**Water Quality Parameters**

**1. Temperature.** This should be in the region of 27-30 C. Sustained temps over 30 C are not healthy for corals or clams.

**2. pH.** This is a measure of the amount of Hydrogen ions in the water. Seawater has a pH range of 8-8.25. A range of 8-8.5 is good. Carbon dioxide in the water is partly responsible for tank pH. The more carbon dioxide the lower the pH as carbonic acid is formed. Also organic acids and phosphate tend to lower the pH. Also the nitrification process of biological filtration helps to lower pH.

**3. Alkalinity.** This refers to the ability of the water to buffer against drops in pH. Seawater has large buffering capacity but over time this can be eroded in a closed system. Alkalinity should be maintained between 2.5-3.5 meq/L. Alkalinity is adjusted through addition of buffers or Kalkwasser (see later) which adds hydroxide and calcium ions to the tank.

**4. Salinity.** Tank salinity should run between 30-35 ppt (g/L). Salinity is maintained by addition of freshwater and is measured using a refractometer.

**5. Ammonia and Nitrite.** Ammonia is excreted by fish and other animals as a waste product of protein breakdown. In addition, excess organic matter such as something dying can produce Ammonia. Ammonia occurs in two forms the non toxic NH4 molecule and toxic NH3 molecule. High pH increases the amount of the toxic form of ammonia. Nitrite (NO2) is formed by the nitrifying process. When this happens an H ion is released which helps to lower pH. In an established tank there should be no detectable ammonia or nitrite.

**6. Nitrate.** This is the final stage in the nitrification process. It is not greatly toxic and can occur at up to 10 ppm or higher. However, high Nitrate levels can lower alkalinity.

**7. Phosphate.** The main problem with phosphate build up in the reef tank is that it fuels unwanted algal growth. Levels should be kept below 0.1 ppm. Overfeeding is the main cause of phosphate build up in the reef tank. Phosphate will be taken up by living plants in the tank and also removed by the skimmer.

**8. Oxygen.** With plenty of circulation in the tank low oxygen will never be a problem in a tank. Seawater holds less oxygen than freshwater but oxygen levels in the tank should be around 7 ppm.

**9. Calcium.** This is an essential element for coral, invertebrate and coralline algae growth. Levels in seawater are usually 380-480 mg/L (ppm). In a closed system Calcium should be maintained at 350-500 mg/L. Calcium must be added to the tank and the easiest way to do this is using Kalkwasser or Limewater. This is a saturated solution of calcium hydroxide or calcium oxide. Both these compounds hardly dissolve at all so each gallon of makeup water will only have 6 g of dissolved calcium. To make up the solution an excess of either chemical is added to distilled or bottled water and shaken vigorously. It is then left to settle for several hours before the clear solution is siphoned off and added to the tank. It is better to discard the undissolved portion. Always use the solution fresh (less than one day old).

Kalkwasser mix is available from aquarium suppliers and often also contains other necessary supplements such as strontium and iodine. Kalkwasser has a pH of 12 so it is important to only add small amounts at a time. It has an added advantage of removing phosphate from the water and maintaining alkalinity.

**10. Trace elements and supplements.** The main elements necessary to supplement to the tank are strontium, iron and iodine. Other trace elements will also become depleted from the tank over time. Exchanges of seawater will help to alleviate problems associated with a lack of these elements. In addition, multi-supplement mixes are available that can added in the makeup water. A single jar of these products will treat many thousands of gallons of seawater.