

# A new system for Sticking Control ('VisStick')

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**Abstract**— A vision based automatic system to monitor that all pigs have been stuck before moving to the next stage of the slaughter process has been developed by DMRI. Although pigs are anaesthetised before slaughter, it is the sticking and bleeding that actually causes death. Sticking is carried out manually by an operator and there is a minor risk that a pig may have been overlooked.

The system consists of a camera, a lamp supplying an evenly illuminated background and a computer for image acquisition and analysis. Images of the pigs in silhouette are analysed by the VisStick software determining whether or not blood is running from the carcass. If no blood is detected, an alarm is activated to alert the operator to ensure sticking of the pig.

System approval tests were carried out by DMRI monitoring 250 non-stuck pigs randomly distributed among 500 pigs slaughtered successively. The false positives (alarms for stuck pigs) and false negatives (no alarm for non-stuck pigs) were recorded.

In approval trials of 5 typical installations, detection of unstuck pigs ranged from 98 to 100 %. DMRI approval criteria for installations are presently minimum 97 % capture of unstuck pigs and max. 2 % false positive alarms.

The DMRI system controls the sticking and improves animal welfare by ensuring that all pigs are stuck before scalding.

**Keywords**— animal welfare, vision control, sticking.

## I. INTRODUCTION

Due to regulations, slaughter pigs have to be stunned before killing (Council Regulation (EC) No 1099/2009) [1]. Although pigs are anaesthetised before slaughter, it is the sticking and subsequently loss of blood that causes death. Sticking is carried out manually by an operator and there is a minor risk that a pig may not be stuck properly. To minimize this risk it was decided to develop a vision system to control

that the pigs are in fact stuck after stunning. During the past three years, the VisStick system has been implemented at most slaughter lines in Denmark.

## II. TEST AND DEVELOPMENT

### Objectives

The aim was to develop a vision based automatic system to monitor that all pigs have been stuck by the sticking operator before moving to the next stage of the slaughter process.

### Material and methods

The vision system consists of a camera and a large area lamp acting as an evenly illuminated background for the pigs, as well as a computer for image acquisition, vision analysis and communication with the sticking line PLC.

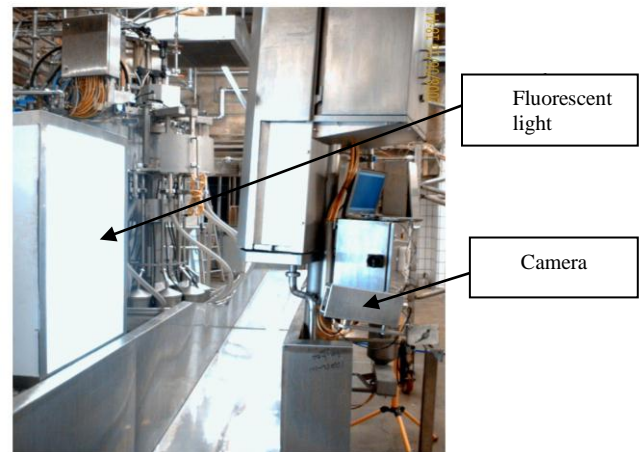


Fig. 1 The system

The camera and the lamp arrangement are placed immediately after the manual sticking.

The acquired images are analysed by the vision computer. The VisStick software decides whether or not blood can be seen running from the carcass. The system is linked to the slaughter line control system. If no blood is detected, an alarm is activated to alert the operator to ensure sticking of the pig.

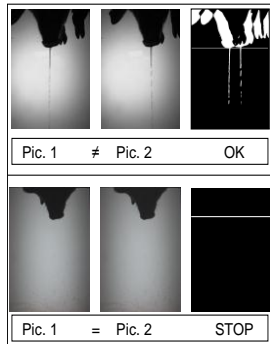


Fig. 2 Pictures taken by the camera

Two pictures are taken quickly after one another. When subtracted from each other all that will remain in the resulting image is the contour of the pig with blood running from the pig's snout. The difference image shown in the top right hand corner of figure 2 clearly shows blood running. The pictures below show a pig that has not been stuck (from the test of the system) and an alarm is activated.

For each installation, system approval tests were carried out by DMRI monitoring 250 non-stuck pigs randomly distributed among 500 pigs slaughtered successively. The false positives and false negatives were recorded. A false negative occurs if the VisStick system does not detect an unstuck pig. A false positive alarm occurs if VisStick gives an alarm even though the pig was actually stuck. Approval tests of 5 typical installations were carried out.

### Results

In the 5 approval tests, a detection range from 98 to 100 % of unstuck pigs was achieved.

In the DMRI approval criteria for installations it is demanded that at least 97 % of unstuck pigs are

captured by the system and that the number of false positive alarms does not exceed 2 %.

## III. DISCUSSION

The developed VisStick system minimizes the risk that a pig is not stuck before proceeding with the slaughter process including scalding. It has to be stressed that the VisStick system cannot stand alone. The monitoring system has to be combined with management and education of the operators at the slaughterhouse. Even though VisStick is implemented it is still of the outmost importance that the operators are aware of the necessity of not only securing that all pigs are stuck after stunning but also to ensure that the pigs are stuck correctly.

## IV. CONCLUSIONS

This system offers new technology to improve animal welfare at slaughterhouses, by ensuring that all pigs are stuck before moving to the next step of the slaughter process.

VisStick systems have been installed at all major slaughterhouses with high line speeds in Denmark and have now been running for more than two years. The system is now being marketed and sold to slaughterhouses outside Denmark in Europe & the USA.

Furthermore, it may be possible to develop the system to be used for other animal species including sheep and cattle.

## ACKNOWLEDGMENT

The authors would like to thank the Pig Levy Fund for financing this work.

## REFERENCES

1. Council regulations (EC) No 1099/2009 of 24 September 2009 on the protection of animals at the time of killing.