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Rubber mats in pens for pregnant sows – durability and cleanness

Rubber mats are still not used in pig housings. This might mainly be caused by the insufficient durability of rubber mats in pig production observed in the past. The mats could not stand the pig's intensive examination. The non-perforated rubber mats used in this study were specially developed for the use in pig housings. They were fitted with a special surface that could resist against the animal's bites. 24 months after having been introduced to pens of pregnant sows these mats still showed a very high durability. The lying area fitted with non-perforated rubber mats, activity area and animals were clearly dirtier than floor and animals in the pen with slatted floor in the lying area. Negative effects on the cleanness of mat surfaces and in consequence of pens and animals must be counteracted by a slope of about 2–4 % of the floor beneath the mats.

Keywords

Rubber mats, pigs, durability, fastening, cleanness

Abstract

Landtechnik 67 (2012), no. 4, pp. 291–294, 8 figures, 1 table, 2 references

Whereas rubber mats are widely used in cattle housings where their positive impact on legs and claws is well documented, they are still not used in pig housings. This might mainly be caused by the insufficient durability of rubber mats in pig production observed in the past. The mats could not stand the pig's intensive examination. The non perforated rubber mats used in this study were specially developed for the use in pig housings. They were fitted with a special surface that could resist against the animal's bites. 24 months after having been introduced to pens of pregnant sows these mats still showed a very high durability. Lying area fitted with non perforated rubber mats, but also activity area and animals were clearly dirtier than floor and animals in the pen with slatted concrete floor in the lying area. Negative effects on the cleanness of mat surface and in consequence of pens and animals must be counteracted by a slope of about 2–4 % of the floor beneath the mats. The fixation of traditional rubber mats is often loosed by the pigs within a few minutes. The mats are often totally destroyed within a few weeks [1]. But health of the pig's claws and legs takes profit from the mat's smoother and more comfortable surface [1, 2]. Whether the investment in rubber mats is rewarded by improved production criteria, for example a better longevity of the sows, could still not be shown.

Aim of the study at the centre for pig production of the Bavarian State Research Centre for Agriculture at Schwarzenau

After a new type of rubber mat had been developed with a modified and enforced character of surface and edge, these mats could be introduced in the lying area of pregnant sows. The mats durability as well as their impact on the sows should be proved in a long time study in the stables of the Bavarian State Research Centre for Agriculture at Schwarzenau. While the results of the health of legs and claws and of production criteria are still not available yet, it is possible to judge durability and cleanness of the mats after 24 months of use. Moreover, recommendations for their installation can be given.

Installation of the rubber mats in the experimental pens

Installation of the rubber mats took place in November 2009. The mats were specially designed for the use in pig housings with a surface specially resistant to the animal's bites ("Protect-Surface"). Two types of mats differing in the structure of their surface were used, each one in three of total six lying zones:

One rubber mat with pyramid like surface and L-formed bar of stainless steel to protect the edge (**Figure 1** and **2**).

One rubber mat with profile „hammer blow" and hard rubber edge (**Figure 3** and **4**).

The mats were fixed with screws to the slatted floor beneath only on that side that was orientated to activity area of the pen. The lying zones had a depth of 2 m and a width of 3.05 m. In each zone three mats were put on elements of slatted floor without any slope. Two mats had the original width of 1.20 m, the



Fig. 1 Rubber mat with pyramid like surface and L-formed bar of stainless steel



Fig. 3 Rubber mat with profile „hammer blow” and hard rubber edge



Fig. 2 Fastening of the stainless steel bar



Fig. 4 Fastening of the mat with hard rubber edge to the elements of slatted floor below

width of the third one was adjusted during the installation. In two lying zones a cut-out for the pipes of the dunging system had to be made.

Daily handling of the mats

Since their installation the mats had never been taken out of the pens. During the cleaning of the pens the mats were fold up. When necessary the mats were brushed once a day, to remove faeces and liquids.

Soiling of the mats and counteractive measures

Cleanness of the pens was judged every two weeks. The results confirm those of former studies [1]. Lying and activity area in

the pen with rubber mats and also the animals kept in this pen were dirtier than the pen fitted with slatted floor and the animals kept in it (**Table 1**). This was true when regarding the whole experimental time as well as when regarding only summer months. Cleanness during summer months was not less. This is a fact which confirms the high acceptance of the lying zones by the sows also at high air temperatures, a fact that could be seen regarding the animals.

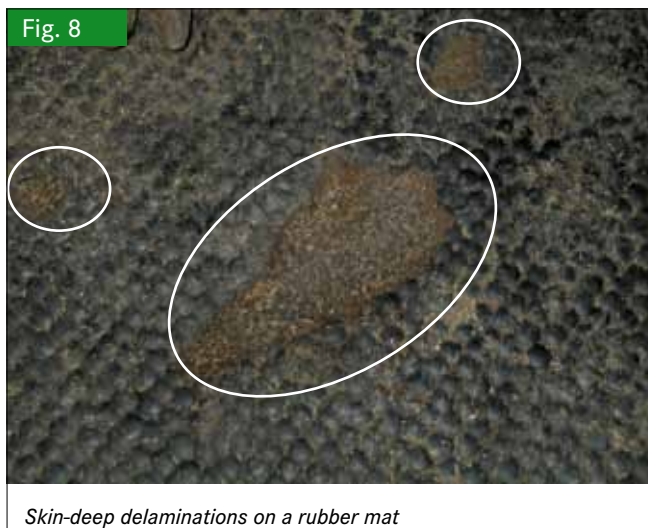
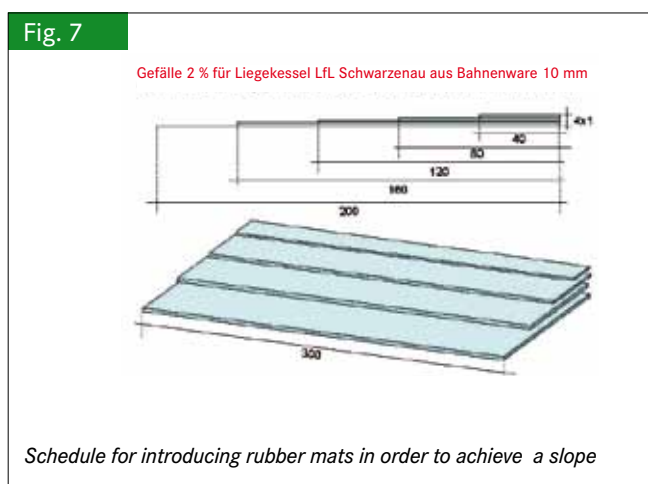
In this study the high amount of liquids gathering on the mats was surprising. Before the installation of the mats the lying zones had mostly been dry. Probably the urine gathered due to the missing slats. Moreover, in the course of time, the mats formed depressions, where urine gathered (**Figure 5**).

Table 1

Overview of the soiling of the pens

Anzahl Beobachtungen Number of observations	Januar 2010 – November 2011 (44 Beobachtungstage) January 2010 – November 2011 (44 days of observation)				Nur Sommermonate (18 Beobachtungstage) Summer only (18 days of observation)			
	Liegekojen/lying area		Gänge/corridors		Liegekojen/lying area		Gänge/corridors	
	Beton concrete	Gummi rubber	Beton concrete	Gummi rubber	Beton concrete	Gummi rubber	Beton concrete	Gummi rubber
Note ¹⁾ Mark ¹⁾								
1	24	6	13	3	10	3	6	3
2	20	23	30	24	8	10	10	11
3	1	15	2	17	0	5	2	4

¹⁾ marks: 1 = dry and clean; 2 = intermediate soiling; 3 = heavy soiling.



As a first counteractive measure the depressive areas of the mats were fitted with holes with a 3 cm diameter (**Figure 6**). Thereby the diameter of the holes was 1 cm larger than the diameter of the holes of the concrete floor below. By means of individually fitted models it was insured that the position of the holes of the mats accorded exactly with the holes of the concrete floor. As the holes of the mats quickly filled and blocked with faeces, this counteractive measure was not successful.

Thereupon a slope was created beneath the mats. Four rubber mats of 1 cm thickness each and of a depth of 160 cm, 120 cm, 80 cm and 40 cm were placed in the lying zones, beginning at the rear side in a way that led to a difference of 4 cm in height and thereby to a slope of 2 % (**Figure 7**). This measure improved cleanness of the lying zones, but smaller amounts of urine still gathered in smaller depressions on every step of the mats. As a conclusion it can be recommended that beneath non-slatted rubber mats there must be a slope of 2-4 % without any steps.

Soiling beneath the mats

Amount of dirt beneath the mats, what means between the mats and the slatted floor, was clearly less than expected. Only

little accumulations of dirt were seen. These could be easily removed when folding up the mats.

Durability of the mats

After 24 months of use the mats showed only few and slight damages. Slight scratches at the surface could be seen on one place, caused by an animal's teeth. A few positions showed skin-deep delaminations (**Figure 8**).

The fixation of the mats was still in a very good condition. The mats lay firmly and evenly with their whole area on the ground. During the whole time of use the mats weren't raised a single time by the sows, neither at the fixed nor at the non-fixed edges.

The very good status of the rubber mats may be caused by the material. Although sows could be seen trying to bite the mats, it seems they could not catch it and therefore the sows soon gave up the trial.

Conclusions

From the experiences made in Schwarzenau the following recommendations for the installation of rubber mats can be drawn:

- Non-perforated rubber mats in the lying area of pigs must be installed with a slope of 2-4 %.

- In principle slatted mats with a perforation of 5–10 % were preferable also in the lying area. Long slats are supposed to keep themselves better clean than round holes.
- The floor beneath the rubber mats should be slatted, in order to allow discharge of dirt and liquids. Extent of perforation should be even higher than in the mats.
- Fixing the mats only on one side has proved successfully and is a precondition for cleaning the mat's bottom side and the floor beneath. The exact and seamless boundary of the three sides and rear edges of the mats by the side and rear walls of the lying zone are also important. They protect the mats from being raised by the sows.

Literature

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