



final report

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Prepared by: Arthur Pitt
FixAll Services
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Production and market validation of shaped beef products using the prototype shaping machine

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Abstract

The purpose of this project was for a South-East Queensland beef processor to customise the application of the prototype SmartShape machine to meet specific market demands and develop optimised pre-and post-shaped processing options. The current MLA SmartShape prototype machine equipment design was modified to meet the processor's immediate customer needs for various beef shaped products, including beef Rostbiffs as the immediate priority.

Specifically, the prototype SmartShape machine required modifications to:

- A new chamber design to assist with more efficient evacuation of product and requiring less manual handling by the operator;
- Adjustable ring sizes to overcome the current issue of variable package firmness and therefore impact on shaping currently experienced if variability in product dimensions; and
- A new quick snaplock design to increase the flexibility of the machine to process products within a limited tolerance of raw material sizes.

In addition, the project evaluated pre- and post- operative processing steps (ie prior and after shaping) to ensure more consistent, enhanced shape and improved quality of beef shaped products. Furthermore, new market opportunities were evaluated with product specifications being identified through market field trials (up to three new prescribed beef shaped product sizes). Finally, pre- and post-shaping processing options were evaluated to facilitate shaping of beef primals and portions. It was noted that whilst a project objective, by optimising pre-shaping processing options it unfortunately did not result in discernible meat tenderisation.

The current report which is a commercial in confidence report for the beef processor includes the following items:

- Specific customer and final product specifications
- Generic product information – including what primals are being used
- Production quantities
- Pre- and post-shaping processing steps
- Product specifications and equipment drawings of all required modifications to the meat shaping prototype machine.
- Process optimisation steps (pre- and post-shaping) including mechanical tenderisation, additives including commercial meat tenderisation enzymes and/or salt/phosphate ingredients as appropriate to meet market / customer needs; and
- Detailed specifications including drawings of modified SmartShape equipment
- Detailed value proposition/net benefits
- Feedback on SmartShape machine design and reliability, including any further suggested modifications
- Customer feedback

A separate industry version is also produced and will be used to disseminate the results to the broader industry.

Executive Summary

The current project proposed to modify existing Meat Stretcher prototype equipment to meet the beef processor's immediate customer needs for various shaped beef products, including Rostbiffs and topsides. Indirectly, this will enable MLA to showcase the application of shaping smaller diameter portions that previously considered by MLA. The outcome of the project was a detailed report containing:

- Product specifications and equipment drawings of all required modifications to the meat shaping prototype machine.
- Process optimisation steps (pre- and post-shaping) including mechanical tenderisation, additives including commercial meat tenderisation enzymes and/or salt/phosphate ingredients as appropriate to meet market / customer needs; and
- Detailed specifications including drawings of modified SmartShape equipment.

The proposed work was commissioned to evaluate prototype SmartShape equipment (see Figure 1) with significant modifications to a number of critical components that were proven to be non-commercial in a series of preliminary trials on MLA's demonstration SmartShape machine design between October 2013 and February 2014. The modifications were identified through preliminary trials to be critical to ensure a commercial process was developed.

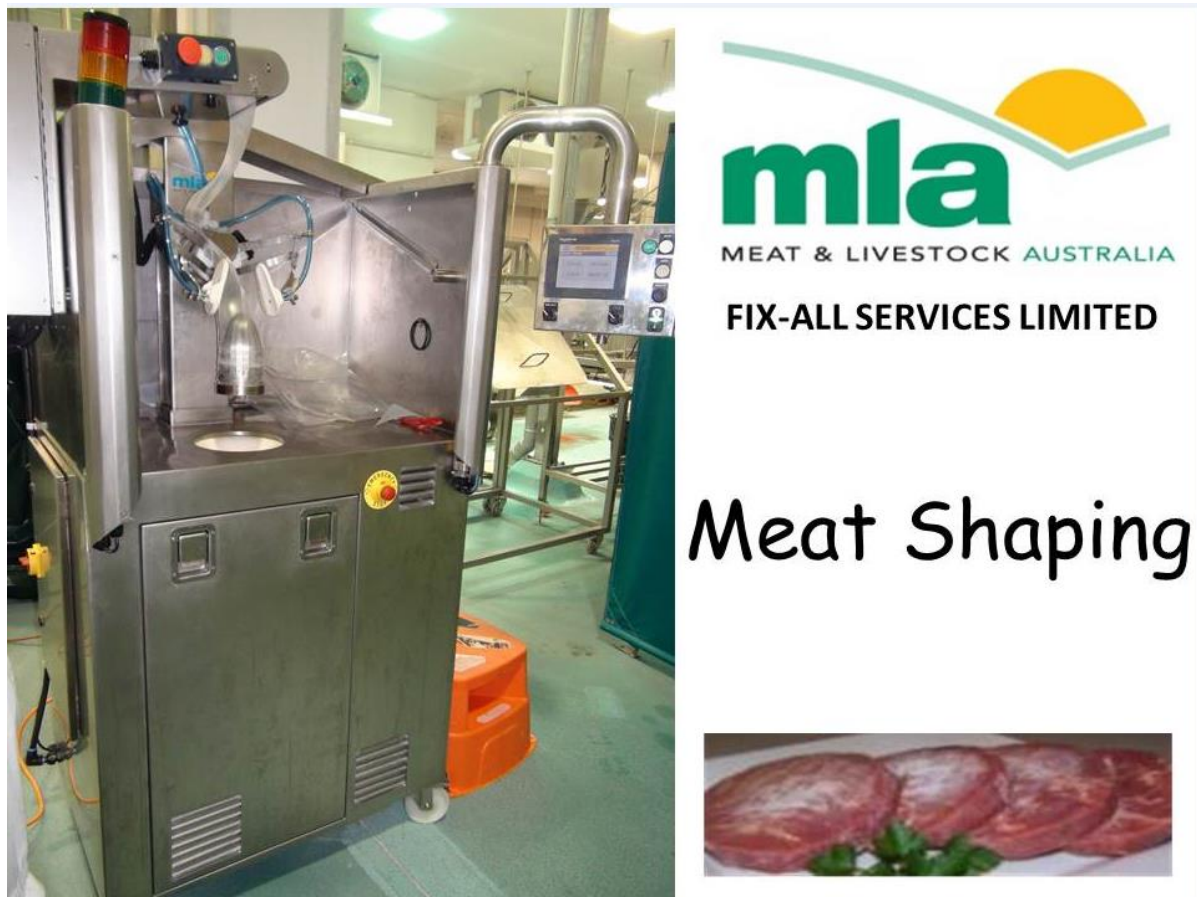


Figure 1. MLA's existing (FixAll Services) SmartShape prototype featuring a new auto-bagging option.

The prototype equipment in the earlier configuration has been validated through a series of pre-production trials to be inefficient and ineffective for a single operator to produce a commercial and viable target of two pieces per minute. Therefore components that were required to be modified included:

- Increase production rates – the new SmartShape prototype that will allow faster and more efficient evacuation of air and therefore expel the product at a more viable commercial rate with a proposed target of minimum of 3 pieces per minute.
- Increase flexibility to process products within a limited tolerance – a quick snaplock design has been proposed to allow for immediate changeover to up to four different ring sizes.
- Adjustable ring sizes are proposed to overcome the current issue of variable package firmness and therefore impact on the consistency of product shape.

The results from these trials suggest the SmartShape technology delivers a consistently shaped portion and therefore a better portion controlled product. Primals with many muscle groups and different muscle fibre directions are generally not suitable for SmartShaping and therefore the technology may be limited to a few select products.

It was noted however that whilst a project objective, by optimising pre-shaping processing options it unfortunately did not result in discernible meat tenderisation. Further trials using commercial volumes would validate the data presented in this report. It is recommended to speed up throughput of product with new chamber performance to facilitate faster cycle times.

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1 Background

The Quick Service Restaurant (QSR) industry is placing an emphasis on 'real food'. Various QSR's have expressed interest in offering a steak sandwich as part of their main menu. Traditional steak sandwiches are made using rib eye or striploin. Beef striploin is a relatively uniform muscle with little inter-muscular connective tissue and was therefore considered a potential portion controlled steak for a QSR steak sandwich offering.

The current research and development was proposed to evaluate and modify a meat shaping prototype machine that will be commercially evaluated in new pre- and post-processing applications for processing Australian beef products. The proposed works were critical to meet the beef processor's new market and customer demand for shaped beef products. The new (FixAll Services) SmartShape prototype machine was evaluated in preliminary pre-production processing trials with product and processing specifications provided by the beef processor. The current prototype machine was proven not to be commercially viable due to inefficiencies and disruptions to production requiring continuous equipment adjustments during short runs. It has been determined through these preliminary trials that significant modifications are required to overcome these production issues. The current work was proposed to build a different prototype machine involving modifying the existing design of MLA's SmartShape prototype machine to meet the beef processor's immediate customer needs for various shaped beef products, including Rostbiffs.

As shown in Figure 2, the base prototype shaping machine was modified in the current project to meet the beef processor's customised needs.

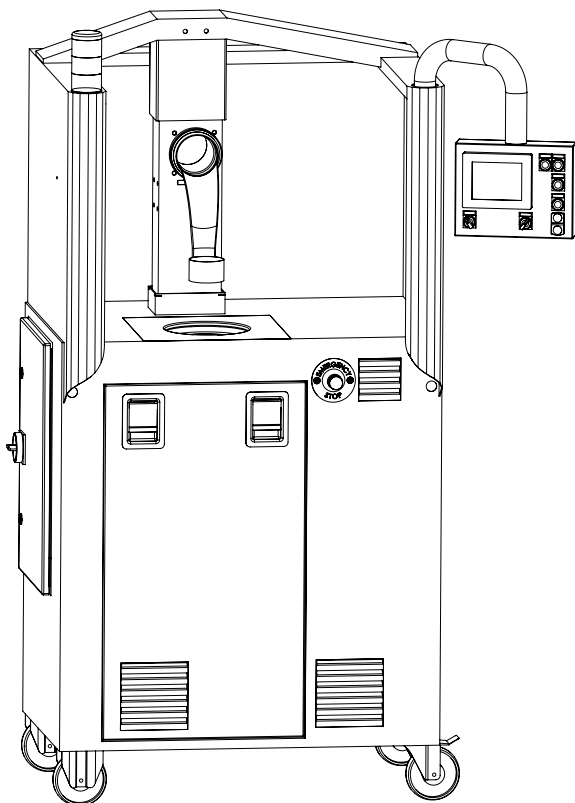


Figure 2: The base prototype SmartShape machine (Generation 2).

The current SmartShape machine (Figures 3 & 4) has been evaluated through extensively trials and the current configuration provided limited capability for a diverse range of product specifications. Specifically, the beef processor had immediate product orders for shaped Rostbiffs but with no viable way of producing the product. Following MLA industry funded A.MPT.055, the current equipment was recently modified to include an auto-bagger option with limited product capability (i.e. a commercial common size is available however it is not compatible to smaller product diameter products desired by the beef processor).

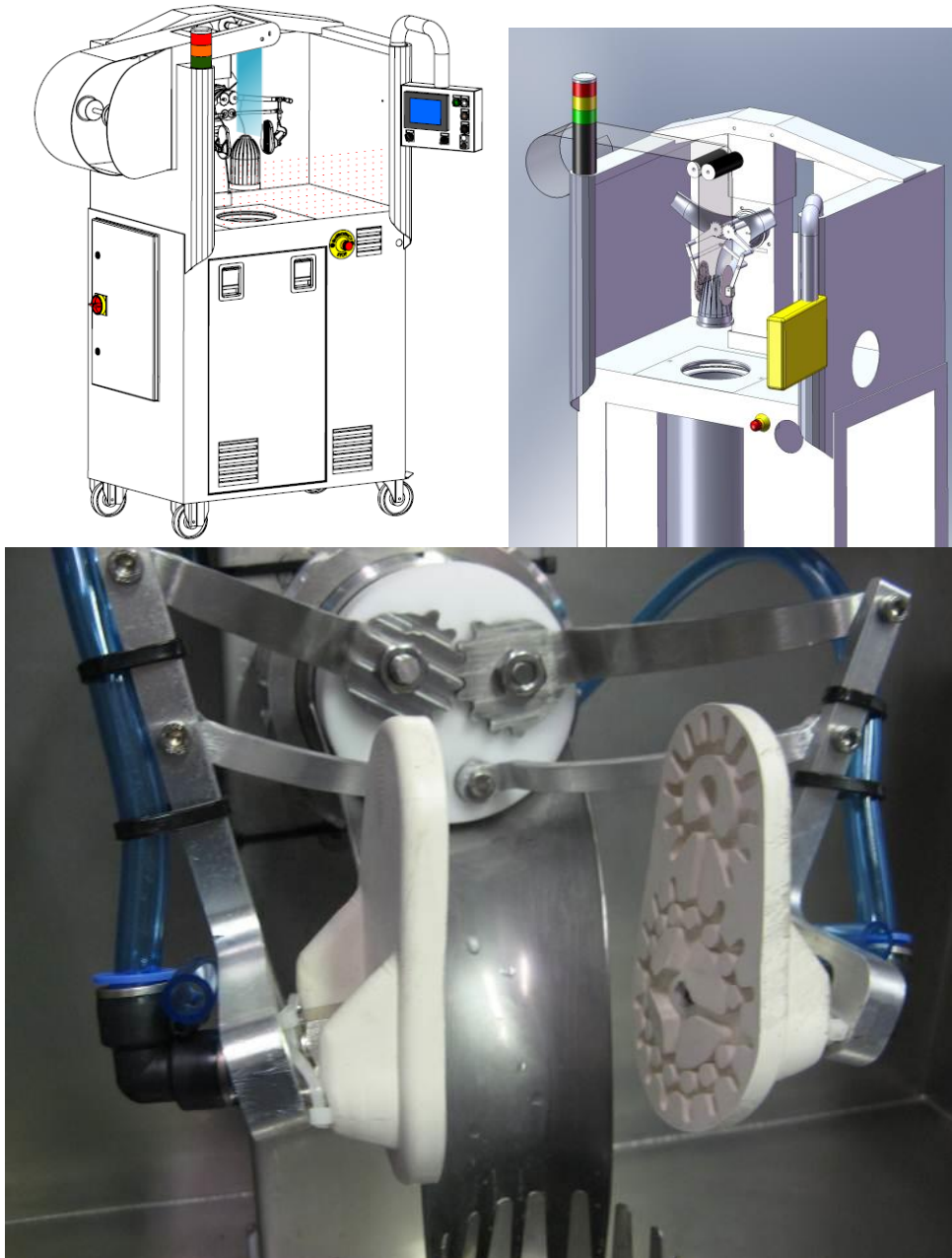


Figure 3. MLA's existing (FixAll Services) SmartShape prototype featuring a new auto-bagging option.



Figure 4. MLA's existing (FixAll Services) SmartShape prototype featuring a new auto-bagging option

The beef processor proposed to customise the unit further to meet specific market demands. It has also been identified through extensive piloting of the meat shaping equipment, that pre- and post-shaping options have been required to facilitate shaping. Specifically, meat tenderisation options were proposed to be evaluated in the current project. Product evaluation including shelf-life testing and market feedback through market field work trials will be critical to evaluate through commercial proving trials.

The following pictures show the stage 2 single feed bagging unit and 'finger' based bag holder as at the end of stage 1.

The current (FixAll Services) SmartShape prototype machine has been extensively evaluated with current product specifications and products cannot currently be produced without some minor modifications specifically to the loading and filling mechanisms of the machine. The current work was proposed to modify the existing MLA's Meat Stretch prototype machine to meet the beef processor's immediate customer needs for various shaped beef products, including Rostbiffs and topsides.

Whilst beef Rostbiffs have been identified as the immediate priority to meet current product orders, opportunity exists to also evaluate new market opportunities with targeted field work market analyses. In addition, this work proposes to evaluate a suite of pre- and post processing steps in order to overcome some of the quality and product consistency issues that until now have only been overcome with labour intensive handling techniques. It has also been identified through extensive piloting of the SmartShape machine that pre- and post-shaping options have been required to facilitate shaping. Furthermore, meat tenderisation options will also be evaluated in the current project. If successful, this will assist the SmartShape machine technology to achieve the commercial cycle times required demonstrated through the trials. In doing this it will also reduce labour inputs and address the current issues being experienced with the current prototype SmartShape machine design having assessed the earlier (FixAll Services) SmartShape models completed in earlier industry funded work, and proposes to customise further to meet their specific market demands.

2 Project Objectives

The overall outcome of the project was for a SE Qld beef processor to conduct product concept trials using SmartShape methodology and customise the application of the prototype SmartShape machine to meet specific market demands and develop optimised pre-and post-shaped processing options. Commercial proving trials were used to assess different meat cuts and final plated options to add value to current and potential new products across existing and emerging new markets.

Specifically the desired outcomes were:

- Modify the existing design of MLA's SmartShape prototype machine to meet the beef processor's immediate customer needs for various shaped beef products, including beef Rostbiffs as the immediate priority. Specifically, modifications are proposed for:
 - A new chamber design to assist with more efficient evacuation of product and requiring less manual handling by the operator

- Adjustable ring sizes are proposed to overcome the current issue of variable package firmness and therefore impact on shaping currently experienced if variability in product dimensions
- A new quick snaplock design to increase the flexibility of the machine to process products within a limited tolerance of raw material sizes
- Evaluate pre- and post- operative processing steps (ie prior and after shaping) to ensure more consistent, enhanced shape and improved quality of beef shaped products.
- Evaluate new market opportunities and determine product specifications through market field trials (up to three new prescribed beef shaped product sizes).
- Develop pre- and post-shaping options to facilitate shaping.
- Optimise pre-shaping processing options including meat tenderisation.
- Product evaluation including shelf-life testing and market feedback through market field work trials.

3 Methodology

The proposed work will evaluate the SmartShape prototype machine. Modules are designed to be retro-fitted to the prototype machine at any time as required. The trial work is proposed using the modified prototype machine but without the auto-loading modules. Additional modules (i.e. auto-loading) are not included in the proposed work. Technical assistance was provided by FixAll Services for all building, designing and commissioning of equipment and modifications. Technical assistance is provided remotely for the entire trial period.

The following proposed stages were conducted (refer to trial plan in the Appendix) :

1) Order SmartShape prototype machine with inclusions of product specifications for up to three product sizes.
2) Supply, commission and assist in factory acceptance test of the SmartShape prototype and ring assemblies for up to four (4) beef product sizes. Provide on-site training to key personnel in use of equipment and safety aspects. Modifications to software program as required. Images and video footage of completed fabrication, sign off on training of personnel in application of the equipment and copy of software program in digital form should be included in the milestone report submitted for review and approval. Go/No Go Decision* Equipment commissioned, product specifications, modification designs supplied and factory acceptance testing approved.
3) Fabrication of materials to modify existing prototype with reformatted software program and design for ring design and commissioned on the prototype machine. Images and video footage of completed fabrication.
4) Product trialling and produce proof on concepts and evaluate product throughput. Evaluation of pre- and post-shaping steps and packaging materials. Report including optimal pre- and post-processing steps and packaging materials submitted for review and approval. Technical services provided to support ongoing R&D trials.

5) Product testing and customer analyses with samples supplied to customers for verification. Milestone report to include shelf-life testing and customer feedback and submitted for review and approval.

6) Final report on equipment and process specifications and product testing provided to MLA with input from FixAll Services to be submitted for review and approval. Final report with input from Fix-All on equipment and process specifications.

Specifically the proposed modifications to existing equipment that was addressed through a staged approach the following areas:

- i) Equipment modification
 - Loader ring
 - Diameter (three sizes to meet product customised specifications)

- ii) Film design & equipment modification
 - Film – material structure and functionality
 - Tubing diameter and lay-flat dimensions (flat – 90mm, 111mm & 130mm)
 - 90 degree perforation and position (i.e. tail/head area of tubing beyond the product for perforation to optimise pack cost)

- iii) Pre-treatment process step
 - Meat cuts (length x circumference), specifically RostBiff cut into 2-3 portions between 250mm-370mm in circumference with length, approx. 250mm, and topside and other specified cuts (as part of the Milestone 1)
 - Massaging and/or needle tenderisation
 - Ingredient additives (as appropriate to meet customer product requirements)

- iv) Post-shaping step
 - Carton inserts as potential device to limit deformation of meat logs/circle steaks
 - Outer vacuum bagging and shrinking – understand possible heat transfer step, discolouration etc

- v) Sample & Market feedback
 - Production of samples for three (3) existing customers and market feedback and shelf life verification

- vi) Reporting & recommendations to commercial samples

An independent cost benefit review of the SmartShape technology was conducted earlier in a separate study (Refer to P.PSH.0691) and the generic outcomes were considered in the current project. In this earlier study, Greenleaf Enterprises carried out a commercial evaluation and viability analysis of using the SmartShape system at Top Cut Foods Laverton, Melbourne. The analysis concentrated on the production of portion controlled and cooked rump steaks. Greenleaf have experience with the SmartShape system and used

modelling previously developed to carry out the analyses. Data from trials and information gathered during a site visit to Top Cut Foods Laverton was used to complete the report.

The following considerations were included in their report;

- Yield implications
- Potential labour savings on plant
- Capital and installation costs, foot print required
- Economic impact
- Reliability
- Maintenance costs

4 Results

4.1 Preliminary Trials

The following issues and opportunities were identified as a direct result of preliminary trials:

Apparent Issues / opportunities requiring clarification (comments & observations by trial team)
1) Speed of chain - Currently operating in manual mode between 1 to 2 products per minute) with automated mode yet to be validated (proposed to be 4 products per minute). Processor requires a minimum of what is achieved with earlier SmartShape & manual methods (ie est min of two products per minute with ability to manage the natural variation of selected cuts).
2) Programming - Currently one customised program exists for shaping only. Further optimisation required to provide flexibility of multiple sizes to account for the typical variation experienced in size of cuts (within carcass specs).
3) Moisture & productivity - Currently moisture and/or oil has been required for dry cuts allowing them to move through the shaping machine. Lost productivity on occasions when dry cuts stick to the white lady walls and inhibit extraction. The issue relates to AQIS and USDA etc and other relevant approvals with “use of acceptable processing aids” to assist with moistening dry cuts. Processor to inquiry with their AQIS advisor with required actions for approvals of appropriate spray materials.
4) Changeover time – Processor believes that multiple new ring sizes are required to process different variable cuts and downtime is experienced (1-2 minutes) which is considered unacceptable and results in product build up and lost productivity. Pre-grading maybe considered a solution to lessen the frequency of changeover of ring sizes, however Processor’s preferred option is to not pre-grade due to lack of space.
5) Tearing of meat / dags of meat – intermittent tearing of meat particularly when cut spec is oversized for ring. FixAll Services advises that this may be due to the bending of the ring arm device
6) Manual finishing into bag – Manual filling of the last portion of product into the bag is not considered optimal.
7) Perforated bags – results in a lot of wastage, preferred option is scissor cutting by hand.
8) Ability to handling large cuts – length of machine is limiting with large cube rolls (7 ribs, 6kg plus). Validation is required to confirm the upper and lower limits of existing equipment (ie length & diameter of product).

Note FixALL initial feedback on preliminary trials:

- Three cube rolls per min have been achieved in previous trial runs (in manual mode). However in auto-mode where the operator only needs to load the bag and place and remove product, it is expected that min of four Rostbiffs cycle per minute may be achievable.
- Currently 1 program exists for the auto bagger only to one of the four ring sizes.
- A click fit can be developed that should allow a ring changeover to take approximately three seconds.
- Tearing of meat was experienced in the trials because of the incompatible rubber size (ie large white rubber used when the smaller option should have been used). Tearing is causing by white rubber not fitting tight around the small rings.
- Dags were experienced due to bent arm not allowing the bag to effectively go over the ring holder.
- Before the arm was bent, trials demonstrated meat being completely filled into the bag (ie not requiring manual fill). Agreed to strengthen the arm to overcome future filling issues.
- Bag design to be reviewed once product specs are finalised. The benefits of perforation are increased productivity and reduced steps by the operator. Agreed the current bag design is not optimal resulting in packaging waste. Manual cutting is also an option.

4.2 Commercial Trials

The SmartShape machine was simple to operate and had a small footprint. The machine used in these trials was an early version and due to this the preparation phase of placing a bag on the bag holder was cumbersome. An automatic bag placement function would improve the process.

A further issue identified in these trials was the need to have relatively uniform meat portion sizes. A small portion did not SmartShape effectively and resulted in misshapen finished product. A portion that was slightly too large would not fit through the bag holder and had to be removed and trimmed to fit. To overcome this issue portions could be graded prior to the process and different bag holders used. However this would affect the throughputs and therefore the efficiency of the process.

A disadvantage with this equipment was that it did not allow a continuous process. The machine is orientated such that gravity is a vital part of the function however if there was a way to make the process continuous or fully automated it would have better potential in a large scale commercial environment.

The recommended process sequence is shown in Figures 5-9.



Figure 5: Step 1: Equipment prepared to commence shaping cycle.



Figure 6: Step 2: Bag fed onto filling mechanism.

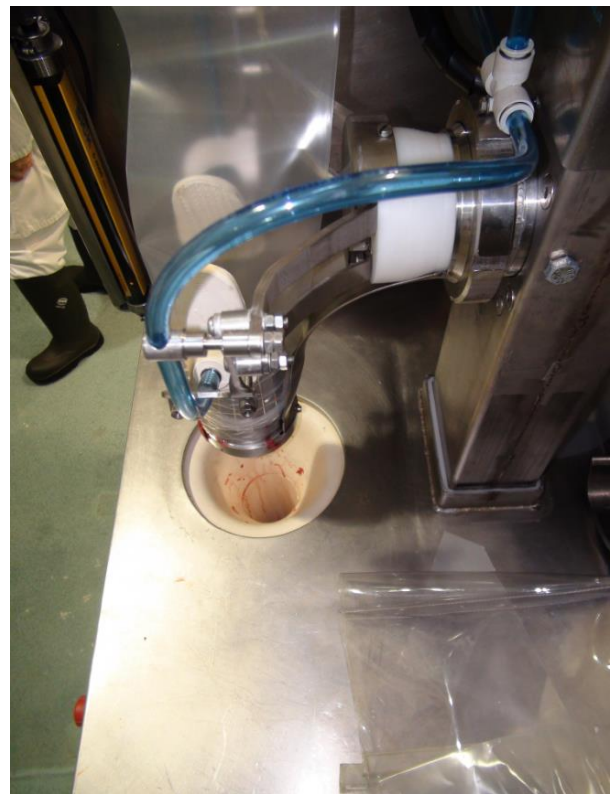


Figure 7a,b: Step 3: Packaging secured and ready for product to be loaded.

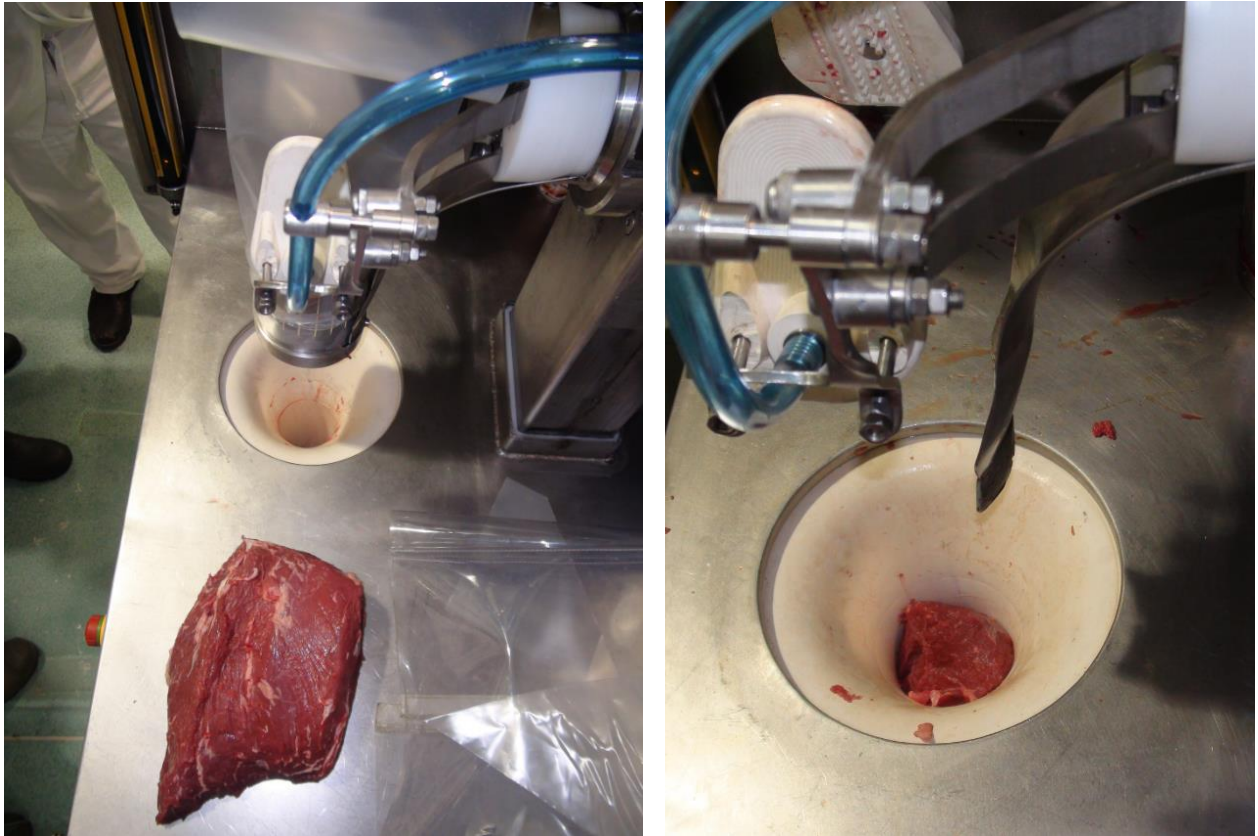


Figure 8a,b: Step 4: Product loaded and pressure applied.



Figure 9: Step 5: Packaged product removed from SmartShaping machine ready for clipping.

Trials on shaped beef RostBiffs using the SmartShape machine were superior to those formed manually where steaks were inconsistent in shape, sloppy and poor shape (see Figure 10-12). The results from these trials suggest the SmartShape technology delivers a consistently shaped portion and therefore a better portion controlled product. Primals with many muscle groups and different muscle directions are generally not suitable for beef shaping and therefore the technology may be limited to a few select products.

The SmartShaped Rostbiff portions and steaks resulted in better yields compared to control samples however low throughputs was identified as an issue for commercialisation.

The raw material costs for SmartShaped roast meats were higher than for the manually shaped products. This means SmartShaped roast meats may not be suitable for cost driven customers in the food service including Health and Aged Care sectors. SmartShaped portions offer customers better portion control and potentially a better quality product. There is therefore potential for whole muscle SmartShaped products to be used in ready meals and marketed as a premium product.



Figure 10: Shaped RostBiffs using the SmartShape prototype machine.



Figure 11: Shaped beef Rostbiff product.



Figure 12: Shaped beef Rostbiff product.

4.3 Factory Acceptance Testing

On-site training was delivered to key personal in the use of the equipment and safety aspects with sign off on training of personal in application of equipment. Modifications were made to the software program as required. Hardware changes were implemented and evaluated to be fully functional as part of the factory acceptance testing. Specifically four arms were supplied to the required specifications. Manuals were supplied to key assigned staff. The SmartShaped Rostbiff portions and steaks resulted in better yields compared to control samples however low throughputs was identified as an issue for commercialisation. It is recommended to speed up throughput of product with new chamber performance to facilitate faster cycle times.

4.4 Design & Specifications

4.4.1 New Bag Holder Design

The new finger design shown below, allows a bag size difference, in a passive way to be placed over the holder in a single action, making bag fitting easier and quicker for the operator (see Figure 13). To make a size step, to the next range of sizes, the operator changes the bag holder arm assembly to one of the four supplied. This has a quick slide and turn square thread fitting to achieve the transfer.



Figure 13: New bag holder design

4.4.2 New Full Flow Air Bag Design

The new air bag design to inflate and deflate more quickly, was a new mould and fitting as shown in picture below (Refer to Figure 14). This means outer bag now a new shape to improve performance for reduction in cycle time. Test at plant achieved three per minute.

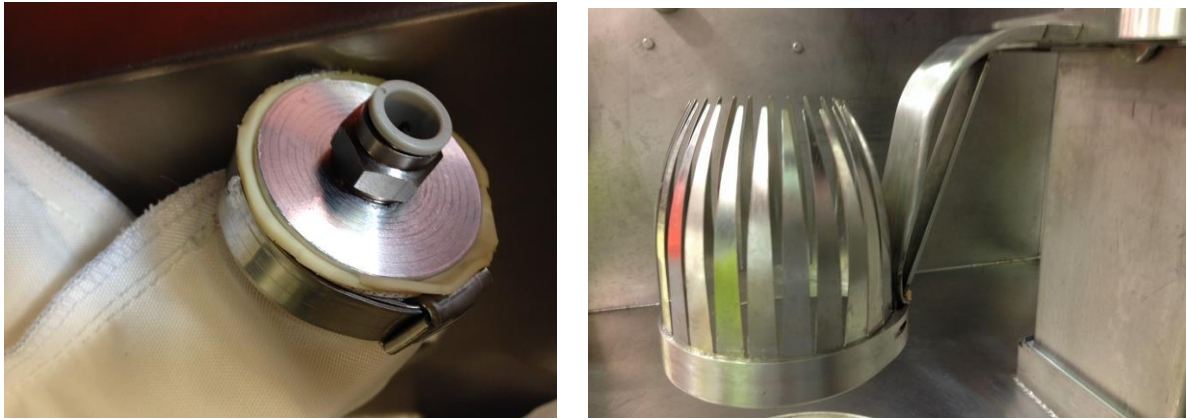


Figure 14: New full flow air bag design

5 Cost Benefit Analysis

The outcomes and key findings of an independent cost benefit review of the SmartShape technology in an earlier separate study (Refer to P.PSH.0691) are summarised below.

5.1 CBA Summary Results

5.1.1 Benefits

The reduced yield losses resulted in a benefit of \$C/C per kilogram and overall a benefit of C/C per annum given the volumes processed. The benefits were derived from the reduced yield loss, allowing more steaks to comply with customer specifications. The total net benefit was \$C/C/kg or \$C/C per annum based on the systems costs involved.

5.1.2 Costs

The costs associated with the implementation of the system, including capital, labour, consumables and repairs and maintenance, is \$C/C /kg or \$\$C/C per annum. The biggest contributor to the \$/kg cost is capital expenditure. As the processing volumes increase the capital expenditure will reduce on a per kg basis. The production volume is a sensitive parameter in the model. A further cost is an increase in labour costs due to further staff required to operate the SmartShape equipment.

5.1.3 Assumptions and ROI

The expected payback period using the yield information collected during the trials is 26.9 months with an NPV value of \$C/C. This NPV calculation assumes a total production volume of 2.5MT per week over 52 weeks of production and a machine life of 10 years.

5.2 Process Flow Options

Greenleaf also proposed an alternative process flow to further reduce the yield losses. The suggestion is to cook the portioned primal in the SmartShaped bag and is based on the concept that steaks cooked in SmartShaped bags retain their shape better. The alternative process flow requires the company to have a high risk facility or to further pasteurise the product post cooking and slicing.

6 Conclusions/Recommendations

The results from these trials suggest the SmartShape technology delivers a consistently shaped portion and therefore a better portion controlled product. Primals with many muscle groups and different muscle directions are generally not suitable for beef shaping and therefore the technology may be limited to a few select products. The SmartShaped Rostbiff portions and steaks resulted in better yields compared to control samples however low throughputs was identified as an issue for commercialisation.

The raw material costs for SmartShaped roast meats were higher than for the manually shaped products. This means SmartShaped roast meats may not be suitable for cost driven customers in the food service including Health and Aged Care sectors. SmartShaped portions offer customers better portion control and potentially a better quality product. There is therefore potential for whole muscle SmartShaped products to be used in ready meals and marketed as a premium product.

The overall outcome of the project was for a SE Qld beef processor to customise further the prototype SmartShape prototype machine to meet specific market demands and develop optimised pre-and post-shaped processing options. Specifically the desired outcomes were:

- Modify the existing MLA's Meat Stretch prototype machine to meet the beef processor's immediate customer needs for various shaped beef products, including beef Rostbiffs, topsides etc.
- Evaluate new market opportunities and determine product specifications through market field trials (up to 3 new prescribed beef shaped product sizes).
- Develop pre- and post-shaping options have been required to facilitate shaping.
- Optimise pre-shaping processing options to include meat tenderisation.
- Product evaluation including shelf-life testing and market feedback through market field work trials will be critical to evaluate through commercial proving trials.

The cost benefit analysis determined the SmartShape technology delivers poor ROI if limited to the production of rump steaks using the current process. The addition of other products and work done on improving the process flow should see benefits in investing in the technology.

It was noted that whilst a project objective, by optimising pre-shaping processing options it unfortunately did not result in discernible meat tenderisation. Further trials using commercial volumes would validate the data presented in this report. It is recommended to speed up throughput of product with new chamber performance to facilitate faster cycle times.

7 Conclusions/Recommendations/Key Messages

7.1 Value proposition and benefits to the Australian red meat industry

Currently shaped beef products are produced non-viably and unsustainably using manual filling and rolling methods. Modifying existing Meat Stretch prototype machine to meet a beef processor's customised product needs will enhance uptake of the shaping technology. Modelling of the throughput of an improved machine within the latest Meat Stretcher prototype model based on preliminary trial data, indicates that even at an assumed low premium of 50 cents/kg, the proposed payback on the machine plus the proposed auto-bagger is within 6 months providing cycle speed is enhanced at the required new product specifications and diameter sizes.

7.2 Further research, adoption and/or commercialisation strategy

At a demonstration in Brisbane on the 16/5/12, companies have indicated their support for the auto bagging approach and the resulting productivity improvements. They would seek to retrofit this auto bagging unit (once successfully trialled) to the current commercial equipment installed at an Australian plant. The estimated commercial cost of the auto-bagger is around \$20,000-\$30,000 (to be funded via another potential PIP or as a commercial purchase). The auto-bagging unit would also be fitted to the demonstration machine being currently built, as well as future redesigns of the SmartShape technology (including the next generation designs currently being trialled).

Beef shaping is a high priority for a SE Qld beef processor with new business currently being evaluated for shaped beef product. Preliminary trials on the new SmartShape prototype equipment with 4 ring sizes (58mm, 70mm, 80mm and 119mm ring size diameter) was conducted with technical input from FixAll Services & MLA. This preliminary work identified that some minor outstanding issues with the design and operation that are currently being resolved by FixAll Services. Work is currently underway and new customised parts (specifically stronger arm to hold the ring) will be shipped to the beef processing plant for fitting and evaluation (with technical advice being provided from FixAll Services remotely). The beef processor agreed to undertake some further commercial trialling of the prototype SmartShape machine. The agreed next steps are that the beef processor was to finalise and advise on product specifications (specifically ring size diameter, ability to pack two shapes in line, and units per minute target).

8 Appendix

8.1 Specifications & drawings

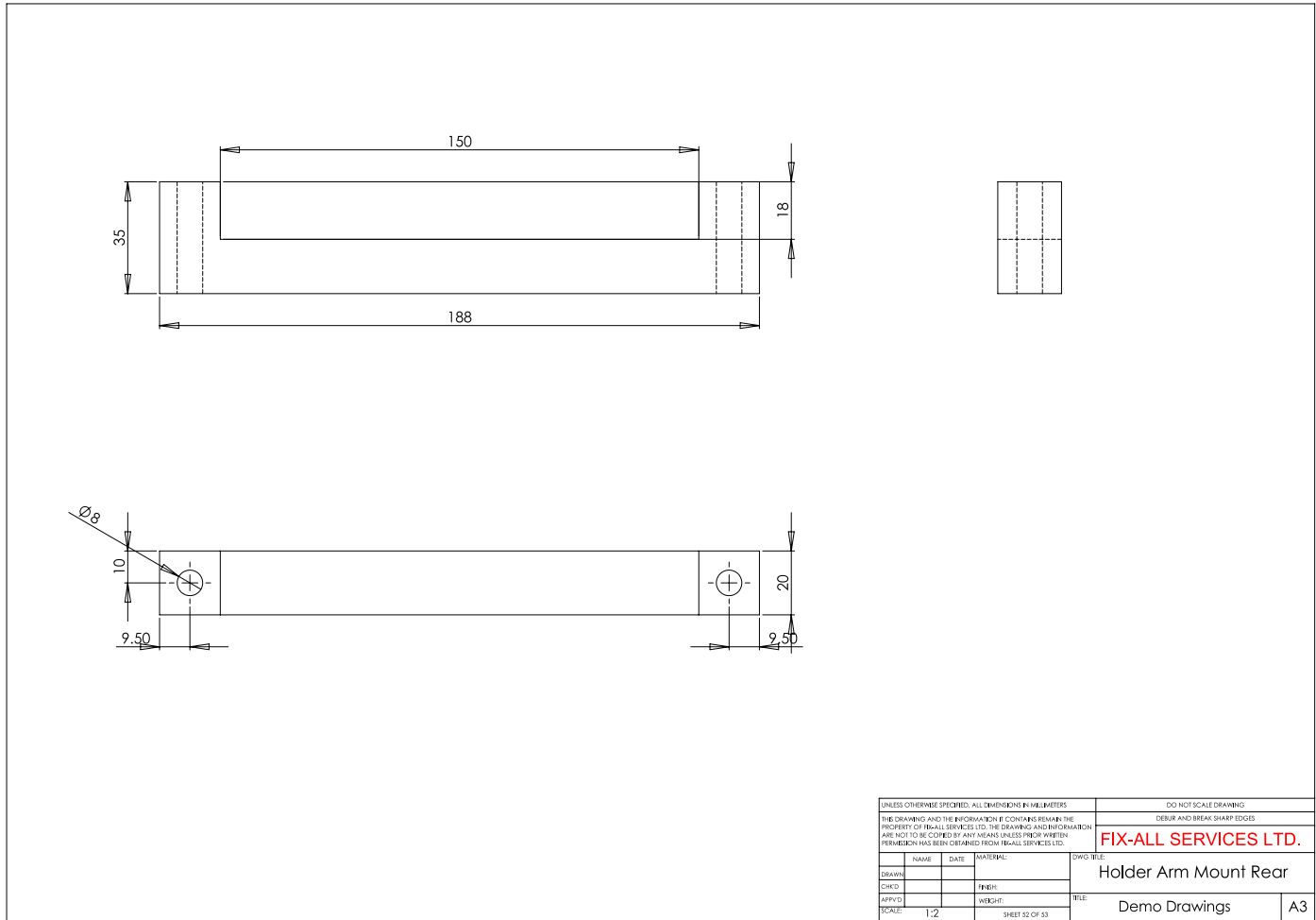


Figure 15: Drawings & Specifications of Holder Arm Mount Rear.

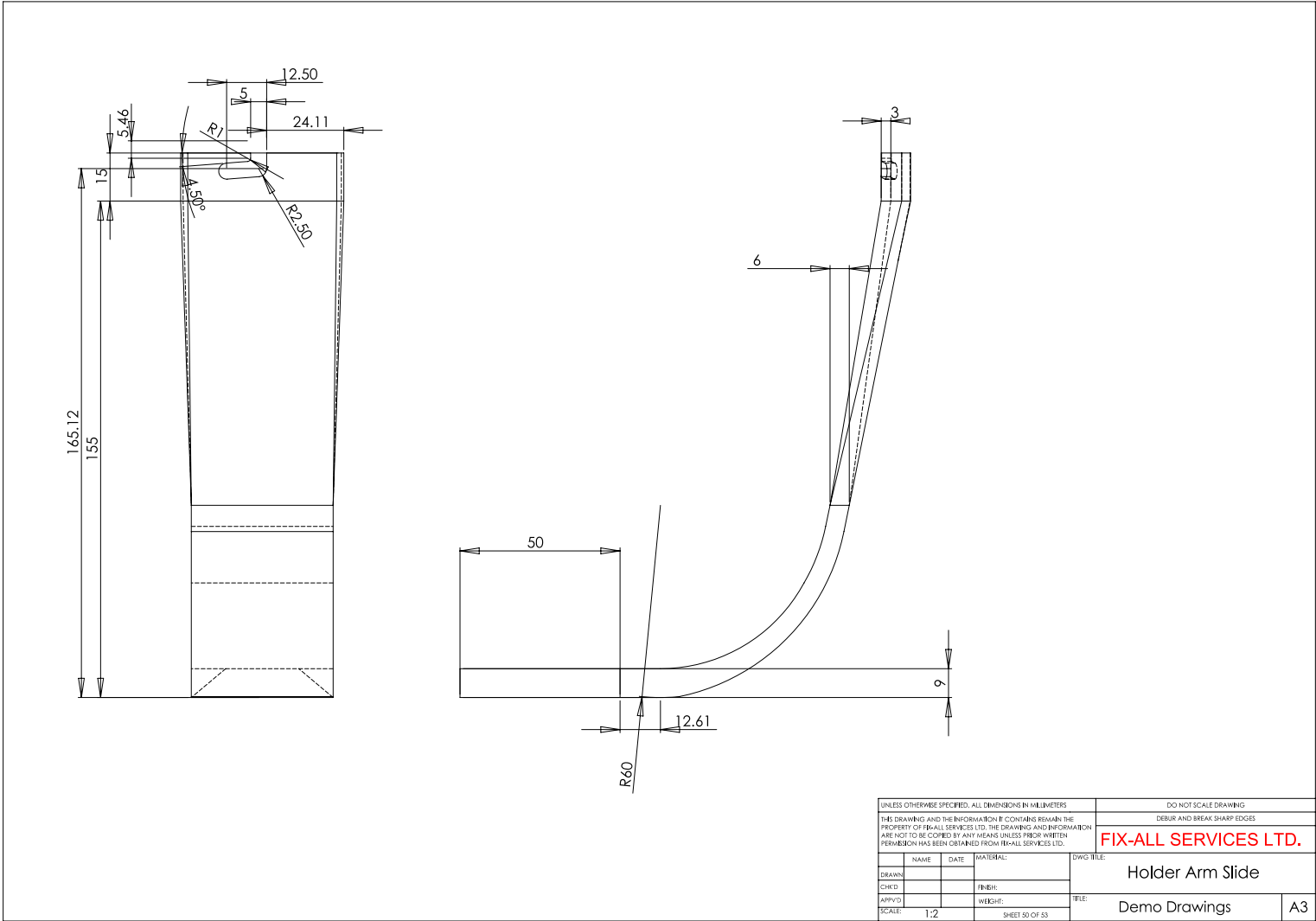


Figure 16: Drawings & Specifications of Holder Arm Slide.

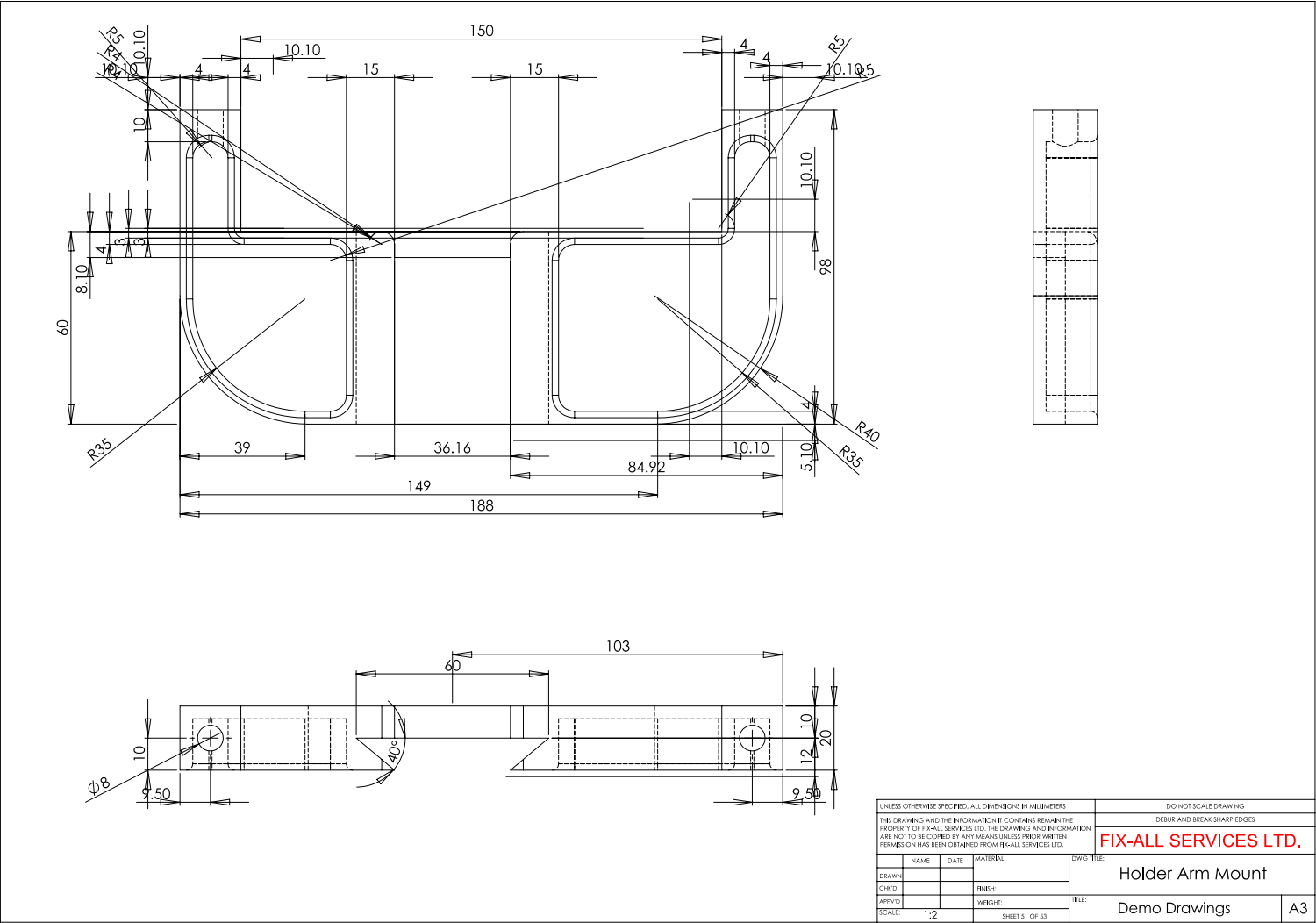


Figure 17: Drawings & Specifications of Holder Arm Mount.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS IN MILLIMETERS				DO NOT SCALE DRAWING	
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				FIX-ALL SERVICES LTD.	
DRAWN:	NAME:	DATE:	MATERIAL:	DWG TITLE:	
CHECKED:			FINISH:	Holder Arm Mount	
DATE:			WEIGHT:	TITLE:	
SCALE:	1:2		SHEET 31 OF 53	Demo Drawings	
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8.2 Sampling Plan

Trials		Objective	Trials	Beef & Equip specs *
1	Preliminary shaping (manual setting)	Determine specs (diameter, weight ranges, length) for 4 ring sizes	Measure diameter, circumference & length before and after shaping for various cuts across the 4 ring sizes	Cuts – RostBiff, Blade, TopSides, Cube rolls, chuck eye log & tenderloins etc (to be confirmed)
2	Processing methods	Determine process flow and SOPs for SmartShape	Trial spray, grading vs non-grading (up the chain), vac packed vs off the line, pack design (double wrap) vs pack inserts	4 ring sizes, cuts as per trial
3	Capacity rates (manual vs auto settings)	Determine the productivity and efficiency (manual setting)	3a) Schedule 4 x 30min run (ie 4 rings) to determine cycle rates & change over time	4 ring sizes, cuts as per trial
		Determine the productivity and efficiency (manual setting)	3b) Schedule 4 x 30min run (ie 4 rings) to determine cycle rates & change over time	4 ring sizes, cuts as per trial
4	Pre- & post-processing options vs manual method	Aim is to simulate manual manipulation & poly-wrapping to assist with shaping and / or tenderising	4a) Shaping press	4 ring sizes
			4b) Tumbling (no vac)	Cuts – as per trial 1
			4c) Tenderiser	Treatments (Fresh vs aged; Temp of cuts)
			4d) Moisture infused (functional ingredients)	
5	Product evaluation & shelf-life	Product evaluation including shelf-life testing and market feedback through market field	Testing <ul style="list-style-type: none"> • Shelf-life (0,2,4,6 weeks) • Container trials 	4 ring sizes, cuts as per trial, Preliminary field trials

		work trials	<ul style="list-style-type: none"> • Sensory / cookup • Tenderness (Tendometer) • Slicing yields 	
6	Market feedback	Generate samples for feedback from market field trials	<ul style="list-style-type: none"> • Product demonstrations, samples, cookups and feedback • Menu design, photos (optional) 	4 ring sizes Cuts – as per trial 1 & according preliminary field trials feedback Max 3 new beef products

**** Equipment specifications**

- Width of rings 58mm, 70mm, 80mm and 119mm
- Modified click fit arm
- Optimal packaging (perforation length, piping width & um) to be determined and data presented to Packaging company (outcome of trial 1)