

One Less Use for Duct Tape

Colin Zak compares the cabled diver's umbilical with traditional laid-and-taped designs.

Technology has had an immeasurable effect on man's quest to conquer his world. The capability to safely deploy a diver to a depth of 1,500 feet (455m) and beyond is a testament to man's ability to harness new materials and techniques in pursuit of knowledge and natural resources. Diving equipment has seen radical change and improvement over the years, allowing safer and more productive diving.

There is, however, one vital piece of a diver's gear that has remained virtually unchanged since the industry moved on from upturned buckets: the diver's life support umbilical. In its simplest form this comprises a breathing gas supply hose, pneumo hose, communication cable, and life-line. More complex umbilicals include additional hoses and cables for hot water, lights, video, and gas reclaim.



Look familiar ? A rack of taped umbilicals.

Patchwork Equipment

The traditional solution to combining these different elements together is to layout a rubber hydraulic hose, an air tool line, a military surplus cable and a length of poly rope, then strap them all together with copious amounts of duct tape every foot or so.

It is interesting to note that none of these components were originally designed for any underwater use, much less diving. Rather, they were adopted on the basis of what was available at the time (early 1950s). The most popular gas hose (Gates 33HB and similar), for example, conforms to the Society of Automobile Engineers' standard for hydraulic hose.



The different component lengths of a traditional taped umbilical cause stress build-up (left), Diveline's new umbilical (right) are engineered like a rope, with the individual elements spiraling around each other.

The military surplus cable used as a comms line (spiral 4) appears to have originated from the Korean war. Again, not best suited to sub-sea use, the PVC jacket cracks in sea water, exposing the steel wire

beneath and creating a handling hazard. This cable is a classic mis-application which has become so ingrained in the industry (at least in the US) that, when the surplus finally ran out, dive supply stores rushed out and had the product manufactured to the same flawed specification. A truly unique case of retro-engineering!



Typical 3 part taped umbilical construction, note the cross hovers and uneven bending when coiled (even on a relatively large radius of 8")

Clearly the attraction of this type of umbilical is low initial cost, particularly if you discount the hours of manual labor needed (on the grounds that the shop hands or divers have nothing better to do!). What is less obvious and often ignored is the cost of maintaining these umbilicals. Duct tape is not cheap by the time you have remade the same umbilical several times. Not to mention, the cost of replacement components and labor (strike that-I forgot the labor is free!). Some in the industry will boast they can make a taped umbilical last years. This reminds me of the road sweeper who claimed to have made the same broom last 10 years, by only replacing the head 17 times and the handle nine times.

All joking aside, how does the traditional umbilical actually perform in the field? The answer is it works, but barely. It is heavy (in air and water)" hard to handle (for diver and tender), apt to throw loops and snag, and generally fails prematurely.

Is there a better solution ?

Fortunately there is – the cabled (or rope-like) umbilical using purpose-built components rather than military surplus and industrial hose. The concept is not new. Rope-like umbilicals have been used for saturation diving since the 1970s and more recently have been adopted by the US Navy.

These umbilicals are engineered products designed specifically for the application. Like a rope, the individual elements are spiraled around each other, allowing them to adjust their relative positions during bending to eliminate stress build-up due to differential lengths.

No one component sees excessive compression or tension and therefore is much less likely to be damaged, considerably increasing the life of the product.

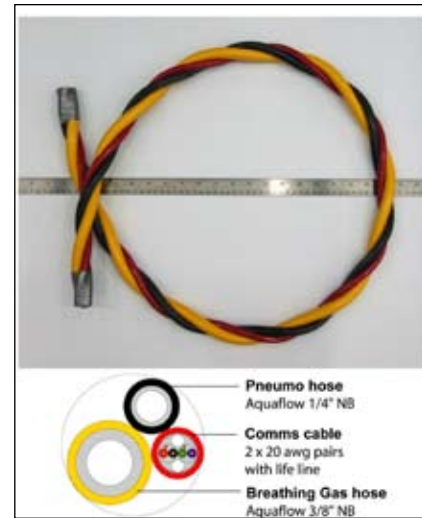
In addition to the simple (but significant) cost savings of reduced maintenance and extended life cabled umbilicals made from purpose designed components offer very significant user benefits over traditional solutions;

They are kink resistant, smaller, more flexible and lighter (both in air and water). Depending on

configuration, the buoyancy can be adjusted from slightly positive to negative depending on preference for any given job site. This reduces fatigue of both Diver and tender improving overall efficiency.

The components are "locked" into their spiral shape by the manufacturing process and have no tendency to separate, therefore eliminating loops that could become entangled, offering a major safety improvement. Long continuous lengths can also be produced eliminating hose joints for extended penetration dives.

The materials of the hoses and cable components are engineering thermoplastics that have exceptional



Typical 3 part Diveline umbilical. Note how evenly the components conform to the bend and the elimination of a separate life line.

strength, abrasion resistance and aging characteristics. In addition to their longer lifetime, they are available in colors to enhance their visibility. They also have excellent chemical resistance and clean easily, ideal for potable or contaminated water.

Finally, replacing a component is a simple process that needs little or no tape.

Of course some will say, "if the Navy's using it has to be too expensive" and "We don't have the budget for the good stuff".

Naturally a high performance product is going to cost more out of the box but lowest cost of ownership has to be what counts. After all responsible Dive contractors want to educate their customers to differentiate between lowest bid and the overall value of the service provided. This makes good business sense and surely should apply to the equipment they purchase, (i.e best value not lowest price).

Given all of the safety and economic advantages and with the increased availability of these superior products, it is surely time to re-asses the "traditional" approach to the humble diving umbilical and reduce by one the things you do with Duct tape. **UW**

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