

Aquaponic Equipment

-Airlifts -

John S. Pade explains the benefits of using airlifts to move water in aquaponics.

Airlifts are a great way to move water and I think they are underutilized in aquaponics. By using air to move the water, you eliminate the water pump and aerate the water all in one step. This reduces initial cost and energy input.

Air lifts are not generally used for large commercial systems and are limited in the height that they can lift. When trying to lift water to a higher level, a water pump is simpler and more efficient than an airlift.

Airlifts lose efficiency (pump less water) the higher you lift the water compared to your total water depth at the airlift. They work best when you only lift water a small percentage higher than your total water depth. The deeper the water depth compared to the lift, the better.

However, in most hobby and backyard systems you only need to move the water a few inches vertically so, in this case, an airlift is the best method.

Airlifts are most efficient when moving water from one place to another within the water column. They become less efficient as the water is lifted higher above the surface. In a raft or media filled bed system, an airlift effectively and efficiently moves the water from the fish tank to a slightly elevated grow bed. The water then gravity feeds back to the fish tank.

Water is heavy when it is in the air, but weighs no more than the water around it when it is in the

water. A water-moving airlift will move water using very little energy. It just needs energy to accelerate and overcome friction.

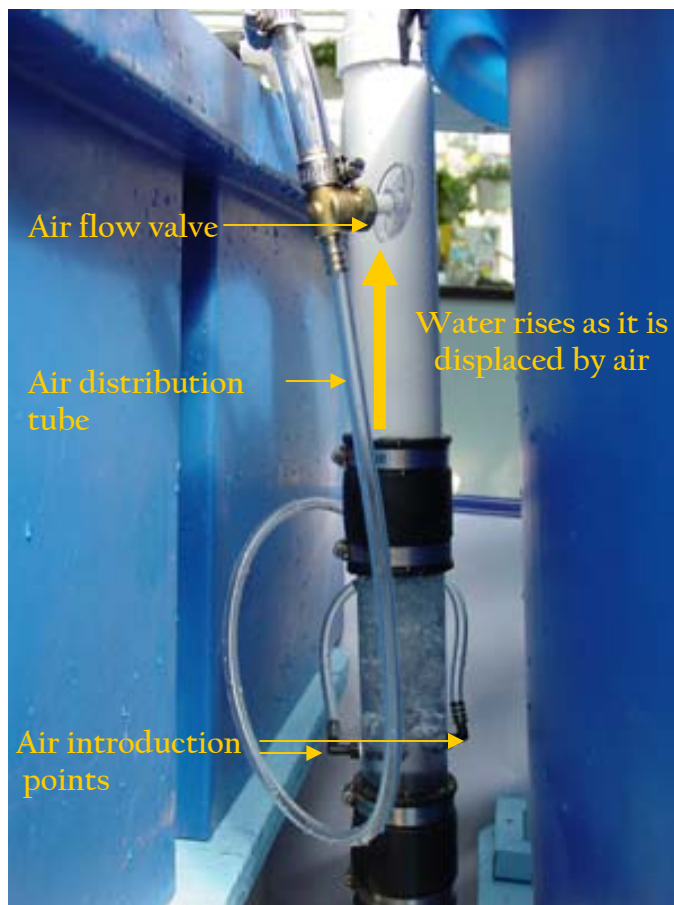
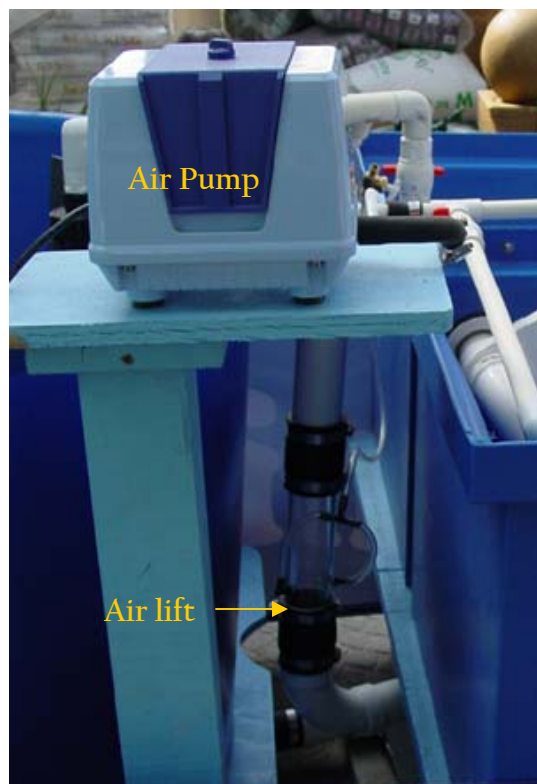
The more air that is injected and the deeper it goes, the more power it provides. An unconfined airlift doesn't even need a pipe. An air diffuser moves a lot of water within its mass of bubbles. However, raising water only slightly above the surface can be done easily and economically with compressed air and an airlift pipe.

Airlifts work by displacing water in the pipe with air, making the total weight within the pipe less than the weight outside the pipe. Since water seeks its own level by virtue of its weight and its fluid nature, it will get pushed up an airlift pipe because the weight is less there (lower pressure). The direction of water flow will always be from high pressure to low pressure.

Air lifts work best with large bubbles of air rising because they displace the most amount of water. Therefore, you should not use air diffusers in an air lift because they break the air into tiny bubbles.



Close up of an airlift



Above and right: Photos demonstrating an airlift used in a small raft system.

Air lifts work best in small diameter pipes, for instance, under 3 inches. If more water is needed, use multiples of small diameter pipes. Also keep in mind that a sweep works better than an elbow.

If you are moving water at a low head pressure (the height difference between where the water starts and where it ends up), air-lifts can pump a tremendous amount of water. Four and a half cubic feet of air per minute will pump 175 gallons of water per minute when it's only lifting that water six inches. While pumping your water, the airlift takes the low-oxygen incoming water and increases the oxygen levels toward optimum.



If you are planning your system, I recommend looking into an airlift if you only need to lift the water a small amount. Often, The same airpump will supply air to the airlift, diffusers in the fish tank and an air distribution grid in the grow bed (raft or media filled bed). The increased oxygen levels that you will have as a result of using air to move water will be beneficial for your fish, plants and bacteria and your system will be healthier overall.

About the Author: John Pade is a consultant in the aquaponics industry and co-publisher of the Aquaponics Journal. He can be reached by email at pade@aquaponics.com