

Guidance on Free Flow Regulators in Cold Water

Fresh water sites can often be close to freezing, even outside the obvious winter period. This often poses the threat of a free flow. Incidents resulting from free flows cannot be completely avoided but they can be reduced if a few basic guidelines and procedures are followed.

What can cause a free flow to occur?

When air flowing from a diving cylinder is subjected to dramatic reductions in pressure (a change from 230 bar to around 10 bar) by the regulator first stage, it loses a lot of heat. If the surrounding water temperature is cold (around 5°C or less) this will reduce the temperature still further. The very cold air caused by such temperature drops in each stage of the regulator can cause any water droplets within the mechanism to form ice crystals, which in turn can cause a free-flow.

Modern down-stream valves will freeze open rather than shut, but, if they freeze, a free-flow will always be the result. Divers are trained to manage free flow situations in basic dive training.

Prevention

Diving in conditions that are cold can increase the likelihood of a regulator free flow. Being prepared and anticipating this event will increase your chances of dealing with the incident in a safe and controlled manner.

- Use a cold water environmentally sealed regulator. The most important consideration will be to have the regulator serviced regularly specifically for cold water. Many of the top regulators meet the European standard (EN250) for cold water.
- Familiarise yourself with the adjustments you may want to make at the dive site and follow proper cold water diving principles detailed below.
 - Try to ensure that your cylinder is kept free of moisture and has been filled with air containing as little moisture as possible.
 - Keep your cylinder out of the cold until you are ready to use it. (Don't leave it in your car overnight.)
 - Blow away any entrapped water (or ice) that may be on your cylinder valve or regulator orifices, with a little air from your cylinder.
 - Take check-out breaths submerged in shallow water immediately before diving rather than in the air.
 - Avoid the cooling effect of fast air flows caused by using the purge button or breathing heavily, or filling delayed SMBs or lifting bags.
 - Do not permit any water to enter the 2nd stage before or during the dive.
 - Consider restricting yourself to no-stop diving, and to a depth from which you are certain you are able to make a free ascent.

Anticipation

- Practice free flow regulator drills and the use of redundant air supplies for such instances. The use of a redundant air supply such as a pony bottle and regulator, or an additional first and second stage mounted onto a Y-valve should provide reliable source of additional breathing gas when a free flow occurs.
- Ensure all alternate air source systems are in plain view and conspicuously marked allowing access at all times.
- Discuss the in water procedures and techniques that should be used when dealing with this situation and clearly agree with your buddy on the action to take in each case.

In-water response to a free flowing regulator

When a regulator suddenly goes into free-flow it can be very startling as there is a sudden roar of bubbles and visibility is reduced. The main strategy is to:

- Remain calm **Stop - Think - Act**
- If you are confident in breathing from the free flowing regulator do so, but check and prepare alternate sources just in case.
- If an alternate air supply is preferred and available switch to it. An alternate air source might constitute an 'octopus' regulator or a fully redundant air supply, such as a pony cylinder and regulator.
- Abort the dive and head for the surface in a controlled manner with your dive buddy
- Once on the surface, establish positive buoyancy as soon as possible

Breathing from a Free Flow

Modern high-flow regulators which freeze open can produce extremely powerful free flows. Even very experienced divers may find it difficult to breathe effectively from a free flowing regulator in these circumstances. Practice breathing from a free flow regulator as indicated by your training organisation. Whichever method is adopted ensure that you do not seal your lips around the mouthpiece. You may use your tongue as a splash guard to prevent choking on water.

This technique takes practice to perfect and to feel comfortable with it, so take every opportunity to simulate it in safe conditions. Moderately powerful free flows can be simulated by pressing the purge button.

Do not assume that you or your dive buddy will always be able to breathe from a free flowing regulator – be prepared to switch to a normally operating source of breathing gas, or to offer your buddy an alternate air source, if required. Bear in mind the possibility of your alternate air source also free flowing in very cold water. The use of pony cylinders and regulators offer divers a fully redundant air source in these circumstances.

Using and alternate air source supplied by another diver

The most common alternate air source is the alternate second stage or "octopus," normally secured in plain view in the triangular area between the chin and the corners of the rib cages. Whether the donor breathes from the primary or the secondary regulator depends upon the regulator configuration and other factors. Generally, it is desirable for the donor to retain the primary regulator and provide the alternate, but alternate inflator regulators and other configurations (such as redundant air supplies) have require the donor giving up the primary to the receiver and then switching to the alternate. The important point is that buddies know how each other's systems work.

The receiver secures the alternate after sufficient time to adjust. The team establishes contact and then ascends face-to-face or side-by-side as appropriate for the configuration, with the face-to-face, grasping right fore arms the most common. During the ascent, divers control their buoyancy to maintain a normal ascent rate.

By implementing some of the suggestions above and by discussing possible reactions to a free flowing regulator with your buddy, you will reduce the likelihood of such an event occurring and improve your responses to the situation should it arise.