

Plant Initiated Project Program Outcomes Report (2000-2004)

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Published by Meat & Livestock Australia Ltd

November 2006

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ISBN 1 74036 921 1

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Off to a great start

While only in its early stages, the program already has proved successful, with investment from plants growing five-fold over the life of the program. Plants that were once hesitant to try out a new technology or process, now invest because they can share the risk with other industry parties – either as a consortium of processors or, as a single processor sharing with AMPC and the government. This has led to unparalleled investment and a process by which MLA can fast track technology transfer to ‘research-ready’ plants.

The research projects to date can be categorised into four themes:

- Improving process efficiency - 23
- Value-adding - 10
- Reducing environmental impacts - 9
- Improving occupational health and safety outcomes -11

While the majority of projects were engineering-led projects - better hooks, better dryers, safer machinery - they reflect the concerns of the plants and the emphasis of the industry R&D agenda, and are expected to change over time as the orientation of plants’ concerns change. Plant **research readiness** has been enhanced through the designation of site-based ‘innovation champions’ (individuals who have initiated multiple projects within a plant), and creation of a network of these people across the industry, to discuss and promote projects.

We are not talking delayed outcomes in these projects either, which is good news for MLA & AMPC who co-invest in this research. Some plants are receiving immediate benefits from their investment, others have discovered potential areas for future benefit and yet others have proven that benefits will not accrue from the line of enquiry they had pursued. All these findings are considered to be of benefit to the industry with a net gain being many-fold the initial investment, as demonstrated through the recent evaluation of the projects undertaken by a panel of industry experts (see project case studies presented as part of this review). So what prompted the industry to develop the PIPP?

Plant Initiated Projects Program

A strategy jointly adopted in 1999 by AMPC and MLA to encourage and support meat processing plants to undertake R&D.

Relevant projects can attract a return of up to 15% of a processor’s levy fees from AMPC and Commonwealth matching R&D funds from MLA.

PIP - Building upon tradition:

The meat industry has a proud history of innovation, including the early practice of salting carcasses in order to preserve them and later, the use of refrigeration to the same end in order to export product; the application of mechanisation to speed up manufacture; and the creation of an array of valuable by-products, from what could be regarded as waste from processes.

In spite of this long and successful tradition of innovation, recent analysts suggest the processing sector could do even better, noting that the industry has become fixated on a single aspect of their business – scraping out productivity gains through reducing fixed labour costs! With these costs representing only 11% of total meat processing costs (the cost of procuring stock, in contrast, could be up to 80%) even astronomical gains in labour efficiency (20 – 30%) would not ensure industry sustainability. This fact appears to have escaped plants which continue to focus on this aspect at the exclusion of much else. In addition, this fixation on ‘productivity’ has the potential to alienate the workforce (seen as the problem) and certainly to act as a disincentive for them to enter into innovative activities.

PIPP: A strategic focus

While the traditional productivity bias has distracted the sector, other strategic challenges, critical to the sector maintaining its global competitive advantage, have grown in prominence. To be sustainable, meat processors must innovate in these areas as well.

The main challenges are emerging as follows;

- Maintaining labour supply;
- Minimising OH&S risks;
- Differentiating product through process automation;
- Value adding to create higher margin products;
- Improving data capture & communication for supply chain management;
- Coping with an old (1900s) meat inspection system in a new high speed processing environment;
- Dealing with escalating environmental compliance costs; and
- Optimising meat quality in high-throughput plants.

In fact, more competitive advantage could be gained through the development of innovative technologies and practices to address these manufacturing issues than could be gained pursuing those issues related to productivity. But processors have placed themselves in a double-bind, with their focus on maximising labour productivity creating a resistance to innovation. Changing processes (or systems) – experimentation - impacts on the very results (product out the door) by which they are measured: hence, creating reluctance amongst processors to disturb the status quo.

MLA and AMPC think that there is a need to encourage meat processing plants to think wider than their current experience has enabled. In their view:

1. Plants needed current information (to enable them to make better decisions);
2. Plants needed strategic research in key areas such as OH&S, and the environment which had the potential to impose heavy cost imposts on the industry, and in processing technology which had the potential to create opportunities;
3. Plants needed applied research (to convert theory into actual benefit on site); and

4. The sector needed enhanced leadership capability (to better position itself).

The MLA strategy for PIPs has focussed upon provision of solutions to address these very issues.

PIPP: Demonstrating that R&D pays

In conjunction with AMPC, MLA saw an opportunity in PIPP to enhance applied research (Strategy 3) at the plant level. The MLA Program is described in Figure 1.

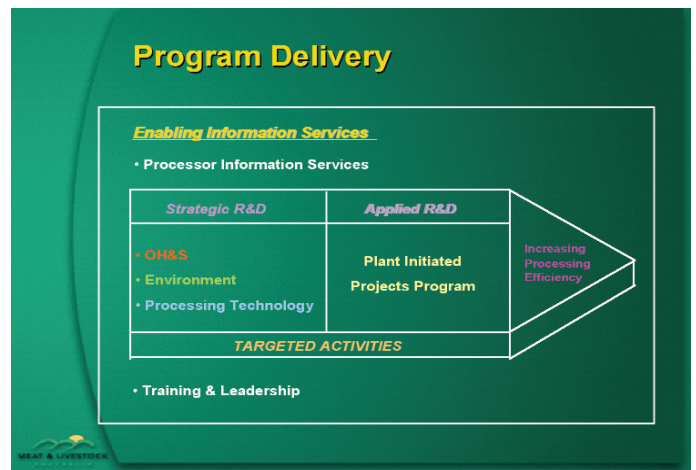


Figure 1: MLA CIS Strategic Program Delivery Model.

In line with world class thinking the desired approach is to move strategic R&D across into applied R&D and it was hoped that PIPP would further this approach.

PIPP was established with the stated objectives to:

- Assist AMPC/MLA members to achieve greater competitiveness through innovation;
- Increase the number of processing innovations available to AMPC/MLA members;
- Demonstrate the commercial benefits achieved from investment in innovation to AMPC/MLA members and the wider industry.

To qualify, a plant-based project must aim to:

- Develop or evaluate new concepts or technologies or
- Seek to use existing concepts in new applications.

The Program logic deduced from these objectives can be graphically displayed as per Figure 2.

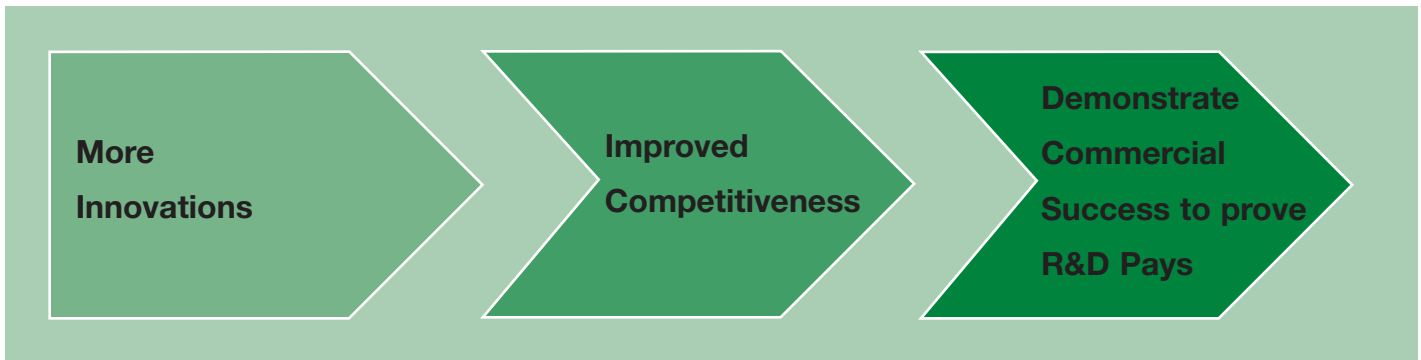


Figure 2: PIPP Program Logic

The logic is that innovations which assist plants should be encouraged because they will improve the business and, ultimately, the competitiveness of the plant and industry (i.e. “A rising tide floats all boats”). If plants become aware of the benefits (through demonstration of project successes) they will invest even more and innovation will spread at a faster rate. MLA/AMPC funding acts like an industry venture capitalist to accelerate this process of innovation diffusion.

PIPP - Innovation in funding:

The Plant Initiated Projects Program provides industry funding to processing plants to invest in appropriate R&D of their choosing.

Each member of AMPC (approx. 200) can use up to 15% of their voluntary membership contribution for research and development programs, which includes Plant Initiated Projects. The schematic below (Figure 3) illustrates how the funding mechanism for the program operates.

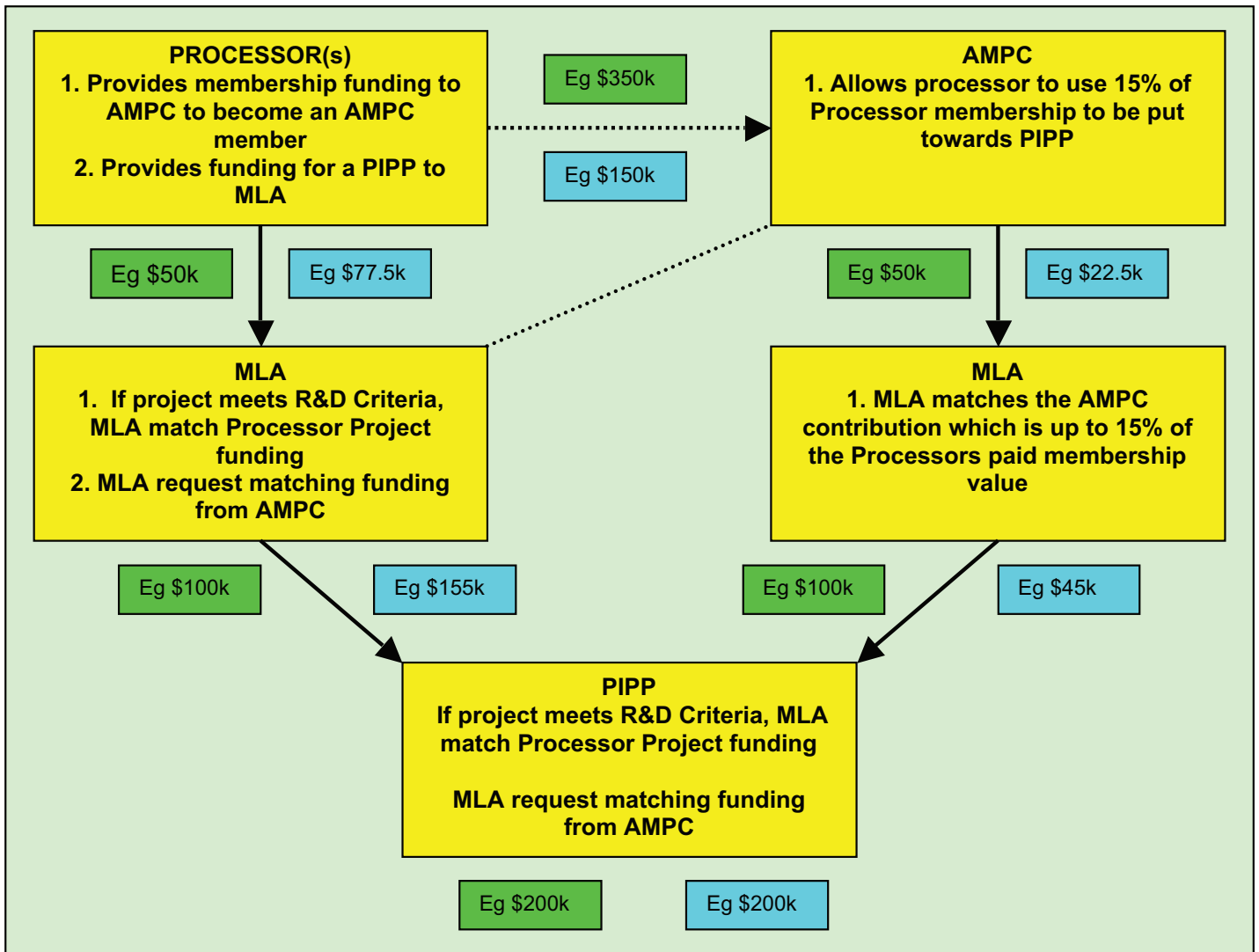


Figure 3: PIPP Funding Model

Project example 1: See GREEN Boxes

1. Processor has paid \$350,000 membership fees to AMPC. This enables them to request up to \$52,500 towards a PIPP accumulative per annum¹.
2. Processor provides MLA with \$50,000 project contributions and MLA requests \$50,000 contribution from AMPC
3. MLA matches the \$50,000 provided by the processor directly towards the project
4. MLA matches the \$50,000 provided by AMPC
5. Total project budget is \$200,000

Project example 2: See BLUE Boxes

1. Processor has paid \$150,000 membership fees to AMPC. This enables them to request up to \$22,500 towards a PIPP accumulative per annum².
2. Processor provides MLA with \$77,500 project contributions and MLA requests \$22,500 contribution from AMPC
3. MLA matches the \$77,500 provided by the processor directly towards the project
4. MLA matches the \$22,500 provided by AMPC
5. Total project budget is \$200,000

8 1 This will now be accumulative over three years. With every three year period all accumulated and unspent funds being lost.
 2 This will now be accumulative over three years. With every three year period all accumulated and unspent funds being lost.

PIPP Impacts:

What impacts did PIPP contribute to plants and to the industry?

- Did PIP assist members to achieve greater competitiveness?
- Did PIP increase the number of processing innovations available to AMPC/MLA members?

- Did PIP demonstrate the commercial benefits achieved from investment in innovation to AMPC/MLA members and the wider industry?

Given that the life-cycle of this program might run beyond ten years, it would not be beyond reason to suggest that certain impacts will be less noticeable at different times in the investment cycle.

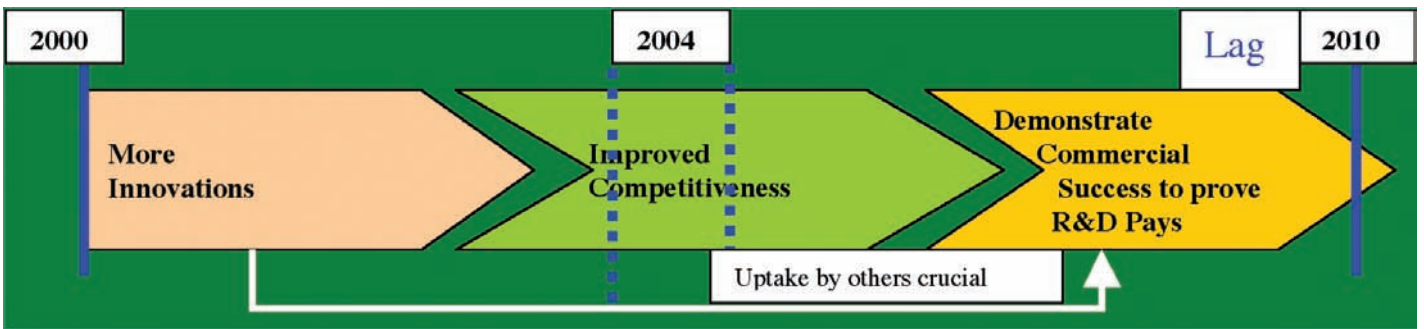


Figure 4: PIPP cycle with lead and lag indicators

Figure 4 suggests that it may be unrealistic to expect to witness industry-level commercial success at this stage in the Program life-cycle. It is more likely that indications at the output level, such as an increase in the number of projects and outputs that will lead to improved competitiveness at the plant (or syndicate)

level, will be evident, rather than any evidence of broader improvement in competitiveness or broad dissemination of outputs across the sector.

Evaluation of the 2000-04 PIP Program used the following indicators (Table 1) to gauge the performance of the Program.

Table 1: Evaluation indicators of program success against goals

Goal	Possible Indicators
Increased number of innovations	Increased number of projects Increased total R&D investment (input)
Greater competitiveness	Cost down Improved profit Improved sustainability – environmental outcomes Accelerated adoptions Improved quality Improved productivity Improved market Improved business decisions
Demonstrate commercial benefits	Innovative culture - Increased R&D capability - Increased investment Dissemination of projects to wider audience

1. Increased number of innovations available to MLA/AMPC members

Increased number of innovation projects

Achievement of the first program goal in the period under review (2000 – 2004) is quantitatively demonstrated by noting the increasing number of projects being undertaken by processors across the sector.

Table 2: PIPP Projects approved annually

Year	00-01	01-02	02-03	03-04	Total
No of Projects	8	16	14	46	84

Apart from the PIPP Projects supported by MLA, there were another 57 AMPC projects for which matching R&D funds were not requested.

Increased total R&D investment

In addition to an increasing number of projects, the table below demonstrates clearly that the program has been a catalyst for a significant increase in additional investment in R&D by individual meat processing companies.

The total program expenditure for the period 2000-04 was \$7,700,000. Half of this investment was made by individual meat processing companies and the balance was in the form of Commonwealth matching R&D funds.

This means that as a consequence of participation in the program individual meat processing companies have made an additional investment in R&D of \$3,850,000.

It is reasonable to suggest that the program has provided the incentive for these companies to invest in innovation in ways that, otherwise, would not have been made by these companies. The following (Table 3), shows the growth and is graphically denoted through Figures 4 and 5.

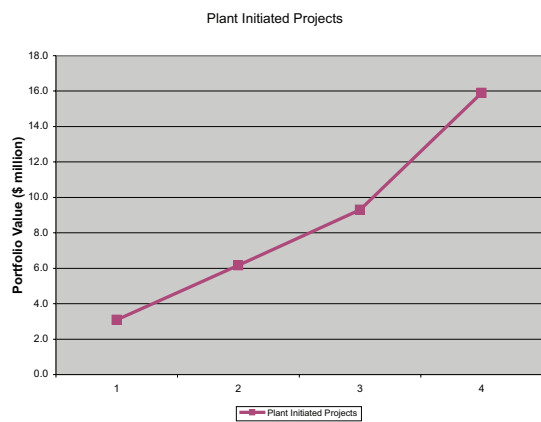


Figure 4: Budget expenditure

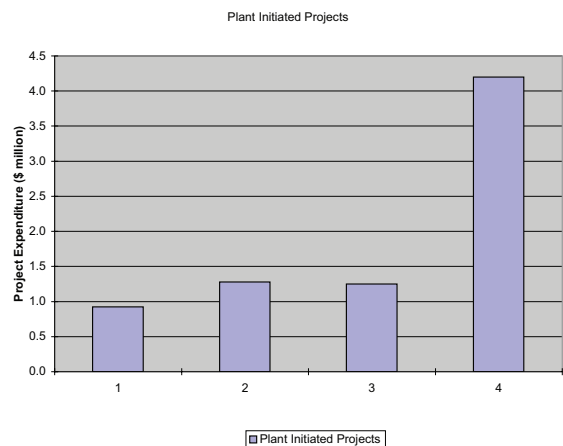


Figure 5: Portfolio value

Table 3: Budget and portfolio investment during the period 2000-04

	Year 1 FY 00/01	Year 2 FY 01/02	Year 3 FY 02/03	Year 4 FY 03/04	TOTAL SPEND 2000-04
Total Program Value	\$3,100,00	\$6,200,000	\$9,300,000	\$15,900,000	
Annual Program Expenditure	\$900,000	\$1,300,000	\$1,300,000	\$4,200,000	\$7,700,000

2. Greater competitiveness

Investment in R&D Programs can harvest a suite of returns – some are reaped early, while others lag with nothing to show until a critical mass is available to demonstrate an outcome. Within the time frame of the PIP Program (2000-04) assurances about achieving the second program goal - increased competitiveness - cannot be given, but exciting lead indicators for member plants would suggest that the program is contributing significantly to greater competitiveness of both individual companies and the red meat processing industry.

Competitiveness can be improved with attention to the following:

- Reducing costs
- Increasing profit capability
 - o Improving quality
 - o Improving productivity
 - o Opening further markets
 - o Improving business decisions
- Increasing sustainability – environmental outcomes
- Accelerating adoptions in order to respond to challenges
- Creating a productive culture

A collection of completed plant initiated projects were evaluated by a team of industry experts and were assessed as having contributed to competitiveness through impact on individual factors above.

Reducing costs:

Projects reducing supply chain costs (103)*; increasing throughput and lowering labour costs (065 and 095); lowering accident rates and rehabilitation costs (088 and 069); and, reducing gas, saving energy and environmental costs (014) were examples of cost minimisation.

Increasing profit:

Projects lifting retention (028); value adding a waste stream (034); improving yield by 1.5% (054 and 091); and lifting production by 33% (039); validating a process for increasing productivity (051); improving boner productivity by 3.8% (054); and, developing markets (084) are examples where profits were lifted.

Increasing environmental sustainability:

Projects improving water quality (012, 039, 134, 010, 011, and 023) and minimising energy use (010) contributed to improved environmental outcomes and in one case enabled a new level of development to proceed on site, once restricted due to lower environmental capability.

Accelerating adoption:

A series of projects utilising electrical stimulation to improve tenderness was the best example of this factor (064.1, 064.2, 097, 101, 105, and 106).

Creating a productive culture:

Projects ensuring worker safety (015); improving supervisor competence (030); ensuring career outcomes (030); improving quality of work life (054 and 072) were examples of this factor.

*() Number relates to PIP Project code and to case studies attached.

With the ongoing contribution of projects accelerating, due to the greater take-up rate of PIP projects, a critical mass of innovation capability will evolve across participating plants and diffuse to the rest of the sector over time which will ultimately enhance industry competitiveness.

3. Demonstrate commercial benefit of R&D investment to processors and the wider industry:

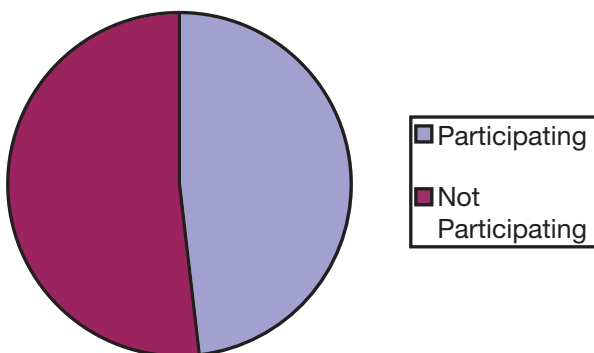
The outcome of having demonstrated the benefits of R&D is the industry maintaining or raising, the degree of investment in innovation. It is argued from the MLA/AMPC perspective that PIPs will encourage a more innovative culture and, as a consequence, more innovation will be observed. Whilst data is still only indicative for achievement of this third program goal, significant improvement has been witnessed.

3.1 Increased innovation capability

3.1.1 Increased participation

Participation rate data indicate an increased willingness by individual meat processing companies to participate. This is further illustrated through companies undertaking more than one project.

Program participation data shows that of the 200 companies that are eligible to participate, a total of 96 companies (approx. 50%) have undertaken at least one project. In addition, 45 (approx. 50%) of these have undertaken more than one project.



With almost half the processors now participating in the Program it is fair to assume that the competency of this group, to conduct R&D projects, has risen.

Figure 6: Plants who have undertaken PIPP Projects 2000-4

Assuming that willingness to participate in subsequent projects is an indicator of increasing capability to innovate then this data suggest that the innovation capability of approximately 50% of participant companies has improved as a consequence of participating in the program.

3.1.2 Innovation champions

Further evidence of the increase in innovation capability has been the identification of a cohort of ‘innovation champions’ within individual participating meat processing companies. ‘Champions’ have, typically, been identified on the basis of their heavy involvement in multiple projects (i.e. 4 or more) over the life of the program. A positive aspect of the program is a willingness to support plants and individuals who are willing to take a risk on innovation. It helps change happen faster.

3.1.3 Innovation manager’s network

MLA has further responded to this opportunity by initiating the formation of an Innovation Manager’s Network. These ‘innovation champions’ participated in 3-4 network meetings/activities during 2004-05 which focused upon elements of the following;

- Skills development training/workshops to address identified needs
- Communication of outcomes of MLA R&D programs
- Linkages with R&D and technology providers
- Introduction to a web-based innovation toolkit
- Participation in other innovation networks and site visits to innovative companies (broader than the meat industry)
- Innovation benchmarking

Approximately 15-20 companies or about 10% of the industry have been targeted initially in this pilot project. Networking is one aspect of demonstrating commercial benefit to the industry.

3.2 Accelerated the adoption of R&D outputs

MLA uses various pathways to accelerate adoption of innovations within the processing sector. These adoption pathways are normally specific to the particular technology or innovation, but can be broadly classified into four categories:

- Commercialisation (user-pays);
- Communication (free-to-air);
- Capacity building (Processor Network Groups); and
- Policy adoption (Industry Best Practice Guidelines).

3.2.1 Syndication

The diagram below (Figure 7) shows how MLA uses project syndication (multiple sites) as a means of facilitating industry adoption via the ‘user-pays’, commercialisation pathway. (Refer also to Figure 1 for context.)

Processors collaborating through syndicates, share the risk of R&D.

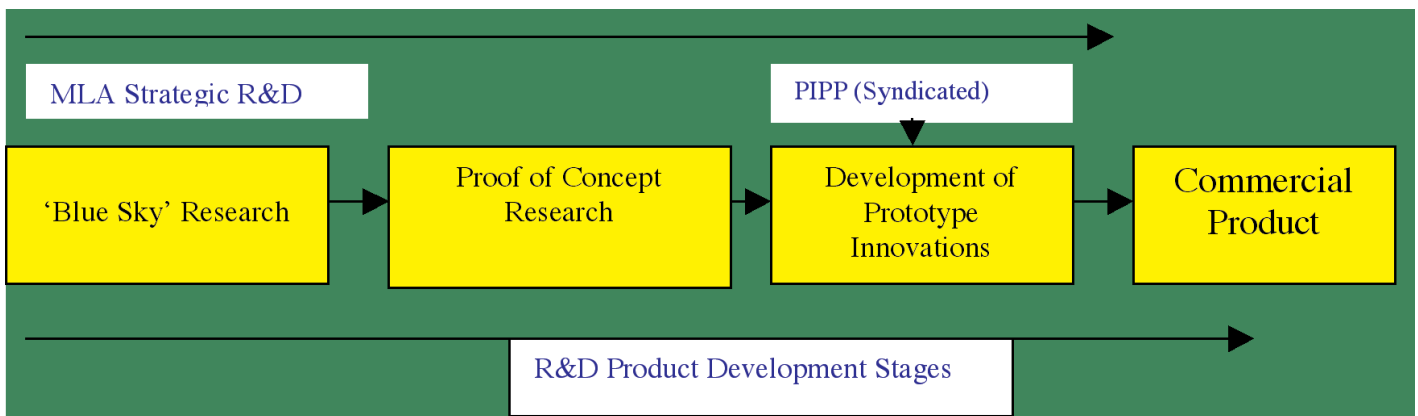


Figure 7: PIP syndication process to share risk and speed uptake

The program has used a multi-site syndication approach in areas where the processing sector has a high priority, strategic need for innovation at the individual enterprise level, such as; reduction of environmental compliance costs, reduction of OH&S costs, improving meat eating quality, rapid implementation of eBusiness tools, and process automation to manage labour supply shortages.

These multi-site project syndicates both compress the adoption cycle for innovations and reduce project risks, by amortising R&D costs across a number of companies. The result is the creation of critical mass (various prototypes) and subsequent diffusion of innovation to the rest of the industry. Therefore, more companies get to access the benefits of innovation faster and with less commercial risk. A number of case studies supporting this document will provide specific examples of how innovation uptake has been accelerated through project syndication.

3.2.2 DIY kits

An alternative method of accelerating adoption of R&D outputs has been the publication of “Do-It-Yourself” (DIY) technical kits. This free-to-air communication process is targeted at small to medium size (SME) meat processing companies.

The DIY kits are designed to contain simple written instructions, materials lists, sketches, diagrams, and photographs to assist SMEs to undertake low-risk innovation projects. The kits have proven to be a great source of ideas, a starting point for ‘innovation champions’, an aid to implementation of new ideas, and a source of encouragement and challenge to ‘would be’ innovators in the industry. A total of three DIY kits have been created from program outputs so far. Examples of these are contained in appendices to this document.

3.2.3 Other strategies

Further work through the strategies of: Innovation champions; Innovation network; PIPP workshops; and Publications, will further this aspect of the demonstration process as outlined earlier in Figure 4.

3.3 Emergence of an industry innovation culture

The emergence of an innovation culture is obvious from an examination of the growth in both the program portfolio value and expenditure for the program since its commencement. Figures 8 and 9, below, indicate that the program portfolio increased by 75% to \$28 million with an accompanying forecast increase in annual program expenditure of 60% to \$6.7 million in the year following this review.

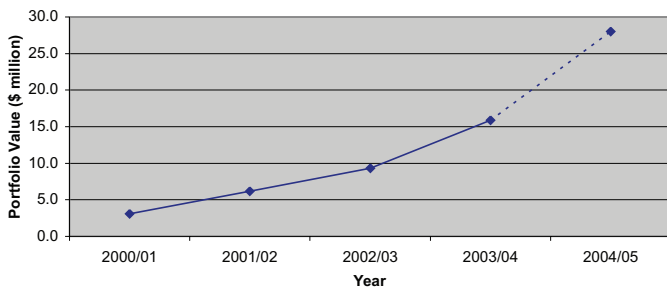


Figure 7: Demonstrating ongoing growth in projected portfolio investment

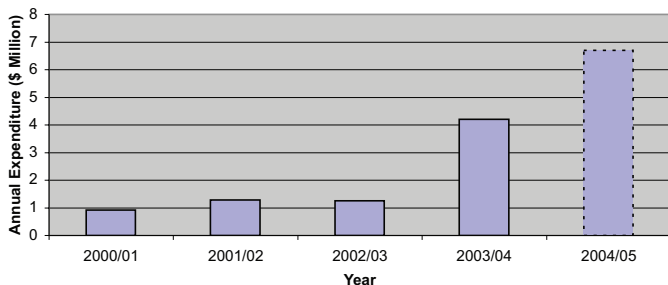


Figure 8: Demonstrating growth in direct project expenditure

This growth is primarily derived from the increasing confidence that the processing sector has gained in undertaking innovation projects. (A company’s past positive experience with a PIPP project enhances its innovation culture, in turn, lifting its engagement rate with the program.)

Benefits of PIPP

1. Ensures Program relevance through users owning the R&D agenda;
2. Focuses on real problems facing plants
3. Develops skills/capabilities of plants to undertake R&D
4. Develops critical capacity across sector to evaluate R&D
5. Creates more benefits from R&D matching grants
6. Links directly into other MLA Programs eg Scholarships, compliance
7. Develops an innovation culture
8. Operates closer to commercial end of the R&D cycle therefore speeds up the process.

The innovation culture is being driven by the evolution of plant-based, core processing competencies, which, more accurately, align manufacturing capabilities with customer requirements. Improved R&D capability enables plants to pursue a unique competitive advantage based upon their business and manufacturing model. The alternatives are ‘one size fits all’, or reliance on outsourced capability and vulnerability to competition sharing in the benefits. In future evaluations, further differentiation should be noticed as a lag indicator after critical mass develops.

Some tales of success

The Singing Slaughter Floor (PIP.015)

What happened?

On the Slaughter floor, workforce injury lost time ran through the roof with two major claims for around a quarter million dollars adding to the burden. The slaughter team was suffering early burn-out.

A team was put together, comprising union and management and undertook an investigation using RIMS. A full ergonomic assessment of risk-critical tasks was undertaken across the whole site. It might seem like a huge job but it certainly paid off!

The team worked with the Engineering Department to look at all risk tasks – most critical task was ‘cutting’ and no one would rotate through it because of their perception of high risk, based on witnessing the broken down guys. So they set about using MPA&RIMS to design a new cutting line.

Why is it significant?

While it is a revolutionary concept for small stock, in reality, it is an adaptation of concepts used in beef slaughter! It was quite simple, reliable, and low cost. It eliminated OH&S problems for cutting, and improved morale across the floor. They’re singing now! In addition we introduced the ‘return-to-work’ program. It allowed us to measure every job and develop a RTW program identifying 20 positions with tasks allowed by injury around the Program.

What difference will it make?

It significantly decreased the plant’s OH&S Premium based on more rapid Return-to-Work.

Recommendation

Promote and replicate across several pilot sites/slaughter floors in 07 for short term.

Cargills Floats to the Top. (PIP.012)

We wanted to add an additional shift here at Cargills, Wagga Wagga, but our current wastewater performance prevented us. We needed to improve our wastewater performance through better quantification processes and management of waste streams.

We did lots of clever measurement and assessment on a range of waste water streams which we had not previously done and then compared our performance with existing MLA data from other plants. As a result, we were able to identify our worst waste streams and, from the data collected, design and build a new air flotation cell that has significantly improved the quality of water discharged from our plant.

In addition, Wagga Wagga City Council has been able to use our data in developing a new water treatment facility nearby. Our data is also a useful addendum to existing industry data concerning waste water.

Why is this a significant story?

Our project not only allowed us to improve our environmental performance but also allowed WWCC to improve its environmental performance.

More importantly for us it allowed us (because of improved environmental performance) to add our extra shift.

What difference will the change make in the future?

It will allow the meat industry to improve environmental impact in the future.

Recommendation

That MLA/AMPC establish the benchmarking data and the methodology to roll out learning across the industry.

Better Boning Technology: Better Business (PIP.054)

The plant had a boning room that was set up for solo boning. It worked well, but it was hard for boners because the heights were all wrong, making it hard physical work. Solo boning stations create variable output and variable quality as a result of the varying skills of the individual boners.

The company wanted to investigate the Proman, mechanically assisted deboner, using 2 teams rather than 8-9 individual boners. This has resulted in reduced effort and more consistent quality of outputs with workers feeling far less fatigued. The teams believe it will 'extend their useful life as a boner' because it does less damage to their bodies. Thus the workforce has received an intangible benefit while the plant gets financial, yield and productivity benefits, as measured by the researchers.

Why did the company introduce this technology?

The company wanted to improve the conditions of the boners, not only for OH&S reasons, but also because we are located in a low unemployment region and it is difficult to get replacement labour. The project demonstrates that alternative technologies can produce a multi-layered benefit.

I believe that such a slow uptake of alternative technologies is a "hangover" from the Murgon and Fututech trials of so long ago, and it shouldn't take industry so long to 'move on'. Now that this "breakthrough" has happened, industry 'open days' are being better attended and others are looking at OH&S more sympathetically.

Once tally systems converted to multi-shift, and work limitations were removed, there has been more work for the boners and slaughtermen, creating a longer "lifespan" on these tasks before they have to be transferred to other tasks.

In the future

This was a demonstration project to get industry to focus on OH&S and technology issues. Industry is still getting over some of the issues surrounding "technology" investment, generally. Success like this might encourage a more positive assessment. These types of technologies also are a good enabler for 'trace-back' systems.

Recommendation

Anybody building a new boning room, who is not considering these types of technology seriously, is very likely to be trapped by old technology.

EAN Integration (PIP.103)

EAN Integration at Nolan Meats to Demonstrate the Use of the EAN.UCC System in the Meat Processing Supply Chain and Processing Environment

Project Aims

There are significant benefits to the meat industry in moving to an e-business environment. However, there are different coding and communications standards in place between plants and levels of the supply chain. This project demonstrates the implementation of internationally accepted standards and the benefits of a standard system.

This project demonstrates the benefits of e-business using internationally accepted standards.

- To demonstrate an EAN compliant e-business system installed at a meat processing plant (Nolan Meats).
- To show the benefits of implementing an e-business system.

Background

This project is one of a number being undertaken on a joint basis by the Queensland Department of State Development and MLA. These projects are aimed at endorsing a) the use of open standards in the meat industry and b) the uptake of EAN.UCC data coding standards. Collectively, these projects cover the range of cattle production, meat processing, transport, domestic and export distribution.

While some of the larger meat companies operate in an integrated manner along the length of the supply chain, the majority of the companies involved in production, processing and distribution, only operate in parts of the supply chain, and need to interact on a detailed level with other companies. With individual companies using different systems, software and standards, electronic communication between companies is often difficult, with the result being that significant amounts of data is entered manually into plant management systems (often more than once) with a physical paper delivery system between companies.

EAN standards provide for reliable, unique and globally consistent, product identification, which: supports best practice through procurement, replenishment and logistics; reduces supply chain costs; and, improves traceability.

The adoption of EAN.UCC standards for product description and numbering codes will provide the basis for EDI (Electronic Data Interchange) between companies in the development of the e-business model. Benefits will be derived from: the timely arrival of accurate data, standard descriptions and numbering between organisations; reduction in data input errors; and the reduction in the use of paperwork and forms.

Description of Project

This e-business project with Nolan Meats allows a number of scenarios in the e-business model to be implemented. Nolan's is to a certain extent an integrated operation with the company owning feedlots, a processing plant and off-site cold-storage. However, the internal resources of the company can only meet a portion of the needs of the company and, therefore, there is a requirement for interaction with external companies, such as AACo to meet all its business needs.

To carry out the project Nolan's needed to implement the use of EAN.UCC codes within its operations and, then, implement the use of EANCOM-compliant messaging systems (both within its own operations as well as with its business associates), to provide a fully compliant EAN system. The project was based on three linked stages:

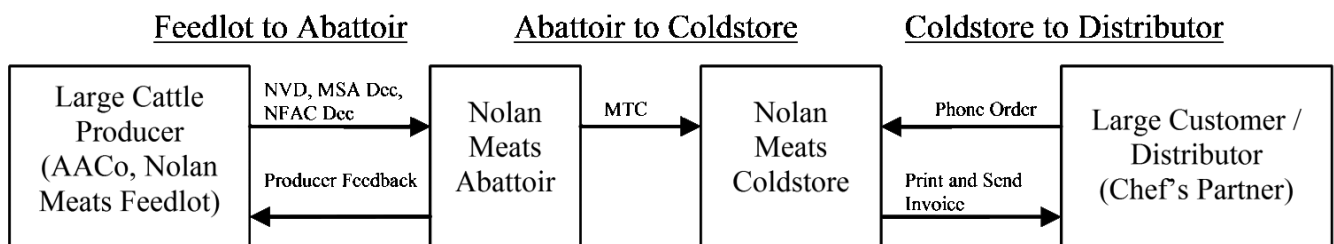
- First, a review of the company's present systems and determination of benchmarks.
- Second, implementation of existing systems and equipment to use EAN compliant numbering systems, and
- Third, implementation of EANCOM-compliant messaging systems.

Installation and Evaluation

An audit of the present systems identified areas which needed improvement - particularly in the double entry of data. The introduction of EAN.UCC was also identified as having the potential to reduce the physical number of documents including the following:

- Combining NVDs, MSA Declarations and NFAS Declarations into an electronic version.
- Notifying Consignors of receipt of cattle electronically.
- Sending producer feedback electronically.
- System generated electronic MTC's (Meat Transfer Certificates).
- Sending consignment information electronically to major customers/distributors.
- Receiving notification of receipt of goods by customers.

With the current system at Nolan Meats, communication between trading partners is basic and still largely paper-based. This diagram (Figure 1) shows the significant flows of information between trading partners of Nolan Meats.



As part of the process the time and costs that would be saved at each data point were identified to give a framework to the expected improvements that may be expected using the EAN system. (Coding and communication).

Key to the success of the new system is the application of EAN.UCC bar coding and classification. It was identified that the new barcodes would be significantly larger than the existing SASTEK™ codes and that the new and old codes would need to co-exist in the system for a period of time necessitating the need for equipment and data systems to be able to handle both codes simultaneously. Consequently, a number of issues needed to be addressed:

- Labels needed to be redesigned to provide for the larger bar code.
- New labels would be required for both slaughter floor (hanging labels) and boning room (carton labels).
- New codes needed to be determined.
- Software needed to be modified and upgraded to handle the new codes and the co-existence of the original and new codes.
- New printers would be required to print the new labels.
- Staff training in the new systems and codes would be required to ensure a smooth implementation.

The change in the bar codes on the labels was significant, with the new EAN barcodes carrying 44 numbers compared with the 16 numbers in the SASTEK™ code, requiring finer lines to fit onto the labels. There was some concern with the need to read the codes without error in the same time as the old bar codes and, on this basis, the barcodes were made wider, new Datamax printers installed and, an extensive program of testing undertaken.

With the new EAN bar codes, systems and labels, in place the company was ready to move on to implementing EANCOM systems for messaging and communicating between systems on different sites and with other companies.

The ultimate goal of the new system was to allow Nolan Meats to replace the paper-based system with a wholly electronic system. To do this a number of the documents needed to be redesigned to fit the new systems and provide traceability for the product through the supply chain.

With the implementation of electronic messaging at Nolan's the flow of information is much faster, allowing data to be sent ahead of loads, removing double data-entry from the supply chain.

Summary

The implementation of EAN.UCC coding systems and bar codes, along with EANCOM messaging systems, provides Nolan Meats with a globally recognised system of coding products. At the same time it has reduced operating cost by reducing labour and eliminating paper documents, while also improving the accuracy and timeliness of data both internally and externally with suppliers and customers. The EANCOM messaging system is based on simple e-mail systems giving it a simple and universal interface - while requiring very little bandwidth - making it suitable for communication with producers on dial-up lines.

Implementing EAN.UCC coding and EANCOM messaging moved the company to the use of global standards, reduced costs and errors and provided traceability of product. On the basis of the results of this project it can be extrapolated that for a plant processing 500 cattle per day savings in data entry and document checking may be reduced by approximately 5 to 6 hours per day. In addition supply chain cost savings of over \$1,500 per day may be achieved.

Contacts

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Further information on EAN codes etc is also available from

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Automated Skin-on Goat Processing (PIP.065)

Adaption of pig processing equipment to dehair goats

Project Aims

- Find suitable equipment for dehairing pigs and adapt it to work effectively on goats.
- Demonstrate that goats processed through the new system comply with the food safety requirements of importing countries.

Introduction

Many of Australia's export markets for goat prefer skin-on to skin-off carcasses. But dehairing goats to produce skin-on carcasses is labour intensive and causes downgrading due processing defects and poor microbiological control. Norvic Food Processing has taken equipment used for automated dehairing of pig carcasses and adapted it for use with goats. After modification to the dehairing equipment and restraining race, a successful system for dehairing goats was installed. The new system increased throughput and reduced labour. Production costs were reduced by \$4 per head and defects from dehairing were cut from 5.6% to almost zero.

Major Outcomes

1. Automated pig dehairing equipment shown to work with goats.
2. Labour costs reduced by \$4 per head
3. Quality improvements worth \$200,000 per year

Description of project

In the first stage of this project modern automated pig scalding and dehairing equipment with throughputs up to 400 pigs per hours was examined at three processing plants. Tests showed what type of scalding and dehairing equipment might work with goats and what type of modifications would be required.

In the second stage, Norvic Food Processors visited several European manufacturers of pig scalding and dehairing equipments. After evaluation of the equipment Norvic decided to commission JWE from Germany to build and supply an integrated scald and twin chamber dehairing system. From the experience of the first stage of the project the new scalding and dehairing equipment was built with some major design variations.

Apart from the modifications to the scalding and dehairing equipment, it was also necessary to design and build a new goat restrainer that could feed goats to the slaughter floor at a rate to match the dehairing machine. Goats are fed from the restrainer to a horizontal bleed conveyor where they are bled in accordance with Halal requirements. The existing bleed conveyor was used with the new dehairing machine but modifications were made. These modifications included raising the overall height, constructing a raised working platform with sterilisers, arm washes, and apron wash. The restrainer and bleed table are shown in Figure 1.



Figure 1: Modified restrainer and bleed table installed with automated dehairer

At the discharge from the dehairer, the dehaired goats are transferred to the smallstock chain with an ergonomically designed transfer conveyor.

All the new equipment was modified as required to make sure it complies with OH&S requirements. This involved fitting new stands, guards around the equipment, interlocks and emergency stops.

After the equipment was installed and commissioned, the performance of the new system was compared with the old dehairing system. The detailed comparisons included an assessment of how much labour was required to operate each section of the two systems; what type of goats could be processed; what throughputs could be achieved; and how many defects occurred. In addition samples for microbiological testing were collected from chilled goat carcasses.

Evaluation

The new scalding and dehairing equipment resulted in an increased throughput of goats, at a reduced level of manning. Labour costs were reduced due to the increased productivity and reduced manning. There were additional labour savings because the new equipment almost eliminated defects and this reduced the requirement for retaining and trimming carcasses. The reduced trimming saved two labour units.

The types of defects that occurred with the original dehairing equipment included broken ribs, torn muscles and beater marks that resulted in heavy trimming or rejection of carcasses. These defects were almost eliminated with the new equipments.

Table 1 summarises what was achieved with the new equipment in comparison with the original dehairer and what Norvic hope to achieve in the future.

Table 1: Comparison of the productivity of the original and new skin-on goat processing equipment

	Original system	New system	Norvic long term target
Throughput per shift	800	1200	1200
Labour units	16	12	6
Reduction in labour cost	0	\$4 per head	
% hair removal	70	>95	99
% carcasses rejected	5.6	<1	<1

The microbiological status of skin-on carcasses processed through the automated dehairing equipment was excellent. No Salmonella were detected on any samples. All samples had total counts of less than 1000 per cm² which is in the excellent range according to the Meat Standards Committee guidelines for microbiological testing.

Output

The project has clearly demonstrated that the automated scalding and dehairing equipment used in the pig industry can be adapted for use with goats with improvements in throughput and product quality and reductions in production costs. The system has been in continuous use at Norvic since the completion of the project. There is a report that explains what modifications were made to the equipment. It provides a detailed comparison of the performance of the new equipment with the original equipment. There is also a report that details all the modifications that were made to the equipment. An open day was held at Norvic to display the dehairer on 25/5/05.

Outcomes

The automated dehairing system has allowed a wider range of goats to be processed for the premium skin-on markets. Costs of production have been reduced by about \$250,000 per year compared with the original system. Improvements in product quality have reduced losses due to rejection of damaged carcass by about \$200,000 per year.

According to Norvic the cost of the project was about \$1.3 million including purchase of the equipment and the savings have been about \$450,000 per year. MLA's budget for the project was \$692,000.

Another abattoir could install similar equipment at a lower cost because the work that went into redesigning off-the-shelf equipment has been fully documented.

Although this project is considered by the abattoir management to be very successful, opportunities to transfer the technology to other abattoirs is limited. There are currently only two other export goat abattoirs and exports of skin-on goats have receded in favour of boneless skin-off goat meat to North America.

Summary

Norvic Food Processing has successfully selected and adapted pig scalding and dehairing equipment for use with goats. This has improved the productivity of processing skin-on goats and has also improved quality and reduced costs.

Contacts

Plant	Commercialiser	Researcher	MLA Contact
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High Speed Sorting and Labelling at Tabro (PIP.095)

The development of equipment to label meat cartons at up to 18 cartons per minute

Project Aims

- To develop a weigh / labelling system that will operate at 18 cartons per minute.
- To develop a label applicator that will apply labels to the leading face of the meat cartons as they travel along the conveyor.
- Complete and install a production prototype at Tabro.

Increase labelling speeds while cutting costs.

Background

Tabro Meats is a Victorian processor that exports product to North America, The Middle East and Asia. The company operates a significant hot boning program for manufacturing meat export to the USA and was looking to expand the operation of this product line. The expansion of the plant to meet a higher processing capacity highlighted the constraints of the present weigh/label set up at the plant. The existing installation consisted of two lines each operating at 6 cartons per minute, however this was inadequate for the increased production and the need for a 3rd line was recognised to complete weigh/label tasks in the required time period.

An alternative approach was also identified however and it was decided in consultation with Sastek, as the equipment supplier, to consider the development of equipment to operate at a rate of 18 cartons per minute to allow the company some headroom to further increase production in the future and make the technology more widely useable in the rest of the industry.

Description of Project

The project was approached in two phases:

- To increase the throughput of the system to 18 cartons per minute up from the existing 6 cartons per minute/line.
- To develop an efficient automated label application device that allows the cartons to travel with the narrow side leading. This orientation is necessary for other high speed and operator free systems such as automatic ladders etc.

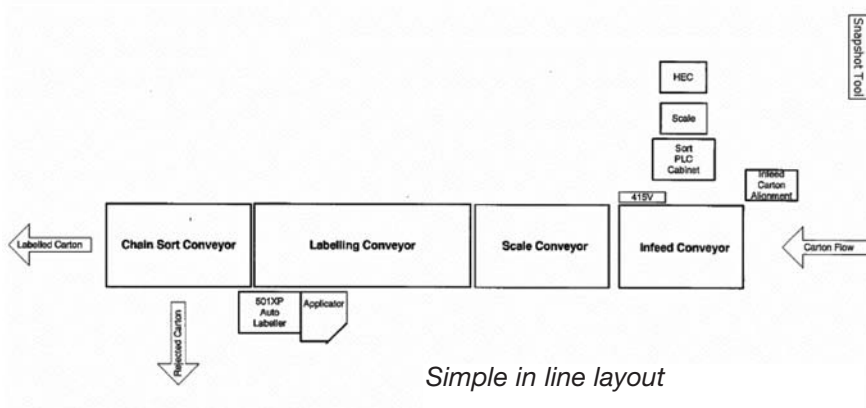
An initial comparison was made between the equipment that could be supplied and the specification for the project and the gaps identified. These were essentially:

- The required speed of operation of the equipment and the need to fit this within the confines of the existing process line and without significant alteration to upstream and downstream equipment and functions.
- The need to accurately apply the labels to a variety of carton sizes.
- The speed of operation of the label applicator and the need to space the cartons.
- The management of information of a number of cartons in the system at the same time.

To address these issues the development focused on:

- The development of a database to track cartons in the system.
- To be able to adjust the speed of operation, the arm is equipped with a variable speed motor.
- To ensure accuracy of label placement the arm is constructed as a rigid space-frame structure with the label held on an EVA foam pad, specifically chosen for its performance in a wet environment, and located with guide pins.
- A number of sensors were also included in the equipment to ensure that the equipment is functioning correctly, such as ensuring that the arm has returned before feeding the label into place etc.

Following the design, construction and testing in the factory the unit was installed at Tabro and tested up to design speed.



Summary

This project further developed existing technology to meet the needs of processing at higher speeds while reducing the costs of operation.

In this instance the plant has been able to reduce 2 processing lines to a single line reducing labour requirements while gaining the ability to further grow the operation.

Funding the development (but not the equipment) by MLA provided a solution that is available to the industry through the supplier since as a one-off development it was unlikely to be cost effective. With the current arrangement this performance improvement will be able to be built into future systems at moderate cost.

Estimated saving of approximately \$200,000 pa at the plant provides a payback in months, rather than years.

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
Tabro Meats Contact: Mr Jim Nolan Ph 03 5684 9300	Sastek Pty Ltd Contact Mr Craig Daff Ph 07 3633 4905 Fx 07 3268 6163	Sastek Pty Ltd Contact Mr Craig Daff Ph 07 3633 4905 Fx 07 3268 6163	Mr Sean Starling Ph 02 9463 9333

Evaluation of Effect of Knife Sharpness on Production and Safety (PIP.088)

An attempt to quantify the relationship between knife sharpness, training and experience

Project Aims

- Identification of the effect of sharpening methods.
- Identification of the effect of training procedures on knife sharpness.
- Identification of the effect of knife sharpness on OH&S costs and productivity measures.

Story

John Dee Warwick has attempted to quantify the relationship between knife sharpness and OH&S issues. Despite a shortage of labour and difficulties in applying trial protocols, this project has identified the importance of training and experience in knife sharpening. However it has raised many more questions. Further work in this area is planned that may provide the required answers.

Description of project

The Australian red meat industry has on-going problems with OH&S resulting in prohibitive insurance & legal costs and a decrease in quality of life for many injured workers. While many injuries are as a result of accidents, there is increasing evidence of repetitive strain injuries, that can result in greater long-term discomfort. One of the major factors contributing to RSI is believed to be the sharpness of knives. The sharper the knife, the less the risk of RSI. Employee perceptions of what is sharp are subjective, unknown and inconsistent.

This project is an attempt to quantify sharpness and to investigate its relationship with training, and the outcomes of yield, injury rates and OH&S costs. Trials were conducted at John Dee Warwick Pty Ltd over a six-month period (although a shortfall occurred in the scope of the work covered due to labour shortages at the abattoir). Yield determinations were in particular omitted from the trials.

An Anago KST 200 sharpness-testing device was used to determine the sharpness of knives throughout the trial. This device tests the force required for a knife to cut through a tensioned material. While it was found that the device is subject to operator error in carrying out the measurement, suggestions have been made to improve the device to give more repeatable results and some quantifying of sharpness was successfully achieved.

Trials were carried out comparing trained and untrained knife hands. The subjects chosen for this study were, ideally, workers who were relatively new to the industry but, due to the availability of labour included workers with a range of experience levels. They were split randomly into 2 groups with the “trained” group receiving an initial training course in grinding, stoning and steeling following the company trainer’s method of knife sharpening. The trainer they used was recognised as the most consistent knife sharpener and always able to obtain a ‘sharp’ knife. His method was followed by this group throughout the trial period with follow-up training as required.

The control “untrained” group carried out knife sharpening as they always had with no new training or additional assistance given. Both groups were given new knives to carry out their day-to-day tasks. Both groups had their two knives measured once/day. Comparisons were made with the trainer’s knife as a benchmark.

This trial showed no difference between the ‘trained’ and ‘untrained’ groups even when data from inexperienced (less than 2 years) employees were compared. Comparisons were also made between styles of grinding. Hollow ground, flat ground and unground knives showed no statistical difference. Mondays were determined as the worst days for sharpness and Fridays the best.

Comparisons between departments showed that the slaughter floor achieved the most consistent and sharpest knife results, with the boning room achieving results almost as good. The slicers and trimmers achieved similar results to each other but, neither as consistent, nor as sharp, on average, as the boners. The offal room achieved the worst results, with very inconsistent results and the lowest average scores. Most new employees are placed in the offal room to begin with, confirming that the most likely factor to a sharp knife in the meat industry is experience rather than training.

The injury statistics indicated that the control group improved in safety during the trials compared to the six months prior to the trials, and had fewer knife-related injuries than the trained group during the trial period. The reduction in knife-related injuries was thought to be a result of heightened awareness of knife handling. Because there was no improvement in knife sharpness for the trained group, no correlation between knife sharpness and injury data could be made.

Management at John Dee are convinced of the importance of training in knife sharpening and are eagerly awaiting the video on sharpening and assessment that will be available to the meat industry from this project.

Evaluation:

Key points to note from this project are:

- No correlation was demonstrated between training and knife sharpness but management is confident that it exists.
- Knife sharpness was directly related to level of experience
- The best knife sharpening person was not necessarily the best trainer for knife sharpening technique
- The trainer's technique of producing a thin edge may not be the best technique for inexperienced staff.
- Inexperienced employees should be encouraged, under controlled conditions, to use a knife-sharpening machine to achieve consistently good results, until experience could be gained. Sharpening machines give inexperienced sharpeners the potential to achieve a better result than with manual sharpening.

John Dee Warwick is planning to progress this work in follow-on projects.

Summary

John Dee Warwick Pty Ltd has made an attempt at quantifying some of the issues relating to knife sharpness and OH&S. While the key issue of experience has been highlighted by this project, many more questions have been raised and remain unanswered. Until experience is obtained, the use of a range of sharpening machines should be considered in a controlled environment.

The issue of knife sharpness remains an important one but any plant pursuing this issue in future is recommended to plan well and ensure that the trial protocol, and time and labour resources, are adequate to achieve the desired outcomes. Management at John Dee Warwick are convinced of the importance of training in knife sharpening and are continuing with a program of identifying the best trainer to maximise the impact of this program. They believe that other processors should be encouraged to focus on knife sharpening training as a potential means to reduce OH&S costs.

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
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Robotic Kidney Fat Removal at Colac (PIP.069)

The development of a commercial robot with a proprietary vacuum system to automate kidney fat removal

Project Aims

- To apply standard robotics to the task of kidney fat removal on sheep and lambs

Background

This project is one of a number of MLA projects that are aimed at the application of robotics to meat processing tasks, particularly on the kill floor. Kidney fat removal (on sheep) has always been a mechanical, repetitive operation. While the physical task has been made less skilled and cleaner by the use of a vacuum nozzle and collection equipment it has not reduced the tedium of the task. Projects to apply robotics to sheep processing tasks have been carried out previously with the most notable being the Y cut robot for front leg opening on sheep.

While still dealing with a naturally varying product this project had the advantage of the sheep hanging on all 4 legs with the front legs captive in the carrying forks as a reference point. For this project the carcass is suspended by only the back legs only and able to swing, this provides a whole new challenge to locate the position of the tool and carry out the work.

Description of Project

While the objective of the project is a relatively straightforward statement “to replace the operator performing the task of kidney fat removal with a robot” the reality of the task is not that simple with a number of factors needing to be investigated and solutions trialled and proven before installation in a working abattoir.

- The correct point of insertion in the body needs to be determined with respect to a fixed point relative to the meat rail. Due to the different sizes and breeds processed at the abattoir this turns out to be a range of points and needed to be researched (see Figure 2).
- The action and effectiveness of the suction nozzle needed to be assessed - while an operator can look at the carcass and adjust his hand action, the robot needs to perform a common task on each animal with an acceptable result every time.
- The design of the robot action needs to be such that it can traverse the nozzle with the moving carcass.
- The robot is replacing one worker and task on the chain and therefore the space taken up should be a minimum, to allow general application in Australian plants.

To enable the variable to be assessed an animal hanging frame was set up at Food Science Australia complete with an IRB4400 robot and Kentmaster vacuum system. With this set up a number of animals were measured (results shown in Figure 2), from the graphs it can be seen that the V position has some correlation with the fat position, however it can also be seen that for animals 5, 6 & 7 although having a common V height the fat position varies by up to 50mm. This is then accommodated in the (over) travel of the nozzle.

Kidney fat removal is a tedious task – this project seeks to apply robotics to remove the labour.

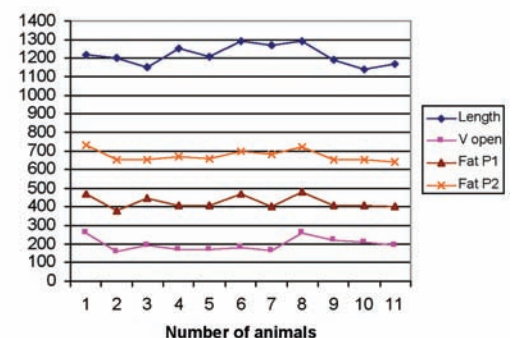


Fig 2 – Various points on animals relative to size

During this testing it was also found that while the larger animals were relatively stable the lighter animals tending to swing when the nozzle ran over the rib cage, enquiring the nozzle to be redesigned.

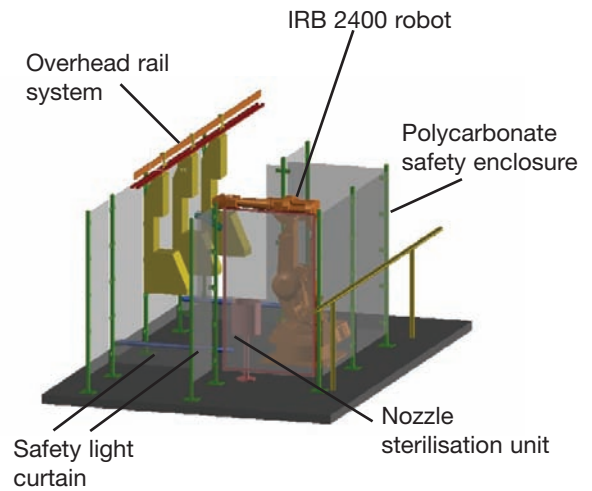
Unattended automatic machinery on a manned processing floor is always a significant safety hazard and this installation is no different.

To provide a safe working environment the robot is installed inside a polycarbonate enclosure, with light curtains at carcass entry points as well as a number of emergency stop buttons located around the equipment.

An 82°C steriliser is also part of the equipment supply and is located within the robot safety cell and being built into the program of the machine, this is one function that is never omitted by the operation.

The robot is also fully integrated with the chain functions, hence, if the chain speed is changed, stop, starts etc the robot and vacuum system stay in synchronisation.

In operation the equipment has proved to be very reliable with over 600,000 carcasses processed through the machine up to the end of commissioning and reporting. Residual fat measurement shows the equipment to be equal to or better than the manual process for a range of animals.



Summary

This development demonstrates the successful application of robotics to particular slaughter floor tasks. With the economies derived from using off-the-shelf equipment this equipment used in a double shift plant would provide a payback for the company of well under two years by removing at least one person from each shift.

The equipment removes the tedium of the task, frees up labour for other activities and removes OH&S risks without any degradation in product quality.

The developed equipment effectively removes kidney fats in sheep and lambs without loss of quality and with reduced labour costs.

Contacts

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Innovation and Energy Management and Reduction (PIP.014)

Saving money by understanding and controlling energy resource utilisation

Project Aims

By benchmarking current resource consumption levels, identify improvements in efficiency resulting in:

- Maximised plant efficiency
- Reduced operating costs
- Reduced emissions
- Freed up capital for other improvement projects

Story

Midfield Meats has effectively established a resource management system that has enabled them to significantly increase the efficiency of their refrigeration and hot water boiler systems. In doing so, they have established a system that can easily identify the effects of changes to equipment and procedures.

Description of project

Midfield Meat International's abattoir in Warrnambool is typical of all abattoirs in that it has large demands both for electricity to operate its refrigeration system and gas to operate its hot water supply. Existing systems have evolved, since the plant was built some 10 years ago, on the basis of demand rather than energy efficiency. The existing systems provided refrigeration at -14°C and -42°C but at variable Coefficients of Performance (COP). Performance was difficult to determine, as there was insufficient information available on the power inputs to achieve the required refrigeration outputs. In addition, the liquid management system had no real control and caused costly plant restarts, that affected maximum demand. This general lack of refrigeration system information and control systems resulted in an efficiency of only 55% which was costing the company money.

In addition, the boilers for hot water generation were inefficient, failing to use waste heat from the refrigeration compressors and returned hot water from the slaughterfloor. 42°C water for general hygiene purposes was being generated from 86°C steriliser water and, as a result, the overall efficiency of the hot water system was determined at 72%.

Midfield management, through this project, put in place the means to measure and monitor resource usage. Data collected from a range of in-line monitoring devices fed information back to a Citect SCADA system. Midfield was then able to identify areas for improvement and took steps to correct performance by focusing on:

- Condenser capacity
- Condenser & suction piping size
- Automatic line purging
- Refrigeration controls
- Demand defrost controls
- Energy efficient doors
- Variable speed fan drives

Major Outcomes

- Refrigeration COP increased from 1.0 to 4.4
- Boiler efficiency increased from 72% to 85%
- The ability to determine the effect of equipment & procedure changes on resource usage

- Town & bore water usage
- Effluent discharge
- Gas usage in boilers
- Reducing reheating of hot water
- Identifying clean stream flows that had potential for reuse in yard washing etc

Effective outcomes were achieved in refrigeration, water, gas and Citect management systems including:

Refrigeration - As a result of this project the refrigeration plant is now running to maximise the plant's power factor resulting in some redundancy in equipment, such as unused refrigeration compressor capacity with reduced operating costs.

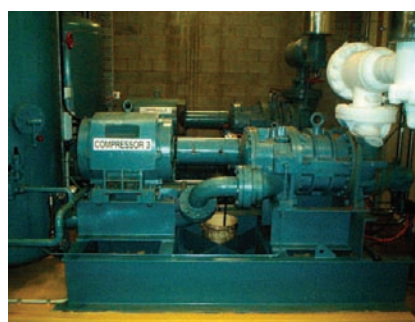
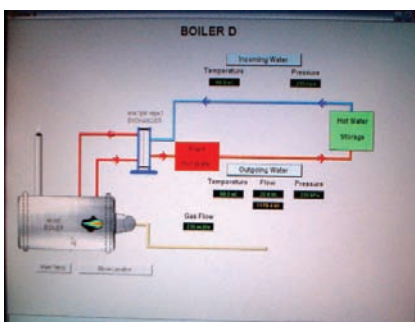
Water – By closely monitoring input/output measurements, management can now rapidly determine how new equipment and changed procedures affect water use. Any plant changes can now be measured. The system even segregates cleaning activities from production and can measure the impact of changes to cleaning systems.

Gas – Equipment is in place to determine water heating costs and boiler efficiencies. To date, this system is neither fully understood nor utilised to its potential by Midfield Meats.

Citect management system – This can be extended beyond this project to be a long-term management system for operating refrigeration and boilers providing auto start/stop and control.

Additionally Midfield has access to current, live and historical data, which can be used in any feasibility studies in the future. They are currently using this data to assess the economics of co-generation, and other environmental opportunities and have used it to report on the Greenhouse Challenge and the National Pollution Inventory.

Midfield has found that having reliable data, to make decisions about further improvements, is a significant outcome from this project.



Evaluation

As a result of this project, Midfield Meats have been able to increase refrigeration COP from 1.0 to 4.4 and increase boiler efficiency from 72% to 85%. This is a significant improvement in energy efficiency and has resulted in considerable, but as yet unquantified, cost savings. However, management has learnt that the investment in information collection and its usage in a control system is only of value if it is used. Midfield Meats have taken every opportunity to use this information to improve resource management systems.

Management at Midfield Meats recognises that the system that they have installed is not yet fully utilised or understood but has the capability to control many more resource usage activities and, hence, save the company considerably more money.

Summary

Through this project, Management at Midfield Meats have generated considerable information on resource usage and waste generation that has enabled them to implement systems to more efficiently control the use of electricity, gas and water.

Learnings from this project are directly applicable to other abattoirs and it is recommended that they should be applied wherever possible. To date, the project report does not include sufficient detail on activities and outcomes. However, MLA is expecting an expanded final report.

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
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Performance and Productivity Program (PIP.028)

Improving productivity through better team performance

Project Aims

- Develop electronic score cards to measure the performance of management and operational teams.
- Identify, quantify and demonstrate improvements in business objectives.

Introduction

The owner of Burrangong Meat Processors (BMP) Grant Edmonds recognised that the business suffered from high absenteeism, teams did not know how they were performing, there were productivity and quality issues and ideas for improvement did not get through. This is summed up in Grant’s statement “BMP has a clear objective to improve productivity, throughput and increase revenues. To do this will require our people to be fully involved and actively contributing.” To get people involved in the business, score cards to track measurable targets within a team’s control were developed. With people in control of and measuring their own performance business, measures of attendance, staff turn over, and sales all improved.

Major Outcomes

1. Teams are measuring and tracking their productivity and performance.
2. Communication between management and staff has improved.
3. Attendance is 93%, carcass sales have grown by 31% and offal recovery and sales have increased by 29% and staff turnover reduced by 2.8% per month.

Description of project

The operational teams at BPM all took part in this project. Initially, the management developed a score card outline which each of the operational teams could refine and use to track performance. The score cards were designed to track team performance in the key result areas (KRA) of:

- best people;
- operational excellence;
- safe/healthy workplace;
- customer satisfaction;
- financial performance.

Workshops were held to help operational teams to develop measures and targets for each of the five KRAs. The measures and targets could be controlled by the team and were clearly linked to BMP strategic and financial aims. The score cards were updated on a monthly basis. The figure below is an example of how results are presented for a selection of KRAs. All results from the five KRAs were presented on one page and the results for each target were colour coded according to performance.

Best people

Attendance rate
Pork Offal team
Actual: 92.5%
Target: 95.0%
Score: 97%
Owner: Team Ldr. Pork offal

Staff turn over rate
Pork Offal team
Actual: 0.0%
Target: 7.5%
Score: 999%
Owner: Team Ldr. Pork offal

Operational excellence

Overall yield POT
Pork Offal team
Actual: 75.8%
Target: 73%
Score: 104%
Owner: Team Ldr. Pork offal

PMG
Pork Offal team
Actual: 100%
Target: 100%
Score: 100%
Owner: Team Ldr. Pork offal

PMR
Pork Offal team
Actual: 100%
Target: 100%
Score: 100%
Owner: Team Ldr. Pork offal

Productivity POT
Pork Offal team
Actual: 262.4 kg/month
Target: 370.0 kg/month
Score: 71%
Owner: Team Ldr. Pork offa

Safe/healthy workplace

Incident hours lost
Pork Offal team
Actual: 7.6
Target: 0.0
Score: 0%
Owner: Team Ldr. Pork offal

Number lost time incidents
Pork Offal team
Actual: 1 incident
Target: 0 incidents
Score: 0%
Owner: Team Ldr. Pork offal

PPE safety and hygiene
Pork Offal team
Actual: 97.1%
Target: 100%
Score: 97%
Owner: Team Ldr. Pork offal

Total number of incidents
Pork Offal team
Actual: 7 incidents
Target: 1 incident
Score: 14%
Owner: Team Ldr. Pork offal

The score cards were developed within a data base which allowed for a variety of displays such as a team's monthly performance against the KRAs, graphical summaries of performance over time of any of the measures (called dashboards), feedback and suggestions for the month and ideas for the month. Display panels were mounted in the amenities room, training room, board room and maintenance area so that the measures and summaries were readily available for viewing by the teams.

The data base also provided reports to management such as internal benchmarks for attendance across all the teams, internal tracking of staff turnover, summaries of work stations and work practices causing accidents, summaries of compliance with OH&S requirements within teams and graphics of what type of accidents are happening and the lost time as a result.

Evaluation

The project involved the staff in the business by opening up details of business performance, providing the staff with a system of measuring and tracking performance within a team and enabling easy access to the results of measuring performance.

A number of lessons were learnt during the project. The main one was that middle level managers were reluctant to share information, open books and be accountable for their own performance. From the lessons learnt in the project, subsequent implementation of the performance and productivity program should be smoother.

As a result, there were immediate benefits of:

- greater levels of accountability and engagement from the workers;
- management and employees were more aware of what was going on;
- implementation of a profit share scheme based on prior month's profitability;
- being able to easily recognise the achievers.

Quantitative benefits have been:

- staff turnover reduced to 2.8% per month;
- attendance rate 93% across the plant;
- carcass sales growth of 31% and forecast to double revenues in 2006;
- offal sales up by 29%.

The performance tracking tool appears to have strong potential to improve OH&S.

The outputs of this project includes software that can be adapted for use at other abattoirs

The project findings were initially fully adopted by BMP. The implementation of the program has since lapsed due to pressures from a major expansion.

There were clear benefits in terms of staff attendance and turnover and increased sales. The financial impact of these benefits has not been released by BMP but they are substantial. For example the 29% improvement in recovery and sale of offal equates to about \$500,000 per year. This alone provides a 5 times payback of the project cost of \$94,000. However, after the initial momentum of the project it appears to be difficult to maintain interest in the performance tracking system because a limited proportion of staff are committed to the BMP business objectives. Thanks to the experience at BMP, subsequent implementation of the performance and productivity program should be more efficient.

Summary

Existing data base and graphics software has been adapted for use to record and track the performance of production teams at BMP. The process involved teams in setting targets and measuring their performance against targets. This has resulted in increased productivity, attendance, and reduced staff turnover. The benefits have easily exceeded the cost of the project.

Contacts

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Sludge Moisture Reduction Pilot Plant (PIP.034)

Dewatering DAF sludge to make it suitable for composting

Project Aims

- Determine whether a Rotary Drum Vacuum Filter (RDVF) will remove enough moisture from DAF sludge to enable processors to compost the material.
- Develop a process that has the potential to reduce the nutrients returning from abattoir waste to pastures.
- Produced a feasibility study for the RDVF process.

Description of project

A common problem facing abattoirs is the effective and efficient management of effluent. Dissolved Air Flotation (DAF) units are commonly used as primary treatment to separate solids from within the effluent. The sludge that forms on the surface of the DAF unit is often hard to handle due to the high moisture and fat content.

The Rotary Drum Vacuum Filter (RDVF) was seen as a potential solution to the difficulties associated with DAF sludge. This project sought to assess whether the technology could reduce the moisture level to 65% - where it was considered that the material could be handled and transported in bins or trucks, rather than in tankers. In addition, the organic content (measured as BOD) would be trapped in the solid portion making it easier to remove from site and the material would be in a state suitable for composting. A trial was conducted using a leased RDVF over an eight-month period and the output assessed on the basis of moisture and BOD reduction. The RDVF was fitted to existing infrastructure to prevent interference to on-going operations.

The RDVF trial allowed the prototype unit to be assessed under production conditions and information to be obtained on the capabilities and efficiencies of the unit. The results of the trial demonstrated that the RDVF is effective in moisture reduction. Although the objective of reducing sludge moisture to 65% was not achieved, the moisture was low enough to allow transport via bins, as opposed to tankers. Trial data showed that a reduction from average moisture of approximately 93.5% to an average of 75% was achieved. Prior to the trial the DAF sludge could not be composted and transport was only possible through the use of a tanker. During the trial, bins were successfully used for transporting caked material to composting sites and allowed material to be composted that, previously, was spread over unirrigated pasture. The results from the BOD tests indicated that the unit significantly reduced the levels of organic waste that would otherwise have been irrigated directly onto pastures. Reductions in BOD potentially provide efficiencies for processors concerned about the maintenance of soil nutrient levels.

Estimated costs to implement the RDVF on a full-time basis was estimated from the trials to be \$136,800 for two complete 8m² units with sufficient capacity to handle all DAF sludge from Fletcher International's WA abattoir. The capital cost was determined to be prohibitive under the existing circumstances.

In the period since the conclusion of the RDVF trial and the unit's removal from the treatment system, the DAF sludge has been spread over the pastures adjacent to the plant. The location of the plant is such that there is sufficient area available to rotate this activity around designated paddocks.

The return-on-income may be more favourable, however, where a processor did not have sufficient land available to dispose of sludge in this way and was required to use an external treatment option for a fee.

Major Outcomes

- DAF sludges effectively dewatered
- BOD loading effectively removed from pastures
- Economic viability shown to occur only under limited conditions

Evaluation

A common problem facing abattoirs is the effective and efficient management.

Key points to note from this project are:

- The RDVF successfully dewatered DAF sludge to allow handling and composting
- The trials proved that organic material (as measured as BOD) could be removed from soil spreading and irrigation
- RDVF is not an economic option unless off-site treatment costs warrant investment in this technology.

Summary

Fletcher International WA has shown that RDVF technology can solve the problems of materials handling of DAF sludges by effectively dewatering them. The resultant solids can be composted and used as a means of reducing the organic load that occurs from wastewater and sludge irrigated directly on to pasture. While the technology is effective, its implementation would only be viable when there are economic or environmental restraints on land spreading of sludges.

Any abattoir facing these constraints should consider this technology as an option. While the capital cost for infrastructure is significant it may be lower than other treatment options.

Contacts

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The Carni Boning System at Yarrawonga (PIP.054)

A demonstration installation of the Carni Boning System to evaluate the technology in an Australian environment.

Project Aims

The aims of this demonstration project were to validate manufacturers' claims for the Carni Boning System:

- Improved product yield
- Improved productivity
- De-skilled labour requirements
- Reduction in strain injuries and improved OH&S outcomes.

The project seeks to address fundamental issues facing all meat processors.

Background

When the Tasman Group acquired the beef plant at Yarrawonga it inherited an aging boning room that was set up with solo side boning stations. This required highly skilled boners that were able to work on the whole animal. The workstation set up was a nightmare – with insufficient building height the boners could not raise the beef side high enough to work on the forequarter – heavy lifting and strain was the order of the day. To compound management problems with the operation, the plant is situated in a low unemployment area making it essential to make the plant and the work attractive to attract and keep staff.

Tasman Group General Management knew this was not a situation that could be allowed to continue and began to investigate alternate means of beef boning.

Plants in Europe had long demonstrated the widespread use of the Carni boning system although previous efforts to introduce it into Australia had been a failure with the reasons generally obscured by incidental factors.

The performance claims made by the manufacturers and the potential benefits made the system attractive. The change in the industrial relations environment in Australia has changed many things and for equipment such as the Carni boning system the new flexibility in employment and pay conditions offered possible advantages to be realised. Concern is always expressed in relation to overseas processing developments and their ability to be directly implemented in Australia, due to the different working conditions, chain speeds process hygiene standards and cattle breeds. Realising the benefit that a successful installation could provide for the industry (both management and workers) Tasman approached MLA for support to install the equipment in Yarrawonga and demonstrate it to the Industry.

Description of Project

The project was simple in its basic concept: measure the performance of the existing plant, rip out the old – in with the new, measure the difference in performance. However, it is never quite that simple. The old boning room used side boning, Carni uses quarter boning – the old system used a boner / slicer team, the Carni would require separation of these functions and new slicing conveyors and tables, and of course the staff would need to be trained in the new system. Add to that the fact that once the project starts there is no going back, no transition or hand over - no gradual start up.

Major Outcomes

1. A yield improvement in boning operations of 1.75 %
2. An improvement in boner productivity of 3.8 %
3. A reduction in work effort of approximately 12% to 15%
4. For a plant processing 500 head per day this is equivalent to a revenue improvement of \$1.75+ million pa.

With only the boning / slicing area of the boning room to be modified installation was relatively straightforward with the plant up and running with minimal downtime. The lack of alternate space meant that staff had to be trained on the start-up with specialist Carni trainers speeding the learning process.

Installation and Evaluation

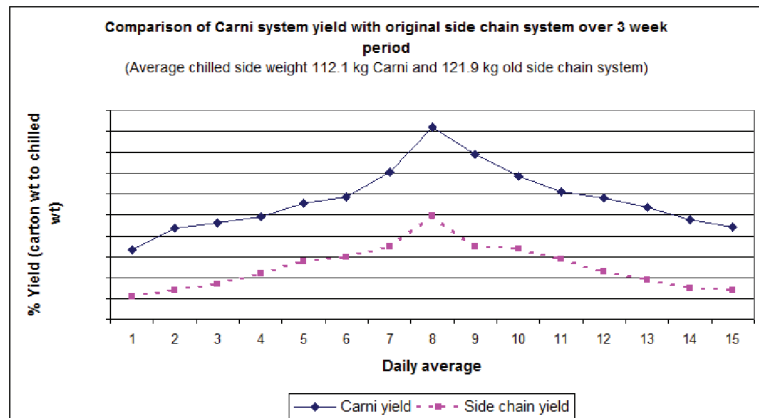
The Carni system is different to conventional boning (side or quarter) in that instead of removing the meat from the bones and dropping it on a table the bones are instead removed from the body leaving the quarter of meat hanging on a hook which is then broken into cuts at the end of the line. To reduce operator effort pulling equipment is used to apply pressure to the bone/meat separation tasks allowing the boner to concentrate on the task of releasing the meat from the bone.

This change in the labour input when using the Carni equipment reduces operator fatigue and allows concentration of the task of separating the meat at the bone interface thereby increasing yield from the carcass. Breaking down the meat on the hook at the end of the line (on a combination of rail and table) allows cutting lines to be maximised improving the return on higher value cuts.

Measurement and comparison with of the new system with the comparative data collected from the previous operation of the room confirmed the manufacturers' claims. The project demonstrated a yield improvement of approximately 1.75% with a boner productivity improvement in the region of 3.8%. Other data also suggests that a reduction of 12% to 15% in physical effort is achieved with this system with the large majority of that gain being identified in the heavy exertion tasks.

Summary

The installation of the Carni boning system at TGS Yarrowonga has shown that the system provides comparable benefits to the installations in Europe achieving financial benefits for processors and work environment benefits for boning room staff. For boners this system is a new way of working and training is essential to achieve benefits, however the reduction in effort and strain encourages worker support and involvement in the project. An industry open day at the plant was successful in demonstrating the process and has encouraged other processors to investigate the system for inclusion in their development plans.



Was it worth the investment?

- An industry open day attracting over 40 visitors
- A return on investment demonstrated
- Demonstrated ability of the equipment to meet manufacturers' claims in the Australian environment.

Contacts

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Plant System Integration at Oakey (PIP.091)

A demonstration installation of track and trace systems and their integration with other augmenting software to provide consumers with a full product history from a retail pack identification code.

Project Aims

This demonstration project seeks to integrate tracking and trace-back systems in a meat processing plant to provide source and destination data at all points along the supply chain to the consumer. The significant amounts of data collected during processing also provides a resource to the business to make better management decisions to drive the business. The derivation of appropriate KPIs and standards are also demonstrated in this project. The primary objectives of the project are:

- The demonstration of how existing technologies can be augmented and integrated to provide full supply chain track & trace and real time control of the processing operations.
- An assessment of the commercial benefits of the integrated system.

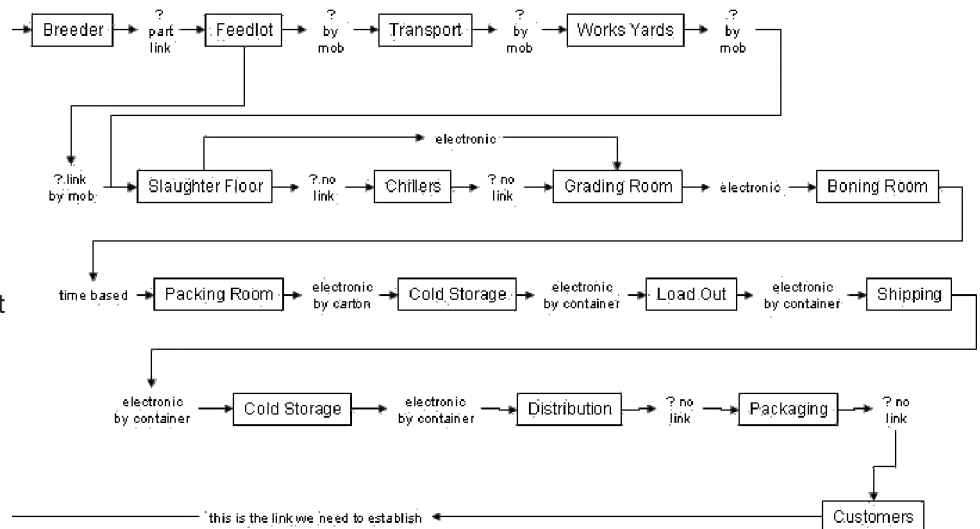
Public health issues are increasingly driving controls and legislation that require trace-back systems for food processors. This project is a demonstration of an integrated system to meet JAS and other standards.

Background

MLA has been an active promoter of eBusiness within the red meat industry and has supported a number of developments and projects over a number of years. IT systems have progressed from simple accounting and inventory management systems to provide significant process control, product and management functions. Developments outside of the processing industry provide other tools for tracking and managing information in processing and production, both in the supply of livestock as well as through wholesaling and retail. However each of these developments tends to operate in its own functional area with only rudimentary data transfer between systems.

The complete redevelopment of the boning room facilities at Oakey and the desire of Nippon to integrate livestock supply and retail in Japan provided the opportunity to develop a fully integrated supply chain system to demonstrate the integration methodology and the business/financial benefits of such a system.

Oakey Abattoir – Product Traceability Flow Line



The Project Aims to Close the Gaps in the Supply Chain

Project Benefits

- Full trace forward and back of meat products.
- Fully integrated supply chain data and management systems.
- Real time information based plant management.
- Estimated fully implemented industry benefits of approximately \$160 million p.a.

Description of Project

This demonstration project forms part of a much larger project for the redevelopment of the boning room and associated facilities at Oakey. When complete the plant will bone approximately 180 head of grainfed beef per hour for the Japanese market.

To a very large degree the limitation for achieving accurate traceability is the physical arrangement of the boning room and the disengagement of the boning, slicing and packing functions, regardless of whether the boning room is set up for side, quarter or table boning. Generally the only situation where the physical arrangement allows for the introduction of tracking and tracing systems is where the boner performs a solo boning operation and is located in close proximity to the slicer (and packer).

The room at Oakey has been designed to overcome the physical difficulties by installing four processing lines with each boner completing all the work on a beef quarter and delivering the cuts directly to the slicer.

Each slicer has a touch screen to confirm the cut and specification that he is working on (or alternately correct the system). Finished primal cuts, fat, bone and trim are then placed in bins at each slicer's workstation so that the drop of product onto the takeaway conveyor belt may be controlled by the system to track the position of the product through the rest of the system.

Information Management

For this project to be successful all the information collection and control elements needed to be in place. Hardware and software was either in situ or being provided by a number of different companies, including Sastek, Cedar Creek, Marel etc.

Information collected or generated in each system needed to be available and verified for use in other systems (preceding, following and supervisory) with the links operating in real time.

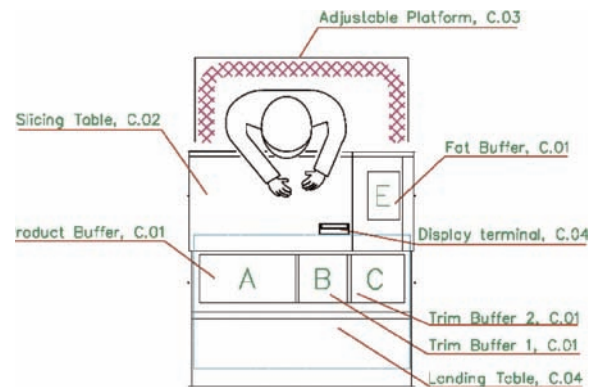
The primary implementation issues of such a system are principally concerned with obtaining the required specifications from different suppliers to enable component integration.

To enable systems integration required focused discussion with actual and potential suppliers, for both hardware and software. Software suppliers in particular may be reluctant to change systems to enable seamless integration mainly because they do not want to trigger unintended consequences in proven systems by making system changes and because they want to limit the variety of systems that they will need to support on an ongoing basis. To overcome this it may be necessary to consider the use of data warehouses to manage information independently of functional systems. Specifications are also required from suppliers and it was found that those with open systems will have the least difficulty with this type of linked data management system.

It was found to be important that supply contracts not only met functional specifications but also required the supplier to meet overall system requirements.

Company Outcomes and Benefits

The provision of real-time transaction-level information to management and the ability of the systems to interact with the staff and provide shop floor processing information provides both workers and management with a range of tools for better managing the business including yield and productivity management, customer interactions, labour management, remuneration systems and inventory / plant management.



Typical New Oakey Slicers Station

Summary

The objective of this demonstration project was to provide a fully integrated data management system to provide full trace-forward and trace-back from an animal to a consumer pack.

- This provides the ability for consumers to be informed of the source and handling of their meat products.
- Manages the company's and consumer's risk in the event of a recall event.
- Provides both plant and workers with the tools to improve the performance of the processing operations through the provision of real-time information systems.
- It has been estimated these systems, if fully implemented across the industry in Australia, would give rise to savings in the region of \$160 million per annum.
- The estimated supply chain savings for this project alone are expected to be in the region of \$11.0 million p.a.

The success of this project is in a large part due to the ownership/control of the supply chain exercised by Nippon, from the feedlot through to distribution in Japan. Companies that operate over a shorter segment of the supply chain may be faced with less functionality and face the need to secure the co-operation of suppliers and customers to achieve similar results.

Contacts

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Rendering Plant Energy Optimisation (PIP.039)

Waste heat recovered as energy savings and increased productivity

Project Aims

- Achieve boiler fuel energy savings (up to or better than 4%) by utilising excess hot water to preheat raw material immediately prior to entering the continuous rendering cooker
- Demonstrate further energy savings from the use of super-heated hot condensate water from the rendering vessel shell and shaft to achieve a design energy savings of >8%.

Story

EG Green & Sons' abattoir and rendering plant, at Harvey in WA, have traditionally produced hot water in excess of their requirements and then wasted excess heat by pumping the excess hot water to a large holding lagoon where the heat is slowly dissipated to atmosphere.

As a result of increased production to 24 hours per day, 7 days per week EG Green & Sons' rendering plant has required a major overhaul, with the installation of new, modern, continuous dry-rendering equipment. This major upgrade provided an opportunity for EG Green & Sons to install a preheater that has utilised this waste heat to give an ongoing energy reduction of 10%, with a significant reduction in operating costs.

Description of project

The new, continuous, dry-rendering plant has been designed and constructed to allow maximum heat recovery from the rendering activities and to allow interaction between the various components of the rendering system. Heat is recovered from the cooker vapours through a shell and tube condenser, with all recovered heat producing hot water. The heat recovery system from the old, decommissioned, Equacooker has been converted to operate with the new Stord Rotadisk cooker.

Raw material feeding the cooker is passed through a preheater to elevate its temperature and reduce the steam requirements of the cooker. The preheater's energy source is waste heat recovered from both the cooker and excess hot water. This preheater is similar in design to the Stord Rotadisk cooker, in that it has a hollow shell and hollow disks. The primary difference is that the shell and disks are constructed to hold hot water rather than steam.

The condensate recovered from the shell and shaft of the rotadisk cooker are under pressure and, hence, are above 100°C. These two condensate sources are blended together to feed the shell of the preheater. In steady state operation the blended condensate temperature is approximately 128°C. This hot condensate flows under pressure through the shell of the preheater to heat the raw material, prior to entering the cooker. Simultaneously, the hot water - produced through traditional condensation of the cooker vapours - that is in excess of the abattoir & rendering plant's needs, is pumped through the preheater shaft to further heat the raw material, prior to entering the cooker.

Raw material is heated in the preheater from 30-35°C to in excess of 90°C using only waste heat. The entering and exiting raw material is shown in the photographs below and clearly shows the change in nature of the material through the preheater.

Major Outcomes

1. **3.3 year payback on major capital investment**
2. **33% increase in production**
3. **10% energy savings**
4. **1.6% increase in tallow value**

Evaluation

Key points to note from this project are:

- Average weekly production volume has increased by 22%
- Average weekly production rate has increased by 33%
- Average weekly gas usage has decreased by 10%
- Average weekly electricity usage has decreased by 9%
- Average weekly total energy usage has decreased by 10%
- Average weekly yield of A&B grade tallow has increased by 12%

A Technology Transfer kit is available. The data within the kit confirms the Atlas Stord design premise that the preheater would reduce steam usage by 8%.

On the basis of energy savings, payback period on the investment in the preheater is 3.3 years. The estimated life of the preheater system is a minimum of 10 years. Total saving over this period, less capital = \$589,800. Estimated return on investment over the 10-year life of the preheater is 20% per annum.

Other identified gains from the system are:

1. The increased yield of A & B grade tallows. During the 2 year assessment period. Production of A-grade tallow increased 1.6%. B-grade tallow production increased by 6.9%. C-grade tallow production reduced by 8.5%. On EG Green & Sons 2005 tallow values and production volumes, tallow value increased by \$89,640 or 1.6%.
2. Reduction in wastage of heat to effluent ponds. Minimal heat wastage from the rendering plant to the effluent ponds now occurs. This has resulted in a stabilisation of pond temperature to an ideal for microbial growth. The effluent pond performance has improved since the installation of this heat recovery system. No dollar value has been established for this but it should translate to savings, even if only in the time required to maintain the treatment system in efficient operation.

Summary

EG Green & Sons have taken the opportunity given by a major plant upgrade to make significant gains in waste heat utilisation. This has resulted in significant financial and environmental gains for the company.

The preheater evaluated in this project was specifically designed for the Atlas Stord Rotadisk continuous cooker system installed in EG Green & Sons rendering plant. While this exact design may not be ideal for other continuous cooker systems, the principles of operation and the performance gains would be expected to be relevant to any continuous dry rendering plant with a heat recovery system of this type. Any plant considering investing in new or upgraded rendering equipment should consider the inclusion of a waste heat preheater.

Contacts

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Recovery of Brains and Tongues from Lambs (PIP.051)

There is potential for higher yields of offal by recovering brains and tongues from lambs

Project Aims

- Develop procedures for hygienic collection of brains and tongues from sheep.
- Improve recovery of brains and tongues for human consumption to 65–100% of available offal.

Introduction

Peel Valley Exporters were not able to save lamb brains and tongues for human consumption because of inspection and hygiene issues associated with the inverted dressing system. By developing a collection system that would allow brains and tongues to remain correlated with carcasses until the final carcass inspection it should be possible for the abattoir to save brains and tongues. With inspection requirements met and by demonstrating satisfactory hygiene Peel Valley Exporters expected to recover 65 to 100% of tongues and brains with a value of about \$500,000 to \$750,000 per year.

Description of project

At the start of this project, regulations for collecting brains and tongues stipulated that tongues can only be collected while the head is attached to the carcass and that brains can only be recovered from skinned heads.

In addition, if edible offal is collected from the head, the head must remain attached to the carcass until carcass inspection is complete. With inverted dressing chains such as used at Peel Valley Exporters heads are cut off the carcass as soon as possible after bleeding to avoid contamination of the inverted carcasses with blood saliva and ingesta from the head. Once the heads are cut off, edible offals cannot be recovered because the head loses correlation with the carcass.

In the revised Australian Standard for Production of Meat for Human Consumption (AS 4696:2002) there is a requirement to skin heads to the extent that is necessary to facilitate the hygienic removal of the brain before brains are collected, however there is no requirement for the head to remain attached to the carcass when tongues are collected.

In discussions with AQIS it was agreed that an alternative protocol to the requirements of the Australian Standard could be trialled. In the alternative protocol heads would be cut off immediately after bleeding and brains and tongues could be recovered from the unskinned heads. Under the alternative protocol brains and tongues had to be retained in batches until the carcasses were inspected. If any carcasses were condemned, all the brains and tongues in the batches that contained a piece of offal from a condemned carcass had to be condemned. In addition the hygienic status of brains and tongues from unskinned heads had to be assessed to make sure it was equivalent to offal recovered from skinned heads.

A head processing room was constructed at the side of the slaughter chain next to where heads were removed from carcasses. Heads were partially skinned by removing the cheeks while the head was attached to the carcass. The skinning took place immediately after the completion of bleeding and the head was then removed from the carcass. The heads were collected on trays and transferred to the head processing room where they were hung on a hook and the tongue removed. Tongues were accumulated in batches of up to 25, packed in cartons and transferred to the offal room for weighing and labelling.

Major Outcomes

1. An alternative protocol for recovery of brains and tongues from lambs has been approved
2. Product worth up to \$750,000 per year could be recovered at the abattoir involved.
3. The report provides a basis for similar approvals at other establishments.

After removal of the tongues the heads were split by machine and the brain removed. The brains were washed and packed and the split heads sent for rendering.

The tongues and brains were identified in batches of 25. If a carcass was condemned, the corresponding batch of 25 tongues and brains was condemned.

Samples of tongues and brains collected according to these procedures were tested for total plate count and E. coli. Samples of frozen brains and tongues were also tested to confirm that the freezing process was effective and that there was no increase in bacteria while the offals were accumulated, packed and frozen. Samples of brains and tongues from the Peel Valley sister works at Wallangarra were also tested for microbiological quality. The brains and tongues produced at Wallangarra were collected by conventional means after the head was skinned and the microbial quality of the Wallangarra product was used as a benchmark.

Evaluation

Findings

The E. coli counts on brains and tongues collected using the alternative protocol were lower than counts on the brains and tongues collected by conventional methods. The total counts were similar for both collection systems.

The results showed that the head can be removed immediately after bleeding and wholesome brains and tongues can be recovered from these heads. Correlation between the carcasses and the head offal could be maintained by batching the brains and tongues and the offal could be condemned if a corresponding carcass was condemned.

After the completion of the project, Peel Valley Exporter collected brains and tongues for human consumption but found that the batching system resulted in excessive loss when a carcass was condemned. The establishment has discontinued collection due to the losses caused by condemnation and a reduction in demand for brains and tongues.

Impact

The alternative protocol allowed Peel Valley Exporters to collect brains and tongues for human consumption. Peel Valley collected brains and tongues from 1 in 4 heads and the average value of recovered product was about \$0.88 per carcass. For a daily production of 3,500 lambs the value of product was \$770 per day.

Outputs

The report of this project includes work instructions and hazard analysis for the steps of removal of cheeks; removal of tongues; splitting heads and removal of brains; and packing of brains and tongues.

The results of the project were submitted to the Meat Standards Committee (MSC). The MSC approved the alternative protocol for recovery of brains and tongues at Peel Valley Exporters. This approval applies to Peel Valley Exporters only but the report could be used to support applications for approval of the alternative protocol at other abattoirs. The report could also be used to support an application to MSC to have the Australian Standard for Hygienic Production and Transportation of Meat and Meat Products for Human Consumption amended to allow for recovery of brains from unskinned heads.

Outcomes

This project enabled Peel Valley Exporters to recover product worth about \$0.88 per carcass. The potential revenue for the plant is about \$750,000 per year. Peel Valley Exporters collected brains and tongues after the completion of the project but have since stopped collecting because demand for brains and tongues has fallen. Collection could resume if demand increased.

The cost of the project was \$66,000. This cost could easily be justified if the profitability of collecting brains and tongues had not been affected by reduced demand. The profitability could be improved by changing the batching system to reduce the amount of product lost through condemnation and by improving collection to more than 1 in 4 heads.

Summary

This project has shown that brains and tongues can be recovered from heads removed from carcasses immediately after bleeding. The hygiene of the brains and tongues is acceptable and the alternative protocol has been approved by the Meat Standard Committee. However, there have been excessive losses of recovered offal when carcasses are condemned. The losses are due to the batching system that results in condemnation of 25 brains and tongues when one carcass is condemned.

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
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Innovative Freezing and Handling System for Bulk-Packed Meat (PSHIP.084)

A demonstration that manufacturing beef can be frozen naked in a plate freezer and palletised without individual cartons

Project Aims

- Determine the market acceptability of naked frozen blocks of boneless meat
- Develop and trial a plate freezing prototype to produce frozen blocks of boneless meat

Introduction

The cost of the packaging for 27 kg frozen blocks of manufacturing meat is about 5 cents per kg of meat. The packaging materials have to be handled by the packer and disposed of by the customer and it is a labour intensive job to put meat into cartons and then remove it from the cartons. If meat could be frozen and handled in naked blocks and shipped on pallets with an overwrap, the expense and disadvantages of handling packaging materials could be greatly reduced.

Offal for pet food is frozen in cells of a plate freezer and distributed as naked blocks. Nippon Meat Packers investigated a similar way of handling frozen manufacturing meat.

Description of project

The initial stage of the project was to assess if customers would accept frozen meat in naked blocks stacked on pallets with an overwrap. Food Science Australia reviewed the packaging requirements of sixteen importing countries. There appeared to be no requirements that would prevent export of frozen meat as naked blocks provided that all labelling requirements were met. Nippon Meat Packers visited end users of the product to find out if the customers would accept naked blocks of frozen meat. Customers in Japan were reluctant to accept the product but customers in the Philippines were enthusiastic and a letter of agreement supporting the trials was obtained from the Philippines National Meat Inspection Commission.

A vertical plate freezer was installed to freeze 70 mm thick blocks of meat. The freezer was based on a pet food plate freezer but the aluminium plates were replaced with stainless steel plates. Blocks of frozen meat the same size as a pallet were produced. The frozen blocks were then cut into six pieces for stacking onto a pallet.

Three trials on freezing meat in the plate freezer were carried out. During these trials there was extensive measurement of freezing rates. These measurements showed that meat could be frozen to -6°C in about 3 hours. The measurements also identified points of slow freezing, for example at the top of the blocks which were not insulated, and at the bottom of the blocks where the

Major Outcomes

- 1. A shipment of naked blocks of frozen meat was prepared and exported to the Philippines**
- 2. Frozen meat can be prepared without individual cartons for 27 kg blocks but customers may have to modify infrastructure to handle the product.**
- 3. Savings could be up to \$1000 per container**



Figure 1: Unloading frozen blocks from the plate freezer

meat was not in contact with plates with circulating refrigerant. The trials identified problems of packing meat into the plates. These problems could be overcome by dicing the meat or packing smaller particles which would pack to the bottom of the plates more easily.

A trial shipment of a 1 tonne pallet load of frozen meat was prepared and exported to the Philippines. Apparently there were difficulties in handling the meat at the destination and there is no report on the outcome of the meat.

Evaluation

The project is a useful first step in investigating the export of naked blocks of frozen meat. It appears that there are few if any regulatory impediments to the export of naked blocks. However, the logistics for receiving meat in this format are probably not in place.

There are several potential benefits of exporting meat as naked blocks. There should be a saving of about 5 cents per kg of meat through dispensing with cartons but this saving could be negated by costs of outer protection for pallet loads of naked blocks. There are savings in transport costs. An average container of frozen meat contains about 1 tonne of packaging material. If most of the packaging is dispensed with there will be a 5% reduction in transport costs. There are environmental and materials handling advantages for both supplier and customer in handling less packaging material and avoiding packing meat in and out of 27kg cartons. Freezing costs should be reduced compared with air-blast freezer.

The main benefits of preparing naked blocks of frozen meat accrue to the customers who do not have to remove meat from cartons, handle the used packaging and dig entrapped plastic out of the frozen meat. These benefits have not been quantified. The packer could save up to \$1000 per container through reduced packaging cost and increased amount of meat per container.

The total project cost was \$395,000. Much the same costs would be involved in setting up another operation to produce naked blocks of frozen meat. This cost could be justified for a boning room that specialises in manufacturing meat e.g. a hot boning plant. The savings based on reduced freight and packaging could be \$600,000 per year.

Freezing equipment has been shown to be effective and the project has identified modifications that should be used for the next generation of vertical plate freezer for prepared naked blocks of meat for human consumption.

The report includes a HACCP plan for preparing and handling naked blocks of frozen meat.

Summary

Preparation of frozen meat in vertical plate freezers for export as naked blocks has several potential benefits although this project has not quantified or demonstrated these benefits. The work that has been done can be used to design an improved plate freezer. Customers will find benefits in receiving frozen meat in naked blocks but before the concept is pursued further it is essential to confirm that the product can be handled throughout the cold chain.

The project investigated shipping product to the Philippines where facilities for receiving the meat were inadequate. Future investigations should concentrate on the larger USA customers who are more likely to invest in infrastructure to handle the product.



Figure 2: Preparing a pallet load of frozen blocks

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
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Analysis & Interpretation of Pollution Loads in Wastewater Streams at the Wagga Wagga Abattoir (PIP.012)

Determining a benchmark performance and opportunities for improvement

Project Aims

- Design of a data acquisition program to determine waste characteristics and flows within the abattoir;
- Evaluate the data obtained, identifying the various waste streams in the abattoir and their likely flow and quality characteristics;
- Identify targets for load reduction;

Description of Project

With plans to extend production using additional shifts, in the future, Cargill Foods Australia needed not only to quantify its current wastewater performance benchmark but also identify areas for improvement and the impact of the additional shifts. This project provided technical guidance to evaluate the work already done and to recommend future directions.

To establish flow characteristics, an extensive wastewater flow-monitoring program was carried out during 2000/2001. It was found that flow measurements for the individual waste streams were generally not possible. However, sufficient water meters existed to measure flow of water into selected production areas. With some on-site wastewater flow measurements backed up by assumptions where necessary, water flows were calculated using a water balance across the plant.

It was identified that there were significant errors ($\pm 10-25\%$) in some estimations due to the difficulty of assigning water consumption to waste streams which were not specifically measured. In addition, there was considerable hour to hour and day to day variability in the use of hoses, etc.

The average potable water intake by the abattoir was approximately 2,200 kL/day. This amounted to an average water use of 8.6 kL/tonne HSCW. However, there is considerable use of reclaimed water that is not included in this figure. Total fresh & reclaimed water use is estimated to amount to be almost 3.0 ML/day – or 11.6 kL/tonne HSCW. While this is near the industry average of 11.8 kL/tonne HSCW (1998 MLA Benchmarking project), the best estimate of World Best Practice water usage, at the time, was approximately 6.0 kL/tonne HSCW. This suggested there was considerable room to reduce water consumption.

Total wastewater flow from the plant was estimated to be between 2.6 – 3.0 ML/day or 11.0 kL/tonne HSCW (vs. 10 kL/tonne HSCW industry average) and aligns with typical wastewater generation of about 90% of water consumption.

To estimate contaminant loads in specific waste streams and in the final wastewater prior to discharge into the ponds, sampling was performed in three campaigns to determine wastewater characteristics of individual waste streams. While the concentration of most streams was found to be within tolerances of industry benchmark data at that time, some of the waste streams were extremely strong, particularly: raw material bin drainage, blood stickwater, paunch dump and tripe processing/green offal washing.

Major Outcomes

- **Identification that there was opportunity to reduce water consumption**
- **Nutrient concentrations were at the mid to high end of industry benchmark data**
- **Areas for improvement were clearly identified**

Altogether, six primary waste streams were characterised in addition to overall red and green streams. Several were identified as contributing disproportionately to pollutant emissions, including:

- raw material bin drainage - 30% of COD, 42% of total nitrogen and 40% of total phosphorus emissions from the plant,
- antemortem yards - 14 – 16% of total nutrient emissions,
- paunch dumping and hasher washer stream - 16% of total phosphorus, 37% of total suspended solids and 28% of oil & grease emissions,
- tripe processing.

Over 40% of nutrient emissions were contributed by the byproducts department, which emitted less than 10% of the total wastewater.

As a result of this project, it was recommended that these streams merit focus for elimination and/or separate treatment if appropriate cost-effective means could be found to do so.

Evaluation

Key points to note from this project are:

- The abattoir was characterised as being slightly above average in total wastewater discharge
- Individual waste streams generally contained richer concentrations of pollutants than the equivalent industry average.
- Key nutrient streams were identified to allow the future targeting of streams to eliminate or separately treat.

The data and concepts from this project has since been used by both Cargill Foods and Wagga Wagga City Council for selection and design of their wastewater treatment processes, so has been of great value. Cargill Foods are planning to use further concepts developed from this project data to handle specific streams such as the raw material bin leachate.

Summary

This project has provided a useful benchmark to Cargill Foods Australia. The information has enabled abattoir management to further develop a wastewater treatment improvement program including installation of a new DAF. The local council has also used this data in development of a new SBR-based water-treatment facility close to the abattoir.



The new DAF designed from data accumulated through this project

While the data from this study adds useful information to the existing benchmark data for the Australian Meat Industry, its direct application to other plants must be tempered by consideration of its relevance on a plant-by-plant basis. The wide variability in plant-to-plant processing techniques and facilities makes data from a single plant only relevant when identical processes can be compared.

Contacts

Plant	Commercialiser / Supplier	Researcher	MLA Contact
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PIP.134: Waste Treatment System Audit and Improvement

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

Frewstal service kill 3 to 4,000 head of sheep per day on a single shift basis, having recently converted to inverted dressing. Chilled carcasses and salted skins leave site and rendering is also done off site. Their on site waste treatment ponding system discharges to irrigation in summer and to sewer in winter. They plan to retain all treated effluent in a 70 megalitre lined storage pond so all can be irrigated.

In 2004/05, Dini Agushi, a chemical engineering undergraduate at RMIT was given the task of reviewing the effectiveness of the treatment system, analysing all major waste streams and suggesting reduce and reuse strategies. He worked with the guidance of Gerard McAloon, Environmental Manager, and an external mentor with support from MLA.

Dini measured the COD and volume of flows into waste treatment at 30 min intervals throughout the processing/cleaning day and weekly COD from the outlets of the saveall, DAF, anaerobic, aerobic and maturation lagoons. The results were linked back to the plant operation. The reduction in lagoon residence time caused by major civil works was calculated. The DAF was repositioned to more effectively remove COD. The extra COD load from the blood caused by the change to inverted dressing was identified and suggestions made to overcome the problem. The sources of pollutants were identified and measured including the volume and COD of flows from sterilisers, runners room and pit blood that was not tankered off site.

Methods were suggested to redirect the effluent from the runners room and invert blood to manure handling and blood pit.



PIP.134: Water and Electricity Management at ACC Brisbane

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

Australian Country Choice is a leading vertically integrated meat supply company processing over 52,000 ETCW annually. It presently spends \$1 million per year on handling 2.6ML/day of water and \$1.3 million on 21 million kWh of electricity per year.

In 2004/05, Phillip McCaughey, a mechanical engineering undergraduate at the University of Queensland was given the task of documenting water use profiles in the major plant areas throughout the 24 hr day and over the weekend shutdown. A second project was to profile electrical use across the site on a typical production day with a view to developing saving initiatives. He worked with the guidance of Alex Hood, Manager Engineering and an external mentor with support from MLA.

A Process Flow Sheet was drawn splitting the site into over 50 major water streams. Tiny Tag data loggers and an ultrasonic flowmeter were used for flow monitoring. Two weekend water balances accounted for over 96% of the water compared to less than 60% previously. Weekend stockyard water waste was reduced by 1ML/year. Other savings were identified. Flow restrictors fitted to 9 of the 42 sterilisers were saving 48kL/day (\$80/day). At 2.53 kL/head, ACC is better than the industry average.

Five flowsheets were drawn identifying all electricity users. All lines were traced and kW meters relabelled. A seven day energy balance was carried out over a typical production period using a clamp meter and fixed meters. Data was gathered into 15 functional areas and under 9 transformers, with refrigeration being the largest user (43%). Eleven recommendations were made to help reduce power.



PIP.134: Plant Energy Audit at Northern Cooperative Meat Co.

Northern Cooperative Meat Co. at Casino NSW processes 1200 head/day of veal and 800 head/day of beef for an annual throughput greater than 42,000 ETCW. It is a service abattoir with a boning room, rendering plant and tannery and treats and disposes of all waste on site. It is a member of SEDA and has platinum status for energy saving. The previous year's programme had found refrigeration used 164kWh/t HSCW for chilling and 0.26 kWh/kg for freezing meat.

In 2004/05, Alicia Nuciflora, a chemical engineering/science undergraduate at the University of NSW was given the task of doing an energy audit focussing on electricity and steam use to evaluate potential savings and to distribute costs within the business. She worked with the guidance of Stephen Wagner, Chief Engineer and an external mentor with support from MLA.

Electricity coming on site was tabulated for the year to Nov 04 and its use was analysed monthly for 3 years in nine site areas using the 41 individually installed meters and compared with plant operational statistics. Steam flow was measured using a hired ultrasonic flowmeter on boiler feed water and major steam users were identified by collecting condensate. Calculations of energy loss via chiller and freezer doors showed a payback of 5 months for fitting automatic doors with sensors. Short payback periods were identified for returning condensate from tallow tanks and for insulating some identified pipework.

The Company is part of the Greenhouse Challenge. It was found to use 0.93t CO₂e /t HSCW with 48% coming from the use of electricity.



PIP.134: Saving Energy by Refrigeration Automation at AMH

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

AMH, Rockhampton processes 650 head of cattle per day. The refrigeration plant was originally built in 1965 with numerous advances since then. It is a semi-automated plant with automatic loading and unloading of compressors.

In 2004/05, Geoff Kyle, a chemical engineering undergraduate at the University of Queensland was given the task of reviewing the overall running of the refrigeration plant and investigate where possible power savings could be made via automation. He worked with the guidance of Michael Lang, Site Engineer and an external mentor with support from MLA.

Geoff found that they used 270kWh per tHSCW (\$4.60/head) which was 7% less than the industry average but 18% more than the AMH company average with refrigeration using 46% of this. Electricity use was graphed to show where peak demands occurred. Maximum demand was at 3pm when all the blast freezers and carcass chillers were turned on while all the rest of the plant is running. One quarter of the monthly electricity bill is levied on peak demand value. Monthly electricity use was mapped throughout the year for the seven areas the plant is split into by meters.

The load factor was constant at 70% throughout all but the Dec to Feb period. Coefficient of performance (COP) was calculated at intervals through the year for the high side, low side and overall. Overall, it was 1.93 in June and 1.95 in February. Automation of the engine room, blast freezer fans and hot gas defrost were costed but all had pay backs of over 4 years.



PIP.134: Water Audit and Reduction at AMH Toowoomba

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

AMH Beef City, located 35 km west of Toowoomba, employs 650 people to process 4,000 head of beef in a 5 day week. It only has bore water so it is a critical resource in limited supply. There have already been a number of water saving initiatives.

In 2004/05, Ryan McMurtrie, a chemical engineering undergraduate from the University of Adelaide was given the task of auditing the water use and identifying areas where further savings could be made. He worked with the guidance of Keith Smith, Plant Engineer and external mentor Mike Jones with support from MLA.

The average water use was found to be 6.3 litres/ kg HSCW (2,460 litres/head) compared to an industry average of 10.6 litres/kg HSCW. A water mass balance was done using existing meters, a portable ultrasonic flowmeter and bucket/ stopwatch.

The plant water use was 1.95 million litres/ production day (\$300,000/yr) of which 10% was RO water. 95.6% of the bore water was accounted for as going to the eight separate plant areas. Half of the water was used on the kill floor and 44% of that was used on the viscera table. Steriliser pots on the kill floor and boning room used 15% of total plant water. Hot, warm and cold flows were individually measured on the kill floor and the top 14 plant water uses were identified and measured.

Five major recommendations were made that together would save 1.3 million litres/ week, 13% of the water used at present.



PIP.134: Site Energy Audit at AMH Townsville

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

AMH Townsville is over 40 years old employing 800 people to process 5,000 head of beef in a 7 day week. The annual energy bill is \$1.6 million spent on electricity, coal and fuel oil. AMH has a commitment to the environment by reducing energy consumption and emissions. At 183 kWh/t HSCW, it is the lowest electricity user of the four AMH plants.

In 2004/05, Ryan Hahn, a mechanical engineering undergraduate was given the task of auditing all forms of energy use and identifying areas of energy waste. He worked with the guidance of Russell Mitchell, Site Engineer and external mentor Mike Jones with support from MLA.

AutoCad piping drawings were produced mapping hot and warm water, steam and condensate. Energy use for 2004 was graphed monthly for electricity, coal, fuel oil, diesel, LPG, hot and cold water and overall energy. When compared to a "standard" plant, electricity use was less due to the efficient refrigeration system but coal use was high and reflected the high use of hot water. Hot water was investigated further.

All steriliser pots were single skinned but double skinned pots would save \$25,000/yr in water and energy. Lagging pipework would save \$27,000/yr, payback of under 1 year and reduce CO² emissions by 59 tonnes. Altering the hot water programme would save \$23,000/yr, at no cost and reduce CO² by 368 tonnes. A new desuper -heater would save \$20,000, payback of 2-3 yrs, reduce coal by 200 tonnes/yr and reduce CO² by 325 tonnes. Solar panels would save 1,000 tonnes/yr of coal, reduce CO₂ emissions by 530 tonnes and save \$33,000 but the payback time was 7 years.



PIP.134: Collecting Paunch Contents for Composting

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

Midfield Meats processes 5,000 head of sheep and 700 head of cattle per day from two separate plants on the same site. It is the largest meat processor in Victoria. All green and red effluent is treated on site by multistage screening and filtration prior to discharge to sewer. It owns a large property nearby where the solid that is separated off is composted. It discharges 460 megalitres of trade waste to sewer per year.

In 2004/05, Ding Tran, a chemical engineering undergraduate at Monash University was given the task of finding an engineering solution for the removal of the liquid and solid paunch contents at source and transporting them to composting along with the manure from the runners. This would reduce the load on the treatment system and reduce trade waste charges. Ding worked under the guidance of Andrew Westlake, Group Operations Manager, and an external mentor with support from MLA.

Ding measured the volume of paunch contents coming from the four paunch rooms and took samples of them for analysis at a local NATA registered laboratory. Solids, nitrogen, phosphorus, COD and pH were measured to calculate the reduction in trade waste charges that would occur if the paunch and runners contents were removed at source, and to establish their value as a compost material. Trade waste COD would drop by 25%. The water consumed during the processing of paunches and runners was measured and recommendations made to reduce this consumption.

A scheme was costed using pumps, pipes, augers and tankers to remove this material from the plant and transport it to the composting site.



PIP.134: Alternatives to 82°C Water for Sterilisation of Knives

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

MC Herd at Corio in Victoria is a top 25 red meat producer. It is a domestic and export registered Tier 1 Halal abattoir with a beef floor that processes 600 hd/day and a sheep floor of 5,000 hd/day.

In 2004/05, Chris Laurent, a chemical engineering undergraduate at the University of Sydney was given the task of validating a two knife system using 60°C water as an alternative method of sanitising. AS 4696 (2002) states "...for cleaning and sanitising implements....hot potable water at no less than 82°C or an equivalent method of sanitising". Benefits of using 60°C water include reduced scald injuries, reduced energy costs, reduced condensation and reduced hot water discharge. Chris worked under the guidance of Charlie Giarrusso (Herd), Ian Jenson (MLA) and external mentor John Sumner.

The project provided a baseline for cleanliness of knives along both chains. Knives were sponge swabbed at 23 stations on the beef floor and 13 stations on the mutton floor plus the large equipment and viscera table were tested. Carcasses and offals were also tested. E.coli and Total Viable Bacterial Count results showed that using two knives with water at 60°C provided a sanitation process equivalent to momentarily dipping in water at 82°C. Water burns presently account for 9% of site injuries, costing over \$50,000 per year. Using 60°C water would save over 4,000 tonnes of top up steam per year (\$160,000). A detailed presentation of these findings was given to Herd and Primesafe.



PIP.134: Energy Usage Review and Improvement at Dubbo

This project was completed under the MLA/AMPC structured summer break professional undergraduate programme. It gives successful applicants the opportunity to apply their studies on current site issues in our red meat industry.

Fletcher International processes over 8,000 sheep per day through slaughtering, boning room, rendering, fellmongery, skin processing, wool scouring and wool tops plants. It spends over \$2 million/yr on electricity.

In 2004/05, Zane Swingler, a mechatronic engineering undergraduate at the University of Queensland was given the task of doing a complete site-wide energy review with a view to recommending where savings could be made. He worked under the guidance of Mark Eastburn, Project Officer and an external mentor with support from MLA.

A map was drawn of the site power distribution network. Two portable analysers were then used to monitor all appropriate energy users and correlated with suppliers records of average and peak loads, and power factors. Extensive and detailed data was generated and analysed.

The review found the plant used 2,494 MJ/t HSCW, much better than the industry average of 3,135 MJ/t HSCW. Power factor correction equipment would have marginal payback of \$10,000/yr but considerations such as supply authority standards not being met and improved maintenance were also important. Staged replacement of standard induction motors with high efficiency motors would save \$40,000/yr. Operation of irrigation and sewage water supply should be altered to use off-peak electricity. Other recommendations concerning refrigeration, air compressors, waste treatment aerators and the water tank were made.



PIP.134: Water audit at Fletcher, Dubbo

This project was completed under the MLA/AMPC structured summer break professional undergraduate program. This program gives successful applicants the opportunity to apply their studies to current site issues in our red meat industry.

Fletcher International processes over 8,000 sheep per day through their slaughtering, boning room, rendering, fellmongery, skin processing, wool scouring and wool tops plants. These diversified activities provide the company with a robust strategy that avoids reliance on narrow markets, however many of the processes are intensive water users.

In 2005/06, Luke Coughlan, an environmental engineering undergraduate at the University of New South Wales was given the task of conducting an overall detailed site water audit with a view to recommending where reduction, recycle and reuse could be carried out. He worked under the guidance of Dave McKay, Project Officer, and an external mentor with support from MLA.

Luke drew nine simple line diagrams for the water piping, covering all sections of the plant. He identified where 92% of the 16.8 ML/week of water was used, with the slaughter floor (36.4%), wool scour (21.5%), wool tops (11.8%) and steam raising (9.6%) areas being the major users, and found that 73% of all water was sourced from the river. The river water pumps could be altered to source the remaining 27%, which is presently town water, from the river to save \$120,000 per year. There were 11 fixed flowmeters monitoring most, but not all, water on-site through the SCADA system. Luke made recommendations which would save 67 ML/yr with a payback of under 12 months, and nominated three important sites where fixed flowmeters should be installed. He also recommended responsible use of water be put into the site training programme.



PIP.134: Creating an environmental management system

This project was completed under the MLA/AMPC structured summer break professional undergraduate program. This program gives successful applicants the opportunity to apply their studies to current site issues in our red meat industry.

Midfield Meats at Warrnambool processes 5,000 head of sheep and 700 head of cattle per day from two separate plants on the same site. It is the largest meat processor in Victoria. All green and red effluent is treated on-site by multistage screening and filtration prior to discharge to sewer. The company owns a large property nearby where the solid that is separated off is composted. It discharges 460 megalitres of trade waste to sewer per year.

In 2005/06, Martin Dawson, an ecology and environmental undergraduate at Deakin University, Warrnambool was given the task of producing a structured EMS for the plant and if time permitted, the rendering and pastoral sites, as part of the company's efforts to continually reduce environmental impacts. He worked under the guidance of Andrew Westlake, Group Operations Manager, and an external mentor with support from MLA.

Martin used AS/NZS ISO 14000 (2004) which is a collection of documents that guide the creation, implementation, certification and auditing of an EMS. This EMS aligned the systems already in place using PDCA methodology, starting with the Environmental Policy and then setting objectives and targets to continually improve. An aspect and impact register and legal register were created and formal systems set up for controlling and recording documents and for emergency preparedness and response. An internal audit was agreed with appropriate EMS review dates by management and the board. He pointed out that an EMS is a commitment to environmental improvement not a guarantee, and ISO 14000 is a management standard not a performance standard. He made a number of recommendations for improvement including training.

Potential for Reuse of Low Contamination Abattoir Effluent (PIP.O10)

Establishing a mutually beneficial water reuse arrangement with a neighbouring process

Project Aims

- Characterise the volume and contaminant level of potential reuse (“white” water) streams
- Determine the appropriate technology to enable the reuse of this water in a nearby industry and/or within the abattoir itself
- Develop a best practice water reuse model for the meat industry.

Story

In this time of heightened concern about water use efficiency, Northern Co-Operative Meat Company Ltd has taken significant steps towards water reuse. The installation of separate drainage systems has permitted the segregation of “white” streams from slaughter floor wastewater and established a viable reuse opportunity at a neighbouring tannery.

Description of project

When the Veal Floor at Northern Co-Operative Meat Company Ltd was rebuilt in 1999 not only was water efficiency incorporated into the design, but separate drainage systems were installed to permit segregation of “white” streams (steriliser and handwash water) from other slaughter floor wastewater streams. To take advantage of the opportunity to quantify and evaluate the various wastewater streams, they installed monitoring equipment to relay details of cold water, steriliser water and handwash water usage on the Veal Floor to a central SCADA system.

Large volumes of reasonably high quality water were found to be available from the viscera table boot-wash wastewater stream, the viscera table 2nd cold wash and the combined steriliser wastes from the hide-on area. They were, consequently, collected along with some other medium-to-high quality wastes such as handwash wastes and viscera table hot water wash wastes.

Substantial reuse of ‘white’ wastewaters reclaimed from slaughter floors could be reused in the stockyards and for cattle washing. However, it was determined that tanning operations, located adjacent to the abattoir, offered reuse opportunities of the same order of magnitude as stockyards with the advantage that the water did not need to be treated to potable level.

The CSIRO confirmed that the use of the reclaimed water from this project (in the tannery presoak, dehairing and delimiting stages) presented insignificant risk to the quality of the tanned hides. However, temperature and microbiological contamination were identified as important issues with some of the stages in the tanning process. One important constraint was that the tanning process at the nearby tannery requires water of about 26 to 28oC whereas the identified slaughter floor wastewaters vary from ambient temperature to over 80 oC.

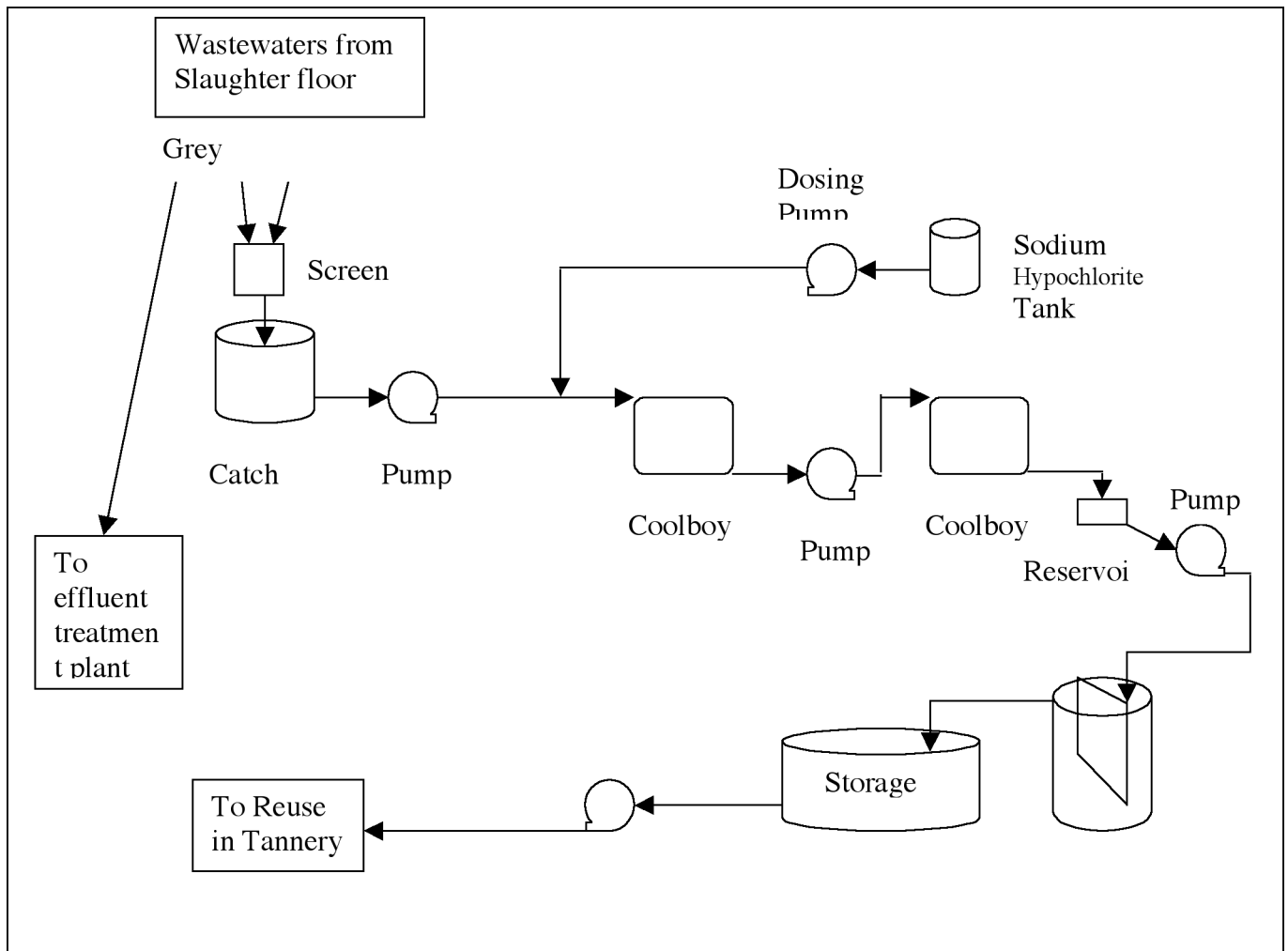
A model was developed to predict the volume, temperature and contamination of any combination of individual wastewater sources. From this model the combination of the following wastes was found to be suitable for reuse in the tannery subject to cooling.

Major Outcomes

- 100kL per day reduction of water usage at the tannery
- Continued expansion of water reuse from the abattoir to the tannery
- Reduced hydraulic & temperature load on the abattoir effluent treatment plant

Effluent Source	Temperature (oC)	Volume(m3)	Quality Rating
Hide on Knife Sterilisers	82 +	20	High
Vis Table 2nd cold wash	20 - 25	21	Med / High
Vis Table Boot Wash - cold	20 - 25	19	Med / High
Vis Table Boot Wash - hot	72	15	Med / High
Vis Table last cold wash	34	10	Medium
Hide on Handwashes	30	10	Medium
Vis Table hot wash	48	8	Medium

When applied to these combined wastes the model predicted the collection of about 104 kL of water at 46°C. Cooling was planned using existing evaporative coolers configured as shown in the diagram below.



The collection, basic filtering and chlorination system were established, with the reclaimed water transferred to the tannery for presoaks and final washouts of the tanning drums. Once established, the average collection temperature was found to be 53°C with the cooling system capable of delivering a high quality water to the tannery at 14-16°C.



The water reuse plant with coolboys at the left rear



The "white" wastewater catch tank

Evaluation

Key points to note from this project are:

- 100kL per day of white water previously sent to the effluent system has been reused
- Removal of 100kL of water at approximately 50°C has allowed the effluent plant to operate at a lower temperature
- Reduced water volume and reduced temperature has created the potential for a smaller, more efficient, effluent treatment facility
- Establishment of a useful wastewater prediction model

The white water recovery prediction model appears to have been successful and can be used at other abattoirs. The reuse of reclaimed "white wastewater" has continued at the tannery since the project was completed and successfully continues to displace fresh town water in the tanning process. There have been no problems with product quality in relation to the use of reclaimed water.

Since the project was completed there have been significant improvements in the amount of water reclaimed and the amount of reclaimed water reused at the tannery. White wastewater sources identified in the PIP, but not collected at the time, are now being collected and there are plans to continue expanding the collection of "white" wastewaters. The reuse at the tannery has been expanded from the first 2 steps of tanning to the first 4 steps. Improvements also are being made to the disinfection of the water to allow chlorination of the stored water when no reclaimed water is being added.

There is no financial transaction between the abattoir and the tannery as it is part of the same corporate ownership. However, with the cumulative savings in town water and the reduced cost of handling the reduced volumes of wastewater, the savings to NCMC are estimated at \$12,000 pa. The cost of capital required to make these savings is an order of magnitude higher than the savings. The project would not necessarily be justified on monetary payback alone. However, there are other advantages of the project including reduced sensitivity to drought, reduced sensitivity to future cost increases in town water, and fostering a responsible corporate ethic with regards to minimising resource wastage.

Summary

Northern Co-Operative Meat Company Ltd has taken the opportunity given by the previous redevelopment of their beef slaughterfloor to identify and establish the successful recovery and reuse of specific “white” wastewater streams. While many abattoirs do not have the infrastructure to easily recover separate wastewater streams, the model prepared by NCMC could allow them to predict a final stream from a number of different source streams. The model would allow other abattoirs to establish the cost/benefit of modifying plant to enable the capture of specific streams.

NCMC have used their relationship with the tannery to their mutual benefit. For NCMC it is the removal from site of a significant volume of wastewater without passing through their effluent treatment plant. For the tannery it is the ability to obtain water to meet their needs without taking potable water from other sources.

This opportunity for reuse would be available to any abattoir with any type of complimentary processing facility nearby and should be considered as a significant environmental improvement.

Contacts

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Water Use Reduction program (PIP.011)

Maintaining carcass hygiene standards while eliminating carcass washes

Project Aims

- Identify and quantify the major water usage points within the slaughterfloor
- Identify areas where water usage could be reduced through technology and/or new work practices
- Implement new water saving work practices and/or new technologies

Frewstal Pty Ltd responded to the pressures of increased production and the associated disposal cost of wastewater to the municipal sewer by quantifying the various wastewater sources and investigating the elimination of some. Despite being well within best practice guidelines, they managed to identify where they could successfully reduce water usage and avoid substantial capital expenditure required to upgrade wastewater treatment facilities. Major changes to Frewstal's domestic smallstock slaughterfloor and effluent treatment system, precluded the uptake of the project outcomes.

Description of Project

As a result of increased production Frewstal Pty Ltd was concerned about the level of wastewater being generated and the associated disposal cost via the town sewerage system. To avoid substantial capital expenditure to upgrade the on-site effluent pondage system, opportunities for reduced water usage were investigated. Flow meters were installed at strategic points throughout the plant to identify areas of high water use. These flow meters were located with the aim of determining the opportunity for water and labour savings at each water usage station on the slaughterfloor.

Major Outcomes

- Identification of potential water reduction by 2%
- Identification of significant labour savings
- Total identified savings of \$67,600

Daily water usage measurements were taken during August and September 2001 to determine the amount of hot and cold water used per unit of production at the following locations:

- All steriliser and hand wash units
- Pre-evisceration (1st) wash – warm hand wash
- Pre-evisceration (1st) wash – cold hand wash
- Forequarter (2nd) wash – warm hand wash
- Automatic (final) wash – cold wash bottom spray only (top sprays normally turned off)
- Total plant water usage.

Water usage averaged 4.1 kL/tHSCW, which was at the lower end of MLA's benchmark data from 1998. Even the worst daily case identified a usage of 5.4 kL/tHSCW which was below the 7 kL/tHSCW benchmark reported as typical in the Eco Efficiency Manual for Meat Processing.

Frewstal's study showed that on average, 53% of water was used for hand washing and sterilisation units, while another 13% was used for carcass washing. They identified that despite offering a relatively small opportunity for reduced water usage, short term savings in water use were most likely to be obtained through reducing existing carcass wash stations where there was no detrimental effect on carcass macro- and micro-contamination levels. They demonstrated that they could reduce from four carcass washes to two.

Previous work undertaken at Frewstal (MRC, 1998) showed that macro-contamination levels were largely related to plant throughput and, therefore, it should be possible to remove one or more carcass wash stations providing attention was given to ensuring the process prior to washing met required macro-contamination levels.

Following identification of the opportunity to reduce water use at carcass washes and, after discussion with quality assurance and production staff, validation trials were conducted as below:

1. Removal of 1st cold manual wash
2. Removal of 1st warm manual wash
3. Removal of 2nd warm manual wash, with top and bottom automatic wash on to ensure removal of any internal blood staining.

In the validation trials carcass macro-contamination was scored on all carcasses following carcass washing. A modified system of scoring based on the Australian Standard (but scoring only those contaminants whose presence could be affected by carcass washing) was used.

Macro-contamination scoring was supported by microbiological sampling and testing of carcasses. Samples were taken from the three standard carcass sites using the sponge technique. Ten carcasses from each treatment group were sampled following carcass washing. Microbiological testing of the samples was carried out for Total Plate Count (TPC) and E. coli Count.

Carcasses that did not receive a pre-evisceration cold wash, those that did not receive a pre-evisceration warm wash and those that did not receive a post-evisceration warm wash, had higher levels of micro-contamination. However, in all cases the average microbiological levels met 'excellent' levels for TVC and 'good' levels for E. coli (as established by industry best practice). The worst carcasses, for both washed and unwashed groups, recorded 'good' TVC levels and 'acceptable' E. coli levels. Also, there were no statistically significant differences between washed and unwashed carcasses for macro-contamination levels.

Based on these findings, it was considered that there would be no detrimental effect on carcass quality as a result of removal of the cold pre-evisceration, warm pre-evisceration or warm post-evisceration washes. However, it was identified that considerable care would be required to minimise macro-contamination during all dressing activities.

Evaluation

Key points to note from this project are:

- In the short term, Frewstal could remove the pre-evisceration cold manual wash. The benefit to Frewstal of removal of this wash was primarily related to a labour saving rather than a major reduction in water usage (2% water saving).
- At the time of year of the trials (late winter/early spring) either the pre-evisceration cold manual wash, or the post-evisceration warm manual wash, could be removed without a detrimental effect on carcass quality. However, removal of the post-evisceration wash would not result in reduced water usage as it coincided with full operation of the automatic wash.
- The annual cost saving to Frewstal from removal of the pre-evisceration cold wash or post-evisceration warm wash is \$34,700 or \$32,900/annum respectively. The primary component of these savings is in labour.

Summary

While some monetary savings were identified and some reduction in water volume was achievable to reduce load on the sewer discharge, these initiatives were not implemented. Before implementation could occur the decision was made to convert the slaughterline from conventional to inverted dressing. This conversion resulted in the reduction of carcass washes to a single automatic post-evisceration warm wash, supported with the option of final manual wash. This option is used only if poor stock hygiene requires it.

Concurrently, Frewstal developed an on-site wastewater treatment facility, including storage and irrigation options, that eliminated all sewer discharge of water from the plant. While the outcomes from the project were not directly implemented at this site, the information generated by this project should be reviewed by any smallstock plant facing similar problems with wastewater volume and the need to reduce water usage, because monetary savings are obtainable.

Contacts

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Biological Desludging of Anaerobic Waste water Treatment Ponds (PIP.023)

A healthy pond under low load does not need biological desludging

Project Aims

- Implement a biological desludging program in the anaerobic pond.
- Establish and implement a monitoring program to objectively evaluate the biological desludging program.
- Provide information to the wider industry on the results of the monitoring of the biological desludging program.

Story

Lachley Meats believed their anaerobic pond to be overloaded and inefficient after years of use. After several months of treatment with desludging cultures it was found that due to the pond's large volume it had low loading and long residence times, ensuring that it was actually in good condition. Whilst little was learnt about desludging performance, valuable lessons were learnt, however, in pond sampling and testing procedures.

Description of project

The treatment of wastewater from abattoirs using anaerobic ponds is one of the most effective and cost efficient methods available. However over time an anaerobic pond may become less effective as sludge accumulates in the pond, reducing capacity and retention time.

Traditional cleaning by mechanical desludging is costly and difficult and requires decommissioning of the pond for a period, causing problems with production in the plant.

Lachley Meats anaerobic pond had been in use for some 30 years with no desludging having occurred in that time. There were concerns that the effectiveness of the pond would have deteriorated over this time so desludging was recommended as a preventative measure.

Lachley Meats used this project to address a lack of information on the biological desludging of anaerobic ponds through the development of a monitoring and evaluation process. BioRemedy Pty Ltd supplied microbiological cultures for the trial and designed the dosing program to suit these.

Effluent quality was determined at various stages of the treatment system by monthly sampling and analysis. Monitoring of the trial also involved visual observation, including taking regular photographs of the anaerobic pond to assess any visual changes that may occur. Physical measurements such as water clarity in the aerobic pond and Hydrolab scanning of the anaerobic pond for pH, temperature, redox potential, turbidity and electrical conductivity were also carried out to assess the health of the pond. The crust depth and the amount of sludge accumulated on the pond bottom were able to be measured from this data.

The monitoring program showed that:

- The anaerobic pond exhibited excellent performance both prior to and during the Biological Desludging Program
- Analysis of the data proved that there was no significant change in pond behaviour due to the 6 month Biological Desludging Program. Average BOD removal performance prior and during the BDP was 88%.

Major Outcomes

- **The Hydrolab minisonde is a useful pond monitoring tool**
- **The addition of bacterial cultures to a well-operating anaerobic pond has no benefit**
- **Bacterial cultures can damage pond crusts and release odours**

- The Hydrolab survey found that there were negligible quantities of sludge in the pond. Due to the large size of the anaerobic pond, the light BOD load, and the long hydraulic retention time, there was probably little sludge present in the pond at the start of the program. This is likely to explain why the pond performance exhibited negligible improvement during the program.
- It was observed that the pond crust thinned considerably during the Biological Desludging Program. This is potentially not a good outcome since while the presence of a crust may not improve anaerobic pond performance, there is little doubt that it greatly diminishes the rate of odorous emissions. It was apparent that Biological Desludging Program could lead to the loss of this protective feature of the anaerobic pond crust.

The study shows that, whether the addition of microbiological cultures can achieve significant recovery of pond volume when a pond is full of sludge, remains untested.

Evaluation

Key points to note from this project are:

- The Hydrolab minisonde proved to be a useful tool for monitoring pond sub-surface conditions.
- A well designed anaerobic pond, with good primary treatment and limited load, will not develop sludge to the extent that the pond performance is affected.
- The use of biological desludging cultures can effect crust integrity and allow odour release.

Summary

A six month program of Biological Desludging of an anaerobic pond at Lachley Meats did not appear to improve its performance, which at all times was excellent with BOD removal typically > 80%. The Biological Desludging did appear to thin the anaerobic pond crust during this time.

The Hydrolab submersible minisonde device used to assess the health of the pond and the amount of sludge remaining at the end of the program proved to be an excellent assessment tool although the pond was shown to be well-mixed and very healthy, with negligible sludge present.

Contrary to initial expectations, there was probably little sludge present in the pond at the start of the program, especially since the pond performance exhibited negligible change during the program. As a result, the addition of bacterial cultures achieved little when the anaerobic pond was already operating well.

The question of whether the addition of bacterial cultures can achieve significant recovery of a pond that is full of sludge remains untested. An abattoir whose anaerobic pond is known to be heavily sludged should still consider this technology. The monitoring systems used at Lachley Meats have proven successful and are recommended for other abattoirs with anaerobic/aerobic pond systems.

Contacts

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The Development of CPMS

(PIP.064.1, PIP.064.2, PIP.097, PIP.101, PIP.105, PIP.106)

Plant Implementations of a Computer Process Management System CPMS at Various Processors as Follows:

PIP.064.1	Tatiara	Transverse Leg Immobiliser
PIP.064.2	Wammco	CPMS Stimulation
PIP.097	Fletchers	CPMS Demonstration
PIP.101	MC Herd	Short Segment Transverse Leg Stimulation Electrodes
PIP.105	Swan Hill	CPMS Demonstration
PIP.106	Hardwicks	CPMS Demonstration

Project Aims

CPMS is an MLA program to develop a process management system to manage the stimulation technologies in processing to achieve consistently tender meat.

This group of projects may be separated into two categories:

- Projects PIP.064.1 and PIP.101 are to test/prove the laboratory developed equipment to pass an immobilising/stimulation current through the hind legs of the animal directly after slaughter while it is hanging in the vertical position.
- Projects PIP.064.2, PIP.097, PIP.105 and PIP.106 are from the group of 6 plants that agreed to being demonstration plants for the technologies. The operation of these demonstration sites provided the underpinning data for the decision to move forward with CPMS.

CPMS Background and Program Strategy

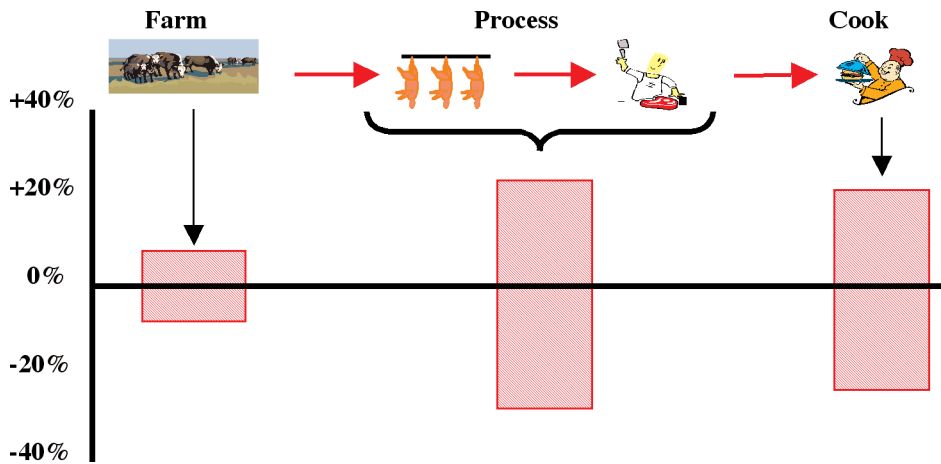
Developing innovations which improve the consistency in eating quality of Australian beef and lamb is a strategic imperative for MLA, and there has, therefore, been considerable investment in the MSA program for beef and, more recently, SMEQ. These programs have already achieved significant benefits and improvements in eating quality and consumer satisfaction. MLA has also undertaken R&D in the area of meat processing electronics technologies. These have also been commercialised and are delivering quantifiable benefits in terms of further improved eating quality (beef and lamb) and processing efficiency.

Previous research suggested that the single greatest contribution to variability in meat eating quality occurs during processing.

In 2000 MLA commenced a research program to develop a suite of processing interventions (based primarily on new forms of electronics technology) aimed at maximising both eating quality and processing efficiency.

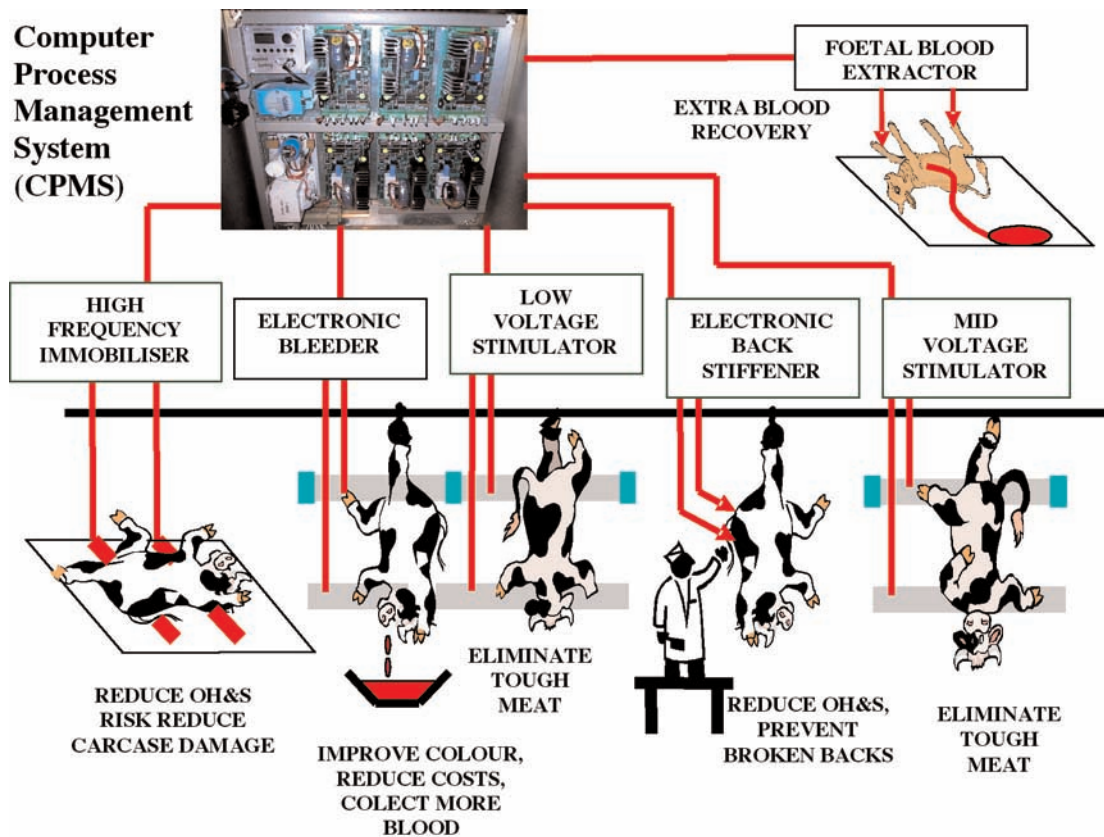
CPMS provides the tools for processors to produce consistently tender meat through interventions at critical points in the slaughter process.

CPMS has been commercialised and installed in over 30% of the top 25 meat processors. In lamb plants tough meat has been reduced from 20% to zero. Fully implemented across Australia the benefits to industry have been estimated to be in the region of \$500 million



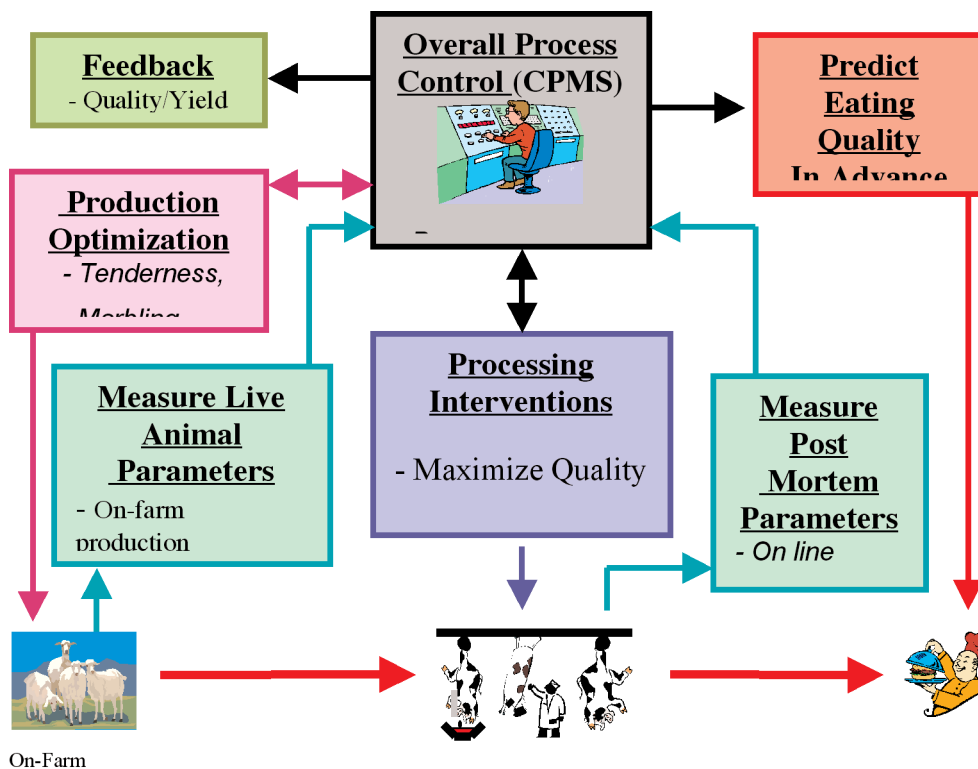
Relative Contributions to Variability in Meat Quality

Following installation of individual production prototypes into several meat processing operations, it was identified that multiple electrical inputs to carcasses had an accumulating effect and, therefore, the different technologies needed to be co-ordinated by a master control system or meat quality could suffer. The Computer Process Management System (CPMS) was conceived and patented.



The Present Suite of Meat Electronics

The diagram below illustrates the way the meat production/processing system can be treated in a holistic way to optimise quality and efficiency. By building on the CPMS concept, additional measurements and interventions could, theoretically, be used in an overall process control system, such as the CPMS, to coordinate all aspects of meat production from paddock to plate.



With the CPMS in place, the whole supply chain can now be viewed as a modern industrial process to:

- Understand the various inputs and outputs to the extent that all important parameters affecting meat quality can be modelled.
- Devise interventions to minimise the effect of variability in the inputs and processing.
- Program the CPMS with algorithms to control the interventions.
- Perform objective measurements to accurately predict the eating quality of the output (meat).

To address these opportunities it was necessary for MLA to develop an integrated R&D Program to address the knowledge and technology gaps. This is known as the “New Generation Process Innovation Program” (NGPI) which is a component of the MLA strategic research portfolio.

Description of the Projects

Projects PIP.064.1 and PIP.101, Transverse Leg Immobilisation

After knocking, sticking and hanging, many sheep carcasses can flex violently for several minutes while being transported to the first work station. Flexing of the carcasses prevents consistent presentation and can even result in legs releasing from the hangers.

Electrical immobilisation can eliminate carcass flexing and is used widely in beef processing. Although the electrical immobilisation technique works on sheep it is very difficult to apply to carcasses hanging by the back legs only. The problem arises because the wool is a very good electrical insulator and prevents good electrical contact being made. Electrical contact through the legs with rubbing “blade” electrodes is possible but with the conventional idea that immobilisation energy must pass through the trunk of the carcass rubbing electrodes need to be applied to both the front and hind legs.

This project addressed this problem by testing, in a production environment, a technique which showed promise in the laboratory. By constructing a hind leg rubbing electrode (with many short segments insulated from one another) it may be possible to immobilise the carcass by passing electric energy from one hind leg to the other. In this case the immobilisation energy crosses the base of the spine and stimulates much of the carcass via the spine.

Projects PIP.064.2, PIP.097, PIP.105, PIP.106, CPMS Demonstration

The CPMS research developed technologies with enhanced capabilities beyond the original specification and this has now been provisionally patented as a Computer Process Management System (CPMS). Several new spin-off technologies from the original research were developed for beef but these have not been demonstrated on a commercial scale with sheep. These projects will demonstrate to the industry, CPMS HF Immobilisation, Electronic Bleeding and Mid Voltage Electrical Stimulation applied to sheep (and goats at Hardwicks).

Commission the total plant CPMS electronics installation and develop optimised parameters which allow for the interaction between the three technologies.

Summary

These projects provided sites to complete the development of the leg stimulation/immobilisation part of the CPMS program and provided data and demonstration sites for industry to view the application of the technologies. The outcomes of these projects are

- Matrix of electrophysiological responses used in a commercial environment to determine parameter setting for the CPMS technologies.
- Coles and Woolworths have now specified CPMS electrical stimulation for their suppliers
- 30% of the top 25 processors using CPMS technologies.

Was the CPMS program worthwhile?

- **CPMS has developed process management technologies that have worldwide application.**
- **The program has demonstrated that process interventions can be controlled to improve and predict the eating qualities of meat products.**

Contacts

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Smallstock Evisceration (PIP.015)

Re-design of the evisceration process to improve the ergonomics

Project Aims

- Reduce repetitive strain injuries by improving the ergonomics of sheep and lamb evisceration.
- Redesign and reposition slaughter chain to reduce heavy lifting and twisting of lower body by operators during evisceration.

Introduction

Eviscerating sheep and lambs leads to repetitive strain injuries and compensation claims. It is a repetitive job involving bending, lifting and twisting. If the viscera could be taken out of sheep carcasses in the same way as beef, the effort and strain of sheep evisceration would be greatly reduced. The idea at Vodusek Meats was to raise and move the slaughter chain so that the carcasses hang over the viscera table and to install a stand to allow the operators to face the carcass. The operator can then lift the viscera out of the body cavity and let it drop into the viscera pans without having to twist around.

Description of project

The small stock chain, from the point of hooking up the hind hocks to hanging carcasses from the hind legs for evisceration to removal of the pluck was redesigned.

The main alteration was to raise and reposition the chain so that the carcasses hang over the pans of the viscera table. Other modifications were:

- A new stand was installed at the height of the viscera pans.
- A hydraulic hoist was installed to lift the gambrel in the hind hocks up to the evisceration rail.
- The evisceration rail was raised allowing the neck trimming, the first job after hanging from the hind hocks, to be done at a more convenient height.
- The next job of cutting around the bung was also done at a more convenient height. The job was modified by removing the task of pulling the bung through the h-bone. This shortened the work cycle. Instead a new job of pulling through the bung, milking, clipping and cutting off the end of the colon was introduced.
- Removal of abdominal viscera was achieved by lifting the viscera out of the abdominal cavity and dropping it directly onto the viscera pan underneath.
- Lifting the rail allowed brisket splitting to be done at a more convenient height.
- Kidneys were removed at a more convenient height and dropped into the viscera pans without the operator twisting.
- The thoracic viscera is lifted over the brisket and dropped to the right avoiding a 180° twist.

Major Outcomes

- 1. Evisceration of sheep can be done with carcasses hanging over the viscera table, as it is with beef.**
- 2. The modified position of evisceration reduces the effort and strain injuries.**
- 3. The value of OH&S claims arising from evisceration has been reduced from 12% to 2% of total claims.**

Evaluation

After the new rail was installed, there was reduced risk of injury in all jobs on the evisceration line due to:

- less effort required to perform jobs;
- adoption of better postures to perform jobs;
- less movement, particularly rotation involved in each job;
- shorter duration of each work cycle.

It is expected that there will be long term savings due reduction in injuries, reduced lost time, reduced work cover costs and work cover premiums. One employee who had been on light duties for 1 year was able to return to work on the evisceration line without aggravating a shoulder injury.

The total cost of the project was about \$90,000. The cost of the project was less than 3 average meat industry Work Cover claims.

The benefits have not been quantified but management have confirmed improvements in OH&S.

Output

The project demonstrated the benefits of redesigning the small stock chain so that viscera can be dropped from the carcass to the viscera pans without the operator having to turn around 180° to put the viscera in the pans.

Open days have been held at Vodusek Meats to demonstrate the modified dressing rail. A multi-media presentation on CD showing video clips of the new system compared with the old system is available.

Outcomes

The redesigned rail has been in continuous operation at Vodusek Meats since 2002. Management confirm that OH&S claims related to evisceration have been reduced from 12% to 2% of total claims and that work cover premiums have been reduced as a result.

Summary

Vodusek Meats has demonstrated the benefits of realigning the sheep dressing chain with the viscera table to improve the ergonomics of evisceration.

The modifications at Vodusek Meats could be applied on other sheep and lamb dressing chains.

Contacts

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Life Directions - Innovative Employee retention program (PIP.030)

The “No Bull” staff development workshop program

Project Aims

- Improvement in vertically integrated communication and attitude within the workplace.
- Reduction in downtime, sick leave and work-care claims.
- Improvement in retention rate of employees.
- Imbuing employees with pride in their work place, who know they count and are appreciated.

Story

Midfield Meats has tackled the industry-wide problems of absenteeism and staff retention through a series of workshops to improve workers’ self esteem, supervisors management skills and worker/supervisor interactions. In doing so, they have provided workers with an understanding of the development pathways available within the company and demonstrated a mentoring system to effectively deal with habitual absentees. The short-term benefits have been clearly achieved but must be reinforced to maintain long-term improvements.

Description of project

The Personal Directions Program was designed to impact on absenteeism and retention rates in the meat processing industry by improving the communication skills of both supervisors and employees. Developed by OnTrack Dynamics, the program was trialed at Midfield Meats, Warrnambool, between March and May 2003. The impact of the program was independently evaluated by Kulu Adventures in Management. The program was designed to be applicable across the industry and to be a practical, work-oriented program specifically to tackle the issues of absenteeism and retention by:

- improving supervisor’s management skills;
- providing transferable communication and problem solving skills for employees that could impact on both work and personal life; and
- supporting the career development of promising young people.

Thirty four senior managers, supervisors, and middle managers based at the company’s various operations in Warrnambool attended 2 day leaders’ workshops and twenty nine non-management employees, considered to have potential for advancement, attended 2 day workshops entitled, ‘Emotional Competence-Self Management and Building Partnerships’.

The program was modified through the workshop series as experience was gained with the emphasis of the leadership workshops shifting from ‘Encouraging and modelling self management’, to ‘leadership skills, with a specific focus on ways of managing absenteeism’. In the employee workshops there was an increased emphasis on employee career development and leadership skills. All courses became more participant-driven. The effect was to maintain a well-structured approach without reminding anyone of school!

The program was extremely effective in achieving its short-term goals. Not only did participants rate all aspects highly, there is evidence that the program had an immediate impact on participants’ attitudes and behaviour in the workplace.

Major Outcomes

- Supervisors & employees gained improved attitude & skills
- The ‘adopt a person’ program has assisted habitual absentees
- On-going re-enforcement is required to prevent gains being lost

Key indicators of the initial impact of the Leaders' program were:

- Despite widespread cynicism, almost all supervisors felt the experience had been worthwhile.
- Every participant had taken steps to implement personal goals, and was able to give examples of what they had done.
- New behaviours were being maintained.
- Most supervisors had adopted a person without further input and were finding that their efforts were making a difference.
- Two employees were promoted following their participation in the Leaders' workshops.

Those at the employee workshops were keen to attend and saw the invitation as a message that the company valued them. After the event, almost all reported they had found the workshops had given them:

- a much better understanding of company operations and the range of opportunities available to them;
- broader options for career development than aiming to become the supervisor of their floor;
- increased motivation to get on in the company;
- useful strategies to get information and assistance;
- an improved network of contacts; and
- better communication and conflict management skills.

One significant new development that has the potential to work in other abattoirs is the 'adopt a person' program. Many supervisors have identified someone they felt might benefit, and their mentoring has yielded some good results. Each absentee has a measurable impact on productivity, adds to workloads and increases frustration. By reaching even a handful of habitual absentees, supervisors can achieve a measurable gain for the company and for themselves.

The workshops were successful because they targeted issues that everyone, not just senior managers, was worried about. Absenteeism, retention, and communication were priority issues for supervisors. Employees were also concerned about poor communication, and about their own futures within the company.

The key features that ensured success for both groups were:

- The flexibility and expertise of the facilitator.
- The clear and continuing focus on participants' priorities and needs.
- The integration of skills training into the discussion of workplace issues.
- On-going support from the company.
- The involvement of the right people from within the company.

However successful in the short term, a one-off workshop cannot be expected to have an indefinite impact. People quickly revert to previous behaviours without on-going support. The company is already working to develop strategies that will help them build on the initial impact and get the best return on their initial investment.

Evaluation

Key points to note from this project are:

- Both supervisors & employees gained an improved attitude and useful new skills from this program
- The 'adopt a person' program showed significant improvements in some habitual absentees
- The choice of facilitator is essential to the effectiveness of the program
- On-going facilitation will be required to maintain the short-term gains made.

This project has had an effective short-term impact on both supervisors and employees that has been clearly identified. However there is danger that this may be lost if reinforcement and on-going support do not occur. A final report published some two and a half years after the workshops has identified that:

- Of the 34 participants who attended the leadership group, 7 are no longer employed by Midfield
- Of the 29 participants who attended the employee group 11 are no longer at Midfield
- The 'adopt an employee' program has not continued.
- Management believes that there has been a significant improvement in attitude of all staff and a reduction in issues relating to: conflict, race, gender or culture.

Summary

The On Track Dynamics program appears to have had some significant short-term impact on the attitudes of both supervisors and employees at Midfield Meats. This pilot project has given employees an improved perception of their potential pathways within the company and has resulted in a number of examples of improved absenteeism particularly with habitual absentees.

Its long-term effect has also been confirmed some two and a half years after the workshops although the 'adopt a person' program has ceased. A final report is available that identifies the most recent feedback from management and employees who were involved in the program.

Other meat processors should consider this type of program in their employee development strategies, as this pilot program appears to have been successful in addressing at least some of the key employment concerns. A CDROM based video "No Bull" highlights the outcomes from the Midfield Meats experience.

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Industry Ergonomic Assessment, Claims and Return to Work Management (PIP.072)

Using the WERCS program to identify and implement effective improvements in work practices

Project Aims

- Conduct a full ergonomic assessment of the tasks undertaken at a range of abattoirs as a first step in assisting plants to eliminate serious injuries and reduce the overall incidence of injuries
- Progressively install WERCS software-based OH&S systems for hazard, incident, claims and return-to-work management, to assist plants to improve their overall performance and management of OH&S
- Identify and progressively develop engineering solutions for “black spot” injury risk tasks.

A trial of the Workplace Ergonomics, Rehabilitation and Compensation System (WERCS) at eight Australian abattoirs included a full ergonomic assessment of all tasks within each plant. Two of the projects were very successful and have resulted in significant re-engineering of "black spot" operations within the plants where serious injuries were occurring. These successful plants also used the project to focus on improved claims and return-to-work management, to achieve better outcomes and lower costs. Four other plants within the project are in the process of implementing the outcomes of the assessments, while the remaining three plants have since closed prior to any implementation of outcomes.

Description of project:

WERCS is a software-based return-to-work management system designed, by Risk & Injury Management Services (RIMS), to meet the needs of the Meat Processing Industry. This program was initially trialled at Vodusek's Abattoir to determine its applicability to the meat industry. A wide range of engineering and procedural controls were developed and implemented within this plant as a result of this initial project. A subsequent project evolved from the WERCS outcomes to redesign the lamb evisceration system. The final design was successfully implemented and achieved a very successful and innovative outcome. Vodusek Meats won the 2002 AMPC OH&S Innovation Award with this innovation.

The Vodusek project commenced with the task analysis assessment of all processing areas for beef and mutton. Non-processing areas were also assessed as well as ad hoc jobs that are performed on a periodic basis.

All jobs that are recorded on the system are considered options for return-to-work and were included in the facility-wide assessment. The key feature of the WERCS program is the matching of an individual's capacity against the assessed demands of these jobs to determine which jobs are appropriate for rehabilitation or return to work. If a job has been identified as being suitable the system then defines how it should be performed, relative to the individual's injury, to then minimise the risk of aggravation of that injury.

Major Outcomes

- 2 abattoirs with successful improvements in OH&S performance related costs
- 3 abattoirs in the process of making significant changes to improve OH&S
- 3 abattoirs in a position to make changes if plants are reopened.

Based on the success of this initial project the following abattoirs separately ran complimentary projects using the WERCS program:

- AJ Bush, Yanco NSW
- Frewstal, Stawell, Victoria
- Frew Kyneton, Victoria
- Penney and Lang, Carisbrook, Victoria
- G M Scott, Cootamundra, NSW
- Southern Meats, Goulburn, NSW
- Stanbroke Beef, Grantham, Queensland

At Frewstal, lamb production, load out, skins, offal, yards and alternative jobs and processes were assessed. The results of the assessment have been incorporated into a significant redesign of the production process as a part of a plan to upgrade to export operations. A range of engineering and procedural controls has been developed with the higher risk jobs determining the priorities for redesign. These changes have been implemented as part of the redesign process. Some 12 months after the implementation, the process was reassessed and fine-tuned. As a result, Frewstal can demonstrate a sudden and significant drop in their injury and claims experience from these changes.

GM Scott commenced the implementation of controls on the lamb production line in mid 2005, with a focus on the redesign of the sticking and shackling table, relocating brisket trimming and breaking down the forequartering job into 4 or 5 separate smaller jobs. By mid 2005, at Southern Meats a range of engineering and procedural controls was developed ready for implementation. Southern Meats is also using the WERCS data as a base for updating risk assessments of ergonomic controls and for injury claim management. RIMS has recently completed assessments at Stanbroke Beef and the abattoir is about to implement recommended changes.

AJ Bush, Frew Kyneton and Penny & Lang unfortunately all ceased operations before identified improvements could be implemented.

Evaluation

Key points to note from this project are:

- A successful outcome from the initial WERCS-based PIP at Vodusek's has led to a PIP to re-engineer the evisceration section of the slaughterline resulting in significant improvements in OH&S and ongoing cost savings.
- A successful outcome from the second round WERCS-based PIP at Frewstal has led to a range of engineering and procedural controls resulting in significant improvements in OH&S and an identified drop in injuries and claims.
- Ongoing engineering & procedural changes are occurring at GM Scott, Southern Meats and Stanbroke Beef.

A limitation of these projects has been the plant by plant focus. While this is necessary to be able to evaluate the needs of each site and build up a body of knowledge, it does not provide any inherent capability to develop common solutions to common problems. RIMS stores the work demand and injury risk assessment information on proprietary software (WERCS) and is able to compare and analyse like tasks across the industry. To date, this type of analysis and development of common control measures has not been carried out. Future work in this area will allow for this "common solution" approach for the broader benefit of the industry.

Summary

The WERCS projects have been effective in evaluating meat industry processing work, pin-pointing the key work demands and injury risks and developing control measures to overcome those demands and risks. Many of the recommended controls have required the design and fabrication of new equipment to support the "optimal" work method. To date two of the abattoirs involved in this series of projects have effectively developed and implemented these changes, while three more are in the process of making changes.

The plants that have been able to move forward and fully implement significant change, Vodusek Meats and Frewstal, have been able to introduce new designs, equipment and work methods, that have resulted in reduced injury severity and frequency and significantly improved claims performances, and reduced costs. In addition, these plants were also able to introduce controls across a broad spectrum, which included subtle changes to tool design and work methods as well as effective job rotation. Plants that have not implemented the recommended changes could still do so, as the template (or plan for improvement) has been provided.

Based on the successful outcome at the plants that have fully utilised the WERCS capabilities, this approach to work demand & injury risk assessment and control measure development should be considered by all meat processors concerned about their OH&S performance and the associated costs. Further work on identifying "common solutions" will enhance the effectiveness of this approach for the meat processing industry.

Contacts

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