final report

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Osso Bucco – Final Report

A terminated project

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Abstract

N S Innovations identified an opportunity at a host processor to make the processing of beef shanks into Osso Bucco a safer and more production efficient solution. The original concept was of taking an operator away from a bandsaw by developing a solution that when incorporated with a bandsaw enable the operator to feed the solution with beef shanks, determine start and end point cut locations, and final cut width was achieved as a prototype. The next step is to convert the prototype, via redesign, into a robust user friendly solution.

Executive summary

This project was predominantly aimed at developing a mechanism that could bolt onto an existing bandsaw to make the task of processing beef shanks into Osso Bucco. The drivers behind the project were:

- Increase saw safety – reduced potential of operator injury using bandsaw.
- Increase product uniformity via fixed width or fixed mass cutting.
- Increase product presentation via developing a solution resulting in Osso Bucco cuts with less saw dust.
- Increase overall Osso Bucco processing efficiencies (decrease labour, waste and product rejection).

Three is also market potential for a standalone machine with a purpose built saw and an opportunity to also ensure that the system can be used to process other retail ready cuts such as t-bones.

The market for the ultimate solution globally is as follows:

Model: OB010

- Butcher Stores
- Bolt to existing saw
- Sensing = Manual
- Indexed = Manual
- Cut/Rocked = Manual
- RRP < AUD$10k
- Global Units = 10,000's

Model: OB030

- SME Boning Room
- Bolt to existing saw
- Sensing = Manual
- Indexed = Semi-Auto
- Cut/Rocked = Manual
- RRP <AUD$30k
- Global Units = 1,000's

Model: OB150

- LME Boning Room
- Bolt to existing saw
- Sensing = Semi-Auto
- Indexed = Auto
- Cut/Rocked = Auto
- RRP <AUD$150k
- Global Units = 100's

Model: OB400

- Large Value Adder
- Standalone Machine
- Sensing = Auto
- Indexed = Auto
- Cut/Rocked = Auto
- RRP <AUD$400k
- Global Units =10's

At the closure of the project a concept had been developed to a sufficient level that beef shanks could demonstrated to be processed into Osso Bucco with the first three of the above four drivers being reached.

Although having said that the system is neither a 'bolt on' solution nor is it a commercially robust solution.

Rather than investing any additional money into the existing prototype, NSI took the approach to terminate the current project and find a client who would consider investing in a new production prototype which would take all of the lessons learnt from the current project and result in achieving a system that meets all of the above four drivers and can remain in a production environment.

In summary, an R&D prototype was developed albeit with some outstanding material handling and cycle speed cutting issues still to be resolved.

The resulting system is arguably too large, has some engineering equipment selection issues (i.e. types of components selected not ideal in hindsight) and missed the boat as a truly ‘bolt on’ solution.

On a positive side the R&D prototype demonstrated that the concepts of:

1. removing the operator from the bandsaw
2. improving resulting cut product presentation are achievable.

In addition the following objective, although not reached with the R&D prototype, could be achieved as an outcome of the next development iteration:

1. increase boning room efficiency (i.e. increased Osso Bucco throughput per operator)

It is anticipated these will be achieved with the next development iteration being undertaken with MLA and a new host processing site.

Contents

1 Background

Australian Processors currently engage dedicated trained operators to cut beef shanks into a product known as “Osso Bucco”, consisting of circular sections measuring between 20 mm and 35 mm. This is a manually performed, arduous task, requiring high levels of accuracy to maximise the necessary yield. This process is highly labour intensive, process flow inhibiting and is an area of extreme OH&S risk.

With beef shank cutting being an essential high throughput aspect of some boning room operations with large orders regularly received for this product, the existing process is becoming increasingly financially unviable.

The production of Osso Bucco currently utilises a vertically positioned bandsaw which has inherent OH&S risks given the blade exposure, the dimensional variability of the beef shank and the potential for human error given the slippery nature of the product coupled with the confined area between the exposed blade and the operator’s hand.

Every known commercial cutting equipment supplier (AEW Delford, Trief, Jarvis, FSA, MLA, Scanvaegt, CBS, FPS, Freund) had been approached to determine whether any suitable or easily adaptable equipment currently exists that could perform this task. In parallel to this research of existing equipment, consultations with Mechatronics / electrical service providers was also undertaken with no commercially available solution identified.

Stage 1 (P.PSH.0452)

A stage 1 project supported by MLA – P.PSH.0452 - successfully demonstrated the viability of the underlining principles required to achieve the eventual outcome of developing multiple pieces of equipment that are capable of cutting beef shanks to the requested customer specifications whilst removing the current production inefficiencies experienced and the inherent OH&S concerns.

Stage 2 (P.PIP.0273)

This stage (PIP.0273), if successful, aimed to develop an automated solution with a product throughput rate of approximately 200 – 250 shanks per hour.

Aspects of this process that need changing include the manual process of the operator cutting the shank against the exposed blade saw and potentially the manual process of tipping the shank ends against the exposed blade saw - dependent on the level of automation achieved and the system accuracy achieved in determining “where the meat starts” on the shank.

This technology will have other applications for other initiatives associated with griping dimensionally variable products by a single point for automated cutting techniques – OP Ribs, T-Bones and a number of retail ready product concepts.

Manual process (1 cut every second)

Figure 1: Manual processing of Osso Bucco (and Video 2012-05-18 - Osso Bucco Manual Processing)

2 Project objectives

At the completion of the Project, NSI will have completed the following to MLA's satisfaction:

1. Developed a 'rough' working lab prototype.
2. Developed a 'refined' working production prototype that is production stable and ready for commercialisation.
3. Identified and explored potential applications of the resulting technology to products other than Osso Bucco.

3 Methodology

The methodology was a four step process:

(1) Take the knowledge from the previous project and convert this to an engineered ‘bolt on’ mechanism to a Processor’s bandsaw.
(2) Install the bandsaw into the Value Adding (VA) room at an Australian host processor and undertake rigorous ‘off-line’ evaluation.
(3) Undertake a continuous improvement modification cycle based on the lessons learnt from Step 2.
(4) Once satisfied that a production ready system was nearing completion, convert budget remaining) into a product ready system and permanently install into an Australian boning room.

The R&D program was terminated after many Step 2 and 3 cyclic iterations, albeit with a pathway forward to conclude the original concept outcomes.

4 Results and discussion

4.1 Results

An R&D prototype (i.e. pre-production prototype) was developed which achieved the following:

- Current saw achieving 26.5 second cycle time (135 shanks per hour) on Osso Bucco, compared with manual process of 20 seconds/cycle. Could reach19.5 seconds/cycle with tuning (or 211 shanks per hour). [Thickness cutting]
- Current saw achieving 21 second cycle time on Centre cutting compared with manual process of 6 second cycle time (could reach 14-16 second cycle time max). [Centre cutting].

4.2 Shank Processing Production Statistics

Indicative shank process statistics are depicted below:

1.	Thickness cutting	@ 3%	(The system can do this now)
2.	Centre cut, without weight range	@ 75%	(The system can do this now)
3.	Centre cut, with weight range	@ 6%	(The system can do this now)
4.	Weight range	@ 16%	(Development a few weeks away)

When original conceptualised, the drive behind the developments was to process shanks predominantly into Osso Bucco and also have the ability to undertake other non-common shank (i.e. low production volumes) specifications, such as centre cutting. Hence the system was designed to undertake rapid thickness cutting as a significant proportion of production, i.e. > 85%, when the original concept was developed.

During the development period, the host processor's production mix change considerably. This was detrimental to undertaking on-going trials of the latest developments and improvements as they were implemented, in a production environment.

As such the project team needed to review both the ability for the system to reach Osso Bucco cutting speeds (as this was the original purpose) but also identify what the implications for the commercial viability with the change to predominant centre cutting operations. Hence could the development be a benefit to a plant undertaking a predominance of Centre cutting operations?

4.3 Shank Processing → Manual vs. New Saw Comparison

A review of the latest upgrade to the R&D prototype ascertained the following production capability. The table also identifies 'easy to achieve' improvements that would reduce overall processing cycle times.

Table 1: Centre Cutting Manual vs. R&D Prototype Comparison

Centre Cut (81% of May 2012 production)		
Manual Processing Statistics		
Cut Speed	2.4 seconds / cut	
Indicative Cycle Speed	6 seconds / cycle	
Shank Processing Saw		
Cycle Time	21.0 seconds / cycle	
Load Time	3.26 s	
Move to first cut position	2.38 s	
Cutting time	2 x 2.5 s	(reduce by 1.5 s)
Move to next cut position	1.21 s	
Return to home	6.82 s	(reduce by 3.5 s)
Unload time	2.34 s	(reduce by 1 second)

Note: Best achievable with current configuration is a cycle time of 16 seconds or 225 shanks per hour. This would be detrimental to production rates.

Table 2: Osso Bucco Manual vs. R&D Prototype Comparison

Osso Bucco (3% of May 2012 production)		
Manual Processing Statistics		
Cut Speed	2.0 seconds / cut	
Indicative Cycle Speed	20 seconds / cycle	
Shank Processing Saw		
Cycle Tim	26.5 seconds / cycle	
Load Time	4.11 s	
Move to first cut position	2.97 s	(tipped amount is larger)
Cutting times	8 x 1.6 s	(reduce by 4 seconds)
Move to next cut positions	Included above	
Return to home	4.22 s	(reduce by 2 seconds)
Unload time	2.41 s	(reduce by 1 second)

Note: Best achievable with current configuration is a cycle time of 19.5 seconds or 184 shanks per hour. Auto-load may result in processing 211 shanks per hour. This would be complementary to production rates, however not result in reduced operator levels which early justification had relied upon. Hence two machines would be required to match full Osso Bucco production speeds.

4.4 Future Development Direction Options

As a result of the previous tabled analysis, the following analysis was undertaken to determine whether to:

(a) Continue developments at original host processor

(b) Continue developments at another processing plant

(c) Terminate all developments due to a non-achievable original goal.

A secondary consideration that ran in parallel to the above decision making process was if the decision was made to continue, then was it viable to continue to invest in the current R&D prototype or commence development on a production prototype.

The following table identifies the decision making information provided to the NSI Executive.

Table 3: R&D Prototype next step analysis information

Positive	Negative
Option 1: Stop Developments	**Additional cost = $0**
- No additional NSI Investment required.	- Sunk cost not recovered or benefited from. - Negative aspect on project staff.
Option 2: Continue to use as is in the VA room	**Additional cost = $5-10k**
- Continue to learn about system and saw R&D. - Undertake Osso Bucco processing in a safe manner (note currently 3% of production).	- Increased manual handling to get product to VA room. - Arguably, will not get used due to small use opportunity and effort to get product to and from the system in VA room.
Option 3: Install in the boning room	**Additional cost = $5-15k**
- Continue to learn about system and saw R&D. - Undertake Osso Bucco processing in a safe manner (currently 3% of production). - Increased chance of being used compared with being the VA room.	- Might not get used as current manual bandsaw is in the ideal process location and easy to use. - Takes up valuable boning room floor space. - Staff may become negative with the system being used for 3% of production (may be seen as a large investment sitting idle, i.e. poor management decisions have been made).
Option 4: Develop for other cutting needs	**Additional cost = $10-30k**
- Continue to learn about system and saw R&D. - Undertake Osso Bucco processing in a safe manner (note currently 3% of production). - Increase overall daily use as capability now extended.	- Does not appear, from last week's quick Board room discussion, that there are too many other saw cutting needs at the host processor at the moment.
Option 5: Sell the Idea to Others.	**Additional cost = $20-30k (May recover $150k)**
- Recover NSI investment. - Could sell a good 'story' to staff and turn the development into a positive. - Finish developments and complete possible learning. - NSI has solution drawings if ever a machine is required for a processor.	- System is not a commercial unit and NSI might have on-going 'warranty' issues (i.e. costs). - Processor loses instantaneous ability to increase O/B in a safe manner.

The decision made by the NSI executive was to:

(a) Offer the existing R&D prototype to others with a clear understanding of its deficiencies, and

(b) Offer the concept to others in a new form.

At the time of report writing option (b) had been achieved.

4.5 Resulting R&D Prototype

Although the project was terminated the follow images show the system developed and the videos titled:

- 25 mm Osso Bucco (4 shanks at 2,06.07) (pc)
- Centre Cut (6 shanks at 2,19.46) (pc) show the R&D prototype in operation.

In addition, videos titled:

- Shank Processing Saw Bandsaw Failure (HD at 0.125 speed)
- Shank Processing Saw Bandsaw Failure (HD)

despite some of the still outstanding issues that need to be resolved in the next development phase.

Figures 1 to 5 inclusive are various depictions of the R&D prototype and resulting Osso Bucco product cuts.

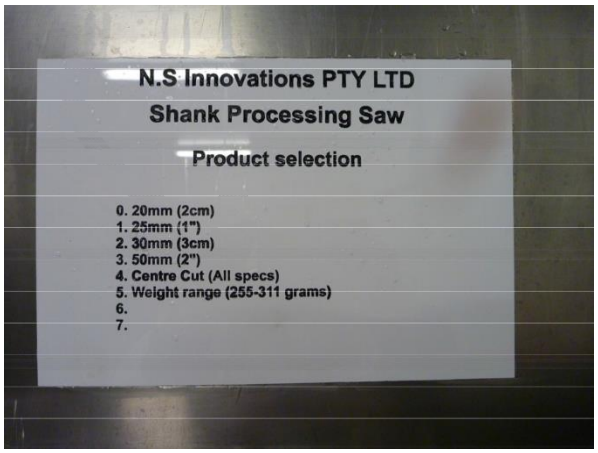

Figure 2: Shank Processing Saw - Product Selections

Figure 3: Shank Process R&D Prototype – Cradle and Control View

Figure 4: Shank Process R&D Prototype - Back View

Figure 5: Resulting Osso Bucco product cuts

Figure 6: Shank Process R&D Prototype - Front View

5 Conclusions and recommendations

An R&D prototype was developed albeit with some outstanding material handling and cycle speed cutting issues still to be resolved.

The resulting system is arguably too large, has some engineering equipment selection issues (i.e. types of components selected not ideal in hindsight) and missed the boat as a truly ‘bolt on’ solution.

On a positive side the R&D prototype demonstrated that the concepts of:

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were achievable.

In addition the following objectives, although not reached with the R&D prototype, could be achieved as an outcome of the next development iteration:

1. Increase boning room efficiency (i.e. increased Osso Bucco throughput per operator).

It is anticipated these will be achieved with the next development iteration being undertaken with JBS.

6 Reference list

None

7 Appendices

Video: 25 mm Osso Bucco (4 shanks at 2,06.07) (pc)

Video: Centre Cut (6 shanks at 2,19.46) (pc)

Video: Shank Processing Saw Bandsaw Failure (HD at 0.125 speed)

Video: Shank Processing Saw Bandsaw Failure (HD)

Video: 2012-05-18 - Osso Bucco Manual Processing