



Setting Up Your Sand Bed

Keeping a salt-water tank has become easier than ever. When I first started in this hobby, I was advised to *read and understand* the water chemistry that is involved in regulating water quality. I read one of Martin Moe's books, for starters, which made a difficult subject palatable. Studying to understand the Seawater Buffer System reminded me of the chemistry class that I hoped that I would never have to return to. I found that I needed to have the salinity held within a specific just like today but I also had to keep my pH stable and my alkalinity in line as well as keeping my calcium above a certain

level, plus the other components that I had to balance. I almost forgot the point of the hobby, to keep fish and invertebrates.

After reading what Dr. Adey had to say about the benefits of sand beds, I ran across the Jaubert method of setting up a plenum system. This seemed to be a refinement that was useful for the home aquarium. I did some research, and then set up my sand bed roughly as specified in the many articles based on his work.

A sand bed that is set up well can go a long way towards creating stable water chemistry. Of course the more reading that you do the better but it

is no longer an absolute necessity to understand all the inner workings of the biological and chemical systems that come into play in the modern salt water tank.

Although I have used only a sand bed and very good aeration to maintain my tank for as much as a year at a time, I advise beginners to also use some of the more standard methods of controlling waste products in the tank. You can start with a good protein skimmer or algae scrubber, as well as carbon, and the like. An experienced sales person should be able to give you an overview of the processes that are important in your tank, and give you

good advise on what to buy within your budget.

As I understand it, and simply put, the Jaubert style sand bed (as most commonly used today,) is a layer of aragonite gravel with a thicker layer of aragonite sand on top of it, all supported by an open space of water called a plenum. This plenum does not have flowing water forced through it by a pump like a normal under gravel filter. This semi-stagnate cavity mimics the reactions that take place in deeper sediment beds of the ocean. Different bacteria populate different parts of the structure according to the amount of oxygen that gets there. These bacteria reduce the amount of three major waste products that are found in the water of the entire tank: ammonia, nitrites and nitrates. These bacteria also slightly acidify the water in the bed to slowly dissolve the sand. This is called dissolution. If the pH in the aquarium itself is low it can dissolve more of the sand, which releases buffers. These buffers work to bring the water back into the normal range. As the sand dissolves it also helps regulate several element levels like calcium, carbonate and strontium that are used up as corals build their skeletons. This is greatly over simplified, but that is how a Jaubert style sand bed works.

To build my sand bed I purchased 5/8" PVC pipe and cut it into 2 to 4 inch pieces with a hack saw. I placed them on the bottom glass in the tank. I arranged them at random angles, about 4 to 6 inches apart. This provided enough support for the fluorescent light diffusers (called egg crate,) along with all the sand and gravel that went on top of it. This diffuser is made of non-coated plastic. I bought my egg crate at Lowe's but it is sold in many hardware and lighting stores. I added extra pieces of pipe where there were seams in the egg crate and at the outside edges of the tank. Some people cut their pipe into lengths that go from one end of the tank to the other. Then they drill holes through the pipe every few inches to provide water flow. I personally found, that for me, cutting the pipe was easier than drilling it. The short supports, open at both ends, ensure lots of open space for water to flow around in and through

the 1-inch deep plenum. They also use much less pipe. I used my hand to push down on the egg crate at several points to double-check the placement of the supports.

I built my plenum so that it stayed about 6 inches off from the front of the tank. This allowed me to lower the level of the sand as it meets the glass. My sand bed is about 6 inches deep in the middle and back of the tank but only 2 inches deep at the front. I also kept the egg crate about a half-inch or more away from the glass on the other three edges. This allowed me to stuff extra screening in the gap so that sand did not get past this barrier.

I placed fiberglass screen over the plenum, extending beyond the edges of the egg crate and down to the glass bottom plus a couple more inches. I was careful to overlap any seams by a few inches. I also did not allow any sand to form a channel between the pieces of overlapping screen that the worms could use to get through. On top of the screen I added about one inch of Florida Crushed Coral. I covered that with another layer of screen. This time I extended the screen out to the glass and up the edge about an inch or two. I pressed this extra screen down into the sand toward the glass bottom and let just a little bit of crushed coral to fall between the glass and the screen. This was done so that the screen would not show. Finally, I added another 2 to 4 inches of Sea Floor Special Grade Reef Sand to the tank. Carib Sea Inc. makes these products. I let the level of both the crushed coral and the sand drop at the front of the tank to get a better appearance. You want to have the sand be as deep as you think will look good in your tank.

Dick Perrin is a successful invertebrate farmer at Tropicorium Inc. He currently uses more than 20 tons of aragonite, of one-grain size or another, in different applications. He does not need all of his tanks to look good through the front glass. Many of his tanks don't even have front glass. He told me that some of his fastest clam growth was in a tank with no plenum but had very deep sand stacked in it for storage purposes. There was more biological dissolution in the deeper bed, so there were more minerals available

for the clams to use to grow their shells. Since then he has found that, in general, deeper is better. Deeper sand or gravel beds are getting more popular where aesthetics are less important like mariculture and sumps.

He also suggested that you can use a pump to suck water down through the bed and out of the plenum, like a standard under gravel filter, for about a week or so to get the bed quickly seeded with bacteria. Then remove the pumping action and seal the hole. The structure will quickly change over to its intended use. Some of the bacteria that uses more oxygen will either switch to low-oxygen bacteria, or die off and provide food for others that require lower oxygen levels.

These bacteria that thrive in oxygen poor areas are called "anaerobic" and are present throughout the tank, including the sand bed in comparatively small numbers. These anaerobic bacteria quickly take over in the plenum and the lower levels of the gravel bed when the water within the area begins to change into a semi-stagnate condition.

If your tank is new, you should get a couple of pounds of sand from an existing tank to provide a starter culture of bacteria. I have used Sure Start from Precision Aquarium Products Inc. to start a tank in the past. I used Coral Vital Live Sand Booster from Marc Weiss Companies, Inc. in my most recent tank set up to stimulate bacterial growth.

Berlin Systems usually have a bare tank bottom, but some hobbyists are starting to use oolitic sand like Aragamax from Carib Sea inc. to form a single thin layer of sand on the bottom. Since water contact through the thin layer is not important, they use this smaller grained spherical sand to provide more surface area for bacteria to grow on. Although this is a good idea for a Berlin System, I do not advise using smaller grain sand on a Jauber-style system because the plenum depends on good water contact within the bed for best diffusion rates and therefore best over all results. In other words, water needs to drifts, slowly but freely, through the bed to work well. Larger grain sizes can give you more water space between the granules. Using the proper size grains is important. Having well graded sand provides more water space or "pore

water” between the grains. That is why you should be careful not to mix the coral gravel with the sand. Oh, and by the way, DON’T use beach sand. It can be made of the wrong material (silicate) and which sometimes cause diatom growth that is like a fine brown powder. It can cover your invertebrates and you don’t want that.

In conclusion, a good sand bed can make your tank easier to maintain and more stable. It will provide a backup system that can reduce the chances of some small problem turning into a big one. It will make your experience with this hobby more enjoyable because you will be able to think less about your water quality and instead, get into the fun of watching things grow! Good luck.