AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Automated AI

2024-1083 Automated AI / X-Ray Enabled
Primal/Box/Label Evaluation

Project code	Prepared by		Date submitted
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Project description

This collaborative R&D project with Foss and SIA aims to improve carton and label verification in Australian processing facilities through the development of an AI-enabled Dual Energy X-Ray imaging system. This initiative involves upgrading existing technology (Meat Master) systems, integrating essential hardware, and implementing an AI overlay for enhanced adaptability.

This projects comprehensive approach includes the integration of the system into existing controls, enabling repeatable rejection processes. Subsequent phases involve running cartons through production rates to obtain baseline X-ray images and ensure accurate labelling. The complied image library will serve as the foundation for rigorous model testing.

During model testing, key verification processes will be executed:
1. Correct product verification will leverage X-ray images of known products, employing AI technology to access each carton's adherence to product descriptions. The rejection of at-risk cartons at the chute will allow operators to verify correctness or initiate re-work. Random manual selections and monitoring complaint trends will validate the system's accuracy and potential reduction in mislabelled products.
2. Chemical lean verification will involve random testing of trim cartons to validate measured CL, adjusting parameters based on Foss Food Scan results.
3. Foreign object detection will be meticulously monitored, recording results to establish system reliability.

Ultimately, project success will be determined by testing results against customer requirements and predefined acceptable levels outlined in the proposal. This undertaking signifies a transformative step in the research and development toward industry-wide adoption of advanced carton and label verification systems.

Project content

- Address challenges/limitations from previous project using X-ray technology combined with AI machine learning computer program.
- Finalise a commercial solution and verify performance.
- To train 10 product algorithms to identify product type initially >96% of cartons with a certainty threshold of >50%, a certainty distance of >30% across 100% of the products. This target has been refined to limit false detections close to 0. At Milestone 6, the target will be shifted to >97% product identification.

Project outcome

Training of an AI algorithm to compony product groups has observed great success in identifying mislabelled product. The AI algorithm will reject a carton when the specifications for that carton are not met. Once the carton is rejected the data and rejection reason is displayed on the rejection terminal for easy identification of what is wrong leading to ease of rectifying the problem. The project has presented 99% true product identification and correctly picked up mislabelled cartons that were able to be rectified.

- 100% of AI identified cartons are being assessed using Meta and Image data.
- AI algorithm presented with 98.8% true product identification. True product identification is the correct cartons plus the true rejects that the AI algorithm detected.
- All cartons rejected by the AI algorithm were further assessed by competent personal to confirm what the product was. This confirmed that 0.27% of the rejected were rejected with a mismatch of label to product (true rejects) and 1.2% of product was falsely rejected mainly with undesirable presentation. This was a result of training the AI algorithm with clean and correct data sets.

Benefit for industry

Implementing an AI-enabled Dual Energy X-Ray imaging system has picked up mislabelled has successfully flagged cartons with a mismatch of product to label identification, reducing the risk of cartons being sent out to customers with a mismatch of product to label claim. The AI algorithm has a 98.8% correct product identification. This is the percentage of cartons that were AI assessed matching the carton label and the true rejects identified. There is overall 1.2% of false product identification seen through the false rejects from the AI assessed cartons. This evidently has met the project objectives of >97% product identification for the 10 SKU's.

The project has also found that a cost saving of $255,070.86 per year can be seen by the number of cartons the AI algorithm has detected that had a mismatch of product to label claim. The return on investment for implementing an AI-enabled system is 2.82 months. The intangible customer relations are also benefited from the AI algorithm as this has mitigated the likelihood of sending out product with a mismatch of product to label claim. This keeps the customer satisfied as they are receiving what they ordered and also reduces the customer complaints and non-conformances for out of spec product. Carton claim is important in the red meat industry and by delivering correct product that was purchased along with it being delivered within specifications will see a continued growth with customers, keep the customer satisfied, gain further market access and enhance brand integrity.