

FACILITATION OF WATER REUSE PROJECTS

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Abstract

The high consumption of water associated with many activities in abattoir operations is a key environmental issue.

Water is used for the watering and washing of livestock, the washing of trucks, the washing of carcasses and by-products, and for cleaning and sanitising of equipment and processing areas. Strategies for reducing water consumption can involve technological solutions, equipment improvement or procedure changes.

This project aimed to demonstrate water efficiency through a single reuse of hot and cold water collected after the sanitation of a moving flight top beef viscera table for the purpose of paunch cleaning and washing. High microbiological counts for generic E. coli and coliforms in the reuse water suggested that this water was unsatisfactory for further application within a meat processing operation without further treatment.

Executive summary

The objective of this project was to facilitate the conduct of trials aimed at demonstrating mechanisms for reducing water consumption in meat processing facilities.

This trial aimed to improve water efficiency through a single reuse of hot and cold water collected after the sanitation of a moving flight top beef viscera table for the purpose of paunch cleaning and washing. It was anticipated the trial will demonstrate a water savings of 0.35kl/tonne standard HCW through this measure.

This trial complements three other trials relating to:

- The adaptation of steam for the continuous sanitation of moving viscera tables in lieu of hot water;
- The design of a water reuse system for the processing of beef tripe and bibles; and
- The adoption of a cleaning program for carcass chillers built around physical manual procedures.

Microbiological testing of the reuse water have returned *E. coli* and coliform counts in the \log_{10}^6 range thereby indicating the water is unfit for use in the production of meat and meat products in its present state.

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1 Background

This trial is part of a broader strategy to identify water efficient technologies, systems and processes that deliver significant water savings to meat processing facilities whilst maintaining food safety standards.

Previous research and trials into water and energy efficient cleaning processes have examined the efficacy of alternative sterilisation methods, including the application of lower water temperatures at higher immersion times, steam sterilisation of viscera tables, tripe wash water re-use and more energy and water efficient chiller cleaning. However, there remains a need for continuing rigorous examination and documentation of a range of new processes that fit within food safety regulations.

A large quantity of water is used to sterilise and cool moving-top viscera tables. The quantity reported varies widely but is generally considered to represent around 20 % of total water use with consumption calculated at between 500 – 600 litres/head.

This viscera table steriliser and cooling water has previously been identified for potential reuse purposes. For example, cold and hot potable water from the sterilisation unit on viscera tables has been captured for application in the initial rinsing of these tables to remove wastes tissues and contaminants from the table surfaces prior to sterilisation.

This trial involves the single re-use of cold and hot potable water from the beef viscera table for paunch opening and relating activities.

In addition to re-use purposes, water efficiency with viscera tables has been demonstrated to be significantly improved by changes to spray nozzle design.

2 Project objectives

This trial involves water efficiency research activities whereby investigations have taken place into the re-use of cold and hot potable water from the beef viscera table for direct application into the spigots used in the flushing of the paunch upon its opening. It is also proposed to re-use the same viscera table water for washing the paunch; the surrounding area of the paunch opening room; and beef runners for inedible purposes.

It is envisaged that this project will deliver the following benefits to the Australian red meat industry:

- A combined benchmark and standard for water and energy efficiency within cleaning, storage and waste water processes – referring to the current Approved Arrangement;
- Reduced expenditure on water and energy through improved efficiency, demonstrated through validation of utility bills and/or data capture from metering of relevant processes;
- Improved understanding of domestic and export food safety regulations and standards;
- Improved understanding of and compliance with domestic energy and climate change regulations and standards including NGERs and the Carbon Pricing Mechanism;
- Improved access to latest water and energy efficiency improvements for meat processing systems through demonstration, reporting and other extension activities.

3 Methodology

Hot and cold water from the sterilisation and cooling unit on the beef viscera table was collected within a depository tank connected directly with the table's drainage system. The water was coarsely filtered to remove solids but was not otherwise treated.

No changes to the viscera table and adjoining structure were made to prevent possible contamination of the water from the underside of the returning slats.

This water was to be re-used for application directly into the spigots for the emptying and initial flushing of the tripe immediately after opening the paunch and prior to carrying out further trimming and cleaning processes.

It was also proposed to use the same water for washing the paunch emptying tank, the surrounding area of the paunch opening room, and beef runners for inedible purposes.

A preliminary analysis of the water savings estimates over one production year was made:

7.2 L/per minute x 27 spray units x 60 minutes x 7 hrs production x 251 days production

= 20,493,648 litres per year

= 20,493 K/L per year less wastage estimated at 5% through overflow and end of production drainage

Total water savings of 19,460 K/L per year were forecast from this trial.

Expressed alternatively, water savings of 0.35kl per tonne of hot standard carcass weight (beef) could be anticipated.

4 Results and discussion

The water collected from the beef viscera table appeared to clear and visually clean. This water was tested for microbiological parameters in the early stages of this trial for the purpose of assessing fitness for use before to proceeding further with trial operations. All testing was undertaken at a NATA accredited laboratory. The test water was collected in accordance with normal procedures for the sampling of water for microbiological analysis under the trial establishment's Approved Arrangement.

Generally, microbiological potability is assessed according to the following criteria:

Coliforms/100ml	E. coli type 1/100ml	Rating
0-2	0	Satisfactory
3-10	0	Suspicious
>10	0	Unsatisfactory
	1 or more	Unsatisfactory

The microbiological parameters tested included generic Escherichia coli (E. coli) biotype 1, coliforms and total plate count. The following results were reported from the laboratory:

- E. coli: $1 \times 10^6/100 \text{ ml}$
- Coliforms: $1.2 \times 10^6/100 \text{ ml}$
- Total count: $3.7 \times 10^5/\text{ml}$.

These results indicate a high level microbiological contamination. The Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption (AS 4696:2007) requires that only potable water is used in the manufacture of meat, other than in certain circumstances. These circumstances include for purposes such as fire fighting, yard cleaning and steam production (no direct or indirect contact with edible product).

Notwithstanding, the use of water with this level of microbiological contamination without further treatment demands careful consideration.

5 Conclusions and recommendations

The microbiological testing results indicate indicating the water is unfit for use in the production of meat and meat products in its present state. Accordingly the project was discontinued at this stage prior to commencing any active trial phase.

Investigations into the reasons for these microbiological counts in the beef viscera water were considered outside the scope of this project and accordingly were not pursued.

6 Reference list

AMPC Final Report A.ENV.0090 Environmental data analysis

AQIS Meat Notice 2008/01 Protocol for Alternative Procedures and New Technology Approvals

Food Science Australia Meat Technology Update 1/05 Water reuse in the meat industry – opportunities and issues.