

SKOV International

PIG EDITION

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Large pens require different ventilation

Pen size and climate control

Pen sizes have always been a good subject for debate. One side of the discussion reflects the desire to create optimum conditions for animal behaviour to ensure growth. On the other side there is the understandable aim of limiting the investment as much as possible without sacrificing performance.

This debate has surfaced again internationally with the tendency to place more growing-finishing pigs together in a pen. Larger pens can save on some costs, but their use automatically changes the layout of the rooms. The change then has implications for the ventilation adopted. A failure to modify the system of ventilation in the house is likely to bring problems in terms of climate control.



Conventional pens
In a conventional layout (illustrated by the first drawing in figure 1), we see a series of pens that are placed in two or four rows running the length of the compartment. Usually the pens are rectangular in shape and their longer sides are directed across the building. The maximum group size would be about 30 pigs per pen. But changing to bigger groups dramatically alters the climatic situation, because the pen direction will now be down the building rather than across it. Most ventilation systems are designed for a house that is stocked equally (on pig numbers and weight) throughout its length. The room temperature should therefore be uniform from one end of the building to the other, with only minor deviations (1-2 degrees C). Today's preference for batch production helps in this respect by avoiding a wide range of animal sizes within the room.

Large pens
With larger pens, the floor-space per pig remains the same. However, there will be increases both in the area occupied by animals and in the open or pig-free area. These can have a negative influence on temperature deviations if the ventilation system is designed for small pens.

The blue-coloured sections in figure 1 indicate the 'animal occupied zone' at the beginning of the batch, in a room with pigs from 30-100 kg. See especially the difference in the animals' lying pattern as the group size moves up to 172 or 344 pigs/pen. Feeder type and placement will also affect how they choose to use their pen. The point is that the big-group layout does not apparently allow the pigs to adopt the lying pattern which would otherwise be dictated by their natural instincts. Four climate factors have to be fulfilled to ensure a high production level: Temperature, air quality, air velocity in the animal-occupied zone and uniformity. In each of these respects it is crucial to be able to persuade the animals to use the pens in a specific way because of the influence of their heat production on air flow, especially at minimum ventilation. Without an equal distribution of the pigs' body heat, we would need to have a movable air intake to achieve the same temperature in all parts of the room. Such intakes are not a practical possibility, of course, so the design of the ventilation system has to depend instead on a pen layout that predetermines the lying pattern.

Temperature control in the pen
Temperatures can vary quite markedly between the area of the room occupied by the pigs and the 'open' area without pigs. Particularly in rooms equipped with diffuse ventilation, it is not unusual to find the open area is 6-10 degrees C cooler than in the animal-occupied zone. A difference of this size creates obvious problems in adjusting temperatures, as well as in the placing of the temperature sensor to give a meaningful reading.

The different temperature levels are also an expression of differences in the rate of air exchange in each part of the housing compartment. So they relate to the concentrations present of the noxious gases carbon dioxide and ammonia (with CO_2 the gas used normally as an indicator of air quality). In a bad situation, you could have the temperature and air quality within acceptable limits on average and yet unacceptably poor where the animals were actually located.

What is more, the heat production from the pigs influences the thermal air movement in the room. This influence is usually at its highest when the stocking density and outside temperature are both low. Under these circumstances it is easy to create a draught because of air going directly into the animal-occupied zone. With a big ΔT (delta T = temperature difference), draughts can occur additionally from very low air velocities. The fact that the pigs are relatively small at this time makes them extremely sensitive to changes in temperature and to the chilling effects of cold draughts.

The Climate in the Pen is affected
Put together, these items will not provide a uniform climate. Eventually the lack of uniformity leads to a change in animal behaviour, with the pigs seeking the part of the pen that they find most comfortable climatically. Their behavioural shift in turn will change the climate situation through the heat output effect mentioned, so a vicious circle is established. When this happens, we start to stress the pigs, and all in all this will have a negative influence on production.

Tunnel Ventilation
Large pens are frequently used in areas of the world where tunnel ventilation is common. In effect the ventilation works like the piston of an engine. All the air is taken in at one end of the room and drawn towards the extractor fans placed at the opposite end. These tunnel systems will deliver a poor climate in large-group housing, however, unless the air moves at the correct rate. The air velocity along the length of a tunnel-ventilated building must be at least one metre per second. Then the ΔT can be kept down to 2-4 degrees C, the exact amount depending on the length of the building. Any decrease in the air speed will increase the temperature

difference. To be able to give an adequate climate, the outside temperature should never go below 18-22° C. Otherwise the pigs will feel a draught.

Conclusion

So there are two inevitable conclusions whenever a pig unit goes for larger pens. First, effective climate control requires a layout that obliges the pigs to use their pens in a specific way in terms of the lying pattern. Secondly, even with such a layout, the ventilation system has to be adapted to the purpose. It cannot be simply the same system as for conventional small-group housing.

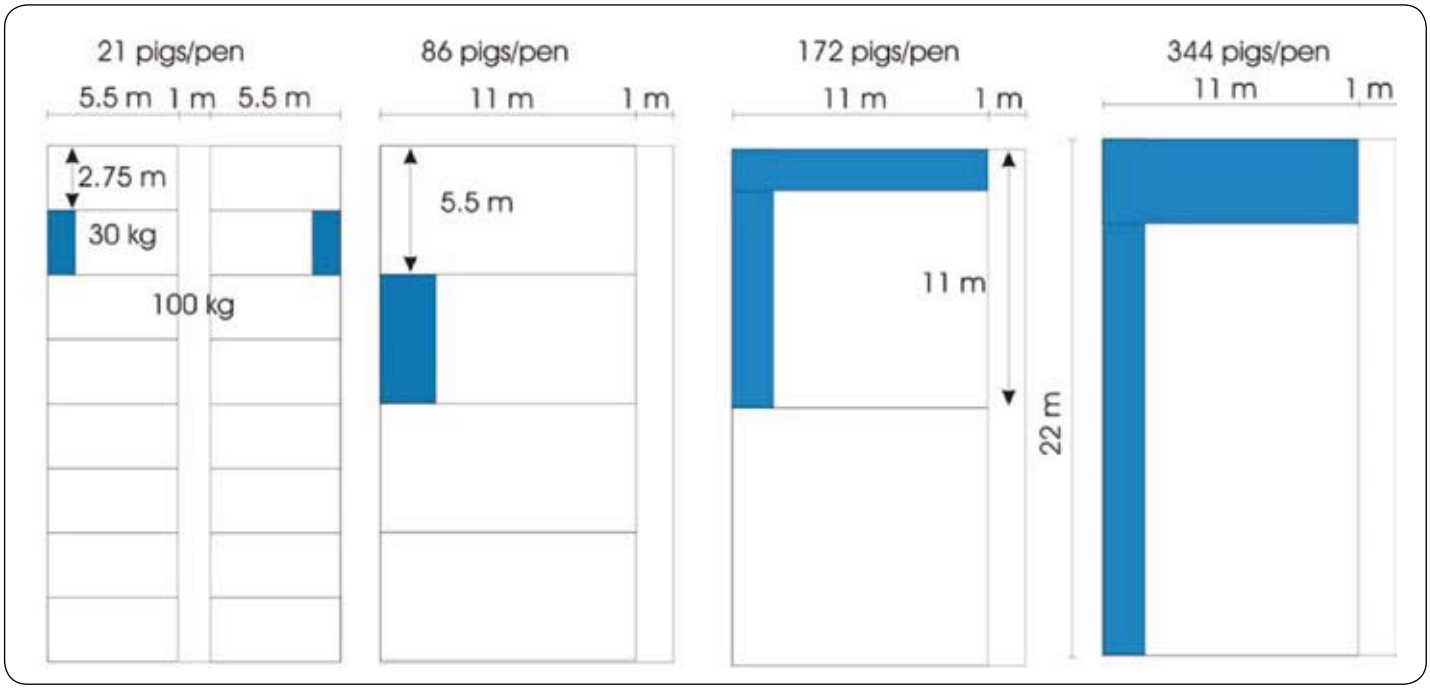

Figure 1: Pen orientation and lying patterns with an increase in the number of pigs housed as a single group. The section of each pen type usually occupied as the lying area is shaded in blue.