

R.F.I.D Project

Small stock Traceability Pilot Studies

Project Code
2022-1129

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Date Submitted
12/05/2023

Published by
AMPC

Date Published
03/08/2023

Contents

Contents	2
1.0 Executive Summary	3
2.0 Introduction	4
3.0 Project Objectives	5
4.0 Methodology	5
5.0 Project Outcomes	11
7.0 Conclusions / Recommendations	15
8.0 Bibliography	15
9.0 Appendices	15

1.0 Executive Summary

AMIC has received funding from the Australian Government, through the Traceability Grants Program. The Grant has been successfully leveraged by industry co-funding from Australian Meat Processor Corporation (AMPC).

AMIC and AMPC will be allocating funding to finance a series of pilot studies. It is AMIC and AMPC's aim that these pilot studies will examine the benefits of electronic Radio Frequency Identification Device (RFID) readers in sheep processing establishments, outside of Victoria.

The purchase and installation cost of the technology and software will be financed as part of the pilot studies.

The staged pilot studies are anticipated to create a better understanding of the additional benefits of RFIDs outside of NLIS compliance, including but not limited to:

- Supply chain integrity
- Compliance with market access requirements
- Better carcass selection for markets
- Animal health and biosecurity
- Provenance claims
- Raising claims
- Sustainability claims
- Advanced objective carcass measurement
- Integration of full carcass tracking systems
- Carcass yield feedback to producers, to facilitate adjustments in genetics

AMIC has completed a desktop research project, investigating the following:

- Average cost for equipment purchase and instalment
- Software requirements for processors

Data received from the pilot studies will be collated. These will be analysed, and outcomes and recommendations will be shared with the broader industry.

2.0 Introduction

Traceability within a meat processing facility is a critical component to the business. Traceability enables corrective actions (such as product recalls or withdrawals of unsafe meat products) to be implemented quickly and effectively when an issue is identified. When a potential food safety issue is identified, whether by a process worker, supervisors / responsible person, inspector (AAO) or a government representative (FSMA or on site vet), an effective traceability system can help isolate and prevent contaminated or unsafe meat products from reaching customers.

Traceability allows the business to target the product(s) affected by a food safety issue, minimising disruption to trade and any potential public health risks. It is important for all food processors to be able to trace products when needed.

The information which will be associated with the RFID with be:

- Date and time,
- Line number,
- Lot number,
- Vendor / farmer,
- Number of carcasses in the mob,
- Lamb or Mutton,
- Description of sheep, and
- Carcase weight

The scope of the RFID pilot will start at the restrainer in the stockyards prior to being stunned / sticking and will finish when leaving the Harvest floor carcase scale.

Project Outputs

- Supply and installation of a single walk through reader and associated infrastructure
- AMIC and AMPC will be allocating funding to finance a series of pilot studies
- It is AMIC and AMPC's aim that these pilot studies will examine the benefits of electronic Radio Frequency Identification Device (RFID) readers in sheep processing establishments, outside of Victoria

3.0 Project Objectives

3.1 Accurate mob traceability

3.2 Through-plant traceability through full carcass tracking

3.3 Reliable feedback to producers e. g. stock weights, animal health

Stages

Attach the RFID tags to a portion of gambrels.

Install the RFID readers.

Design and implement the traceability software.

4.0 Methodology

In most cases, abattoirs will need to upgrade their software to some extent to allow for the RFID technology. The type and cost of the upgrade will depend on your establishment's current software capability.

As with hardware, requesting tenders from several software providers would clarify what is required, and should be included in our proposal form. In Victoria, the cost range was estimated to be about \$50,000 to \$250,000 per plant in medium and large plants, depending on individual hardware and software requirements.

Software solutions may also incorporate features into software applications for processors that can accommodate a range of additional fields, including:

- Electronic NLIS (sheep) tag numbers
- The number of head in lines of sheep presented for processing
- Species
- Animal health and quality information in relation to carcasses detained on the retain rail, such as bruising, grass seed damage, sheep measles, pleurisy and arthritis, in partnership with the National Sheep Health Monitoring Project (NSHMP)
- Body numbers
- Carcass description data
- Electronic NLIS (sheep) tag details and PIC of dispatch for animals that were dead on arrival or were euthanized in the lairage
- Reader time stamps
- Electronic NVDs

The pilot consisted of 4 stages:

1. Programming the site's livestock system to incorporate traceability software. The traceability software will be called the Livestock System.
2. Installing the RFID to the gambrel.
3. Installing the RFID readers.
4. Designing the RFID mob tags.

4.1 Software

The majority of the Livestock Coordinators and Livestock Assistants information and data entry is done within the Livestock System developed.

The programming department was able to update the Livestock System to incorporate the RFID system.

4.2 Installing the RFID tags on the gambrel

The RFID tag Pictured below.



In order to fit the RFID tag onto the gambrel a bracket needed to be made. Brackets pictured below.



The bracket and RFID tag together (pictured below).



Gambrels used onsite without the RFID tag attached (pictured below).



The first attempt RFID tag attached to the gambrel, pictured below.



The second attempt RFID tag attached to gambrel, pictured below.



There are gambrels on the market which already have the RFID attached.

4.3 Installing the RFID tags on the chain shackles

The original plan was to install RFID tags on each of the shackles on the foreleg and hind leg chain. This task was completed however it was abandoned and the use of sensors counting the shackles was implement instead.

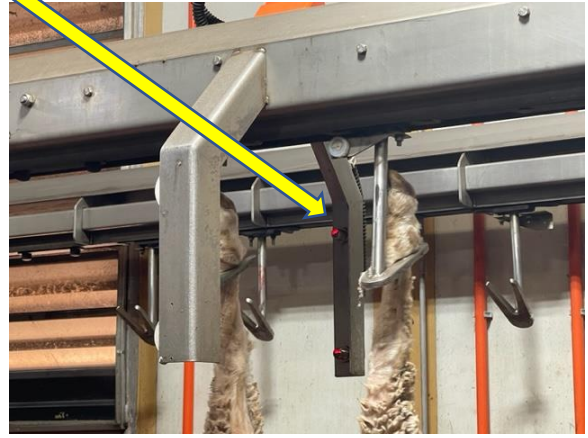
The reason the RFID tags on the shackles was abandoned was due to two main reasons.

1. The RFID tags attached to the stainless steel shackle was causing interference and was not always 100% guaranteed to transmit the data. The RFID tags over time would also fail causing various shackles to have no data.
2. When the chain stretches and a section of the chain and shackle is removed it causes the system to not function correctly. By using sensors and counts the system will always know the location of a carcase.

RFID Tag on shackle



Sensors used on the chain for counting and positioning



4.4 Installing the RFID readers and sensors

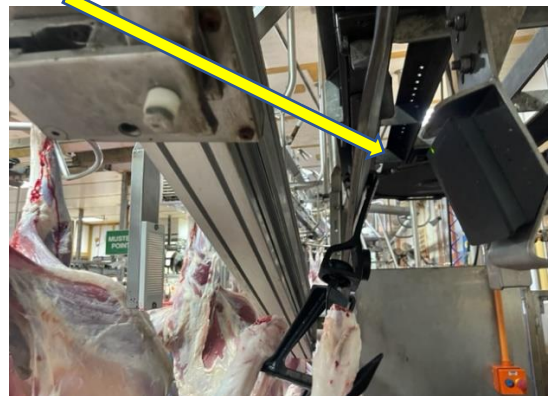
Location of RFID readers:

- Restrainer conveyors
- Ear tag computer / operator
- Beginning of the foreleg chain conveyor
- Beginning of the dressing chain conveyor
- Animal Health Station
- Scales at the end of the Slaughter Floor
- Hook / gambrel wash room

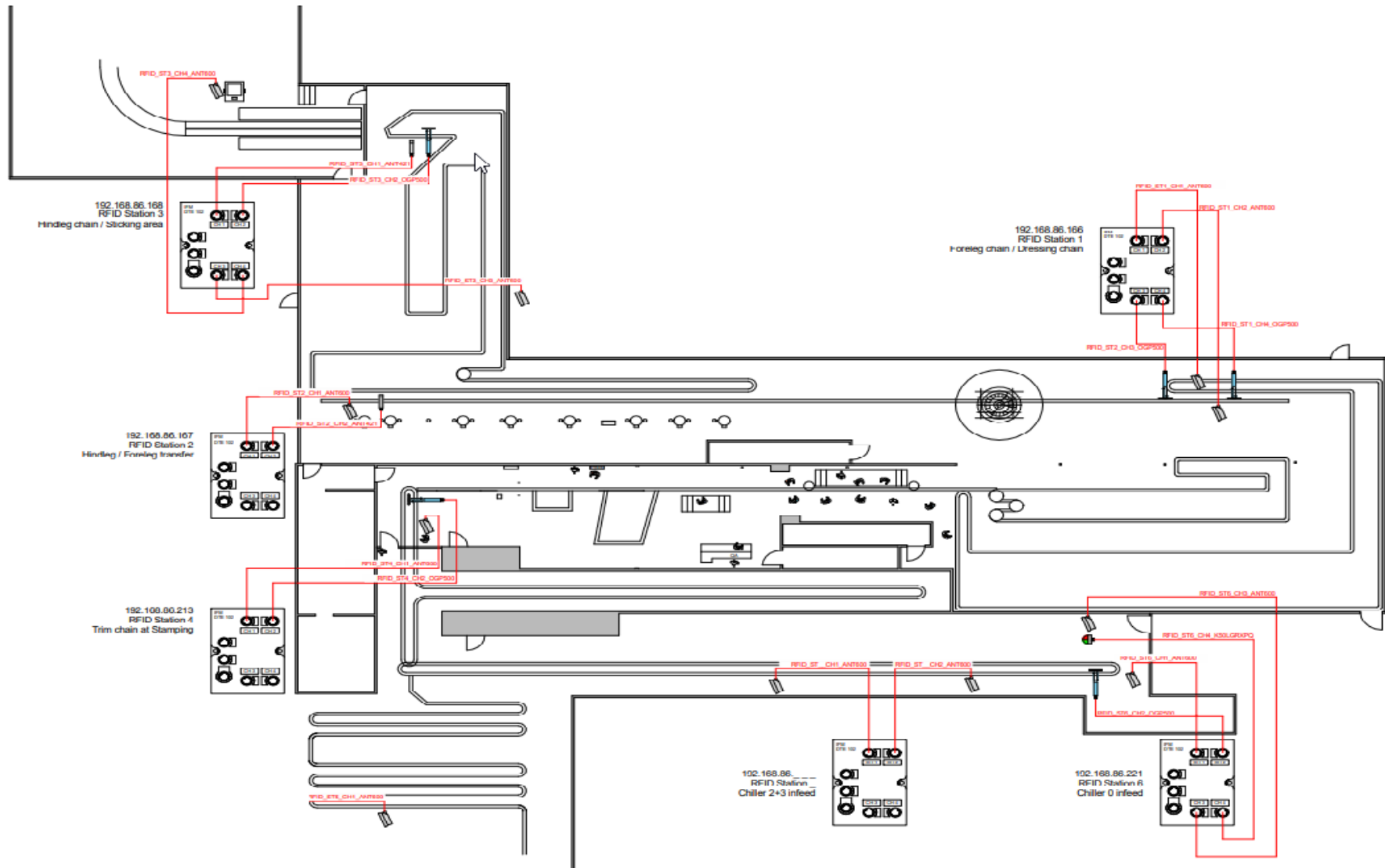
Various sensors already installed on the chain conveyors for the chains syncing have been multipurpose used to help the system identify the carcass location.

The sensors and RFID readers are all connected to the programmable logic controller (PLC) in the switch room. The livestock system software communicates with the PLC to get the data.

RFID Readers installed on the chain



A location diagram of the RFID readers on the Harvest floor pictured below.



4.5 RFID mob tags

The RFID mob tags are simply a RFID tag with an electric band through the middle to attach to the sheep's leg.

RFID Mob Tag



5.0 Project Outcomes

The RFID Traceability Operating Procedure

Prior to Harvest floor Traceability:

1. Stock purchases are filled out electronically under the livestock system. The stock buyers fill out a contract on farm electronically, pictured below.
2. All relevant information such as owner's details, property and area, veterinary health information, agent's earmarks, quantity, etc. must be included.
3. At the end of the day the livestock buyers email their purchases (contracts) to the livestock coordinator.
4. The livestock coordinator then arranges the transport and delivery dates of the sheep.
5. A delivery sheet is generated each day and given to the stock yards.
6. As the sheep are delivered the stockman match up the NVD's to the delivery sheet and enter the NVD serial number and confirmation count into the livestock system.
7. Saleyards differ in that the NVD's are emailed by the agents to the livestock coordinator and stockyards instead receive a Waybill to match against the delivery sheet.

8. Every morning a kill sheet is generated from the livestock system which has all the sheep which will be slaughtered. The kill sheet includes line number, lot number, pen number, quantity, but weight, property / vendor name, description, any comments and ear tag number.

Carcase traceability during slaughter process:

1. The sheep in the raised stock yards are segregated in individual pens per mob / line number. Each pen has an identification card at the gate to identify which mob / line it is.
2. As each mob / line first enters the race to the slaughter floor, the stockman spray paint the line number on the back of the first six sheep.
3. The RFID mob tag needs to be uploaded with the mob details. To do this the mob is selected on the computer near the restrainer. Once the mob is selected the RFID tag needs to be placed on the RFID reader attached to the computer to transfer the data.



4. As the new line / mob enters the restrainer the RFID tag is placed on the sheep's leg.



5. The RFID mob tag stays on the sheep's leg until it reaches the ear tag computer / operator.
6. The ear tag operator removes the RFID mob tag and places it on the RFID scanner. The scanner reads the RFID mob tag and assigns the adjacent shackle to the start of the new mob / line. All shackles therefrom are assigned to the particular sheep hanging on that shackle to the particular mob / line.



RFID Reader for mob changes

7. The ear tag operator cuts off the ear tag and places it under a camera. The camera automatically takes photos of each ear tag and assigns it to the correct shackle.



8. From the ear tag computer each shackle is assigned to each carcass.
9. There are two chain conveyors on the Harvest floor which use shackles. The first one is the hind leg chain and the second one is the foreleg chain. The computer system assigns the carcasses to the particular shackle with sensors.
10. When the foreleg chain ends and the dressing chain begins a gambrel is attached to the hind legs.
11. At the start of the dressing chain there is a RFID reader which uploads the RFID gambrel information into the data base.



12. At the animal health station (where the AAO inspectors are) there is another RFID reader which updates the RFID gambrel data base of any health issues with the carcass. The AAO inspectors have a touch screen computer each and all defects found on the carcass are entered into the computer.

13. The final RFID reader is at the end of the Harvest floor at the scales which automatically weighs the carcass and updates the RFID gambrel data base with the weight.



The maintaining of the RFID tags on the gambrels will be done by randomly testing a hook trolley worth of gambrels on a RFID reader near the hook / gambrel wash room. Supervisors or Trainers from the Harvest floor will complete this task.

When a gambrel RFID is scanned and it has is a bad read, the person doing the check will remove this gambrel from circulation and the electrical department will replace the RFID unit.



Future RFID Traceability System Upgrades

RFID readers have been installed at the entrance of every chiller. The RFID traceability system will be able to scan which chiller the carcass will be held in.

RFID readers will be installed at the exit of each chiller which will alert the system when the carcass leaves the chiller.

The Hot Fabrication room and Cold Fabrication room have RFID readers at each of the scales prior to being processed. The RFID readers will be able to alert the scales computer of a new mob / line and also record the weights into the data base. It will also advise the system the carcass has been processed.

6.0 Conclusions / Recommendations

The RFID traceability system has been a success. The new system has eliminated a lot of manual data enter that was once required.

Due to the reduced manual data entry it will make the traceability system much more user-friendly and almost flawless. It will also assist in reducing the supervisor's workload and make training in the traceability procedure easier.

7.0 Bibliography

None

8.0 Appendices

None