Session 2 : Slaughter technology and early post-slaughter handling

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Increasing the cleanliness of pig carcasses by the introduction of improved equipment and mechanisation for cleaning and disinfection.

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1 Introduction

Research of Snijders (1) revealed that in the pig slaughter line the level of contamination of the surface of carcasses is raised by the influence of the blackscraper, the brushes and the polishing equipment (whipping machine). With a daily and an intensive cleaning of these equipments the level will be lowered (2,5). Investigations of Gerats and Snijders (3) in 30 pig slaughter lines showed clearly that there is a strong relationship between the visual and bacteriological state of the equipment on one hand and the bacteriological state of the carcasses on the other . Good cleaning and disinfection of the equipment appeared to be strongly obstructed by equipment that is not adapted to the cleaning process. Since 1981 some research has been done to improve the effect of cleaning and disinfection (4). In this work recommandations are given to lower the contamination rate of the pig carcasses from the moment they enter the so-called "clean part" of the slaughter line by improvement of the construction and the cleaning of the equipment.

2 Methods

2.1. The construction of the equipment

Polishing equipment (whipping machine) is ment to remove the burnt epidermis and hair from pig carcasses in a continuous process. The transport system of the carcasses in this equipment is a very important source of pollution. The lose hairs, epidermis and the process water are mixed with grease of the conveyor system (and eventually with the grease of the conveyor tube). This mixture becomes impacted on the equipment. In this pollution the microorganismes are able to survive and to multiply. During the process they are rinsed out of the hard-to-reach angles and holes together with the pollution. In this way all treated pig carcasses are contaminated. By separation of the transport process from the mechanical action of whipping the grease will not be mixed up with the epidermis and the hairs. So the pollution will not be sticky and will not adhere to the equipment. In figure 1 the outline is shown for the separation of the transport process and the mechanical action of whipping. The pollution of the process part of the equipment will be lowered and the cleaning will be simplified because the pollution consists of less components. The possibilities to separate the epidermis and hairs from the process water will be within reach and possibly the re-use of the process water will be realised. The separation of the transport process from the mechanical action of whipping will be executed by changing the construction of the ceiling as given in figure 2.

By introducing curved corners in the equipment the epidermis and hairs will easily be rinsed down. Corners existing of rubber flaps or in which slits appear create an ideal hideaway for pollution. As result they are breeding places for microorganismes. Equipment with a smooth inside and application of construction beams from an adapted design will improve the removal of the pollution-water mixture.

Figure 1 Outline of the processes in the whipping machine

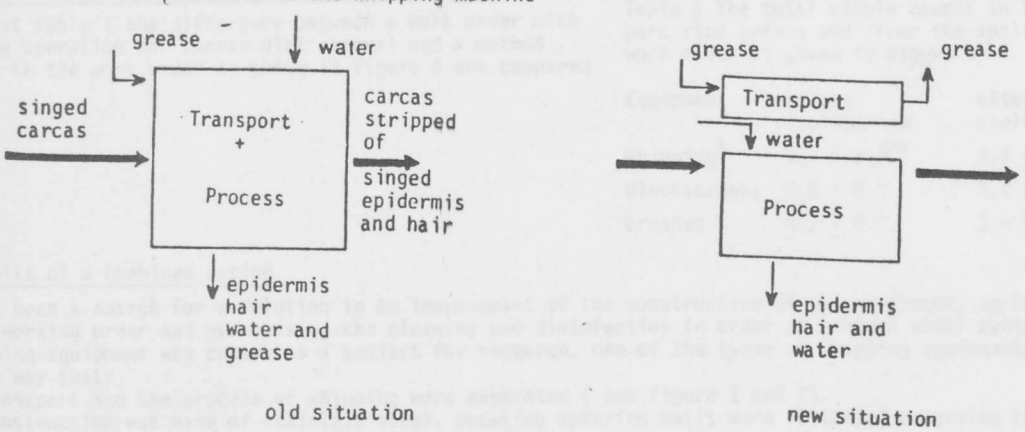
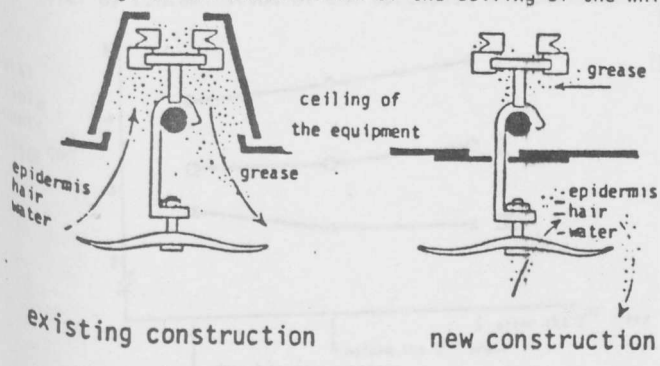


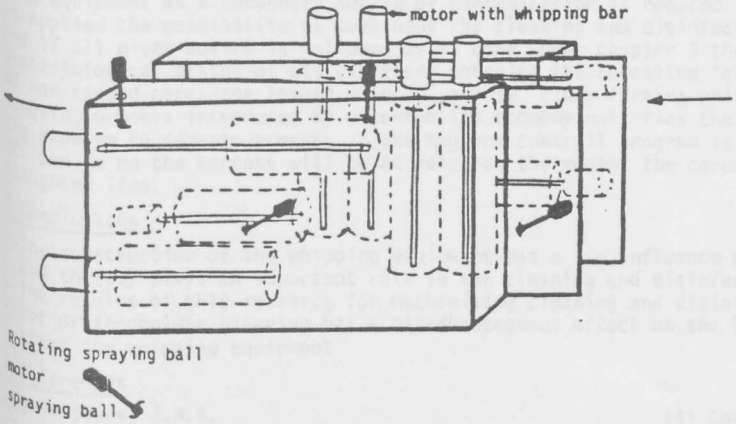
Figure 2 Change of the construction of the ceiling of the whipping equipment



Using stainless steel as a construction material offers important advantages. It decreases the affixing of dirt and offers the possibility to work with more agressive and fast working agents. A short spraying tube of non-corrosive material with nozzles that bring the process water with an aimed spray conus prevent the (often long and dead ended) water tube from being a source of contamination.

2.2. Mechanisation of cleaning and disinfection

Figure 3 Construction of a whipping machine with 4 electrically driven rotating balls



In construction wise adapted whipping equipment mechanised cleaning and disinfection is executed. 4 Rotating spraying balls are placed in a large (9 whipping bars) whipping machine. The rotating spraying balls supply 17 liters of water at 130 bar. each. The water temperature increases to 60° Celcius. The spaying balls were placed as follows: 2 on the top side and 2 in the back side of the whipping equipment.

2.3. Intensive cleaning and disinfection

The method of cleaning and disinfection of equipment that come in intense contact with the carcasses has a big influence on the level of contamination of those carcasses. The application of a work order as given in figure 4 with a cleaning and a disinfection separated by a rinsing operation lowers the level of contamination of the carcasses considerably. Figure 4 gives an overvieuw of the separate parts of an optimal working order for an intensive cleaning and disinfection procedure. In practice the working order is often insufficiently maintained. This is often the result of high costs for labour.

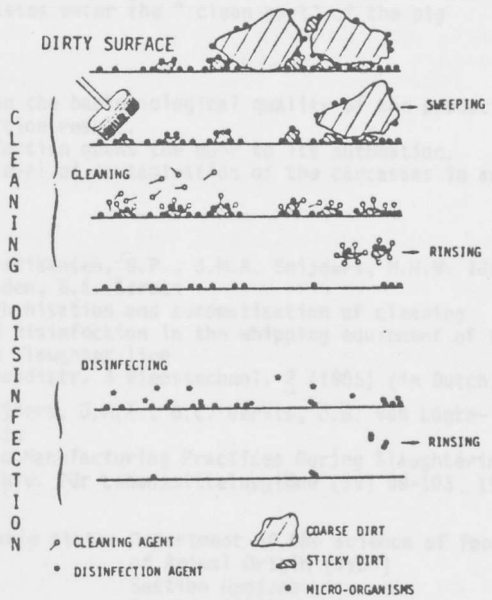


Figure 4 Working order for an intensive cleaning and disinfection procedure

3 Results

3.1. Results of an intensive cleaning and disinfection

In the next table 1 the difference between a work order with no rinsing operation nor coarse dirt removal and a method according to the work order as shown in figure 4 are compared

Table 1 The total viable counts in $\log_{10}.cm^2$ of porc rind before and after the application of the work order as given in figure 4

Equipment	before application	after application
Whipping*	4.0 ± 0.3**	3.2 ± 0.2
Blackscraper	3.8 ± 0.3	3.2 ± 0.3
Brushes	4.2 ± 0.2	3.4 ± 0.2

3.2. Results of a combined action

There has been a search for a solution in an improvement of the construction of the equipment, application of the good working order and mechanising the cleaning and disinfection in order to achieve their autimation. First the whipping equipment was chosen as a subject for research. One of the types of whipping equipment was adapted in such a way that:

a) The transport and the process of whipping were separated (see figure 1 and 2).
b) The construction was made of stainless steel. Rotating spraying balls were installed according to figure 3.
c) The working method as described in figure 4 was applied.

The level of contamination of the carcasses was estimated : I before the test was started
II after some days of mechanised cleaning and disinfection immediately following the production time
III after some days with an additional combined cleaning and disinfection during the breaks.

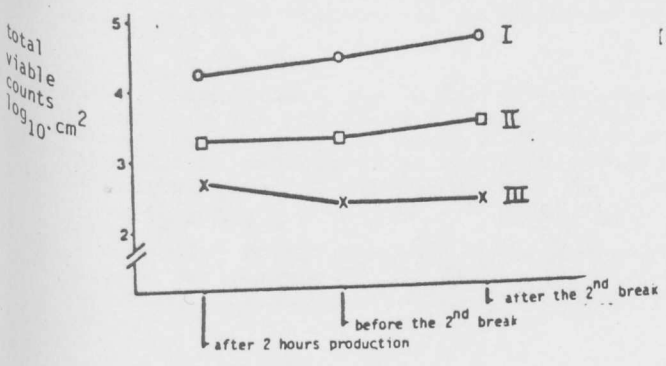


Figure 5 The level of contamination of pig carcasses in total viable counts ($\log_{10}.cm^2$) at 30° Celcius after 3 test situations.

4 Discussion

If the whipping equipment is constructed according to all previously mentioned advices, it will be possible to clean and disinfect mechanically and eventually to autimate the process. The level of contamination of the pig carcasses will decline to the level they had when leaving the singeing oven. The working order as shown in tabel 1 has an important influence on the effect of the cleaning and disinfection process so the role of whipping equipment as a secondary source of contamination is reduced. If a continuous rinse of water over the walls is applied the possibility of combining the cleaning and disinfection by using a combined agent is within reach. And if all given advice is followed as is done under chapter 3 the process of the singeing will determine the bacteriological status of pig carcasses entering the so-called "clean part" of the pig slaughter line. Passage of non-singed carcasses loaded with 10^4 and 10^5 clony forming units per cm^2 (Snijders 1976) or a too short singeing process introduced by uncontrolled economy nullifies the effect of the methods described. Therefore the problem to address process in the hygiene controll program is the singeing process. A contamination level of 10^2 per cm^2 on the carcass will be at reach at the moment the carcasses enter the " clean part" of the pig slaughter line.

5 Conclusions

--The construction of the whipping equipment has a big influence on the bacteriological quality of the product and thereby plays an important role in the cleaning and disinfection result.
--The results of this researcg for mechanising cleaning and disinfection opens the door to its automation.
--Not or incomplete singeing has a disadvantageous effect on the level of contamination of the carcasses in and after the whipping equipment

6 References

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