Case study

Sustainable cogeneration project in the sugar manufacturing industry

Howden's thermal renewables solution has enabled sustainable growth for our customer Industrias Alimenticias el Trebol in Colombia.

Industrias Alimenticias El Trebol S A, a producer of Panela, is located in Andalucía, in the department Valle del Cauca, Colombia.

Introduction

Panela is a typical but important produce from South and Central America, resulting from boiling unrefined sugar cane juice and consumed as an alternative for sugar or as main product in local traditional food and beverages. The sugar cane is hand cut using machetes, then cleaned and milled to extract the sugar cane juice. The biomass waste, known as bagasse, is used as fuel source to generate process steam in a water-tube boiler.

Panela sector in South America originally used traditional methods such as mechanical traction with horses and open evaporation systems. However, some companies have been investing in innovative and sustainable solutions to improve and industrialize the processes and methods with new technology. Howden's thermal renewable solution has supported sustainable growth, operational efficiencies and cost savings for our customer Industrias Alimenticias el Trebol.

The challenge

Some countries from the Pacific coast in South America experience a weather phenomenon called El Nino - a prolonged period without rain and extremely hot temperatures. In 2015, South America experienced one of the strongest and longest El Nino, with a huge impact in Colombia and their power source. In Colombia, the main source (70%) of electric energy generation is hydroelectric. This phenomena reduced the capacity from the main hydroelectric plants, resulting in black outs and rationalization of the electricity all over the country.

This extreme weather conditions have historically inspired governmental actions to support alternatives that will reduce the dependency of hydroelectric energy. As a result, the ley 1715 launched in 2014 to support the development of non-conventional renewable energy projects, including solar, wind and Biomass.

Recognising the need to provide solutions and support activities that generate sustainable development in the region, Howden visited customers and attended industry meetings in Colombia to identify and discuss the potential from customers to use their own resources to generate the energy demand for their operations.

Panela production requires thermal energy for multiple effect evaporation systems, with steam demand using pressures between 2-13 bar(a). For Industrias Alimenticias el Trebol, live steam from the boiler at 8 bar was being fed directly to the middle pressure evaporation stage, parallel to a PRV (pressure reducing valve) to expand the steam to the low pressure demand 2,4 bar.

The expansion occurred at the PRV represented a huge loss of thermal efficiency in the plant, wasting the whole internal energy from 8,7 t/h of live steam.

The solution

The Howden team supported and presented to our customer an engineering solution to replace this PRV with a Howden BASE AFA 4 turbine. The solution was designed to optimise the boiler, expanding and controlling the steam for the low-pressure turbine and transformed part of the internal energy from steam into the electric energy demand to operate the factory efficiently.

Close cooperation with Industrias Alimenticias el Trebol, enabled Howden to understand and generate a tailor made cogeneration solution, designed to meet the customer's specific thermal and electric energy demands.

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The outcome

The Howden BASE AFA 4 Turbine, will control the back pressure to meet the process steam demand, moreover, it will also transform the energy previously wasted at the PRV, into electricity required to operate the factory, formerly purchased from the network.

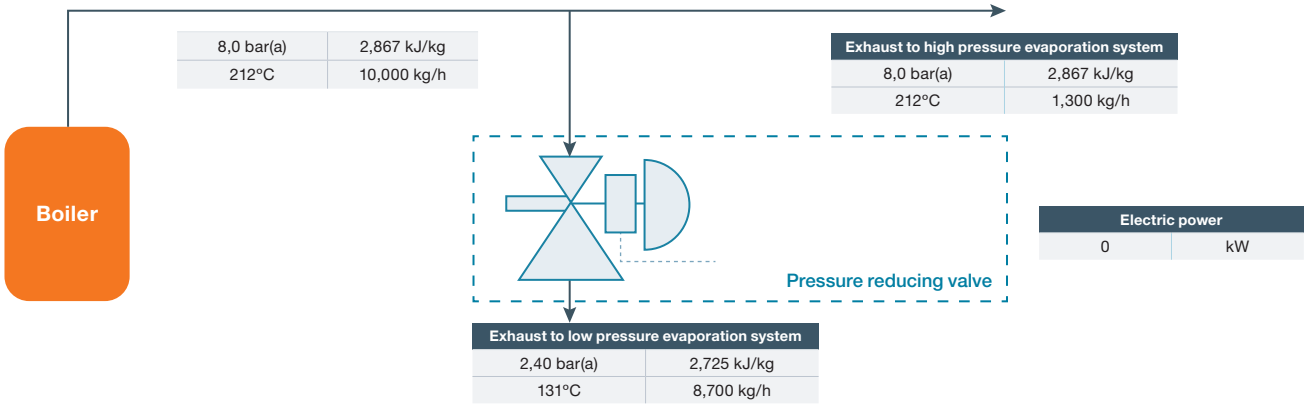
Customer operating at normal operation will save almost $36,000/month only with energy generated and estimating a break even time of 2 years.

Furthermore, the BASE AFA 4 met with all requirements from the government to successfully apply to the Ley 1715, generating the following benefits for the customer from the purchased equipment.

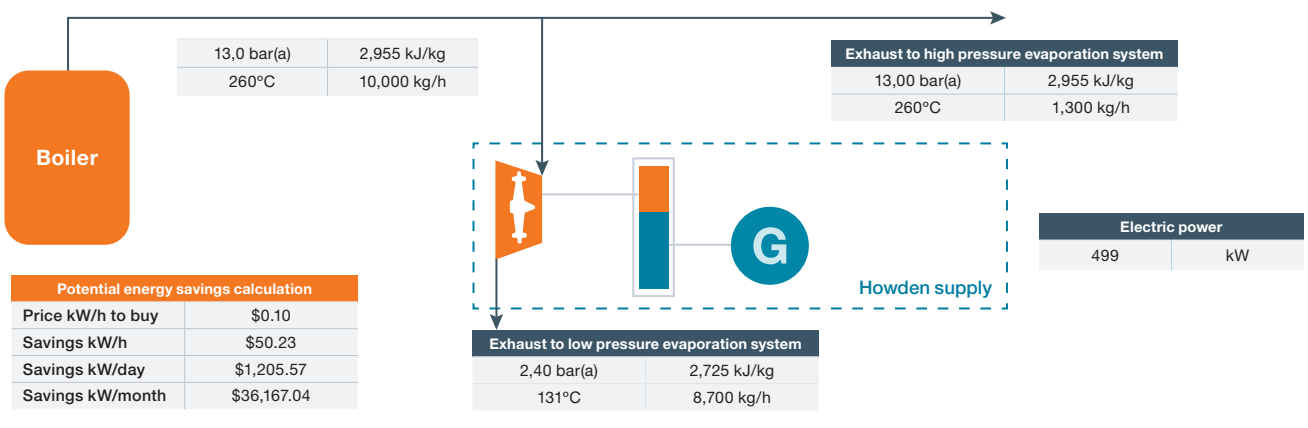
- VAT exemption
- Import tax exemption
- Rapid depreciation
- Income tax discount of 50% from the total amount invested, which can be divided in 5 years

Energy demand analysis between 01.01.2018–26.09.2018	
Total [kW]	2.017.302,50
Average [kWday]	7.499,27
Average [kWh]	312,47
Maximum [kWday]	11506,4
Maximum [kWh]	479,43

Heat balance diagram before Howden solution



Heat balance diagram after Howden solution



Potential energy savings calculation	
Price kW/h to buy	$0.10
Savings kW/h	$50.23
Savings kW/day	$1,205.57
Savings kW/month	$36,167.04