Lights: Two 115V light packages are available which provide bright, beautiful night illumination and can be added to either the fountain or the aerator. The 8" incandescent lights are flood lights and should be used with wide spray patterns like aerator fountains to provide full illumination. The 4" halogen lights are semi spot and should be used for high and narrow patterns like the geyser. Additional, snap on, colored lens caps can be added to provide colored illumination.

Screens: Suction screens are available. Because of the unique Aqua Control deep suction, most floating debris hazardous to other aerator designs will not be sucked in, so under most circumstances screens are not recommended or required. Most debris will go through the pump with no problems, but the screen, if used, would require periodic cleaning. The major reason for using a screen would be to prevent accidental intake of fish, frogs or turtles.

Aqua Control, Inc.

MANUFACTURERS OF AERATORS AND DECORATIVE FOUNTAINS

Some birds know more about water than others.

ENGINEERING LIMITATIONS OF AERATOR AND FOUNTAIN PERFORMANCE
A method to analyze performance claims and determine which are inacurate

Almost every manufacturer of Aerator Fountains and Decorative provides performance figures listing the height sprayed and the gallons per minute per day pumped. It is natural for the purchaser to think that these figures provide valid and pertinent information with which to make a purchasing decision. Unfortunately, this is usually NOT the case. Most manufacturers either do not know the true performance of their products or they are misrepresenting that performance.

Auqa Control does not wish to use the “exaggeration” technique for impressing its customers, but reporting true performances makes us look bad by comparison with many of our competitors who do,exaggerate. Therefore, this paper will examine the possible performances of these types of pumps and provide the reader with a method of determining whether many of those claims are realistic or possible. This will be accomplished by providing a simple explanation of the fundamental engineering limitations of pump performance. A simple formula will also be supplied so that the purchaser can enter performance claims and determine the amount of exaggeration and the likely real performance.

First, we will briefly explain pump types. An aerator, or aerator fountain as they are usually supplied, is a device that uses an axial flow pump to pump the water. Axial means that the water flow travels in a straight path through the pump in a direction parallel to the axis of the pump shaft. A propeller is the most common and obvious type of axial flow device. These axial flow pumps pump high volumes of water at a low pressure so they are ideal for aeration and circulation. Typically, in the common 1 to 5 horsepower sizes, they can pump 400 to 1000 gallons per minute and generate 3 to 15 feet in height.

Decorative fountains typically are made using centrifugal pumps which generate high pressures and low flows. These pumps can provide the pressures to generate heights of 20 to 60 feet and can pump 100 to 200 gallons per minute. A centrifugal pump takes the water in a small hole around the pump axis, flings it radially (to the outside) with the centrifugal force from the rapidly rotating impeller, collects that high pressure flow with a diffuser, and redirects the water to the discharge. Multiple sets of these impellers and diffusers (a 2 stage pump, for example, has 2 impellers ad 2 diffusers) can be installed to provide very high pressures.

The law of engineering that governs the performance of pumping water applies exactly to either type of pump and is expressed by the equation:

Theoretical horsepower=gallons per minute x 8.34 x height / 33000

Theoretical horsepower is the horse power required to produce the performance stated if there were no losses, that is, perfect efficiency. Since nothing is perfect, and there are always substantial losses, the actual horsepower required is significantly greater than the theoretical horsepower. Losses occur due to propeller/impeller losses, inlet flow losses, losses from flow through the unit, and nozzle losses. Typically very good propeller/impeller efficiencies are in the 60% range. Many of the more crudely made propellers and impellers surely do far worse, but lets start with this number, 60%. To this must be added the correction for the other losses. These losses occur due to sudden changes in diameter in the flow path, sharp bends, obstructions,surface roughness, and poorly designed nozzles. Again, most units are poorly designed and built, thus suffering from many efficiency robbing deficiencies.

Let's assume that these losses total another 10%, for a total efficiency of 50%. This 50% number would be a good system efficiency for a well designed system but would be too high for most systems. Nevertheless, for this analysis, this number, 50% (.50), will be assumed. The new formula becomes:

Actual horsepower required = gallons per minute x 8.34 x height / 33000 x system efficiency

written another way so that the correct division is more obvious:

$$\text{Actual horsepower required} = \frac{\text{gallons per minute} \times 8.34 \times \text{height}}{33{,}000 \times \text{system efficiency}}$$

where:
Gallons per minute (GPM) is the stated number or is calculated from gallons per day (GPD) by dividing by 1440; so GPD/1440=GPM
8.34 converts GPM to pounds per minute.
Height is the stated height of the spray pattern in feet. See footnote at the end for a more thorough and technical explanation of this concept.
33,000 is the foot pounds of energy per minute that is the definition of one (1) horsepower.
System efficiency, as stated, use .50 in the equation for 50%.

Please be careful when doing calculations so that the division is done properly. Calculator technique is; GPM. times, 8.34, times, height, divide, 33,000, divide .50. The division numbers can be simplified further by combining them and dividing once by 16,5000.

Let's do some examples, first from the "biggest" name in the industry. (unfortunately, not yet Aqua Control.) They provide performance numbers for an aerator with a conical fountain discharge for a 3 HP of 7 feet high and 1500 GPM. Seemingly impressive numbers, especially GPM. Let's put these numbers in the formula.

Actual horsepower required= 1500 x 8.34 x 7 / 33,000 x .50 = 5.3 HP. So they would need a pump with a motor larger than 5 HP to produce this performance. Since they are not using a motor of this size then one of the performance numbers must be mistated. Since it is easier to get height correct, it is likely that GPM is th number overstated. So in this case, the pumping rate is most likely about 1/2 the stated 1500 GPM, or 750 GPM.

Another performance claim fro the same company, a high decorative fountain pattern with a 5 HP pump that reportedly produces a pattern 26 feet high and pumps 1000 gallons per minute. Again, we put this through the formula and get;

actual horsepower required = 1000 x 8.34 x 26 x /33000 x ,50 = 13.14 HP. Thus, it would take a motor almost 3 times larger to create the performance claimed. Again, it is most likely that the GPM number is overstated and that they are really pumping less than 400 GPM. This performance is so overstated that if they had a "perfect" system they would still require 6.5 horsepower.

Let's take a look at a typical high volume aerator for another "big" name in the field. Claimed performance for a 3 HP is, 12 feet high and 1500 GPM. Put this into the formula:
actual horsepower required = 1500 x 8.34 x 12 / 33,000 x .50 = 9.1 HP. Thus, performance is overstated by three times!

Another example from this same "biggie" is a 1 HP aerator with reported performances of 10 feet high and 700 GPM. Again, putting this in the formula:

actual horsepower required = 700 x 8.34 x 10 / 33,000 x .50 = 3.5 HP. So this performance is overstated by 3 1/2 times!

Unfortunately, this inaccurate and misleading performance information is rampant in the industry. Please check the number of other combinations yourself.

Now let's take a look at Aqua Control performances. A 3 HP aerator fountain performance is rated 10 to 12 feet maximum in height and 1,080,000 gallons per day (GPD) maximum. Note that we are careful to state that these are maximums since each nozzle creates different heights and volumes. This GPD=750 GPM and is achieved with a nozzle that generates a height of 10 feet. Putting this in the formula:

actual horsepower required=750x8.34x10/33,000x.5=3.8HP. This is slightly higher than 3HP and is explained by the fact that the Aqua Control design pulls all the water over the motor thus providing superior cooling which allows the motor to operate at the high end of the service factor. In other words, the Aqua Control motors can be operated at slightly higher than the nominal horsepower rating. In addition, and very important, our highly engineered design and precision construction create higher efficiencies. Doing a calculation at 60% (.60) system efficiency, for instance, puts this unit well within the service factor rating for this motor.

Another Aqua Control example: a 1 HP decorative fountain geyser performance is 30 feet high and 144,000 GPD. This GPD is 100 GPM.

Actual horsepower required = 100x8.34x30/33,000x.5=1.5HP. Again, operation at higher horsepower and higher efficiency account for the slight higher horsepower number.

Compare the accuracy of this Aqua Control 1 HP decorative fountain with the result for the competitive example above that required 3.5HP to achieve their claimed performance!

When evaluating aerator or fountain performance and comparing between manufacturers' claims use this technique to determine who is honestly providing accurate information.

NOTE:
Technical people and engineers reading this may realize that the height definition used in this report is simplified and that the real factor should be pressure head. Using pressure head would cause the numbers to worsen. That is, the calculated horsepower required would be even larger, which worsens the discrepancy. There are two factors that account for this:
1. The use of spray height as a measuring tool is somewhat too small, because the pressure head does not perfectly to vertical height of a spray pattern due to the air resistance on the water being sprayed. Nozzle efficiency also greatly affects height, but this has already considered in the system efficiency number.
2. Many aerator fountains do not spray vertically, but they spray at some angle to the vertical. This causes some of the energy that could have been used to create a higher spray pattern to send the spray pattern horizontally. Correcting for this would cause a higher height to be reported which would also cause the horse power error to be even larger. These factors are not included in the simplified formulas used in the examples, because the precise effect of air resistance is almost impossible to determine and every nozzle design would require a different consideration. Also, it would be impossible to know the angle from the vertical of every spray pattern thus rendering that refinement error prone. Since these factors could not usually be known, since a great deal of complexity would be added, since the impact on the comparison is usually minimal, since the impact of these considerations would worsen the discrepancy, and, most importantly, since these refinements do not alter the accuracy of the comparisons, they have been omitted from the basic formulas.

AQUA CONTROL AERATOR FOUNTAIN DESIGN FEATURES

Spray Cone- The spray cone is a special nozzle that causes the swirling water that is flowing up the tube, to swirl faster as it spins in an ever-tightening circle, until it flies off upwardly and tangentially, creating a high and beautiful conical-spray pattern. Since the spray cone has a large opening and no obstructions, it is free of plugging and is highly efficient in providing high-volume flow.
Head- The head attaches to the upper tube, retains the float, and provides the attachment point for a wide variety of nozzles for both aerator fountains and decorative fountains.
Float- The float is a tough, molded polyethylene case filled with closed-cell urethane foam. The float color is a deep blue for minimum visibility. Threaded insets are molded into the bottom of the float for mooring eyes and for optional light attachment.
Upper Tube- The upper tube is tough PVC with a machined PVC coupler attached for connecting to the pump outlet transition.
Mooring Eyebolt- The two stainless steel eyebolts are screwed into inserts and are used for mooring or anchoring the unit in position.
Pump Outlet Transition- It provides a streamlined flow path between the pump and upper blade.
Propeller Shroud- The propeller shroud provides a precision housing for the propeller, maximizing propeller efficiency, flow rate, and pressure. The wear surface is protected by a stainless steel insert.
Propeller- It is a precision, investment cast, stainless steel propeller with the tips machined to closely fit the propeller shroud. This combination creates maximum efficiency, flow, and pressure.
Motor Shaft Extension- The motor shaft extension is a short, rigid, stainless steel extension that is shrunk and pinned to the motor shaft for perfect alignment.
Pump Inlet Transition- The pump inlet transition provides a smooth flow into the pump and it permits a larger diameter inlet tube that maximizes flow potential.
Motor Base- The motor base connects the motor to the pump.
Motor- The motor has a stainless steel shaft and exterior, is maintenance free, water cooled, and water lubricated. It never needs maintenance, and it has no oil to leak, ball bearings to freeze, or seals to leak.
Inlet Tube- The inlet tube is tough PVC sized to minimize pressure-robbing flow losses.
Motor Lead- One end of the motor lead screws into the motor alignment, streamlines the water flow, and prevents large objects from getting into the pump, all without restricting flow.
Lower Motor Support- The lower motor support maintains motor alignment, streamlines the water flow, and prevents large objects from getting into the pump, all without restricting flow.
Stainless Steel Fasteners- Stainless steel fasteners are used exclusively throughout the unit.
Flow Path- The flow path is straight and streamlined for maximum efficiency and performance.
Motor Plug- The motor lead plug screws into the underwater connector attached to the electric cables from shore to provide a watertight electrical connection that is easy to disconnect.
Castings- All castings are high-strength, corrosion-resistant, aircraft-grade aluminum alloy.

Aqua Control, Inc.

MANUFACTURERS OF AERATORS AND DECORATIVE FOUNTAINS

Some birds know more about water than others.

GFI NUISANCE TRIPPING

11/96 ac gfi nuisance tripping.wpd

The Ground Fault Interrupter that is part of Aqua Control's Control Panel is a device commonly used in electrical circuits today. In fact, it is required under many electrical codes for household, business and industrial applications. The purpose of the GFI is to shut off the electrical flow if it detects an electrical leak of any kind. This shut down takes place in a manner of milliseconds in order to prevent the leak from shocking a person or animal.

All GFIs are very sensitive and are subject to nuisance tripping under some circumstances. If the cable from the GFI to the pump is greater than 200 feet the current flow may induce a very small current flow may induce a very small current which the GFI detects and which causes tripping. If the cable is very long, such as 400 feet, the circuit may never even come on since GFI may shut down the circuit down immediately.

On the Aqua Control Specification sheet we give the length of 12 gauge or 10 gauge cable that is appropriate for each horsepower, voltage, and phase of motor. This length is meant to be a guideline for the size of cable needed to bring the necessary power to the fountain in order for it to run adequately. This length does not have anything to do with the proper length of cable to avoid "nuisance tripping" of the GFI. The gauge has no effect on this nuisance tripping issue.

Since any length over 200 feet can cause nuisance tripping it is to the customer's advantage to place the Control Panel which contains the GFI(s) as close to the fountain as possible at the edge of the water. It is also generally less expensive to use the underwater cable only from the fountain to the Control Panel, and then cover the distance out of the water from the Control Panel to the power source with less expensive underground cable. Customers occasionally want to place the control panel with the GFI at the power source so the panel is not conspicuous at the water's edge and then run the underwater cable from the Control Panel (at the power source) all the way to the fountain, even though much of this distance is underground, not underwater. This is not only the most expensive cable use, but if that length is greater than 200 feet it also risks nuisance tripping with the GFI.

There are two solutions for nuisance tripping other than shortening the cable.

1. If your electrical codes allow, you could bypass the GFI. We cannot recommend this method, but it will work

2. If your electrical codes allow, you could install a special, optional, extra cost GFI that has a higher trip point. However, these higher trip point GFIs are not approved for human protection, although they provide practical protection.

We can never know exactly what length of cable greater than 200' will cause the nuisance tripping problems, but it is good practice to warn th customer of this possibility if their requirements cause a long run of cable between the GFI and the fountain. Any time you have any questions about the appropriate use of cable in a specific installation, feel free to give us a call.

Pond Water Quality and the Function of Aeration
July 9, 1997 ac aeration benefits from landscape & irrigation. wpd

The following is an excerpt from the article, “Pond Management and Chemical Options” in “Landscape and Irrigation”, June 1997.

Quote:
Aeration systems serve three purposes: (in helping to improve and maintain good pond water quality).
1. The oxygen level in the water can be increased, which allows the normal biological process in the lake system to become balanced.

2. By circulating the water, bringing up colder water from the bottom, and eliminating low circulation areas, aerators help control algae.

3. If chemical or biological treatments are necessary, the system will allow more complete mixing throughout the pond.

Their action mixes layers and breaks up the stratification that is conductive to algae growth. They can oxygenate water directly, transferring essential dissolved oxygen from the air back into the water, stimulating natural water cleanup processes. If used in conjunction with either a clarifier, chemical, or biological additive their dispersion is improved. The result is cleaner-looking water and no foul odors.

To be most effective you should begin aeration early in the season, even before the hot weather starts. If there is a thick algal bloom, an aerator may take some time to fully
clear the water’s surface...

Aeration is only indirectly effective in preventing aquatic weed growth... It helps to minimize bottom sludge build-up. This means less rooting medium for aquatic plants, hence less chance these plants will really take hold. Also, aeration does prevent fish kill that can occur in warm weather when large quantities of (dying) weeds consume too much oxygen.

Unquote.

Note that Aqua Control is unique in the industry in that our fundamental design is, and always has been, to naturally take deep suction and provide simple and economical extension suction tubes that can take suction at virtually any depth. Contrast this with most of our competitors who simply take suction immediately under their float which is within about 6” of the surface Thus, they are pumping already oxygen rich surface water in a loop and are not circulating the pond nor are they aerating since the surface water is almost always highly oxygen saturated.

This magazine article did not stress one very important feature. When using bio-augmentation, that is, the introduction of beneficial bacteria (biological additive in the above article) that consume organic matter and nutrients, those bacteria are much more effective and remain effective much longer when they are well oxygenated. It is especially important that they be well oxygenated deep in the pond where they are digesting the organic sludge on the bottom that is normally low or devoid of oxygen. Again, the Aqua Control deep suction design provides a superior system combined with bio-augmentation for optimizing pond water quality.

The following is an excerpt from the article, “Clarifying Irrigation Reservoirs Naturally with Beneficial Bacteria” from “Irrigation, Business and Technology”, June 1997

Quote.

...More recently, the emphasis has been on encouraging nature’s own solutions to the problem by keeping stored water circulating and dissolved oxygen at health levels for decomposition by organisms such as bacteria. Lately there has been a move toward enlisting the help of beneficial bacteria to correct overabundant algae.

To cure the (algae) problem, algicides are commonly used. Algicides are good solutions for the short term, the problem is that they cause plants to die rapidly. The plants decompose, break down into nutrient form, and supply a new food source for a new population of algae. If algicides are used continually, they kill the beneficial bacteria in the water ecosystem that normally compete with the algae for nutrients. Over time, a pond loses its ability to regulate its nutrient level, and you have an out-of-balance system that favors the overabundant growth of algae...

Bacteria do not kill algae. They out-compete algae for food causing the algae to starve.

Bacteria also digest floating matter reducing the total suspended solids that normally cloud water. And, they take the “stink” out of ponds.

An expert suggests the following when using beneficial bacteria: Aeration is important. Bacteria are living organisms and need a ready supply of oxygen to thrive. keep ten water moving through surface agitation.

Unquote.

Summary of lake and pond management and the benefits of Aqua Control aeration:
1. Increasing the oxygen level in ponds helps to attain an equilibrium that helps to control algae. Since it is usually only the deep levels that are oxygen deficient only the Aqua Control deep suction design can optimize aeration.
2. Bringing cooler water to the surface and circulating it through dead spots in the pond helps to control algae. Obviously only deep suction design can do this optimally. Only Aqua Control has natural deep suction and provides for simple and economical deep suction to any depth.
3. Complete circulation is required when treating the pond to completely disperse the treatment. Only Aqua Control, with the deep suction design, truly circulates the entire pond.
4. Bacterial treatment can be a very effective method of providing pond equilibrium and controlling algae, suspended solids, and odors. The bacteria need a high level of oxygen to survive and function. Only complete aeration and circulation of the entire pond will allow the bacteria to flourish in the deeper pond levels. Again, only Aqua Control, with its deep suction, can provide complete circulation and aeration of the entire pond.

AQUA CONTROL

January 30, 1997 ac turnover calculation .wpd

POND TURNOVER RATE CALCULATION

Calculation of Pond Turnover Rate when the acreage is known.

These calculations will assume that the average depth of ten pond is 1/2 the deepest value. If this assumption is not correct then the .5 multiplier used below will need to be corrected to a higher number if the pond or lake has a fairly flat bottom and to a smaller number if only a small area is deep and the much of the remainder of the pond is significantly more shallow.

Information needed:
1. Surface acreage of the pond or lake
2. Greatest depth
3. Pumping rate of the Aerator selected

Acreage x depth x .5 = acre feet of water in the pond
Acre feet x 326,000 = gallons of water in the pond
Gallons/ gallons per day rating=days turnover rate

Example: A 2 acre pond 8 feet deep and using a 1 HP Tornado Aerator wit ha 500,000 gallons per day rating. Note: an acre is approximately 200' x 200'

2 x 8 x .5= 8 acre feet
8 x 326,000= 2,608,000 gallons in the pond
2,608,000 / 500,000= 5.2 day turnover rate

Calculation of pond turnover rate when surface dimensions are known for rectangular ponds.

Information needed:
1. Average length
2. Average depth
3 Greatest depth

length x width x depth x .5= cubic feet of water in the pond
cubic feet x 7.5= gallons of water in the pond
gallons/gallons per day rating of the aerator= days turnover rate

Example: A 200' x 100' pond 12 feet deep and using a 1 HP Tornado Aerator with a 500,000 gallon per day rating.

200 x 100 x 12 x .5=120,000 cubic feet
120,000 x 7.5= 900,000 gallons
900,000 / 500,000= 1.8 day turnover rate

Calculation of pond turnover rate when surface dimensions are known for circular ponds.

Information needed:
1. Average diameter
2. Greatest depth

diameter x .5= radius
radius x radius x 3.14 x depth x .5= cubic feet of water in the pond
cubic feet x 7.5= gallons of water in the pond
gallons / gallons per day rating of the aerator= days turnover rate

Example: A 500’ diameter pond 15 feet deep and using a 5 HP Tornado Aerator with a 1,300,000 gallon per day rating.

500 x .5= 250’ radius
250 x 250 x 3.14 x 15 x .5= 1,491,875 cubic feet of water
1,491,875 x 7.5= 11,039,060 gallons of water in the pond
11,039,060 / 1,300,000= 8.5 day turnover rate

Remember that to actually achieve turnover the suction must be near the bottom since the thermocline will prevent natural circulation of the pond below the thermocline. Aqua Control uniquely achieves that capability with its economical extension suction tubes.

The turnover rate desired can vary from a few days to 2 weeks depending on the nature of the problems that need to be corrected. Severely affected ponds should be turned over more frequently and ponds with few problems may be turned over less frequently.

Also, remember that the pond owner may wish to see a larger and more impressive spray pattern which will dictate a larger unit than the minimum required for the pond.

Aqua Control, Inc.

MANUFACTURERS OF AERATORS AND DECORATIVE FOUNTAINS

Some birds know more about water than others.

POWER CALCULATION FOR FOUNTAINS

ACPWCAL.WPD

Customers sometimes want to know how much it will cost to run their fountains and lights. This calculation can be done if you know the cost of kilowatts in the customer's areas. This is listed on their power bills or can be obtained by calling the power company. Several formulas are needed to do this calculation. The one we are covering this month is for single phase. In a future newsletter, we'll review three phase power usage. These formulas are listed below with examples for you to follow.

Power=Amps x Volts=Watts

The values for amps and volts for each of the fountains are in the table on the top of the price & specification sheet.

Watts divided by 1000= Kilowatts

Kilowatts times customer's cost of kilowatts=cost per hour to operate fountain or lights

Example: A 2 HP aerator uses 230 V and draws 13 amps and we'll use a cost of power of $.08 per kilowatt hour.

Power = 230 x 13 = 2990 watts
2990 divided by 1000= 2.99 kilowatts
2.99 kilowatts x 0.8/hr= .239 or $.24 per hour to operate the lights

Example: lights use 115V and draw 10 amps
115 V x 10 Amps = 1150 watts
1150 watts divided by 1000 = 1.15 kilowatts
1.15 kilowatts x $.08 = $.092 per hour to operate the lights

If a customer has a 2HP aerator and lights and decides to operate both continuously the cost would be $.092/hr + $.239/hr or $.33/hr x 24 hrs/day= 7.92 per day. The cost per month is $7.92 times 30 days = $237.60.

If the customer buys a timer to limit operation to the hours between 5 PM and 1 AM you can calculate the savings as follows:

$.092 times 24 hours times 30 days = $66.24/month without timer
$.092 times 8 hours times 30 days = $22.08/month with the timer
This operating savings would actually pay for a control panel in the course of a year.

Hope this helps answer some of your customers' questions. Obviously, this calculation can be used for competitors' units as long as you know volts, phase, and amps.