TRACEABILITY SYSTEM FOR SLAUGHTER OF UNMARKED PIGS

P. B. Andersen, R. Sørensen, B. Steenberg[1], L. Lykke, and N.T. Madsen

DMRI, Danish Technological Institute, Maglegaardsvej 2, DK-4000 Roskilde

[1]Danish Agriculture & Food Council, Axeltorv 3, DK-1609 Copenhagen V

Abstract – As full truckloads of pigs supplied for slaughter are becoming more frequent with larger farm size, an alternative system for securing traceability is required. Irrespective of method, present marking methods used on pigs for slaughter are associated with some level of stress for the pigs, they require labour and there is a cost of tags. Furthermore no system available today provide full readability. This inspired to the development of an alternative system by which unmarked pigs can be supplied from a farm and kept in an intact group from farm collection until they are identified by RF-ID tags on the slaughter line, still respecting that traceability from the supplying farm must be maintained. The system consists of IT (information technology) solutions combined with own check systems, trained operators and management focus. Live transport traceability is ensured by the use of GPS control of transport vehicles. IT monitoring of all stock is used in lairage areas assigned at pen level, transfer of group ID through the driveway, stunning, sticking, bleeding, scalding, dehairing, and further with different combinations of RF-ID in shackles and gambrels, and using a FIFO system combined with marking of three pigs at group changes prior to dehairing. The solution allows resource saving and less stress at the farm with a marginal extra cost at the slaughterhouse. The system is now gradually introduced in the industry.

Key Words: Pigs, marking, traceability, stress

I. INTRODUCTION

Identification systems for pigs vary depending on country and local legislation [1]. Marking of pigs for delivery to slaughter is required in EU directive 2008/71. In several EU member states the requirement is met by tattooing a herd number on the pig ham at the time of delivery. Alternative systems are plastic or metal ear tags with printed numbers, electronic tags with built in RF-ID, injectable transponders in the ear or intraperitoneally. Practice and tests in Denmark and elsewhere show that all these systems have some limitations regarding their use and ability to achieve full readability. Differences in overall readability from 95.9 to 100 % of different systems have been reported [2], which is why not all systems may reach > 98 % as recommended by ICAR in 2005 [3].

All tagging systems require manual labour and handling of animals, furthermore they are associated with some level of stress during marking. Other well-known issues are lack of identification, misread tags, loss of tags, non-readable tags, or transponders left in carcass parts with commercial value or with environmental disposal limitations. Missing ID is a cost for the slaughterhouse and requires time to sort out, and in Denmark each pig without readable tattoo results in a payment reduction of 2.7 € for the farmer.

At the same time, herd and delivery group size increase and more and more pigs are delivered as full truck loads (200 - 250 pigs/load) from the farmer to the slaughterhouse. The poultry industry is in a similar situation and separates different truckloads in batches maintaining herd traceability by systems applied at the slaughterhouse without marking any individual animal.

On this background, a concept and system for delivery of slaughter pigs without any marking but maintaining herd traceability was formulated, tested and approved officially for daily use from the beginning of 2012, still respecting the EU directive 71/2008. The objective was to establish a full proof system, with reduced marking of pigs. A system with at least as good a performance of herd traceability as existing systems in the chain from collecting pigs at the farm until the carcass enters the chiller.

A robust traceability system is a priority for all parts in the delivery chain as a basis for:

- Food safety
- Veterinary inspection
- Correct payment to the farmer
- Market requirements
- Production concept contracts

II. MATERIALS AND METHODS

The task was to provide a system that allows traceability and secure separation of different loads of pigs collected at the farm and during slaughter, and at the same time avoid marking, reducing production capability or experiencing overall higher cost. It is essential to avoid mixing with other unmarked or marked groups of pigs. This is solved by a combination of procedures, own check systems and specific IT systems established at the slaughterhouse. The IT system configuration is shown in Figure 1. The system requires management focus and all operators must be trained, follow procedures and use the control and IT system according to the manual to make the system work.

Farm registration: The present Danish implementation of EU regulation 71/2008 [4] is the Danish order #1078 of 28th November 2011 [5], which now allows delivery of un-marked pigs in groups for slaughter under certain conditions. These are e.g. a preregistration of the herd in the national CHR database, and that all piglets and fattening pigs in the herd must have been born in the same sow herd.

Transport registration: During transport, the system approved haulier and GPS monitored vehicle must transport unmarked pigs only. The pigs can be collected from up to three locations if the farms are owned by the same farmer. The haulier has a transport document which is validated at collection of the pigs that may have been preregistered for slaughter e.g. five days earlier in the IT system.

Slaughterhouse registration: The slaughterhouse must be approved prior to processing unmarked pigs and must have demonstrated extensive control of procedures and functionality of established IT systems that facilitates no mixing of different groups, see Figure 1. The system consists of a number of important steps which secures that groups of unmarked pigs are kept intact:

1. The transport document is validated with corresponding IT monitor information at the recieval bay prior to allowing unloading. The staff checks the actual number of pigs in the load by counting and checks the transport route.

2. A gate latch locking system controlled by the IT system allows pigs from one lorry, only, to be unloaded and led to the lairage pens at a time.

3. The operator moves the pigs to pens in groups of approx. 15 pigs and when locking the pen gate he activates a control light box. The lamp is switched on and indicates that the data of pigs in this pen are now linked to the data of the supplier. A lairage screen monitor and the activated lamps show the operators the actual use of pens.

4. When pigs are led from lairage pens into the driveway, the operator activates a switch and the hoist gate goes up while transferring the information of the pen group to the driveway position.

5. As pigs are released into the CO_2 stunning box, the pig data are automatically transferred from the driveway to the shackling table after stunning. Then it is linked to a unique RF-ID tag in the shackling chain. When a new group of pigs arrives, the system checks that boxes are only emptied after clearing the previous group on the shackling table, and an info box alarms the operators that there is a change of groups. The operator acknowledges the group change by pushing a light button, which in turn changes the IT system, to link the data for the new group to the RF-ID in the shackling chain.

6. For safety reasons after a group change, the first three pigs are marked by a tattoo symbol on the shackling table. The tattoos are used as an extra precaution to secure ID after the dehairer.

7. The shackle RF-ID takes care of identification during sticking, bleeding and scalding. And their numbers and reading are continuously monitored by counters alarming for faulty RF-ID or lost shackle chains.

8. As pigs are unshackled and enter the dehairer, the ID is changed to a First In - First Out system (FIFO) by means of activated sensors.

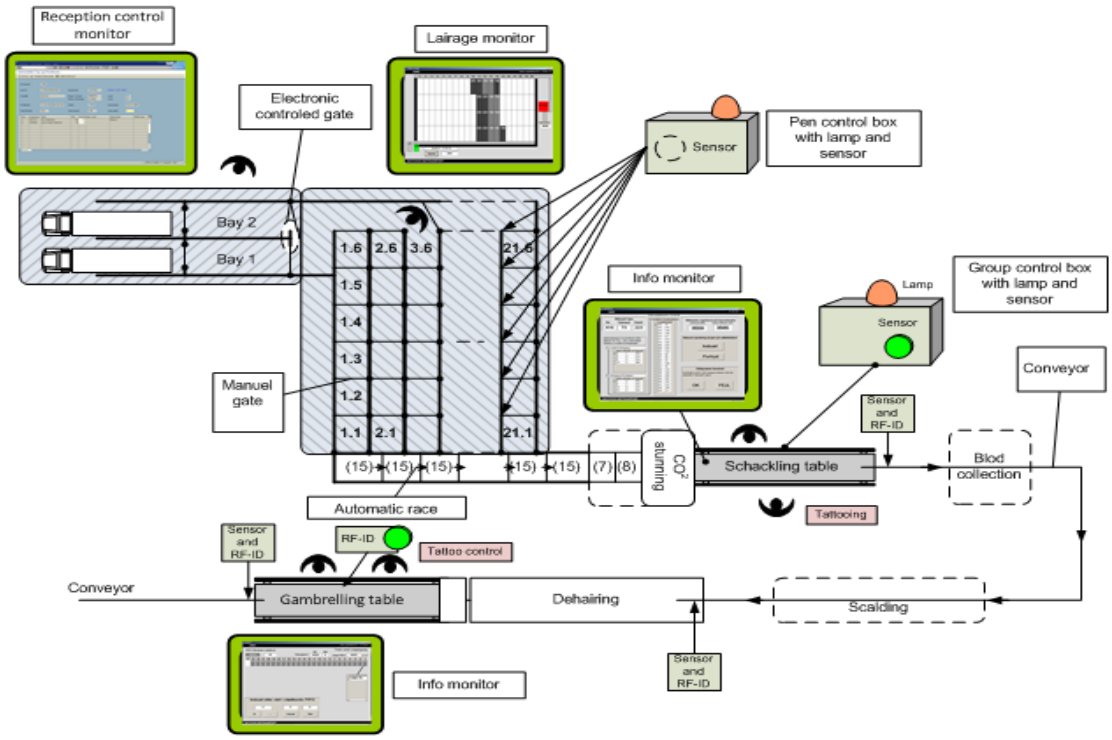

Figure 1. Slaughterhouse system layout with ID-check points

9. During the dehairing process which is a continuously running process with e.g. 8 pigs in the dehairer at a time and no separation of groups, tests have shown a small probability < 1 % that pigs may overtake each other. However, when the tattoo symbols on the three pigs given at group change after stunning are used as a control and for validation, the risk of mixing pigs from 2 groups is reduced to 0.6 $^{0}/_{00}$.

As the pigs exit the dehairer, the FIFO counters alert the gambrelling operators of the group change by a control lamp approx. 6 pigs before the change occurs. Group change is identified by the tattoo symbols on the three pigs, and the operator acknowledges the group change by pushing a light button, which in turn changes the IT system to link data for the new group to the RF-ID in the gambrel. Unique RF-ID in the gambrels carries the pig identity throughout the rest of the slaughter line and further addition of quality data and meat inspection is recorded on the RF-ID tags. Thus the full traceability identifying the individual pig on a gambrel all the way back to the supplying herd is now established.

If the operator finds that all three tattooed pigs arrive in a row, all is well. However, if a pig from the next group by chance has overtaken pigs from the previous group, he enters this in the data system for the specific pig by using the RF-ID in the gambrel, thus allowing for subsequent sorting at the weighing terminal. If the operator cannot identify all three tattooed pigs a fall back procedure is used, as there is a breach in the system.

10. Fall back procedures are established for any possible breach in the full system. Breaches may occur in case of e.g. dropped pigs during slaughter, operator errors etc. The IT and control system relies on power supply, however, the system is a mirrored system and can be rebooted to full control even at lairage pen level. The fall back systems are quite extensive and part of the slaughterhouse's own check system, and associated with deviation reports to be made. A trained operator responsible for the slaughter system has to be on site at all times to guide and assist in case of deviations. The practical procedure in case of system breach and fall back procedure is to tattoo the unmarked pigs with a unique number and

report the incidence for subsequent sorting and allocation. Such pigs are considered at a similar ID level as pigs for which the conventional tattooed herd ID is not legible.

III. RESULTS AND DISCUSSION

The technical system has been in operation for several years in a commercial slaughterhouse and proved to be robust in the environment. During this period, all pigs received at the slaughterhouse were marked on the farms as required. The daily use of the system has also become routine and is readily accepted by the staff. In 2011, the complete system documentation and own check systems were updated, and the registration of the farmers, hauliers and slaughterhouses in the national database started following the new Danish order 1078 of 28th November 2011 prescribing the final system requirement for delivery of unmarked pigs. The full system was audited and approved by the authorities in 2012, and the first loads after approval were supplied in March. There is extensive interest among larger pig suppliers to have the system rolled out in more slaughterhouses, and plans for this are now underway. It is presently estimated that the potential delivery of Danish pigs using the system may reach 30 - 50 % of the pigs slaughtered.

The installation and configuration of the IT system will be marginally different in other slaughterhouses depending on the physical layout, but overall identical to the system described here. Installation cost will depend on slaughterhouse size and layout and is estimated to be in the range of 100.000 - 500.000 € plus internal cost for training, management, and adaptation of procedures. There will be an extra cost operating the system for maintenance and system control estimated to a range of 50.000 - 100.000 €/year. The payback time using the system in the supply chain is expected to be relatively short depending on use and speed of uptake. The farmers and pigs will be less stressed with the new system, and overall labour will be saved. After gaining more experience, there may be future perspectives of increasing the use of the system even further by developing robust systems to differentiate decks on trailers or even pens on different trailer decks.

It is important to note that any breach in the ID system, when supplying both marked and unmarked pigs for slaughter, will not compromise food safety as all records on the slaughter line from veterinary inspection are established on data systems that are not in any way depending on the ID of the supplying farm.

IV. CONCLUSION

An alternative system for delivery of pigs for slaughter from registered farms without marking was developed. The system maintains traceability back to the supplying farm on the individual pig throughout the slaughter chain, using a solution that secures that pigs are kept in intact groups. The system consists of a number of technical IT solutions, limited marking at group change combined with own check systems, trained operators and management focus. The solution allows resource saving and less stress at the farm with a marginal extra cost at the slaughterhouse. The system is now gradually introduced in the industry.

ACKNOWLEDGEMENTS

DMRI thanks Danish Crown, Esbjerg for good cooperation during development and testing. This work was financed by the Danish Pig Levy Fund.

REFERENCES

1. Meisinger, J. L., Pendell, D. L., Morris, D. L., Belk, K. E. and Smith, G. C. Swine Traceability Systems in Selected Countries Outside of North America (2008): The Professional Animal Scientist, 24: 295–301
2. Babot, D., Hernández-Jover, M., Caja, G., Santamarina, C., and Ghirardi, J. J., 2006. Comparison of visual and electronic identification devices in pigs. J. Anim. Sci. 2006. 84:2575–2581
3. ICAR 2005. International Agreement of Recording Practices. Guidelines approved by the General Assembly held in Sousse, June 2004. Int. Comm. Anim. Recording, Rome, Italy
4. Council directive 2008/71/EC of 15th July 2008. On the identification and registration of pigs.
5. Danish order #1078 of 28 November 2011.
6. Mellergaard, S., 2011. Traceability of pigs without tagging – Danish perspective. Danish Veterinary and Food Administration.