

Digitally signed steaks

Traceability - Primal to Steak / Steak to Primal Track 1 -
Printed Primals using Countermark

Project Code
2021-1192

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Date Submitted
29/05/2022

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Project Description

This project was one of two tracks investigating the use of Countermark to implement Primal to Steak / Steak to Primal traceability. This document describes Track 1 – where direct printing of Countermarks onto beef primals was tested.

Countermark is a printed data carrier – like a QR code except it can be printed with conventional ink jet printing and it uses alphanumeric characters rather than black and white squares.

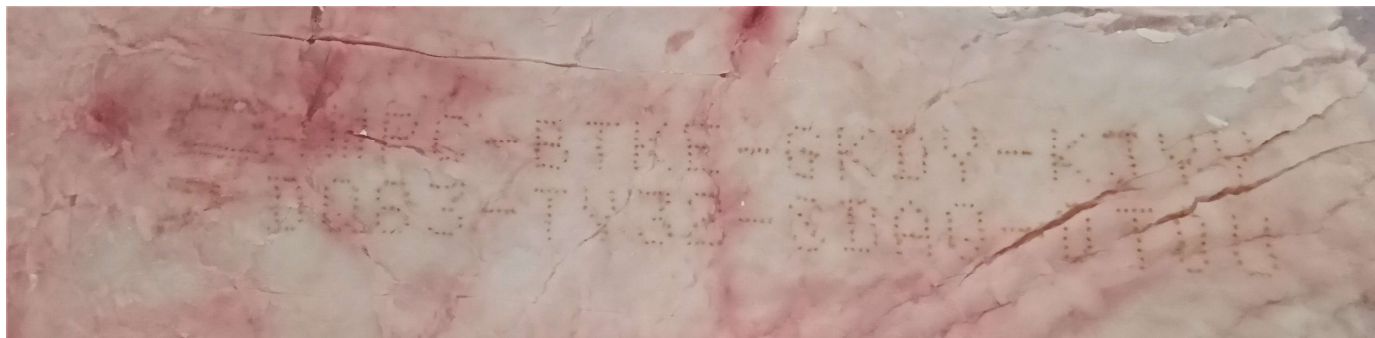


Figure 1 Inkjet printed Countermark on the fat layer of a beef primal after freezing and maturation.

The use of alphanumeric characters means that the Countermark can be entered by hand when automated reading does not work. The Countermark data carrier itself is part of a much larger data system - a complete environment including servers hosted on the Microsoft Cloud, mobile apps, printer and weigh scale interfaces and web portals for data analysis. The Countermark data system integrity is assured using Ethereum blockchain and comprehensive data and application encryption is used to ensure data security.

Countermarks can be used as a digital signature to show provenance and are linked to further information such as phytosanitary data or promotional material.

The goal of this track of the project was to determine whether it was possible to achieve Primal to Steak / Steak to Primal traceability by attaching Countermarks to the steaks whilst still part of the primal, before they left the abattoir.

Project Content

The project assumes that the provenance of the primal is known in the abattoir. Printing unique Countermarks on a primal every 2 cm parallel to typical steak cut lines would mean each steak to be cut from the primal would be fully identifiable in the abattoir. Traceability of the steak for the consumer would be available without further intervention by the local meat processor.

This track of the project evaluated two different methods of attaching Countermarks to the primal in a simulated abattoir environment:

- Inkjet printed Countermarks directly onto primals using edible ink already in use in the meat (pork) industry
- Edible labels pre-printed with Countermarks stuck to the primals. The edible printable labels were selected as being established printable foodstuff.

The primals and their Countermarks were subjected to two simulated journeys corresponding to the Australian domestic market and the Australian export market. The domestic journey consisted of holding the primals for typical maturation period and temperature, the export journey consisted of freezing the primals for a week, followed by a typical maturation period.

At the end of these journeys the Countermarks were tested for readability and adhesion to the primal - the Countermark (Figure 1) was photographed after the simulated export journey.

The direct costs and benefits of implementing digital signing of beef primals or steaks was not calculated as part of this study. Also the benefit expressed as improved confidence of buyers of Australian beef should be evaluated.

Project Outcome

The tests showed that the inkjet ink withstood both of the simulated journeys and was still human readable – at least until the steak was cooked. The inkjet printed Countermark was clearly visible through the Cryovac wrapping, which would be important for shipping, and after the Cryovac was removed which would be important for operations in a local meat processor.

The available combination of inkjet ink and printer could not produce Countermarks small enough print on individual steaks and further work would be needed to either redesign the Countermark as a single row of data or reformulate the ink to allow it to be printed with dots closer together, giving smaller Countermarks.

The printing setup used for the tests was not suitable for food manufacturing and requires development for routine printing on primals – the printer nozzle would need to follow the contours of the primal.

The larger Countermarks that could be printed with the technology available during the test could be used to digitally sign individual primals. This would give primal buyers a great degree of confidence about the authenticity of the primals they were purchasing and an audit trail that allowed a product recall to be very focussed with known destinations of all Countermarked primals.

The edible labels did not survive the simulated journeys however the tests showed a new unexpected phenomenon that may form the basis of a completely new method of printing on meat. One of the edible labels (printed waffle paper) showed that ink originally printed on the waffle paper migrated through the waffle paper and fused with the fat layer on the primal.

The resolution of the transferred printed image was much better than could be achieved using inkjet print and the process could possibly support multiple ink colours. The creation of a printable transfer label would need further work, but it could simplify data application as the printing process (requiring inks, electronics and mechanical parts) would not need to take place in a food processing environment.

Benefit for Industry

Australian beef is a premium product, well known for its quality and taste. Preventing product substitution in the supply chain maintains the reputation of Australian meat producers and prevents the lost revenue of missed sales and the possible commercial impact of a recall due to tainted meat passed off as Australian produce.

Using Countermark as a digital signature for individual primals or steaks reduces the ability for fraudsters to substitute product and can provide the abattoir with aftersales information – clear data on where and when their product was used or consumed.

This project showed that a known food approved ink / printer combination can be used to mark the fat layer of primals in a way that remains in place and readable through packing freezing and maturation.

The tested print / read technology allows the primals to be signed and verified, although further work would need to be done to identify individual steaks.

Separate work done as part of Track 2 of this study shows how Countermarks can have data attached to them – this could allow export and phytosanitary data to be attached to the primals virtually and could simplify export processes as Australian beef enters new markets.

The new discovery made during this project - that high resolution information could be printed onto transfer labels then applied to the surface of the primal requires further development, this innovation could pave the way for very targeted branding to be applied to the primals and steaks.

Useful resources

www.Countermark.com