AMPC

SNAPSHOT

PROJECT

First prototype robotic lamb FQ rib cage de-boning

Project Report Reference: 2018-1045 **Date: 29 October 2020**

Project Description

The meat industry has a major requirement to automate its processes of slaughtering and meat preparation including primal cutting, sub-primal breakup and de-boning.

This stage 2 project, following Stage 1 feasibility, has developed a first lamb forequarter de-boning prototype, to meet the declared need by several Australian meat processors. In particular, the separation of the Lamb FQ rib cage has been evaluated and a solution for implementation as a first world prototype integrated.

Project Content

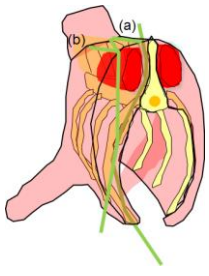
The specific tasks included the assessment of shoulder primal variability in relation to de-boning as intended for automation. The integration of a solution has been reached through the milestones of the project, which also included practical trials. The outcome of the R&D supports practical future commercial outcome with a $180k estimation of the cost for a rib cage de-boning system as a simplified robot cell accommodating forequarter variability as deboned in Australia. The project is planning its Stage 3 to reach a production prototype for extended trials in a lamb plant.

Project Outcome

The R&D, in its iterative stages, has reached a first world prototype for practical trials, which were concluded using primal pieces. The conditions of the set up for trials have been identical to a typical meat room using whole lamb forequarter pieces as if they were delivered to the cell from a production line.

The process steps to separate the rib cage involves the following actions:

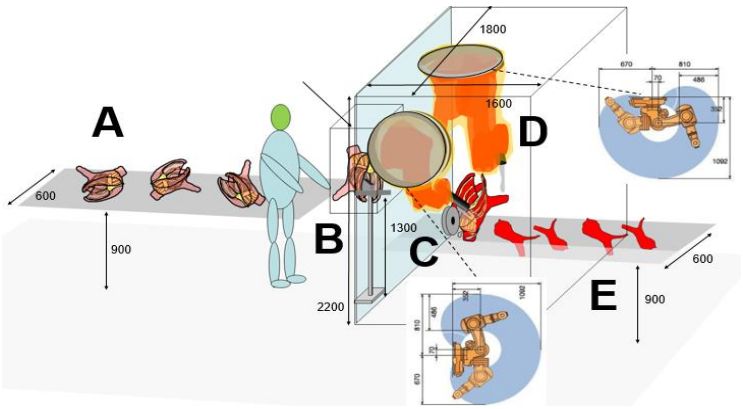
- Separation of shoulder muscle from the spine featherbone by performing two knife incisions one on each side of the featherbone along the back of the shoulder.
- Separation of the foreleg and shoulder muscle from one side of the rib cage and then the other side of the rib cage (see image).



The approach to using automation would remove 30%-40% of the whole manual processing time, when focusing on the separation of the shoulder rib cage.

Trials and observations of the processes have been conducted and two practical options have documented that represent the manual process.

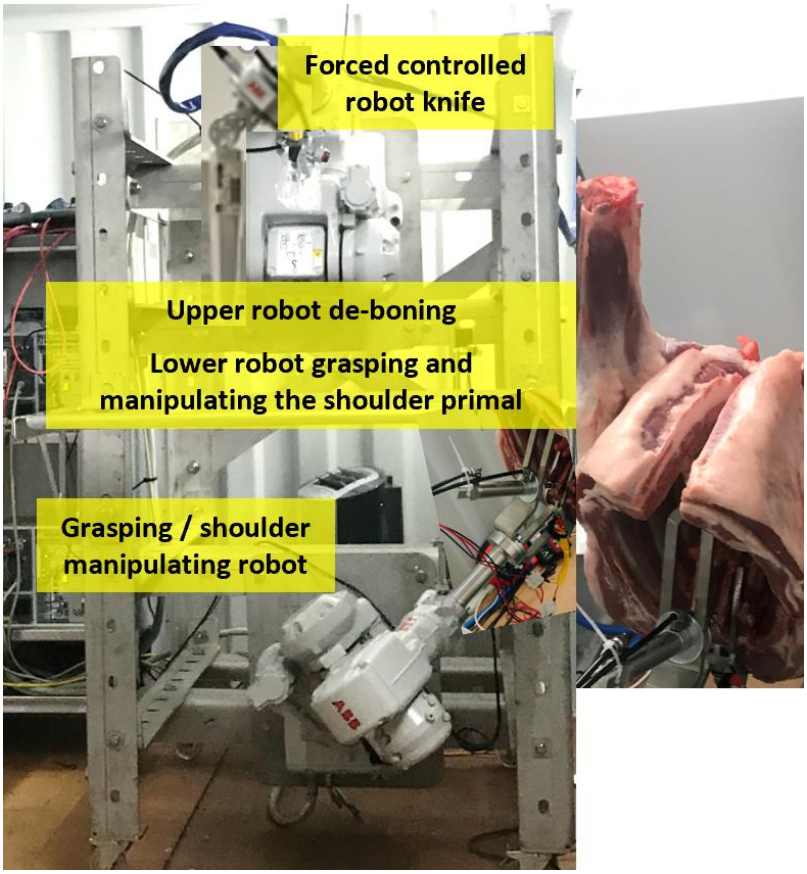
a) Separation of meat in the whole shoulder, neck and leg or the “banjo” as one piece, from the shoulder carcass, leaving behind the shoulder carcass, with the neck attached,
b) Separation of the banjo from the shoulder leaving behind the neck and shoulder muscles for the production of shoulder cutlets.



Assessments of the cutting schemes with cutting tool possibilities has been made and a robotic approach is identified as a solution for further examination.

A robotic solution has been reached forming the bases for evaluations and developments.

The Figure gives the overview of the Robot Cell for lamb forequarter de-boning. Prototype, implemented and tested.



Benefit for Industry

The cost commercial cost of such a system is estimated at below AU$ 180k achieved by cost engineering and based on an overall labour saving of 2 people the ROI is calculated at shorter than 18 months over one shift, given a ribcage separation throughput, equivalent to 300 pieces per hour.

USEFUL RESOURCES

http://scott.co.nz/meat-processing/lamb/automated-boning-room-
https://www.cambridge.org/core/journals/robotica/article/robot-deboning-for-beef-forequarters/C08514A1D04A03A0921FE3A75BBAAAC1

http://www.atiia.com/Products/ft/sensors.aspx?gclid=CJTu7P2Mp9MCFYZjvAodAywHpA