Rendering Plant Energy Optimisation (PIP.039)

Waste heat recovered as energy savings and increased productivity

Project Aims

- Achieve boiler fuel energy savings (up to or better than 4%) by utilising excess hot water to preheat raw material immediately prior to entering the continuous rendering cooker
- Demonstrate further energy savings from the use of super-heated hot condensate water from the rendering vessel shell and shaft to achieve a design energy savings of >8%.

Story

EG Green & Sons' abattoir and rendering plant, at Harvey in WA, have traditionally produced hot water in excess of their requirements and then wasted excess heat by pumping the excess hot water to a large holding lagoon where the heat is slowly dissipated to atmosphere.

As a result of increased production to 24 hours per day, 7 days per week EG Green & Sons' rendering plant has required a major overhaul, with the installation of new, modern, continuous dry-rendering equipment. This major upgrade provided an opportunity for EG Green & Sons to install a preheater that has utilised this waste heat to give an ongoing energy reduction of 10%, with a significant reduction in operating costs.

Description of project

The new, continuous, dry-rendering plant has been designed and constructed to allow maximum heat recovery from the rendering activities and to allow interaction between the various components of the rendering system. Heat is recovered from the cooker vapours through a shell and tube condenser, with all recovered heat producing hot water. The heat recovery system from the old, decommissioned, Equacooker has been converted to operate with the new Stord Rotadisk cooker.

Major Outcomes

1. **3.3 year payback on major capital investment**
2. **33% increase in production**
3. **10% energy savings**
4. **1.6% increase in tallow value**

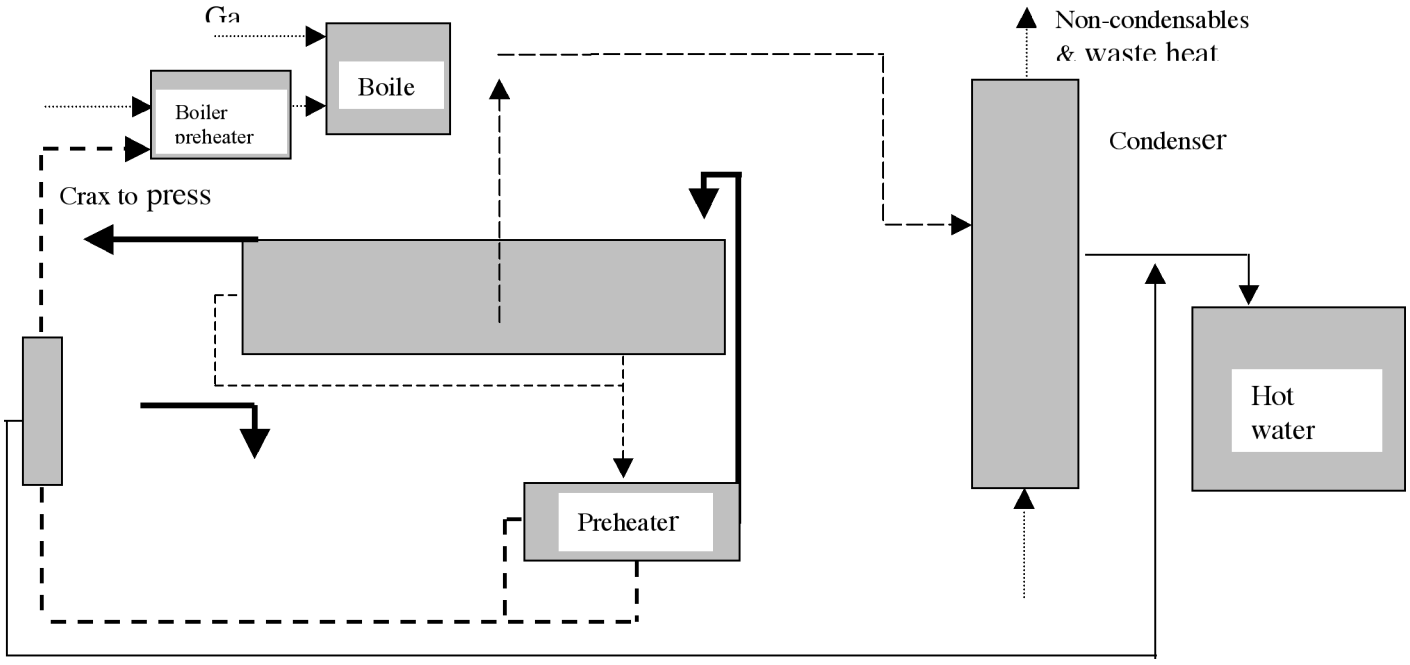
Raw material feeding the cooker is passed through a preheater to elevate its temperature and reduce the steam requirements of the cooker. The preheater's energy source is waste heat recovered from both the cooker and excess hot water. This preheater is similar in design to the Stord Rotadisk cooker, in that it has a hollow shell and hollow disks. The primary difference is that the shell and disks are constructed to hold hot water rather than steam.

The condensate recovered from the shell and shaft of the rotadisk cooker are under pressure and, hence, are above 100ºC. These two condensate sources are blended together to feed the shell of the preheater. In steady state operation the blended condensate temperature is approximately 128ºC. This hot condensate flows under pressure through the shell of the preheater to heat the raw material, prior to entering the cooker. Simultaneously, the hot water - produced through traditional condensation of the cooker vapours - that is in excess of the abattoir & rendering plant's needs, is pumped through the preheater shaft to further heat the raw material, prior to entering the cooker.

Raw material is heated in the preheater from 30-35ºC to in excess of 90ºC using only waste heat. The entering and exiting raw material is shown in the photographs below and clearly shows the change in nature of the material through the preheater.

Final condensate from the steam supply side of the heat exchange system is recycled to the boiler feed water to minimise any losses of energy and water. Condensate from the cooker vapours is fed to the abattoir effluent ponds for treatment, while non-condensable vapours are passed through a biofilter for treatment.

The layout of the cooker and preheater energy recovery system is shown below and demonstrates the relationship of the various heat generation and recovery components.



Evaluation

Key points to note from this project are:

- Average weekly production volume has increased by 22%
- Average weekly production rate has increased by 33%
- Average weekly gas usage has decreased by 10%
- Average weekly electricity usage has decreased by 9%
- Average weekly total energy usage has decreased by 10%
- Average weekly yield of A&B grade tallow has increased by 12%

A Technology Transfer kit is available. The data within the kit confirms the Altas Stord design premise that the preheater would reduce steam usage by 8%.

On the basis of energy savings, payback period on the investment in the preheater is 3.3 years. The estimated life of the preheater system is a minimum of 10 years. Total saving over this period, less capital = $589,800. Estimated return on investment over the 10-year life of the preheater is 20% per annum.

Other identified gains from the system are:

1. The increased yield of A & B grade tallows. During the 2 year assessment period. Production of A-grade tallow increased 1.6%. B-grade tallow production increased by 6.9%. C-grade tallow production reduced by 8.5%. On EG Green & Sons 2005 tallow values and production volumes, tallow value increased by $89,640 or 1.6%.
2. Reduction in wastage of heat to effluent ponds. Minimal heat wastage from the rendering plant to the effluent ponds now occurs. This has resulted in a stabilisation of pond temperature to an ideal for microbial growth. The effluent pond performance has improved since the installation of this heat recovery system. No dollar value has been established for this but it should translate to savings, even if only in the time required to maintain the treatment system in efficient operation.

Summary

EG Green & Sons have taken the opportunity given by a major plant upgrade to make significant gains in waste heat utilisation. This has resulted in significant financial and environmental gains for the company.

The preheater evaluated in this project was specifically designed for the Atlas Stord Rotadisk continuous cooker system installed in EG Green & Sons rendering plant. While this exact design may not be ideal for other continuous cooker systems, the principles of operation and the performance gains would be expected to be relevant to any continuous dry rendering plant with a heat recovery system of this type. Any plant considering investing in new or upgraded rendering equipment should consider the inclusion of a waste heat preheater.

Contacts

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