

## The Protein Skimmer

Protein skimmers have been applied to use in marine tanks since the mid-60's. They are the only filter that completely removes most organics from the system before they are broken down biologically.

Ozone generators are very effective in conjunction with the protein skimmer, but this topic will be discussed in an upcoming 'Fish Talk'. Proteins and organic build up in a tank because it is a closed system. Without constant water changes you depend on your biological filter to breakdown waste (feedings, organic decay, fish waste) to nontoxic compounds or the least toxic forms possible. In order to keep this build-up to a minimum we should remove these organics in a complex form (before they break-down into nitrates). After a tank has been running for several months you will notice a slime coat floating on the surface of the water. This is a by-product of heavy organic waste build-up in your water. The skimmer does not actually skim this off of the top of the water, it removes it from the water so that it never builds up to the point of surface scum. An efficient protein skimmer which is maintained properly is so effective it can actually stop a tank 'WIPE OUT'. It is reported, Lundegaard (1985), that protein foam skimming prevents tank wipe outs (toxic tank syndrome) from accumulation of unknown toxins.

There are three basic types of protein skimmers available; *venturi*, *countercurrent*, and *cocurrent*. The first being the most effective and the last the least effective. A venturi skimmer draws air in with the water by use of a air pipe or tube. The combination of air and water is then pumped into the skimmer. Because of the high volume of water and consistency of bubble size passed through the venturi, it will be the most effective if properly designed.

The countercurrent and cocurrent skimmers use a limewood air stone in conjunction with a strong air pump to produce very fine bubbles. The larger the unit (in height) the more effective it will be. The height of the unit changes the contact time between the air and water, and the greater the time the more effective the unit. The difference between these two (cocurrent and countercurrent) is the direction of the water flow. In countercurrent the water flows in the opposite direction of the air bubbles producing longer contact time and higher flow rate.

One of the biggest misconceptions is 'I do not need a protein skimmer because my tank has no invertebrate inhabitants!'. In a reef tank the invertebrates will display symptoms of poor water quality before fish will. Anemones and corals will not open as much as they should and may even die off without a protein skimmer. Fish will live in water which is not top quality, but since they cause a much higher biological load and are fed much more, the skimmer is just as important. It will actually remove much more toxins from the fish tank than the invertebrate

tank. In these times the constant battle to keep nitrates down is also helped by removing the complex organic compounds.

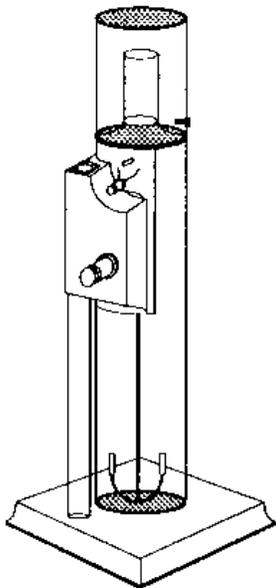
A protein skimmer is a very simple installation on a tank that has a wet/dry sump below the tank. An inexperienced hobbyist can usually grind through the plumbing in fifteen to thirty minutes and then reap the benefits of their new addition. Well, with most upgrades on your tank you install it and that is it, but you should be forewarned that your new skimmer will need the air stones replaced bi-monthly and may require fine tuning once in a while. Remember, in order for your skimmer to perform its miracles it must be operated properly.

### **Technical Addendum**

The technical term for 'protein skimmer' is foam fractionation. The process involves mixing air, in the form of fine bubbles, and salt water. Proteins and other dissolved carbon compounds adhere to the surface of the bubbles as they rise, forming a foam at the surface. The foam is then collected off, removing the proteins and other organic compounds from the system.

Surfactants are molecules that are attracted to the surface of the water. These molecules form the stable coating on the bubbles at the surface to form a temporary base for the foam. The water will begin to drip back down leaving a dry foam if sufficient proteins are present. When the skimmer is adjusted optimally, for a dry foam as compared to wet foam, loss of trace elements is kept to a minimum.

Two additional benefits gained by using a protein skimmer are excellent aeration and higher redox potential. These are both of great value to all the inhabitants of the tank and add to the reasons for installing a skimmer on your system.



**Protein Skimmer**