

Partial air cleaning to reduce ammonia in pig housing

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Munters has found the solution to problems with clogging of filter material in air cleaners. The solution is an air cleaner that uses nozzles instead of a filter. Some of the key phrases that have been considered during the development of this air cleaner include – ‘keep it simple’, ‘get rid of clogged filters’, ‘high ammonia reduction’, ‘plug and play from day one’, ‘easy to maintain’ and ‘price optimised solution’.

Vertical and horizontal design

The first air cleaner from Munters is incorporated in a tube and in the bottom is a liquid reservoir holding a sulphuric acid solution with a pH level of 2.

The liquid is pumped to nozzles which create a mist inside the tube. When the air from the livestock unit is sucked through the air cleaner it passes through the mist.

The sulphuric acid in the mist reacts with the ammonia in the air from the housing unit. The captured ammonia gets stored in

the circulated liquid and drained to a manure tank. At the top of the air cleaner is the fan and beneath that are two mist eliminators.

Munters have their own factory so the company has great experience in developing mist eliminators for the livestock industry in general. Between the two mist eliminators a group of nozzles are located and once a day they automatically clean the mist eliminators. This company is the only one producing air cleaners which are able to reduce the ammonia concentration from livestock buildings by more than 90% and without using filter material.

Normally air cleaners using sulphuric acid to reduce the ammonia emission from pig facilities consist of a filter block where the solution of sulphuric acid trickles through.

However, the filter block can easily get blocked with dust and it is difficult to clean. So the designers were happy to introduce an air cleaner without a filter block.

Munters has also designed a horizontal air cleaner. The components and process in the horizontal air cleaner are, in principle, the same as in the vertical model.

The horizontal model has an advantage that you can pull out the mist eliminators, which enables the farmer to wash them in

free surroundings. For Munters, the farmer’s working environment is a high priority.

Ammonia reduction

The capacity of the air cleaner is some 25,000m³/hour and the reduction of the ammonia concentration in the air through the air cleaner is more than 90%.

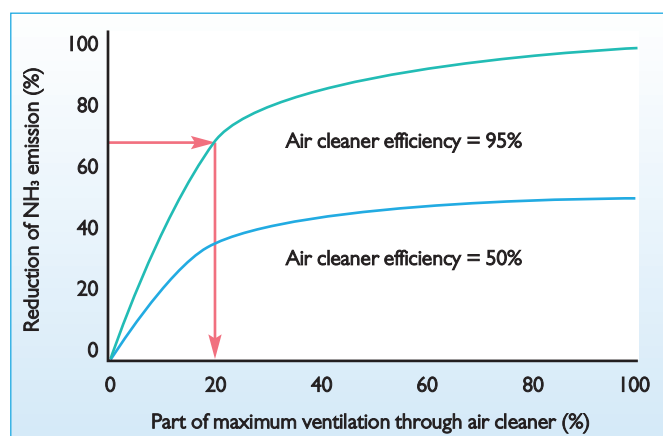
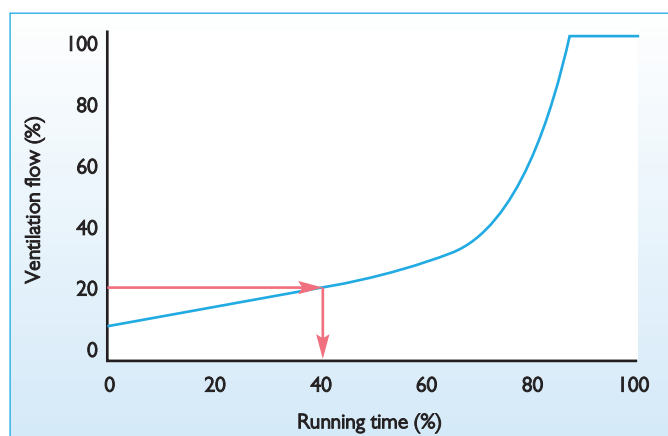
Many farmers and people with ventilation knowledge will perhaps comment that an air cleaner with a capacity of 25,000m³/hour is not big enough – even if a number of air cleaners are installed on a farm. However, the Pig Research Centre in Denmark has shown that ‘partial air cleaning’ instead of cleaning all the air from the housing unit can give a good ammonia reduction for the entire building if the air cleaner is efficient.

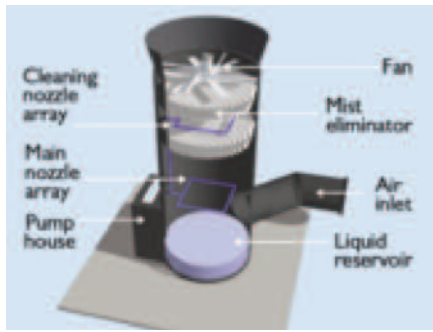
Partial air cleaning

In many climate zones in the world there is a huge variation in the outdoor temperature during the year. Mostly the livestock housing units are cooled by outdoor air, which results in a much lower ventilation rate in

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Figs. 1 and 2. The diagrams that are used when farmers receive environmental approval in Denmark from the authorities. In a finishing unit in Denmark, the ventilation flow is less than 20% of maximum capacity 40% of the time during a year. If the first 20% of the ventilation flow is led through an air cleaner with an ammonia efficiency of 95%, then about 70% of the total ammonia emission from the housing unit during a year is captured. Similar graphs can be made for other climate zones, and the livestock industry in countries with cold winters will be able to get a high ammonia reduction by using partial air cleaning, which is more economically realistic compared to cleaning all the air from a housing unit.





Vertical air cleaner without filter material and more than 90% ammonia reduction.

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the housing unit during the winter period compared to the summer period. In contrast to the yearly differences in ventilation rate, the variation of the ammonia evaporation in the housing unit during the year is negligible.

In Denmark, the ventilation rate in a finishing unit is less than 20% of the maximum capacity 40% of the time in a year. That means, if an air cleaner is able to clean the first 20% of the maximum air capacity, then 100% of the air is cleaned 40% of the time during a year.

In addition, the air cleaner will clean the first 20% of the air in the rest of the year. It can be simulated and measured that if the farmer cleans 20% of the air, then he will be able to reduce the yearly ammonia emission by about 70%.



The horizontal air cleaner.

This knowledge is a gold card for the livestock sector, because it is too expensive to clean all the air from a housing unit.

Chemical air cleaners have some advantages compared to biological air cleaners. Firstly the chemical air cleaners are able to reduce the ammonia emission by more than 90% as soon as they are installed. It is 'plug and play' from day one.

Often it takes 4-6 weeks before a biological air cleaner is running optimally. Therefore, a temporary stoppage of the chemical air cleaner will not have a huge effect on the ammonia emission, because it will reduce the ammonia emission as soon as it gets started again. The farmer can even plan to stop the chemical air cleaner in periods with limited ammonia emission.

Another advantage is that the efficiency of the chemical air cleaner is not dependent on

the temperature. In biological filters the bacteria can die if it gets too cold because of stoppages or because the filter dries out. The use of disinfectants can also be a problem for biological filters because the microorganisms can get killed.

VERA certificate

The Pig Research Centre in Denmark performed a VERA test on one farm and in August 2012 Munters got on the technology list in Denmark with 90% ammonia reduction.

At the moment the air cleaner from Munters is being tested on farm number 2 in order to get a VERA certificate (European test certificate). The test on the second farm will be finished at the beginning of 2013. ■