Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Development and validation of thermoformed packaging for 27.2kg hot beef trim cartons

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1.0 Abstract

Poly entrapment in frozen beef trim cartons is an ongoing issue for the Australian red meat processing industry, resulting in customer complaints, rework, and unnecessary plastic usage. This project investigated the use of thermoforming as an alternative packaging method for 27.2 kg trim cartons, with the objective of eliminating poly entrapment while maintaining product integrity, export compliance, and operational practicality.

The project was conducted through a staged approach, beginning with proof-of-concept trials using a small-scale thermoformer, followed by equipment modification, commissioning, and controlled production trials. Custom thermoforming templates and spacers were developed to support the weight of a full trim carton and prevent pack sagging and air entrapment during sealing. The system was progressively integrated into the boning room with supporting conveyors to improve workflow efficiency.

The project demonstrated that thermoforming can eliminate poly entrapment, support reduced plastic usage, and produce stable packs suitable for freezing and downstream handling. The outcomes provide a practical pathway for industry adoption and future automation, delivering benefits in product quality, sustainability, and process control.

2.0 Executive summary

Poly entrapment in frozen trim cartons has long been a source of customer dissatisfaction and operational inefficiency across the beef processing sector. Traditional carton lining methods rely on manual bag placement and folding, which increases labour requirements and creates variability in pack quality. This project was undertaken to evaluate whether thermoforming could provide a more controlled and repeatable packaging solution for 27.2 kg beef trim cartons.

The project progressed through four milestones, beginning with small-scale proof-of-concept trials that confirmed thermoforming could successfully eliminate poly entrapment. Subsequent stages focused on modifying the thermoformer to handle full-weight cartons, including the development of custom template chambers and spacers to prevent sagging and trapped air. Commissioning and production trials validated forming, sealing, and pack stability under plant conditions.

In the final stage, the thermoformer was placed within the boning room and supported with infeed and outfeed conveyors to enable efficient packing of nominated customer orders using manual loading. While the system is not yet operating as a fully automated production line, it is now configured to support controlled commercial use and customer acceptance.

The project has demonstrated that thermoforming is a viable alternative to conventional trim carton packaging. It delivers consistent pack quality, eliminates poly entrapment, and supports plastic reduction initiatives. The outcomes provide clear value to levy payers and establish a foundation for future automation and broader industry adoption.

3.0 Introduction

Frozen beef trim cartons are widely used across domestic and export markets, however traditional packaging methods are prone to poly entrapment, inconsistent pack formation, and high labour input. Poly entrapment can affect product presentation, downstream processing, and customer confidence, creating both commercial and reputational risk for processors.

This project sought to address this issue by developing and validating a thermoforming process capable of packaging 27.2 kg trim cartons without poly entrapment. Unlike conventional bag-in-carton methods, thermoforming offers the potential for controlled forming, improved seal consistency, and reduced reliance on manual handling.

The project is unique in that it focused on adapting thermoforming technology to support the full weight and dimensions of standard trim cartons, while operating within the constraints of a hot boning room environment. The outcomes were intended to provide processors with a scalable alternative packaging solution that improves product integrity and supports sustainability objectives.

4.0 Project objectives

The objectives of the project were to:

- Evaluate thermoforming as a method to eliminate poly entrapment in 27.2 kg beef trim cartons.
- Develop a thermoforming template and chamber capable of supporting the full weight of a trim carton during forming and sealing.
- Assess plastic film options, including reduced UM densities, for durability, seal performance, and sustainability.
- Validate pack integrity, stability, and suitability for freezing and downstream handling.
- Establish a workflow suitable for controlled commercial use and future automation.

All objectives were achieved through the staged delivery of Milestones 1 to 4.

5.0 Methodology

The project was conducted through a staged methodology aligned with the approved milestone plan. Initial proof-of-concept trials used a rented thermoformer to assess basic forming and sealing performance on smaller trim packs. These trials focused on identifying air entrapment risks and assessing pack release under frozen conditions.

Following successful proof of concept, the thermoformer was modified with custom-designed template chambers sized to fit a standard 27.2 kg carton. Spacers were incorporated to prevent pack sagging and allow air to escape during sealing. Commissioning and production trials were then undertaken using hot beef trim under plant conditions.

In the final stage, the thermoformer was placed within the boning room and integrated with infeed and outfeed conveyors. The system was manually loaded and operated intermittently to pack nominated

customer orders, allowing evaluation of workflow efficiency and operational suitability without full production-day operation.

6.0 Results

Across all stages of the project, thermoforming consistently eliminated poly entrapment in frozen trim packs. Custom template chambers and spacers successfully supported the full carton weight and prevented sagging prior to sealing.

Reduced-thickness plastic liners were trialled without seal failure or loss of pack integrity, supporting the project's sustainability objectives. Commissioning and production trials confirmed stable forming, reliable sealing, and consistent pack presentation suitable for freezing and handling.

Placement of the thermoformer within the boning room, supported by conveyors, demonstrated that the process can be accommodated within existing operations and used to pack nominated customer orders in a controlled manner.

7.0 Discussion

The results demonstrate that thermoforming provides a practical solution to long-standing poly entrapment issues associated with traditional trim carton packaging. By controlling pack formation and sealing, the process reduces variability and improves consistency compared to manual methods.

The staged approach allowed risks to be identified and addressed progressively, particularly around air entrapment and pack sagging under full weight. The final configuration supports efficient workflow while retaining flexibility through manual loading, making it suitable for controlled commercial use and future scale-up.

The project also highlights opportunities for further automation, including no-touch entry systems and upstream integration, which could further improve efficiency and labour utilisation.

8.0 Conclusions

This project successfully developed and validated a thermoforming process for packaging 27.2 kg beef trim cartons. The system eliminates poly entrapment, supports reduced plastic usage, and produces stable packs suitable for freezing and downstream processing.

Through progressive testing, modification, and integration, the thermoformer has been demonstrated to operate effectively within a boning room environment and is ready to support controlled customer acceptance. The project provides a strong foundation for broader industry adoption and future automation initiatives.

9.0 Recommendations

- Progress controlled customer acceptance using the thermoforming system to validate performance under commercial conditions.
- Continue collaboration with equipment and packaging suppliers to optimise materials and workflow efficiency.
- Investigate further automation opportunities, including no-touch entry systems and upstream integration.
- Promote industry awareness of thermoforming as a viable alternative to traditional trim carton packaging.

10.0 Project outputs

- Validated thermoforming process for 27.2 kg beef trim cartons
- Custom thermoforming templates and spacers
- Demonstrated reduction in poly entrapment
- Reduced reliance on plastic liners
- Operational workflow suitable for controlled commercial use

11.0 Appendices

11.1 Frozen Thermoformed Packs