final report

Project Code: PRTEC.035

Prepared by: Philip Boyce
Food Science Australia

Date published: April 2005

PUBLISHED BY
Meat and Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Automatic Beef Splitting Saw Electrical/Mechanical Roller Guide Ralph's Meat

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government and contributions from the Australian Meat Processor Corporation to support the research and development detailed in this publication.

Roller Guidance Trials

Trials of the Splitting Saw roller guidance system were carried out at Ralph's Meats on the 1st to 2nd March 2005. These trials were carried to evaluate the performance of the roller during the cutting process on random species cattle. The beef carcase preparation was as per the normal process quality.
Observations of the roller trials are as follows:

1. The roller tended to track the centre of the spine on fatty and lean carcases if the roller started aligned on the tailbone.

2. If the carcase hung too far to one side at the start of the cut, the roller did not engage the tailbone correctly and caused severe soft siding (See Figure 1). The nature of the roller would not allow the spine to re-centre itself. This caused problems and will need to be investigated to prevent from re-occurring.

3. Most carcases slumped or hung to one side during the cutting process due to the either the flanks being torn and/or the roller spacing too wide.

4. During the cutting process the saw tracked the movements of the roller and remained central. In most cases when the saw was soft siding, the saw blade was central to the roller but the carcase was slumping and/or pulling away to one side.

5. The saw soft sided through the shoulder and neck region on some carcases due to the carcase slumping and/or the distance between the roller and blade too great.

All the above observations indicate that the roller system does track the centre of the spine on fatty to lean carcases, provided that it started aligned on the tailbone and maintained contact with the carcase surface.
The trials that were carried out were not a true indication of the potential of the guide roller. Changes to the system were very limited and restrictive. This had a huge impact on results and outcomes of the trials.

Figure 1: Tailbone to One Side

Solutions

There are some associated problems with the system that are possible to solve. These are as follows:

1. The carcase slumping to one side during the cutting process.
    - The leg spreader currently at Ralph's is too wide and/or the flank torn out from the hide puller.
    - Reduce the leg spreader from 1200mm to 950mm and evaluate the hide pull process and possible change in process.

2. Carcase hanging to one side at start.
    - Use a sensing system to pickup the tailbone and slew the robot to that point. This may give the saw a wider operating scope and solve the unmatched hook issue.

3. Carcase soft siding caused by too wide of a gap between the roller and saw blade.
    - Reduce the distance between the roller and the saw blade to the minimal functional clearance.
    - Sensing roller may need a simple rocker system as per the ultrasound head.

Further trials of the above solutions would be required after each change to the process. It would be a greater benefit if a step by step approach was adopted as this may reduce costs and time.

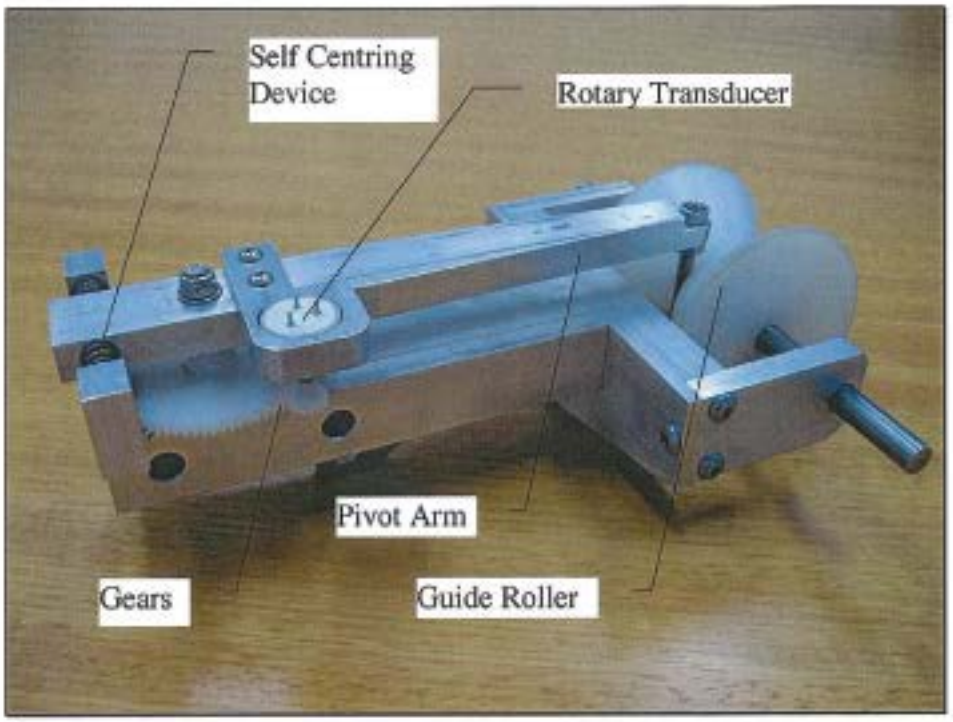

Figure 2: Assembly of the Electrical/Mechanical Roller Guide

The guide roller consists of a vee shaped roller, a pivot arm, rotary transducer and a self centring device. The roller is able to freely slide along the shaft and in doing so rotates the pivot arm that carries the rotary transducer. This then rotates the transducer that relays its position the controlling computer. The signal is then analysed for the position of the roller and compares this to the position of the saw. If there is a given difference the saw is then moved to the position of the roller. When the roller is disengaged from the carcase the roller is centred on the shaft by the self centring device mounted on the end of the pivot arm.

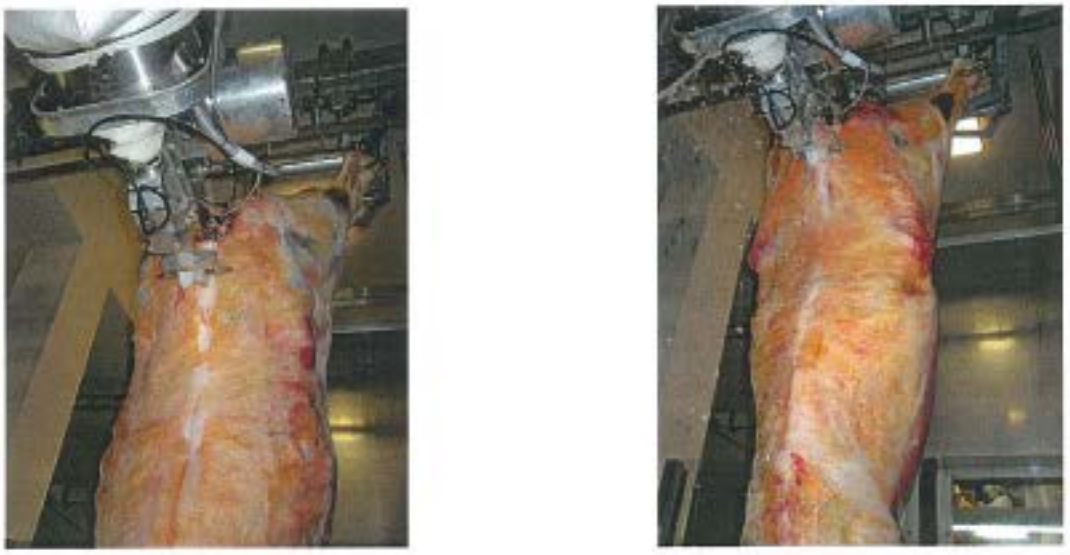

Figure 3: Guide Roller at the Start Position

Figure 4: Roller Guiding During the Cutting Process

As seen in figure 4 the distance between the roller and the saw blade is too great. This distance needs to be reduced for the roller to sense the position of the carcase prior to the saw blade.

Recommendations

Further trials should be carried out to determine the full potential of the guide roller system. The device that was trialled was only developed to trial the concept and was not intended to be used as a production model. Modifications should carried out on the roller device and to the some peripheral equipment and adopt a step by step approach should be adopted for these trials.