Project overview

MEAT & LIVESTOCK AUSTRALIA

Development of energy modelling software for Australian red meat rendering processes

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Brief summary

Meat plants use heat energy for rendering operations and hot water production. Fuel costs for supplying this heat typically account for 5% of the total processing costs. Results from previous studies have indicated that fuel costs can usually be reduced by about 20% with savings of up to 50% possible in some plants. This project aimed to develop user-friendly computer software, containing mathematical models of meat plant energy-using operations, for use in optimising the energy efficiency of both existing and new meat operations.

Objectives

1. To develop a programme for validating and developing energy models.
2. To collect process data from rendering and hot water systems at three meat plants, and analyse the data.
3. To refine mathematical models of three types of rendering equipment that generates and uses hot water.
4. To design, program and test new beta-prototype heat energy modelling software.
5. To refine the software, release and promote it to the Australian red meat industry.

Project outcomes

This project had three principal phases: collection of industrial data for use in model development and testing; model development and testing or all important component models and design and implementation of a user-friendly simulation environment for detailed meat plant energy modelling.

All models associated with water use (i.e. water tank, water usage stream, water mixing valve and hot water heat exchanger models) were enhanced to allow prediction of water temperature within each application. Six new models were formulated and implemented in the software, including a chain model, a raw material model, a low temperature rendering (LTR) vessel model, a blood coagulator, an ancillary steam usage model and an ancillary water heating model.

The major outcome from this project was the development of user-friendly energy modelling software, The software was a major enhancement on any meat energy modelling and analysis tools available to the Australian red meat industry at the commencement of the project. For new plants the software will be used to optimise the design of heat energy using processes and allow the most economic use of equipment. For existing plants the software's ability to calculate energy consumption on an hour-by-hour basis will allow plants to optimise their processing schedules to avoid overloading of boilers and hot water generators, and prevent associated hot water shortages.

Benefits to industry

During the experimental phase of this project, valuable data on rendering plant operation and meat plant hot and warm water usage was collected. The data collected were used for both testing existing models and developing new or enhanced models of energy usage by these operations. The information included useful data on meat plant water usage and rendering plant process parameters, for which little information existed before.

Future research and recommendations

The rendering process models should be enhanced in the future in conjunction with new microbiological studies and meal residence time and temperature measurements. Such expanded models will assist meat plants in assessing the hygienic effectiveness of their rendering processes in relation to regulatory and market requirements.

The software was developed on a 16-bit operating system. Some testing was performed in Australia on a 32-bit operating system and this showed that some software enhancements may be necessary. Widespread adoption of32-bit operating systems by industry is likely within the next few years; thus, it is recommended that the software be fully tested on a 32-bit operating system and enhanced if necessary.