enviro technology services

Air pollution factsheet

ammonia

NH_3

What is ammonia?

Ammonia is a highly reactive colourless gas with a strong, pungent odour and is readily soluble in water. Ammonia is emitted into the atmosphere and then either deposits back onto land or is converted into secondary particulate matter (i.e. $PM_{2.5}$) through chemical reactions in the atmosphere.

Although trace quantities of ammonia are produced in nature, the majority of ammonia emissions come from anthropogenic activities with agriculture being by far the dominant source of emissions (88% in 2016), primarily from the storage and spreading of manures, slurries and artificial fertilisers. Ammonia is also emitted from vehicles and also from industrial processes where it can form as a by-product known as 'ammonia-slip' from de-NOx emission abatement systems (i.e. in power plants and waste incinerators etc).

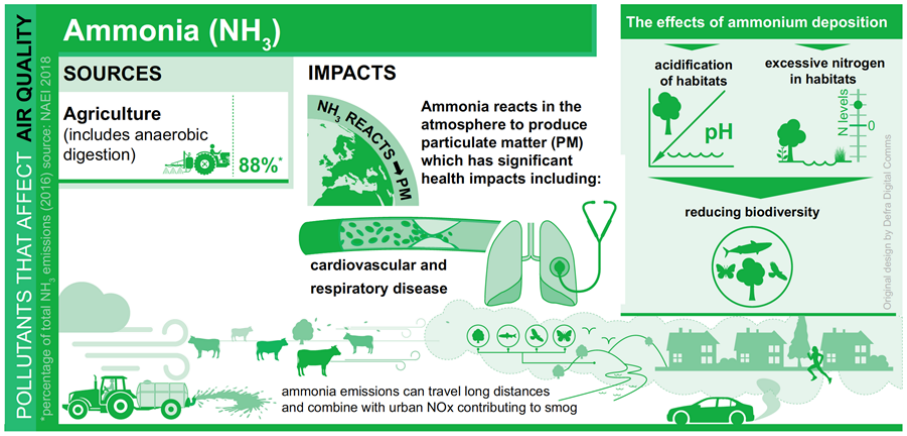

Image credit: DEFRA 2019

Why measure it?

Secondary PM, formed from atmospheric chemistry reactions producing ammonium compounds, can be transported large distances in the atmosphere where they can then add to background particulate levels in towns and cities, and be deposited onto land leading to negative ecological consequences.

There are two main causes for concern with ammonia that justify more wide-spread measurement of it in gas phase in both rural and urban environments.

The first being its contribution to the formation of secondary fine particulate matter (PM) including **$PM_{2.5}$**, one of the most dangerous modern-day air pollutants with far reaching human health impacts.

The second main issue is ammonium deposition which causes significant long-term damage to sensitive habitats and ecosystems as well as eutrophication, the over-nutrification and excess nitrogen in aquatic environments leading to acidification and a reduction in species richness and biodiversity.

Measuring ammonia

Being highly reactive, and often referred to as 'sticky', ammonia has been traditionally difficult to measure in trace concentrations in ambient air (i.e. at ppb levels) due to memory-effects and sampling issues due to the extremely reactive nature of the gas.

These effects and difficulties lead to sampling losses and often very long measurement times as the gas adsorbs (i.e. sticks) to 'wetted surfaces' within sample manifolds, sample lines and the detection assemblies and catalytic converters of some types of gas analysers.

In fact even with the latest generation of fast responding, optical instruments such as those offered by ET, care needs to be taken with regards to the exact choice of materials used in sample lines and filters and to ensure residence time is as fast as possible, minimising losses.

ET's solutions for monitoring ammonia

Los Gatos Research / ABB

ABB-Los Gatos Research's range of ammonia analysers continue to be popular with field and lab-based researchers alike. Like all ABB-LGR instruments, the ammonia analysers require very little maintenance and no recalibration, and provide high levels of precision and selectivity.

ABB-LGR offer ammonia analysers in different configurations, see below.

- Ultraportable Economical Ammonia Analyser (17kg, built into Pelican case) **GLA132-EAA**
- Enhanced-Performance Rackmount Economical Ammonia Analyser - **GLA331-EAA** (19" rack mount with temperature regulation for improved precision and drift)
- Trace Ammonia Analyser - **GLA451-AAQC** (19" rack mount, Quantum Cascade Laser for highly-sensitive measurements in the mid-infrared, liquid nitrogen cooled detector, temperature regulation)

LSE Monitors

LSE Monitors produce affordable high-precision analysers for the measurement of N_2O and NH_3 using photoacoustics.

LSE Monitors offer two NH_3 analyser models, the NH_3-1700, which has a precision of 2 ppb and a time resolution of 60 seconds, and the NH_3-1710, with a precision of 25 ppb and a time resolution of 2 seconds.

LSE MONITORS

Our useful comparison table will enable to you see which option best suits your requirements.

	LGR GLA132-EAA Ultraportable Economical Ammonia Analyser	LGR GLA331-EAA Economical Enhanced Performance Ammonia Analyser	LGR GLA451-AAQC Rackmount Trace Ammonia Analyser	LSE 1700 Ammonia Analyser	LSE 1710 Ammonia Analyser
Range	Up to 100ppm	Up to 100ppm	0.5 ppb - 10 ppm	0-15 ppm	0-15 ppm
Precision	1.4 ppb / 0.5ppb / 0.2 ppb	0.9 ppb / 0.3 ppb / 0.1 ppb	0.7 ppb / 0.2 ppb / 0.8 ppb	0.002 ppm max	0.025 ppm max
Flow Response Time	<8 seconds (1/e) [T_{90}<60 seconds] <2 seconds (1/e) with ACC-DP3H [T_{90}<20 seconds]	<10 seconds (1/e) Up to 5 Hz with ACC-DP4H (fast flow option)	1.2 seconds with ACC-DP3H 0.7 with ACC-DP4H	6 seconds (approx)	6 seconds (approx)
Outputs	Serial RS232, USB (x2), AO, ethernet LAN, VGA display, wifi 300Mbps	Wifi, ethernet, USB, serial (RS-232)	Digital (RS-232), analogue (0-5 VDC), ethernet, USB (Wifi optional)	Ethernet, RS232, USB, analogue, digital outputs and inputs	Ethernet, RS232, USB, analogue, digital outputs and inputs
Power	60 W (11-30 VDC) 66 W (100-240 VAC, 50/60 Hz)	110/240 VAC max 550 watts with ACC-DP4H	115/230 VAC, 50/60 Hz 300 watts (EP model, steady state)	230 Vac, 110 Vac available on request	230 Vac, 110 Vac available on request
Dimensions H x W x D	18 x 47 x 36 cm 7 x 18.5 x 14 in	40 x 48 x 61 cm 15.75 x 19 x 24 in	Rackmount package enhanced performance model) 14 x 45 x 17 in	12cm (H) x 37.2cm (D)	12cm (H) x 37.2cm (D)
Weight	16.9 kg (37.3lbs)	40kg (88lbs)	68kg (enhanced performance model)	8 Kg	8 Kg

All LGR/ABB analysers have 64GBSSD internal storage.

Contact us for more information on how we can help you monitor ammonia.

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