final report

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Cost Benefit: Lamb Brisket Cutter

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EXECUTIVE SUMMARY

This report discusses and delivers a cost benefit analysis for an automated Lamb Brisket Cutter that has been developed by Machine Automation and Robotics Pty Ltd (MAR) in conjunction with Meat and Livestock Australia Ltd (MLA).

This machine is installed at Peel Valley Processors and replaces a manual method of cutting the brisket in a lamb carcase.

The purpose of this cost benefit is generally for use as a tool to assist processors in making a financial investment decision on a major capital purchase. This cost benefit examines the changes to the costs of a processing plant after this machine is installed. In this case the equipment was installed at Peel valley Processors in Tamworth.

It was unfortunate that the information needed to develop a comprehensive cost benefit had not been recorded or there was not sufficient detail to enable what information was available to be used in all areas of the cost benefit. Accordingly, there are certain assumptions that have been made and it is expected that these assumptions will be challenged and the cost benefit modified as other processing plants install this equipment. It is expected the cost benefit model will be updated over time with this new information with the result being a much more confident model.

This Cost benefit model examines a number of financial tools that can help in financial decision making.

These include:-

1. Net Present Value
2. Payback period
3. Rate of return
4. Benefit per head

All of these are standard financial methods of making a decision and all are included since different processors seem to prefer different methods of thinking in their financial decision making.

INTRODUCTION

Peel Valley Exporters are based in Tamworth NSW and operate from a reasonably modern plant constructed approximately 8 years ago.

They are exporters of sheep and Lamb products from this plant and also export Sheep and Goat Products from Southern Queensland exporters processing facility at Wallangarra, QLD.

Country Fresh Australia is the parent Company and export Lamb, Mutton and Goat products to the US as well as domestic sales.

This Peel Valley Plant in Tamworth employs approximately 350 people and processes 3500 lambs on day shift and 2500 lambs on the second, night shift. They have plans to increase their production to 3500 per shift in the future. The main problem in increasing production levels has been the lack of a continued supply of skilled labour. This one problem has triggered the strong interest in robotics and automation as a means of helping resolve their production issues.

Peel Valley Exporters have a number of robotic machines installed that are part of this review.

These include:-

- A SaniVac for the front of the foreleg
- A Brisket Cutter utilising a rotating saw
- A SaniVac machine for the rear of the hind legs and around the anal area.

The Brisket Cutter and Foreleg SaniVac have been installed approximately 8 months while the Hindquarter SaniVac machine has been installed approximately 12 months.

ROLE OF THE ROBOTIC BRISKET CUTTER

This robot uses a circular breaking saw to replace the current manual brisket shear. It includes appropriate safety guarding and interlocking, safety equipment, operator controls, sensors and a standard circular breaking saw integrated with an off the shelf “standard“ robot.

Sensors record the physical characteristics of the carcase when it is in front of the robot and these measurements are then used to compute the best cutting path for the blade. The lamb does not stop travelling along the processing chain and the path of the cutting head is adjusted so as to move with the lamb.

This machine replaces a task that was done by one person or one Full Time Equivalent employee.

The major benefit of the Robotic Brisket Cutter is:-

- To take a full time equivalent person from every operating shift
- To do a consistent job of cutting the brisket in exactly the right place every time

And

- Reduce the loss of offal due to damage during the manual cutting process.

THE COST BENEFIT

The findings from this study of installing a Lamb Brisket Cutter Machine are as follows:-

Gross Benefit Per Head	Year 1	$0.06
Nett Benefit Per Head	Over 10 Years	$0.03
Net Present Value	NPV	$469,639
Profitability Index	PI	2.97
Payback time in years		2.6
Internal Rate of Return	ROPC or IRR	41.96%

These values suggest that the installation has been a particularly good investment on Peel Valley's part. The NPV is strongly positive. For an investment of $239,000, a NPV of $469,639has been delivered over the 10 years this project has been considered.

BASIS OF COST BENEFIT ANALYSIS

The process of determining the Cost benefit was to compare the increase or decrease in costs as a result on having one Robotic Brisket Cutter machine installed. Cash flows for a year were then estimated to determine the Net Present Value (NPV) and other similar financial cost benefit statistics.

The following assumptions and /or determinations have been made in developing this cost benefit:

Initial Purchase Costs (Capital)

These costs are all of those related to the installation of the equipment so it is a productive operating unit. Training of operators and maintenance people has also been included here as this is considered an initial cost of enabling the machine to become productive.

Initial work and assessment leading to a decision to purchase

A nominal figure of $10,000 has been allowed for here as the cost to Peel Valley to review the available technologies and the costs associated with making a decision to purchase.

Initial capital Purchase Cost

This price includes the cost to purchase the equipment plus any freight to the site and is what would be expected when a quote was provided after an enquiry. The price used has been obtained from the supplier of the system and reflects the "commercial" price of such an item which is largely bought "off the shelf". It comes with the normal manufacturers warranties.

Installation Cost

This includes the time and materials required to fully install a system into a processing plant. It would include building modifications if they are needed.

Commissioning Costs

This includes all of the labour cost (predominantly) to get a system to a stage where it is working consistently and. It would include all software modifications and integration issues with making the system work within the Processors existing slaughter chain.

Initial Training – Operational

Includes the training of operators, supervisors and cleaning staff in how to turn on and get ready to operate and the basic trouble shooting techniques.

Initial Training – Technical

Costs associated with all training materials and time to make a technical person from the Processors competent in the basic trouble shooting and capable of fixing 95% of issues that arise either on their own or with telephone and internet access support. This includes both Mechanical and Electrical trades.

Additional Changeover Parts

Costs associated with purchasing additional items that can be removed and changed over as a module and the old module sent back to the manufacturer for repair and or refurbishment.

Initial Essential Consumables and Spares parts

This includes cost of those parts that are needed to be replaced on some regular basis. Such items would include the saw blade in the Brisket Saw and the robot protective cover.

Insurance Spares

Insurance spares are those spares that are held because of the potential long downtime associated with them not being readily available. These spares are a function of the geographical position of the plant in relation to the source of supply and it could be assumed that a plant in Western Australia, 3 hours drive from Perth might reasonably carry more Insurance spares than a Processor located 2 hours drive from Sydney.

In Peel Valley's case, they are located 5 hours drive from the manufacturers head quarters and no insurance spares were purchased.

Sources of other funding and at what % of Capital Cost?

This allows for any other grant money that may have been available that could be utilised and could make a project more attractive. In this case the cost benefit has taken no other sources of funding.

POTENTIAL SAVINGS

The following items lists those areas where costs have potentially changed compared to the manual operation of a Robotic brisket cutter which is what this robot replaces.

Increased Yield Gain

The increase in yield comes from the reduced loss of offal from damage. Under a manual system, the operator can, if not careful, puncture some or the offal inside the carcase cavity. This leads to loss of product that is no longer available for sale. In this case there were no records available to allow an estimate to be made of this benefit.

Operational Labour

Under the existing system, the operator is used to hold and operate a hand held, pneumatically driven brisket cutter unit supported by a balance weight. Any cleaning necessary is done by the operator as part of his normal daily work and the cleaning of the station is done by the regular slaughter floor cleaners at the end of the shift. There is no increased measureable workload for the existing cleaning staff to clean this station since it is occupying floor space that is easily hosed down. As a result the current costs of cleaning are ignored but there is the additional cost of a full time operator on each shift when the plant is processing lamb or mutton.

Existing system			
Total labour units required to operate including on-costs		1	$123,760
Cleaning labour	hours/day	0	$0
Sub Total - Existing Manual System			$123,760

The Lamb Brisket Cutter system replaces one full time equivalent in the operation of the brisket cutting process. It does however require additional labour to clean the surfaces of the robot and the guard screens and surrounding electronic lockout systems. This additional cleaning time is estimated to be 18 minutes per day or 0.3 of an hour

Item	Units	Value	Cost/Year
Total labour units required to operate including on-costs		0	$0
Cleaning labour	hours/day	0.33	$5,105
Sub Total			$5,105

The net benefit in labour saving is listed below.

Net savings in operational labour			$118,655

Operational Materials

This is an allowance predominantly for cleaning materials and other incidentals such as scourers etc since there is an increased cleaning time and thus cost.

Item	**Units**	**Value**	**Cost/Year**
Cleaning Materials	$'s Per shift	5	$2,505

Maintenance Labour

These costs are associated with the need for an Electrician or a mechanical trade's person to undertake some form of repair. It is unfortunate that the costs associated with this activity cannot be unraveled from other maintenance costs within Peel Valley Processors.

An assumption of 10 minutes on average per day and an additional 30 minutes per week on startup and another 1 hour per week are reasonable estimates to be able to maintain each piece of equipment.

Item	Units	Value	Cost/Year
Daily maintenance	Hrs/Day	0.2	$1,793
Scheduled preventive maintenance	Hrs/Week	1.2	$2,152
Unscheduled maintenance	Hrs/Week	2	$3,586
Breakdowns	Hrs/Week	1	$1,793
Software mods & cleanups	Man hrs/Year	20	$716
Other maintenance		0	$0
Sub Total			$10,041

The existing manual system also has a need for maintenance with the need to replace air lines, adjust triggers and sharpen blades as examples.

These have been estimated as follows:-

Item	Units	Value	Cost/Year
Existing System			
Repairs to Pneumatic operated shears	Hrs/week	0.3	$538
Replacement /Repairs/Sharpen of blades	Hrs/week	0.5	$897
Sub Total - Existing System			$1,435

This leaves the net benefits of maintenance labour as follows.

Costs for maintenance labour			-$8,606

Maintenance Materials

These material costs have been estimated as listed in the table below. It is also assumed that the majority of material costs in the first 12 months are covered by Warranty. Additional major maintenance items are included with the Overhaul costs.

A nominal amount has been included to allow for such items as water lines, sterilizer hoses etc that are likely to wear on an ongoing basis. These need to be monitored when additional data becomes available to confirm the values

Item	Units	Cost/Year

Maintenance consumables	Lump sum	$1,000
Oils & greases	Lump sum	$200
Sub Total		$1,200

For the existing, manual system the consumable costs were estimated as:

Item	Units	Cost/Year
Maintenance consumables	Lump sum	$300

A net benefit results in:-

Costs for maintenance materials		-$900

Occupational Health and Safety

The use of a robot replacing a manual operation should reduce the number of personal injuries that occur, particularly cuts, sprains and repetitive strain type injuries. The greater number of mechanical and electrical components in an item of equipment will expose the Mechanical and Electrical trades to greater risk but with the appropriate training this should be far less than the potential for operator injuries.

The main benefit areas should be in

- Insurance Premium reduction
- Workers Compensation Cost savings
- Direct Employee Medical Costs

In this instance there was no readily accessible data to determine these benefits. An assessment was made of the benefits of a similar more accident prone task which had been replaced by a robot and 15% of the benefits that were attributable to that piece of machinery have been taken as an estimate.

In developing the cost benefit the following price assumptions have been used.

	Estimated Amount of Saving per Year
Insurance Premium Reductions	$0
Workers Compensation Cost savings	$0
Reduced direct employee medical costs per year	$5,700

It should be noted that the systems have not been installed for a sufficient length of time to have a Workers Compensation savings or an Insurance Premium savings.

Other Savings

Other areas of opportunity such as less damage to pelts and lower bacteriological counts have no measurable benefit with the Robotic Brisket cutter.

Direct Expenditures

These are expenditures that are directly attributable to the installation of the piece of equipment that were not present under the previous system.

Electricity

This covers the Costs of power associated with powering the electric motors and electronic power supplies. The cost been assumed at 15c/kWh. A power factor correction has been applied to this value and a power factor has been estimated at 0.8 with an installed power of 5.5 kW.

Assumptions	Unit	Value
Installed power	KW	5.5
Hours of use per week	hours	80
Cost per KWH	$	$0.25
Estimated cost per week		$110
Costs for electricity		$5,280

Major Over Haul Costs

Experience in other industries with robotic machinery has shown that their life is not easily definable. Rather, as technology changes the robotic equipment and sensors are upgraded or replaced rather than the whole machine replaced. Advice was sought from Kuka and ABB based on other projects and the following assumptions have been used.

Item	Life (Hours)	Life (Years)	Cost to Overhaul
Lamb Brisket Cutter Robot	25000	6.2	$30,000
Brisket Saw	15000	3.7	$7,000
Replace other Major add-on Components	10,000	2.5	$5,000
Replace & upgrade electronic computer systems	25,000	6.2	$7,500

Other Costs

Loss of Productivity

This has not been considered at this time because of the Complexity of including such a figure. Whilst it is a real cost it is not part of the scope of this analysis and has been ignored.

Employment and Ongoing Training

This assumes that ongoing training of the Meat Processors operational, maintenance and technical staff will be required on a yearly basis. Basis for cost is for a daily charge of $1,200 for 1 trainer plus a per diem cost of 300 per day.

Item	Cost/Year
Ongoing training of Technical and operational Staff	$3,000

It is recognised that the existing system will still need training and re-training as the labour force changes. This is a much lower value than the ongoing technical training of the electrical and mechanical trades on a robotic system. Accordingly a nominal value to reflect the need for retraining a workforce that is constantly changing as employees leave and there is a need to employ and train a new operator

Item	Cost/Year
Employment and Training Costs	$2,000
Extra Costs as a result of ongoing Training	$1,000