



# TANK TAILORING

**You wouldn't take a pair of twinsets and a bevy of stage tanks diving unless you had a good reason - would you? Configuring your cylinders is easy, says **Jack Ingle**, but they must be suited to the task - and you gotta practice**

It seemed tricky when you first learnt to dive, but in a short time it all began to seem ridiculously simple - perhaps too simple. You started with a single cylinder of air and a regulator with a spare second stage attached. But now that you want to move on, do more, dive deeper, stay down longer, or simply feel safer in all environments, how do you go about it?

There is no single point at which by adding on cylinders and regulators you suddenly become a "technical diver", and there are

no simple right or wrong answers to what equipment you should carry. It all depends on the depth and duration of the dive, what you feel comfortable with and how familiar you are with the equipment.

## **ONE TANK, ONE REG**

It might be simple, but a single cylinder has big advantages. It is the least cumbersome way to dive. It is relatively light, not too bulky, and requires minimal buoyancy from your drysuit or BC.

The problem is that if, for any reason, your air should run out, you have no back-up, otherwise known as "redundancy". In the same way, a standard regulator with an octopus rig offers only the minimal redundancy provided by the alternative second stage. Should you experience any problems with the cylinder valve or first stage, you could find yourself in a bit of a mess.

## **ONE TANK, TWO REGS**

One way to provide some redundancy with a single cylinder is to fit a special valve with a Y or H fitting to allow two regulators to be fitted to a single cylinder valve. These can then be opened or closed independently of each other.

But don't just pounce on that solution. It requires a fair bit of practice to reach the valve behind your head, and to ensure that you know how to switch off each regulator should a problem occur. In any case, it does not solve the primary problem - you still have only one gas source with no redundancy and, for technical dives going deeper for longer, not enough gas.

## **ONE TANK, TWO REGS AND A PONY**

A completely redundant gas source is a must for technical diving. The most basic choice is a pony cylinder: a separate, smaller tank fitted with its own breathing apparatus. The capacity of a pony is usually between 3 and 5 litres and, carried alongside the main cylinder, it provides a gas source that could make all the difference in the event of equipment failure or some other emergency.

This is a relatively cheap system. It isn't too cumbersome, nor does it require a lot of extra buoyancy. There are various ways of attaching a pony to the main cylinder but the main thing is to ensure that it holds firmly rather than flapping around as you move.

The disadvantage is that a fully charged 3 litre pony cylinder, used at depth in a stressful situation, will last only a few minutes. It is an excellent system for shallower recreational dives but not ideal for a serious technical dive.

## **TWO CYLINDERS, TWO REGS**

One way to ensure that you always have enough gas is to opt for a twinset or doubles - two identically sized main cylinders. They can be as small as 7 litres or as big as 18 litres, though the average twinset cylinder is around 12 litres. A major advantage of this system is that it provides two independent gas sources. In case of failure on one cylinder or its regulator, you just switch to the



regulator that is working correctly and abort the dive.

The disadvantage - and there usually is one - is that you need to switch regulators throughout the dive to ensure that the gas in each cylinder is used as equally as possible. If you don't do this, you could use up the gas in the first cylinder, switch to the second, and have no redundant gas left if there is a problem.

Many divers who use twin independent cylinders work on a 30 or 50 bar rule. They breathe the first cylinder down by 50 bar, for example, then do the same on the second and continue switching. Be sure you know which regulator and contents gauge belongs to which cylinder, without having to think about it too hard!

Another disadvantage with any twinset system is that it is heavy and calls for plenty of buoyancy. A large-volume BC or wing is a must if you are to feel comfortable.

## **TWO CYLINDERS, TWO REGS AND A MANIFOLD**

Another way of using a twinset is with a manifold between the cylinders. This allows the diver to use one primary regulator throughout the dive; there is no need to switch constantly between two. The secondary regulator remains as a redundant system in case the primary unit fails.

The original manifold systems simply linked the gas source between the two cylinders, and in the event of a catastrophic gas loss the diver parted with the whole supply. Today's manifolds allow you to close the cylinder valve and isolate the regulator on that cylinder, so that the gas it contains can still pass through the manifold and be breathed through the second regulator.

This calls for you to reach behind your head to get to the valve - which can be difficult, but practice makes perfect.

## **TWO CYLINDERS, TWO REGS, A MANIFOLD AND AN ISOLATOR VALVE**

If you place an isolator valve in the manifold, you can quickly revert to having two independent tanks in an emergency. Should a regulator go into free-flow, for example, you would close the isolator valve and gas would be lost from only one cylinder.

Time is critical on such occasions. Always dive with the isolator valves half a turn on, then you can close them in a split second. Once the cylinders are isolated, the problem regulator can be closed down at the cylinder valve and the isolator can be re-opened, allowing access to any gas that remains in the closed cylinder.

The disadvantages of this system are obvious - you must be able to isolate and close cylinders very fast. This takes a lot of practice and you have to put in the work in a controlled practice environment before undertaking serious dives with this configuration.

Isolator valves are usually mounted on the manifold behind the diver's head, in which case they should be angled slightly towards you for ease of access. I prefer to use a remote on/off system, with the valve on my right side and the cable fed down between the cylinders. It's far easier to operate than when it was behind my head!

There have to be disadvantages, of course, and with this system of manifolds and isolators you have introduced another set of O-rings. It's highly unlikely, but bear in mind that any O-ring could fail.

## **BACK-MOUNTED STAGE CYLINDERS**

The other cylinders technical divers wear are for decompression gases used during staged decompression on the ascent. I believe strongly that divers should be totally self-sufficient, which means carrying all the gas you require for the whole dive. The extra cylinders can be mounted in various ways, worn as side or front mounts or attached to the main cylinders on your back.

Back-mounted cylinders, like ponies, need to be very firmly attached to the main cylinders, either upright or inverted. If upright they should be open throughout the dive, with the regulators stowed so that you can get at them easily but cannot use them in error at the wrong stage of the dive.

Inverting the tank allows you to leave it switched off until you require it during the ascent or decompression stop. Simply reach down to the valve, open it, release the regulator - which is stowed under rubber bands - and switch to the decompression gas.

Back-mounted stage cylinders lessen the clutter of cumbersome equipment caused by side- or front-



mounted systems. The downside is that they add even more weight to your back. This is not a problem in the water, but it is a good idea to remove the whole set before climbing up the dive-boat ladder at the end of the dive!

### **SIDE-MOUNTED STAGE CYLINDERS**

These range from 6 to 12 litres, depending on how much gas is required for decompression. They have two fixing points, one at the cylinder neck, the other further down. The priority of any such system must be to ensure that the cylinder cannot accidentally become unattached while allowing you to remove it without hassle when required.

Large dog clips can be used to attach the top mounting to a D-ring high on your harness, towards the shoulder. The lower mounting can be attached, again by a dog clip, to a D-ring on your side. Some divers prefer to attach the lower fitting to a D-ring on the back-mounted cylinders, but if you have arms as short as mine this makes access difficult.

### **FRONT-MOUNTED STAGE CYLINDERS**

If only one stage cylinder is to be used, it can be mounted across your chest. Consider, however, that this does cause clutter in a place where important life-saving equipment, such as the secondary regulator, suit and BC inflators, should be stowed.

Choose your dive, then choose a configuration to suit it. But don't overload yourself with unnecessary extra equipment - it only causes stress, and that's the last thing you need.

And don't jump straight into a real dive without trying this equipment out in controlled conditions. The pool is the ideal place initially, followed by sheltered open water. From the simplest to the most complicated, all the systems mentioned here need practising!