

Case Study on GasPTi-LP for Furnace Control

Introduction



Based on a real application, some assumptions are made regarding the operating conditions of a typical furnace and the variations which can be expected in gas quality that will inevitably affect the setting of control system parameters. This note is produced to demonstrate the typical improvements, savings and payback which can be expected with the installation of a fast and accurate measurement of Calorific Value (CV) as provided by the GasPTi Gas Properties Transmitter.

Assumptions

Net CV variations in gas supply between 10.50 and 11.00 kWh/m³ (37.8-39.6 MJ/m³)
Variation = 0.50 kWh/m³ or ~ 5%
Air flow to furnace ~ 18000 nm³/hr
Gas flow to furnace ~ 1300 nm³/hr
Air/Gas Ratio ~ 14:1 or 40% Excess Air

The high excess air is currently required to enable lean firing if the gas CV increases by up to 5%. Typically the CV data from the gas grid operator is received with several hours delay. If run with rich firing at less than stoichiometric air/gas ratio then combustion efficiency is impaired and emissions of high NO_x, CO and unburnt gas will occur. The furnace is therefore run conservatively with 40% excess air.

GasPTi-LP will give data on CV changes in less than 10 seconds and so combustion control can be operated closer to stoichiometric/ideal settings.

Stack Temperature ~ 1000 DegF

Calculations

From standard text references for furnace firing :

	Excess Air	Combustion Efficiency	Fuel Saving
Current	40 %	60 %	-
Ideal	0 %	70 %	10 - 15 %
Proposed	20 %	65 %	5 - 8 %

Conclusions

From the above data the conclusion is that by reducing the excess air level and controlling the furnace with instantaneous CV data rather than several hours delay then the fuel savings which can be made by reduction to 20% excess air will be between 5% and 8%.

Our example boiler/furnace has a gas supply of 1300m³/hr at CV 10.5kWh/m³ giving 13,650 kWh/hr at say 3p/kWh or fuel cost of £410/hr. A 5% saving in fuel cost would give savings of some £500/day and a consequential payback of the GasPTi-LP purchase and installation within two months.