

High Pressure Rusting

a problem with high pressure steel tanks?

A breath of fresh air is something we all take for granted, even when that air's been bottled up inside a tank. But for diver Mike Daniels, who was diving with Aldora Divers in Cozumel last November, the air that came his way was anything but. He was in a swimthrough with 1800 psi in his steel tank when he suddenly found himself unable to draw any air at all from either his primary or alternate supply. Fortunately, Aldora's divemaster, Alexandra, was quick to respond, and they ascended normally with a five-minute safety stop. When they got back on the boat, they discovered that both the tank valve and first stage were completely clogged with rust that Daniels felt could only have come from Aldora's steel tank.

Daniels was understandably upset, and Dave Dillehay of Aldora Divers bore the brunt of his wrath. Like many divers, Dillehay likes steel tanks, saying that the extra air capacity "provides a real extra margin of safety" on long dives. (He also points out that aluminum tanks aren't corrosion-free either, although oxidation doesn't tend to accumulate as rapidly as with steel tanks.) Dillehay had believed Aldora's routine six-month tank inspections were frequent enough to detect any problems before they became serious. In fact, Dillehay says that Daniels' tank had been inspected in September and was clean at the time of inspection. He believes that the rapid contamination was the result of seawater incursion that probably occurred when a tank was emptied during

an unsupervised beach dive, and Aldora has since banned the use of steel tanks on beach dives. They've also stepped up maintenance

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efforts: they completed a visual inspection of all tanks within a few days of the incident, and, from now on, each tank will undergo an inverted, agitated flow test each

month and be visually inspected every six months.

It's hard to believe that a tank can rust as quickly as Aldora's apparently did, but studies have shown that seawater, tank pressure, and tropical temperatures all significantly accelerate oxidation. In 1976, for example, the University of Rhode Island tested new pressurized cylinders to which they'd added 500 ml of salt water. The tanks were stored in a horizontal position at a temperature of 105° F. for 100 days. By the end of the test period, tanks were already severely corroded, and some had lost over two-thirds of their wall thickness. Because tanks that contained fresh water or were unpressurized or stored vertically had significantly less corrosion, the study recommended handling procedures such as fresh water rinsing and drying, storing tanks with minimum pressure, and storing them in a vertical position.

Ombudsman: Nekton 2000 Buoyancy Compensator

At first, reader Bill Dognin (San Mateo CA) liked his Nekton 2000 buoyancy compensator — at least until, during the course of his sixtieth dive or so, the integrated weight pouches fell out of the BC. Worried that losing his weights might turn into a major safety problem, he wrote International Divers Inc., which manufactures the Nekton 2000. When he still hadn't received a response a couple months later, he turned to *Undercurrent* in the hope that we might solve his problem.

I called International Divers and spoke with Customer Relations' Debbie Taylor. Although her records indicated that they had responded to Dognin's letter, she agreed to help me with his problem. Apparently Dognin wasn't the first person to have trouble keeping his weights inside his BC: any time weights weren't fastened "very securely," she told us, they tended to fall out. International Divers finally solved the problem by designing a modified version of the pocket of the BC, which they will fit at no cost.

Owners of a Nekton 2000 buoyancy compensator should call 800-257-2822 to receive an authorization number and shipping information, then pack up the BC and send it back to them. While Taylor said this information was printed on the warranty card included with the unit, any readers who skipped the fine print can now upgrade to a safer unit.

— UC Ombudsman

Since high-pressure steel tanks are gaining popularity, what else can dive operators do to make sure that their tanks remain rust free? *Undercurrent* spoke with Paul Caputo of Quiescence Diving Services in Key Largo, who handles high-pressure steel tanks in large volume. According to Caputo, frequent inspection is important, but, because even a little water can be the start of a serious rust problem and corrosion can occur very quickly in tropical temperatures, Caputo emphasizes the importance of keeping water out of tanks in the first place. Since air pressure inside the tank tends to keep water out, tanks are most likely to take on water either when the tanks are filled or if they've been emptied completely during the course of a dive, allowing water to be drawn in.

Tanks are vulnerable to taking on water during filling because some tank valves tend to catch water from boat spray or other sources. If the valve isn't cracked open briefly and blown out before installing the fill whip, the water sitting in the valve will be pushed into the tank when it's filled. If a

The Simple Hammer Test

Want a simple test to find out if a steel tank is rust-free? The Compressed Gas Association still recommends an old-time method, the hammer test. It's as simple as it sounds: hit the sidewall of an empty, unpressurized tank "with a light blow using a half-pound ball-peen hammer or equivalent," and if the sound you hear is a clear bell tone, the tank is clean and free of corrosion. If the sound is dull or dead, however, suspect contamination with fluid, corrosion, or other foreign material and have the tank inspected. Also, bear in mind that the test is not effective on aluminum tanks.

large percentage of tanks at an operation had rust problems, Caputo said he would suspect that water was being introduced during filling. Since Aldora found contamination in only a few of its tanks, however, it's more likely that contamination occurred when these tanks were emptied during dives (which was also Dillehay's assessment of the problem). Quiescence's own tank maintenance program calls for visual inspection of all tanks three or four times a year and immediate inspection of any tank that comes back empty. Additionally, tank valves are always opened briefly to blow out any water sitting in the valve before the tanks are filled.

Obviously, the thousand-dollar question is, "Are the tank maintenance efforts in place at Aldora and other operations adequate to prevent other divers from experiencing the problems that Daniels did?" Dave Dillehay obviously thinks so. In fact, Dillehay's so confident that they have a handle on the problem that he gave *Undercurrent* a thousand-dollar answer: "Pay \$10 to open any Aldora tank, and I will pay \$1000 for every flake of rust found. For those truly convinced of our lingering 'serious tank problem,' that could be an easy way to pay for their next dive vacation."

— John Q. Trigger

The Politically Correct Guide to Eating Fish

Jacques Cousteau, Rachel Carson, and ... Carl Safina? Yes, this is a list of authors of classics of marine ecology, and reviewers really are bandying Safina's name around with such august company. Elliott A. Norse, president of the Marine Conservation Biology Institute, says it straight out: "the best writer about the sea

since Rachel Carson." Stephen Colwell, executive director of the dive organization CORAL, says Safina's book, *Song for a Blue Ocean*, "captures the good, the bad and the ugly of what is going on in the world's oceans." Bert Jones and Maurine Shimlock, authors of *Secret Sea*, had the strongest reaction of all: by the

time they'd reached the end, they'd decided to give up eating fish — even sushi!

For those of us who aren't ready to make a commitment of that magnitude, a sliding scale to let us know just how much damage we're doing appeared in a past issue of *Audubon*. The scale, which Safina himself prepared, ranks marine species from populations in abundant supply to species in serious trouble. It considers such issues as the species' current status, its management history, and ancillary