



Drysuit Dump valves – An addendum to “The Exploration Suit of Choice”

When asked to write an article for Global Underwater Explorer’s DIR Quest magazine (Vol.5, Number 1 – Winter 2004), about DUI drysuits and the Woodville Karst Plain Project (WKPP), I had no idea how much attention those few paragraphs would garner. This addendum to that article is an effort to highlight new developments since it was written and address some frequently asked questions.

The History:

When the article was written (2004), the recommendation was for the older style high profile Apeks dump valve (Fig. 1), over the then standard low profile Apeks dump valve (Fig. 2). We had discovered a perplexing leak issue with the original low profile dump valve that seemed to be caused by pulling a vacuum on the suit. Divers, or more accurately task-loaded students, were pulling their way into Florida’s Devil’s Ear cave system, without adding gas to offset the suit squeeze, and coming up with a wet left arm. In most cases, divers were descending from approximately 15 ft (6 m) to 60 ft (18 m), without adding appropriate amounts of gas to their drysuit, as they pulled their way against the flow, into the cave. This reach and pull action generated a negative pressure within the suit, significant enough to unseat the mushroom valve and draw it into the valve body. We were able to reproduce this scenario, however, during the dive, as suit inflation gas is finally added the mushroom valve would usually return to the normal position. Upon closer inspection of an array of dump valves, in suits where the mysterious leaks occurred, I finally found one where the mushroom valve had remained stuck in an open position, and confirmed the theory. The mushroom valve had caught on one of several small protrusions designed (I believe) to support the mushroom valve and prevent the occurrence of just this issue.

Historically, why the preference for the high profile dump valve?

The high profile Apeks dump valve (which is still currently available) was the best solution at that time. The design of the high profile dump valve features 6 support arms beneath the mushroom valve (Fig. 3), while the original low profile valve featured only 4 support arms, bolstered by a pair of rounded protrusions between each support arm (Fig. 4). At the time, and based on the common demands of cave diving in north Florida, the high profile valve was clearly the better choice, despite the fact that the low profile design was more efficient at dumping gas, especially toward the lower end of the range, where smaller amounts of gas are dumped (as in normal diving depth changes). That is to say, any dump valve will perform admirably under a sustained and relatively high pressure. The real key to exhaust valve performance is at lower pressures with small amounts of gas to be vented, as would be found in normal drysuit diving situations. Given this performance requirement, DUI’s current standard exhaust valve of choice is the current Apeks Low Profile valve (Fig. 2.5). The definitive test established by DUI

Engineer Bob Stinton was a derivation of the simple “Pickle Barrel Test” from years past. For more information on this test, see the DUI website, Technical FAQ Section.

Obviously, the next question many ask is, “I have a low profile valve, but which one?”

Identifying your dump valve from the exterior:



Figure 1 – Apeks High Profile Exhaust Valve
Note the narrow diameter and slightly taller profile of the High Profile valve.



Figure 2 - Original Apeks Low Profile Exhaust Valve
The original design of the Apeks Low Profile valve features two offset "slatted" portions.



Figure 2.5 - Current Apeks Low Profile Exhaust Valve
Current design of the Apeks Low Profile exhaust valve features three radial "slatted" portions.



Figure 3 - Apeks High Profile Exhaust Valve back (note: 6 support arms)



Figure 4 - Original Apeks Low Profile back (note: 4 support arms)

In order to view the differences between each of the various valve styles of low profile exhaust valves within your DUI suit, the valve backing can be easily removed by hand (Fig. 5).

NOTE: Do not remove the valve backing of the high profile exhaust valve unless you are prepared to properly re-install it with the appropriate techniques and sealant. The picture included below should satisfy any curiosity and save you the time and effort of re-installing.

The backing plate is an important component of any exhaust valve, mitigating the possibility of your insulation garment fouling the mushroom valve, and impeding normal function.

To reinstall the backing on a low profile exhaust valve, center the backing over the valve body. When properly aligned, the backing will snap back into place by pressing firmly on the middle of the backing plate. Each arch leg of the backing plate should be seated within the narrow channel along the outer circumference of the valve body.



Figure 5 - Remove valve backing by hand to view



Figure 6 - Current Apeks Low Profile Valve back (note: semi-circular supports)

Results:

At the behest of DUI, Apeks has since altered the design of the low profile dump valve to address the mushroom valve issue. Current style Apeks low profile dump valves can be easily identified by popping off the back cover of the valve inside your suit. The current low profile design features 4 support arms and 4 small "half moon" or semi-circular supports between the main support arms (Fig. 6). The semi-circular supports have proven effective over the last few years, and the current low profile design still outperforms the Apeks high profile valve in efficiency throughout the pressure range, and especially at the lower end of the range, where smaller amounts of gas are dumped.

Concerning Drysuit Dump Valve and surface swims: ALL dump valves of this type may leak if left in the open position while engaged in dynamic movement, even redundant style valves found in commercial diving ops. With lower amounts of gas in the drysuit, the movement of swimming and wave action etc. can cause the mushroom valve to open briefly under a relative negative pressure, and allow a small amount of water to enter. With enough of this sort of movement, a diver could detect the cumulative water entry given enough time. This becomes important in contaminated water diving scenarios, where contact with the water is not advisable, even with the use of a redundant or dual valve system.

The answer: Close the valve during surface swims.

Concerning the Apeks vs. Si Tech valve debate; as far as it concerns low profile dump valves, their performance is very similar, with only slight variation from batch to batch. Apeks serializes each valve for product tracking and customer support. At this time, Si Tech does not serialize their dump valves to my knowledge. Either valve is available on DUI Drysuits, with the improved Apeks Low Profile design as standard equipment. Divers specifically requesting the Si Tech Low Profile design should do so at the time their suit order is placed, and should expect a small non-standard component service charge. It is important to note that these valves are not easily interchangeable, given that they require slightly different mounting hole in the drysuit sleeve.