

BEST-PRACTICES TO CUT AMMONIA EMISSIONS

REPORT FROM 29 FEBRUARY 2016 WORLD CAFÉ

INTRODUCTION: AMMONIA & AIR QUALITY

Agriculture is responsible for over 90% of ammonia emissions in the EU. The main sources of these emissions are:

- ✓ Chemical fertilizers, such as synthetic urea based fertilizers;
- ✓ Manure and slurry from livestock.

Ammonia emissions cause significant damage to both human health and the environment, as pointed out by **Pieter de Pous** from the EEB in his introductory remarks. In particular, ammonia emissions are responsible for:

- ✓ Adverse health impacts through the formation of secondary particular matter (PM) especially in certain periods of the year (see Paris pollution peaks in March 2014 when ammonium nitrates were responsible for 51% of PM2.5 concentrations according to the [CNRS](#));
- ✓ Eutrophication of soil and water which negatively impacts e.g. biodiversity and water quality.

This is why the European Commission proposed to limit EU ammonia emissions by 2030 through its [clean air policy package](#), which includes the revision of the NEC Directive. This was presented by **Thomas Verheye** from the European Commission in his opening statement.

There are many ways of reducing ammonia emissions, as shown in the [UNECE guidance document](#) on this matter. With this event, the EEB and partner organisations wanted to highlight some of these solutions, and show that it is possible to meet ambitious ammonia emissions reduction commitments throughout Europe.

OVERVIEW: AMMONIA EMISSION REDUCTION POTENTIAL IN THE EU

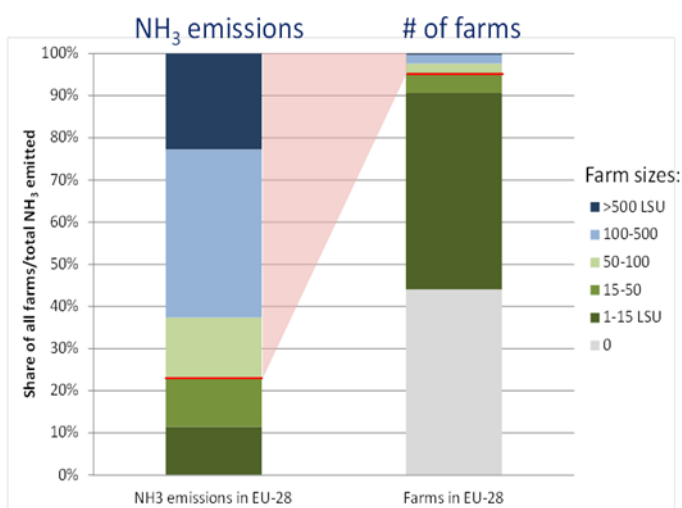
Zbigniew Klimont from the International Institute for Applied Systems Analysis (IIASA) gave an overview of the most promising measures to cut ammonia emissions in the EU. He presented the three most promising areas for emission reductions:

- ✓ Improved storage of manure;
- ✓ improved application of manure;
- ✓ Improved application of urea fertilizer or substitution by ammonium nitrate.

Zbigniew pointed out that 80% of EU ammonia emissions come from only 5 % of farms. The 2030 targets for ammonia in the NEC directive proposed by the Commission can therefore be met by addressing merely 3% of all EU farms, i.e. the largest industrial animal farms.

IIASA's estimates of the technical emission reduction potential have fully taken into account efforts already taken in Member States. Moreover, the estimates are conservative. Firstly because the farm size structure was frozen at the 2010 situation, while the trend is that farms get bigger and bigger farms have a higher reduction potential and lower costs per unit emission reduction. Secondly, because it was assumed that all technical measures could be applied only on the bigger farms, i.e. those with more than 100 livestock units.

Alberto Sanz-Cobena from the Polytechnic University of Madrid presented his study concluding that there is an important potential for abating ammonia emissions in Spain without affecting crop yields. The study can be read in full [here](#). A summary is available on the [European Commission's website](#).



In the EU, 80% of ammonia emissions come from just 5% of farms.

BEST PRACTICE #1: LOW EMISSION HOUSING AND MANURE SPREADING

Kevin Grauwels explained how Flanders managed to cut its ammonia emissions by half since the 1990s. Ammonia emissions from manure spreading only were cut by as much as 80% over the same period. This happened progressively through the implementation of the Nitrates and NEC Directives as follow.

Manure spreading:

- During the 1990s, Flanders introduced maximum limits of application for manure (in kg), shortening of manure spreading periods, and a compulsory incorporation of manure within 24 hours.
- In the 2000s, the incorporation time limit became 4 hours on bare arable land, and injection/trailing shoes/hoses became mandatory.
- Since 2007, manure must be incorporated within 2 hours or injected on arable land.

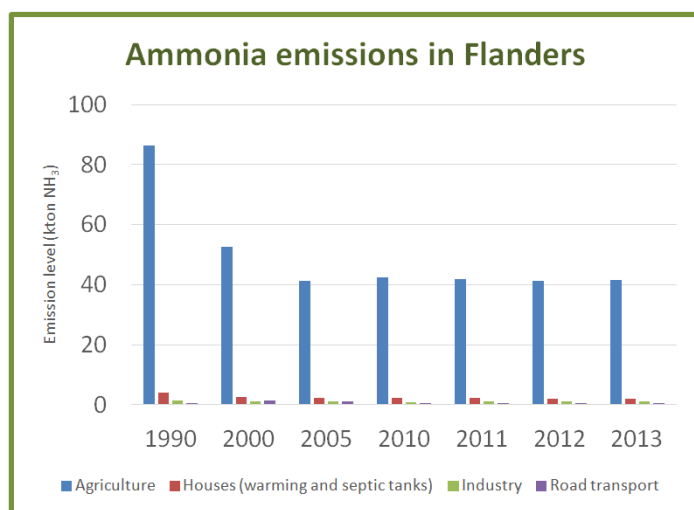
Animal housing for pigs and poultry:

Since 2004, low-emissions housing methods including building techniques and the use of chemical or biological air scrubbers have become compulsory for new stables and stables undergoing a thorough

renovation. The reductions from animal housing techniques are less impressive than for manure spreading techniques because new rules take longer to take effect.

The Flanders example teaches us three things:

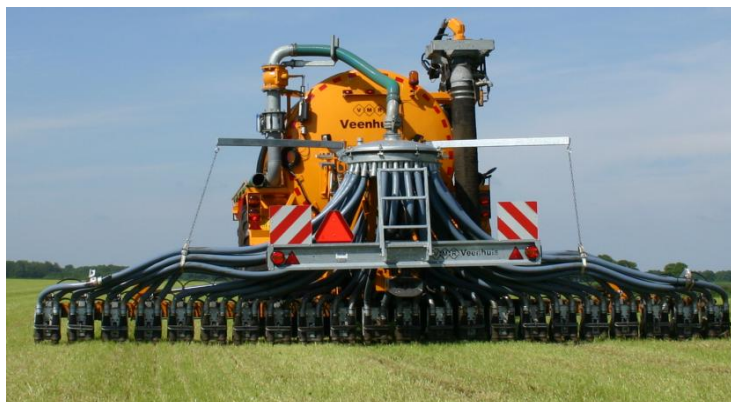
- Both the Nitrates and NEC Directives help to achieve significant reductions in ammonia emissions from farming practices - it is unlikely the outcomes would have been the same without such legislation in Flanders.
- Nitrogen is a precious farming resource and should be used in the most efficient way. When calculating the costs of measures, this should be taken into account as the benefits are big (e.g. savings due to less chemical inputs).
- It is important to anticipate new legislation and set early policies. This allows a gradual and smooth implementation of ammonia emission reduction objectives.



In Flanders, ammonia emissions have been halved since the 1990s as a result of national legislation.

BEST-PRACTICE #2: AGRICULTURAL MACHINES TO REDUCE AMMONIA

Johan Courtz presented the activities of [Veenhuis](#), a Dutch company producing agricultural machines for slurry application, handling and distribution - one of the most effective ways of reducing ammonia emissions into the air, according to the UNECE guidance document.



Direct injection of manure in the soil results in 7 times less nitrogen loss compared to manure spreading.

- Direct injection improves soil fertility and crop yields, resulting in less need for artificial fertilizers.
- Manure can be injected with precision, taking into account the fertility of the soil and allowing plants to grow even better.
- Machinery to inject manure into the ground is widely used in the Netherlands, Denmark and Flanders as a result of national policy limiting ammonia emissions.
- In countries where injection is not currently required by law only a small proportion of farmers have invested in this technique – mostly those who have done the calculation and for whom it is economically profitable. Whether or not it makes sense for a farmer to acquire such a machine depends on the crop and the type of soil. In general, it is more attractive for holdings that have both manure and arable land.
- In the Netherlands, Flanders and Denmark, when it doesn't make economic sense for farmers to buy the machines themselves, they contract service providers to inject the manure on their land using the machinery. It is often the same contractors doing both the injection and harvesting work.

The European umbrella association for agricultural machinery ([CEMA](#)) participated in the event and highlighted that family-owned companies similar to Veenhuis existed outside the Netherlands, e.g. in Germany.

BEST PRACTICE #3: SOLUTIONS FROM THE FERTILIZERS INDUSTRY

Another share of EU ammonia emissions comes from the use of synthetic fertilizers, in particular urea-based chemical fertilizers. **Gregor Pasda from BASF** presented one of the solutions to address such emissions i.e. using urease inhibitors which drastically reduce emissions from urea-based fertilizers.

Here are some highlights from Gregor Pasda's presentation and discussion with participants:

- Ammonia losses from mineral fertilizers mainly occur from urea-containing products.
- Urea is the most important mineral fertilizer worldwide and in many EU countries.
- Urease-inhibitors block urease for a certain period of time - urease being the enzyme responsible for turning urea into ammonia.
- The use of urease-inhibitors reduces ammonia emissions by up to 90%.
- There is an indirect effect of urease-inhibitor on the reduction of nitrate leaching and N₂O emissions.
- BASF launched the product last year in the US and this year in Europe.



BASF's urease inhibitor can reduce emissions from urea-based fertilizers by up to 90%

CONCLUSION: TIME FOR POLICY ACTION

In his concluding remarks, **Bastiaan Hassing** from Dutch Permanent Representation said he was optimistic for the NEC Directive after hearing about positive examples for reducing ammonia emissions, despite the difficult political negotiations. **Pieter de Pous** from the EEB insisted on the urgency of tackling ammonia for improving Europe's air quality and to do so immediately as part of the revision of the NEC Directive. He called on the three institutions to agree on a high level of ambition, especially as technologies are available and are set to become cheaper if the policy is there – as we already see in some Member States.

All presentations as well as the agenda and participants list can be downloaded from the EEB website.