

The HangLine

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Ferrari's and Rebreathers

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Fast Cars and Rebreathers? What would motivate me to publish an article comparing the two? Well...let's see.

Power, capability, cost to name a few. High performance automobiles have the ability to achieve high speeds in relatively short periods of time, they handle very well at these high speeds and they usually have a very smooth ride. All made possible by a well built engine controlled by sophisticated electronics. If you have ever dived a closed circuit Rebreather you should start to understand the parallel.

The individual elements required to dive deep and long are perhaps as complex as taking a Ferrari onto a highway. They also require some equally sophisticated tools. When one first starts diving mixed gas, it is usually on open circuit. Planning your dives took hours of comparing computer-generated profiles with hard tables and then copying them onto slates. Then you spend even more time blending and analyzing all of your gases, gases that in the long run still did not provide optimal mixes from

a physiological point of view. As technology advanced, it introduced blending apparatus that facilitated quick, accurate and inexpensive mixes. It also married this technology with SCUBA (Rebreathers) essentially providing an onboard, self-contained gas blending machine capable of providing optimal mixes in real time. Now we can knock off a ninety-minute deep mixed gas dive to 60 MSW (200 FSW) with little planning and minimal decompression obligations.

Think of it as multi-dimensional diving MD^X: diving to the exponent of X where X represents a couple of different factors;

- The elements we need to consider when planning our dives and
- The increase in capability to extend our range of diving.

We can begin with deep air diving on open circuit, or MD¹. This is one dimensional diving where we dive with a limited volume of gas with a single fixed fraction of oxygen (FO₂) and nitrogen (FN₂). Not only is our quantity of gas restricted, but so is our ability to do things with it





because of its qualities (hyperoxic and narcotic).

Later a diver learns how to incorporate nitrox (MD²) or trimix (MD³) into his bottom gases. This increases his ability to extend his bottom times and reduce the narcotic and hyperoxic effects of a mix. However, he is still diving with a fixed FO₂ and FN₂. Ideally, a diver wants to maintain a fixed PO₂ and change his gas mixture accordingly, anytime his depth changes. He can do this by carrying a number of different tanks or 'stage bottles' (MD⁴) with different gas mixes (semi-fixed PO₂); however, he reaches a certain point where he is overloaded with gear. He still is not able to change his mix for every significant change in depth.

A semi-closed circuit Rebreather helps resolve some of these problems by extending the volume of gas supply, reducing the amount of equipment a diver needs to carry, and by making a rough guess at what might be a good gas mix for that particular depth. A well designed, passive, semi-closed Rebreather would have a multi-dimensional factor of about 4 or 5 (MD⁴ or MD⁵). Fully-closed circuit Rebreathers, on the other hand, are very smart machines and not only accurately calculate and deliver a premium gas mix to the diver regardless of what depth he is diving, but also provide a nearly endless supply of gas (MD⁶). Some units on the market today are so well equipped they can measure the levels of other constituents in a gas mix such as helium (MD⁷) and even carbon dioxide (MD⁸), and are capable of notifying the diver with audible alarms if concentrations reach dangerous levels.



However, with multi-dimensional equipment comes a necessity to think multi-dimensionally. That means adopting a comprehensive understanding of advanced diving physics, physiology and theory. It also means that we incorporate a meticulous, uncompromised approach to dive planning and equipment preparation.

Finally, it requires that we maintain our skills and knowledge because the complexity of this level of diving activity makes it extremely vulnerable to deterioration. These are perishable skills and need to be sustained through on-going training, practice and experience. The rewards however are incomparable.

~ Safe Diving

