Process combustion: money to burn?

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As industry looks to save money and increase efficiency, Tony Kelly provides some advice for selecting burners for process heating applications and how energy savings can be achieved.

Selecting a burner for any process heating application always involves a choice between different burner models and different burner sizes. Both will have a significant effect on product quality and system efficiency.

Product quality is always the overriding requirement. It is pointless saving an extra 5% of the energy requirement of a furnace if the cost of that energy saving is a reduction in product quality. Scrap product wastes 100% of the energy used to produce it.

Whatever goes into a furnace is heated up to the furnace temperature and then exits the furnace. Energy saving is achieved by either:

- Minimising whatever enters the furnace;
- Improving the way energy is transferred from the burner to the product;
- Limiting the temperature at which the furnace operates; or
- Recovering energy from the exhaust products leaving the furnace.

Minimising input to the furnace may simply involve reducing the weight of carriers and other furnace furniture or reducing the amount of excess air being supplied through the burners. Reducing excess air levels from 25 to 10% on a furnace operating at 1000°C will save almost 20% of the energy required to do the same job in a furnace.

Improving the way energy is transferred may involve fitting better high-velocity burners to improve convective heat transfer or selecting a specialised burner such as the Lanemark small-bore immersion tube burner to increase the heat transfer surface area when tank heating.

Limiting the temperature at which a furnace operates can be achieved by maximising convective heat transfer to reduce radiant transfer. For example, using medium-velocity burners on an aluminium melting furnace could allow the roof temperature to be lowered by 150°C, reducing the energy requirement by more than 10%.

Recovering energy that would otherwise be lost to the atmosphere through stack losses can reduce furnace energy requirements dramatically. The energy in the stack gases can be used to preheat the incoming load or to preheat the combustion air being used by the burners. Heating the combustion air through a recuperator will be limited to a preheat of 450°C by the design of the recuperator and the materials used. On a furnace operating at 1200°C, this would result in an energy saving of 26% when compared to cold air operation. Even bigger savings are achieved if regenerative burners are fitted. The combustion air preheat achieved through regenerative recovery on a furnace operating at 1200°C would exceed 1000°C and this would produce an energy saving of 50% when compared to cold air operation. These reductions in the fuel usage and the temperature of the exhaust gases will reduce the amount of atmospheric emissions which can be further improved by the low NO_x features available with the regenerative burners.

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It is important that a burner supplier can offer a wide range of burners so that the burner can be selected to do the job required rather than the job being adjusted to suit the burners available. Hurll Nu-Way offers burners to suit a range of applications from the high excess air operation of the Lanemark FD range that are suitable for firing ovens up to 400°C enhancing the convective heat transfer, to the flat flame burners and infrared panels for radiant energy transfer, with the Nu-Way burners for the lower temperature ranges. Fives NA burners (including the Twin-Bed range of Regenerative Burners) are available for higher temperature applications allied to gas trains and controls built in Australia to ensure compliance with local codes. Federal grants are available to reduce capital outlay and improve ROI.

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