SUMMARY

The dominating source of mechanically generated noise inside livestock houses is ventilation fans. Demands on a noise criteria for animal houses were raised during the 1970s. According to the animal welfare directive in the Code of Practice issued by the Swedish Board of Agriculture, the mechanically generated noise in livestock buildings is set to a maximum sound level of 65 dBA in the nearness of an animal. The criteria does not take into account how animals tend to apprehend sound at different frequencies.

A distinguish tone can be found among all fans which depends on the speed and the number of wings of the fan. The noise generated at frequencies outside the fan tone is caused by turbulence in the airflow. It is experimentally proved that the sound power generated by a fan is proportionally to the 5th power of the flow velocity.

Ventilation systems make out an own category in the acoustics. The sound is led from the source to the recipient by the ventilation ducts. The only relevant changes in sound power come from bends, orifices and silencers.

Installation of a silencer is an easy and effective way of reducing the sound power from a ventilation fan in animal houses. There are three general principles of silencers used in ventilation systems:

- Lined ducts
- Parallel-baffle silencers
- Round silencers

Thick sound absorbing materials have to be used to obtain a good acoustical performance at low frequencies. For sound with high frequencies the performance generally depends on the distance between the absorbers.

A test was carried out among four different models of silencers made specially for ventilation systems used in livestock houses. The function and the construction were studied. All three general principles of silencers were included in the test. According to the results the best function could be obtained with lined ducts and parallel-baffle silencers.

The high concentration of dust, moisture and gases in animal houses has to be taken into account when constructing a silencer to be used in such a building. Dust in combination with moisture on the surface of a sound absorbing material could form a hard layer, which decreases the acoustical performance. It is hereby important that a silencer can be cleaned in an easy way. Because of the high concentration of corrosive gases the material choice also has to be taken into consideration when constructing a silencer.

A parallel-baffle silencer and a round silencer were constructed for the purpose of damping the sound power level from a high speed 50/1400 fan to the sound level of 65 dBA at a distance of 0.6 meters outside the silencer. An experimental arrangement was built to work as a ventilation system used in animal buildings. The sound level was measured according to the Swedish standard SS-ISO 3744 on different versions of the constructed silencers. The result shows that the sound can be lowered to an acceptable level. The sound pressure level measured on two of the versions has a good margin to the noise criteria for animal housing.

Ventilation fans that are constructed according to the same principles obtain a similar frequency curve. Therefore, the obtained results can be used to get a good estimate of the sound pressure level generated by another ventilation fan used together with one of the tested silencers.