Manage ammonia emissions with real data

The advent of cost-effective sensor solutions to monitor levels of ammonia in near real-time means farmers can now make more informed decisions to reduce these emissions and demonstrate practical impacts to regulators and supply chains.

Ammonia (NH_3) is a significant air pollutant that can have a serious impact upon the health and performance of both humans and animals, as well as being deleterious to the environment. Excess environmental ammonia is linked to adverse health conditions in livestock which impacts productivity and GHG emissions intensity.

Agriculture dominates the ammonia emissions inventory, accounting for around 92% of all emissions in Scotland. Importantly, ammonia emissions have not reduced in line with other air pollutants and the UK is legally committed under the UNECE Gothenburg Protocol and the National Emissions Ceilings Directive to reduce ammonia emission by 16% (compared to 2005 levels) by 2030.

Most of Scotland's agricultural ammonia emissions come from livestock manures in animal housing (especially intensive pig and poultry operations) and stores, and when manures and nitrogen fertilisers are applied to land. Moving forward, it is anticipated that greater pressure will come to bear upon agriculture from government and regulators to mitigate ammonia emissions. Whilst much good work has been done in the pig and poultry sectors to mitigate ammonia emissions by introducing new technologies, improving building design and implementing new management practices, much more can be done using real data and insights to better target interventions. NH_3 levels can be linked to many variables, including building and manure storage structure, management practices, animal age, stocking density, outdoor temperature, ventilation control, time of day, weather and season.

In addition to negative environmental impacts, elevated levels of ammonia in indoor animal housing systems can have a deleterious effect on the health of livestock and workers. Whilst low levels of NH_3 will have limited impact upon animal (and human) health, higher concentrations (50ppm or more) can reduce growth rates, reduce bacterial clearance from the lungs, exacerbate nasal turbinate lesions in pigs infected with bordetella bronchiseptica and may influence the course of infectious diseases.

To ensure any effort to reduce ammonia emissions is of the right scale and targeted appropriately it is important to have access to data on emissions within buildings and to understand how these vary over time and with different regimes. To date, the collection of data on ammonia levels has been cumbersome and expensive. LoRaWAN sensors offer pig and poultry producers the opportunity to cost effectively monitor NH_3 and a host of other environmental parameters that have an impact upon health, welfare, productivity and environmental impact.

Having insights into the levels of ammonia being Generated and patterns in the data will ensure that pig and poultry producers are able to put in place mitigation measures that are appropriate in scale and cost and, importantly based on real data.