Summary

To be able to comply with European standards on maximum fine dust concentrations in the ambient air, measures need to be taken in The Netherlands to reduce emissions of fine dust from major emission sources. In view of this, the Ministry of Economic Affairs, Agriculture and Innovation has commissioned Wageningen UR Livestock Research to set up a plan of action for the development of practical and effective solutions for the reduction of dust emissions from poultry facilities. One of these solutions is the application of negative ionization of poultry house air.

Within the framework described in the plan of action, a negative ionization system for broilers was tested and optimized in previous research in an experimental broiler house. In the current study, the performance of the system was validated on practical broiler farms using a case-control experimental design. At two broiler farm locations, both consisting of two identical broiler houses, one house was equipped with the negative ionization system, whilst the other house within the same farm location served as a control. In total, four broiler houses were used in this study. Emission measurements were conducted at these farms for particulate matter, ammonia, odour and green house gasses.

The aim of this study was to determine the emission reduction of the negative ionization system according to official measurement protocols and under field conditions. Based on this study, official emission factors can be adopted in legislation and used for environmental permit granting.

Based on this study at two broiler farm locations with four broiler houses, the following yearly emissions have been determined (average ± standard deviation between locations), corrected for an empty period of 18% in case of dust, ammonia, methane and nitrous oxide emissions:

- PM10 emission: 22.9 ± 4.6 g/animal place per year for control houses and 11.7 ± 1.9 g/animal place per year for ionization houses
- PM2.5 emission: 1.5 ± 0.4 g/animal place per year for control houses and 0.5 ± 0.0 g/animal place per year for ionization houses
- Ammonia emission: 47.6 ± 19.4 g/animal place per year for control houses and 57.6 ± 34.1 g/animal place per year for ionization houses
- Odour emission (not corrected for empty period): 0.31 ± 0.08 OU_E/animal place per second for control houses and 0.27 ± 0.10 OU_E/animal place per second for ionization houses
- Methane emission: 2.0 ± 0.6 g/animal place per year for control houses and 1.9 ± 1.1 g/animal place per year for ionization houses
- Nitrous oxide emission: 2.5 ± 0.8 g/animal place per year for control houses and 2.1 ± 0.4 g/animal place per year for ionization houses

Based on these results, the following emission reductions (ionization versus control houses; average ± standard deviation between locations) were calculated:

- PM10: 48.8 ± 2.3%
- PM2.5: 64.9 ± 12.0%
- Ammonia: -21.0 ± 24.3%
- Odour: 12.2 ± 8.2%
- Methane: 5.3 ± 24.4%
- Nitrous oxide: 15.9 ± 13.2%