

Nitrous Oxide Capture and Destruction

The NHS is responsible for around 5% of the UK's carbon emissions and has set ambitious targets to become Net Zero a decade ahead of UK government targets.

Newcastle Hospitals were the first in the world to declare a climate emergency and have committed to achieve Net Zero Carbon by 2030 (a decade before the ambitious NHS targets). At present anaesthetic gasses account for 5% of NHS carbon emissions and fall within the emissions we control.

The largest proportion of these anaesthetic gas carbon emissions comes from nitrous oxide (N₂O), including those from Entonox (which is 50% N₂O and 50% air). Nitrous oxide is a powerful greenhouse gas, 300 times more potent than carbon dioxide.

A national first

Newcastle Hospitals have led the way in trialling innovative new-to-UK equipment to capture and destroy this gas, which is used in many clinical settings, including but not limited to Maternity, Endoscopy, and Dentistry. The [UK's first 'climate-friendly' baby](#) was born at the RVI in September 2021 using this N₂O capture and destruction technology, previously only available in Scandinavia.

The technology converts up to 99% of exhaled N₂O into harmless nitrogen and oxygen and also reduces staff exposure to exhaled nitrous oxide, so contributes to a healthier working environment for staff.

Due to the birth of Baby Rosie the trust was successful in securing Greener NHS funding to trial the use of 4 Mobile Destruction Units (MDU) in the Newcastle Birthing Centre and the installation of the UK's first Centralised Destruction Unit (CDU) serving Delivery Suite. The latter is attached to the existing gas scavenging system with very limited impact on the clinical setting.



A multidisciplinary team was established including: consultant obstetricians & anaesthetists, intrapartum matron, Estates, EME, Sustainability and the manufacturer Medclair. Much training and engagement has taken place over the course of 2022 to lead the trust into a formal three month trial. The trial of all four MDUs and the CDU system officially started on 26th September 2022 once the CDU was installed and successfully commissioned.

Results

1. Reduction in N₂O emissions

Concentrations of N₂O were measured using mobile Nitrous Oxide Detectors over the course of the trial.

Claire Winter, Senior Net Zero Programme Manager - North East and North Cumbria Integrated Care System

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A reduction of 81% was recorded in the Birthing Centre where the MDU was used, and a reduction of 70.5% was recorded in the Delivery Suite where the CDU was in use.

Newcastle Birthing Centre (NBC)			Newcastle Delivery Suite		
MDU			CDU		
Ave N ₂ O level without MDU (ppm)	Average N ₂ O with MDU (ppm)	% Reduction	Average N ₂ O without CDU (ppm)	Average N ₂ O with CDU (ppm)	% Reduction
178	33	81%	190	56	70.5%

2. Patient and clinician friendly

For the technology to be used effectively it needs to be minimally intrusive, easy to use and work for both patients and clinicians. In light of this, testimonials from anaesthetists, midwives and patients have been overwhelmingly positive. A few are selected below:

“This is such an important project for the Delivery Suite and Newcastle Birthing Centre at the Royal Victoria Infirmery. Both on an individual level for staff, reducing their exposure to high levels of nitrous oxide, but of course for the environment. Entonox is a really helpful analgesic in labour which many women benefit from and we are delighted to be able to provide this in a significantly more sustainable way.”

Dr Katy Whitehouse, Consultant Anaesthetist at NUTH

“It’s going to help change the future and it’s going to massively help the environment, not just for ourselves but for future generations as well.”

Lindsay Craney, first midwife in UK to deliver gas and air climate-friendly birth at NUTH

“I didn’t expect this when I came here today – I just came to have my baby – but I started on the traditional machine and then swapped over. It was quieter and much more comfortable to hold – it’s nice to make a little bit of history!”

Mum Kaja Gersinska, the first NHS patient to trial the technology, on her experience of using a closed system demand valve and MDU

Other benefits

There are health and safety benefits for staff in areas that use N₂O, as there are health concerns related to prolonged exposure.

Next steps

There is potential to increase the use of the capture and destruction technology in other areas that use this type of anaesthesia, such as dentistry, endoscopy, A&E and more.

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Integrated Care System