

Red meat processors, process heat studies

Process heat studies for seven red meat processor sites

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Prepared by
pitt&sherry Pty Ltd

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Project Description

The Australian Meat Processor Corporation (AMPC) selected seven red meat processor sites across five states to participate in the process heat study program to support each member in achieving their carbon neutrality commitments (e.g. CN30). The study initially intended to conduct an energy balance and a pinch analysis on the process heating system. Based on this, heat recovery and renewable energy technologies were investigated to transition to renewable energy for process heating. For those sites where a pinch analysis could not be conducted, the assessment focused on energy efficiency and productivity opportunities, as well as the next steps needed to be taken in order to be ready for renewable energy projects. Confidential site-specific reports were issued to each participant following site inspections and individual workshops.

The main objectives of the project were to:

- Complete a thermal energy balance and pinch analysis at the participating AMPC member sites
- Summarise the common energy intensity patterns and identify any potential or specific areas of loss
- Identify opportunities to reduce energy consumption
- Identify opportunities for passive heat recovery
- Identify opportunities to upgrade waste heat to useful heat using heat pumps
- Identify opportunities to replace electrically driven refrigeration with biogas fueled absorption chillers
- Develop a business case for each identified opportunity
- Assess the opportunities that were the most economically feasible and created the most significant reduction in Greenhouse Gas (GHG) emissions
- Identify any restrictions or risks to the implementation of each opportunity
- Identify the capacity to self-generate renewable energy to displace grid electricity
- Combine these measures to quantify how far they progress the site toward GHG reduction

The following areas for improvement were identified across the participating sites:

- Implementation of a comprehensive sub-metering system, connected to a smart monitoring platform, to support and improve everyday operational management of the site
- The need for a formalised sustainability and/or net zero target and action plan, adopted and supported at an executive level. While most facilities demonstrated general recognition of, and movement towards more sustainable energy and carbon practices, the businesses who had made the most progress towards a net zero operation had quantified emissions reduction targets and publicly stated these commitments
- Dedicated budget and staff capacity for sustainability initiatives, emissions reduction projects and/or energy and process efficiency improvement

Project Content

This study has been conducted for an in-depth thermal balance and pinch analysis of some selected red meat processor plants to identify the specific heat recovery/replacement opportunities and how they might be integrated into existing processes. The combination of these two analytical tools was to develop a robust understanding of each site's energy loads, identify potential loss reduction opportunities, develop a concept design of an optimum heat recovery network, and identify further opportunities to replace gas-driven steam/hot water with electrified heat pumps. To round out the analysis, renewable energy assessments were completed to identify the potential for each site to generate its own electricity. The quantification of energy replacement/reduction, GHG impact, and economic analysis for site integration were developed for each opportunity. Generation of a prioritised list of the options which quantified the impact on GHG emissions was to provide an action plan for implementation and economic analysis.

The sites without adequate available data were assessed for energy efficiency opportunities and provided with a metering and monitoring plan. The process for progressing from the energy efficiency stage through to pinch analysis and investigation of renewable energy opportunities was also laid out to provide a clear pathway towards emissions reduction for sites at all energy and carbon maturity stages.

Project Outcome

The study provides a comprehensive analysis of process heating end uses and thermal energy demands throughout the facilities. Figure 1 represents an indicative example of hot thermal flow in a red meat processor plant.

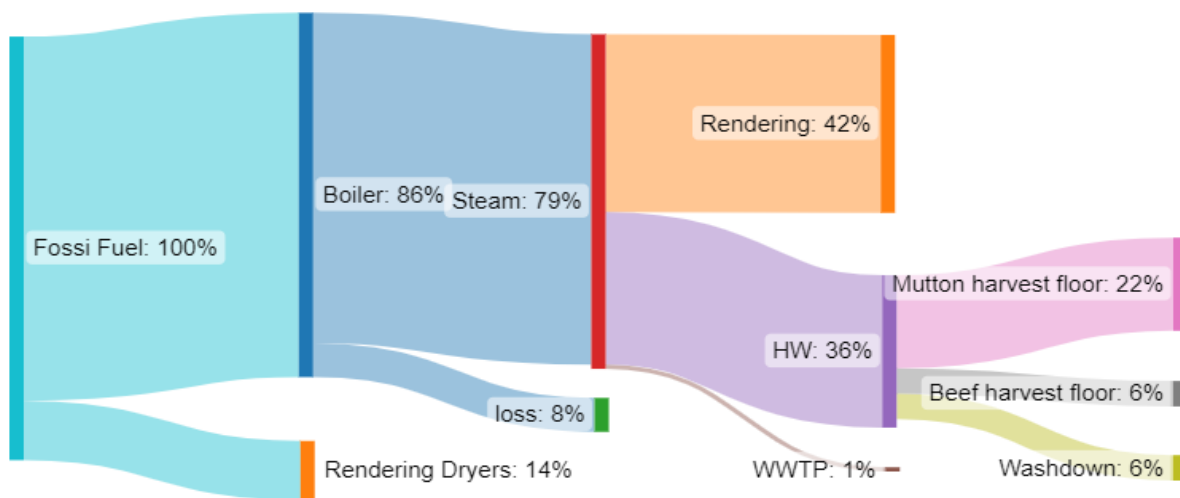
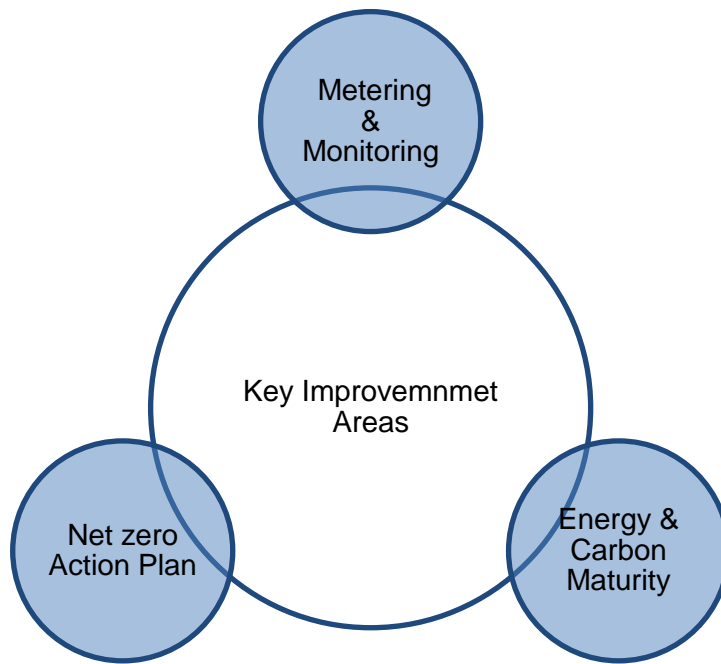


Figure 1: Sankey diagram showing hot thermal energy flow at a multi-species red meat processor plant with rendering

The major outcomes of the project were:

- An energy consumption breakdown along with estimation of energy and emission intensity at each stage
- A pathway guidance for energy and carbon transition
- Energy performance and management strategies for each site
- Energy efficiency and renewable energy opportunities for each site
- Key areas for improvement including: energy and carbon maturity; metering & monitoring; net zero strategies and targets



Benefit for Industry

A key opportunity to support industry net zero change is to further the understanding and awareness of the potential impacts of a net zero transition for red meat processor businesses. A key part of the transition is developing sustainable, energy management strategies; the highlights are noted below:

- Harnessing the power of data through the introduction of a proper metering and monitoring system. For a metering system to drive energy and carbon reduction action, the data it generates must be collected, monitored and analysed. The value in metering energy use is significantly reduced if not monitored regularly and used to inform operational decision making in a continuous improvement loop
- Designing the site's heat recovery system around the pinch point minimises the consumption of utility energy for process heating and cooling
- Key passive waste heat recovery opportunities are economisers, desuperheaters and rendering plant heat recovery with simple payback of less than 6 years in the cases studied
- Renewable energy is suitable for each and every site. Solar PV should be optimised for self-consumption
- Where biogas is generated through on-site anaerobic digestion of wastewater, it may be used for steam production or cogeneration to reduce GHG emissions
- Electrification technologies such as heat pumps should be investigated thoroughly with feasibility studies on a site-by-site basis, as they are not always appropriate and should be sized correctly according to specific site energy usage
- Industry innovators should keep an eye on large-scale solar thermal, large-scale battery storage and biogas to biomethane technologies, which have the potential for application to Australian meat processing facilities
- It is important for each red meat processor business to develop their own Net Zero plan. Development of a site and/or overarching business net zero strategy can be undertaken internally by a sustainability manager within the red meat processor organisation. A clear, strategic pathway will set the course for businesses to continuously reduce their emissions into the future