

# FOR THE LOVE OF SCIENCE

## Seeking the best flooring slat and gap widths for sow comfort and manure handling

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It is well known both within and outside the pork sector that the industry is transitioning from individual stalls to group housing for sows. What is still

being determined are the most suitable barn designs, design features, and management systems for housing sows in groups. Unlike stall housing, there are a variety of options.

Animal welfare, profitability, productivity and functionality are key metrics in identifying the most promising barn designs. Barn staff and pig safety, health and well-being are paramount.

Scientific research is the primary tool for determining the pros and cons of a particular design feature or combination of features. It is also the means by which we can quantify the potential impact of a given design on all the key aspects of a sow operation such as those listed above.

A team of researchers with the National Centre for Livestock and the Environ-



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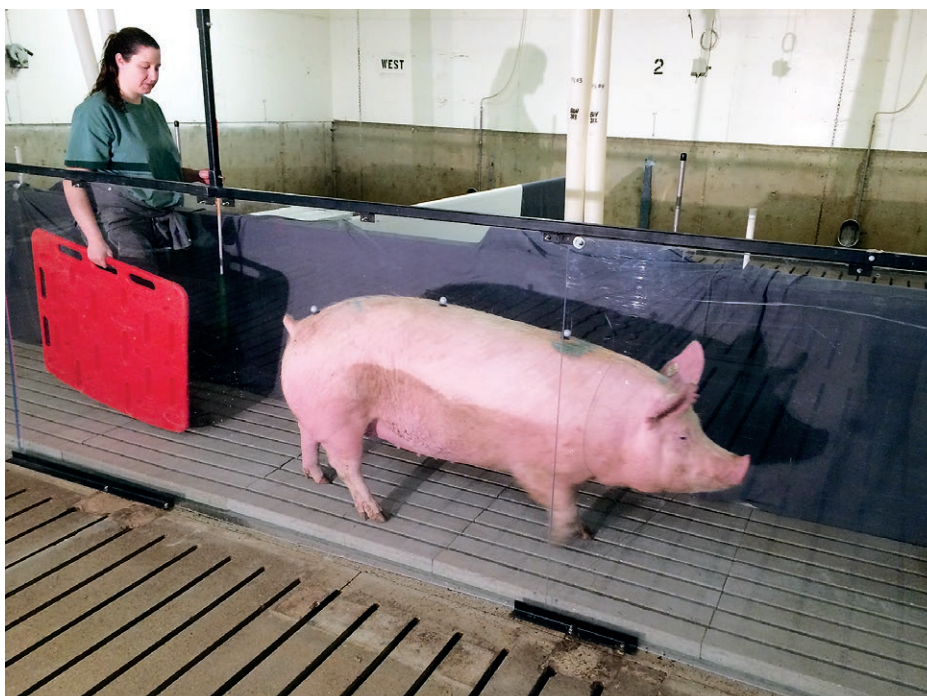


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ment at the University of Manitoba, working in collaboration with researchers across Canada and with Manitoba Pork, have developed and contributed to sow group housing decision making resources that have been shared widely with producers (Tools for Group Housing - <http://manitobapork.com/manitobas-pork-industry/animal-care/tools-for-group-housing/> and National Sow Housing Conversion Project - <http://groupsowhousing.com/>).

One current project is investigating flooring characteristics and social management for group-housed gestating sows. The project, funded by Swine Innovation Porc, involves researchers from the University of Manitoba, Prairie Swine Centre and AAFC-Sherbrooke. This research focuses on concrete slatted flooring configuration, pen environmental enrichment and sow mixing post-weaning in terms of productivity, profitability, functionality and sow well-being.

Drs. Laurie Connor, Qiang Zhang and Kris Dick at the University of Manitoba, along with ethologist Dr. Nicolas Devillers at AAFC-Sherbrooke, are looking specifically at the pen flooring design for group housing systems using concrete slatted floors. Taking a systems-based approach they are evaluating flooring based on both sow parameters and manure management implications. "Concrete slatted flooring is the industry standard across North America,"



Technician Lindsey Lippens guides a sow along a corridor during the kinematics test.

says Connor. "Floors were designed for cleanliness and ease of in-barn manure management when sows were in stalls. Now that sows will be in groups, flooring design should also address sow comfort and mobility needs."

Their study consists of two stages, one of which has been completed. First, a kinematics pre-test was conducted to identify the two most promising flooring designs for sow movement from a number of slat and gap width configurations. The second stage will evaluate the flooring at full-scale in pens with

sow groups over the course of two gestation periods.

Kinematics is a biomechanical assessment of motion. In this study kinematics was used to assess sow gait by analyzing digital recordings for sow walking speed, stride length, swing time, stance time and foot height for each limb, as well as joint angles during the walk along a specially constructed corridor.

### Stage 1 – Kinematics pre-test

Sow locomotion using kinematics was evaluated using a total of 18 floor de-

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signs, featuring combinations of three concrete slat widths (85, 105 or 125mm, equivalent to 3, 4 or 5”) and 3 gap widths (19, 22 or 25mm, equivalent to 3/4, 7/8 or 1”). Each test-flooring was installed along a corridor with the slats facing either parallel or perpendicular to the direction of sow travel. A solid concrete corridor was used as the control.

“There does not seem to be a recognized standard for concrete slatted flooring for sows, although currently in North America five inch slats and one inch gaps seem to be most common,” notes Connor. “Our other test dimensions were selected based on European manufacturing standards, but there is very little scientific literature to support these, except with reference to manure removal or floor cleanliness. Yet, we know there can be sow problems associated with concrete flooring.”

Sows were video recorded as they walked down the kinematics corridor and their

movements analysed with specialized software to identify changes in gait parameters with the various flooring configurations. Both small, non-lame sows and large, lame sows were used in the study to account for possible differences in foot size and stride length as well as initial sow comfort influences.

The orientation and sizing of the slats and gaps did affect sow gait. They determined that flooring design had a greater impact on the gait of small, non-lame sows and that the impact was more pronounced when the flooring was oriented parallel to the direction of travel. Gait was least altered with slat width of 105mm (4”) and gap width of 19mm (3/4”).

**Stage 2 – In-barn scaling-up test**

The scaled up in-barn testing will assess this best performing slat and gap width combination from the kinematic test and compare it with the current industry standard of 125mm:25mm (5”:1”). The flooring is currently being installed in two pens at the University of Manitoba swine research facility.

Starting as bred gilts, sows will be evaluated over two gestations for development of lameness, unevenness of weight distribution on each limb, general activity level, lying comfort and use of space within the pen. Manure handling measures will include pen cleanliness, percentage of manure coverage of the

floor, percentage of gaps blocked with manure, animal cleanliness, as well as air quality testing for ammonia and hydrogen sulfide levels.

These measurements will help the researchers determine if there are differences in how sows move and use the space within the pens, in the incidence and degree of lameness and injuries such as claw or hoof lesions over time and overall changes in how the sow carries herself and distributes her weight. They will also identify if there are differences in floor cleanliness and air quality between the two flooring systems, the importance of sow size and initial condition, as well as if indicators of sow comfort change over time.

The information from this study will be used to make recommendations and develop guidelines for designing and selecting slatted flooring for group sow housing which incorporates indices of sow well-being as well as ease of manure management

“Ultimately we want to be recommending a flooring system that promotes good sow health and comfort while maintaining the features for ease of manure removal. Reducing incidents of sow discomfort, lameness, injuries or infections translates to improved productivity, lower use of medications and lower rates of injury-related culling which all improve the bottom line,” concludes Connor. ■



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