

The importance of flooring in designing loose lactation pens



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Pig housing



A sow with her piglets in a free lactation regime. Photo: SEGES

Freedom during lactation has been on the agenda for quite a few years now in the European Union. One of the questions occupying scientists is what the ideal pen could look like. Selecting the right type of flooring is one of them – but making the right choice is not as straightforward as it seems. In Denmark, ongoing research has been going on to find the right balance between welfare and emissions, writes housing and welfare expert Dr Vivi Aarestrup Moustsen.

In a pen for sows in a loose lactation regime, what dimensions are optimal? What are the ideal proportions of solid floor, drained floor and slatted flooring*? There is no simple answer, except that the flooring is important for the pen's function. The pen design determines what flooring or better said, combination of flooring types, would likely lead to higher animal welfare.

Choice of enrichment

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One factor affecting the choice of flooring is the choice of enrichment. In a 2025 paper in *Frontiers in Animal Science*, a team led by Dr Emma Baxter at Scotland's Rural College (SRUC) recommended that the floor profile and choice of enrichment (nesting/ rooting/ employment materials) ought to be taken into consideration all at once. It is recommended that a solid floor is provided for all piglets to rest, additional proportions of solid floor and their respective locations will depend on the pen design, dimensions and choice of enrichment.

Dr Baxter and her colleagues pointed out that the purpose of a solid floor is to retain material so that a dry, soft bed can be offered. However, as loose sows dung and urinate in several places in the pen, a solid floor means that manure and urine are not drained away, and, if straw is offered, there is even less chance for manure and urine to be drained away. Instead, it results in an area with very poor hygiene, which is negative for both sow and piglet welfare. To ensure that nesting and other materials are attractive to sows and pigs, it is important that there is a high level of pen hygiene and that the floor profile and enrichment materials “work” together.



When sows can stretch their legs in the farrowing pen, they have more areas to relieve themselves.

Photo: SEGES

Flooring and hygiene

So there is a significant risk of poor pen hygiene in farrowing pens with a larger proportion of solid floors. That fact was also evident in the Danish research-project “Systems for sows with high animal welfare and low emissions” (Sowemis**), led by [Aarhus University](#). In the project, in which I was involved myself as well, experience was collected in a herd with pens for loose lactating sows, where there was a partially solid floor in the pens.

In total, back in 2022, we tested 11 different measures to reduce manure deposition on the solid floor, but none of the 11 measures resulted in the desired improvement in pen hygiene.

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Subsequently, in several tests we carried out an experiment with the initiative that had shown the most promising effects in terms of improved hygiene in order to achieve stronger evidence. The measure had an effect, but despite the measure and daily routines with cleaning, hygiene remained unsatisfactory.

In Sowemis, we concluded that the desired reduction of the slurry surface by establishing a partially solid floor did not lead to improved animal welfare and lower emissions. Sowemis then continued to achieve high welfare and low emissions in farrowing pens for loose sows by ensuring high pen hygiene (by a reduced area having a drained floor in the sow area) and low emissions (reduced slurry surface under the floor); this research was published in 2025 and was led by Stine Grønborg of [SEGES Innovation](#).

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Working conditions for pig farm staff

In addition to affecting the pigs' health and welfare, the deposition of manure on the solid floor will lead to significantly reduced working conditions for staff. The Sowemis project showed that the necessary repeated cleaning is physically demanding, and takes place in an environment with poorer air quality. On top, the cleaning occurs in the sow's "zone," which poses a risk to the worker safety.

This complexity in the layout and the importance of the layout for a functional farrowing pen was supported in a survey conducted by SEGES, in which 8 experts assessed that both the area and the dimensions of the area were significant for the function of the pens in relation to the sows' and piglets' ability to perform specific behavioural elements, as well as partly for the staff's working conditions and for the environment.

Progress rather than standstill

The welfare of the sows can and will be significantly improved by transitioning from crates to loose housing systems. In loose housing pens, the sows can turn around during the periods when they are active. That fact is important for sow welfare, as "turning" is behaviour that the sows are very motivated to perform.

However, due to a multitude of reasons, there has been a standstill in the implementation of farrowing pens for loose sows in Denmark as well as Europe for a number of years. Among those reasons are the complexity regarding pen design and the uncertainty concerning future legislation in relation to pen specifications, but also the transition periods and the moment the new legislation will commence. For that reason, it is needed to adopt a common EU legislation which will facilitate the widespread implementation of farrowing pens for loose sow housing.

However, it is important allow for significant proportions of the flooring to be slatted. The above-mentioned challenges in maintaining a dry and clean solid floor will lead to a significant risk that it will take significantly longer to transition from crates to farrowing pens for loose sows. That, in turn will lead to fewer sows eventually benefiting from the possibility of improved welfare.

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** In Denmark "drained flooring" is defined as flooring with a maximum of 10% opening and is equated with solid floor. According to Danish legislation, in pens for weaners and finishers at least one-third of the at any time required space allowance must be solid or drained flooring or a combination of solid and drained. Pigs from weaning and until 10 weeks of age must be kept in pens where at least half of the at any time required space allowance is solid or drained or a combination of solid and drained.*

*** The research is known under journal number 34009-19-1516.*

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