



# finalreport

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## Manual Measure Single Tower Primal Cutting System

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## Abstract

After more than 10 years of Scott and MLA developing an automated integrated lamb bone-in processing vision for larger processing companies (operating at >7cpm), Scott has recently been working with MLA to ascertain how the fully automated system can be reduced in offering and made cost effective for smaller processors operating up to 5cpm. The brief is that the system should:

- Have a cycle rate of 5 carcasses per minute
- Be smaller and of lower cost than the Scott 10cpm X-Ray machine
- Be easy to install
- Improve the cut accuracy and yield benefits from the current manual head saw cutting/pre marking process.
- Provide the ability to add an additional tower and X-Ray system in the future.

Thus encouraging small – small medium processors as well as larger processors who have been hesitant to embrace automation to invest in the system due to the lower cost and potential to build on the system at a later date.

## **Executive Summary**

After more than 10 years of Scott and MLA developing an automated integrated lamb bone-in processing vision for larger processing companies (operating at >7cpm), Scott has recently been working with MLA to ascertain how the fully automated system can be reduced in offering and made cost effective for smaller processors operating up to 5cpm. The following objectives of the project have been achieved. The system:

- Has a cycle rate of 5 carcasses per minute
  - The machine will be reduced to a single station with combined clamping to enable the Forequarter and Saddle cuts to be performed within a cycle rate of 5 cpm.
- Is smaller and of lower cost than the Scott 10cpm X-Ray machine
  - The reduction to one station and a reduction in transfer stroke will enable a reduction in cost and foot print.
- Is simpler to install
  - The system will be designed in a modular format and utilise "Plug and Play" style electrical reticulation to enable the processor to undertake installation themselves.
- Has improved cut accuracy and yield benefits from the current manual head saw cutting/pre marking process.
- Provides the ability to add an additional tower and X-Ray system in the future.

The industry as a whole can benefit from Manual Measure system. It can be seen that the reduced cost and footprint will enable that smaller processors to invest in automation without the need for the expense of a fully blown X-Ray system. Similarly the system allows the larger processors that have been hesitant to engage in automation to try this 'cut down' version, with the ability to add more complex technology (X-Ray) to the system at a later date if desired.

Scott's recommendation is that, with the support of MLA, this system be installed on a processor's site and that this site be used as a demonstration site for other processors to come and view the system in operation.

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## 1 Background

After more than 10 years of Scott and MLA developing an automated integrated lamb bone-in processing vision for larger processing companies (operating at >7cpm), Scott has recently been working with MLA through project A.COM.0227 to ascertain how the fully automated system can be reduced in offering and made cost effective for smaller processors operating up to 5cpm.

This project will enable MLA and Scott to take the preferred design from A.COM.0227 and develop and ex-works entry level manual measure single tower primal system ready for installation and demonstration into an Australian Processors facility.

The developed design will benefit smaller throughput processors and hence increase the previous MLA investment in the X-Ray Primal Concept to a wider Australian processor base.

The selected design can also be added to at a later date to either include a second cutting tower (to increase throughout from 5 to 10 cpm) and an x-ray sensing device to increase yield benefits over manual measure and drive other Scott systems as the middle machine and Forequarter and Hindquarter cells

## 2 **Project Objectives**

The objective of this project is to develop a Manual Measure Single Tower Primal Cutting System for small to small medium Australian Processing Companies that is ready for installation into an Australian host site. Specifically the system will aim to achieve the following:

- Cycle rate of 5 carcasses per minute
  - The machine will be reduced to a single station with combined clamping to enable the Forequarter and Saddle cuts to be performed within a cycle rate of 5 cpm.
- Smaller and of lower cost than the Scott 10cpm X-Ray machine
  - The reduction to one station and a reduction in transfer stroke will enable a reduction in cost and foot print.
- Simplified installation
  - The system will be designed in a modular format and utilise "Plug and Play" style electrical reticulation to enable the processor to undertake installation themselves.
- Improve the cut accuracy and yield benefits from the current manual head saw cutting/pre marking process.
- Provide the ability to add an additional tower and X-Ray system in the future.

## 3 Methodology

The design and build of the system was undertaken in Scott's workshops in Dunedin and the following section shows progression from design to FAT.

## 4 Results and Discussion

#### 4.1 System design

The design of the Manual Measure Single Tower Primal Cutting System was based on the Scott X-Ray Primal machine and as detailed in Section 2 above, this design work took the following into consideration:

- A requirement for a reduced footprint
- The requirement to reduce the machine and implementation costs
- The requirement to allow processors to undertake installation themselves
- The requirement to allow future addition of an X-Ray module and/or an additional tower should the required production rates increase.

The sections below discuss the specific areas that have been redesigned to incorporate these requirements.

#### Manual Measure Station Development

A manual measuring station has been designed to take the place of X-Ray measuring module. The carcass measurement is achieved using a carcass clamp to secure the product and a laser line measuring device which then feeds the data to the single tower automated cutter. The images below show the manual station in relation to the cutting system.





Fig.1 Manual Measuring station

#### **Multi Cut Cutting and Clamping Station**

With system footprint reduction in mind, the clamping of product at each of the forequarter and saddle stations that occurs on the 10cpm X-Ray Primal Machine has been incorporated into a single cutting station in this Manual Measure Single Tower design. This had been achieved by:

- 1. incorporating the functions of the saddle stations back clamp with a mechanism that fits within the available space of the forequarter station.
- 2. modifying the saddle front locators such that it performs both the forequarter and saddle functions.



#### Fig.2 Multicut, cutting and clamping station

#### Product transfer

While the transfer of product occurs in a similar manner to the 10cpm machine the transfer mechanism has been optimised around the single tower machine. Redesign has seen a reduction of stroke which reduces the overall machine footprint while incorporating inherent safety for the operator as well as protection at machine entry.



#### System Layout

The layout below shows the reduced system footprint.



Fig.4 System Layout and elevation views

#### 4.2 System build

The images below show components of the system in various stages of fabrication, machining and assembly.



Fig.5 System components ready for assembly



Fig.6 System components fabricated, machined and ready for assembly

The images below show the completed system on Scott's factory floor in New Zealand. Note the Plug and Play nature of the Electrical and Pneumatic connections designed to simplify installation and enable installation to occur without the need for a qualified electrician (excluding mains connection). In addition the electrical and drives panel along with the electrical connection panel is all one cubical. This reduces the footprint and allows for easier installation.











Fig.7 System setup for FAT in New Zealand

#### 4.3 System FAT

The FAT for the Manual Measure Single tower Primal Cutting System was conducted on the 4/11/15 at Scott's facility in Dunedin New Zealand in the presence of Darryl Heidke from MLA. Darryl has copies of video of the system during the FAT. The videos show the system dry cycling at 5 carcasses per minute as well as the system processing carcasses. These videos should be attached to this report as Appendices. The images below show the primals produced during the FAT.



Fig.8 Primals produced during FAT

## **5** Success in Achieving Objectives

The objectives of the project have been achieved:

- Cycle rate of 5 carcasses per minute
  - The video attached as a Appendix to this report shown the system dry cycling at a rate of 5 cpm. The actual rate will be dependent on speed of the operator in marking the carcass with the laser and will obviously improve as the operator becomes more familiar with the machine.
- Smaller and of lower cost than the Scott 10cpm X-Ray machine
  - The reduction to one station and a reduction in transfer stroke has reduced the footprint of the system and also the cost.
- Simplified installation
  - The modular format of the system and "Plug and Play" style electrical reticulation allows for easier installation, potentially allowing the processor to undertake the installation themselves.
- Once the operator becomes familiar with the laser marking technique the cut accuracy and hence yield will be improved when compared to the current manual bandsaw process.
- As mentioned above the system is modular and provides the ability to add an additional tower and X-Ray system in the future.

## 6 Impact on Meat and Livestock Industry – now & in five years time

The immediate impact on the meat industry is that a Manual Measure Single Tower System will allow smaller processors to introduce technology to their site without having to invest in a full blown X-Ray system. With this technology introduced there is potential that in the future the processors invest further with an x-ray module replacing the manual measuring station, and/or a second tower being added if the processors throughput also increases to over 5 cpm.

In addition it is felt that this entry model may also be a good way for the larger processors, who are still not engaging in the full automated system to try a smaller version of the system before committing to a fully automated solution.

## 7 Conclusions and Recommendations

As can be seen from the video that accompanies this report and the above images a manual measure Single tower primal Cutting system has been successfully manufactured. This system is capable of running at 5 cpm and comprises of a reduced foot print and modular format that simplifies installation. These aspects should make it appealing to the small – small medium processors that wish to introduce technology to their site without investing in a full blown X-Ray system. It should also appeal as an entry level system to larger processors who are not yet engaging in automation and should see this as a way of trying automation before committing to a full system.

Scott's recommendation is that, with the support of MLA, this system be installed on a processors site and that this site be used as a demonstration site for other processors to to come a view the system. A number of sites were contacted in this regard and their feedback has been provided to MLA.