

Carcase Inkjet Printing

Meat Carcase Ink-Jet Fluid Development

Project Code
2021-1101

Prepared by
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Date Submitted
13/2/23

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Project Description


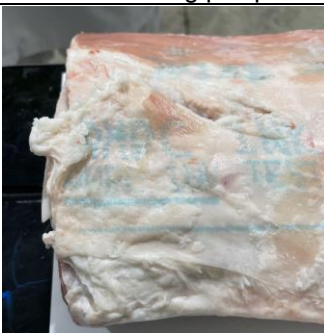

The project aims to develop a custom food grade ink for use in Matthews Drop on Demand (DOD) inkjet printers capable of printing directly onto lamb and beef carcasses. This ink will need to be adequately visible, adhere and dry on a range of varying meat, fat and muscle tissue, resistant to moisture from the substrate and environment.




Project Content

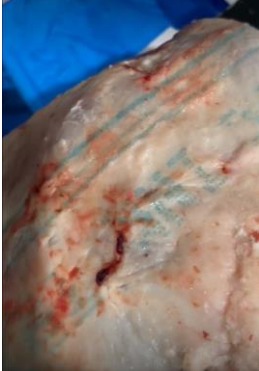

Methodology


An onsite printing trial was undertaken to evaluate ink adhesion, quality, dry time and print contrast onto a range of beef and lamb cuts. Meat was placed and conveyed mechanically on a sample marking slide table under Matthews DOD 8000+ Printheads which printed downwards onto the top face of the meat. Due to compliance requirements, an adjacent warehouse was utilised to conduct print testing under ambient temperatures.

Results


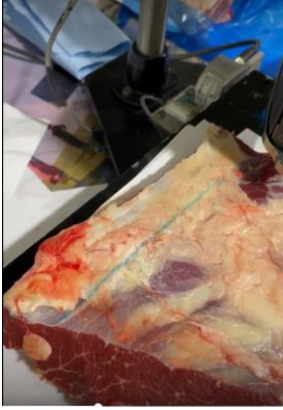
Leg		
First Prints –Light in colour, noting additional flushing pre-print		
		

Ribs		
Numerous prints conducting with altering dot size		
Printing onto membrane and red meat itself – Visual colour contrast was reasonable		
		

Leg		
Numerous prints altering dot size		
Reasonable print colour contrast, similar adhesion to lamb ribs, substrate integrity will impact print resolution if disrupted – e.g., fat.		
		

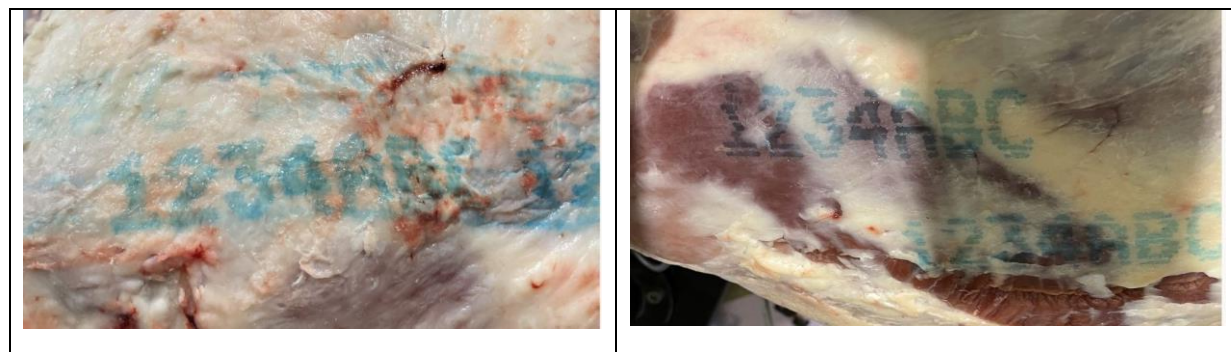
Inside Ribs		
Increasing DOD dot size, note the whiter rib colouring offers even better print contrast.		
This cut had less moisture when presenting for printing (see separate analysis below).		
		

Beef

Ribs		
Numerous prints, the larger dot size enhanced print prominence.		
Not colour contrast on white and red meat background improvement		
		

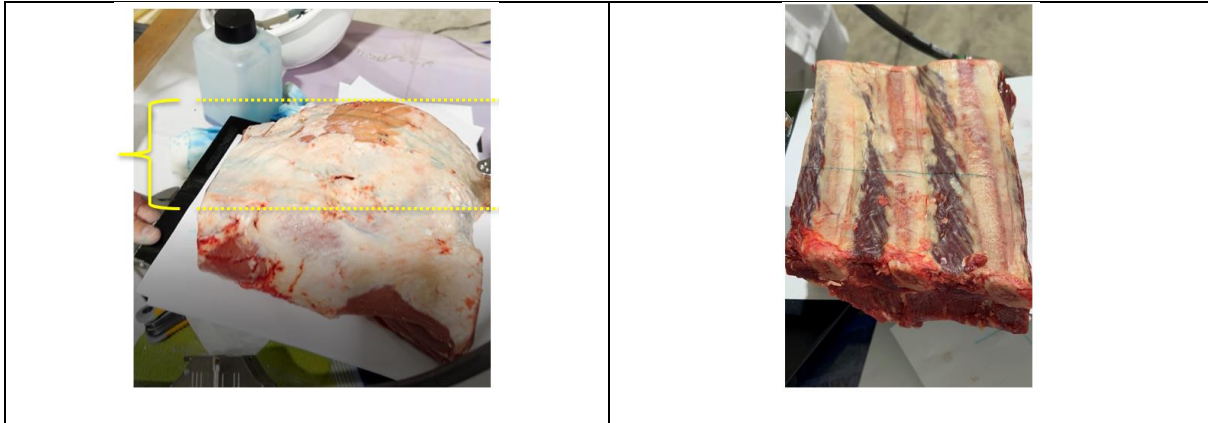
Moisture Analysis

- Moisture plays a significant role in print quality / integrity (see below comparison).
- Print conditions were in a general warehouse (rather than inside a cold room), which may have impacted on-meat moisture - Perhaps this is different in cold room environment.



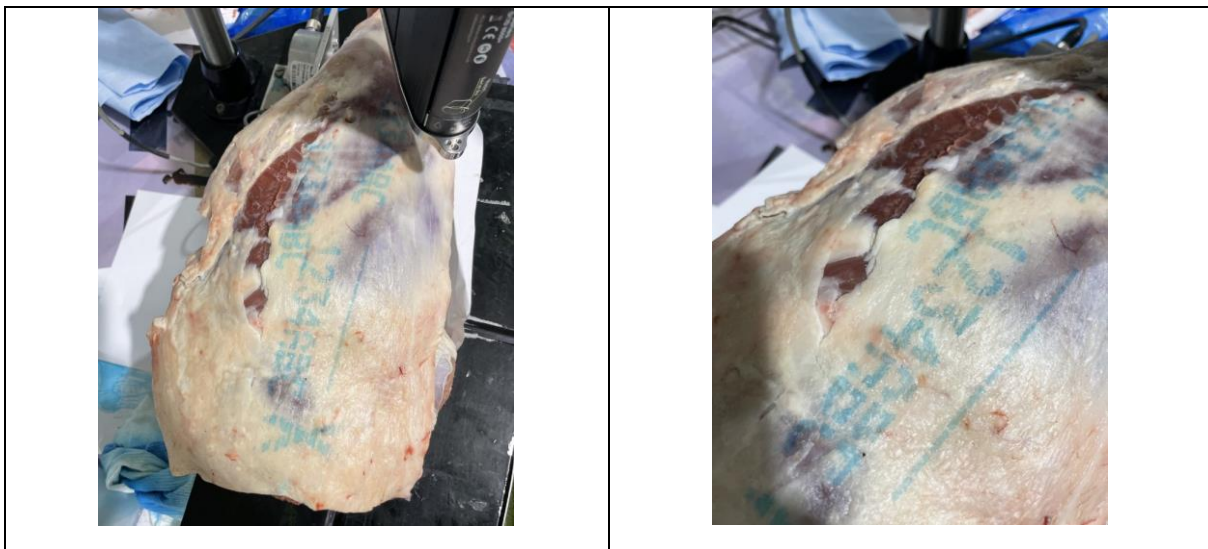
Throw Distance

- Initial prints were inconsistent in throw distance, this was controlled in later test prints
- Throw distance was a more noticeable impact for text vs printed lines/dots



Dry Time

- Difficult to assess dry time initially due to moisture on meat
- Once it dried, the print integrity was maintained (Adhesion post dry)
- Printing onto the fat, print quality can be easily disrupted by moving the fat itself
- Need to clarify ink dry time expectations from end user's if moisture cannot be minimised



Performance Criteria

Key Criteria	Result	Notes
Print Contrast	Good	Good across all meat cuts reviewed, better on lighter parts
Print Quality	Good	Good on as long as the substrate is dry
Ink Adhesion	Good	Good on as long as the substrate is dry
Ink Dry Time	TBD	Hard to assess within the trial scope and environment ¹

Project Outcome

Milestone 2 simulated a production environment (as close as possible) for inkjet printing onto a range of meat cuts and subjectively evaluating colour contrast, adhesion and dry times. The onsite trial demonstrated reasonable print quality and adhesion, however dry time was difficult to assess within the aforementioned trial scope / environment limitations. The end user advised at the conclusion of the trial that a halal approved formulation would be required for future commercialisation which was outside the scope of original custom ink development, this will require further assessment and ink development.

Benefit for Industry

Marking various cuts of beef and lamb carcasses can facilitate a certain level of boning room primal traceability and has the potential when integrated with other robotics and vision technologies to further enhance operational efficiency.

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