STAFFORDSHIRE DIVERS · CLUB TALK

# Nitrox: how we use it and how we test it

Enriched air basics, oxygen limits, and a live demo with our analyser

**Analyser demo included**

A BSAC nitrox introduction

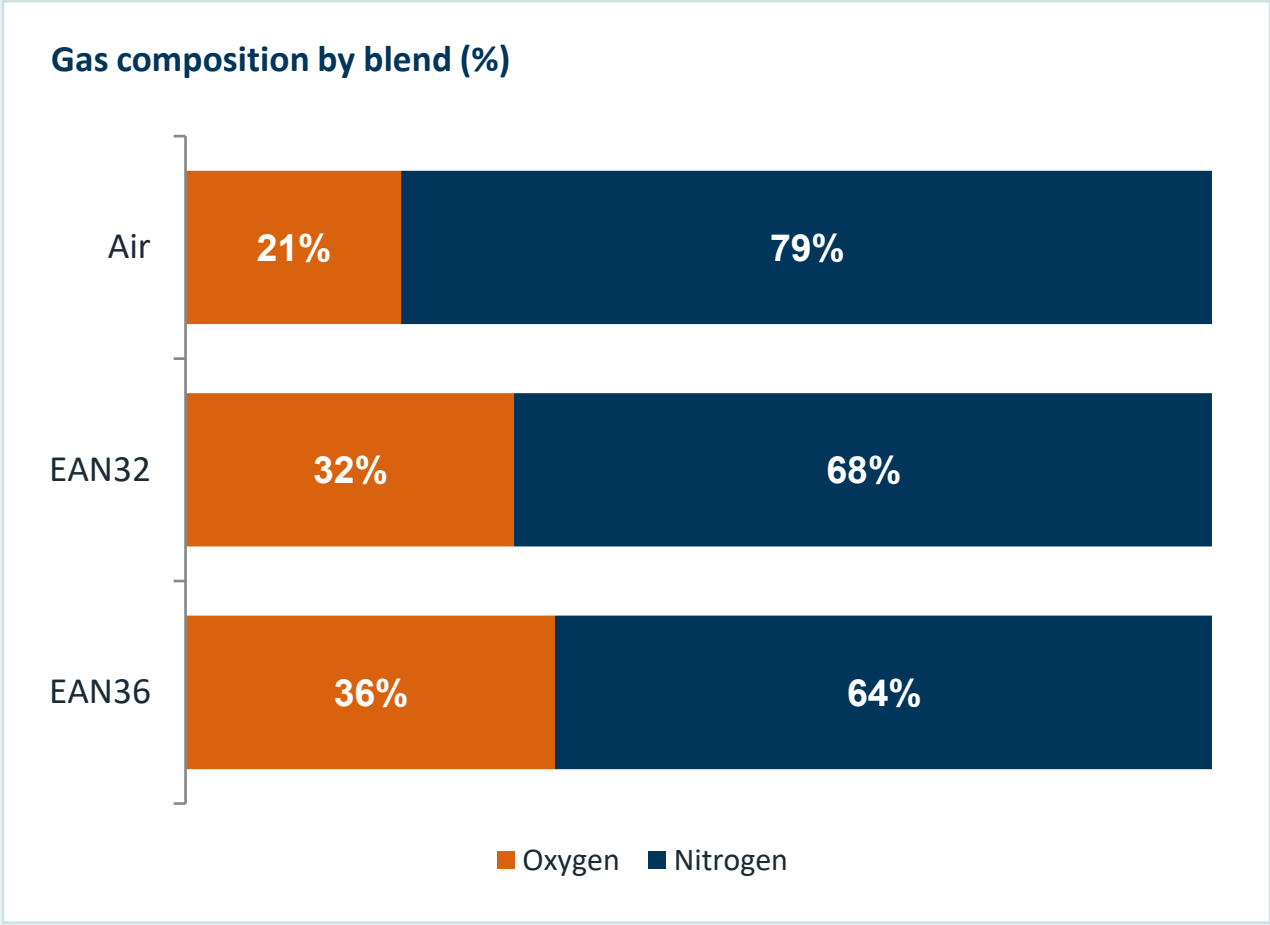
# Nitrox is air with extra oxygen, so less nitrogen

Nitrox (enriched air, EAN) is any mix of oxygen and nitrogen with more than 21% oxygen.

Recreational divers mostly use two blends:

- **EAN32 – 32% oxygen**
- **EAN36 – 36% oxygen**

Less nitrogen means less nitrogen absorbed on the dive, but more oxygen means a shallower depth limit.



THE PROBLEM AND THE FIX

# Nitrogen is the problem - nitrox helps

## Why nitrogen matters

- **Absorbed under pressure:** the deeper you go, the more nitrogen your body takes up
- **Decompression sickness:** too much nitrogen leaving the body too fast can cause DCS
- **Sets your time limit:** absorbed nitrogen decides how long you can stay down without stops
- **Narcosis:** nitrogen can cloud judgement at depth

## How nitrox helps

- **Less nitrogen:** EAN32 is 68% nitrogen, against 79% in air
- **Longer no-stop times** on many dives
- **Less loading,** so shorter surface intervals

**The trade-off: more oxygen means a shallower MOD, so analyse every cylinder.**

BENEFITS AND LIMITS

# Why dive nitrox - and what it asks of you

## What you gain

- Longer no-stop times on many dives
- Less nitrogen loading, so shorter surface intervals
- Extra margin against decompression sickness when diving to air limits

## What you must respect

- A maximum operating depth (MOD) set by the mix
- Oxygen toxicity risk if you go deeper than the limit
- You must know your mix – analyse it, plan it, label it

OXYGEN LIMITS

# More oxygen means a shallower depth limit

| Mix | Oxygen | MOD at $ppO_2$ 1.4 bar |
|---|---|---|
| **Air** | 21% | 56 m |
| **EAN32** | 32% | 33 m |
| **EAN36** | 36% | 28 m |

*MODs rounded down to the whole metre. Always plan from your own dive plan and training, not this slide.*

**1.4**

bar $ppO_2$: BSAC maximum – the limit we plan to

**1.6**

bar $ppO_2$: used as a decompression gas by technical divers only, not for our dives

THE RISK

# Oxygen at depth: the warning signs

## Warning signs

- **Visual changes** tunnel vision, blurring
- **Ears** ringing (tinnitus)
- **Nausea**
- **Twitching** face and lips first
- **Irritability** mood or behaviour change
- **Dizziness**
- **Convulsions** can come with no warning

## What to do

- Tell your buddy and stop going deeper
- Ascend to shallower water to lower the $ppO_2$, and end the dive
- Report it to the dive manager afterwards

**A convulsion underwater is life-threatening. Stay within your MOD and follow your rescue training.**

THE MATHS

# Working out your maximum operating depth

$$\text{MOD (m)} = (\text{ppO}_2 \div \text{O}_2 \text{ fraction} - 1) \times 10$$

**Worked example: EAN32 at $ppO_2$ 1.4**

| | | | |
|---|---|---|---|
| $1.4 \div 0.32$ | $4.375 - 1$ | $3.375 \times 10$ | Round down |
| **= 4.375** | **= 3.375** | **= 33.75 m** | **MOD = 33 m** |

**Why testing matters:** if the cylinder is really 34% not 32%, the same sum gives about 31 m. A wrong label means a wrong depth limit.

SETTING UP

# Set your dive computer for nitrox

## Set the mix

Enter the analysed oxygen % before the dive, not the figure you hoped for.

## Check the limits

Set the $ppO_2$ limit to 1.4 bar and check the depth limit shown matches your own MOD.

## Check every dive

Some computers return to air by default, so confirm the setting each time.

**Ocean Divers:** do not set your computer to nitrox. Leave it on 21% (air) for an added margin of safety.

**Wrong setting, wrong limits. Check it every dive.**

KIT AND SAFETY

# Oxygen and equipment safety

## Why it matters

- **Oxygen feeds fire:** richer mixes make fires burn harder
- **Contamination:** oil, grease and dirt can ignite in oxygen-rich gas
- **Compatibility:** higher-oxygen mixes need oxygen-clean, compatible kit

## Good practice

- Open cylinder valves slowly
- Keep cylinders and valves clean, free of oil and grease
- Follow your club's and BSAC guidance on cleaning and fills

**Not sure your kit is suitable? Ask your instructor or the dive manager before you fill.**

WHY WE TEST

# Never trust the label: analyse every cylinder

### Check it yourself

Your depth limit and dive plan depend on the actual percentage, so see the number with your own eyes.

### Mixes can be wrong

Fills can differ from what was intended, and a cylinder may have been used for a different mix before.

### Label what you find

The analysed result goes on the cylinder so your buddy and the next person can rely on it.

**Analyse it. Plan it. Label it. Sign it.**

LABELLING

# Marking and recording your cylinder

## Nitrox marking

A clear nitrox marking, commonly a green and yellow band, so no one mistakes it for air.

## Contents label

Oxygen %, MOD, date and the name of the person who analysed it.

## Fill and dive log

Record every analysis so there is a trail for each fill.

**If it isn't labelled, don't dive it.**

THE TESTER

# Meet the analyser: how it reads oxygen



## Gas sample

A gentle flow from the cylinder valve



## Oxygen sensor

Electro-galvanic cell that responds to oxygen



## Display

Shows the oxygen reading as a percentage

- Sensors wear out with use, so calibration before every session is essential.
- The reading depends on flow, temperature and pressure, so we keep conditions steady.
- An analyser tells you the % of oxygen only; you still plan the dive from that number.

LET'S TEST ONE

LIVE DEMO

# Demo: analysing a cylinder in five steps




**1**

## Calibrate

Expose the sensor to fresh air and set it to 20.9%.

**2**

## Connect

Attach to the valve and open it slowly for a gentle flow.

**3**

## Wait

Let the reading settle fully before you trust it.

**4**

## Read

Note the oxygen % and compare it with what was intended.

**5**

## Record

Write the result and MOD on the label and log, then sign.

AFTER THE DEMO

# Reading the result and recording it

## NITROX CYLINDER LABEL (EXAMPLE)

| | |
|---|---|
| Analysed $O_2$ | **32.0 %** |
| MOD at 1.4 bar | **33 m** |
| Date | __ / __ / __ |
| Analysed by | **Name & signature** |

## Watch out for

- Skipping calibration or using a tired sensor
- Reading too early, before the number settles
- Blasting the sensor with high flow
- Calibrating in one place and testing in very different temperature

**If it isn't what you planned for, re-plan on the analysed figure, or don't dive that cylinder.**

NEXT STEPS

# Getting nitrox trained with BSAC

## What the course covers

- **Theory:** oxygen limits, MOD, planning and equipment
- **Practical:** analysing a cylinder and setting a computer
- **Qualification:** dive nitrox within the limits of your training

## How to start

- Talk to your instructor or the club's training officer
- Bring your questions from today
- Ask about nitrox fills and analyser sessions at the club

**Always dive within the limits of your qualification.**

KEY TAKEAWAYS

# Know your mix before you leave the surface

1. **Oxygen sets the limit** More $O_2$ means a shallower MOD; plan to $ppO_2$ 1.4.
2. **Test every cylinder** Calibrate, sample gently, wait, read.
3. **Record and sign** Label the cylinder so the number travels with it.

Questions?