

The HangLine

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How Much Longer can Open Circuit Survive?

By Bill Nadeau

When people see a Rebreather or hear the term closed circuit underwater breathing apparatus they think of the future or something relatively new in the dive industry. It has been proposed that the Rebreather concept has been around for thousands of years. In 885 BC an illustration was discovered in an Assyrian Bas-Relief- which showed a diver breathing from an air filled leather bag strapped to his chest suggesting that perhaps this individual was breathing in and out of the same source. Since that time a huge evolution in Rebreather technology has occurred and is continuing at an ever-increasing rate.

Today there are over a dozen Rebreather models available on the market at a fraction of their original cost. The reliability and benefits of these units are quickly being discovered and there is no question that the Rebreather will soon become as accepted as a dive computer or BCD. But just exactly where did these gizmo's come from, how do they work and what is all the scuttle about people getting hurt? Is the Rebreather just a fad or what?

As I have said Rebreathers have been around for a very long time. Some of the earliest Rebreather designs date back as far as the late 1800's with units that used highly caustic potash to scrub out the carbon dioxide. In fact it was during this era when the first dives on Scuba were made and they were conducted using a semi-closed Rebreather. Later at the turn of the century a German company called Draeger designed a unit for a fire department that used pure oxygen allowing rescue crews and firefighters to carry large amounts of breathing gas in relatively small kits.



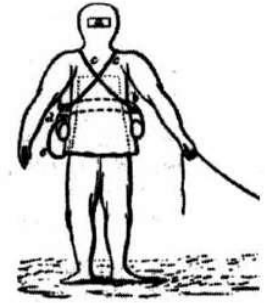


Shortly after, similar units were produced for miners and before long the first underwater oxygen Rebreather was developed and tested. In 1941 Draeger Works manufactured light compact pure oxygen Rebreather as an escape mechanism from submarines in World War II. This was the primitive version of what would become the chest mounted LAR V pure oxygen Rebreather that has been a military standard for shallow water clandestine operations since 1981. The LAR V and another shallow water oxygen Rebreather used by the military since it's development in the early 1970's is the CCR (closed circuit Rebreather) 25 showed the world that divers could stay down for incredible lengths of time with a very small gas supply.

The needs of the military created a powerful driving influence in the research and development of Rebreather designs eventually giving birth to true free-swimming (non-depth limited) CCR units such as the Biomarine MK15 and the CCR155 manufactured by Carlton Technologies which has mixed capabilities of over 300fsw (see inset). We are now seeing units with depth capabilities over 1500fsw and six-hour bottom times. Even DAN (Divers Alert Network) has employed Rebreather applications to their Oxygen First Aid Kits. It is this kind of technological maturing that has got to make you wonder how long open circuit will last.



Despite its complex appearance the concept of a Rebreather is actually quite simple - in fact to you can build one right now. Grab a paper bag and seal it around your mouth. Congratulations! You have just passed CCR 101; 'Building your own Rebreather!' Warning though - don't actually try to breath on your new unit quite yet. You see there is a couple of problems with your this specific model.



It is true that with each breath of fresh air we take, we only metabolize a very small portion of the oxygen in our lungs, the rest is exhaled out to the environment and wasted. However if we re-circulate that air in and out of a bag we will gradually use up all of the oxygen. We therefore need to add a little O2 every now and then in order to maintain a healthy level of oxygen. Another problem is that our breathing bag will begin to accumulate an excess of Carbon Dioxide and if it reaches dangerous levels than we will eventually suffer from hypercapnia (too much CO2). This is not a good thing, as it will eventually lead to unconsciousness. So in addition to installing a system that supplies our breathing bag with a small amount of Oxygen or Nitrox, we need to pass our exhaust through a system that will 'scrub out the CO2 before we 'Re-breath' the gas supply. That's it, these are the basics to every Rebreather model on the market. The are other





features that include oxygen monitoring systems, electronics that control Oxygen, Nitrox and mixed gas flow rates and some even have bailout switches that allow you to go to open circuit.

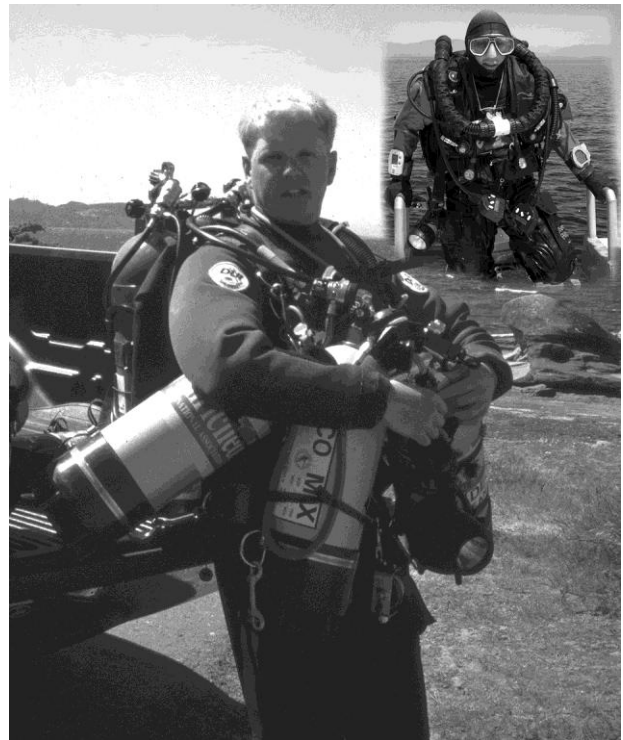
What makes each of the Rebreathers available on the market today so different is their ability to budget the gas flow and the means with which they can determine the best mix during any particular point or depth in the dive.

Like any new enterprise there is a bit of pioneering that has to be done and is not without its consequences which include a trial and error process involving higher risks. Yet the Rebreather evolution has progressed through its dark ages and has emerged as a viable and safe tool to conduct sport diving activity. Those incidents that seem to black-mark it's reputation are more often user error due to improper instruction or equipment abuse/unfamiliarity.

It is true that even a basic semi-closed Rebreather such as the Draeger Dolphin or Atlantis 1 does require some additional training, preparation and dive planning considerations but the benefits far outweigh the disadvantages. Rebreathers breath easier, are much quieter, less disturbing for marine life, supply warm moist gas enriched with optimum Nitrox blends and weigh far less than bulky steel or aluminum tanks.

So does it really have a chance at replacing the open circuit system? Well, ask your self why any diver would choose a bulky, heavy, noisy system with a relatively limited gas supply when they could be breathing warm moist air from a Rebreather that will

soon cost the same as an open circuit system. Rebreathers are not the future -



Despite all of the tanks I am wearing, my friend Ralph Hoskins (inset) has a far greater gas supply and much more comfortable.

they are today. Training is now available from the largest international training organizations in the world including PADI, IANTD, NAUI, TDI and ANDI. I just try to imagine a new diver finishing his open water course in ten or fifteen years from now looking back through an old magazine. What will his response be when his instructor tells him that divers used to strap so much metal on their backs for such a small gas supply. Just imagine.

~Safe Diving

