AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Veritide Camera Scanner Prototype Snapshot Report

PoC End-of-line Bovine Carcase Inspection/Contamination Management Prototype

Project Description

Veritide and the Australian Meat Processing Corporation (AMPC) have been collaboratively working on a project to evaluate the effectiveness of Veritide's modular faecal scanning technology (the BluMax Scanner) in Australian processing conditions. They have concurrently been exploring the potential to further develop digitization and automation of end-of-line (slaughter-floor) carcase inspection; these initial projects were focused specifically on precision faecal contamination detection and management, in real time, at chain speed. For the purposes of this project, a site trial was undertaken at an export beef processor for one week. The system was run at line speeds on hot carcases which confirmed Veritide is able to distinguish specific parts of carcases that are clean and those parts that are contaminated.

Background:

At the end of the slaughter process carcases must be free from contaminants such as hair, wool, dust, ingesta, faeces, bile, urine, Salmonella, E. coli and Listeria (examples only) prior to entering the chiller network.

Currently, processing plants use operational staff to remove contamination with knives and/or steam vacuum systems. These practices can then be backed up with whole of carcase decontamination wash units.

This combination of approaches, although producing the required outcome from a food safety perspective, require considerable labour resources and use considerable energy and water. The latter is then high in contamination (fats and blood) which needs processing/treatment before discharge. All of these approaches can result in parts of a carcase being unnecessarily trimmed and/or treated; detrimentally impacting on yield, operational efficiency and supply chain value.

Veritide's BluMax Scanning System will target:

- Reduced labour, or more efficient labour use
- Reduced trimming of the carcase
- Reduced energy and/or water utilisation
- Lower pathogenic and spoilage bacterial cell counts
- An extended product shelf-life for the packaged product

The BluMax Scanning System will ultimately consider how it can enable the robotic or automated management of contamination removal; whereby digital information/data can be used to inform either robotic/automated trimming, robotic/automated steam vac, robotic/automated knives, or mixed reality/screens showing staff exactly where to trim; and just as importantly, where not to trim.

Project Content: Harnessing Veritide's Technology Capability

Identification of faecal contamination in real time provides opportunities for immediate intervention, along with a range of other benefits quantified during the project that are not possible with microbiological swabbing that informs one to two days post the event and negates many of the benefits Veritide can deliver on.

Processing trials involved the observation, testing and confirmation of the following technology capabilities:

Real-time detection and intervention – this is a proven feature of the Veritide technology. Trials run at line speeds easily identified, in real-time, the contamination locations. Spectroscopic analysis and small scale industry trials of positive contamination detections confirmed Veritide's capacity to identify clean parts of a carcase vs contaminated parts.

A correlative link between Veritide's positive detections and TVC's, Coliforms and E. coli – has been identified, based on small microbiological trials undertaken in Australasian Bovine plants. The results indicate a correlation between Veritide's ability to detect chlorophyll/faecal/ingesta contamination, and increased cell counts for E. coli, Coliforms and TVC's.

Calibration to regulatory inspection standards - The technology's detection capabilities and sensitivity controls can be adjusted to ensure inspection is better than current visual inspection standards, but not too sensitive to result in excessive detection and removal beyond safe biological loads and practical plant processes approved by the Department.

Detection and display of specific contamination points on each carcase or primal product enable targeted visual inspection and precision contamination removal.

Project Outcomes & Value Propositions Delivered

Modelling was undertaken and then extrapolated across "average" small and large beef processing plants to remove any confidential plant details. Note that values arising from the benefits described below will depend on each company's market access, customer base and product mix and should be used indicatively:

Pre-Boning Room Trim reductions – provide a small yield benefit by focusing trimming inspection and removal on the specific contaminated portions. Installation of Veritide's BluMax System on the slaughter floor, prior to final carcase inspection, minimises cross-contamination of carcases during chiller sortation and chiller loading. This also minimises the labour required in the pre-trim area.

Labour Reduction for inspection and removal – would result in the pre-trim, prior to boning room entry, if Veritide confirmed carcases were clean prior to the grading scale. Furthermore, visual detection and identification would keep inspectors focused just on the removal in specific areas, thereby increasing the efficiency of each inspector.

Shelf-life benefits

- Reduction in airfreight
- Short life export Freezing due to delayed shipping schedules have resulted in freezing sea freight containers of chilled meat. The loss in value for some products can be significant.
- Markdowns and dumps at retail can exceed 8% of sales. As more product is centrally packaged as retail ready product and the control of shelf life moves from in-store butcher to cold store and logistics managers, shelf life becomes even more critical. Although this cost is more directly carried by the retailer, there is an impact on everyone in the supply chain. To maintain the conservative nature of this benefit case analysis the

benefits have been estimated, but not included in the processors return on investment calculations for Veritide units.

Presumptive Downgrades reduced - as a result of market entry and microbiological testing requirements (particularly in the USA), a proportion of product is rejected due to contamination such as E. coli and other zero tolerance mandates. This is expected to reduce as more effective identification and removal of contaminants is enabled by the Veritide technology.

Risk of losing market access – due to detection of zero tolerance contaminants is a very real risk that all plants are concerned about. A single detection of ingesta contamination on a beef brisket is a tremendous reliance on staff (with a turnover rate of 30-60%) to process effectively, and visually inspect and remove effectively if required. The value difference between market access and no access can be significant. This value has been estimated. Given this is a risk, and hopefully not a reality, it has not been counted in the return-on-investment calculations.

Water usage, Waste treatment and Energy Cost savings – contribute 4.6% of the cost of operating in Australia. A portion of water usage, effluent treatment and water heating costs is due to carcase washing, inspection and waste removal.

- Given Veritide has mapped the locations on a carcase to be cleaned, targeted carcase washing could focus on the contaminated areas with a reduction in water usage while maintaining or increasing the effectiveness of that water application.
- Reduced water usage also reduces wastewater treatment.
- Energy costs used to heat wash water in some plants would also be saved. Although many plants consider hot water to be a product of existing boiler costs, the increased focus on energy reduction and environmental sustainability will increase the importance of hot water costs in future.

Training and Recruitment Costs – result from the associated labour reductions through more effective pre-trim inspection.

Training Support and Automated Corrective Action - is possible in real-time by live-streaming contamination detection results to operators at critical points in the slaughter process; providing real-time training, intervention and corrective actions. This type of improvement has been accounted as part of the Shelf-Life Improvement Benefits.

Process Improvement Benefits –using the same real-time feedback, enable testing, adjustment and acceptance of process improvements.

Benefit for Industry & Return on Investment

Modelling using values from the trial site and broader industry data was undertaken. Based on current capital costs of the system, assuming configuration of three BluMax units and ongoing service and support, the system will deliver between $4.73 and $5.31/head for Beef (Table 1) assuming likely benefits in the left hand and middle scenarios.

The far-right scenario calculates the total potential benefit that could be possible along the whole supply chain. The left and middle scenarios assume a direct, realistic and conservative portion of that potential value that a small (left) and large (middle) processor could expect to receive in direct benefit from installing the Veritide system. The weighted portion of total potential benefit is highlighted in orange input cells to the right of the Product Benefit Descriptions. These scenarios are considered conservative and provide a payback of ~12 months for bovine plants.

Table 1: Cost Benefit Analysis (Beef)

BEEF INSTALLATION								
BluMax Manual System (3 x wide angle units installed)						**Potential S.C. Benefit**		
		Small Volume Plant		High Volume Plant		High Volume Plant		
Total Cap Ex (incl. Installation)		$541,000		$541,000		$1		
Gross return Per head		$5.63		$5.61		$79.88		
Total costs Per head		$0.90		$0.30		$0.30		
Net Benefit Per head		$4.73		$5.31		$79.59		
Annual Net Benefit for the plant		$567,098		$2,549,616		$38,200,835		
Pay back years		0.95		0.21		0.00		
Net Present Value (15 yrs.)		$2,946,373		$14,966,136				

Plant Specific Drivers								
		Small Volume Plant		High Volume Plant		High Volume SUPPLY CHAIN		
Useful working life		7		7		7		
Discount rate (for NPV)		7%		7%		7%		
Hours/Shift & Shifts/day		7.6 Hrs	1	7.6 Hrs	2	7.6 Hrs	2	
Chain speed (#/min) &		1.1	500 Hd	2.2	2,000 Hd	2.2	2,000 Hd	
Weeks of operation/year		48		48		48		
Annual number of head		120,000		480,000		480,000		

Drivers										
			Small Volume Plant		High Volume Plant			High Volume Plant		
Item	Description		$/hd	$/ annum	$/hd	$/ annum		$/hd	$/ annum	
Product	Pre-Boning Room Trim -	100%	$3.38	$405,504	$3.38	$1,622,016	100%	$3.38	$1,622,016	
Benefits	Airfreight $/kg Differential	5%	$0.02	$2,675	$0.02	$10,699	100%	$0.45	$213,986	
	Market Access Price	0%	$0.00	$0	$0.00	$0	100%	$59.62	$28,619,803	
	Short Life Export Freezing	5%	$0.67	$80,370	$0.67	$321,480	100%	$13.39	$6,429,599	
	Markdowns	0%	$0.00	$0	$0.00	$0	100%	$1.30	$625,100	
	Presumptive Downgrades	50%	$0.20	$23,728	$0.20	$94,911	100%	$0.40	$189,822	
	Other		$0.00	$0	$0.00	$0		$0.00	$0	
Operational	Labour		$1.32	$158,719	$1.32	$952,317		$1.32	$634,878	
Benefits	Training & recruitment		$0.04	$4,356	$0.02	$8,712		$0.02	$8,712	
	OH&S		$0.000	$0	$0.000	$0		$0.000	$0	
	Existing operational costs		$0.000	$0	$0.000	$0		$0.000	$0	
Total Benefits			$5.63	$675,352	$5.61	$3,010,135		$79.88	$38,343,915	
System Costs	Capital Cost		$0.61	$73,429	$0.15	$73,429		$0.15	$73,429	
	Service / maintenance		$0.29	$34,826	$0.15	$69,652		$0.15	$69,652	
				$0		$0			$0	
Total Annual Costs			$0.90	$108,254	$0.30	$143,080		$0.30	$143,080	
Net Annual Benefit			$4.73	$567,098	$5.31	$2,867,055		$79.59	$38,200,835	

Recommendations for the Future

The harnessing of the technology requires industry to consider the implications of increased rigour in identification of potential E. coli contamination, interventions, changes in policies and processes, as well as validating extension in shelf life which is possible through improved hygiene standards. It is recommended that a whole of industry approach be taken to integration of the Veritide technology into industry. This should assess the utility and management of the data created when deploying the Veritide modular camera and handheld scanners, and how the previously identified digital modernisation reforms could be enabled. A number of further bodies of work have been described in the full report.

Figure 1: Commercial Version of Veritide's Single Module BluMax Scanner

Figure 2: The red-meat industry and Daff's collaborative vision for modernisation of risk-based regulation of the supply chain