The RescuEAN Pod

The RescuEAN Pod is a unique diving rescue aid that delivers available Nitrox & O2 decompression gas mixes safely and in a constant flow to an injured diver in accordance with the standards of current best clinical practice. It can be used via a suitable mask with both conscious and unconscious casualties requiring Oxygen, as well as those individuals who deteriorate into Cardiac Arrest and require resuscitation before the arrival of the Emergency Medical Services.



The RescuEAN Pod was not developed to replace authorised adult emergency Oxygen administration equipment as in all cases of Evolved Gas Disease (DCI) and regardless of symptoms, all cases of Sudden Cardiac Arrest (SCA) and all cases of Drowning or Trauma - adult emergency Oxygen administration should be provided in accordance with current best clinical practice guidelines as issued by the following organisations *or those of similar standing in your home country*:

- The Royal College of Surgeons (Edinburgh) Faculty of Pre-hospital Care
- The British Thoracic Society
- Joint Royal College Ambulance Liaison Committee (JRCALC)

However, in some instances the above may not be possible, It is then that the RescuEAN Pod is beneficial as an emergency alternative for providing gas mixtures with an increased fraction of inspired Oxygen (FiO2) to injured divers who will benefit from increased Oxygen partial pressures during resuscitation, stabilisation and evacuation to an appropriate medical facility or while awaiting for such evacuation to occur. Due to the physiological effects of emergency Oxygen administration, the highest possible FiO2 should be achieved. Although the Pod can be used with any Nitrox gas mix, we advocate that you use the highest

possible 'decompression' mix available, or 100% Oxygen from a closed-circuit rebreather (CCR) before using standard Nitrox diving mixes.

- Try to use Nitrox mixes of at least 50% Oxygen or 100% Oxygen from rebreathers (CCR's)
- Using standard Nitrox mixes thereafter.

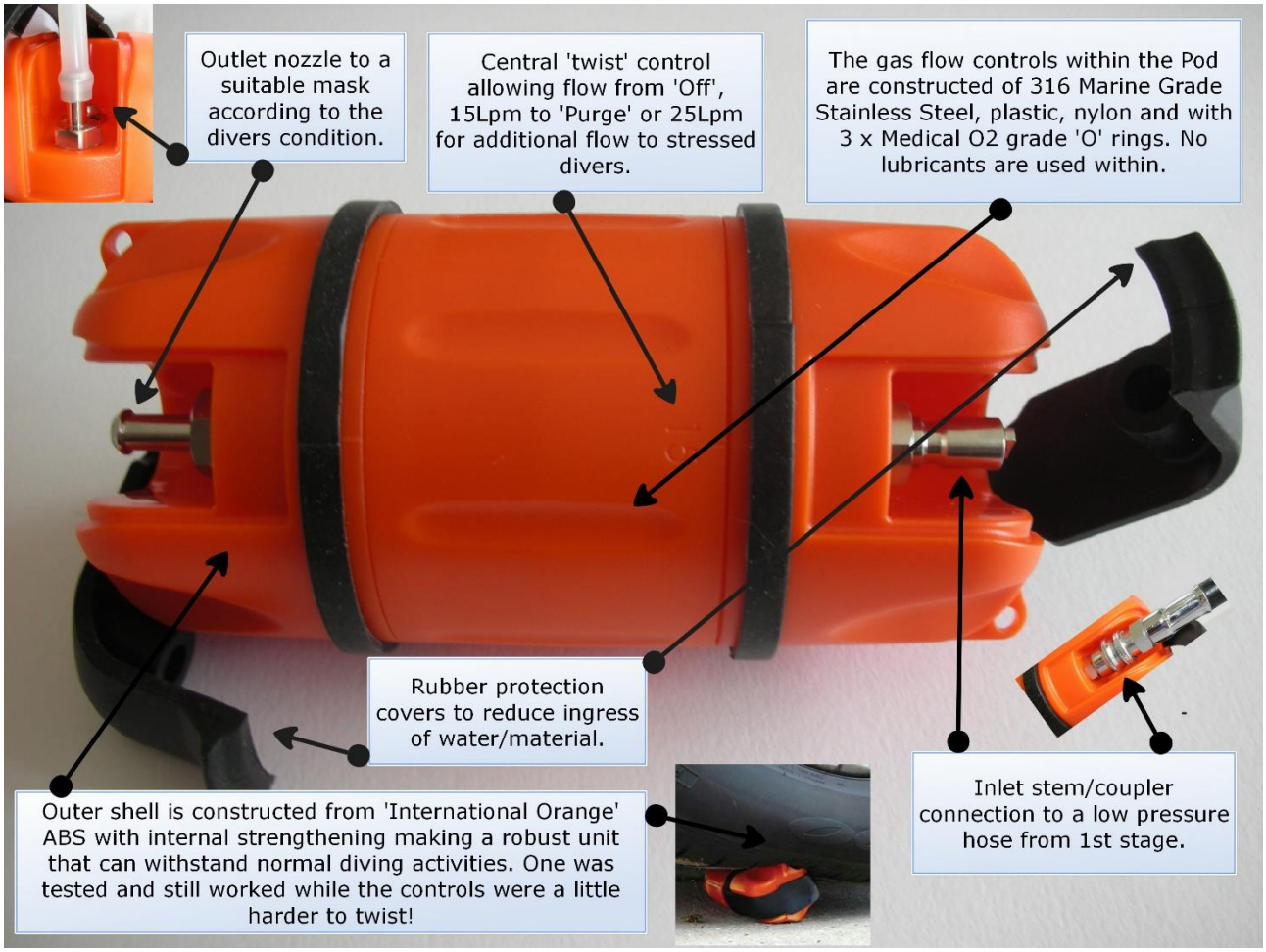
In these circumstances the Pod is designed for use during club/branch diving activities or by professional diving instructors who have a 'Duty of Care' to provide emergency Oxygen equipment as part of these organised activities as stated in the HSE Diving at Work Regulations 1997 and associated Approved Codes of Practises (ACoPs). Branches/Clubs/Professional Divers and Instructors can use the Pod when:

- Additional casualties present with sign and symptoms of Evolved Gas Disease (DCI) and Oxygen Administration equipment is being used to treat a more seriously injured diver
- The current supply of Oxygen has been exhausted and evacuation is still under-way
- There has been an equipment failure in the Oxygen supply equipment.

It can also be used by individual divers who do not have immediate access to an emergency Oxygen supply and are awaiting the arrival of the Emergency Medical Services. Individual Divers should use the Pod when:

- There is a rapid onset of Evolved Gas Disease (DCI) signs and symptoms
- Professional help has been called
- Awaiting arrival of the Emergency Services and no other emergency Oxygen supply is available.

<u>Setting-up the Pod emergency Oxygen delivery system & guidelines for correct use.</u>



To set-up the Pod:

1. Place the cylinder with identified gas safely near the casualty in a secure position

2. Flip off the two black rubber covers at each end of the Pod, revealing the low pressure input coupler and the 'nipple' for the Oxygen tubing for either a reservoir mask or bag-valve mask with the last choice being a pocket mask with O2 inlet

3. Making sure the cylinder valve is 'OPEN'

4. Connect the low pressure hose from the first stage to the Input Coupler on the Pod

5. Twist the Pod's centre control to 25L/min-1 'purge flow rate' and allow the gas to flow through the Pod, clearing any water, etc., from within, before setting and leaving the flow rate at 15L/min-1

6. The Pod nipple can now be connected to emergency Oxygen administration mask as dictated by the severity of the casualty, see below:

> *Note: The remaining Bar pressure within the cylinder can be monitored by using the standard dive gauge attached to the cylinders first stage (or a dive computer with a 'sender' that monitors the remaining level). If the cylinder's supply is running low and the Emergency Rescue Services (EMS) are not yet on scene, obtain another cylinder (if available) to maintain the highest O2 concentration for the maximum period of time. With the quick release connection of the Pod to the LP hose, it can be instantly transferred to the new cylinder.*

Pod use with a conscious, breathing, casualty

1. Administer emergency gas supply with the highest FiO2 @ 15L/min-1
2. With the casualty in a secure position of comfort, place the high concentration Oxygen reservoir mask (non-rebreather mask) over the casualty's mouth and nose and secure in accordance with manufacturer's instructions
3. Monitor the casualty and record findings for the Emergency Medical Services
4. Record evolution and progression of any Evolved Gas Disease (DCI) signs and symptoms and report to a Diving Medical Officer - UK Institute of Naval Medicine DDMO - 07831 151523, or; Scottish Hyperbaric Medical Officer - 0845 604 8888, or; Diver's Alert Network - International Emergency Contact Hotline - +1-919-684-9111
5. When emergency medical Oxygen (100%) is available, disconnect from the Pod exit nozzle and reconnect to a low-pressure medical Oxygen cylinder

Pod use for the unconscious, breathing, casualty:

1. Administer emergency gas supply with the highest FiO2 @ 15L/min-1
2. Move the casualty into the secure Recovery Position, placing the high concentration Oxygen reservoir mask over the casualty's mouth and nose and secure in accordance with manufacturer's instructions
3. Check for condensation and breath sounds to ensure the casualty is breathing
4. Monitor the casualty and record findings for the Emergency Medical Services
5. Assume Acute Progressive Neurological Decompression Illness if signs and symptoms present within 2 hours after a dive and report situation to a Diving Medical Officer: UK Institute of Naval Medicine DDMO - 07831 151523, or; Scottish Hyperbaric Medical Officer - 0845 604 8888, or; Diver's Alert Network - International Emergency Contact Hotline - +1-919-684-9111
6. When emergency medical Oxygen (100%) is available, disconnect from the Pod exit nozzle and reconnect to a low-pressure medical Oxygen cylinder, without interrupting the flow of Oxygen.

Pod use for the non-breathing casualty (Drowning):

1. Administer emergency gas supply with the highest FiO2 @ 15L/min-1
2. Place the casualty on their back, Open, Check and Maintain the Airway
3. Check for obvious signs of life

4. Perform 1 minute of rescue breathing with a Bag-Valve Mask (BVM); 1 breath every 5 to 6 seconds
5. Place the BVM over the casualty's mouth and nose (Rescuer 1) while squeezing the bag (Rescuer 2)
6. If no response after 1 minute, treat as for cardiac arrest as described under the next section.

Pod use for the non-breathing casualty (Cardiac Arrest) – Pre-COVID-19:

1. Open, check and maintain the airway, checking for normal breathing and signs of life
2. If not normal breathing, perform chest compressions at a rate of 100-120/min-1 at a depth of 5-6 cm with a ratio of 30 compressions to 2 rescue breaths
3. Confirm that EMS has been contacted and obtain or ask for an Automated External Defibrillator (AED) immediately, if available;
4. Administer emergency gas supply with the highest FiO2 @ 15L/min-1
5. In cases of emergency Oxygen administration the Bag Valve Mask (BVM) method is preferred, alternatively use a standard high concentration Oxygen reservoir mask if you are unable or unwilling to perform artificial ventilation and perform chest compressions, as above;
6. Use a pocket mask if no other mask is available, or in the first instance - while setting up equipment.

UPDATE – With advent of COVID-19 - Pod use for the non-breathing casualty (Cardiac Arrest)

The Resuscitation Council UK Guidelines 2015 state "If you are untrained or unable to do rescue breaths, give chest compression-only CPR (i.e. continuous compressions at a rate of at least 100–120 min-1)".

Because of the heightened awareness of the possibility that the victim may have COVID-19, Resuscitation Council UK now offers this advice:

1. Recognise cardiac arrest by looking for the absence of signs of life and the absence of normal breathing. Do not listen or feel for breathing by placing your ear and cheek close to the patient's mouth. If you are in any doubt about confirming cardiac arrest, if you are alone, the default position is to start chest compressions until help arrives.
2. Make sure an ambulance is on its way. If COVID 19 is suspected, tell them when you call 999.
3. If there is a perceived risk of infection, with only one rescuer on site, the rescuer should place a cloth/towel over the victims mouth and nose and attempt compression only CPR and, if available, early defibrillation until the ambulance (or advanced care team) arrives. Perform chest compressions at a rate of 100-120/min-1 at a depth of 5-6 cm.
7. If there is an additional rescuer on site, the use of the emergency Oxygen administration via Bag Valve Mask (BVM) method can also be used with a ratio of 30 compressions to 2 rescue breaths via the BVM
4. If available, early use of a defibrillator significantly increases the person's chances of survival and does not increase risk of infection.
5. If the rescuer(s) has/have access to personal protective equipment (PPE) (e.g. FFP3 face mask, disposable gloves, eye protection), these should be worn.
6. After performing compression-only CPR, etc., all rescuers should wash their hands thoroughly with soap and water; alcohol-based hand gel is a convenient alternative. They should also seek advice from the NHS 111 coronavirus advice service or medical adviser.

VERY IMPORTANT: Risks and hazards associated to Nitrox/Oxygen use:

IT IS STRONGLY RECOMMENDED THAT ALL USUAL SAFETY PROCEDURES BE FOLLOWED WHEN HANDLING CYLINDERS CONTAINING ANY INCREASED LEVEL OF OXYGEN. FOR FULL DETAILS OF RECOMMENDED PRECAUTIONS VIEW:

BOC's Oxygen Safety Recommendations HERE (in particular from page 9 onwards).

The gas flowing through the RescuEAN Pod is at low pressure when entering the Pod as it has passed through a 1st stage - therefore the friction risk is greatly reduced.

As the Oxygen concentration in a cylinder can vary greatly - common sense and safety procedures (Please also refer to your Diving Certifier's Guidelines for use of higher Oxygen concentrations) should make the use of the Pod safe for both the rescuer and the casualty.

These include:

- Avoid open flames. Do not use high concentrations of Nitrox or Oxygen within three metres/10 feet of open flames, cigarettes or other ignition sources.
- Keep high concentrations of Nitrox or Oxygen away from electrical equipment that may spark and use only in well-ventilated areas. In closed areas, Oxygen concentration can build up, resulting in a more combustible atmosphere.
- Keep all petroleum and hydrocarbon products (e.g., grease, oil, etc.) away from direct contact with high concentrations of Nitrox or Oxygen. Never use petroleum, silicone grease or oil on the RescuEAN Pod or on any Nitrox/Oxygen cylinders or regulators. High concentrations of Nitrox or Oxygen use equipment require special lubricants ONLY.
- Keep Nitrox and Oxygen cylinders away from heat sources.
- When carrying cylinders, use both hands around the cylinder and avoid holding the cylinder by the valve because this can leave behind potentially combustible contaminates, including dirt and skin oil.

RescuEAN Pod maintenance:

Each time the Pod is exposed to the elements or immersed/sprayed with water or on a boat/RIB - the Pod should be thoroughly rinsed with fresh, clean water and purged by connecting to a low pressure hose and blown through to clear of water, debris, etc.

In many instances, the Pod may not be used for long periods of time. In this event, every three months, the Pod should be tested by setting up and checking its functions BEFORE taking as a safety back-up on a dive outing.

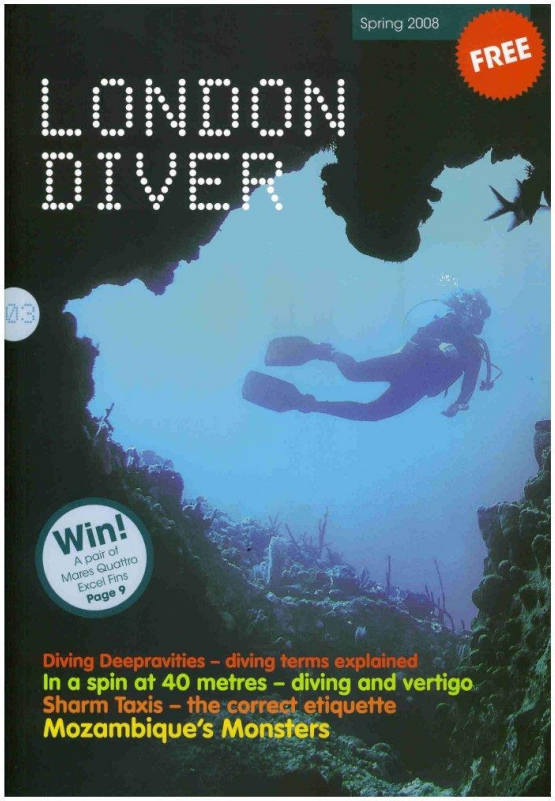
The Pod is constructed with the best materials available to reduce, as much as possible, the need for ongoing maintenance but please advise RescuEAN of any concerns you may have.

By using 316 marine grade stainless steel for the internal control valve system, stem/coupler and nozzle, it offers the maximum resistance to corrosion, even in salt water and is a highly recommended metal for use with all levels of Oxygen. The three 'O' rings within the control system are medical grade/Oxygen compatible and, if the Pod is properly maintained, will last many years.

There is no grease or oils used within the controls that could contaminate the oxygen mix as it passes through and when the Pod leaves us, it can be considered O2 clean.

TEST DIVE
RESCUEAN

Simon Wilson





When the guys at the chamber are given a job to do, we like to do it well. That's why when Martin and Chris asked us to utterly destroy their RescuEAN we were more than happy to oblige.

At least, I'm pretty sure that's what they said; it might have gotten a little lost amongst "Test it, see what you think" and "See if it can go to 50 metres in the pot". To me that means, drop it, kick it, take it further than the manufacturers would like in the chamber, take it utterly apart and reassemble without the instructions and then run it over with the van.

Now this uniquely new invention has been well tested before we got our paws on it to ensure it does what it's supposed to: Deliver enriched air from otherwise unusable scuba cylinders to needy divers by connecting the low pressure hose normally assigned to the BCD to the unit and then connecting the (supplied) hose to an oral/nasal mask which is then put on the stricken diver. Thus enabling divers to make use of any high oxygen percentage mixes left over or donated by other divers without having to stick the second stage in the mouth or a clip on the nose, particularly useful when tending an unconscious diver.

This of course it does very well, it is simple to use, handles oxygen flow well, has few parts to break or fall off and, of course, is a fantastic combination of industrial chic orange plastic and weakened black rubber.

But, it is all very well it working straight out of the box. What if, and this would be more common than not, it's called upon after an age of sitting at the bottom of your dive bag or rattling around in the back of the estate, will it still work then? That's where The London Diving Chamber team come in, experts in pressure systems and environments, explosives and non destructive testing and access to a van, let the testing begin...

First of all, we kicked it through the car park to the resuscitation department to be given the once over by brains much larger than our own. The verdict: "Jolly good". Gas goes in one end and comes out the other, flow rate is spot on. So far so good. Next - repetitive pressure tests. The RescuEAN accompanied elective patients and divers on dives in the pot to 14m and 18m for 90 minutes and 6 hours respectively. Often with as little as 10 minute surface intervals.

The Result

Nothing. No cracks, no compression of the internal pipes and no bends, good working order, it was time to get serious.

Final Pressure Test

This time we picked up on the one thing the manufacturers were concerned with, which was water not getting into the internal pipes quick enough because of the rubber seals covering the quick connectors. This would lead to compression of the pipe inside due to unequal pressure. So, at last, a weakness to exploit...

The ingredients were all here for the final assault: deep chamber, 300,000 litres of air on tap, exhausts big enough to blow London's carbon footprint all the way to China. This could mean only one thing, fast compression, fast decompression, no stops. If we could get the pot down deep enough quickly enough and bring her back up before someone had a



£99.95

chance to say "You've missed my deep stop", then we might be able to squeeze the internals so flat that even Zebedee couldn't put the spring back in them.

The Dive
Medium: air environment, rescuEAN in water
Max Depth: 73metres
Time to Depth: 4.8minutes
Time at depth: 5minutes
Decompression rate: 9metres per minute

Result
No compression of pipes, water ingress noted in internal pipes to equalise pressure, no compression of housing (was easily disassembled after dive), drained and usable in 1 minute 6 seconds.

The Final Curtain
So nothing we could do could put a dent in the armour of this device, we were beaten by an orange suppository, downbeat and demoralised; we dragged ourselves off to get the keys to the van:

Conclusion
Much like Top Gears' Hilux, the RescuEAN still worked even after all the abuse we gave it, which is a real testament to its engineering and simple design. In fact, the cracked housing was the only damage the unit sustained. The stainless connectors and the internal mechanicals survived intact, proving it hardy enough for even the clumsiest of divers.

Whether divers will take this into the water with them is another thing, it will probably be left on the boat or shoreline until needed. But those who feel the need can rest assured their big orange pill will resist the pressures of the deep admirably and return to the surface fit for its purpose.

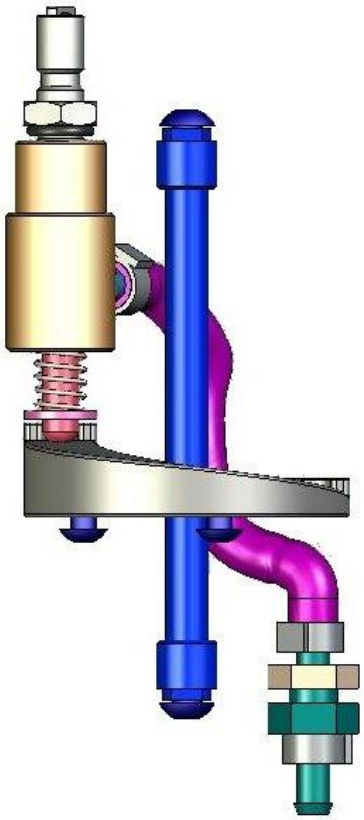
To be fair, we did put the RescuEAN through extremely arduous tests, far more than would be usually expected of it and yet it still survived (reasonably) intact. Even with the van, we had to drive slowly over it, allowing it to realise the full weight of the vehicle before it succumbed and cracked. It has to be said though, that the drain time was significantly reduced to about 1.5 seconds after the outer shell had been "rearranged".

The RescuEAN is one of those pieces of kit that you just love to own, it's well designed, works with minimum fuss or input from its owner and looks good. So good in fact that you could easily see it becoming a common sight rolling around both the dashboards of dive sheds and the bilges of RIBS around the country.

Rating: A

RescuEAN basic unit MRP £89.95 (incl VAT) + P&P
RescuEAN basic unit + Facemask MRP £99.95 (incl VAT) + P&P

www.rescuean.com



ABOVE: Inner controls constructed from – 316MGSS, nylon, O_2 tubing & medical grade 'O' rings within the plunger control (golden item above).

BELOW: The outer casing is ABS and rubber.





RESCUEAN

PICTURE THE scene – you have an unconscious shallow-breathing diver who is being administered oxygen. After 20 minutes the oxygen is depleted, however, there is still another half an hour until you can reach port and the emergency services. On board you have several half-used nitrox cylinders, but these are connected to conventional diving regulators. What if you could use this oxygen enriched air to give to the patient?

This is the scenario that RescuEAN's inventors Chris Wood and Martin Kerley hypothesised when they recently attended a rescue course. They were informed by their instructor that there was no way that nitrox could be given to an unconscious diver because the cylinders only had demand valves attached to them.

After the course they set out to produce a device that could remedy this situation. They thought the easiest method would be to use the connection on the BC inflator hose. Their solution is a pressure-reducing valve with internal flow control that connects directly to a direct feed at one end and to a tube and mask at the other. Named the RescuEAN, this allows any gas from a conventional diving set to be administered to an unconscious or conscious diver. The flow can be set at either 15 or 25 litres per minute by simply rotating the body of the unit, and delivers the nitrox via the attached 1.5m-long 5mm-diameter clear tubing to the oral/nasal face mask.

We tested an early production model at the *DIVE* test centre and I asked Kerley who the product was aimed at? He explained: 'The aim behind the development of the RescuEAN unit was to fill the gap between basic emergency first response, that is mouth-to-mouth resuscitation, and the accepted best form of oxygen provision, the full 100-per-cent oxygen rescue kit.

'It is also for the personal use of certified rescue divers using nitrox and finding themselves in a situation where a full oxygen kit is unavailable.'

During our test, we simulated the scenario above using a 75-per-cent nitrox mix. It worked just as described and got us all thinking a bit more – if it works for nitrox, it would work for 100-per-cent oxygen as well. So the RescuEAN can quickly convert any oxygen-filled diving cylinder into an oxygen kit! In fact, I would go as far to say this device could replace expensive oxygen kits altogether, enabling dive boats to carry any oxygen-clean cylinder and regulator, dispensing with special fitting and valves.

To my mind this product is a must for every boat that carries divers – I just hope they've manufactured enough of them. CH

VERDICT

Could become an essential piece of kit

Value	8/10
Performance	9/10

CONTACT

Company	RescuEAN
Phone	07990 890514
Web	www.rescuean.com



RESCUE ME: testing the RescuEAN

Dive Magazine 'gear test' article…