

Gas Mixing and Bottle Marking

By George Irvine

Let's assume all bottles are correctly marked - that means MOD only, horizontally, in three inch high letters, on both sides of the upper bottle in the orientation of the tank. All tanks turned off, all regs parked. To deploy, we locate the bottle by MOD, we remove the reg and put it in our mouth, we then relocate the bottle by MOD, and turn it on. If we can breathe, we are breathing the right gas. Now, mixing. First put two pieces of tape or one GUE split tape on the empty bottle. Hook up to either gas, but I do helium first since I want my oxygen addition to be more in the middle of the operating range of the gauge, but it can be done either way. Figure the correct amount of helium for your mix considering coefficient of compressibility and heat expansion. Helium will need about 17% overfill to get the % you seek. Let's say we want 50% and we are filling to 3000. Fill the tank first to 1750 to get to half, but then add another 10% or so for heat expansion, so go to a total of 1900 roughly. It should cool back to 1750 or so. No sense getting real precise here, the heat expansion is simply equal to the ratio of absolute temperature change, using the Kelvin scale - just guess at it. Turn the bottle off, but do not remove the whip until you have written down the contents of the tank and the date. Now remove the whip.

Now, add the oxygen. Keep in mind that it will be heated and expanded, but not too badly. Go a little over your intended amount but not too much. Calculate this independently of the helium, and add it without regard for the "pressure" of the helium. If you added the oxygen first, keep in mind that it will have expanded as well from the heat of the helium filling and be giving you a higher overall helium pressure reading than you really have, so add a touch there if that is the case over and above the other two reasons. Do not remove the whip until you have written down the new gas added and the date. Analyze it if you please, to solve for the helium later to satisfy yourself.

Now add the air, unless that was heliox and we are done. Immediately analyze the gas and write the analysis on the other piece of tape or the split tape, write the date on it as well, and take the original tape off the tank and cover the valve with it to indicate that the tank is full. Do not move the tank until this is done. Obviously, the analysis should compare with the MOD. To dive the tank, you can remove the tape so as not to litter (and obviously the only thing we go by in water by is MOD), but if you do not use the tank, retape it and the valve, rewrite the contents and date, and transport that way, including partially full tanks that you intend to reuse (I reuse my deco tanks for two dives usually, so I may write some thing like "2000 psi 50% 10-18-00"). If you use it and are not going to reuse it, it is now assumed that the tank has some amount of that gas in it, but can not be used again unless reanalyzed, so is not retagged. It can not be stored full without a tape, and it can not be transported full without a tape. Doubles can not be stored untagged if they have gas in them, and if that mistake is made, dump the partial gas and remix rather than adding to a mix. A lot of people fool themselves this way on the helium %.