case study

ENERGY SYSTEMS OPTIMISATION (ESO)

Rhodes Food Group

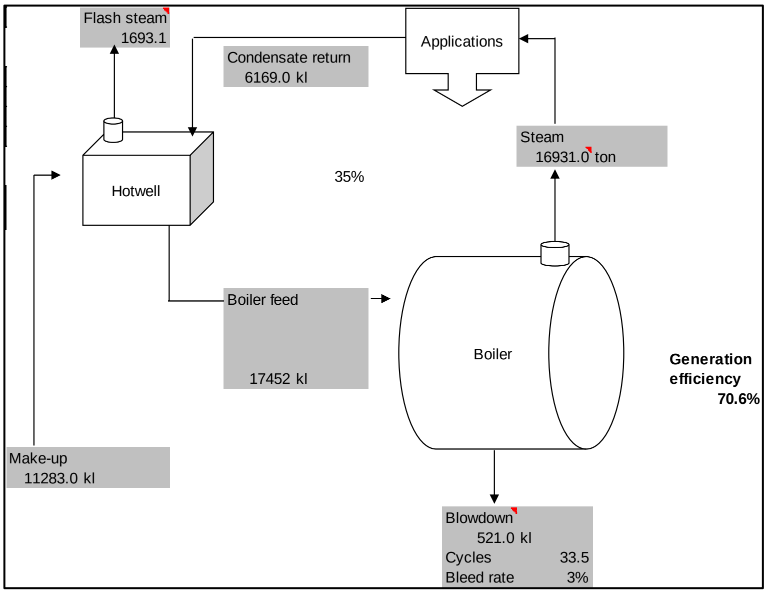
Agro-processing – Steam System Optimisation Candidate Plant 2014

BACKGROUND

The Rhodes Food Group is one of the oldest food producing companies in South Africa. Its proud heritage dates back to 1896 when its original founders pioneered the deciduous fruit processing industry in the country. Today, this Western Cape-based manufacturer ranks among the top 10 listed food companies on the Johannesburg Stock Exchange.

The Group has eight state-of-the-art production facilities and two agricultural farms. Its product line comprises fruit products (Western Cape and Swaziland), vegetable, meat, juice, pulps and purees, ready meals, dairy, pies and pastries, and dairy and pineapple (the two agricultural farms).

The ESO interventions took place at the ready-made meals and dairy (Ayrshire) facilities at Groot Drakenstein in the Western Cape. The plant produces a diverse range of chilled and frozen fresh ready-made meals; and milk, cream, cheese, fresh pasta and sauces are produced here for leading South African retailer, Woolworths.



The company is a large user of electrical and steam energy. With the costs of fuel increasing significantly over the past 10 years, a concerted effort was necessary to reduce consumption and costs. The steam system on the plant had two generation locations with an 8 tonne/hr boiler and a 4 tonne/hr boiler, respectively.

During the fruit processing season both boilers would be operational. Out of season only the bigger boiler would be in operation with an average load of 2 tonne/hr. The fruit cannery operation was moved to the Tulbagh facility in 2013 resulting in a significant drop in steam requirement for half the year. Thus, the plant's steam distribution infrastructure was significantly over capacity.

The diagram (left) provides an overview of the system after the cannery operations had been moved.

IEE Project capacity building programme

The site engineer attended the advanced steam training course and has utilised his learnings as well as the findings during the candidate plant assessment to implement efficiency measures on the boiler system.

KEY FINDINGS

During 2014/15, two projects were undertaken, resulting in a total energy saving of 928 000 kWh, valued at R135 750. With a total investment of R270 000, the estimated average payback period is two years. A reduction of 928 tonnes CO_2 was achieved.

IMPLEMENTATION OF ENERGY SYSTEMS OPTIMISATION

The steam distribution lines were consolidated allowing for the return of condensate from the plant as well as the removal of redundant piping and insulation of bare piping. Additional opportunities were implemented and captured as a part of the Energy Management System (ISO 50001) implementation. In more detail:

- Condensate return: All of the factory condensate and the majority of the dairy condensate was lost to drain. A new steam line was installed to increase supply to the plant and the old steam line was utilised as a condensate return line. The dairy condensate was also recovered by consolidating the boiler plants. The condensate returned increased by roughly 1.5 tonne/hr (from 40% to 80%).
- Distribution system optimisation and insulation: Sections of steam pipe were unlagged and redundant pipe lengths were still live. The dairy clean-in-place (CIP) tanks were also uninsulated. Redundant piping was removed; new insulation was installed on the distribution system as well as the CIP applications. The heat losses from the redundant lines and poor insulation were calculated to be around 66 kW. Insulation would result in an 80% reduction or 52 kW.

PROCESS CHALLENGES

Part of the fruit processing plant's process had been decommissioned resulting in a significant reduction in steam demand over the summer months. The reduction in steam demand saw an increase in the overall baseload when expressed as a percentage of steam supplied. As a result, regression analyses did not provide any significant correlations with which to determine the cumulative sum of savings.

There were uncertainties as to the future expansion plans for the plant, which made the decision to decentralise steam generation difficult to assess.

SUMMARY OF INTERVENTIONS

System	Intervention	Investment ZAR	Savings ZAR	Payback Yrs	Energy saving (kWh)	GHG Emission Reduction (Kg CO_2/year)
Steam	Condensate recovery	R150,000	R75,000	2	512,000	512,000
Steam	Insulation and removal of redundant pipework	R120,000	R60,750	2	416,000	416,000
Total		**R270,000**	**R135,750**	**2**	**928,000**	**928,000**

LESSONS LEARNED

- The ESO process greatly facilitated the calculation of possible savings by introducing efficiency measures. A task team with clear roles and responsibilities drove the various interventions through to completion.
- Regression analyses was used to quantify the savings but no correlation between energy consumption and production was found. Actual savings were estimated through calculating from first principles.
- Additional ESO assessments have been conducted across the group as a result of the initiation of the steam system optimisation assessment.