

Prototype development of machine to remove fat from beef striploins leaving a uniform thickness behind - Stage 2

Koorosh Khodabandehloo, BMC UK

Project Report Reference: 2017-1045

Date: 10 June 2019

Project Description

Manual fat trimming is a labour intensive and highly inaccurate process, especially when a uniform layer of fat is to be left to 1-millimetre tolerance on a piece of striploin beef where the precise location of the fat-lean cannot be visually observed by an operator. There is significant skill applied (Figure 1), and the requirement for wearing safety gloves also reduces, if not making it impossible, to use human touch to gauge the fat-lean interface from the fat side as a way of applying a degree of control during the trimming actions, to leave a uniform fat layer behind on the lean meat.

This project has achieved a first research capability solution for the automatic striploin fat trimming with the objective to leave a uniform layer of fat on beef striploin primal pieces.

Project Content

The project has included the following:

- Sensing for measuring fat thickness in manner that can be referenced in 3D space as input to an automated trimming system. Ultrasonic and laser measuring units have been used.
- A robotic approach with modified trimming tool, adapted for use with an industrial robot.
- An arrangement that provides for robotic sensing and cutting as a two-arm and cost effective first solution.
- Based on the developments and trials of the project has defined a production prototype with the anticipation of its implementation during a Stage 3 project.

Project Outcome



Stage 2 has achieved the following:

- Evaluation of fat trimming tool based on the requirements of the project, defining a 55mm diameter rotary blade with a conic profile circular tip Bettcher trimmer for the purposes of first implementation.
- Evaluation and capability assessment of an ultrasonic sensor of low cost for measuring meat thickness. The evaluations have used a robotic system and a purpose designed holding plate for the striploin meat to rest on, whilst the sensor performs measurements from below the meat, Figure 1.
- A low-cost laser measurement unit has been defined, also integrated with the robot performing ultrasonic measurements, to determine the fat cover.
- The system has been integrated in the first robotic set up for fat trimming as in Figure 2.



Figure 1: Ultrasonic and laser measurements arrangements.



Figure 2: Two-arm robot arrangement in plant trials.

The project has reached its objective to implement a first operational robotic solution for trimming striploin primal pieces using ultrasonic measurement of meat height and fat thickness. The system has shown the pathway to a stage 3 development to achieve a production prototype and first trials in an Australian beef plant have revealed important

findings in support of improvements and developments that overcome performance limitations of the first developed solution under stage 3. The system as implemented may be used for extended trials to reach detailed specification improving on the definition for the production prototype derived from Stage 2 R&D.

Benefit for Industry and recommendations

The benefits for the industry are envisaged from yield improvements in final product and efficiency. Quantified at over A\$1 million for an average plant processing 60 carcasses per hour.