

# Salt crusts and Lime scale



AquaCare GmbH & Co. KG  
Am Wiesenbusch 11 - D-45966 Gladbeck - Germany  
☎ +49 - 20 43 - 37 57 58-0 • 📠: +49 - 20 43 - 37 57 58-90  
www.aquacare.de • e-mail: info@aquacare.de



Lime scale is a natural process and occurs at many places of the earth. In the aquarium these crusts are unwanted and may cause large harms.  
photo (AquaCare): Lime sinter terraces "Mammoth Hot Springs" in the Yellowstone National Park, USA

## Characteristics of lime scales and salt crusts in the sea water aquarium

Sea water and some other salt solution (e.g. potassium chloride inside of pH probes) tends to creep. That is that salts dissolved in water are able to creep through fine openings or cracks but without flowing water.

As a result at places like o-rings, unions, ball valves and tank connectors salt will get out and creates big salt crusts. Strictly at all connections that are not air-tight salt crust will occur.

Dissolved chalk in sea water consists of calcium and hydrogen carbonate ions. The solubility is strongly depending on temperature, pH value, pressure and total salt content. If the solubility is exceeded solid calcium carbonate = limestone precipitates. This occurs easily during the daily pH oscillations. Especially at warm parts (heaters) or places with varying pressures (inside the pumps and skimmers) lime scale is a normal E1KALKAB.DOC, Mrz. 12, Seite 1

process and we must live with this. Lime incrusting animals and plants (corals, coralline algae, foraminifers and many others) support the forming of lime.



Lime forming feather duster worms, foraminifers and others are forming filigree structures of lime.  
photo: AquaCare

Lime scale may cause considerable damages. Incrusted pump will stop and may induce catastrophes up to total failure of the live support system (LSS). Very cheap and small pumps may burn if they get power but cannot run. Heaters are critical components, too. Especially the small heater with high power may form crusts that hinder the heat exchange. If a heater is not protected from overheating it may burn out or the glass cracks. The consequence is a short circuit that stops the whole LSS (if it is not build redundant). After a short time – and these incidents

occurs at the weekend of if the aquarist is on holiday – all life is destroyed.



A heater that is not maintained regularly forms lime scale and ...  
photo: AquaCare



... will overheat. A cracks glass will bring death if a residual-current circuit breaker is not installed.  
photo: AquaCare

## Preventing salt crusts

To prevent salt crusts is very easy:

- Take care that all tube and hose connections are air-tight. Main-

tain the o-rings regularly. If they are flat you have to change them. Do not forget to grease them with silicone fat or oil.

- Tank connectors should be glued with silicone adhesion to the glass hole (do not forget to clean the surfaces very carefully). Do not use the flat packing. With the time they are not air tight and salt will creep through it. Normally you cannot change an old flat packing.
- Objects reaching the sea water, e.g. pumps like "Turbellen", can be grease about 1 cm over the sea water surface. The salt crust will not go behind this layer.
- If you wipe salt crust with a wet clout do not forget to dry these surfaces. Otherwise the salt creeps very fast over these places.

### Preventing lime scale

- Avoid large pH oscillations: work with the chalk reactor (CO<sub>2</sub> driven) at day and works with the chalk mixer (with calcium hydroxide) during the nights. Increase the KH to minimum 7°dH but not more than 12°dH.
- Never increase the calcium concentration over the optimum of 450 mg/l. Measure the calcium concentration regularly (once a month).
- Magnesium should be around 1350 mg/l. If the concentration drifts too much calcium tends to precipitate more faster. Measure the calcium concentrations very regularly (once a month).
- You cannot prevent all lime scales. Therefore:
  - Maintain rotating parts regularly, e.g. rotors of pumps. Do clean the pump before they get loud or stop.
  - Take tubes and hoses one diameter large than optimal. With the time the diameter narrows by lime scale.
  - Especially maintain the heaters very carefully.



With the years sea water filled tubes are covered with lime crusts generated chemically or biologically. The flow resistance rises. If you cannot clean tube every 1 or 2 years you must calculate one size larger to make sure to get enough water through the system.  
photo: AquaCare

### Removing lime scale

If scales have occurred you must remove them. Some scales you easily wipe off, especially salt crusts or mixtures of salt and lime. Solid scales may be removed mechanically or chemically.

If the surface is very insensible you can scratch the scales away. Use an old screw driver or similar tools for this. But take care of your hands.

Sensitive surfaces or filigree structures like rotors of pumps should be clean chemically. Lime scale can easily get off with acids. Suitable for cleaning are vinegar essence (acetic acid), formic acid (coffee machine cleaners), citric acid and diluted hydrochloric acid. Others like sulphuric acid, phosphoric acid and nitric acid should not be used because of the high risk for you and your animals.



If you handle with acids you **MUST** use gloves (chemical resistant quality) and protective goggles.

Never use concentrated acids – even the diluting is dangerous if you do not do this professionally.

Never use metal matters: e.g. sinks made of stainless steel will corrode very fast with acids. And you get trouble with your wife or mum if you wreck the kitchen sink.



Before chemically cleaning the parts should be washed with water to remove the dirt. If you dip the parts into the acid the lime scale is dissolving. The forming carbon dioxide is raising. If bubbles are formed any longer all lime crusts are eliminated.

Take out the part and flush it very carefully with clear water.

Exhausted acid is not able to form carbon dioxide bubbles any longer. You can drain exhausted acid without problems into the sink. Use a lot water.