Snapshot Report

Bung handling and cutting

Automatic equipment for handling of the bung in the lamb slaughter process – Phase 2

Project Code
2018-1031

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Project Description

An automatic unit, which handles the bung, after the bung is cut free in a previous process, has been developed and is in use at pig slaughterhouses in Denmark, providing a hygienic improvement of the slaughter process.

The objective of this project was to design, manufacture, and test a modified version of the existing pig bung handling equipment (a factory prototype), to match slaughter lines for lamb under conventional Australian processing operations. In the bung handling process, the machine grabs the free-cut bung in the pelvic duct using a vacuum cup. As the cup is pushed further forward, the bung end is wrapped in the mesentery (inside itself) and left protected in the abdominal cavity. The primary objective for using the unit is to reduce the risk of faecal contamination, which is commonly associated with manual handling of the bung following bung dropping.

During the first part of this project, it was by variation agreement decided to extend the project to also research the options for developing a technical solution for automatic free cutting of the bung. This was done by, as a first step, developing a process and tool set to be demonstrated and tested in a mock up test unit at line at an AU host slaughterhouse. Thus, this project has two aims:

- A. To design, build, install, validate, and demonstrate the hygienic improvement of using the bung handling unit adapted for lamb, based on the original unit for pig processing
- B. Developing a process and tool set to automatically cut free the bung, for a later full automation

If deemed feasible, the bung cutter (B) should be developed with the ultimate goal of being integrated with the bung handling process (A), but both processes (A and B) should also be capable of implementation and operation independently.

Project Content

In Q1 and Q2 2019, the bung handler equipment (A) was adapted for lamb processing. It was installed and tested running in-line at an AU host site Q1 2020. Results in terms of “bagging the bung” inside the mesentery were satisfactory and comparable with results obtained for pigs in Denmark. More than 10,000 carcasses were processed during the commissioning and fine-tuning at a line speed from 700-760 heads/hr. Some needs for improvements were identified to avoid clogging up the cleaning system. Also, minor mechanical design changes on brackets and the balancer system were necessary. The changes resulted in minor redesigns concerning expansions of the piston and vacuum line. The manufacturing of new components was completed in Q2 2020 and subsequently shipped to the AU host site for mounting, new test runs, and demonstration.

In Q2 2022, as Covid-19 travel restrictions were lifted, it was possible to restart activities at the AU host site. The machine was rebuilt and remounted to be tested in-line. Due to several unforeseen conditions at the host slaughter site, it was only possible to test the changes on a limited number of carcasses. Overall, however it is the assessment of the project team, that given that the technical supplies are in place and the sufficient time for commissioning to the carcass variation is granted, the performance as observed in Q1 2020 would be achievable also with the new and improved set-up. As such, the technology could be taken further towards a commercialisation and adoption in the AU industry as desired.

The idea generation and background search for possible ways to automate the bung cutting (B) of lamb was initiated Q4 2019 and continued in Q1 2020 at the AU host site during the testing of the bung handler (A). Several ideas and concepts were pursued and tested with dedicated tools and processes at a local Danish lamb slaughterhouse during Q2-Q4 2020, before a process giving viable results was obtained.

Project Outcome

For the bung handling process (A), a successful transformation and adaptation of the automatic bung handling equipment operating on some Danish pig slaughter lines has been achieved to process on a sheep slaughter line. The adapted equipment was demonstrated to run in-line at an AU processing line, and the final commercialized equipment can be used on Australian processing lines while obtaining a hygienic improvement.

Figure 1: Bung handler unit adapted for sheep slaughter

For the bung cutting process (B), a new method and tool was developed and was able to cut the bung free automatically, either presented with skin surrounding the sphincter area or with the skin fully removed:

- Without the use of vacuum
- In a quality like manual cutting
- With minimal risk of perforating the intestines
- With the option to proceed with one of the following:

    1. Push the bung end inside the mesentery while it is still pinched, in an integrated bung cutting and handling process
    2. Releasing the bung end after cutting and placing it conveniently for bung dropping
    3. Releasing the bung end after cutting and placing it conveniently for a separate bung handling process (A) prior to bung dropping

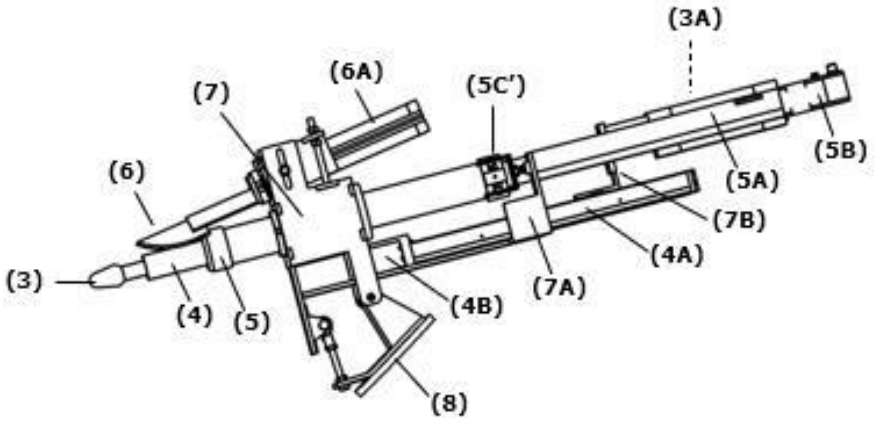

Figure 2: Technical drawing and design of fully automated bung cutter with actuators

As an outcome of the demonstration of the cutting tool and principles, ideas for alternative directions and use of the cutting principles arose. It is a well-known issue that during the scouring season (runny faeces) it is extremely difficult to maintain a high slaughter line hygiene. In addition, it also known that albeit the use of plastic plugs inserted in the intestine will reduce contamination issues, the plugs also introduce a risk of damaging and tearing the intestine during the plugging operation. It was discussed that if the bung cutting process combined with the bung handling process, could be executed earlier on the slaughter line, in the cradle position, either as a semi-automatic or fully automated tool, several other benefits might be achieved:

- Faster adoption of the new technology
- Better working conditions compared to manual cutting
- Savings by omitting the plug insertion operation
- Elimination of ruptured intestines due to the plugging operation
- Implementation of the equipment without having to rebuild the slaughter line

Benefit for Industry

The installation of the automated bung handling and cutting equipment will benefit the Australian lamb processing sector as an enabling tool to decrease the faecal matter and microbial number on carcasses and improve the hygienic standard on the whole processing line. It is considered that the “automatic procedure” not only brings the benefits of automating a unit operation but will also generate significant improvements in the slaughter hygiene quality. The automatic bung handling and cutting equipment will help maintaining process control and may also be useful for obtaining and maintaining market access and finally ensure compliance with national food authorities’ and customers’ requirements.

Useful resources

DMRI website video clip. Available from: https://www.dti.dk/specialists/automatic-handling-of-the-bung/35305

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