Are You Damaging Your Aquarium Pump With Reef Supplements?

by John Tullock

How many of you reef hobbyists routinely add two- and three-part reef supplements into the sump? How many of you add both calcium and alkalinity supplements at the same time? Doing either of these things runs the risk of damaging calcium carbonate deposits building up on the system pump. Other factors can increase deposit formation, as well. Proper maintenance and correct water chemistry can help avoid pump damage and maintain your system pump's designed efficiency.

Importance of Calcium Carbonate to Corals

Corals extract both calcium and carbonate ions from seawater in equal molar ratios. That is, each calcium atom is paired with a carbonate ion to form the calcium carbonate lattice of the coral skeleton. For this reason, both calcium and alkalinity (in large part due to carbonate concentration) decline over time in an aquarium of growing corals, making supplementation a necessity. Because the rate at which calcium is depleted depends upon numerous variables, including temperature, types of corals, how much they are fed, and so forth, it is impossible to prescribe a fixed supplementation rate for all aquariums. Each tank must be treated individually. However, as a general rule, once the rate of calcium depletion is known, supplementation can be undertaken with the assumption that the rate will not measurably change unless more corals are added or something else alters the status quo.

Carbonate Deposition on Pumps

If you take any two-part reef supplement product and mix the calcium and alkalinity parts together in a glass tumbler, you will immediately see the milky white precipitate of calcium carbonate form and eventually settle to the bottom of the tumbler. Preventing damage to expensive pumps depends upon avoiding situations where this same type of precipitation is favored in the aquarium.

In a typical reef aquarium, calcium carbonate is at or near saturation. Its precipitation from the water is a function of several factors: pH, alkalinity, temperature, magnesium concentration, and iron concentration. Precipitate formation occurs naturally in the ocean, and may also occur in the aquarium. This is a problem only when the precipitate is deposited where it may cause damage, such as on the outside of a heater, or especially on a pump shaft.

Elevated temperature is the primary factor encouraging calcium carbonate deposition on heaters and pumps. In the case of pumps, in particular, the process can become a vicious cycle. Deposits on the impeller shaft increase friction, in turn increasing the temperature of the shaft and exacerbating the deposition of more calcium carbonate. Not only do these deposits measurably reduce the pump's efficiency, they also have the potential to cause pump failure if left unchecked.

As part of routine aquarium system maintenance, pumps should be disassembled and inspected regularly for calcium carbonate build-up. Check manufacturer's recommendations for cleaning your pump. Most of the time, vinegar will be sufficient to loosen deposits, which can then be removed with a

soft brush. Rinse the pump components well with tap water before re-assembling. It is easier and less time-consuming to avoid calcium carbonate build-up, rather than frequently cleaning the system pump.

Ironically, the most efficient, higher tolerance pumps are more easily damaged by calcium carbonate deposits, which create irregularities between the shaft and its bearing that increase friction.

The Role of Seawater Chemistry

Avoiding calcium carbonate precipitation in the first place requires paying attention to the factors that promote it. Look at the various published recommendations for aquarium seawater chemistry and aim for parameters that are at, or slightly above, natural levels. The aquarium pH should be maintained around 8.2, and in no case should it rise above 8.5, even at the end of the day. Similarly, alkalinity should be around 2.5 milliequivalents per liter. The magnesium concentration should approximate 1300 ppm. Magnesium at the normal seawater level helps to inhibit calcium carbonate precipitation. Use a magnesium test kit and a supplement to maintain the appropriate level. Do not over use iron supplements, as too much iron can encourage carbonate formation. Attempting to "supercharge" the tank with extremely high levels of calcium or high alkalinity may result in rapid coral growth, but may simultaneously create significant damage to system components. Being aware of this allows the individual aquarist to judge whether the trade-off is worth it.

Technique Matters

When using any form of two-part calcium and alkalinity supplement, do not add these components to the aquarium simultaneously. Wait a few minutes, at least, for each component to fully disperse before adding the other one. Don't add products directly to the sump or to areas where they will quickly be drawn into a pump. It is much better to add the product directly to the aquarium tank, ideally where the outflow from the pump will disperse it within a couple of minutes. Alkalinity supplements containing sodium carbonate may produce a fine white precipitate immediately upon addition to the aquarium. This is most likely a magnesium compound that should disperse and will re-dissolve quickly.

One of the most important factors concerning carbonate precipitation is the pH. For a given alkalinity reading, as the pH increases, the level of carbonate saturation also increases, making calcium carbonate precipitation more likely. Thus, adding supplements early in the day, before the lights are turned on and when the pH is typically lowest, is the strategy most likely to avoid precipitate formation.

Summary

To summarize, because of the higher temperature adjacent to the pump impeller shaft, this critical system component is at risk of damage from calcium carbonate deposition. Avoiding calcium carbonate deposition in general involves adhering to the following recommendations:

- Add calcium or alkalinity supplements directly to the tank, in an area of high water movement
- Add supplement early in the day, when the pH is lowest
- Maintain an average daily pH of 8.2, and in any case below 8.5

- Maintain an average alkalinity near the natural seawater level of 2.5 milliequivalents per liter
- Keep magnesium at an average concentration of 1300 ppm, using a test kit and a supplement
- Use iron supplements according to the manufacturer's directions, avoiding an overdose
- Regularly inspect pump components and remove calcium carbonate deposits if needed

Sicce USA has posted a troubleshooting guide to their pumps:

http://sicceusdealers.com/warranty/pdfs/troubleshootingguide.pdf

Also check out Sicce's video for the method of disassembling their pumps and removing calcium carbonate deposits: https://www.youtube.com/watch?v=4jucEJnlWjI&feature=youtu.be

Don't Forget:

Proper maintenance, a few simple techniques, and attention to seawater chemistry will help to insure that your system pump has a long, efficient, and fully functional lifespan.