SNAPSHOT

Technology evaluation for fat removal for beef striploins leaving a uniform thickness behind

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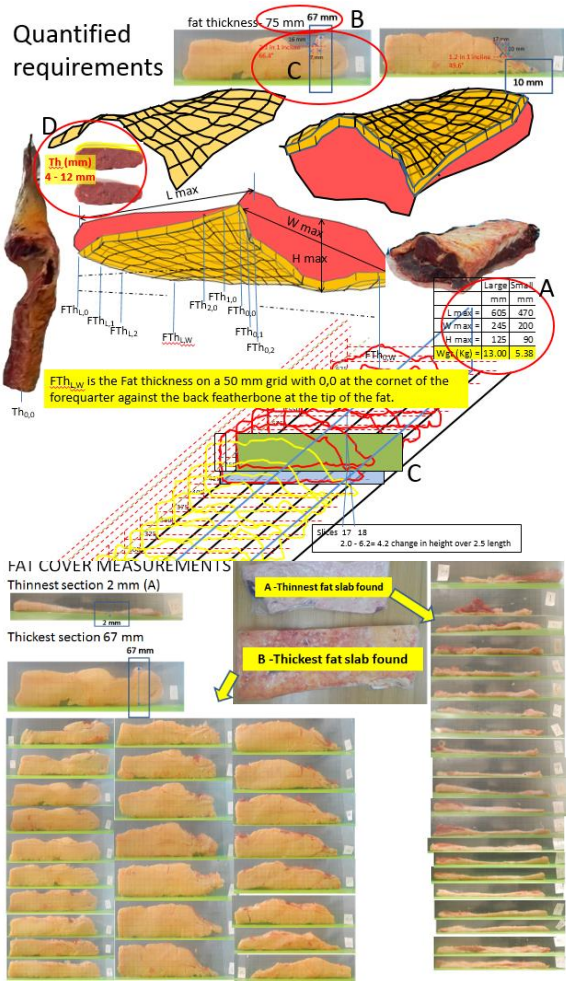
This project has researched the processes of fat trimming with the objective to determine automation feasibility to achieve trimming leaving a uniform layer of fat on beef striploin primal pieces.

The approach has included the examination of variability of fat cover on beef striploins, taking examples from Australian meat plants and to document the current capability in performing such a task manually on a production line. Evaluation of fat cover sensing technology using ultrasonic, optical and mechanical devises has been a key objective, quantifying their limitations in order to provide at least one type of sensing solution that would meet the requirements in accuracy, speed and integration possibilities with different mechanical trimming arrangements. An important aim of the feasibility has been the trimming methods for leaving a uniform layer behind resulting in the definition of specification and validated concept design of an automation solutions for uniform fat trimming.

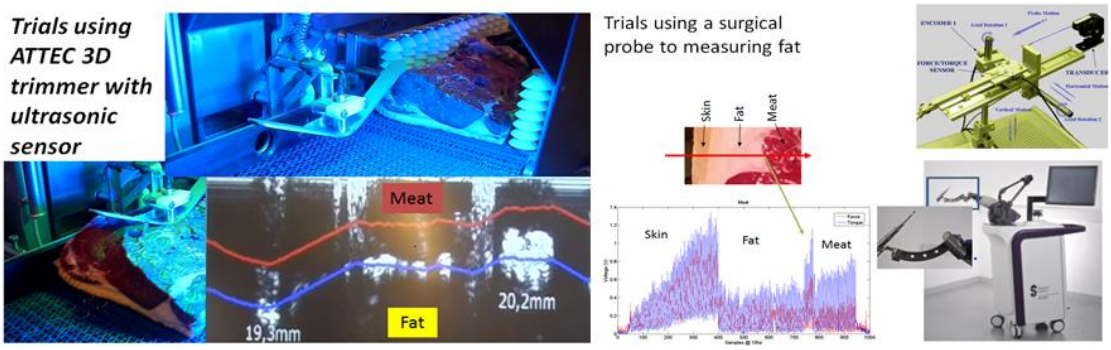


The variability in beef striploin has been examined in connection with the processes that would be involved in automatic trimming of fat from de-boned primal pieces. It has also tested viability of fat-meat interface measurements using existing sensors. Of particular interest is the maximum and minimum dimensions of striploin and fat cover as well as availability of proven sensing technology for beef striploin.

Beef striploins range in size and an automated system for fat trimming needs to deal with sizes within a 700 mm length, 300 mm width and 150 mm high striploin dimensions. The fat cover on striploins observed in Australia can be 75 mm in thickness down to 2 mm, with changes in height of fat over meat, within the same primal piece, being as great as 50 mm over a 25 mm distance both along the length and along the width of a striploin primal.

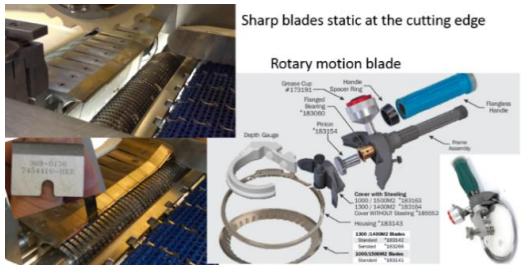
Review of literature, shows that a concept for fat trimming leaving a uniform layer behind was patented over 25 years ago, but no practical equipment has been available to the beef industry. The only machine with similarity available on the market is from ATTEC for pork loin trimming.

The most promising sensing is ultrasonic sensing determining the position of fat and lean interface operating from the lean side. The 3D profile of the fat-meat interface is the main feature of interest and use of ultrasonic sensors has been evaluated with success for beef striploins.



Fat on beef striploins can, in some sections, be delaminate or have air gaps (bubbles) within their structure. The sensing approach measuring fat-lean profile from the lean side, as well as trimming the fat under cross sectional pressure minimizes or avoids complications related to delamination or air bubbles.

Trials have been conducted with sensors revealing that there a number of technologies available, including mechanical probing, but the most promising is ultrasonic sensing for determining the position of fat and lean interface operating from the lean side.



Trimming capability using available technologies has been reviewed in current machines such as the ATTEC 3D Fat Trimmer for pork loins and the wizard hand trimming tools available from companies such as Bettcher or Freund.

The processes of separation may be achieved by a static blade sharp enough to cause sheering or cutting as meat/fat is forced against it. This is commonly seen in fat removing machines. An advanced form of this in a configuration of a “piano” key arrangement with especially designed static blades next to each other are used in the ATTEC pork loin 3D fat trimmer.

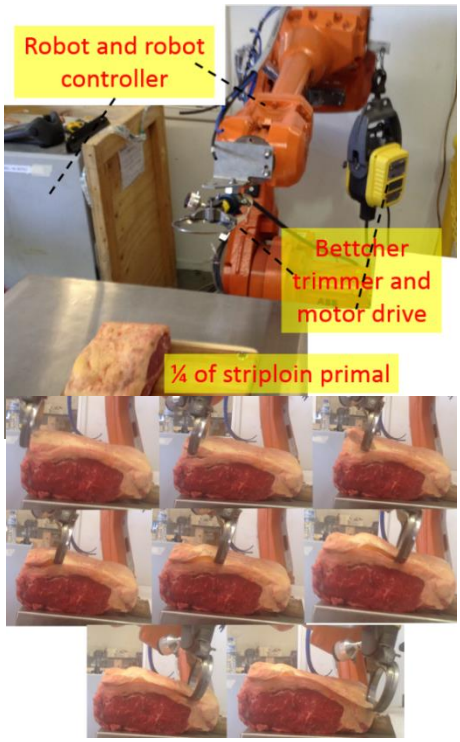
Reciprocating blades or pair of blades working in opposition to each other, where various forms of blade tips are also used. Rotating blade can achieve separation also, commonly used in a variety of machine and powered hand tools.

Evaluations have been made of all such options, with practical fat trimming of Beef Striploin attempted

in two specific cases, the wizard trimmer and the static “piano” type blades of the ATTEC 3D trimmer.

The wizard trimmer has capability to remove fat in thicknesses as low as 1 mm and as thick as 12 mm in a single pass at speeds higher than 0.3 m/s. The ATTEC 3D trimmer can achieve the same speed of trimming with static blades, however, trials suggest that the thinnest layer is 2.5 mm as a minimum, but the thickest is 20 mm, due to the machine design and construction constraints.

Fat trimming leaving a uniform layer behind requires the change of cut thickness as the fat trimming process is being executed. The evaluation concluded that both methods (the wizard rotating cutter and the ATTEC static “piano” blades) may be used for trimming fat; however, further evaluations point to an open blade wizard rotating cutter can supports the necessary controllable process given that thicker than 20mm fat will need to be removed in certain cases. Additionally, there is a need to change the angle of line the cutting to achieve closer to a truly three-dimension contour of separation to meet the requirement, a feature that is limiting in the “piano” blade arrangement. It is thus concluded that the approach to reach a working solution requires 3D manipulation of the trimming tool. To this end a test rig has been integrated to further validate the approach.



Wizard trimming used with a robotic or a 3D manipulation could provide the basis for automation with the capability of removing fat in strips of 15-20 mm along the width of a striploin to a resolution of 1 mm at a speed of 20-25 mm/s.

It is concluded that it is feasible for an automated trimming system to perform separation of fat leaving a uniform layer on the striploin, giving users the capability for an effective increase of fat over the area of the primal by at least 1 mm, whilst meeting specification.

The feasibility has relevance to other sectors of the industry in particular lamb where similar loin fat trimming operations require automatic solutions, such as fat trimming of lamb loins for uniform fat cover.

Work continues under a stage 2 project to develop an industry prototype for testing and confirmation of benefits.