Ascent Rates

Introduction

We all remember from our open water training that our ascent rate should not exceed 60 ft/minute. Some of you may have read or heard about more conservative recommendations for ascending from a dive. Recommendations for slower ascent rates are being adopted by some training agencies. The newer computers are incorporating slower ascent rates into their algorithms as well. This isn't to tell you to run out and buy a new computer or that you have to change the way you dive, but to present some current thoughts on how some other divers are finding ways to dive safer and feel better afterwards.

Bubble Trouble

When we dive, our bodies absorb additional inert gases, mostly nitrogen. We realize that eliminating the nitrogen is important so as not to form large bubbles in our blood and tissues that results in decompression sickness (DCS). Models have been made for tables and dive computers to allow us to safely ascend from dives without developing DCS.

These are the so called 'No Decompression Limits' or NDL's. Recreational dive training uses these tables and dive computers to limit depth and bottom time so that decompression stops are not required. Even so, we must be aware that since off-gassing occurs with every dive, then every dive is a decompression dive. The reason all dives are decompression dives is simple - the diver is ascending from under pressure (i.e. decompressing).

More recent studies on divers using an ultrasound technique known as doppler have shown that even though a diver does not have DCS, there often are bubbles in our tissues and blood. Since these bubbles do not cause DCS, they are termed asymptomatic or "silent" bubbles; but are they still affecting us?

Did you ever finish a dive or a series of dives and feel, well, not to be too technical, like crap? This feeling is sometimes called sub-clinical DCS or "Diver's Flu". What you are feeling is not unlike the flu. Your body sees the micro bubbles as an invading horde and responds with antigens to fight them off much like it would a virus. It is the waging of this battle inside you that makes you sometimes feel so wasted after a weekend of hard diving.

The ascent is sort of like a continuous decompression stop and, as a diver gets closer to the surface, a slower ascent rate will be better for nitrogen removal. More effective nitrogen removal will significantly reduce sub-clinical DCS as well as reduce the chances for a DCS 'hit'.

How Slow Should We Go

The rate of 60 ft/min for ascents came from the US Navy and is commonly recommended in North America. A rate of 10 m/min (33 ft/min) is common in many other countries. Many training agencies now commonly recommend rates of 30 ft/min and some recommend rates as low as 10 ft/min. The fact is that many recreational divers commonly come up much faster than even the old recommendation of 60 ft/min. Most divers will exceed this rate either due to lack of awareness or because they find it hard to control.

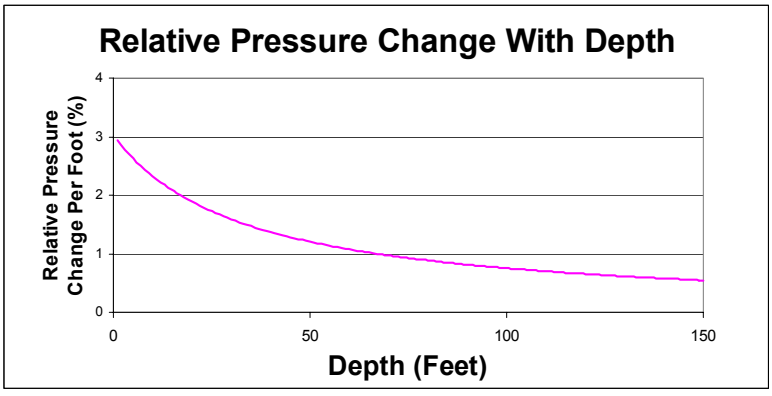
For every dive there is a point in the ascent at which the diver's tissues stop accumulating nitrogen and begin to eliminate it. The various models calculate this depth and call it the gas transit point. Below the gas transit point you are taking on nitrogen and for this part of the ascent you should be coming up more quickly in order to limit your nitrogen uptake. Above the gas transit point, you are eliminating nitrogen and for this part of the ascent you should be coming up more slowly so that nitrogen is safely eliminated.

So then, what is the best ascent rate? Technical training for decompression procedures recommends that the diver ascend at 30 ft/min from the maximum depth to the gas transit point and then to ascend at less than 30 ft/min (and as slow as 10 ft/min) above the gas transit point. For a diver who is observing recreational no decompression limits, this makes little difference in the time spent at depth.

As an example, a dive on the Niagara II to 90 feet for 20 minutes on air would have a gas transit point of about 60 feet. The difference in time between ascending at 20 ft/min or 30 ft/min from 90 feet to 60 feet is only 30 seconds. This suggests that for dives as deep as 100 feet, ascending slowly in the beginning has little effect.

The point however is that you'll be doing yourself no good what so ever if you ascend from the bottom at less than 30 ft/min. All you are doing is adding more nitrogen to your tissues while you are spending more time at depth.

What about the upper part of the ascent? This is where the ambient pressure change is greatest and where it is most important to control ascents. The graph below shows how the pressure gradient changes with depth. The vertical scale is the % change in pressure for a 1 foot change of depth.



The change in pressure per foot of depth at 10 feet is more than 3 times what it is at 100 feet. That is what makes buoyancy control trickier near the surface. It also makes the last 10 feet of the ascent the most important of all as your tissues eliminate nitrogen. For this reason, technical agencies recommend ascent rates as low as 10 ft/min in the upper part of the water column. They also stress taking a full minute to come up the last 10 feet from a dive.

How to Control Your Ascent Rate

What is the best way to control ascent rate? Many divers will exceed even the 60 ft/min recommendation on most of their dives. Sometimes this is due to a lack of attention. Other times it's due to a lack of control. Ascending on a line is usually the best method for controlling the ascent when diving from a boat. We can use the bottom structure for a reference when ascending from a shore dive. Close attention to your depth gauge or computer is critical so that you are aware of your ascent rate. Buoyancy control by dumping air from your BC and drysuit (if used) during the ascent is also important to prevent 'runaway' ascents if you come off the line and also so that you don't lift the line (and other divers on it) if the line is not taut.

Even still, most divers will still underestimate their ascent rate and come up more quickly than they should.

One solution to this is to keep a close eye on your time and come up in 10 foot stages, stopping to let the time catch up so that the effective ascent rate is slowed. For a 10 ft/min ascent rate, you should be taking a minute to come up through each 10 foot stage. So you come up slowly to the next 10 foot mark and ensure that a minute has passed before you move to the next 10 foot stage. This will ensure that you do not exceed the recommended 10 ft/minute ascent rate.

Summary

Slowing your ascent rate may require you to practice better buoyancy and be more aware of your depth and time. It also may require you to spend a few more minutes in the water. You have to ask yourself if that extra time and trouble is worth it to dive safer and feel better after all of your dives.