Digital twins report: Executive Summary

Results available: Results available
Area of research interest: Meat Hygiene Research Programme
Research topics: Food hygiene , Meat hygiene
Authors: Professor Sonal Choudhary, Dr Victor Guang Shi, Dr Cansu Kandemir, Dr Chao Sun, Dr Raymond Obayi, Mr Rakesh Nayak
Conducted by: University of York, Manchester, Sheffield and LeanSig Limited, Food Standards Agency, Science and Technology Facilities Council
DOI: https://doi.org/10.46756/sci.fsa.wca758
Planned completion: 15 September 2022
Project status: Completed
Date published: 15 September 2022

Acknowledgements

This research was jointly funded and supported by the STFC and the FSA. We thank our colleagues from the FSA, FBOs, the STFC, University of Sheffield AMRC, University of Manchester, the University of York and LeanSig Limited who provided insight and expertise that greatly assisted the completion of this review.

Our special thanks to Geoff McBride from the STFC for initiating the collaboration between the FSA and the STFC Food Network+ (SFN) and for their constant support and encouragement. We cannot thank enough Ben Goodall from the FSA for his guidance, support and facilitation throughout the research work. We are also thankful to Mark Geraghty and Richard Grossman from the FSA for valuable insights that immensely contributed towards the review.

We would also like to show our gratitude to the employees of the FBOs we visited for sharing their expertise and experience with us during the course of this review.

Executive summary

This project was developed following a 21st century abattoir review commissioned by the Food Standards Agency (FSA) and the Science and Technology Facilities Council (STFC) to explore areas where advanced technologies could augment or enhance the delivery of FSA’s official controls for meat safety, traceability and authenticity in line with the FSA’s operational transformation agenda. The review captured the current state of processes, practices and technologies used in UK abattoirs, and provided independent recommendations on the most appropriate data and technology capabilities of the STFC, as well as other technologies available

on the market to support the delivery of official controls (Ante- and Post-Mortem inspections) and improve Food Business Operators (FBOs) operational efficiencies. The preliminary findings of the 21st century abattoir review were used to propose feasible and scalable development areas during a joint FSA-STFC Sandpit event held in October 2019.

Following the sandpit, a consortium led by the University of Sheffield AMRC received joint funding from the STFC and the FSA to explore advanced technology interventions that could upgrade certain key meat processing and inspection operations from the 18th to the 21st century. The project aimed to simulate a specific PM inspection critical control point (visual contamination checks and offal inspection) using digital twins to identify opportunities for enhancing inspection quality and failure prevention through scalable people-technology-machine interfaces. The objective was to build a simulation model of offal inspection processes to capture the value streams of people, processes and technology, and identify potential opportunities for improving the current inspection process in UK abattoirs.

This study uses discrete-event simulation (DES) modelling with virtual testing of technology, people, and process configurations to allow the exploration of ‘what-if’ scenarios to predict and optimise the system behaviour. A generic simulation model of a pig abattoir process flow was developed to provide the FSA with a methodology for visualising how equipping inspectors with technologies could support efficient and accurate operations. In addition, this proof of concept would also contribute to the FSA strategy to deploy the right balance of technology and labour via the new operational transformation agenda.