FINAL REPORT

PROJECT V.NLI.0066

NLIS SHEEP - PIC AND BODY CORRELATION PROJECT

January 2011

Project funding partners

AMPC

Australian Government
Department of Agriculture, Fisheries and Forestry

mla
MEAT & LIVESTOCK AUSTRALIA

AMIC Australian Meat Industry Council

INTRODUCTION

The Australian Meat Industry Council (AMIC) is the recognised Peak Council in Australia representing the post-farm gate sector including the export and domestic processing industry, smallgoods manufacturers, wholesalers, distributors, boning rooms and independent retail butchers.

AMIC provides services and support to approximately 3,000 member companies aimed at improving their working environment. AMIC focuses on achieving the best outcomes for the industry and its members as part of one voice on issues critical to their business.

In mid 2009 AMIC entered into an agreement with Meat and Livestock Australia (MLA), the Federal Department of Agriculture, Forestry and Fisheries (DAFF) and the Australian Meat Processing Corporation (AMPC), to administer a Federal Government National Livestock Identification System (Sheep and Goat) Grant for the sheep processing sector.

The purpose of the Grant was to investigate technical solutions that would deliver systems to meet the European Union's (EU) requirement for Australian sheep processors to correlate each ovine carcase to their Property Identification Code (PIC) of last residence up to the point of carcase disposition.

This document is AMIC's final report on the project V.NLI.0066. "NLIS sheep - PIC and body correlation project".

PROJECT DRIVER

Traceability requirements for European Union (EU) approved sheep processing establishments became more stringent in mid 2009. In response AQIS released Meat Notice 2009/14 which sets out specific criteria that each EU establishment must meet in order to prepare ovine product for the European Union.

From November 2009, EU sheep processing establishments were required to demonstrate that they have in place fully-documented processes whereby individual carcases, at the point of disposition or inspection, can be traced back to their last property of residence or Property Identification Code (PIC). Up until that point carcase correlation in sheep had been done on a mob basis.

This project has attempted to document, develop and increase adoption of technical solutions that could meet these AQIS regulations for EU market access.

PROJECT OBJECTIVES

This project had the following key objectives:

1. Review and document the technical solutions that were currently available in achieving correlation of the carcase body number to the PIC of last residence to the point of disposition in EU sheep establishments.

2. Develop a software solution designed to streamline the correlation requirement and trial the solution in an approved processing establishment.

3. Assist wider industry adoption of available technical solutions by funding multiple trial sites.

PROJECT DELIVERABLES

This project had the following key deliverables:

- Component 1: Case studies of technical solutions to correlate carcase body number to the PIC of last residence to the point of disposition in EU sheep establishments.

- Component 2: Software solution to correlate carcase body number to the PIC of last residence to the point of disposition in EU sheep establishments.

- Component 3: Direct grants to EU Sheep Processing Establishments to implement solutions to meet the EU's requirement, conduct trials and provide a report that assesses each solution, technical issues encountered, resource requirements and costs.

ACKNOWLEDGMENTS

Funding was provided by the Federal Department of Agriculture, Forestry and Fisheries (DAFF) and Meat and Livestock Australia as part of the National Livestock Identification System (Sheep and Goats). Funding was also provided by the Australian Meat Processor Corporation (AMPC). AMIC provided administrative support and project management.

Under component 3 of the project each establishment contributed 50% of expenditure for development and implementation of each installation in their establishment.

AMIC would like to thank the Federal Department of Agriculture, Forestry and Fisheries and the Australian Meat Processor Corporation for their support and financial contribution to this project.

PROJECT OUTCOMES

Component 1: Case studies of technical solutions to correlate PIC of last residence to body number to point of disposition in EU sheep establishments

The aim of this component was to provide a report documenting case studies of technical solutions that address the EU's requirement to correlate carcase body number to the PIC of last residence to the point of disposition in EU sheep establishments.

The principal objectives of the project were as follows:

- Identify the requirements of the EU for correlation of PIC of last residence to body number to point of disposition
- Identify the existing technical solutions in place in industry that address the EU requirement to correlate PIC of last residence to body number to point of disposition.
- Document for each solution the key decision making elements and characteristics with regard to operating the solution.
- Compile a report for AMIC that presents each solution as a case study for publication and distribution to Industry.

A total of eight case studies were documented and provided in a final report that was published in November 2009.

AMIC engaged *ProAnd and Associates* to undertake this component of the project.

The final report provided by *ProAnd and Associates* is included in the appendix 1.

Component 2: Software solution to correlate PIC of last residence to body number to point of disposition in EU sheep establishments.

The project aimed to develop and deliver a software solution that streamlined requirements to correlate sheep carcases to the last property of residence up to the point of post mortem inspection.

The principal objectives of the project were:

- Develop a software solution to enhance and streamline the requirement to correlate sheep carcases to last property up to the point of post mortem inspection.
- Conduct a trial of the software solution in an AMIC approved sheep processing plant to investigate the technical issues and resources required
- Develop a report outlining the software solution that assesses the system's operation, effectiveness, technical issues encountered, resource requirements and cost.
- Provide a report that presents the solution for publication and distribution to Industry.

To facilitate this component AMIC engaged Cedar Creek Company and in consultation with Industry, selected an appropriate processing establishment to trial the solution.

The establishment selected was Fletchers International at Dubbo, NSW.

Fletchers International staff worked closely with the Cedar Creek Company to develop the solution. A considerable investment in time, resources and finances was provided by Fletchers International and AMIC would like to acknowledge Terry Mitchell and Peter Field for their contribution.

Following refinement of the solution, Fletchers International held at least three field days with key industry leaders to demonstrate the system. Representatives from a wide range

of organisations included NLIS Ltd, the Sheepmeat Council of Australia, Safemeat, AQIS and DAFF all participated in these field days and experienced a 'walk through' of the technology and system. The response from these field days has been overwhelmingly positive.

In line with the project requirements Cedar Creek Company provided a final report which is included in Appendix 2. This report has been developed in consultation with AMIC and Fletchers International staff.

Component 3: Direct grants to EU Sheep Processing Establishments to implement solutions to meet the EU's requirement, conduct trials and provide a report that assess each sites solution, technical issues encountered, resource requirements and cost.

Component 3 of the project was to provide direct Grants to EU sheep processing establishments to implement solutions that meet the EU's requirement, conduct trials and provide a report that assesses each solution, technical issues encountered, resource requirements and costs.

FUNDING REQUIREMENTS FOR TRIAL SITES

The funding was made available to sheep processing establishments that were registered with AQIS for supplying sheep meat to the EU market.

The funding eligibility criteria that each applicant was required to meet included:

1. Software purchase or upgrades, and hardware. Software and hardware must be able to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.
2. Costs associated with training staff in the usage of the purchased software and hardware.
3. Capital costs associated with plant modifications or additions to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.
4. Costs associated with protocol development and documentation (QA manuals, approved arrangement documentation etc) of the requirements to correlate PIC of last residence to body number to point of disposition.

Payment was made in arrears upon the provision of 'proof of purchase' documentation (ie tax invoices for eligible expenditure), full documentation of 'in-kind costs' and the provision of a final report that included a signed declaration.

These requirements were outlined in a 'Federal Funding Application Kit' which was distributed to all EU registered sheep processing plants during July and August 2009. The kit was developed by AMIC and endorsed by DAFF and MLA. A copy of the kit is included in Appendix 3.

REPORTING REQUIREMENTS FOR TRIAL SITES

Applicants were required to provide a final report outlining the solution that was implemented in their Establishment. A report template was provided to applicants, which included the following topics:

- Establishment details
- Establishment size
- Overview of the solution
- Accuracy of the solution
- Issues experienced and how they were rectified
- Solution specifications
- Solution costs
- Ongoing operational requirements and costs
- Photos

TRIAL PARTICIPANTS

The following Establishments sort and received funding to trial various solutions.

Peel Valley Exporters (trading as Country Fresh Australia), Tamworth, NSW	Castricum Bros Pty Ltd, Dandenong, VIC
Lobethal Australia Pty Ltd, Lobethal SA	Southern Meats Pty Ltd, Goulburn, NSW
Tatiara Meat Company Pty Ltd, Bordertown, SA	T & R Pastoral Murray Bridge Pty Ltd, Murray Bridge SA
WAMMCO International, Burswood, WA	

TRIAL OUTCOMES

Due to the commercial nature of the information this report only provides a summary of the key aspects of each trial site.

To protect the companies involved, the summary does not indicate which solution has been adopted by the trial participants.

TRIAL SITE 1

Trial overview: Ear tags were removed and put into a tray with numbered slots that correspond to the body number on the processing chain. A light system was installed at the meat inspection point to alert chain operators when a tag was not present forcing the chain to stop and correlation to be investigated.

Trial Accuracy: 100% when all information was correct.

Issues: The trial identified a need for a system to enable the tag operator and meat inspector to communicate when a positive ID correlation was not successful. This was resolved with the installation of a light system and altering the SOPs to ensure correlation was achieved. The trial found that multiple ear tags hinder the process.

Initial Cost: $8,155

Ongoing costs: 1 employee to collect ear tags (approx $60,000).

TRIAL SITE 2

Trial overview: The systems uses a reader and digital camera using Optical Character Recognition (OCR) technology. The reader takes an image of each tag and then correlates the image to an individual carcase using a software system. The software also attempts to convert the PIC number image into a data (binary) file using optical recognition technology. The ear tag PIC image and data file is correlated to the pre entered PIC from the NVD and to the body number. This information is then relayed to the point of inspection and is accessible to the inspector if a problem with the carcase is found.

Trial Accuracy: The PIC entered into the camera touch screen was 100% accurate at supplying the identical PIC to the body number to the point of carcase disposition (inspection).

Issues: 'Training' of the OCR was a key issue, especially due to the different fonts used and colors of the tags.

Initial Cost: $23,600

Ongoing costs: No extra staff added to kill chain.

TRIAL SITE 3

Trial overview: The trial developed a software system where the NVD data was pre-entered and prepared as the kill schedule. This information was then relayed to the ear tag station as the kill was underway. The on-floor operator then read the PIC on each tag and matched it to the corresponding number on a touch screen. The information is then correlated to the carcase body number using software. The information is then

relayed to the point of inspection and is accessible to the inspector if a problem with the carcase is found.

Trial Accuracy: Correlation is accurate. Issues arise when the lots are not compliant with the NLIS requirements such as lost tags or incorrect / incomplete NVDs.

Issues: The Establishment explored a number of potential solutions such as a chocolate wheel or a conveyer belt with a hook or slot corresponding to carcase bodies. General issues experienced included clarity from the regulators about the specific requirements, no standard PIC prefix, usability of data entry units on the slaughter floor, general compliance in the supply chain with NLIS requirements such as no tags, unreadable tags, the NVD not being complete, documentation not received in time, multiple ear tags, and boxing too many lots.

Initial Cost: $30,878

Ongoing costs: 1 employee to collect ear tags (equating to approx $60,000), electricity $1,000, on-site maintenance at $4,260, and depreciation at $6,000 per year.

TRIAL SITE 4

Trial overview: The trial developed a software system where the NVD data was pre-entered and prepared as the kill schedule, correlated on floor and then relayed to the inspector.

The PIC list is pre determined via the NVD and entered via the kill agenda process prior to the kill commencing. The ear tag data was then manually entered into a KCD computer terminal by an operator. The PIC data is queued and then displayed when the mirco switch is triggered at the AQIS inspection point.

Trial Accuracy: The system was deemed very accurate as long as the data was correct, the data was keyed correctly into the system, dropped bodies were replaced with a dummy hook and the micro switch system worked.

Issues: Positioning of units on the floor proved challenging. Training of staff on the system. Multiple ear tags were seen toe hinder the process.

Initial Cost: $27, 445

Ongoing costs: Employment of a level 5 certificate employee.

TRIAL SITE 5

Trial overview: The trial developed a software system where the NVD data was pre-entered and prepared as the kill schedule, correlated on floor and then relayed to the inspector.

The PIC list is pre determined via the NVD and entered via the kill agenda process prior to the kill commencing. The ear tag data was then manually entered into a KCD computer terminal by an operator. The PIC data is queued and then displayed when the mirco switch is triggered at the AQIS inspection point.

Trial Accuracy: The system was deemed very accurate as long as the data was correct, the data was keyed correctly into the system, dropped bodies were replaced with a dummy hook and the micro switch system worked.

Issues: Positioning of units on the floor proved challenging. Training of staff on the system. Multiple ear tags were seen toe hinder the process.

Initial Cost: $27, 445

Ongoing costs: Employment of a level 5 certificate employee.

TRIAL SITE 6

Trial overview: The system utilized a manual correlation process. A conveyer belt with individual slots was installed alongside the processing chain. Ear tags were removed and placed on the conveyer belt into slots that corresponded to hooks on the chain and therefore the body. The tags then move along the conveyer belt to the point of inspection keeping in sequence with the corresponding hook and therefore carcase.

Trial Accuracy: 100% when all information correct.

Issues: Ensuring the chain speed was equal to the conveyer belt speed to ensure correlation is correct was a key challenge.

Initial Cost: $6,126

Ongoing costs: Minimal.

TRIAL SITE 7

Trial overview: This system was a software based standalone solution. Once supporting NVDs were verified the consigning PIC information was entered into the system in a kill schedule prior to slaughter commencing. Tag information was then entered at the first station directly from the ear of the animal and correlated to the pre entered PIC information. Correlation is made to the body number using the software system and then relayed to the point of inspection.

Trial Accuracy: The solution was deemed accurate to the point where producers were compliant with NLIS requirements.

Issues: Initial understanding of requirements and regulators clearly articulating the correlation requirement was a key issue. Understanding the physical operations of the

system; which was resolved through training. Multiple tags hindered the operation as it increased the time required to find the correct PIC entered into the kill agenda.

Initial Cost: $30,700

Ongoing costs: 1 employee and associated costs (clothing, laundry, consumables), Electricity, repair and maintenance, additional administrative activities, operational costs associated with EU segregation.

APPENDIX 1:

Case studies of technical solutions to correlate PIC of last residence to body number to point of disposition in EU sheep establishments

Final report provided by *ProAnd and Associates*.

PDF-XChange
Click to buy NOW!
www.docu-track.com

ProAnd ASSOCIATES

FINAL REPORT

CASE STUDIES OF TECHNICAL SOLUTIONS TO CORRELATE PIC OF LAST RESIDENCE TO BODY NUMBER TO POINT OF DISPOSITION IN EU SHEEP ESTABLISHMENTS

November 2009

PROAND ASSOCIATES AUSTRALIA PTY LTD.

65 Payten Avenue
Roselands
Sydney, NSW 2196
Australia

Telephone: +61 2 9879 5500
Facsimile: +61 2 8079 6971
www.proand.com.au

PDF-XChange Click to buy NOW! www.docu-track.com

CONTENTS

PDF-XChange
Click to buy NOW!
www.docu-track.com

EXECUTIVE SUMMARY

Traceability requirements for EU-approved plants processing sheep for the European Union have become more stringent. AQIS has released Meat Notice 2009/14 which sets out specific criteria which plants must meet in order to prepare product for the European Union. From November 2009, plants will need to be able to demonstrate that they have in place fully-documented processes whereby individual carcases, at point of disposition or inspection, can be traced back to the property of origin. The Notice specifically excludes saleyards as being an adequate point of origin for sheep.

Several aspects of the mob-based sheep production sector in Australia are at variance with this requirement. Vendor-bred sheep (i.e. have only resided at one PIC) coming forward for slaughter are relatively straightforward to identify through the existing NLIS and NVD protocols. Non-vendor bred sheep, however, are more complicated to trace back to the property of origin. In particular, the fact that abattoirs routinely box sheep from different lots and PICs for their kill schedules makes this a highly complex area to consider, both from an information technology perspective as well as from an operational view given the number of high-speed sheep plants in the industry.

The project presents a total of eight case studies in which processing companies have attempted to improve sheep traceability at their plants. The solutions identified in the case studies have been developed either to meet the anticipated AQIS regulations for EU market access or to explore avenues for adding value to information management within the works. A range of manual, delayed time and real-time solutions have been examined along with capital expenditure and operating cost estimates. Impact on day-to-day operational issues has also been considered such as labour usage and integration with other slaughterfloor tasks. Where real-time and delayed time options have been developed, processors need to be able to obtain PIC and NVD details in a timely manner. Manual systems can operate with fewer hindrances, however, they offer limited access to data once inspection has occurred, or difficulty in linking with other carcases with the same PIC which may be on the premises at the time.

The case studies have achieved different levels of reliability in trials, however, AQIS review and approval at individual plants will ultimately determine whether the EU requirements are being met. The most robust systems, but also potentially the most difficult to synchronise, are those using delayed data entry. The simplest are the manual systems although they offer less potential to interrogate data after the kill lot is finished and a new schedule has been commenced.

1 Background

Australian Meat Industry Council (AMIC) contracted ProAnd Associates Australia Pty Ltd (PAA) to complete a report on options that have been trialled by abattoir operators that could potentially comply with European Union (EU) regulations regarding traceability of sheep carcases. These options have been developed either to specifically address the EU requirement for full and accurate traceability, or to provide the operator with the opportunity to better manage information about carcases going through the slaughterfloor and subsequent stages of production.

Through site visits to specific plants (including some which are not EU-listed) and discussions with other stakeholders including the Australian Quarantine Inspection Service (AQIS), AMIC and Sheepmeat Council of Australia (SCA), a comprehensive picture has emerged of the different systems that processors are developing to improve traceability; the robustness of the systems against existing requirements; the challenges inherent in designing a suitable system for sheep; and the labour, cost and operating implications.

1.1 Project Objectives

The principal objectives of the project were agreed as follows:

1) Identify the requirements of the European Union for correlation of PIC of last residence to body number to point of disposition

2) Identify the existing technical solutions in place or under trial in industry to address this requirement

3) Document for each the key decision-making elements and characteristics with regard to operating the solution.

4) Provide a report to AMIC for publication and distribution to Industry.

1.2 The European Union

The EU is a significant market for Australian sheepmeat and among the most lucrative, providing the industry with an access level of approximately 18,800 metric tonnes per annum. Shipments in 2008 carried an estimated value of $122 million (AC FOB basis). The Union is progressively introducing more stringent requirements regarding traceability of foodstuffs – including meat and meat products - back to point of origin, both for its own member states and for third country suppliers like Australia. Continued access to the EU market for sheepmeats will be dependent upon EU-registered plants being able to demonstrate this capability in practice and in written procedures for in-plant processes. In addition, it is expected that selected buyers in other international markets may start to require this same level of capability for their import requirements.

1.2.1 Background to EU Food Regulations

Food safety and traceability are intertwined issues in the EU. In regard to this project, the relevant EU regulation is (EC) No. 178/2002[1] which establishes the principles and requirements of food law in the Union. The major principle addressed in the Regulation is that of protecting the safety of foodstuffs in order to protect human health within the Union:

> Food safety and the protection of consumers' interests is of increasing concern to the general public, non-governmental organisations, professional associations, international trading partners and trade organisations. It is necessary to ensure that consumer confidence and the confidence of trading partners is secured through the open and transparent development of food law….
>
> Recent food safety incidents have demonstrated the need to establish appropriate measures in emergency situations ensuring that all foods, whatever their type and origin, should be subject to common measures in the event of a serious risk to human health, animal health or the environment.

The basic aim of the Regulation, therefore, is to provide a framework on food safety and to give consumers confidence in the decision-making processes underpinning EC food law. The Regulation covers risk analysis over the supply chain for all foodstuffs, including feed and other agricultural inputs, processing and transport, and the whole supply pipeline to the final end consumer.

To this end, the Regulation mandates the need for traceability in order to respond to potential risks that might arise, and to provide national authorities and food businesses with the ability, should a risk be identified, to trace the article back to its source. This theoretically allows isolation of the problem and prevents contaminated product reaching consumers.

1.2.2 Specific Provisions in the EU Regulations

The following sections of Regulation 178/2002 are germane:

- Article 2 defines *food* as "any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be, ingested by humans."
- Article 3 defines *traceability* as "the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution."

Article 18, titled *Traceability*, is central to the topic and states as follows:

> 1. The traceability of food, feed, food-producing animals, and any other substance intended to be, or expected to be, incorporated into a food or

[1] *Regulation (EC) No. 178/2002 of the European Parliament and of the Council [Of The European Union] of 28 January 2002, laying down the general principles and requirements of food law, establishing the EFSA and laying down procedures in matters of food safety.*

PDF-XChange Click to buy NOW! www.docu-track.com

feed shall be established at all stages of production, processing and distribution.

2. Food and feed business operators shall be able to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any substance intended to be, or expected to be, incorporated into a food or feed. To this end, such operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.

In terms of this project, EU traceability policy means that operators must be able to identify the source of supply of an animal, or any food derived from an animal, and be able to demonstrate procedures and a documentation system to this effect. The EU authorities, therefore, now require that Australian abattoirs preparing product for the market be able to demonstrate that they have systems in place to accurately identify the property of last residence for sheep until post-mortem disposition or inspection by AQIS. This will be achieved through the systems introduced by individual plants, which will need to be approved by the AQIS On-Plant Supervisor (OPS) as consistent with the EU requirements. To this end, on 13 November 2009 AQIS released an updated Meat Notice 2009/14 on traceability (see section 1.4).

1.3 Australian Sheep Industry Context

1.3.1 Property Identification Code (PIC)

In Australia, cattle, sheep and goat producers are required by federal law to have a property identification code (PIC). A PIC is an eight-character numeric or alphanumeric code allocated by the state department of agriculture, and it relates to a parcel of land.

In cattle, either the PIC of birth or the PIC of the farm where the device was applied is included in the data carried on the RFID tag, which is part of the National Livestock Identification System (NLIS) compulsory for bovines. Subsequent movements between different PICs are recorded in the NLIS database so all movements, from birth to slaughter, can be recorded and recovered for traceability purposes.

For sheep, the PIC for the animal is shown through application of a plastic ear tag bearing the PIC details. When accompanied with NVDs or waybills a “paper trail” is available for traceability purposes.

There are differences in the format of PICs between states, as indicated in Figure 1.

Figure 1 - Typical PIC Formats by State

State	Typical PIC format
NSW	NB123456
VIC	3ABCD123
WA	WCAL1234

PDF-XChange Click to buy NOW! www.docu-track.com

Because there is currently no uniformity in PIC formats across the states, it has been difficult to date to devise a scanner which can optically read the PIC details.[2] WA PICs, for example, can have a 'lazy' or sideways character to indicate a particular piece of information.

1.3.2 NLIS (Sheep and Goats)

NLIS (Sheep & Goats) commenced on 1 January 2006 and replaced the National Flock Identification Scheme.

Since 1 January 2009, all sheep and farmed goats are required to carry an approved NLIS tag prior to movement from property of birth. The tag carries the PIC details of the property of birth. (In Western Australia, the ear tag may also carry a property name or owner's name on the reverse side.)

Currently the vast majority of the tags in use are visual tags. RFID tags are not mandatory for sheep[3], however the Victorian Government has introduced a voluntary program to encourage uptake of the technology. The decline in the size of the national flock, combined with the gradual reduction in the average age of older sheep and the increasing push to compliance, would suggest that within a few years virtually the whole flock will carry NLIS ear tags.

Sheep and farmed goats must also be accompanied by a correctly completed NVD or Waybill.

With regard to non vendor bred lines being consigned, vendors have the option to either:

1 retag all the sheep with a pink transaction tag containing the PIC from which they are being consigned, or

2 include on the accompanying NVD a list of all the PIC details from all tags of the sheep in a mob. These are referred to as "secondary" PICs.

These NLIS Sheep rules apply consistently irrespective of the method of sale, including for slaughter, through saleyards, over-the-hooks, in paddock sales or via on-line transactions.

1.3.3 Ear tags

With regard to ear tags, the NLIS Sheep system relies on conventional visual ear tags that meet the NLIS Visual Standard. This standard outlines factors such as readability and retention and specifies each ear tag is printed with the PIC of its property of issue. Ear tags are intended to remain on the animal permanently. Tags meeting the standard carry the NLIS logo indicating that they have been trialed and are approved for use within the NLIS. Approved visual tags can be printed in a specific year colour, thereby indicating the age class. This system differs from the NLIS Cattle system that relies on an RFID device.

[2] Prior to NLIS, cattle tail tags had a 3D barcode that enabled the PIC to be "optically" read with a barcode reader.
[3] In December 2008, the NLIS Standards Committee established a technical standard for radio-frequency identification devices (RFID) for sheep and goats

PDF-XChange Click to buy NOW! www.docu-track.com

The disadvantage of conventional visual ear tags is twofold. Firstly, tags can catch in yards, gates, ramps, etc, during transport and lairage and in close proximity. As a result, ear tags may be missing or damaged when the sheep reach the slaughter chain.

The second major problem with visual ear tags is the range of PIC formats in use as discussed in section 1.3.1. Abattoirs on the eastern side of Australia often receive sheep from four or five states. Given that most smallstock chains run at 7 to 10 carcases per minute it is important that the operator can quickly read the PIC on each tag.

1.3.4 Sheep movement and marketing practices

The Australian sheep production system operates on the basis of properties running flocks or 'mobs' of sheep with similar characteristics such as breed type, gender and age. As a result the approach taken by the industry is geared towards the mobs structure. This applies to on-farm operations and carries through to the sale of sheep from the property, so that a line of sheep is usually sold privately or through a saleyard as a whole mob.

Sheep may be moved off-farm for slaughter or as store stock, but they may also be traded in response to drought and other seasonal conditions, or sent for agistment to interstate properties with superior feed availability.

Movements of livestock off-farm must be accompanied by appropriate National Vendor Declaration and Waybill (NVD) documents. In the case of sheep, this document is also mob-based and provides details about the status, origin and ownership of the livestock the Declaration relates to.

Sheep leaving the property fall into one of two groups:

1 vendor-bred (sheep moving off their property of birth from which they have not previously moved); and

2 non-vendor bred (sheep which have been to one or more holdings since leaving the property of birth).

If the sheep are being purchased for slaughter the usual practice is to have buyers attending several sales each week, and multiple purchases are picked up from a number of saleyards in the same trip. The NVDs are supplied with the livestock which are transported to the works and offloaded into the lairage where they are sorted into kill lots. If sheep are moving to another property, the NVDs are provided to the new owner.

1.3.5 Movements at Abattoir Level

While production and sale off the property is normally mob-oriented, identification systems at saleyard and abattoir level are not necessarily mob-oriented. Transport from saleyards to abattoir usually involves large-scale transport picking up purchased sale lots from various vendors and saleyards in the same trip. Furthermore, several sale lots may be formed from one mob. On or even prior to receival at the abattoir, the kill for the day is organised into "kill

PDF-XChange
Click to buy NOW!
www.docu-track.com

lots", with some level of commonality among the class of livestock in a particular kill lot. The usual practice is that a kill lot will contain more than one sale lot. If tags are kept during the slaughter process they are generally aggregated, with all ear tags from the same kill lot being kept together.

1.3.5.1 Boxing of sheep

'Boxing' or comingling of sheep from different mobs and/or different properties or saleyards reduces the ability to trace back a carcase to the last property of residence. In particular if sale lots are mixed together, as is commonly the case in pickup and transport of sheep from saleyards, when a carcase subsequently comes along the kill chain with no ear tag there is no means to verify which of the several PICs in the kill lot it belongs to. To demonstrate the traceability required by the EC regulations, the theoretical means to achieve this with conventional ear tags and NVDs is to keep each sale lot separate all the way through the distribution system from property, through saleyard, through the lairage and onto the kill chain. The practicalities of this method, however, are for individual processors to determine. Plants that hot bone, for example, or organise their kill schedules based on what the boning room requires may find this mode of operation to be a challenge and individual processors are therefore approaching the traceability requirement in a variety of ways.

1.3.5.2 Carcase identification

The EC regulation requires that the abattoir be able to demonstrate the capability to reliably trace specific carcases and their mob cohorts, both forwards in the distribution chain as well as backwards. That is, if a problem arises at the AQIS inspection point with a carcase, the system must be in place to identify the property from which the carcases were derived, and to also identify other carcases originating from that same property.

1.4 Regulations in the Australian Industry

AQIS has advised processors preparing product for the EU market of new arrangements under Meat Notice 2009/14 which was released to industry on 13 November 2009. It identifies the specific traceability requirements against which AQIS OPS and ATMs will assess plants' arrangements for traceability in regard to sheep processing for the EU as follows:

1. The enterprise must demonstrate that it has a documented procedure for the sourcing of animals for slaughter which ensures that livestock are identified to their last holding up until the carcase is passed fit for human consumption (point of disposition).

2. Any relevant information on the NVD or equivalent must be available for ante-mortem and post-mortem inspection

3. The sourcing program ensures that the last holding is identified by PIC (or other state approved system) and can be obtained from NVD or NLIS device. Livestock markets may not be identified as place of production.

4 Correlation of this information to the body number must be maintained until disposition is completed and it must be to the individual animal identification and NVD.

This exceeds what is required under the applicable Australian Standards requirements and has been the cause of some discussion as AS 4696:2007 provisions[4] will now not be adequate for product prepared for the EU.[5]

The relevant component of the mob traceability is the NVD (National Vendor Declaration) or its equivalent, the Post-sale Summary. These documents record details of ear tag numbers and property of last residence.

In the case of vendor-bred sheep the NVD should contain a "whole-of-life history," meaning that the PICs on the tags in the livestock's ears correspond with the "consigning PIC" or "PIC of last residence" pre-printed on the NVD.

The situation is more complex for non-vendor-bred sheep as the processor is dependent on the accompanying NVD including all the PIC details from all tags of the sheep in a mob (referred to as "secondary" PICs), in addition to the "consigning PIC" or "PIC of last residence" pre-printed on the NVD.

Processors routinely form kill lots by aggregation of different sale lots, and as such each kill lot can easily comprise several different PICs.

Processing plants supplying sheep into the EC market need to demonstrate that they have in place fully documented systems with the capacity to traceback an individual animal to the last holding, even if its route to the abattoir was via saleyards. Part of each solution must be the ability to handle animals that arrive at the works or present on the slaughter chain without an ear tag. The solution adhered to by the abattoir must be able to cope with the pre-slaughter mixing of animals from different properties and different saleyards, where that is the usual procedure in the formation of kill lots.

1.5 Discussion

As can be seen from the above analysis, it would theoretically be possible to fulfil EU requirements on traceability by sourcing a mob of vendor-bred sheep from a property, keeping it and subsequent sale lots segregated, and processing the mob through the abattoir using ear tags with the NVD as the lynchpin to the property of origin.

It is probably not feasible to do this on a practical scale as processors invariably need to draw from non-vendor bred sheep lines as well and will want to arrange their kill lots, not according to where the sheep originated, but how subsequent processing, boning and packing configurations work best for their plant.

[4] *Hygienic production and transportation of meat and meat products for human consumption. AS 4696—2007*

[5] Currently AS 4696:2007 requires that enterprises have a documented system that provides for the accurate identification of, and the ability to trace and recall meat and meat products to a consignment of animals.

PDF-XChange Click to buy NOW! www.docu-track.com

The two major alternative supply categories are:

1 vendor-bred lines purchased directly, and

2 non vendor-bred lines purchased in saleyards.

In terms of carcase traceability, vendor-bred lines purchased in the paddock are accompanied with full NVD information and are usually transported as a distinct mob without mixing with other sheep from other properties.

With purchases from saleyards, however, there is usually some degree of comingling of sheep from different properties given that buyers purchase a number of sale lots and these are mixed in transport to the abattoir. There may also be further mixing in the lairage.

When non vendor bred sheep are presented for slaughter, or indeed there is comingling in lairage, the processor cannot be confident that the PICs on the tags are the "last PIC of residence". In this case the processor needs to be able to link the PIC in the animal's ear to the "secondary PIC" listed on the accompanying NVD; which in turn enables the processor to identify the "consigning PIC" or "PIC of last residence" which is pre-printed on the NVD.

With the latter category of, non vendor-bred lines, there are two main alternative approaches being developed by processors to meet the traceability requirements:

- Real time "PIC of residence" correlation and data capture: These are solutions in which the PIC of last residence is carried in some way with each carcase and is available to the inspector immediately.

- Delayed time "PIC of residence" correlation and data capture: These are solutions in which the PIC on the ear tag is correlated to the carcase until post mortem inspection and, if a problem is identified with a carcase, the corresponding paperwork is located to identify the PIC of last residence.

The basic approach of all the options reviewed is to provide the plant with the capacity to trace a carcase back to its last property of residence. The following case studies examine the alternatives against this requirement.

1.6 Selection of Plants for Case Studies

PAA contacted a group of export-registered plants nominated by AMIC to discuss processes they have considered introducing in their plants to improve traceability. This group also included some non-EU plants which are seeking to improve traceability in their overall processes through development of traceback solutions. Site visits were conducted at six plants and telephone discussions were held with two others. The composition of the plants visited is shown at Figure 2.

Figure 2 - Plant Visits and Discussions (EU Project)

Plant ID	State	Single species	EU-reg'd
1	Vic	NO	NO
2	Vic	NO	NO
3	Vic	YES	YES
4	NSW	YES	YES
5	NSW	YES	YES
6	SA/WA	NO	YES
7	Vic	NO	NO
8	NSW	YES	YES

Each of these plants routinely slaughters smallstock drawn from other states and therefore had to address the differences in the PIC formats in devising a system or software solution.

Figure 3 indicates chain speed for participating plants, with 75% of plants processing at 8 head or more per minute. Each plant processes in excess of 3000 head per day and three plants process in excess of 6000 head per day.

Figure 3 – Plant Breakup by Chain Speed

Chain Speed	No. of plants
>10 head/minute	3
8-10 head>minute	3
<8 head/minute	2
	8

All plant visits went smoothly and information was mainly made available when requested. Several plants requested anonymity in the case studies which has been agreed to.

1.7 Summary of Major Issues Encountered by Processors

1.7.1 NVD or Similar Documentation

Approximately 60% of plants experience ongoing problems with NVD documentation being incomplete. The companies that are exploring automated solutions and wish to maintain the data beyond the kill day would like to be able to access the list of PICs from the NVDs direct from saleyards as well as from paddock sales because this would alleviate their own labour input and reduce or eliminate double-entry of data.

Processors are now exploring ways to advise growers that they will be more stringent about supply and completeness of NVD forms as these forms are vital to accurate traceback of carcases.

1.7.2 Use of RFID Tags to Overcome Data Gaps

Two processors offered the opinion that RFID tags on sheep would streamline data entry and management, however, other processors felt it was unnecessarily

PDF-XChange
Click to buy NOW!
www.docu-track.com

complicating an issue that could be readily sorted with careful indexing of carcases and that the procedures they have introduced will support this.

1.7.3 Literacy of Operator

Management has to be confident that operators are literate and understand the logic behind the system being employed, whether simple (tag in bag) or more complex (choosing from pre-selected PIC options, reading lazy character tags etc). Where one worker is assigned the tag-reading task on a fast chain there is great pressure to maintain pace with the chain: locate tag, read tag, select correct PIC or quickly make a decision on other options.

1.7.4 Permanency of Data

Three-quarters of the processors stated that one of the reasons they persisted with developing the system and undergoing trials was to investigate what further use the data could be put to. They believe that the effort required to record the minimum amount of data (PIC, kill sequence etc) was wasted if it was thrown out at the end of the day's processing. Through development of the system these processors hope to have the tools to further improve chiller loading, order and inventory management control.

1.7.5 Labour Costs

Processors are keen to save on labour where possible. The labour implications of the solutions reviewed were considered very seriously by processors in deciding what to do about traceability. It was not possible to estimate accurately the likely labour costs for each of the solution. It was clear, however, that certain solutions involved the worker performing one or more additional steps in order to read a tag, enter data, or cut off an ear. The impact of these additional actions over a full day's production is apparent. In most solutions, an additional worker was required to perform the tasks leading to PIC traceability. Labour rates will vary between enterprises along with on-costs. A further issue is the time expended by back-office staff in chasing documentation (NVDs and sale summaries) or in chasing documentation or pre-entering data for use on the kill floor as required in some of the solution scenarios.

1.7.6 Integration

Approximately 50% of the plants in the case studies intended to integrate the data gathered in the carcase correlation process into their wider information management programs at plant level. The cost of doing this, however – financial and time-wise – was seen to be considerable. Other processors determined it was preferable to keep the process separate from other kill and production data. Fully manual systems do not collect any data to be managed or integrated at a later date.

PDF-XChange
Click to buy NOW!
www.docu-track.com

CASE STUDIES OF TECHNICAL SOLUTIONS TO CORRELATE PIC OF LAST RESIDENCE TO BODY NUMBER TO POINT OF DISPOSITION IN EU SHEEP ESTABLISHMENTS

2009

PDF-XChange
Click to buy NOW!
www.docu-track.com

2 Case Studies

2.1 Case Study 1 – Victorian plant

BACKGROUND

The plant is located in Vic and approximately 50% of the smallstock it processes are sourced from saleyards in Victoria and interstate. The balance comes from paddock sales. Stock from WA are infrequent. In general, livestock sourced from paddock sales produce fewer problems with NVDs but this plant frequently has issues about finalising NVDs for saleyard-sourced sheep. The plant is not currently registered for the EU.

The plant runs its own kill plus a standard service kill. The plant arranges sheep into kill lots before the kill commences; each kill lot can contain sheep from several properties and possibly mixed saleyards. Heads are not retained but are removed two stages after sticking and normally neither ears nor tags are retained. When traceback is required for a particular kill lot, it is traced through the NVD information kept in the plant office. This, however, does not identify an individual animal with an individual property, but with all the properties in that particular kill lot.

SOLUTION OVERVIEW

The plant participated in a trial in 2009 whereby the ear and ear tag is cut off and placed in the anal aperture of the corresponding carcase. Therefore each carcase, in principle, carried identification with its PIC up until inspection and disposition. If, on inspection, a carcase was condemned, its PIC could still be identified. Stock with the same PIC that had already been passed at inspection, however, could not be identified. Stock from the same PIC still proceeding to the inspection point could be identified but this would require looking at each individual ear tag. A sheep/lamb presenting for slaughter with no ear tag would be automatically considered ineligible for the market in question.

ACCURACY

As far as can be determined from the processor, the three-month trial gave an accuracy of around 80%. Contributing issues were missing ear tags, ear tags falling out of the anal aperture, and ears not being removed prior to head being disposed of.

PDF-XChange Click to buy NOW! www.docu-track.com

COMMENTS

Theoretically this system enables each carcase to carry PIC details right up to point of inspection by physically connecting the ear tag to the carcase. In this way it is an improvement on a mob-based identification system. However, the main problem with the system is the risk of the tag being dislodged during evisceration and movement along the chain. Once the tag has been lost it is difficult to re-unite it with the carcase further along the chain. It is also questionable if the process would be acceptable on hygiene grounds in an EU-listed plant. Also, there is no correlation between the tag and the body number and no permanent record once the carcase is passed at inspection. If the ear tag is missing then the carcase is lost from the market, or if the header moves quicker than the worker collecting ears, then the ear tag is lost.

The operator noted a high percentage of smallstock presenting with incomplete or inaccurate NVDs. One full-time person is normally deployed to chase NVD data for individual lots.

COSTS

Low or nil expenditure was recorded for the solution in this case study. The processor reported the main impact was in the time taken to remove the ear and attach it to the carcase. The slaughter process needed to be modified so that the ear is cut off before the head is disposed of. There is no software or hardware involved in this method.

Carcases without tags are diverted to other markets regardless of the PIC handling method in place so there is no further loss that can be attributed to the failure of the system.

The traceback system in this trial relied on the animal presenting with an ear tag; the ear and ear tag unit staying attached to the carcase up until point of inspection; and the PIC being that which is recorded on the NVD.

SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	Worker cuts ear off head if ear tag present. Head disposed. Ear placed in anal aperture and disposed of once carcase is approved by inspectors.
Solution costs	Labour: uncosted but one extra task and 2 movements. No additional waste cost. Carcases without ear tags diverted anyway so no penalty.
Ongoing operational requirements and costs	Low or nil

PDF-XChange
Click to buy NOW!
www.docu-track.com

2.2 Case Study 2 – Victorian plant

BACKGROUND

The plant in this case study runs an inverted dressing system. It is not currently registered for the EU but the operator is conscious of the increased demands of international customers for traceability and decided to trial various options for compatibility with current plant procedures.

Approximately 70% of smallstock are sourced from saleyards and the balance from over-the-hooks sales. Paddock sales are not a big means of obtaining livestock. Most sheep sourced from saleyards come from Victoria or NSW and very few from Western Australia.

Lot sizes range from 10 head to 1000 head. Boxed sale lots come from different saleyards and each kill lot will comprise mixed PICs. Currently the operator experiences few problems with information on the NVD or post-sale summary: this may be due to very stringent sale conditions because the processor will not accept stock without the NVD being filled in fully.

Currently on the chain, the head is removed and no ears/ear tag units are retained or recorded. The only correlation for a specific carcase is therefore back to the kill lot it came from: there is no means of tracking the specific carcase back to a specific ear tag, PIC or sale lot at the saleyard. There is improved traceability with over-the-hooks sales from breeders.

SOLUTION OVERVIEW

The plant recently made a trial using bobby calves of the Kool Abattoir system with a view to making it applicable for smallstock. The software system provides at the start of each working day an electronic report of calf purchases from each saleyard, scale operation and/or paddock sale/ pick up, including RFID number of each calf. The report can be interrogated by vendor, by PIC and by health status warnings (where a “watch” status is previously advised). This enables the plant to sort kill lots and to keep records on this basis. When the RFID tag is read, it is indexed to the body number.

ACCURACY

The trial (conducted on bobby calf carcases) provided accuracy of greater than 95%. Reasons for failure are attributed to unreadable tags; and data input errors.

PDF-XChange Click to buy NOW! www.docu-track.com

COMMENTS

Plant operator is enthusiastic about the potential for using radio frequency (RF) tags to provide PIC traceability within the plant This would enable the slaughterfloor to use an RF reader identical to the one already installed for bobby calves. The data could then be transferred to an RF tag on the carcase hook. Currently the plant encounters slowdowns in locating and recording ear tag numbers from smallstock and find that a manual data entry system cannot keep pace.

The operator wants to use the carcase traceability system beyond the point of inspection so that it becomes a tool to manage carcases into chillers and possibly into grading lines. The link between the PIC in the Kool system and the carcase in the chiller would be through the carcase hook being fitted with an RF device.

COSTS

Costs are indicated in the table below.

SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	Existing RFID ear tag is read by electronic scanner. Ear tag contains PIC data. Data is sent to database and indexed to carcase number for the day's kill. Data can be retrieved once carcase is approved/retained.
Solution costs	Reader installation: $15,000-$20,000 Stand-alone software: $30,000-$38,000
Ongoing operational requirements and cost	Periodic replacement of readers.

PDF-XChange
Click to buy NOW!
www.docu-track.com

2.3 Case Study 3 – Victorian plant

BACKGROUND

The processing plant operates an inverted dressing chain and is registered for the EU. It sources approximately 60% of its livestock through over-the-hooks or paddock sales, and the balance through saleyards. This is dependent on seasons, with OTH increasing to 80% under some circumstances. To date the company has not been pro-active with producers and suppliers about the presence of ear tags or the accuracy of NVDs that accompany livestock. As a consequence up to 4 hours is typically spent each day by one employee on locating or correcting sales documentation that arrives with or after the livestock.

Saleyards are typically those in south and south-eastern Australia i.e. few sheep from Western Australia. There is a high proportion of vendor-bred livestock.

Currently, on arrival the NVDs are checked against the livestock. Ante-mortem checks are made. The livestock intended for the EU is boxed together. Heads and ear tags are retained for data collection.

EXISTING SYSTEM OVERVIEW

In order to satisfy market requirements and to ensure they are able to provide product to the EU markets, the plant is currently using a manual system. Processing of single PIC lots (i.e. only NVD or PIC in the kill lot) does not present a dilemma. For mixed kill lots (i.e. two or more PICs in the kill lot) the procedure is as follows. The ear carrying the tag is removed from the head. The head is later removed and disposed. The tags are kept in sequential order on a long board comprising of a series of hooks. These must follow the same order as the sheep carcases for the system to work. If the inspector detains a carcase or requires ID about its history, the supervisor staff count back 50 hooks on the work board in order to locate the ear and ear tag unit off the suspect carcase. Should the inspector require more information about the PIC or other animals on the same NVD, the office must locate the paperwork. A “watch” is then put on that PIC for other kill lots until the situation is clarified.

The advantage of the current system is that there is little or no cost related to this solution. It is also advantageous that a high proportion of the sheep processed here come from vendor-bred lines i.e. there are relatively few NVDs with multiple PICs. Should their kill composition change to include more mixed lots, the current system may become more difficult to administer and be more time-consuming if AQIS raises queries.

PDF-XChange Click to buy NOW! www.docu-track.com

EXISTING SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	Worker cuts ear tag from ear; placed on hook with other ear tags from that kill lot in exact sequence of bodies. If inspector requires PIC details, staff count back 50 places to identify the ear tag and PIC that correlates to that sheep.
Solution costs	Cost of software: Nil Cost of hardware $5000-$10,000
Ongoing operational requirements and costs	Not identified

CASE STUDY 3A

FUTURE SOLUTION OVERVIEW

Being focused on the EU market, the company has already invested time and money in seeking a feasible means of introducing a system that would satisfy AQIS and EU requirements within its own commercial requirements. The proposed solution is based on a joint proposal from Triton Commercial Systems and SDL Ltd. There are already readers installed in the plant which would be utilised for reading RFID tags and SDL will provide the software and database management components. Under the proposed option, PICs would be entered from the visual tag. Data entry will remain manual from the NVDs and visual tags.

The console operator adjacent to the reader will manually add PIC numbers. There is a requirement here for a high level of attention to detail. (If RFID tags are used on smallstock, then tag reading at the yards will obtain the required data in the lairage or race and transfer it to the slaughter line). Automated readers check that the body indexed to that position is still on the chain (sequencing) and the carcase data is transferred from the body to the plastic hook it hangs on. The RFID number will be displayed on a monitor at the AQIS inspection point further along the slaughter chain.

ACCURACY

This system has been trailed over an extended period with other stock processed on this chain and found to be very accurate when RFID tags are read by installed tag readers which then upload data into the database.

PDF-XChange Click to buy NOW! www.docu-track.com

Management anticipates the system would have a high success rate if competent operators are used and sheep without ear tags are only a very small percentage of the daily kill.

COMMENTS

Potential for failure includes data entry error; nil ear tag (carcase is diverted to other market); illegible PIC on ear tag (operator normally will enter PIC of the preceding animal which may be picked up by audit team and rejected); carcase falling off chain and hence breaking the sequence along the chain, or otherwise being diverted or lost in the carcase index.

COSTS

Costs are indicated in the table below.

FUTURE SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	Existing RFID hardware and schematics in plant will be replicated to smallstock floor. Ear tag data will be manually entered if individual RFID tags are not used.
Solution costs	Cost of software: $50,000-80,000 Cost of additional reader panels: $20,000 Cost of additional reader panels $50,000
Ongoing operational requirements and costs	Not identified

Photo 1 – Scanner position

PDF-XChange
Click to buy NOW!
www.docu-track.com

Photo 2 – Restrainer/stun area

Photo 3 – Wall-mounted data cabling adjacent to restrainer area

PDF-XChange
Click to buy NOW!
www.docu-track.com

2.4 Case Study 4 – NSW plant

BACKGROUND

Saleyards and paddock sales comprise about 70% - 80% of livestock acquisition. There is ongoing difficulty in getting full and accurate NVD details about livestock purchases which subsequently takes up time in the processors' administration office. The plant processes its own kill and is trying various means to obtain better NVD compliance from producers.

A software program was developed with the company that handles other IT systems on plant. This has enabled integration of systems so that the data was not 'lost' once disposition occurred and could therefore be used to manage the information.

There has been a big effort made to liaise with the various saleyards so that the NVD data for each sale lot (post sale summaries) can be sent electronically and loaded onto the software program which has been designed for this purpose. This has not happened to date although the plant is actively progressing this.

Ear tags were already being removed before the present trial was conducted. The head is removed and disposed but the ear comes off first.

SOLUTION OVERVIEW

A software program has been written to support data management.

The PIC data is obtained from the NVDs (or, as intended, from post sale summaries) prior to kill, then correlated to the body shortly after sticking and bleeding.

An office worker enters all PICs that are available for the stock being slaughtered the following day in corresponding kill lots.

For non-vendor bred lines this includes all "secondary" PICs if listed on the NVD and the corresponding "primary" PIC of residence (taken from the pre-printed PIC on the NVD). "Secondary" PIC information is linked to "Primary" PIC information in the data capture process; for later retrieval at the point of disposition.

Ear is removed (see Photo 4) by one worker who places it on a short conveyor belt (Photo 5), where it is read by another worker (Photo 6) and matched with a number of possible PIC choices that are on the screen of a monitor placed immediately adjacent to the kill line (Photo

PDF-XChange Click to buy NOW! www.docu-track.com

7). This correlates the ear tag PIC with the carcase in the computer file. The ear tag PIC may be either the "secondary" PIC of a non vendor bred line, or indeed the PIC of residence if from a vendor bred line. The ear is then disposed of. Staff at these tasks change over approximately every two hours.

When correlation of the ear tag takes place the software program interrogates the pre-entered information looking for links to a "Primary" PIC for later retrieval at the point of disposition.

If the tag is missing or illegible, the body number shows "no tag" but the kill lot and other relevant data is still recorded.

At point of disposition, the inspector can select a specific carcase and interrogate a monitor on the slaughter floor. The data displayed includes the NVD serial number, the actual "secondary" PIC corresponding to the carcase and the actual "primary" PIC of residence; thereby delivering correlation of the carcase to the PIC of last residence in real time.

The inspector can also determine the number of carcases killed or waiting to be killed that day from that corresponding PIC of last residence. The computer report will highlight the body numbers for that day's kill coming from that PIC. Meantime the indexing of that carcase with others (even if from another PIC) has been retained in the database.

ACCURACY

The processor reports that the accuracy rate is very high at over 95%. Where there are errors they seem to be due to one of the following: incorrect PIC selected (due to human error or illegible ear tag); or the carcase going to a retain rail and then re-entering to point of disposition out of order.

COMMENTS

The system depends on the NVD data being accurate and available before the kill. This facilitates the worker being able to quickly tie the "Primary" PIC to the body number, through selecting the secondary PIC off the ear tag.

This system also means that sheep can be reboxed or organised in the lairage prior to slaughter without compromising traceback to the PIC, which is a significant advantage.

COSTS

Costs are indicated in the table below.

SOLUTION SPECIFICATIONS AND COSTS		
Solution specification	Install a short conveyor belt to take ear and ear tag to worker who reads the PIC code off the tag and locates it in a database of pre-existing choices/fields. Software integrates this data into the company's wider IT system for later use. Body number can be queried by PIC provided PIC is accurate and paperwork in order. Monitor is installed near to kill chain. Corresponding monitor located at point of disposition enables inspector to query PIC and whereabouts of other PIC-related carcases.	
Solution costs	Software Monitors and hardware Conveyor Installation Other costs (management time):	$25,000-$35,000 $25,000 $10,000 $10,000 $15,000-$20,000
Ongoing operational requirements and costs	Ongoing labour cost, replace monitor, maintenance.	

PHOTOGRAPHS

Photo 4 – Ear and ear tag removed by Worker 1 (this task already existed)

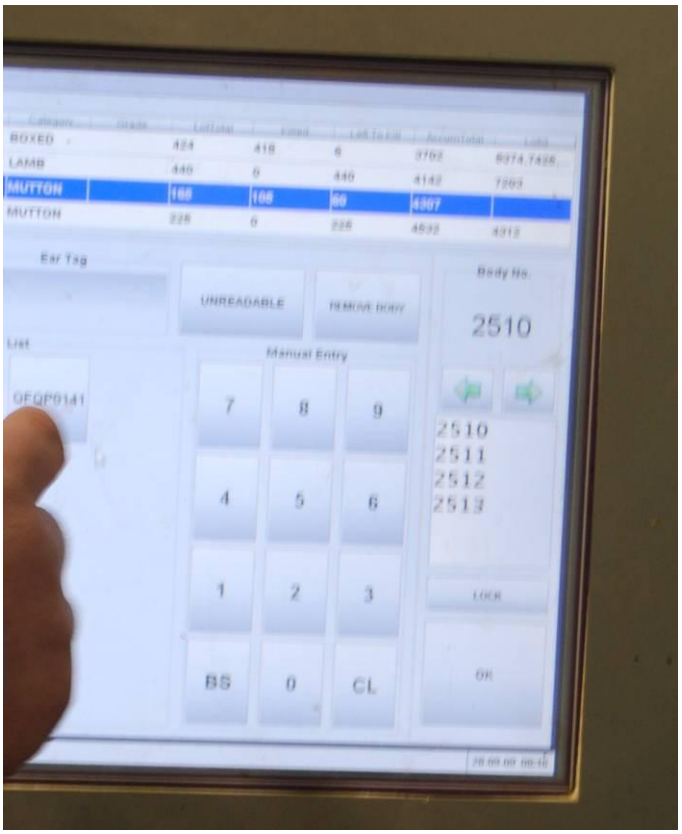
PDF-XChange
Click to buy NOW!
www.docu-track.com

Photo 5 – Ear and ear tag placed on conveyor to Worker 2 who operates data input console

Photo 6 – Worker 2 reads ear tag and locates PIC

PDF-XChange
Click to buy NOW!
www.docu-track.com

Photo 7 – PIC is chosen from left of touchscreen & automatically correlated with body number (right hand side of screen) Note that operator can manually enter a new PIC if needed.



PDF-XChange
Click to buy NOW!
www.docu-track.com

2.5 Case Study 5 – NSW plant

BACKGROUND

The plant is EU registered and has spent considerable effort in designing a scheme that would cause minimal difficulty to workers and livestock flow while also satisfying the AQIS inspectors of its ability to meet EU requirements. Inverted dressing is employed at the plant. Approximately 60%-70% of livestock are sourced through saleyards. They report that OTH sales and paddock sales are generally accompanied by full documentation however non-vendor bred lines via saleyards are a big problem with many PICs having to be tracked and entered.

SOLUTION OVERVIEW

Initially a “chocolate wheel” (segmented board with enough compartments to accommodate ear tags from a kill lot) was developed however the shortcoming of this solution was soon perceived, as it offers no means to retain data for further verification or audit. The operator required a solution which would gather data needed for any future audit.

It therefore developed a new solution with floor staff and management. The HEC (Harsh Environment Computer) solution will accept all tag types because they are input manually by workers and provide forward/back tracing for carcases. The system operates independently of other production data being managed by the Sastek system.

The sequence is as follows: stick, bleed (3-5 mins), ear removed manually, automated head removal. Data manually entered at monitor placed adjacent to changeover point. It is then 77 positions to inspection. If inspector finds a problem he can look at the monitor and highlight the body number which illustrates the PIC in question, then take a decision on next step. The PIC inputted by operator should correlate with PIC on NVD (from property of origin).

At time of plant visit, the system had not been fully installed.

Arriving at the solution has involved development and testing of software; training/education; installation of monitors and CPUs to capture/manage data.

All data is input manually. Currently the business is receiving little indication from saleyard operators about the possibility of uploading saleyard data directly in a usable format.

PDF-XChange Click to buy NOW! www.docu-track.com

ACCURACY

Although at trial stage, there were satisfactory results. It depends primarily on ear tags being present, along with correct NVD information, accurate data input and smooth software operation.

The company is keen to identify the NVD issue to all producers supplying livestock. In this way it hopes to encourage better NVD documentation from the over-the-hooks and paddock sales areas, however, compliance from saleyards may be lower.

Because the tag details are entered manually, the operator would expect more difficulty with multiple tags being presented on sheep. He enters details from the most recent tag although the most recent tag may have fallen off.

COMMENTS

There is a high rate of missing tags through saleyards or missing information on NVD and post-sale summaries. This reinforces the need to retain indexing of the carcase and PIC details until sign off by AQIS is achieved. The varying PIC formats between states also can serve to slow down day-to-day implementation.

The processor highlighted a number of development issues, particularly the issues of cost control and retaining indexing of carcases until signoff is received. Some software interface screens needed to be revised for ease of input.

Additional staff time is also spent in following up late documentation.

COSTS

Costs are indicated in the table below.

SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	
Solution costs	Cost of software: $10,000-$15,000 Estimated capital expenditure (monitor, wiring, other electrical): $25,000-$30,000 Other costs (management time) : $15,000-$20,000
Ongoing operational requirements and costs	1 person per shift (at monitor position). Plus 0.5 person daily to follow up documentation.

PDF-XChange
Click to buy NOW!
www.docu-track.com

2.6 Case Study 6 – SA/WA plant

BACKGROUND

The plant processes a large mutton and lamb kill which is primarily scheduled according to the grades required in the follow-on boning room. As a consequence, the slaughter chain draws from a number of lots and pens throughout the day and the same PICs will recur several times and several hours apart. For this EU-listed plant, data management efforts need to be permanent and versatile to take account of this factor.

Approximately 70% of sheep come from saleyards located in a wide catchment. The vendor bred to non-vendor bred proportion is about 40/60, but this varies monthly

SOLUTION OVERVIEW

This works on a “save-forward” system. PIC data is gathered in advance and entered into a software program as a range of PICs that the operator on the floor can access and select when the carcase with ear tag is presented. Carcases come from the sticking area to a worker who locates the tag on the ear (*Photo 8*), visually reads the tag and records the PIC number using the touchscreen. There is a console and touchscreen placed where the worker stands and a sensor observes when the carcase goes past this station. The PIC number on the ear tag is located from the field available on the screen and recorded against the body number as shown on the left hand side of photo 8. This correlates the PIC number against the body number. The data is stored and sent forward to another screen and console where the inspector is located. Carcases that have fallen off the chain, or that have no ear tag, are shown on the screen and by a pink clip on the hind shank near the gambrel. There is another sensor located adjacent to the inspector: when this is tripped the body number is highlighted on the screen. The same data is available at the monitor used by AQIS inspector. Missing PIC or dropped carcases are marked as ‘no tag’ and the body number noted. If the inspector rejects a carcase or sends it to the detain rail, this is noted on the screen with the body number. A worker then diverts or removes that carcase and its place in the index is maintained. The report system can be queried through another screen to indicate the body number of carcases with the same PIC, or by kill lot.

ACCURACY

Trials of the system, which is now running permanently in the abattoir, indicated accuracy of over 98%. Errors occur with incorrect PICs

PDF-XChange Click to buy NOW! www.docu-track.com

entered or when the sensor jams and either skips or does not detect a loaded gambrel, thus changing the index system.

COMMENTS

The plant's system is reliant on NVDs being available before the kill in order to be put into the database for selection the next day by the worker looking at the ear tag. Obviously cooperation from saleyards would assist in this regard. Provided the NVD and PIC data is available and input correctly, the system has many advantages because late changes to kill orders, particularly on the day of the kill, will have ramifications for the pool of PIC options and this scenario can be accommodated by the system in its current state.

To assist the implementation on a day-to-day basis, the plant has installed a Chain Stop button near the first monitoring point. This enables the operator, if necessary, to stop the kill chain briefly to sort out any issues with missing tags. The plant typically handles a high number of interstate PICs therefore a degree of flexibility needed to be built in for the operator to ensure the PIC data is entered correctly. There is also a high reliance on having the PIC data adequately sorted before the kill commences. In addition, changes to the kill schedule need to be notified promptly so that the corresponding PIC section can be adjusted.

The plant has purchased gambrels which can be retrofitted with RFID tags. An RFID reader could be mounted at the first station on the kill floor. PICs would be referenced with kill lots and loaded on the RFID tags which would then be able to show property of origin, lot numbers and kill sequence.

COSTS

Costs are indicated in the table below.

SOLUTION SPECIFICATIONS AND COSTS		
Solution specification	The worker selects the PIC number from a pre-entered field of PICs included in the kill for the day. Changes in lot numbers and other details are supplied by the kill scheduling department.	
Solution costs	Monitors: Installation Software development Sensors	$30,000 $9,000 $10,000 $$3000

Ongoing operational requirements and costs	Replacement of sensors; touchscreens 1 worker to locate and enter tag number

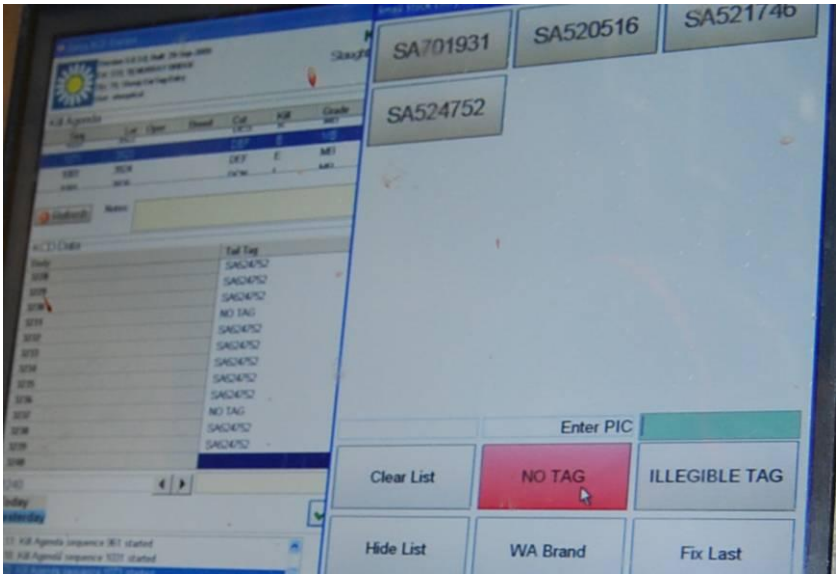
PHOTOGRAPHS

Photo 8 – Ear tag located by worker but remains attached to head

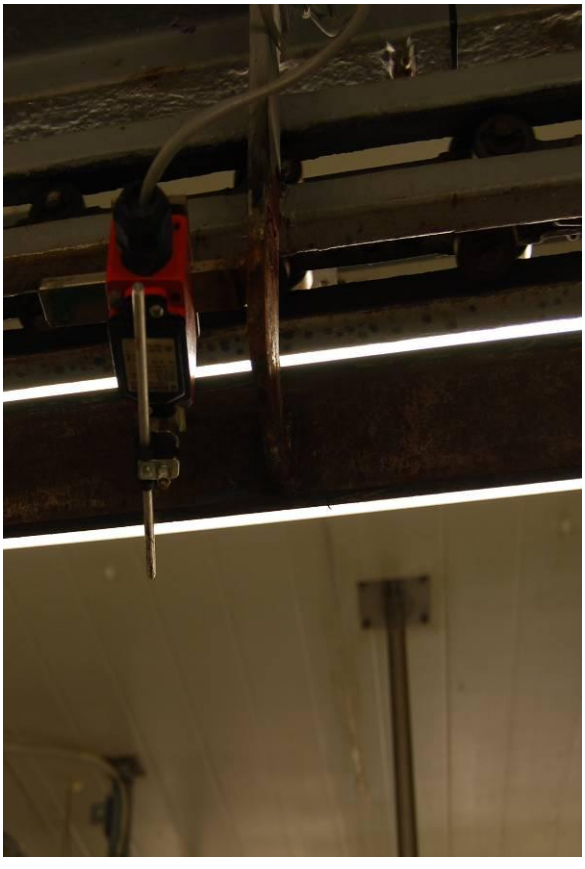
Photo 9-New plastic gambrels can be retro-fitted with RFID tags to carry PIC and other data for the associated carcase.

PDF-XChange
Click to buy NOW!
www.docu-track.com

Photo 10 – Worker selects PIC from touchscreen of several PIC options (at top on right hand side) or else "No Tag." The PIC is then recorded against the body number (left hand side).



Photos 11 and 11a below – After carcase dressing, the loaded gambrel trips a reader which records that the body number is presenting for disposition; empty gambrel on the right, or "no tag" maintains place in indexing for kill lot.



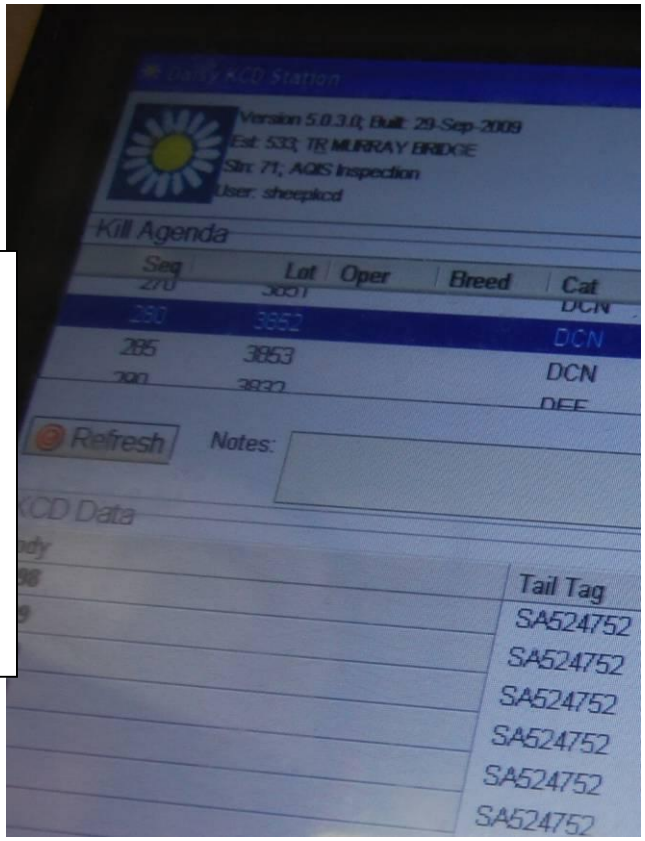


Photo 12 (right) – Carcases from the same PIC appear individually next to body number (far left hand column on screen). The column heading, while showing “tail tag” records ear tag number

2.7 Case Study 7 – Victorian plant

BACKGROUND

The plant currently does not supply the EU market but is keen to investigate technical means of value adding to its production capabilities for low cost. It processes bobby veal and other smallstock on the same line and is a full service kill facility which has implications for the issue of NVD and ear tags. In general over the past three years, about 10% of smallstock were sourced direct or over the hooks, and the balance through southern Australian saleyards, particularly livestock that are vendor-bred.

The smallstock kill floor runs several chains concurrently which form one line for inspection and evisceration. In the course of the processing day calves, lambs and sheep are run, depending on the way the kill has been organized.

NVDs are obtained for all stock and the company will not process livestock which are presented without an NVD or a Post-sale Summary. Like other plants there is a large amount of labour involved in checking the documentation is present although its accuracy is sometimes more difficult to verify.

The kill is organized into “kill lots” which can vary in size from 10 to 800 head. The kill lot comprises both multiple vendor properties and multiple saleyards in that a single truck picks up sale purchases from a number of saleyards and the stock from each are ‘boxed’ or mixed. On the day of the site visit, for example, there were 15 kill lots averaging 50 head, with one containing 254 head. As such this can make individual traceback for smallstock impossible.

This data and kill procedure has been in place only three months but appears to be working for the plant because they are rigid about receiving the NVD or Post-sale Summary data.

SOLUTION OVERVIEW

The solution which has been devised for this plant to improve traceability is as follows. All ear tags are cut off (Photo 13) after the bleed chain and immediately before head removal. All the ear tags from a particular kill lot are aggregated in a plastic bag labelled with the kill lot number and the total head count for the lot (see Photo 14). The bag is tied off once a kill lot is completed and is kept for the day of kill in case AQIS detect any problems on inspection (Photo 15). If AQIS do detect a problem then all the ear tags and NVDs from the kill lot are involved, which can obviously entail multiple NVDs.

PDF-XChange Click to buy NOW! www.docu-track.com

ACCURACY

No trial results were available.

COMMENTS

At this stage the company has no plans to enter the EU market. Management recognize the problems that they would have in putting in place a system for full traceability and that this would be both expensive and logistically difficult. Such a system would have to cope with their current chain speed and configuration which they feel is difficult given the ongoing problems with ear tags that are missing, unreadable, or, in many cases, one of multiple ear tags. The plant management feel that unlike a beef carcase, the cost of an electronic tag is not cost effective on sheep or lamb carcases.

COSTS

Costs are indicated in the table below.

SOLUTION SPECIFICATIONS AND COSTS	
Solution specification	Ear tag is removed and placed in bag along with others from the kill lot. Bag is sealed and retained till that kill lot is approved by AQIS. Questions relating to carcases in the kill lot are addressed by examining the ear tags in the bag, however, there is no indexing or sequence numbering.
Solution costs	Minimal – bagging costs only.
Ongoing operational requirements and costs	Low or nil.

PDF-XChange
Click to buy NOW!
www.docu-track.com

PHOTOGRAPHS

Photo 13 – Ear and ear tags removed immediately after bleed.

Photo 14 Ear and ear tags placed in plastic bag with others from kill lot.

PDF-XChange
Click to buy NOW!
www.docu-track.com

Photo 15 – Plastic bag tied off and numbered for kill lot 7 for the day; disposed of at end of processing day if no issues rose.

PDF-XChange Click to buy NOW! www.docu-track.com

2.8 Case Study 8 – NSW plant

BACKGROUND

Information for this case study has been extracted from the 2008 report for the Sheep CRC[6] The purpose of that report was to examine the practicality of enhancing the current system of NLIS ear tags as applied to sheep and goats by implementing an abattoir-based system of RFID tags allowing PICs for single or mixed mobs to be related to individually RFID identified gambrels used through the abattoir.

SOLUTION OVERVIEW

A system was designed at an EU-registered plant to allow carcase identity to be linked within the abattoir to the PIC and for this to follow through to the boning room stage. Mob identity through PICs was related to gambrels embedded with RFIDs on the slaughter chain. The electronic tracking system for sheep carcases was developed to enable the ability to relate individual carcases to a mob PIC and to read individual sheep ear tag EIDs (electronic identification device) and then correlate this with an RFID embedded in a gambrel. An image of the NLIS tag is taken which is then correlated to the RFID gambrel on which the carcase eventually hangs. The data correlation was projected forward to the inspection area. It is not understood to be able to offer individual animal traceability. The primary challenge identified with this trial is that the reader cannot detect the difference between a non-reading tag and an untagged carcase.

ACCURACY

The trials resulted in accuracy rates of over 99%.

COMMENTS

There are some similarities between this desktop study and the current arrangements in the New Zealand industry.

COSTS

The report on the project indicated that total costs of equipment and installation would be in the order of $200,000-$220,000.[7] This includes approx. $44,000 for retrofitting of RFID tags to gambrels/skids.

[6] NLIS (Sheep and Goats) Technical and Operations Barriers Reduction. Sheep CRC: June 2008.
[7] Technical and Operations Barriers Reduction. Page 34.

3 Summary for industry

	CASE STUDY								
	1	2	3	3a	4	5	6	7	8
Descriptor: / *Criteria:*	"Ear tag in bung"	"Use RFID readers"	"Ear tag Index on Hook"	"Data on RFID tag on Hook"	"Pre-entry of data"	"Enter PIC in Advance"	"Save-forward"	"Tags in Bag by Lots"	RFID Cards for Lots
EU Plant	NO	NO	YES	YES	YES	YES	YES	NO	YES
Chain Speed hd/minute	<8	8-10	8-10	8-10	>10	>10	>10	<8	8-10
Trials held	YES	YES	YES	YES	YES	YES	YES	NO	YES
Trials outcome for accuracy	80%	95%	>92%	87%	99%	na	>98%	na	99%
Solution In use	NO	NO	YES	NO	YES	YES	YES	YES	NO
Est. Cap. Expenditure $	Nil	$15,000-$20,000	$10,000	$60,000 - $70,000	$35,000	$25,000-$30,000	$40,000	Nil	$150,000
Est. Software Costs $	Nil	$30,000-$38,000	Nil	$60,000 - $80,000	$25,000 - $35,000	$30,000	$10,000	Nil	$30,000 - $40,000
Software-dependent	NO	YES	no	YES	YES	YES	YES	YES	YES
Real Time/Delayed/Manual	Manual	Delayed	Manual	Delayed	Real Time	Real Time	Real Time	Manual	Delayed
Ease of Correlation to PIC	High	Low	Low	High	High	High	High	Low	Low
Ease of Locating Sheep with Same PIC	Low	Low	Low	na	High	High	High	Low	High
Data Retrieveable Later	NO		NO	YES	YES	YES	YES	NO	YES
Labour Implications	Minimal	Medium	Minimal	Medium	Medium	Medium	Medium	Minimal	Medium
Level of Technology	Low	High	Low	High	High	High	High	Low	High

PDF-XChange
Click to buy NOW!
www.docu-track.com

4 References

Australian Standards. Hygienic production and transportation of meat and meat products for human consumption. AS 4696—2007.

Official Journal of the European Communities. Regulation (EC) No. 178/2002 of the European Parliament and of the Council [Of The European Union] of 28 January 2002.

NLIS (Sheep and Goats): Technical and Operations Barriers Reduction. Sheep CRC. June 2008.

Meat New Zealand website www.meatnz.co.uk

AQIS Website. www.aqis.gov.au

APPENDIX 2

Component 2: Software solution to correlate PIC of last residence to body number to point of disposition in EU sheep establishments.

Final report by Cedar Creek Company

CEDAR CREEK
COMPANY

SOFTWARE SOLUTION TO CORRELATE PIC OF LAST RESIDENCE TO BODY NUMBER TO POINT OF DISPOSITION IN EU SHEEP ESTABLISHMENTS

Project 2 of V.NLI.0066

Date: 30th May 2010

Contents

1 Introduction

The European Union (EU) market is requiring processors to accurately trace to property of provenance which involves identifying sheep prior to slaughter, and being able to trace sheep meat back to the place of production until post-mortem disposition. AQIS (Australian Quarantine Inspection Service) has advised that EU Sheep processors, to meet this requirement, will need to be able to demonstrate carcase correlation to last property for sheep carcases up to the point of post mortem inspection.

AMIC (Australian Meat Industry Council) has engaged Cedar Creek Company to develop technical solutions, specifically a software solution to correlate Property Identification Code (PIC) of last residence of the carcase to point of disposition in EU sheep establishments.

Using the current Industry systems provided under the National Livestock Identification System and National Vendor Declaration program Cedar Creek Company was engaged to undertake the following project objectives:

- Develop a software solution to enhance and streamline the requirement to correlate sheep carcases from last property up to the point of post mortem inspection.
- Conduct a trial of the software solution in an approved sheep processing plant to investigate the technical issues and resources required.
- Develop a report outlining the software solution used in the trial that assesses the system's operation, effectiveness, technical issues encountered, resource requirements and cost.

The methodology specified by AMIC was as follows:

- Define and understand the requirement: Carcase correlation from last property for sheep carcases up to the point of post mortem inspection.
- Consult with on-plant abattoir staff to understand the tools and Industry systems in place (i.e. NLIS, NVD's) that will need to be utilised to meet the requirement.
- Develop the solution conceptually and work with abattoir staff to refine solution.
- Build prototype and install on plant.
- Trial solution in agreed establishment.
- Monitor and measure solutions' effectiveness/accuracy through appropriate verification methods.
- Identify problem and build contingencies.

- Refine solution until establishment staff is comfortable that solutions meet the carcase correlation requirement.

- Document above process and provide a written report.

AMIC also advised an appropriate and willing establishment to undertake the trial, which was Fletchers International Exports, Dubbo NSW, Australia. Fletchers International Exports specialises in meat production and related sheep product processing. The company is headquartered in Dubbo, NSW with the plant having a weekly slaughter capacity of approximately 40,000 head at that location.

Fletchers Dubbo operate on two shifts per day that caters for the processing of up to 8,000 carcases each day. The average chain speed runs at 10 carcases per minute. There are approximately 70 bodies between the removal of the ear (to which is attached the tag identifying the PIC) and the final inspection point.

The key establishment contact for this project is Peter Field:

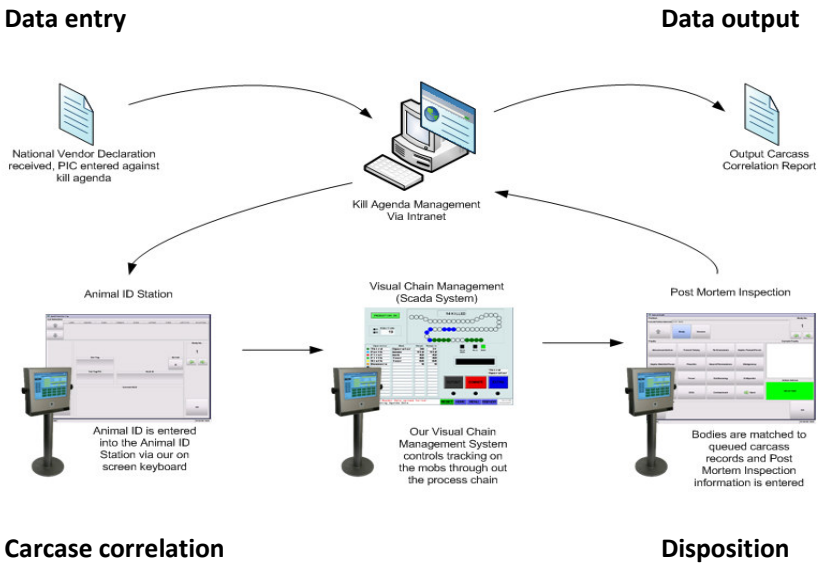
Peter Field
Manager Information Technology
Fletcher International Exports Pty Ltd
Locked Bag 10
Lot 11 Yarrandale Road
Dubbo NSW 2830

Telephone: +61 2 68845833
Fax: +61 2 68846566
Mobile: 0439 845833
Email: peterf@fletchint.com.au
WWW: http://www.fletchint.com.au

2 Sheep Carcase Correlation Solution Overview

The system involves a software solution that requires pre-entering of all corresponding PIC information from accompanying NVD (National Vendor Declaration) forms. This information is then displayed on a screen on the slaughter floor. Post slaughter, the tag is read and the slaughterman correlates the carcase to the corresponding PIC number presented on screen. This information is then relayed to the Inspection Point via another terminal. Sensors strategically placed along the multiple chains ensure data integrity is maintained. At the Inspection Point the Inspector has the ability to recall the corresponding PIC and link any required animal health dispositions on an individual carcase basis. Diagram 1 below provides an overview of the process for PIC correlation per individual carcase.

Diagram 1: Solution Overview – Carcase PIC Correlation & Tracking



2.1 Data Entry

The PIC data is obtained from the NVD's prior to kill. Administration staff enter all PIC's that accompany stock being slaughtered the following day. The information is sorted into corresponding kill lots. The project also allowed for an automatic data transfer of livestock information from saleyards which are referred to as Post Sale Summaries.

Where non vendor bred lines are presented and the NVD has been correctly completed by the producer both Secondary PIC's and the corresponding Primary PIC of residence (taken

from the pre-printed PIC on the NVD) are inputted. This is derived from the existing NLIS Sheep requirements that require producers, where marketing non vendor bred lines, list all the PIC's in the ears of the sheep in the mob on the NVD. The Primary PIC is derived from the pre printed PIC on the NVD and represents the last property of residence.

A critical and valuable step in the software is that the Secondary PIC information is linked to Primary PIC information in the data capture process which can later be viewed by an Inspector when the carcase disposition is assessed.

The process time for data entry of NVD information and correction/collation of complex Saleyard data initially took approximately four hours per day. Then once the kill has been completed, extra units of time are required to analyse the capture results and then provide feedback to DPI regarding kill numbers and body/ear tag correlation. Initial administration processes have been reviewed and the site has decided to split functions across various work areas to relieve some of the administrative costs.

2.2 PIC Carcase Correlation Animal ID Station

Shortly after slaughter, the ear is removed and is placed on a short conveyor belt where it is read by another worker who then matches the PIC number with a number of possible PIC's displayed on the touch screen terminal. If the PIC is not immediately sighted, the operator uses an on-screen keypad to enter the last two digits of the PIC from the tag. The system then reduces the number of displayed PIC buttons to only those that match the entered digits.

This correlates the ear tag PIC with the carcase record in the computer file. At this point the correlation may either be the Primary or Secondary PIC. The software program makes an assessment of the pre-entered information and establishes the link to the "Primary PIC" or "PIC of last residence".

Sensors along the chain can identify dropped carcases and there are a number of contingencies for non tagged or unreadable tags.

2.3 Inspection Station - Disposition

The inspection station has a monitor with the accompanying PIC data corresponding to each carcase displayed.

The data includes the NVD serial number, the Secondary PIC and/or corresponding Primary PIC of residence thereby delivering correlation of the carcase to the PIC of last residence in real time. The Inspector also has the ability to link diagnostic information to each carcase at this point.

The software solution also delivers to Inspectors' important information about cohorts from the PIC being slaughtered on the day, such as the number of carcases killed or waiting to be killed. A PIC of concern can be determined so that any carcases presented from that point can be highlighted for inspection.

The software solution also provides end of kill reporting summaries and the processor is able to retain this information for auditing purposes.

3 Contingency Plan

The contingency plan for Dubbo is to use a “chocolate wheel” concept whereby the slots correspond to positions and a tag is dropped into a corresponding slot. As the chain progresses, the wheel rotates until the body reaches post mortem. Then the existing ear tag is removed from that slot and a new one inserted. Fletchers hold onsite spares for all equipment as well as providing specific training to maintenance and electrical personnel to reduce changeover time to get the electronic system operational again.

The contingency plan for Albany, (because space is crucial) is they have developed a solution for photographing the tags. These are recorded in a mini data base on a separate computer to the ID station.

4 Multiple Tags and Transaction Tagging

Transaction tagging is currently in place. If producers list all PIC’s, Primary and Secondary, that are in the ears of their sheep, then any number can be entered and accuracy will be higher as any tag can be entered and it will relate back to the correct NVD for that kill mob.

In the event of a saleyard mob, if multiple growers supply animals with the same ear tags (Eg grower “a” purchased from Grower “b” so would have Grower “b” as a secondary PIC) and they sold the stock at the same time, the system will list the tags as duplicates. However it still enables trace back to the growers.

5 Sheep Carcase Correlation Solution Installation

In July 2009, Cedar Creek Company installed an on floor system for the Manual Carcase Correlation of PIC's at the Fletchers International Dubbo plant. This included the installation of a Carcase Animal ID, SCADA Graphical Tracking and Animal Health Inspection stations. The solution included the installation of chain and body sensors to ensure the synchronisation of the multiple chains and accurate tracking of the carcase across the processing floor. The personnel at Fletchers actively participated in all facets involved as Cedar Creek Company trained operators, derived feedback on usability, addressed changes in plant processes, and noted site suggestions on functionality improvements.

5.1 Accuracy of the solution

With the chain and body sensors positioned and tracking accurately, each carcase was physically followed by Cedar Creek Company personnel to ensure 100% accuracy. In all cases the presented carcases were accurately identified with the associated PIC data when that data was successfully read and entered at the Animal ID station.

Fletchers Dubbo continued to trial the solution for several months and a tag system was put in place to test the accuracy of the correct PIC number correlating to the correct carcass. At random intervals throughout the trial a tag was placed on a chain link so that carcases could be located at the Inspectors' station. The ear tag was retained for the sheep hanging from that link after it had been saved in the Cedar Creek Company system and therefore could be physically checked that the correct PIC number was representing the correct carcase at the Inspectors' station. This testing system was trialled on the full range of mobs that are purchased by Fletcher International, and providing there was no human error the system proved to be accurate.

Fletchers Dubbo have stated that, as a rule, the NVD information they receive from over the hook and paddock sale mobs is of a considerably higher quality than the information they receive for sale yard mobs. This is largely due to the fact that private sale mobs are predominately vendor bred and the fact that Fletchers buyers are diligent in their effort to ensure that the farmers are filling out their NVD's with all of the required information.

The main influences that may affect successful correlation are:

- The accuracy in detail of the NVD data provided and whether all PIC information including Secondary PIC's is completed accurately.
- The ability of both the ear tag removal operator and ID station operator to communicate efficiently and effectively in order to maintain correct sequence of the

ear tags to match body sequence. In practice, site has reported achieving accuracy rates of greater than 95% (at times100%).

- Factors that may affect accuracy rates include:
  - Inaccurate data on NVD's
  - New operators who enter the data onto the ID station incorrectly
  - Mobs being sent up out of sequence
  - Poor quality or badly damaged tags.
  - Woolly sheep
  - Rams
  - Horns
  - Higher than normal percentage of foreign tags
  - Multiple tags
  - Accuracy of data entered on XML files sent via the corresponding saleyards

Fletchers have stated that while initially they are experiencing a requirement for additional work hours, over time this will settle down and they will be able to use the collected data for providing feedback to suppliers and enhance the inventory tracking through their plants. They have results that show capture of animal data far exceeds the accepted rate required currently by the industry.

6 Typical Solution Requirements

The minimum requirement is for three Harsh Environment Computers (HEC's) which include an Animal ID, Animal Health Inspection and SCADA Control HEC's. Each chain between slaughter and post mortem inspection requires either a mechanical link to maintain synchronization, or a set of chain and body sensors. In Dubbo several sets of these sensors are required.

The physical installation requires a day to run cables and manufacture brackets, one day to position sensors, install HEC's and gauge accuracy, and a day whilst in production ascertaining operational effectiveness. The capital cost of this system reported by Fletcher's Dubbo is currently in excess of $50,000 when considering onsite modifications.

Cedar Creek Company Software Modules	
Kill Agenda Management	
Carcase Correlation Software – ID Station	
Carcase Correlation Software – Animal Health Inspector Station	
Post Mortem Correlation Reconciliation and Reporting	
Installation & Training – 5 days	
Cedar Creek Company Hardware Components	
HEC – Animal ID Station	
HEC – Animal Health Station	
SCADA Chain Control and Visual Chain Display including HEC t/s Station	
Chain and Body Sensors on line	
Hardware Installation – 3 days	
Cedar Creek Company Solution Costs	**$50,900.00**

7 Appendix A – Carcase Correlation Solution Detail

This section outlines the design and development phase of the project. The development of this project was two tiered.

Stage one was to develop a solution that would allow an operator to capture all PIC's where tags exist as carcases were processed in real time on the kill floor.

Stage two was the introduction of a Livestock Payment System solution capable of the electronic import of each Kill Lots PIC data from the Live Stock Exchange NVD's.

7.1 Kill Agenda Management

A kill agenda may be created or interfaced from existing systems. For each Kill Lot, PIC's will be entered against each Kill Agenda Line. The Kill Agenda may be modified on floor to allow for changes to mobs such as an emergency kills.

Where the plant has a suitable Livestock Payments system in place Saleyard bookings may be able to be imported electronically.

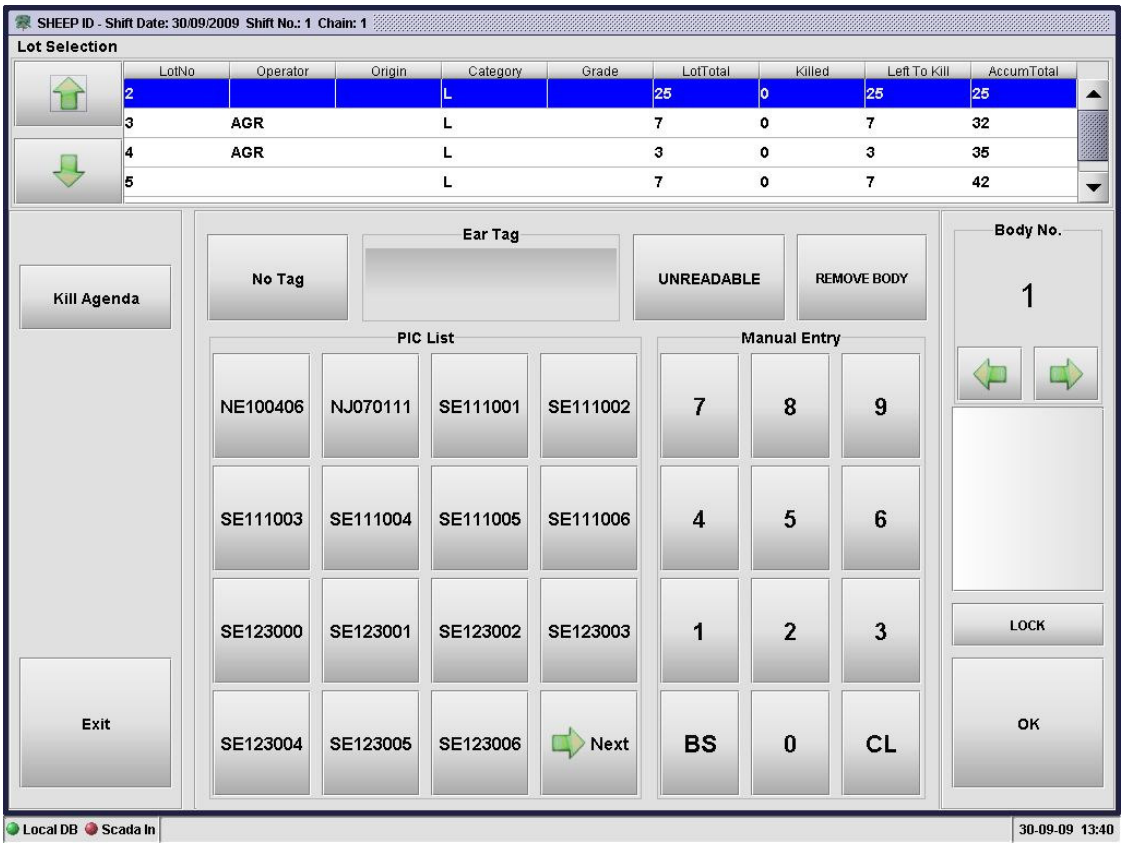
For each kill lot all PIC's from the NVD's must be entered. It is important to note that when an NVD references non vendor bred animals, then all PIC's for original properties, referred to as "Secondary PIC's" must be entered, in addition to the Primary PIC pre-printed on the NVD.

It is assumed that each animal will have only a single ear tag and the tag will contain the PIC of original holding.

As the legislation requires correlation to PIC of last holding, it is essential that NVD's be completed correctly.

To ensure that the highest percentage of accuracy, it is essential to check and verify every NVD that is to be processed. Extra work in the back office transfers to greater accuracy, higher speed and less stress on the operations floor.

7.2 Animal ID Station



A harsh environment touch screen station (HEC) was mounted post slaughter. At this point the kill agenda is displayed together with the current mob and expected PIC's for that mob. The operator visually identified the PIC from the animal's ear tag and matches it with the correct on-screen PIC.

Fletcher's innovation to assist capture of PIC data in real time was to build a conveyor system to queue the ear tags as they are removed from the carcase.

Each ear tag is presented and the operator selects the appropriate PIC.

If the PIC is not present then the operator enters the entire PIC and it is recorded as a foreign PIC for reporting purposes.

This foreign PIC is then added to the expected PIC's and can be selected from that point on from the list of PIC's presented to the operator. This was achieved in the following manner:

- Expected PIC's for the current mob are displayed as buttons. Where there are more PIC's for the mob than can be displayed a <More> button is displayed and pressed.
- If the carcase has no PIC tag then the <NO TAG> button is pressed.
- If the operator can immediately sight the correct PIC, touching the button records that PIC against the current carcase.
- If the PIC is not immediately sighted the operator uses an on-screen keypad to enter the last two digits of the PIC from the tag.
- The system then reduces the number of displayed PIC buttons to only those that match the entered digits.
- If the operator then sights the correct PIC, touching that button records that PIC against the current carcase.
- If none of the expected PIC's matches the entered digits, an alpha numeric keyboard is displayed to allow the characters of the PIC from the tag to be entered. The 8-digit number is then validated via a check digit calculation to ensure a valid PIC has been entered. If valid, the PIC is then recorded against the current carcase, else <UNREADABLE> is recorded.
- Chain and body sensors are included at this point to ensure carcase correlation. If the operator has not recorded a valid PIC by the time the next body is presented on the chain then <NO TAG> will be recorded automatically. A First in First out (FIFO) Buffer allows for storing bodies up to the number of positions between the ID and AH (Animal Health) stations.

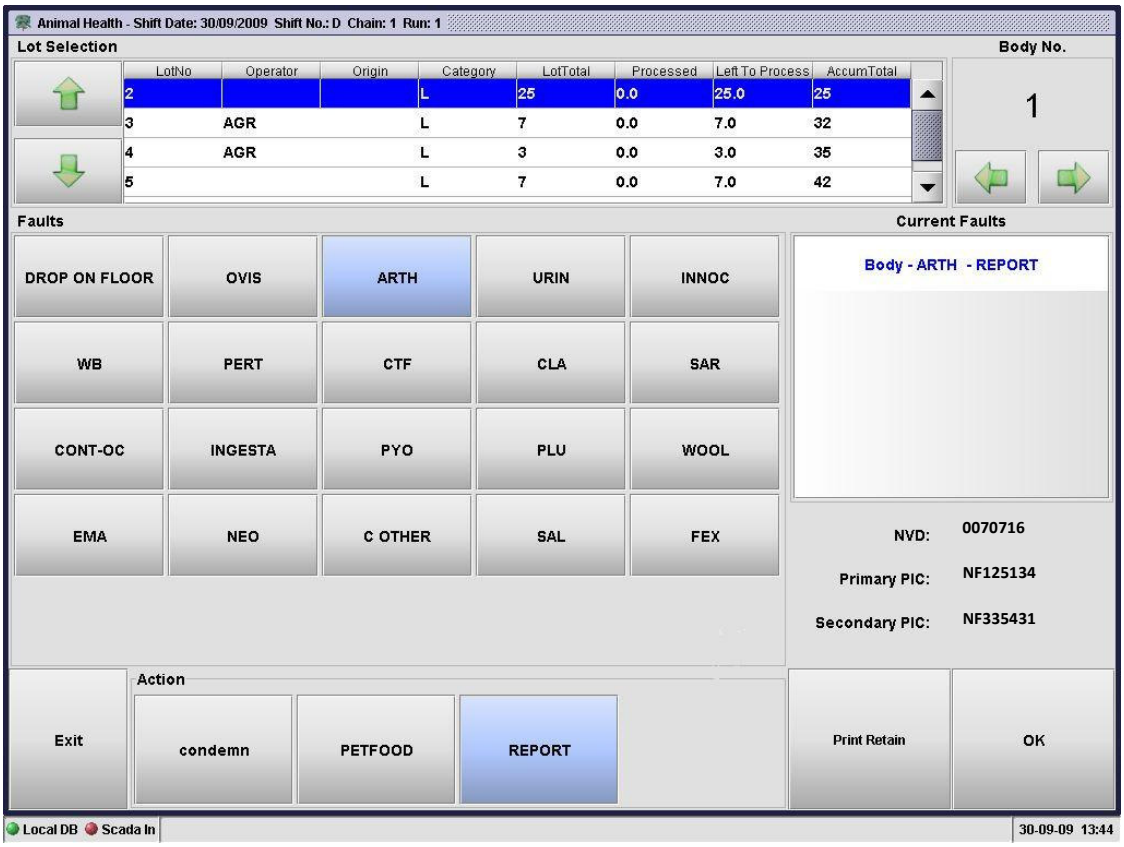
7.3 Chain Correlation and Carcase Tracking

Strategically placed chain position sensors are used to detect and record movement of the chain. Body sensors are used to detect bodies in each position on the chain. Used in combination, the system can then sense when a body has been dropped and the data is adjust accordingly.

7.4 Chain Correlation Graphical Display

The Cedar Creek Company SCADA HEC provides visual chain management. A real time display shows a physical representation of each body location on the chain showing mob, PIC, dropped bodies and the number of bodies processed. The solution is tailored to mimic the actual look of the chains onsite on the slaughter floor. In the case of Fletchers Dubbo the carcase correlation solution traverses multiple chains as depicted onscreen. The chain positions are represented by blank circles which are coloured in as carcases populate the processing floor. Each mob is assigned a different colour and as the PIC is entered, the word 'PIC' appears visually within each dot. The individual dot representing a carcase can be pressed on the touch-screen to bring the NVD, MOB and PIC data associated with that carcase onscreen.

7.5 Post Mortem Inspection



The system tracks each carcase across the slaughter floor and at the Animal Health station they are presented to the Inspector with the NVD number and PIC. The carcase may at this point be inspected and any faults recorded or specific carcase action such as a condemn can be recorded. As the chain is constantly moving there is an identified area 'window' on the chain that faults need to be added by the Inspector. Once past this window the system automatically moves to the next body.

A HEC is installed at the Post Mortem inspection point. This HEC screen displays the current agenda and the current body queue. Visual identity will be maintained for the current body,

PIC and NVD. If no action is taken against that body then the queue will be automatically advanced. Dropped or condemned bodies may be recorded.

The options that are presented to the Inspector onscreen include recording a specific fault or disease, the action required such as ‘condemn’, ‘pet food’ and ‘report’

Optional collection of animal health data is possible at this point.

7.6 Post Mortem Correlation Report

A report is available showing all kill lots, body numbers, PIC’s and disposition of each body. Any specific carcase details that are captured during this process are stored electronically and available for reporting purposes. These reports can be tailored to each individual processors requirement. The current report at Fletchers contains: Lot Number; Body Number; NVD; Primary PIC, Secondary PIC, Foreign PIC’s and an information field recording PIC reconciliation result.

7.7 Uploading of Data

All data captured may be uploaded to external systems.

7.8 Adaptability

This technology can be integrated with any current on floor system.

8 Appendix B - Sheep Carcase Correlation Trial

This section outlines the trial of a prototype system undertaken in June 2009. This phase enabled Cedar Creek Company and Fletchers to work through some of the basic technical issues associated with the concept.

In June 2009 Cedar Creek Company attended Fletchers Dubbo and reviewed operation and held discussions with site in order to understand operational requirements and feasibility for electronic recording of PIC data. From this Cedar Creek Company developed and bench tested a technical solution incorporating a user interface that would be suitable for manual data entry to capture PIC's at sheep plants for each individual carcase. The system was required to be usable for 'Real Time' data entry and processing. An operator was required to visually identify the PIC from the animal's ear tag and enter the minimal data/keystrokes required to match it with the correct PIC. Operator entry options for 'No Tag' or an 'Unreadable Tag' were developed.

The major development considerations at this stage surrounded the ease of PIC data entry for operators and how to both minimise and cater for incorrect data entry.

This installation was the initial phase of the project whereby an Animal ID station, a harsh environment touch screen station (HEC), was mounted post slaughter. A second HEC with Cedar Creek Company's SCADA chain control solution incorporating body and chain sensors was also installed. This SCADA HEC is used to track an individual carcase across the floor and manage sequencing issues around chain speed, dropped or lost bodies while providing a visual display of the processing floor.

Cedar Creek Company personnel were onsite at Dubbo from the 23-26th June refining the solution, ascertaining accuracy of sensors, testing the speed of entry and capacity for the operator to both read and enter the PIC.

Through this testing and development it became apparent that the operators would be able to successfully enter the PIC data in real time. Whilst there are variable tags in both design and quality of readability the majority of Tags can be entered comfortably.

The personnel at Fletchers Dubbo continued to test and assess operability of the system for several months, providing feedback, and assisting Cedar Creek Company further refine the data entry screen. The original QWERTY keyboard was changed to an alpha numeric style; the initial number of digits to input in order to associate a carcase with a PIC was decreased from four to two.

The site built an ear tag conveyor and established a cleaning regime to assist with the queuing of tags for ease of entry by the operator.

The solution requires an operator to remove and sequence the ear tags and an operator to enter data at the Animal ID station and Animal Health station. This effectively means that

the operator removing the ears has an extra responsibility as the ear already had to be removed prior to rendering. An extra unit of labour has been required to enter the PIC data into the Animal ID station. Administration staff is required for NVD data collection and entry, stock receivals, and kill agenda maintenance.

In order to ensure accurate capture of the NVD data was a labour intensive process to ensure the accuracy of the NVD data received and then manually entering it.

9 Appendix C – User Operability and Functionality Requests

During the evaluation period Fletchers Dubbo continued to test and assess user operability and functionality. The below comments address the opportunities to optimise the solution as identified by Dubbo site personnel.

Comments	Solution Deployed
There is a need to increase the keyboard size. At times operators are struggling to hit the right button when in a hurry. If the keyboard when it pops up can be made to maximise as much of the screen as possible this would help.	Key board size was maximised
When doing a split in KFS, the split line goes to the bottom. On some of the kill agendas, there have been > 15 lines. If we need to move it up, it takes a long time to click on move up. There is a move up/down button but this is only good if there are only a couple of lines to move	Functionality was added in order to move and insert to line X, for example the newly created line 19, move and insert between lines 4 and 5
We need to have displayed on the ear tag and KFS kill agenda screens. Cedar Creek Company Kill line number, (Auto allocated) Site lot number (entered at booking or receival, the quantity to be killed (On the ear tag and animal health, the number remaining) Description and estimated weight.	Functionality was added to display this.
When splitting line in KFS, is it possible to either retain the same line number or have a subset of the original line number? This has been creating some confusion to the on floor operators knowing what mob is coming through.	Functionality was added to display site lot numbers.

A report to show a summary of lots killed for the day broken down by PIC then foreign PIC per run. Kill line 1, Dubbo lot 1234, Expected to kill 300, processed 302. PIC number EW123442 No extras. Kill line 2, Dubbo lot 5432, Expected 500 processed 498, PIC Numbers 400 x XXXXXX 90 x YYYYYYY and 4 x Foreign tag ZZZZZZZZ and 4 x foreign tag AAAAAAA.	A report was written to capture this detail and show discrepancies per day per shift
Is it possible to include a purchase date on either the receivals screen or the NVD entry screen?	Functionality was added to display purchase date.
When entering kill agendas, searching by NVD number alone or by date is cumbersome. Fletchers: We know and always refer to everything by our lot number. If we were able to search by lot number and date range (Unless the system is purging off older lots) then that would simplify things for us no end. By doing it this way we have consistency throughout the whole process. Currently, we buy using lot numbers, receive using NVD and lot numbers, do the kill agenda by lot number and kill by lot number. Under the KFS system, we book by NVD, receive by NVD or date, do Kill agenda by NVD, and then process by line number.	Functionality was addressed to included site lot number and date range criteria to facilitate receival lookup. Site has requested functionality to search by Lot number.
There are times where animals that have been added to a kill agenda have started to be processed but due to operational constraints the kill cannot be completed. (EG woolly/burry skins) The remainder need to be physically returned to the yards, but also the ability is required to be able to return them to the yard create screen so they can be reallocated at a later date.	Further Functional requirement that is scheduled for completion. As at 09/09/2010. Stock can only be returned as long as a kill on that line has not been recorded.

In order to address the quoted 5 hours administration required to input the Livestock NVD data that to date had proved to be a show stopper; due to lack of time, availability of the data prior to slaughter and an unacceptable resource cost to the plant	In Mid November 2009 Livestock Exchange (LE) confirmed that they had now completed changes to their export routine that will now include Secondary PIC data in the XML file. LE are still in the process of deploying these changes to sites using their solution as at 09/09/2010. Cedar Creek Company has modified the import routine based upon the XML structure provided and implemented our web based Live Stock Payment software in order to facilitate the electronic import of data. This required a substantial effort for the site IT department to map their data requiring detailed user manuals and two days onsite support to instigate.
Fletchers required a great deal of flexibility in the way in which they handle mobs. This effectively meant that the initial software solution required more flexibility in kill agenda management. The more boxing of mobs that occurs the more possible returns of PIC's and the more real estate onscreen is required. The operator will also need to select the right PIC from a larger selection increasing the chance of errors.	The software solution was made more flexible to cater for the boxing of mobs. Enhancement of screen designs and sizing of buttons was the flow on affect of more PIC's to choose from.
Require ability to be able to export end of day kill data to CSV so it can be sent to DPI/NLIS for correlation to database.	Export available with the data structure yet to be finalised.

APPENDIX 3

Federal Funding Application Kit

FEDERAL FUNDING APPLICATION KIT

Grant to assist EU registered sheep processing establishments implement solutions to correlate PIC of last residence to body number to point of disposition.

Overview

The EU market is requiring Australia to accurately trace sheep to property of provenance; which involves identifying sheep prior to slaughter, and being able to trace sheep meat back to the place of production until post-mortem disposition.

AQIS has advised that EU Sheep processors, to meet this requirement, will need to be able to demonstrate carcase correlation to last property for sheep carcases up to the point of post mortem inspection.

AMIC's National Export Sheep Lamb and Goat Council (NESLGC) has accepted the EU's requirement to trace back product to "property of provenance", and that each EU Establishment will need to ensure they have systems in place to meet the requirement; acknowledging that an EU audit is scheduled for November 2009.

The Federal Government is providing funding for EU Establishments to implement solutions to meet this requirement.

Funding

Up to $13,600 is available on a dollar for dollar basis for "eligible expenditure" (see below). This means that every dollar spent on "eligible expenditure" will be matched by the Federal government up to a maximum contribution by the government of $13,600 per Establishment.

Reimbursement will be in arrears, following assessment of the application form, report and provision of suitable purchase documentation.

In the event that the applicant requires "upfront" payment, application may be made based on the provision of quotes. 70% of the total cost may be provided in advance with the remainder being made available on proof of purchase and the submission of the final report. If this is the preferred method please contact Christian Mulders on the details below.

Eligibility criteria

The funding is available to sheep processing Establishment that are registered with AQIS for supplying sheepmeat to the EU market.

“Eligible expenditure” includes:

1. Software purchase or upgrades, and hardware. Software and hardware must be able to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.

2. *Costs associated with training staff in the usage of the purchased software and hardware.

3. Capital costs associated with plant modifications or additions to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.

4. *Costs associated with protocol development and documentation (QA manuals, approved arrangement documentation etc) of the requirements to correlate PIC of last residence to body number to point of disposition.

*Note: “In-kind” costs associated with staff training, protocol development and documentation may include for example QA Management staff time/salary costs so long as these are documented in the application process.

Application process

The Funding application form accompanies this document.

Funding applications will need to be submitted to AMIC for approval.

Funding applications will be processed on a first in first served basis.

Funding applications must be completed in full and must include accompanying documentation including:

- “Proof of purchase” documentation being tax invoices for eligible expenditure.
- If claiming ‘in-kind costs’ these must be documented.
- Final report.

Reporting requirements

As payment will be in arrears the funding application must be accompanied by a report on the solution that was implemented in the Establishment making the application.

For your convenience a report template has been provided on page 6, which includes the following topics:

- Establishment details
- Establishment size
- Overview of the solution
- Accuracy of the solution
- Issues experienced and how they were rectified
- Solution specifications
- Solution costs
- Ongoing operational requirements and costs
- Photos

Where do I submit the application?

Complete the application form and report template, attach copies of appropriate "proof of purchase" documentation and please provide an electronic copy via email to:

cmulders@amic.org.au

Application closing date

15 September 2009. Applications will be assessed on a ***first in first served basis*** so it is advisable to complete and send the application requirements prior to the closing date.

More information?

Christian Mulders
Manager Livestock and Product Integrity
Australian Meat Industry Council
PO Box 1208
Crows Nest NSW 1585
Phone: (02) 9086-2244
Email: cmulders@amic.org.au

APPLICATION FORM: PROCESSOR GRANT TO CORRELATE PIC OF LAST RESIDENCE TO BODY NUMBER TO POINT OF DISPOSITION IN EU SHEEP ESTABLISHMENTS

APPLICATION CLOSING DATE: 15 September 2009

1. Applicant Details (Entity to Receive Grant)	
Est Name:	
Address:	
ABN:	
AQIS Est number:	
Key Contact Person's Name:	
Key Contact Person's details	Phone
	Email

2. Eligible Expenditure Claim *	
Item	**Cost**
Hardware (Attach tax invoice)	
Software (Attach tax invoice)	
Capital (Attach tax invoice)	
Training (Attach tax invoice/ staff time costs)	
Protocol development and documentation (Attach tax invoice/ staff time costs)	

** Eligible expenditure includes:*

1. Software purchase or upgrades, and hardware. Software and hardware must be able to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.
2. *Costs associated with training staff in the usage of the purchased software and hardware.
3. Capital costs associated with plant modifications or additions to facilitate compliance with the requirements to correlate PIC of last residence to body number to point of disposition.
4. *Costs associated with protocol development and documentation (QA manuals, approved arrangement documentation etc) of the requirements to correlate PIC of last residence to body number to point of disposition.

*Note: costs associated with staff training, protocol development and documentation may include for example QA Management staff time/salary costs so long as these are documented in the application process.

3. Report requirements

This application must be accompanied by a report. Please use the report template provided on page 6, which includes the following topics:

- Establishment details
- Establishment size
- Overview of the solution
- Accuracy of the solution
- Issues experienced and how they were rectified
- Solution specifications
- Solution costs
- Ongoing operational requirements and costs
- Photos

4. Declaration

The applicant declares that:

- They are eligible to apply for funding, being a sheep processing establishment that is registered with AQIS for supplying the EU Market.
- That the purchases are required to assist the processor to meet the EU's requirements to correlate PIC of last residence to body number to point of disposition.
- As you are receiving government grant money, you agree that the report accompanying this application can be made available to DAFF and the NLIS Management Committee.

Name of Authorised Person:		**Signature:**
Date:		

Where to submit the application?

Complete the application form and report template, attach copies of appropriate "proof of purchase" documentation and please provide an electronic copy via email to: cmulders@amic.org.au

More Information?

Christian Mulders
Manager Livestock and Product Integrity
Australian Meat Industry Council
Phone: (02) 9086-2244
Email:cmulders@amic.org.au

REPORT ON SYSTEM IMPLEMENTED TO CORRELATE PIC OF LAST RESIDENCE TO BODY NUMBER TO POINT OF DISPOSITION

Please type in directly to the report. Please provide as much detail as possible.

1) ESTABLISHMENT DETAILS

Establishment name:	
Address:	
Key contact person's name:	
Key contact person's details:	Phone:
	Email:
Date:	

2) ESTABLISHMENT SIZE

Number of carcases between knocking and first point of inspection:	
Chain speed:	
Other points of interest:	

3) OVERVIEW OF THE SOLUTION

General overview of the solution:	
How does the solution installed actually operate?	
What procedures have been developed to support operating the solution?	

4) ACCURACY OF THE SOLUTION

How accurate was the solution in being able to correlate PIC of residence to body number to point of inspection?	
What was the methodology used to trial how accurate the solution was?	
What were the results of the trials undertaken?	
Accuracy of the system is likely to depend on the accuracy of the NVD/ tagging compliance of sheep entering the establishment. Did the "source" of the stock impact the	Direct OTH:
	Saleyard vendor bred:
	Saleyard non vendor bred:

accuracy rate ie) what was the accuracy rates for each category?	Paddock sales:
	Other:
Would transaction tagging (multiple tags) assist or hinder the solution's ability to meet the requirements? Please explain in detail:	

5) ISSUES EXPERIENCED AND HOW THEY WERE RECTIFIED

What were the main problems/issues identified and how were these resolved?	"Development" issues:
	"Implementation" issues:
	"Day to day operating" issues:
What contingency procedures were developed to overcome issues experienced during day to day operation of the solution?	

6) SOLUTION SPECIFICATIONS

Hardware:	
Software:	
Capital (including plant modifications):	
Training:	
Protocol development and documentation:	
Other:	

7) SOLUTION COSTS

Hardware:	
Software:	
Capital (including any plant modifications):	
Training:	
Protocol development and documentation:	
Other costs: (for example abattoir staff time to develop and implement the solution):	

8) ONGOING OPERATIONAL REQUIREMENTS AND COSTS

Ongoing resources to operate the solution day to day (ie Labour, electricity etc):	
Ongoing operating costs:	

9) PHOTOS

Include photos of the solution (include at least point of correlation and point of inspection) with a brief description of what each photo is demonstrating:	

AUSTRALIAN MEAT INDUSTRY COUNCIL

ABN 65 990 653 488

Processor Group

Level 2, 460 Pacific Highway

St Leonards NSW 2065

Australia

P O Box 1208

Crows Nest NSW 1585

Contact Details:

Christian Mulders

Manager – Livestock and Product Integrity

Telephone: (02) 9086 2244

Facsimile: (02) 9086 2201

Email: cmulders@amic.org.au

www.amicprocessors.org.au