A Study on the Pressure Prevention System for Suckling Piglets

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Abstract. Korea hog industry has grown with the biggest product scale. However, recently Korea hog industry is having hardship caused by increased production costs owing to continued rise in world grain prices and low level productivity of farms. To solve these problems, this paper propose a pressure prevention system for suckling piglets to lower the mortality of piglets and increase income of farm. The proposed system can minimize the mortality rate to detects the position of sow when piglets are dangerous. This system is expected to increase the income of farms by reducing the mortality rate of piglets upon preventing piglets death by pressure.

Keywords: Pressure prevention, Suckling, Piglet, Hog, Farrowing crate

1 Introduction

Currently, various studies are being conducted to increase the profit of hog farms. To increase the profit of farms, productivity increase and production cost reduction are required and there is also a method of lowering mortality rate by well managing piglets that have been born. When mortality rate is reduced, number of hogs that can be shipped increases, thereby increasing the profit of farms[1]. Among the causes of the death of suckling piglets in Korea, the percentage of death from pressure is the highest and the percentage of death from pressure by sow is nearly 3.7% in average[2]. When death by pressure frequently occurs, it occurs until 4~5 days after birth[3]. The rate of raising market pigs decreases when the number of suckling piglets that die from pressure, thereby reducing the profit of farms[4]. To prevent such damage, it is necessary to prevent pig-lets from being underneath sow when it wakes up or moves[5]. However, it becomes difficult to solve the issue as it ends up requiring much labor for manager to continuously manage pigsty.

This paper proposes a piglet death by pressure prevention system that not only prevents piglets from entering between the legs of sow but also that does not give stress to sow and piglets as much as possible. The proposed system detects the movement of sow when it stands through position detection sensor upon modifying the farrowing crate where sow lives during its delivery and lactation periods. In

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addition, it helps to elevate the floor by installing multi-layer cylinder only on floor where farrowing crate is located. Farrowing crate elevates to the height to which piglets cannot climb up, during which piglets end up being remained on the floor near the elevated farrowing crate, to prevent their death by pressure. Based on this, it is expected to increase the profit of farms by reducing the mortality rate of piglets upon preventing piglet death by pressure.

2 System Design

The pressure prevention system proposed in this paper has significance in reducing stress compared to existing system. Based on studies on pig stress that have been conducted for a long time throughout the world, they defined that stress causes a serious sexual disorder to pigs[6, 7]. Particularly, neuroendocrine system (NES) is a generic term for two systems of nervous system and endocrine system that are closely interrelated and the brain activates NES upon receiving stress[8]. Such NES activation decreases the quality of meat from breakdown of protein synthesis and feed demand rate worsens, thereby having enormous effects on sow's health and piglets' growth. Accordingly, compared to existing method, this system has an advantage of preventing death by pressure while minimizing stress.

2.1 System Configuration

The proposed system is composed as shown in Figure 1.
The proposed system is composed as shown in Figure 1.

2.2 System Process

The proposed death by pressure prevention system operates as shown in Figure 2. When position detection sensor detects sow’s movement of standing up, sensing data is transferred to management server. Management server that collected information sends control command for multi-air cylinder located underneath the farrowing crate in which sow is located to use compressed air to elevate the floor of sow. When sow does not move for a certain amount of time after sitting, position detection sensor transmits this to management server and management server sends control command upon considering as being safe. Multi-air cylinder located underneath farrowing crate operates once again to descend the sow floor to the same position of the floor where piglets are located.

![Flowchart]

Fig. 2. Process of pressure prevention system
The advantage of the death by pressure prevention system proposed in this paper is that elevate part cylinder has been designed in multi-level, which is supplementation of the disadvantage of single cylinder not operating during trouble until it is repaired. It was designed using four cylinders and the system will operate even when up to three cylinders break down. It is expected to provide time to fully repair the product by manager. In addition, it can help sow and piglets to maintain good health by minimizing their stress, which is also expected to correspond to the current issue of animal welfare system.

3 Conclusions

Currently, animal welfare is becoming a global issue. Layer chicken animal welfare certification system has been conducted also in Korea since March 2012, and animal welfare certification system on pig has been expanded since September 2013. Interest in reducing animals' stress is also increasing as animal welfare system is expanding. The death by pressure prevention system of piglets proposed in this paper is expected to alleviate the stress of sow and piglets that occurred in existing system. In addition, it will be able to prevent piglets' death by pressure.

Based on this, it is expected to drastically reduce piglets' death by pressure rate and increase the number of market pigs to increase the profit of farms.

The system will be applied to actual farm in the future to verify and supplement the death by pressure prevention system.

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