INTRODUCTION

This simplified guide is intended to teach the fundamentals of the proper aeration techniques in keeping live bait, and "catch & release" fish, alive and healthy in live wells.

The advantages as well as disadvantages of many types of aeration will be discussed.

UNDERSTANDING THE CONCEPT OF AERATION

There are many misconceived ideas about aeration.

Two common fallacies are:

1. **Large live wells are required to sustain a large quantity of fish.**
2. **Large live well pumps are needed to move large quantities of water through the live well to keep live bait and fish alive.**

To understand what is really needed for proper aeration, it is best to take a parallel look at ourselves and fish.

FACTS FOR HUMANS

- **If we were enclosed in a large airtight room we would be able to breathe for many hours before we would consume all the oxygen.**
- **If we were in an airtight closet, the oxygen would be consumed a lot quicker.**
- **If we were swimming underwater without a snorkel, the oxygen in our lungs would be consumed very quickly.**
- **In all cases, without additional oxygen we would eventually expire!**

However, we could stay alive indefinitely, if we could use a breathing tube or snorkel that was in contact with outside fresh air or oxygen. It would not matter about the size of the container or the quality or air that surrounded us.

FACTS FOR FISH

- **If we enclosed a fish in a sealed, 1,000 gallon tank, it would survive for a long time before consuming all the oxygen.**
- **If we enclosed the same fish in a sealed 10 gallon tank, the oxygen would be consumed more quickly.**
- **If we removed the same fish from the tank and placed it on a table, the fish could live for an extremely short time.**
- **In all cases, without additional oxygen the fish would eventually die.**

However, our fish could stay alive indefinitely if we could put oxygenated water through its

gills and keep it wet. It would not matter about the size of the tank.

AN AERATOR IS TO A FISH, WHAT A SNORKEL IS TO US!

SIZE OF AERATORS AND SNORKELS

FACTS

- It is more difficult to breathe through a straw than through a large snorkel.
- A small or ineffective aerator cannot provide as much oxygen in the water as a larger or more effective one.
- If an aerator can provide enough oxygen in the water for the fish to breathe, it doesn't matter how much water surrounds the fish! The only reason that water must be changed occasionally in live wells is to remove ammonia. The smaller the container of water, the more frequent the changing.

BASIC REQUIREMENTS OF AERATION

There are two major considerations in aeration.

1. The gentleness and direction of water flow
2. The size and amount of the air bubbles
3. The temperature of the water

GENTLENESS AND DIRECTION OF WATER FLOW

FISH THAT SWIM IN SCHOOLS Delicate bait such as shad, green-backs and croakers will not survive a day of fishing unless the water flow in the well is soft and gentle. Turbulent water will damage the bait and force them to work against the current. Ideal water flow within the well should be approximately 1 to 2 MPH, and in a circular motion. This will allow fish to school and provide a smooth flow of water over and through their gills. If the water flow is excessive, bait tire quickly and will not be lively. Keep water flow as low as possible, with fish swimming in a stationary position within the tank.

SHRIMP AND FISH THAT DO NOT SCHOOL Species that do not school do not need a circular or oval container. Keep water flow to a minimum for fish such as bass, redfish, crappie, bream, and walleye.

For shrimp, provide material in the well so they can cling and not be swirling about the well and become damaged. Leave a dip net in the well, or tie a stone in a piece of cloth such as burlap.

SIZE AND AMOUNT OF AIR BUBBLES

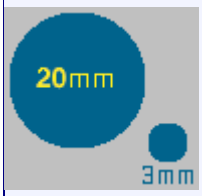
Take a look at at the air bubbles produced by an aquarium aerator. Watch how quickly the bubbles rise to the surface. They provide little aeration, but are aesthetically pleasing to watch. Bubbles must remain contacting the water, if they are to do the job properly. A good rule of thumb is: The smaller the bubble, the longer it will remain suspended in water to dissolve.

WATER TEMPERATURES

The warmer the water, the less oxygen it will hold. Fish will deplete the oxygen quicker as the water warms, and poor aerators will maintain less fish. Colder water will hold more oxygen. Water frozen in a plastic bottle will lower temperatures and keep the chlorine out of the tank.

Use an aquarium thermometer to compare temperatures. Keep temperatures within eight degrees Farenheit between water in the well, and water outside the boat.

CAUTION: Placing fish in different temperatures quickly will shock and kill them. It is best to place fish in the same water and temperatures where they were caught.



A Lesson in Air Bubbles

by
Bob Heideman
of
Aquatic Eco-Systems, Inc.

The smaller the air bubble, the more slowly it will rise, giving it more time to dissolve in the water.

Due to the higher density of salt water, air bubbles are usually smaller in salt water than in fresh water.

A large 20mm bubble has a volume of 4.19 cm3, and a surface area of 12.6 cm2.

You could make 260 small 3mm bubbles from the large bubble. They would have a total surface area of 83.6 cm2. This is 6.6 times the surface of the 20mm bubble.

The small bubbles, can theoretically aerate 6.6 times as much water with the same amount of air.

Knowing the importance of air bubble size, the effectiveness of different aerator systems becomes readily apparent!

LIVEWELLS

Livewells come in many shapes and sizes. Oval or round tanks provide the best circulation.

However, rectangular or square wells are satisfactory if there is a directional discharge into the well. The directional discharge will induce the more desirable circular motion.

Species that do not school, do not need a circular or oval container. Keep water flow to a minimum for fish such as bass, redfish, crappie, bream and walleye. They do not need a water flow for survival.

For shrimp, provide material in the well so they can cling and not be swirling about the well and become damaged. Leave a dip net in the well or tie a stone in a piece of cloth such as burlap.

AIR VERSUS OXYGEN

Oxygen will maintain higher quantities of fish, but extra care must be taken when using pure oxygen. To understand the fundamentals or air versus oxygen, each should be individually discussed.

AIR

A human breathes in oxygen and gives off carbon dioxide (CO_2). The CO_2 is then dissipated into the atmosphere.

A fish breathes in oxygen from the water and gives off CO_2. The CO_2 is absorbed into the surrounding water. The CO_2 is then dissipated into the atmosphere through the process of aeration.

An air bubble as it passes through water has the ability to put oxygen into the water and also absorb CO_2 as it passes slowly to the surface. The bubble then pops at the surface and the CO_2 is dissipated into the atmosphere. The smaller the bubble, the longer it remains in the water to exchange oxygen and CO_2.

OXYGEN

An oxygen bubble will insert a higher percentage of oxygen into water than a normal air bubble. This allows for higher quantities of fish in a given size of container, or it will make bait fish lively. However, an oxygen bubble does not have the ability to absorb CO_2. As the fish eliminates CO_2 in it's body, there will be a build-up of CO_2 in the livewell water. When the percentage of CO_2 equals that of the fish, the fish will be unable to expel the CO_2 and absorb the enriched oxygenated water. If a closed livewell does not have the ability to aerate and remove the CO_2, the fish will suffocate.

CAUTION: TOO MUCH OXYGEN WILL KILL YOUR FISH!

USING OXYGEN SYSTEMS

Theory suggests that large percentages of oxygen in water will turn your bait into star performers and attract more fish.

To increase the oxygen percentages higher than what would be normally found in the water entering your livewell, the intake pumps to the well should be turned off. Otherwise, oxygen enriched water produced by your oxygen system will be dumped overboard and defeat the purpose of producing livelier bait.

USING AERATORS WITH OXYGEN SYSTEMS

Aeration systems should be turned off when enriching water with higher than ambient levels of oxygen. When aerators are on, they will try to keep oxygen levels at normal conditions. You won't produce livelier bait, but they will remain healthy, Remember that oxygen cannot absorb and dissipate CO_2, so high levels of CO_2 in the water will eventually kill your bait. Watch your bait occasionally to see if they start to stress. If stress occurs, immediately start your aeration system or change the water in the livewell.

One recommendation when fishing tournaments, is to keep aeration and oxygen systems both operating until 20 minutes prior to reaching your fishing area. Then turn off the aeration or fill pumps to allow oxygen levels to build in the water, and time for the bait to increase physical activity. CO_2 levels will be low in the livewell, so more time can be spent fishing rather than observing your bait. When changing areas, replace the water or start the aerator.

FISHING OXYGEN INFUSION SYSTEMS

Fishing oxygen infusion systems are designed for use in a marine environment.
Warning: Not for medical use.

ALWAYS FOLLOW GOOD SAFETY PRACTICES WHEN USING OXYGEN!

Pure oxygen is not an explosive. It is an oxidizer and allows things to burn more quickly. Never smoke or have an open flame in the proximity of pure oxygen.

OXYGEN REGULATORS, DIFFUSERS, AND CYLINDERS

Fishing regulators use a CG540 valve to connect the regulator to the oxygen cylinder. The cylinder can be filled at most welding shops. They are never used for medical purposes.

Marine grade fishing regulators are exposed to the marine elements and are made of brass with nickel plating. Aluminum regulators can corrode in salt air and water, and should be avoided. They can be either a needle valve or rotating barrel with preset openings. Only small amounts of oxygen is needed to maintain fish so the first settings are very small.

Never lubricate or spray your regulator. This will contaminate the regulator and may render

it inoperative.

The diffuser is probably the most important item of your equipment. Inexpensive air stones waste precious oxygen. Bubbles are large and do not maintain contact with the water long enough, and are little use to good oxygenation. Diffusers are made of ceramic with tightly formed pores. The require 25 to 35 lbs of pressure to force the oxygen through ceramic pores, resulting in micro-fine bubbles. The bubbles are so small that they stay suspended in the water and the water absorbs the oxygen. Ceramic diffusers will give many years of service. If the pores clog at the surface due to impurities in the water, a light sanding on the ceramic surface will generally solve the problem.

Oxygen cylinders usually come in three sizes, made of aluminum to prevent rust spots on your boat, and use the CG540 welding valve. Use the largest cylinder that will fit on your boat comfortably. The cost of refilling a cylinder is generally the same, so there are substantial savings if you are fishing frequently.

Some welding shops have programs where you can purchase your cylinder and trade it for another filled cylinder immediately. The only disadvantage to this type of program is that the cylinders are steel and care must be taken to prevent rust spots on your boat.

Care must be taken to secure the high pressure cylinder securely to your boat. **Do not secure your cylinder in a closed compartment.**

OXYGEN GENERATORS

Oxygen generators are a new innovation to the fishing industry. In lieu of a regulator, diffuser, and high pressure cylinder, the oxygen generator takes outside air and filters it to produce 90% pure oxygen.

Oxygen generators operate with low pressures, so the delivery system must be different than ceramic diffusers that require high pressures to produce the micro-fine bubbles.

When the low pressure pure oxygen is fed into the air tubing of a KeepAlive Infusor, the micro-fine bubbles equal that of a ceramic diffuser.

The advantages of oxygen generators are:
1. Low pressure safety on a boat.
2. Mixing the oxygen at the impeller of the KeepAlive Infusor allows a circular movement of water in the well for proper schooling of bait.
3. The use of a T connection in the air line allows different mixing of pure oxygen and air to reduce CO_2 build-up.

SPRAY BAR AERATORS

Spray bar aerators add oxygen to the water by jetting small streams of water into the

surface. Some air is absorbed into the spray as it passes from the spray bar to the water surface, and when the spray strikes the water surface, air bubbles are injected into the water. For the most part, these bubbles are rather large.

Jets of water from spray bars are generally harsh to delicate bait. Their protective coating and scales are easily removed, and their survival is drastically reduced.

Spray bars are an inefficient aeration system, and should be used only on the hardiest bait.

AIR STONE AERATORS

Air stone aerators are an inexpensive way to keep bait alive in small containers. They are quiet and gentle, but because their bubbles are typically larger, they need a greater amount of bubbles for a large amount of bait.

Air stone aerators do provide gentle aeration, but they sustain less bait per unit of air than aerators that produce smaller bubbles.

VENTURI AERATORS

This is the much copied, old aeration technology. They can be purchased as a floating aerator or a bottom aerator with suction cups.

The fast-moving water at the output of the pump creates a vacuum, which suck air into the pump output. This system typically provides larger amounts of smaller air bubbles than previously discussed aerators.

Some models damage bait due to the high speed of water from the pump output.

THRU-HULL PUMPS

Thru-hull pumps provide a constant flow of new water into the livewell and eliminate the problems of heat and ammonia build-up. As long as clean water is available, more bait can be placed in a given amount of water than with any of the previously discussed systems. However, when entering water that is less than ideal for delicate bait, care must be taken to secure the intake water. By utilizing a combination of the thru-hull pump with other aeration methods, bait can remain healthy and lively for longer periods of time.

KeepAlive® Oxygen Infusion Systems

KeepAlive® Infusors are new, revolutionary Oxygen Infusion Systems.
GUARANTEED TO OUTPERFORM ALL OTHERS !
They might look like the competition, but their superior technology is completely different. Air is infused with the water at the pump impeller. The micro-fine bubbles produced, are

sent gently out of the pump and into the livewell, containing life giving oxygen.

KeepAlive® **Infusors are specifically designed for delicate shad, greenbacks and white bait. The millions of micro-fine bubbles are so small that they remain suspended in the water longer thus providing more oxygen for your bait and catch. Our smallest model will aerate from a 5-gallon bucket up to a 55-gallon drum or livewell, gently and efficiently.** ***KeepAlive®*** **Infusors will virtually disappear in a mass of micro-fine bubbles when used in salt water.**

The water speed is controlled by it's Air Control Center to allow fish to school in a stationary position.

KeepAlive® **Infusors are available as a bottom infusor with suction cups, a floating infusor, or thru-hull infusor. Conversion kits are available to convert your Rule bilge pump or Rule livewell pump to the exciting KeepAlive technology!**

KeepAlive® Infusors **are an investment that will save you time and money by keeping your bait healthy and lively longer than any other comparable aeration system. . . .** GUARANTEED!

Don't let your fishing trip end before its time,
just because your bait did!

Make *KeepAlive®* a part of your fishing gear!

***KeepAlive®* . . . the newest technology in aeration and oxygen systems!**