final report

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SmartShape - R&D / demonstration machine design, build and trial

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Abstract

To further show case the value in shaping red meat, this project was commissioned to design and build a modified “Smartshape” machine (Gen 2) that has improved functionality and portability to allow minimum of 2 year demonstration program for industry R&D to be undertaken with a closer to commercialised model that can increase adoption of this technology platform, thereby growing red meat dema

Smartshape Technology

An exciting value adding opportunity

Primal utilization, portion cutting and consistency in cook doneness continue to be key interest areas for the Australian Red Meat industry. The famous round plate profile for Beef Tenderloin is often considered one of the premium selections. Meat and Livestock Australia have been developing Smartshape technology to likewise deliver consistent “round” premium offer from whole muscle sub primals of irregular, natural shapes.

Lamb leg and shoulder primals, Beef Rump tritips and topsides can all be “shaped” using this technology. Likewise, larger diameter cube rolls can be reduced 20-30% to targeted eye muscle shapes to deliver logs of whole muscle primals that can maximize slicing yields, reduce block trim and second grade steaks by consistently meeting tray or plate profiles and have improved cook doneness success.

The shaped product is maintained during storage and upon cooking is found to naturally “relax” somewhat.

		
Smartshaped Primal	Portion cut steak	Cooked centre of plate steak

Meat and Livestock Australia are continuing to investigate productivity initiatives for auto bagging and meat loading and any improvements to eating quality for shaped products.

An opportunity for you
MLA is currently seeking expressions of interest from companies wishing to pursue the use of Smartshape technology.

Background: Smartshape

In December 2007, Fix-All Services (FAS) delivered a prototype BOA (SmartShape) machine to MLA (under project A.MQT.0040). The primary purpose of this machine was to allow R&D trials of stretching (SmartStretch) and shaping (SmartShape) in Australia, as well as demonstrations to potential commercial users of the technology which has continued for several years now.

Key limitations of the current unit (Gen 1), and the reason that a modified Gen 2 machine is required include:

The unit was designed for R&D use with an experienced I&I operator. It does not meet current in-plant OH&S standards (e.g. no light curtain). This needs to be addressed now that processors and value adders are increasingly requesting a 'loan' of the unit for in-plant SmartShape trials.

The unit was never designed for the extensive travelling now being undertaken, and several times damage has occurred during transit.

The unit was developed for relatively short R&D trials, and cannot cope with the longer production trials now taking place as these are placing considerable 'wear and tear' on the unit.

- The rubber mould was sized based on best available estimates for R&D on stretching and shaping. New applications (such as glued tenderloins) have shown that the rubber mould needs to be resized and made longer.

- The slow performance and early prototype appearance of the current unit have detracted from MLA's ability to market a production ready unit to processors and value adders.

Under project P.PIP.0284, a greatly improved, production ready, SmartShape machine was built for a leading processing partner as the early adopter of Smartshape in Australia which has continued to be commercially used today. It is proposed that a version of this machine (modified for generic R&D and demonstration use) be built for use by MLA to increase adoption and commercialisation of shaping technology platform to grow demand and value from shaping red meat. The unit is projected to have a minimum of 2year "display" life.

The current commercial machine in its present form is not suitable for MLA's use, as it has been sized for a specific customer requirement.

Key changes to the existing Smartshape machine include:

a) Resized mould (medium size, additional length) - includes trialling geometry changes for optimised ejection (variable thickness, inner surface contours etc)
b) Individual screw on/off packaging heads

c) New ‘finger’ based packaging head (trial only)
d) Potential interface to an automatic packaging system (separate project or sourced from third parties)
e) Stronger wheels for in-plant movement
f) Improved doors and handles
g) IP69K safety light curtains
h) Modified guarding to suit new model light curtains
i) Bottom plate adjustable mounting system
j) Program improvements - Rear door access to mast cylinder, Lifting points, Flush externals for practical transport

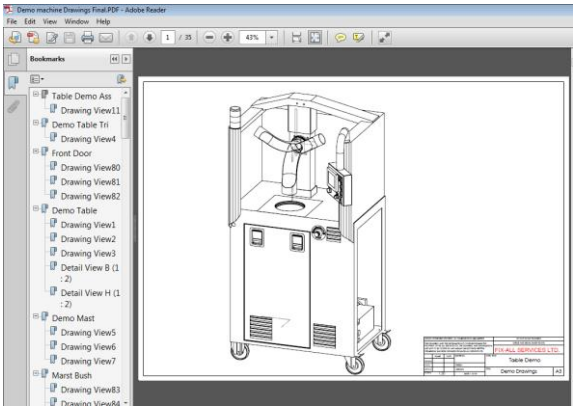
Project Objectives & Methodology

Design, build, supply and trial Smartshape Demo machine (Gen2). This machine will deliver the following outcomes:
• Allow further R&D, especially for shaping trials and improved packaging options.
• As a pre-production prototype, be used for demonstrating SmartShape to processors and value adders.
• As a loan unit, be used by processors and value adders for production trials, prior to their purchase of
a commercial unit or as part of a PIP project.
• As this machine will meet in-plant safety standards, where a value adder or processor urgently needs a
SmartShape machine for production, this unit could be sold & replaced with another demo unit.

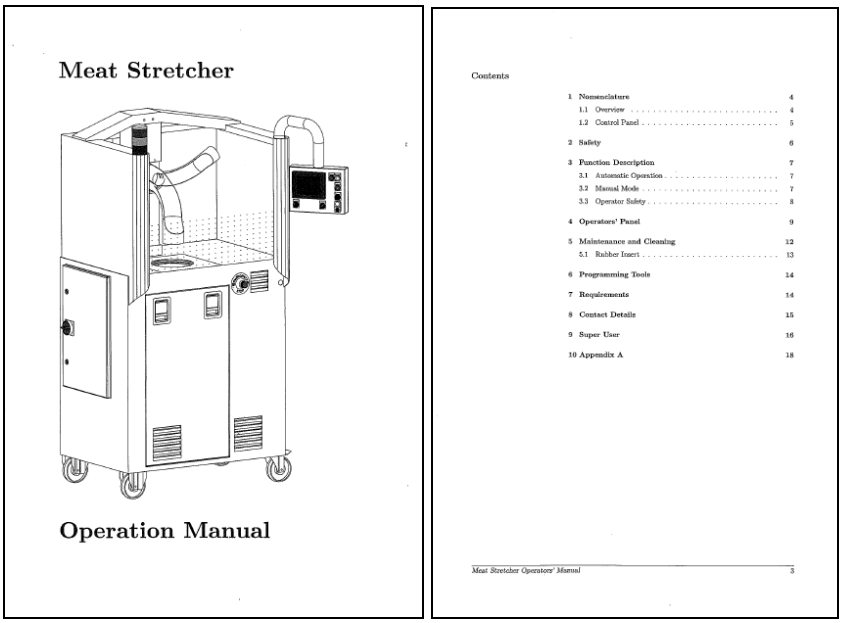
A series of meetings were undertaken to finalise machine specifications, including OH&S requirements and mould sizing prior to engineering changes and machine design specifications agreed to. Thereafter, the machine was fabricated along spare parts and operator manual and design drawings and delivered to MLA in Australia for testing.

Deliverable Results

Engineering drawings (MLA IP) – see attachment saved in H/drive under project AMQT0061



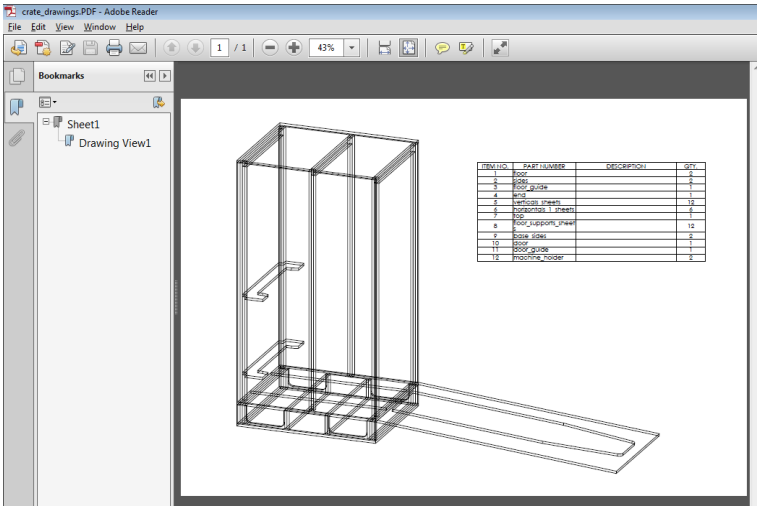
Operator Manual (MLA IP) – see attachment saved in H/drive under project AMQT0061



Meat Stretcher

Operation Manual

Contents



Transport crate (MLA IP) – see attachment saved in H/drive under project AMQT0061

The following components were delivered and trialled at meat processing facility in April'12.

- 1 x Wooden crate
- 1 x Smartshape Demo machine with PLC
- 1 x operating manual
- 1 x lifting bar
- 1 x air valve
- 5 x small rubber inserts
- 1 x large rubber insert
- 1 x spanner
- 1 x large bag holder (100, 110, 120mm)
- 1 x small bag holder (80, 90, 100mm)
- 3 x packaging roll holders
- 4 x replacement air bags

The feedback from the early adopter of Smartshape Gen1 unit providing input along with MLA Science & Technical team members. All participants agreed the model displayed promising results with next steps further analysis in a commercial mode. All agreed, the unit was acceptable to proceed as a replacement demo unit to the previous 2007 model which is to be removed from display and returned to Fix All as a test rig for pending future RD&E in New Zealand.

Conclusion:

A R&D/demonstration version of the Generation Two SmartShape machine was successfully fabricated. This machine is an evolution of the previous Generation Two, and features improved portability features such as being more durable. This project also included on-going technical support and on site trialling with the early adopter of Smartshape.

The key areas of design change focused on the portability of this machine as it will be travelling frequently. To improve this, the first major amelioration was to refine the shape of the machine's main guarding. This included changing the placement of the planned placement of the photoelectric light curtains which were exterior to the guarding. In this position there is exposure to potential impact during transportation. The refined guarding now integrally houses the photoelectric light curtains, dramatically reducing their exposure to impact damage in transit.

A further refinement to the main guarding is its top profile, modified to offer more rigidity to the guarding.
The control panel was also modified to suit ergonomic requirements, being brought forward of the machine's front surface, and as such is on a station protruding from the front of the machine. For transit, ultimately the control panel requires removal to be secure. This is not suitable for frequent transportation. The new control station is a pendant type, supported by a positionable arm. The range of movement for the arm is such that the control panel is able to be stowed within the machine's internal dimensions, therefore no longer subject to impact possibility. Further, the control panel is securable to the inside of the main guarding, and in it's secured position rotates so that it's fragile side is facing the main guarding, away from risk.

Additionally for the control panel, the Human Machine Interface touch panel is included in the pendant control station. This is an advancement as; the operator has fewer areas of focus; the screen is located in a more ideal visual range; and for operating the touch panel the operator is kept clear of the machine's operating area.

Ducting apertures have also been revised. Previously, external traditional 'vent covers' were fitted to the machine cooling ducts to prevent substantial water ingress. Standard items were suitable for a fixed location machine, however quite likely to be a problem in frequent transportation. On this machine, integral 'vent covers' are built into the cabinet from industrial materials. These are more durable, and are not external to the cabinet.

Finally, the removable doors now feature industrial grade flush-fitting fastenings, which have an integral handle. The new fastenings are more secure, long-lasting and make for easier door operation.

A purpose-built, custom enclosure is manufactured additionally for this machine. This enclosure will function as the shipping enclosure and as a transportation case for the

machine. It is designed to securely surround the machine, offering an additional barrier of protection.

Five rubbers were also manufactured that suit the new mould. These new rubbers were tested in the factory and appear to be acceptable. Potentially, one iteration of changes may be required to increase opening size which were identified at Factory Acceptance Tests.

Spare parts as reasonably required were either supplied with the machine or held in New Zealand at FAS for immediate dispatch.