# final report

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# Automated Sani Vac & Brisket Cutter Market Readiness

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## EXECUTIVE SUMMARY

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

There are 2 types of these machines in operation:-

1. Fore Leg SaniVac
2. Rear Leg SaniVac

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 these machines have been installed and assumes that the machines are replacing an existing manual process of operating a manual steam vacuum unit. In this case the equipment was installed at Peel valley Processors in Tamworth.

It was unfortunate that much of the detailed information needed to develop a comprehensive cost benefit had not been recorded or there was not sufficient detail to be able to tease out the appropriate numbers for use 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.

This study suggests that the installation of either a Fore or rear SaniVac automated system is an excellent investment with a gross benefit per head of $0.17 in the first year, $0.10 net benefit over 10 years and a Nett Present Value (NPV) of $1,250,696

# 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 process 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 EACH MACHINE

## Fore Leg SaniVac

This machine replaces a task that was done by one person or one Full Time Equivalent employee. Its purpose is to wash, suck and steam the front and sides of the foreleg and remove any contaminant material. The contaminant material includes hair, dirt, dust and Sweat Stain than can get onto the surface of carcase during the opening up cuts at the beginning of the pelt removal process.

It is situated after the pelt is almost completely removed and before the carcase is inverted to commence the evisceration part of the process.

The machine makes 3 “strokes” of each foreleg covering approximately 170 degrees in the 3 vertical sweeps.

It has to complete this process so as to fit within the fastest processing speed of 520 carcase per hour or 8.6 per minute. The processing chain does not always run at this speed and on the day the plant was visited, the processing chain was operating at 470 per hour which meant that the SaniVac machine had a brief period at the end of its cycle where it was waiting for the next carcase to arrive.

The benefit over the existing manual process of steam vacuuming is the consistent placement of the steam vacuum head in exactly the same place on every carcase with no misses.

A more detailed operation and description of the machine can be seen from the document entitled “Automated Forequarter SaniVac” as produced by the Manufacturer of the units, MAR. There is a similar brochure for the Hindquarter machine entitled “Automated Rear Sani Vac”.

### Rear Leg SaniVac

This machine operates in exactly the same was as the Foreleg SaniVac except that the carcase is now inverted. This operation happens just before final inspection and is on the main processing carcase rail. The detain line for carcases that have been contaminated and have been ejected by an inspector for further re-work, re-enters at the next station downstream of the Rear Leg SaniVac.

This machine replaces a task that was done by one person or one Full Time Equivalent employee. Its purpose is to wash, suck and steam the back and sides of the now inverted rear leg and the top of the rump area and remove any contaminant material. The contaminant material includes hair, dirt and faeces than can get onto the surface of carcase during final stages of the pelt removal process or during the evisceration process.

The machine makes 3 “strokes” of each foreleg covering approximately 170 degrees in the 3 vertical sweeps. These strokes are in exactly the area where the contamination is likely to have been deposited.

It has to complete this process so as to fit within the fastest processing speed of 520 carcase per hour or 8.6 per minute. The processing chain does not always run at this speed and on the day that the machine was observed, the processing chain was operating at 470 per hour which meant that the SaniVac machine had a brief period at the end of its cycle where it was waiting for the next carcase to arrive.

## THE COST BENEFIT

The findings based on projected cost outflows and benefit inflows from this study of installing an Automated SaniVac Machine are as follows:-

| | | |
|---|---|---|
| Gross Benefit Per Head | Year 1 | $0.07 |
| Nett Benefit Per Head | Over 10 Years | $0.03 |
| Net Present Value | NPV | $559,187 |
| Profitability Index | PI | 3.91 |
| Payback time in years | | 1.9 |
| Internal Rate of Return | ROPC or IRR | 56.5% |

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 $205,000, a NPV of $559,187has 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 Automated SaniVac machine installed. In this case at Peel Valley there are 2 machines, a

Fore leg and a rear leg system as described above. The individual costs or benefits derived from each of these were unable to be determined and they have been considered as though they were individual machines. Where appropriate any befits have been halved and attributed to both machines.

## 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.

### 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.

### 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 Cover for the SaniVac

### 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 Peel Valley's case, there were no other sources of funding.

## POTENTIAL SAVINGS

The following items list those areas which have changed compared to the manual operation of a SaniVac machine which is what these automated systems have replaced at Peel Valley.

### Improved Processing Efficiencies

These benefits are derived from the assumption that the re-work on the slaughter floor and especially the trimming stations is less since the Automated SaniVac does a more consistent job than a person. It consistently reduces the level of contamination thus resulting in less contamination being identified and therefore less carcases being ejected by the inspector and les re-work required to be undertaken on the detain rail. This benefit has not been quantified as yet and an estimate based on discussion with the slaughter floor operators and their experience has been applied as 0.1 of a full time equivalent labour unit per shift.

| Item | Units | Value | Cost/Year |
|---|---|---|---|
| Reduction in Labour as a function of reduced need for Re-work | Fraction of a FTE | 0.1 | $12,376 |

### Increased Yield Gain

There is an argument to suggest that there will be an increase in carcase yield as a result of reduced trimming. However, any yield benefit in reduced trimming is assumed to be offset by the carcase weight when the carcase is weighed at the scales.

### Operational Labour

Under the existing system, the operator is used to hold and operate a hand held SaniVac unit. Any cleaning costs are done by the operator on the equipment 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.

In the Existing manual process the following is assumed:-

| **Item** | **Units** | **Value** | **Cost/Year** |
|---|---|---|---|
| Total Labour units required to operate including on-costs | | 1 | $123,760 |
| Cleaning Labour | hours/day | 0 | $0 |

| | | | |
|---|---|---|---|
| Sub Total - Existing System | | | $123,760 |

The Automated SaniVac system replaces one full time equivalent in the operation of the SaniVac 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 | 0.3 | $4,641 |
| | | | |
| Sub Total | | | $4,641 |

The net benefit in labour saving is listed below.

| | | | |
|---|---|---|---|
| Saving in Operational Labour | | | $119,119 |

## 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 for m 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. This time is allocated to the Brisket Cutter and 50% to each SaniVac machine.

| 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 |

## Maintenance Materials

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

| Item | Units | Value | Cost/Year |
|---|---|---|---|
| Maintenance consumables | Lump sum | | $1,000 |
| Oils & greases | Lump sum | | $200 |

## Occupational Health and Safety

The use of a robot replacing a manual operation will reduce the number of personal injuries that occur, particularly cuts, sprains and repetitive strain type injuries as a result of removing the manual handling task. The greater number of mechanical and electrical components and the more complex the systems are will however expose the Mechanical and Electrical trades to greater risk. With the appropriate training this risk should be greatly reduced compared to that of the repetitive manual handling processes and result in far overall 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 - Pelt Improvement

There have been robotic systems that have resulted in there being less damage to the hide or pelt and therefore delivering a benefit. This is not the case in this project and there is no benefit to hides or pelts

## Other Savings - Bacteriological Improvements

The reduced handling of the carcase and the more consistent approach to the SaniVac operation by the robot is expected to reduce the contamination on the carcase. This is the case based on comments by the plant operators and is also supported by scientific trials (Helle D. Larcon, 1/2009). When the systems were first installed, there were bacteriological swabs taken and cultures done to determine if there was a change. When these cultures were taken, the objective was to ensure that the system was no worse than the current process and the number and frequency of the bacteriological swabs was not done with the idea of quantifying the improvement.

It is believed anecdotally that the bacteriological count is lower and is manifesting as a benefit to the end customer as an increase in shelf life of the product. Whilst this is potentially a significant benefit, there has been no quantification done to be able to measure the benefit. It has not translated into higher selling prices for the product.

## Direct Expenditures

### 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.

It is worth noting that the cost of operating the Vacuum pump for the SaniVac has not been considered since this is also a part of the manual process.

### 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 |
|---|---|---|---|
| SaniVac Robot | 25000 | 6.2 | $30,000 |
| 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 | Units | Cost/Year |
|---|---|---|
| Ongoing training of Technical and operational Staff | | $7,500 |

It is recognised that the existing manual system will still need process worker 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 | Units | Cost/Year |
|---|---|---|
| Employment and Training Costs | | $2,000 |
| Extra Costs as a result of ongoing Training | | $5,500 |