Breathe Free or Die

Performance Diver bites the big one

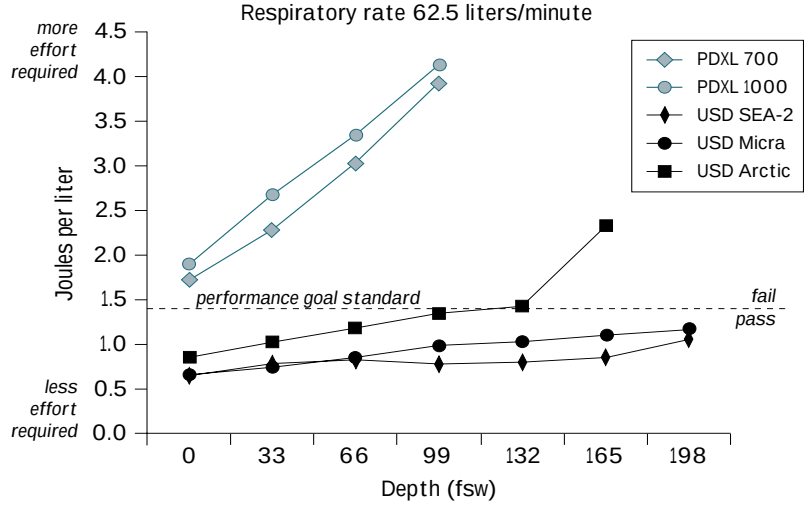
In the late 1980s, the U.S. Navy's Experimental Diving Unit (NEDU) rocked the diving industry by publishing no-holds-barred ratings of scuba regulators. NEDU was lambasted by the sport diving community for not tailoring its procedures to recreational divers, despite NEDU's protestations that its mission did not include evaluating gear for nonmilitary purposes. Better deserved were the thumps manufacturers gave NEDU for supplying air to the test regulators though a plumbing system that exceeded the flow rate possible through a standard scuba tank valve, and for overemphasizing high flow rates at the expense of other important factors, such as stability and ease of purging.

The tests focused on meeting a goal based on "work of breathing," a computer-derived estimate of total respiratory effort using a regulator with a mechanical breathing simulator produced by Reimers Consultants. The rating depended on the maximum depth at which work of breathing remained within the Navy's set limit. Regulators that could cut the mustard at 198 feet of sea water (fsw) were put in Group A; those that could make it down to 132 fsw, Group B; and so forth. Manufacturers who received the coveted Group A rating made the most of it in their sales campaigns. As you might guess, no company advertised that its regulator "qualified in Navy Group C," even though Group C regulators were still approved for military use.

Hoping for the best possible NEDU rating somewhere down the line, every manufacturer — especially those who were bashed in the earlier tests — hustled to improve its regulators before NEDU had another crack at them. A lot of engineers went back to a lot of drawing boards. Since NEDU seemed likely to use the same setup the next time around, manufacturers measured their success by tests using NEDU's own protocols. They weren't taking any chances on producing the ideal recreational diving regulator only to find that it looked bad on NEDU's system. They either leased time on bench setups identical to the Reimers mechanical breathing simulator at NEDU, or built their own benches.

Okay, Everybody, Take Seven

NEDU then inexplicably suspended testing (or releasing test results), ducking all questions with nice, clear statements such as "We're not tasked to do that at this time." While regulator manufacturers waited — and waited, and waited — for another shot at official NEDU tests, there were no retakes in sight, and for all anyone knew, there might never be. Frustrated marketing people went out on a limb, stating in their ads that their regulator was "designed to meet Navy Class A standards," or some variant on that theme. Mares had its own Reimers equivalent and used this approach very effectively to sell its aptly named Navy regulator. Things then got nasty. Other manufacturers, who didn't have their own NEDU-grade test benches, tried hard to rip a patch out of Mares for capitalizing on the name, as well as for the ads that emphasized the Mares regulator's purported ability to



NEDU test results for Performance Diver regulators compared with three USD regulators, including one coldwater regulator

pass the NEDU test. Insults were hurled, credibilities impugned. Of course, nobody really knew what NEDU would actually find until they resumed testing and published the results.

There They Go Again

Finally, after a seven-year hiatus, NEDU has once again started to test regulators and publish results, and as before, there are a few surprises in store: the Navy has raised the bar. Gone are the letter-group ratings, replaced with a much simpler, do-or-die scale. Regulators now are on the "Authorized for Navy Use (ANU)" list, or they are not. Period.

To make it onto the ANU list, regulators must meet the Navy's work-of-breathing standard all the way down to 198 fsw (in 33-foot increments) at about 70˚F and back up, unless they are specifically designed for use in cold water. In that case, they must meet the work-of-breathing standard only down to 132 fsw at 28-31˚F. Cold-water regulators' first stages must not freeze at all, and their second stages must not fail due to freezing, though minor free-flow is acceptable.

The simulated ventilatory rate (lung volume times number of breaths per minute) used for pass/fail evaluation in the work-of-breathing tests is 62.5 liters. For a diver — remember, we're supposed to cruise around slowly with minimum exertion underwater — that's really honking. An average person pumps about 6–10 liters per minute in and out of his lungs at rest, according to the U.S. Navy Diving Manual, although this can increase to 100 liters per minute "during severe work" or "during a short period of extremely forceful breathing."

To satisfy NEDU, all regulators must also maintain their cracking pressure (initial inhalation resistance) within 0.5 inches of water pressure on either side of manufacturers' specifications at various flow rates ranging from 0 to 30 cubic feet per minute. Five different samples of each regulator model are tested at 1,500 psi on the way down, and at 500 psi on the way up.

Next month: Find out which regulator failed NEDU's work-of-breathing tests, but was judged acceptable anyway, because they liked it so much.

Finally, there is a series of manned test dives in NEDU's Ocean Simulation Facility to 198 fsw and in open water to 130 fsw to evaluate subjective factors such as fit, function, and feel in various positions.

Performance Diver Regulators

Performance Diver is a mail-order diving-equipment company that sells its own line of regulators. In Technical Report No. 6-94, dated April 1994, NEDU published the results of its tests on two Performance Diver regulators, the PDXL 700 and the PDXL 1000.

The PDXL 700 was wiped off the field before halftime. At a supply pressure of 1,500 psi and the lowest measured ventilation rate (40 liters/minute), the PDXL 700 barely passed the performance goal for work of breathing at the surface, and was out of the running by the time it got to 33 fsw. At 62.5 liters /minute, the PDXL 700 exceeded the maximum acceptable work-of-breathing, even at the surface!

At that point in the game, the Navy terminated further testing of the PDXL 700. NEDU's report described it as a "sub-standard-performing regulator, not capable of meeting Performance Goal Standard at any depth or ventilatory rate." NEDU recommended that "this regulator be excluded from the ANU list."

How about its big brother? The PDXL 1000 didn't do very well, either. At 1,500 psi, it exceeded the maximum acceptable work-of-breathing goal at all ventilation rates, from the surface on down. As with the PDXL 700, further testing was terminated. NEDU's recommendation was "that this regulator be excluded from the ANU list."

Summary

Both Performance regulators failed miserably in NEDU's work-of-breathing tests. The amount of effort it took to breathe either one exceeded the work-of-breathing limit (1.37 joules per minute) right at the surface. Breathing effort rose so sharply under water that NEDU stopped testing both regulators without proceeding to the manned evaluation phase. The results couldn't have been much worse. . . .

Delmar Mesa

Order Before Midnight Tonight!

The latest Performance Diver catalog lists the PDXL 1000 regulator on sale for $239.99 and the PDXL 700 for $199.95. Both regulators come with a money-back satisfaction guarantee. Call Performance Diver at 800-933-2299.