



# Aquarium Professionals Group

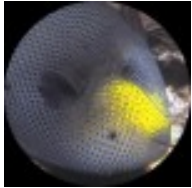
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## Ultraviolet Sterilizers & Ozonizers

### Part Two - Ozonizers



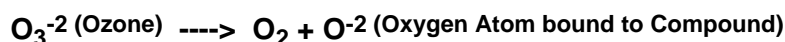
**Ozonizers** (or ozonators) are electronic devices that produce ozone (O<sup>3</sup>), a highly reactive gas that has the ability to oxidize anything it comes in contact with. Like ultraviolet sterilizers, ozone also helps to control undesirable microbes. Ozonizers have the added benefit of improving water quality by oxidizing pollutants, and they can also serve to add dissolved oxygen into oxygen-poor environments. At first glance, one may wonder why everyone doesn't have an ozonizer on their aquarium. The problem with ozonizers is that they are very expensive to use properly. If they are used improperly, they can cause severe damage to the health of the fish and possibly the fish owner. If accidentally introduced into aquarium water, ozone can kill fish faster than the waste that it neutralizes.

**Ozone is a highly reactive gas** that occurs in nature due to a reaction of oxygen with UV radiation from the sun and also from lightning discharges in the atmosphere. It is a hybrid, three atom form of oxygen. Ozone will react with nearly everything, including the plastic components of filters, making them hard and brittle over time. The most proper method of using ozone is in a separate (and expensive) reaction chamber specifically designed for the purpose. Both the air and water leaving the ozone reaction chamber should be treated with carbon to remove excess ozone so it will not harm the fish OR THE FISH KEEPER! Regardless of whether a reaction chamber is used, the amount of ozone released should be carefully controlled using an (also expensive) ORP meter/controller.

**The traditional method of using ozone** was to pump the gas into a protein skimmer. The ozone enters the skimmer via the air input that creates bubbles. At one time it was thought that this would enhance the foam fractionation process. Instead, it has been found that ozone actually interferes with proper foam fractionation by oxidizing undesirable liquid wastes so that they either become soluble in water or they flocculate (solidify) and become solids. Either way, these waste products cannot be removed as easily using a protein skimmer.

**Many aquarists report that their protein skimmers** seem to stop working after they add ozone, and we feel this is due to organics becoming soluble or forming solids in the skimmer reaction chamber. To compensate for this, the amount of air entering the skimmer should be increased. This may be accomplished with venturi skimmers by increasing the flow into the skimmer or by adding an air pump to the input of the ozonizer. If this is done, the water level in the skimmer should be set lower by increasing the flow out of the skimmer. The flow exiting the skimmer should pass through carbon to eliminate excess ozone that might enter the aquarium.

**We won't delve deeply into the mechanics of how ozonizers** produce ozone. Suffice it to say that some ozonizers use a special UV lamp which reacts with oxygen to produce ozone (3 atoms of oxygen bound together). Others may use a controlled electrical discharge to form ozone. Ozone will react with most organic and many inorganic compounds through oxidation. When the ozone encounters another compound, one oxygen atom will break away, attach itself to the compound, and oxidize it, leaving a molecule of oxygen behind in the water. Depending on the nature of the compound being oxidized, the compound may become more or less soluble in water. If the ozone does not react with anything, it will rapidly convert to oxygen molecules.



**Unlike ultraviolet sterilization which kills microorganisms** by destroying nucleic DNA via radiation, ozone kills microorganisms on contact by reacting with and eating a hole in their cell membranes (a process called cell-lysing). This cannot only destroy single-celled bacteria, algae and protozoa, it can also damage multi-cellular microorganisms. If ozone can destroy cell membranes, keep in mind that it can do the same thing to the sensitive gill membranes of fish and outer membranes of invertebrates. Ozone also can be harmful to humans. Ozone has a pungent "odor." Once you've smelled it, you won't forget it. If you smell it, you're using too much! The bottom line is that if you intend to use

ozone in your aquarium equipment scheme, you should consider using an ozone reaction chamber. Regardless of the method used, dosage should be carefully controlled with an ORP meter/controller.