Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

DTS: Diathermic Syncope® stunning technology - Commercialisation

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1.0 Abstract

This project was undertaken to further the commercial potential for DTS: Diathermic Syncope® (DTS) as a method of stunning, acceptable for routine use and also for religious slaughter. The system continues to be demonstrated to meet animal welfare expectations and further detailed studies have demonstrated potential suitability for kosher and halal slaughter. A new box design will allow retrofitting into small spaces in existing processing establishments and work at a rate of greater than 60 head/hour. DTS is ready to be fitted into many medium-speed and slower processing establishments. In Australia, DAFF accept it as meeting the requirements of the *Australian Standard* and therefore would accept suitable arrangements made for its use. It has met with favourable reviews by scientific and animal welfare experts and organisations. The acceptance by other regulatory and religious authorities is in progress.

2.0 Executive summary

New technologies, such as DTS: Diathermic Syncope®, aiming to solve problems of animal welfare with conventional methods, particularly with religious slaughter, have problems in gaining acceptance because everything needs to happen at once, particularly in terms of having data evaluated by regulators and religious authorities, and gaining processor interest and collaboration to support the implementation of the system. The Objective of this project was therefore to disseminate information and interact with various groups that would lead to the acceptance of the technology, and also design and construct a system that is more commercially useful than the system that has been used for development purposes.

To gain acceptance of the technology presentations have been made at conferences and papers have been prepared for publication in peer-reviewed scientific journals. Discussions have been held, and submissions made to animal welfare standards setters and religious authorities. To make the system more commercially useful, a new box has been designed with a smaller footprint, suitable for retrofitting into an existing slaughter floor, and operate at more than 60 head/hour.

DTS is ready to be fitted into many medium-speed and slower processing establishments. In Australia, DAFF accept it as meeting the requirements of the *Australian Standard* and therefore would accept suitable arrangements made for its use. It has met with favourable reviews by scientific and animal welfare experts and organisations. The acceptance by other regulatory and religious authorities is in progress.

The system is ready to be implemented and meet the expectations of animal welfare authorities and organizations as well as potentially meeting the expectations of religious authorities in a commercially viable way. There is a continuing need to provide authorities and standard setters with information and negotiate consideration of the technology for inclusion into standards.

3.0 Introduction

DTS: Diathermic Syncope® (DTS) has been accepted by the Australian competent authority for incorporation into an approved arrangement as meeting the standards required by the Australian Meat Standard (AS4676:2023). Regulatory recognition is being sought in other countries, and the method also requires exposure to, and dialogue with, potential customers, from the perspective of technological performance (processing efficiency and animal welfare) and product acceptability (particularly its suitability for use in religious slaughter). Improving processing

efficiency and development of a design acceptable for retrofitting into small spaces in existing processing establishments are required for commercial success. Acceptability for religious slaughter tis completely in the hands of religious authorities and their processes, which are approached on a personal level and based on the understanding of competent and trusted members of religious communities.

The work described here responds to the recommendations of an MLA Donor Company report on the business design for DTS (Teese et al., 2022):

- Refine system design to facilitate a quicker, more reliable build as part of the commercialisation process.
- High-speed design and development of a single race system, providing a double box that can stun simultaneously and also fit in the constraints of the available space.
- Ongoing collaboration with animal welfare organisations in Australia, United Kingdom, United States of Australia and Europe to be recognised as a best practice option which is compliant with Halal and Kosher religious slaughter requirements.

The results from this work will assist in the commercialisation of DTS by helping to establish the stunning method as an acceptable option for religious slaughter and a practical option for implementation by meat processors. These steps are necessary from an industry perspective, to ensure that the modest industry funding of DTS development bears fruit in a commercialised process with a market for the product.

4.0 Project objectives

The objectives of the project are to undertake activities to commercialise the DTS Stunning technology including:

- Continuing to roll out stakeholder engagement and awareness activities.
- Refining the DTS Stunning Technology to move it from a pre-commercial prototype to a commercial proposition.

5.0 Methodology

Phase 1: Engagement with stakeholders both within Australia and overseas

- A series of demonstrations at the Wagstaff Garfield Plant.
- Presentation of technical and scientific data at domestic and international conferences.
- Meetings with key personnel from overseas regulatory authorities.

Phase 2: Refinement of the DTS technology to develop a commercial system

- Design and prototyping, CAD/Drafting of preferred animal and carcase handling methods.

6.0 Results

The work conducted under this project has occurred concurrently with activities funded in other ways. This report provides a status against the objectives rather than limiting the report only to activities specifically funded through this project.

6.1 Stakeholder engagement and awareness

6.1.1 Conference presentations

North American Meat Institute (NAMI)

Dr Alison Small attended and presented at the North American Meat Institute (NAMI) Animal Care and Handling Conference in Kansas City, MS, USA in May 2023, attended by almost 200 people, particularly auditors and training providers.

Alison described the DTS: Diathermic Syncope® technology, the rationale for developing the technology, and the story of development over the past 15 years. DTS uses electromagnetic energy to induce a hyperthermic unconsciousness that lasts for 3-4 minutes. It is reliable, rapid and blood flow is strong, a desired criterion for the religious markets. It can be fully recoverable at the appropriate energy parameters, there has been no evidence of aversiveness or meat quality issues. Application data are stored by the software for post-hoc audit purposes.

Discussion after the presentation were around speed (large US processors use a center-track restrainer and aim for 400 or more per hour for general processing), but the fact that currently all religious slaughter is unstunned, and slow anyway, so 100-120 per hour is probably reasonable. Dr Temple Grandin commented that about 100 per hour was the maximum processing speed in any box restraint system, because of the need to handle animals into the box. DTS might suit medium-sized processors looking to develop a high-welfare religious slaughter line; or a larger processor might have a separate religious slaughter box to complement their high-speed secular line. Temple commended the team on progress towards regulatory acceptance.

6.1.2 Demonstrations

Demonstrations of the technology have been made to several groups, including animal welfare organisations, representatives of religious groups, industry and regulators within Australia.

6.1.3 Regulatory authorities

Progress is being made with regulatory approval in several jurisdictions. In support of approval for DTS considering other methods of stunning a review was commissioned and published (Musk and Johnson, 2024) which concluded that:

> The pre-slaughter stunning of cattle with DTS is reliable, reversible, non-concussive, non-penetrating, does not cause carcase damage, and has a body of evidence extensive enough to inform appropriate practices in cattle processing facilities. These attributes optimise animal welfare in this context, align with Australian legislative requirements, and suggest that DTS might be a suitable stunning technique for consideration by religious authorities in terms of both halal and kosher slaughter criteria.

Australia

DTS: Diathermic Syncope® (DTS) has been accepted by the Australian competent authority for incorporation into an approved arrangement as meeting the standards required by the Australian Meat Standard (AS4676:2023).

The Department of Agriculture, Fisheries and Forestry (DAFF) has tasked the Animal Welfare Task Group (AWTG) with developing new Australian Animal Welfare Standards and Guidelines for Livestock at Processing Facilities. Submissions have been made to the AWTG and discussions have been held with the group, seeking recognition for DTS as an acceptable method of stunning. A public draft for comment is expected during 2025.

Europe

An application has been made to the EU, and is currently being reviewed by the European Food Safety Authority.

USA

At industry's request, DAFF has sought recognition from the USA that meat processed using DTS is equivalent to meat processed using methods that are considered humane by US authorities, which would allow meat processed in Australia using DTS to be exported to the USA/

An application may be made to the USA for recognition of DTS as a humane method of stunning, which would allow the use of this technology in the USA.

6.1.4 Religious authorities

Kosher

Discussions have been held with international kosher authorities about DTS and some have contributed to work to provide data that will contribute to the determining the kosher status of meat processed using DTS (Small et al., 2025a). The process for considering the acceptability of DTS is out of our hands.

Halal

Discussions have been held on the acceptability of DTS for halal slaughter. Some certifiers are certifying the meat from animals stunned with DTS technology as halal. The technology is being reviewed by some importing countries. Further work has been conducted to demonstrate aspects of the process that may contribute to more widespread acceptance of the process as producing halal meat (Small and et al., 2025).

6.1.5 Animal welfare organisations

The American Veterinary Medicine Association *Guidelines for the Humane Slaughter of Animals*: 2024 Edition (American Veterinary Medical Association, 2024) acknowledges microwave stunning for use in religious slaughter:

> A new technique that has been developed in Australia uses microwave energy inputted directly into the brain of cattle (and sheep) to cause them to become rapidly unconscious. At the appropriate energy application, brain damage does not occur, and the animal can recover consciousness. Research shows that the loss of consciousness is fully reversible and that animals will return to the equipment, suggesting that the procedure is not aversive.
>
> The method is highly controllable using the incorporated software system and may provide greater certainty of outcome than current reversible stunning techniques such as nonpenetrating stunning and electrical stunning, both of which are used mainly for the halal slaughter of animals by those Muslims who accept such practices. The software system also retains data on each application allowing for post hoc auditing and verification.

6.1.6 Industry animal welfare standard

The Australian Meat Industry Council has agreed to assess DTS for inclusion in the 'Industry Animal Welfare Standards for Livestock processing Establishments Preparing Meat for Human Consumption'

6.2 Refinement of DTS technology

6.2.1 Design, construction and demonstration of a commercial system

A rotary box was designed that would allow adequate restraint of the body and head, positioning of the head and positioning of the DTS applicator, application of microwave energy within a Faraday cage, rotation, access for slaughter, and release of the animal to a bleeding table.

In operational trials, the box was demonstrated to rotate, release the animal onto the table, and return the box to the upright position in about 30 seconds. For the purpose of these trials, the chin lift was not implemented.

These trials have demonstrated that this new box design, with a smaller footprint, and faster operation, would be suitable for retrofitting into an existing establishment, and operating at a speed consistent with the operation of many Australian beef processors.

Some adjustments and site work will be required to install the box onto an existing slaughter floor. This design will suit processors with limited area for retrofitting into existing plant and operate at a rate of approximately 60 head/hour.

6.2.2 DTS Operational outcomes

Operational aspects of DTS stunning have improved through improved contact of the applicator with the forehead of the animal and uninterrupted energy delivery (160-200 kJ at 18-20 kW), which will result in close to 100% first stun effectiveness, demonstrated ability to recover from the stun, and animal viability and wholesomeness at the moment of slaughter (Small et al., 2025b, Small et al., 2025a, Small and et al., 2025).

7.0 Discussion

Considerable progress has been made in demonstrating the DTS system as an effective stunning method that maintains animal welfare and potentially meets the requirements for religious slaughter.

8.0 Conclusions

DTS: Diathermic Syncope® is ready to be fitted into many medium-speed and slower processing establishments. In Australia, DAFF accept it as meeting the requirements of the *Australian Standard* and therefore would accept suitable arrangements made for its use. It has met with favourable reviews by scientific and animal welfare experts and organisations. The acceptance by other regulatory and religious authorities is in progress.

9.0 Recommendations

There is little, if anything, that is required to demonstrate and animal welfare and religious slaughter credentials of DTS: Diathermic Syncope®. Those with authority and standards setters, should take a close look at the available data and ask themselves whether this method of stunning has a weight of evidence supporting effectiveness and maintenance of animal welfare equivalent to other cattle stunning methods.

10.0 Project outputs

- Several publications in peer-reviewed scientific journals (Musk and Johnson, 2024, Small et al., 2025b, Small et al., 2025a, Small and et al., 2025)
- A presentation at North American Meat Institute conference
- Submissions made or drafted to regulatory authorities and standards setters
- A new box design with small footprint suitable for retrofitting existing slaughter establishments

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