Reef Tank Chemistry

Dosing, Precipitation & pH Management

A practical guide to Calcium, Alkalinity, Magnesium & Kalkwasser

Understanding why parameters drift — and how to fix them

The Big Three Parameters

Alkalinity

Target: 8 – 10 dKH

NSW: 8.5 dKH

Fuels skeletal carbonate deposition. Most volatile parameter — test 2–3×/week. Swings of 1+ dKH in 24hrs cause coral stress.

Calcium

Target: 420 – 450 ppm

NSW: 425 ppm

Primary building block of aragonite skeleton. Consumed proportionally with Alk. Never dose one without the other.

Magnesium

Target: 1250 – 1350 ppm

NSW: 1285 ppm

Keeps Ca & Alk in solution by inhibiting unwanted precipitation. Above 1400 provides no added benefit and can cause problems.

Stability matters more than hitting a specific number. Consistent 8.5 dKH beats fluctuating 9.5 dKH every time.

What Causes Calcium Carbonate Precipitation?

⚠ Root Causes

Localized supersaturation

Concentrated Alk dose meets Ca-rich water near the dose point — aragonite crystallizes instantly.

Dosing Alk >> Calcium

Chronic carbonate excess with no proportional Ca offset keeps ionic ratio out of balance.

Mg above 1400 ppm

Excess Mg^{2} ions compete with Ca^{2+} and destabilize the Ca-Alk equilibrium.

Still water zones

Low-flow areas (sump baffles) let high-pH kalk water dwell and react with carbonate.

The Precipitation Loop

1. Alk drops below target
2. Correction bolus dosed
3. Carbonate spikes locally
4. Precipitates with Ca on surfaces
5. Alk reads low again (lost to precipitate)
6. You dose again → loop repeats

Kalkwasser: Friend or Foe?

What Kalkwasser Does

- ✓ Raises Ca
- ✓ Mild Alk contribution (via hydroxide/CO_2 reaction)
- ✓ Raises pH — most effective during nighttime pH dip
- ✓ Replaces evaporation passively

pH-Triggered Dosing Risk

If daytime pH is suppressed (e.g. by CO_2), the trigger fires around the clock — delivering far more Ca than evaporation replacement alone warrants. This floods the system with Ca, driving ionic imbalance and precipitation when combined with continuous Alk dosing.

Delivery Location Matters Enormously

✓ Ideal

High-turbulence entry point (overflow box). Kalk at pH 12+ mixes instantly and dilutes before reaching the sump.

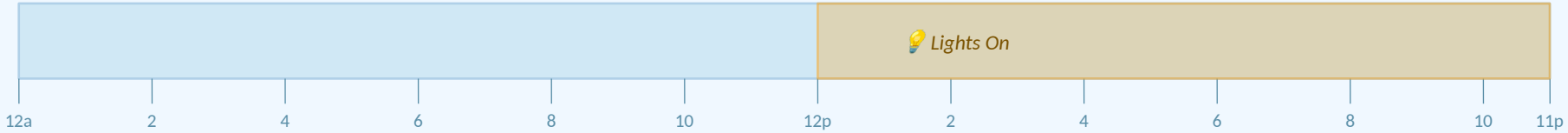
✗ Risky

Still sump baffle sections. High-pH kalk water dwells and reacts with carbonate Alk — perfect precipitation conditions.

✗ Risky

Same zone as two-part dosing. Kalk + concentrated carbonate Alk in the same low-flow area = precipitation reactor.

Optimal Dosing Schedule (Noon–11pm Light Cycle)



9pm – 11am (14 hrs)
Covers full pH dip window

CALCIUM

1pm – 7pm (6 hrs)
Midday, lights on

MAGNESIUM

11am – 12pm (1 hr)
Clean buffer gap

Key principle: Minimum 2-hour gap between Ca ending and Alk starting — and between Alk ending and Ca starting. Never let windows overlap.

How One Blocked CO_2 Scrubber Cascaded Into Everything

1. Scrubber 100% blocked

No air through media. Skimmer pulls CO_2-laden room air directly into the water column.

2. CO_2 injected into tank

Continuous CO_2 from office breathing suppresses photosynthesis systemwide — coral, chaeto, all affected.

3. Daytime pH ceiling collapses

pH drops from 8.35 peak → stuck at 8.08–8.11 around the clock. No natural diurnal swing.

4. Kalk trigger fires continuously

pH never climbs above trigger — kalk drips all day. Far more Ca delivered than evaporation replacement.

5. Ca + Alk ionic overload

Excess kalk Ca + continuous two-part Alk + still sump sections = non-stop precipitation on glass and surfaces.

6. Scrubber fixed → recovery begins

pH climbing again. Chaeto resuming growth. Precipitation will slow as ionic load normalizes.

Kalkwasser Trigger Recovery Plan

As the CO_2 scrubber restores daytime pH, step the kalk trigger threshold upward gradually. Goal: kalk fires primarily at night.

When Daytime pH Consistently Reaches	Move Kalk Trigger To	Expected Timing	Effect
Currently (recovering)	**8.12**	Now	Reduces continuous daytime firing
8.17 – 8.20	**8.15**	~2–3 weeks	Kalk shifts toward evening/night
8.25+	**8.20**	~4–6 weeks	Daytime firing becomes infrequent
8.33 – 8.35 (full recovery)	**8.25**	~8+ weeks	Kalk fires mainly 11pm – 11am

At full recovery: Kalk fires nocturnally (11pm–11am), replacing true evaporation and providing gentle pH floor support. Two-part carries the calcification load during the day. Clean division of labor — the system self-regulates.

Your Action Plan

Immediate

- Move two-part doser to refugium discharge port
- Raise kalk trigger from 8.08 → 8.12 pH
- Confirm Ca:Alk dose ratio is 1:1 (25ml:25ml for Red Sea)

This Week

- Test N & P with Hannah checkers for baseline
- Verify kalk drip enters overflow box (high turbulence)
- Begin observing pH curve daily to track recovery

Ongoing

- Step kalk trigger up as daytime pH recovers (see table)
- Harvest chaeto regularly as growth resumes
- Retest and recalibrate two-part dose after precipitation stops

Expected outcome: Within 3–4 weeks, precipitation stops, parameters stabilize, and Euphyllia health improves measurably.