Ventilating converted sow rooms

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Ventilation affects many aspects of the of the environment as well as barn operating costs.

Retaining the existing ventilation system in converted sow facilities will lead to over-ventilation during winter months, because existing minimum ventilation fans are designed for higher animal densities. This results in using extra heating fuel, and potentially causing chilling of the animals affecting performance. If ventilation is continued at the pre-conversion levels, the building would be ventilated by 33% higher than required which can cause a rise in heating energy consumption of 75%. During summer, the impacts are less pronounced but over-ventilation will use extra electricity which translates to higher costs.

In addition, the transitioning of the ventilation system design from stalls to group housing involves not simply reducing the ventilation rate but also requires careful re-configuration to ensure proper air distribution throughout the room to eliminate dead spots (unventilated areas) and unwanted drafts. Air exchange is critical to providing a healthy environment that fosters efficient pig growth by reducing humidity and gases like ammonia and carbon dioxide. Since under-ventilation can create an unhealthy environment and over-ventilation wastes energy, finding the right balance is key to a healthy environment for both animals and workers as well as to energy savings and efficiency. This balance can only be achieved by careful re-design of the existing ventilation system of a converted gestation barn.

In this project, numerical computer simulation technique which utilized computational fluid dynamics (CFD) principles to numerically simulate fluid flow, heat and mass transfer, and mechanical movement, was used as a tool to examine various design configurations and determine the most effective design of the ventilation system for a converted group sow housing facility. Ventilation system design parameters investigated include: (1). Capacity and location of exhaust fans, and (2). size and location of air inlets. These two parameters were configured in such a way that the resulting ventilation system design followed the following principles: upward airflow, downward airflow, or horizontal flow ventilation.

Barn implementation of the most effective ventilation system design

Two group-housed gestation rooms were used: one room designated as the Treatment room was modified to incorporate the horizontal flow configuration, identified from the simulation work, while the second room's ventilation system was similar to those in pre-converted (stall) gestation

Figure 1. Photos of the control room with the existing (unmodified) ventilation system (A) and the treatment room with the air inlets on the opposite side (B) following the principle of a horizontal flow ventilation system. B – inset: wall air inlets installed in the treatment room.

barns (Control room). Eight replicates (4 winter, 4 summer) were carried out.

Figure 1 shows the ventilation design configuration of the two experimental rooms. In Treatment rooms, air inlets were located at one end of the room and exhaust fans at the opposite end allowing air to flow horizontally through the entire length of the room (Figure 1A). In Control rooms, inlets were located on the ceiling while the fans were on one of the external walls; this configuration represented a downward air flow direction which is typical in commercial sow barns (Figure 1B).

Conclusions

Results from the computer simulation work have confirmed the need to re-design the ventilation system of a newly-converted group sow housing facility. Among all the design configurations tested, horizontal flow ventilation system was the most effective in removing heat from the animal occupied zone (AOZ) in the room during both summer and winter seasons.

In-barn evaluation of the selected ventilation system design showed about 21% reduction in natural gas consumption during heating season and 14% reduction in electricity consumption in the room with the horizontal flow ventilation system.

The horizontal ventilation system design for group sow housing has provided better air quality and cleaner floors than the unmodified ventilation design.

Animal performance and productivity were not adversely nor beneficially impacted by having a horizontal flow ventilation system in a gestation room.

In terms of behavior and welfare, enrichment use was greater in the room with the horizontal ventilation design which implies that sow comfort was better in the Treatment room.

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(Identification, treatment .... cont'd from page 3)

(chlortetracycline spray) on healing of shoulder ulcers in three sow herds. Sows were paired according to the grade of their ulcer and were randomly divided into two treatment groups: i) mats and zinc ointment, or ii) antibiotic spray.

The rubber mat and zinc treatment had a statistically significant effect for lean sows, the average shoulder ulcer size was smaller on day 14 (3.8cm^2 versus 9.5 cm^2) than when antibiotic spray was used[9].

Prevention of shoulder lesions:

Based on previous scientific studies, two methods were identified as most effective for reducing the prevalence and severity of shoulder lesions: 1. Ensuring good body condition when entering farrowing, and 2. Using rubber mats to reduce pressure on the shoulder region of the sow.

Monitoring and maintaining body condition prior to farrowing and throughout the first weeks of lactation is critical. Increasing movement in the most vulnerable sows could be a strategic management strategy to prevent the development of sores in at risk sows. Interrupting the lying bout by getting the sow up periodically will theoretically increase blood flow to the tissue and restore the oxygen supply[9]. It has also been found that the odds of a sow developing shoulder ulcers during lactation is three times higher in sows housed without rubber mats than in those with rubber mats extending to their hind limbs[10].

The true incidence of shoulder lesions is likely underestimated due to their multifactorial nature and lack of accuracy in reported reasons for culling. Because these lesions cause pain and contribute to the culling of sows, they raise concerns for animal wellbeing as well as representing a significant economic cost to producers. Future research should focus more on preventative management of sows, as this is a far more effective and useful approach, however robust strategies to deal with shoulder ulcers once they appear must also be developed, as the problem will persist until such time as an effective means of prevention can be implemented.

Take Home Message:

The prevalence of shoulder lesions in sows is associated with higher weaning weights, suggesting that higher producing sows are more susceptible to this condition. Thus, it is important to monitor sow body condition and adjust feeding levels as needed and to treat shoulder lesions promptly when they occur to promote the wellbeing and productivity of the herd.

However, both sow and farm factors influence the prevalence of shoulder lesions. Environmental factors which can play a role include the type and condition of flooring, temperature and humidity conditions, and to some extent, genetic selection. Regularly monitoring sows in farrowing and following up with rapid treatment of early signs of lesions (eg. use of mats) are useful steps in preventing these injuries from developing. Reducing the prevalence of sow shoulder lesions can save money and reduce losses to producers due to veterinary treatment, lost production, and the cost of replacement sows which currently represents a significant economic loss.

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