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Comparison of ESF to open stall systems in large sow units

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Group housing is a complex issue involving welfare understanding, producer concerns of economics and welfare. Science has provided some guidance. In a report from McGlone, et al, 2004 and AVMA 2005 no alternatives improve wellbeing based on reproduction, behavior, and physiology.In the countries of European Union it is now required that any new dry sow housing must have all pregnant sows and gilts in groups from four weeks after mating until one week before farrowing. Existing accommodations for pregnancy must conform to the same rules as from July 2013. For producers in European Union, space requirement varies with group size. The minimum amount of unobstructed floor area is put at 2.5 square meters per sow in groups of five sows or less, 2.25 square meters for groups between 6-39 sows, and 2.025 square meters with 40 sows or more. These space requirements are not yet required in the U.S.

The EU legislation for gestating sows generally house sows from four weeks after service until one week prior to farrowing. Sows must have permanent access to manipulable material and have access to high fiber feed. Sick or injured animals must be in a turnaround pen. Staff training, confidence in animal welfare issues must be completed. Space for gilts in Table 1.

In the US, group on pen housing is typically either open small capacity groups or electronic sow feeing, or dynamic groups. We service several sow herds that utilize ESF ranging in herd size from 720 to 6,000 sows. Our experience with ESF includes Nedap, Schauer, and Osborne. We service several sow herds that have open stall small group housing ranging in herd size from 1,800 to 2,500 sows. Our experience with small pen three stalls is with Hog Slat/AP free access stalls. This presentation reviews production of and operation of the two systems. Sows and gilts are housed in gestation crates until 35 to 42 days in 40 percent of the systems, and then enter either ESF stations or small pens. In the other 60 percent of the systems, sows and gilts are housed in stalls until seven days post weaning and then placed into ESF. Each electronic sow feeder station accommodates from 50-65 sows depending on the station. In the free stall open pens, sows are housed in stalls until Day 35-Day 42 of pregnancy. Animals are then grouped by body condition into pens of 10. Each open stall has a drop box. The feed system is run two or three times per day to the entire barn. When grouping sows if either system, they must be grouped either before implantation starts or after implantation is finished 28 -35 days post breeding. When using post-implantation crates, the advantages are the reproductive management is identical to a crated barn. The disadvantages are that up to one-third of sow's are in crates and possibly more social conflict in making groups. With pre-implantation crates, the advantages are it minimizes crates in the barn making it easier to group sows, and better paired with dynamic groups, which means there is optimal space and

Table 1:

	Gilts
17 square feet per sows	1.64 square meters per animal
24 square feet per sow	2.25 meters square per animal
If there are less than six animals per group you must increase the space 10%. If there is greater than 39 animals per group, you can decrease the space 10%.	
	Flooring
10 square feet per gilt	0.95 square meters for gilt solid or drained
14 square feet per sow	1.3 square meter for solid or drained for sows

Application for this is that all are new or rebuilt units from January 2003 and all units from January 1, 2013.

feeder utilization reducing facility cost. Key disadvantage with pre-implantation pen is 21 day heat check and 35 day pregnancy check has to be done in the pen.

When comparing reproduction of stalls versus group pens, some studies have shown reproduction to be better with shorter wean-to-first service intervals, lower replacement rates, and reduced reproductive failure (Backus et al., 1997; Den hartog et al., 1993; Barbari et al., 2000; Karlen et al., 2006) Other studies have shown greater pregnancy rate post mating of 15 percent with less spontaneous abortions with stalls versus group pens (Esteinne et al., 2006; Munsterhjelm et al., 2008) However, other studies have shown greater farrowing rate and pregnancy without stalls. Other studies have shown similar pregnancy rate and embryo survivability (Langendijk et al., 2006; Salk-Johnson et al., 2007; van Wettere et al., 2008) Other studies have shown group pens productivity to be higher in stalls with respect to lower mortality at Day 8, higher liveborn, heavier wean weights (Cronin et al., 1996; Barbari 2000; Bates et al., 2003) while other studies have shown similar liveborn and greater litter birthweights (Barbari et al., 2000; Bates et al., 2003).

Management of animals can be either with a static or dynamic group. In a study reported by Lee and Gonyou they found that the ESF system could achieve equal or greater productivity than the conventional system with the greatest advantage to the ESF in the productivity of mature sows. In that study, productivity in the ESF system was reduced if animals were removed into the pens before implantation has occurred. Static groups are constant throughout gestation. Typically, one breeding group benefits from a stable social order with the physical group remaining intact. Challenges are that no group is stable and there is poor space and station utilization. Dynamic groups are groups that are not constant throughout gestation. Animals are continually added to the group and typically only about 10 percent are put in at one time. Dynamic groups are used to increase the number of animals in a group either because the animals are sorted or too few animals are bred in one week to achieve desired group size.. Breeder group may be spread across several pens. Dynamic groups easily accommodates then flows of breeding group size and works best in pen sizes greater than 100 animals, which may lead to less social conflict. It also allows more than one feeder per pen, which makes it harder for dominant sows to guard the feeder. Dynamic group benefits are that the large group prevents social stress while allowing optimal space and feeder utilization with total management flexibility. Challenges of dynamic groups are physical integrity of breeding group is lost and it requires total faith in the computer.

Data from a Danish study of greater than 600 litters showed no difference in totalborn or farrowing rate between static and dynamic groups. (Report 311, DPP) Looking at the time of mixing either after mating or four weeks post mating showed a similar farrowing rate, but a 0.6 higher totalborn per litter when mixed four weeks after mating. (Report 311, DPP). Large static groups with individual feeders from another Danish study in 1,000 litters showed no difference in totalborn when mixed immediately after weaning or four weeks post mating (Report 602, DPP).

Welfare issues vary between stalls and groups without comes varying by studies. Some of the advantages of stalls are lost in groups. In stalls, modern sows can now be able to lie in full lateral recumbency. Movements are limited, but there may be a reduction in lesions. There is typically a reduction in skin lesions. Stalls limit socialization, but not entirely. Groups frequently still experience some aggression at mixing and feeding. It is important to match sows for body size and condition when filling pens four weeks after servicing. Size matching and body condition matching has same driver than of group size housing. The group size is dependent on the sow inventory. Facilities must be available for housing individual sows that lose body condition in groups. Removal of recycle sows and thin sows can result in an irregular stocking density per pen resulting in under utilization of space.

Sow comfort for a majority of the sows in pens appears very good after the initial few days after being placed in the pens. General fighting occurs when sows are mixed, a social hierarchy is determined and the sows settle down. General body scratches and occasional lameness will be seen. Sows tend to go through the station in the same order each day, so the timid sows are usually last. During the first week after the pen is established, pen division is used to ensure that every sow has the chance to go through the station or be assisted by staff the next day. This is basically a re-training period. This re-training period has greatly reduced non-eaters. Sows will lay in pens along all fence lines and then lay right next to each other, the same as laying in rows of crates. The employee daily walkthrough usually doesn't disrupt sows unless they are getting everyone up. Most sows will lay there and not move as you walkthrough.

Individual sow fall-out in the pens is still higher than crated gestation. Crated gestation will typically have 2-5% group fall-off after pregnancy check. Group penning is running 3-6%. This is an ongoing challenge to the production staff. Individual weeks can get under the 5% target, but not consistently. Sow social order has obvious effect on feeding habits. Timid sows have the most likelihood of falling out due to not-eating or not pregnant. Sows are pulled out either to another "hospital" pen or to the crates. Hospital pen is set up the same as all pens with the addition

of a self feeder for full time access to feed. Feeding station malfunctions can result in challenges. On/off feed events has induced acute ileitis and vulva biting. Location of aggression in an ESF system is primarily at the entrance to the station. Staff must understand a few principles of the system such as the importance on fixing systems quickly due to the time required to get all animals through a station. The stations have small hoppers for feed, but that is only enough for a few sows and then would need to fill multiple times every day to get everyone fed. The pens have no built in option to mass feed entire pen. Feed speed dropping is extremely important. Slow feed dropping decreases the daily turns through the station and increases the level of vulva biting from aggressive sows. Feeding speed has to be lower for gilts and can be increased as herd matures. Cutting the feeding time in half can reduce the hours required to get the same number of animals through your feeding stations. Feed stations are operated on a 24 hour time cycle. You can alter the time of the day to initiate the cycle. This should be correlated to avoid when you are moving sows during the daily routine.

Gilt training starts in the GDU. Two stations are in the set-up with dry feeders in each pen to help keep gilts on the right growth pace and cycling. Besides training to the stations, crate braking is also part of the protocol. Timing of the training has been changed several times to attempt to get better. Gilt pens have been designated in gestation barn next to GDU and flow as their own snake from the sow snake.

Treatments in pens take a different discipline. With moving populations within the pens, you must systematically go through each pen to identify the individual to treat. Non-eaters are not visually obvious, cannot see feed left in the trough. Velos will provide remaining feed budget for animals that have feed left to consume in the last period or several periods. Lame sows are easily seen when sows are up and moving, but is a challenge to identify when they are lying down. Most sows get very comfortable and are sometimes hard to get up.

Typical ESF training recommendations

1. Do not train animals from Day 0 to 28 after insemination.
2. Do not train those animals in the last three weeks of pregnancy.
3. Do not train wean sows.
4. Do not feed animals for at least 24 hours before starting training.
5. Divide the pen with feeding between the entrance and exit gate and the feed station.
6. Insure sufficient light over the feed stations during the day and the night.
7. When training gilts or small sows, use the adjustable side walls to narrow the feed stations.
8. For training gilts only, move the entrance gate closer to the feed trough. This will also help adapt the station to the size of the gilts.
9. Use closed partitions to lead animals to the feed stations.
10. Never feed animals that do not enter the feed station outside of the feed station.
11. Never use force or loud noises when training loud animals.
12. Use your hand to scratch the sows back.

Typical training schedule

1. When starting a new installation, reduce the feed speed of feed strategy 99 to 100 grams/minute, especially when training only gilts.
2. Do not put too many sows on one station as this will lead to unfed sows.
3. Allow the gilts/sows to enter the feed station on their own.
4. Adjust the positions of the feed station that has a mechanical entrance door as shown in the following table.
5. Training button on the station to allow gates to open when triggered from the back of the station is extremely helpful.

ESF advantages

1. Monitor individual feed intake through the ID of each sow.
2. Individually feed sows in a group environment.
3. Feed sows according to feed curve by day of pregnancy.
4. Feed two different diets to animals in the same pen depending on the system.
5. Allows sow to dictate her eating pattern.
6. Adjust last 21 days of increase feed intake through programming.
7. Calculate daily feed usage.
8. Reduces dominant sow affect.
9. Lower prevalence of vulvular biting.

ESF disadvantages

1. Requires more skilled labor.
2. No reserve of feed if the system is interrupted.

Small open pen advantages

1. Easy to operate
2. Few mechanical challenges

Small open pen disadvantages

1. Need to feed 2-3 times per day to minimize body condition variation

Summary

Both small group open and pen housing for sows is adaptable to large farms. Reproductive performance is acceptable in both systems and comparable to stall gestation as experience occurs. The debate on performance differences is systems housing in stalls for 7 days or less post service versus systems housing in stalls 35-42 days post service requires more research. Small group open pen housing compared to ESF is a simpler system to operate but may not provide all the advantages of ESF.

References

McGlone, et al. 2004. Review: Compilation of the Scientific Literature Comparing Housing Systems for Gestating Sows and Gilts Using Measures of Physiology, Behavior, Performance, and Health. The Professional Animals Scientist 20 (2004): 105-117.