Sabien M2G Pilot Scheme

Project Report

Installation of two Sabien M2G Boiler Optimisation Units on 600kW and 800kW hot water boilers at a manufacturing site in Wagga Wagga

CCM ENERGY SOLUTIONS

The installation of two Sabien M2G Boiler Optimisation Units led to a temperature normalised reduction in gas usage of nearly 10% with a payback of just over one year at a delivered gas price of $11.60/GJ.

February 2018

Project Summary

The project involved the installation of full measurement and verification equipment, including dedicated gas flow meters, a water flow meter, flow and return temperature sensors as well as a data logger. The energy efficiency upgrade project involved the installation of two Sabien M2G boiler load optimisation units retrofitted on to the existing hot water boilers, supplying hot water to the manufacturing process. The boilers included a 600kW Unical boiler and an 800kW cast iron sectional boiler.

The Sabien M2G system operates using temperature probes on the boiler's flow and return water pipework, and a control unit which aims to minimise boiler 'dry cycling' (when the boiler fires to replace standing losses, rather than when responding to a genuine call for heat).

The principal aim of the project was to improve the overall efficiency of the boiler system by reducing boiler cycling and overall boiler run-times, with the goal of reducing fuel consumption and associated costs, as well as minimising carbon dioxide and other greenhouse gas emissions. The fuel fired on site was natural gas and the unit was installed and fully operational from August 2017.

Data Analysis

CT loggers were placed on to the main gas valves to ascertain on/off cycling of the two main boilers. A comparison of these two boilers for several weeks pre-installation and post implementation yielded the following results.

	600kW		800kW	
	Pre	**Post**	**Pre**	**Post**
Monitoring Time	983.92hrs	309.63hrs	983.95hrs	2035.05hrs
On Time	543.20hrs	143.10hrs	244.90hrs	122hrs
Percent On	55.21%	46.22%	24.89%	5.99%
Estimated Annual Hours	4837hrs	4049hrs	2180hrs	525hrs
Number of Turn Ons	1,897	315	2,380	1,096
Average On Time	0.29hrs	0.45hrs	0.10hrs	0.11hrs
Longest On Time	4.02hrs	2.95hrs	0.78hrs	2.28hrs
Number of Turn Offs	1,896	316	2,379	1,097
Average Off Time	0.23hrs	0.53hrs	0.31hrs	1.74hrs
Longest Off Time	30.39hrs	94.54hrs	11.83hrs	94.02hrs

The following information can be gained from this table:

- The lead boiler (600kW) has an increased average 'on' and 'off' period reducing the losses from unnecessary cycling. The boiler now cycles approximately once per hour, versus twice per hour beforehand. This reduces the purge time by 95s (1.5 minutes) per hour.

- The lag boiler (800kW) has a similar average 'on' period and increased average 'off' period, reducing the cycling considerably. The boiler now cycles approximately once every 2 hours, instead of 2.5 times per hour.
- The percentage time the lag boiler operates has dropped significantly from 25% to 6%, reducing losses associated with this boiler.

Fuel Consumption

Data is currently available for the 2017, pre-installation of the equipment and post-installation. These figures are taken from the dedicated gas meters on the main gas line to the boilers and also the mains gas meter to site. A straightforward year-on-year comparison can be made, but the figures have also been adjusted to take account for differences in ambient temperature (the pre-project baseline temperature was 14.3^{0}C and this was used for post-installation verification).

- Pre-project baseline energy consumption (14.3^{0}C): 30,042 MJ / day
- Post-project baseline energy consumption (14.3^{0}C): 27,055 MJ / day

- **Nominal Energy Reduction: 2,987 MJ / day**
- **Nominal Energy Reduction: 9.94%**

Payback Period

	Value
Expected Consumption	10,470 GJ
Predicted Consumption	9,489 GJ
Gas Cost ($/GJ)	$ 11.6 / GJ
Savings (GJ)	984 GJ
Savings ($)	$ 11,416
Equipment Costs	$ 12,500
Simple Payback	**1.1 years**

Reduction in Carbon Emissions

The decrease in fuel consumption has a corresponding impact on the amount of carbon emissions from the boiler. These are estimated to be 53 tonnes per annum.