Energy Efficiency Concepts

In face of rising energy prices and stricter environmental regulations there is increasing demand for heat treatment plants with greater energy efficiency. Depending on the furnace size and the process there is always a certain amount of potential energy which can be recovered from the waste heat and re-used. This is especially true for large furnace systems or long process times which allow for huge energy savings that the additional investment has a short pay-back time. The thermal energy from finished charges can also be used to pre-heat cold charges which is also an efficient way of saving energy.

The following examples outline engineering alternatives for heat recovery:

Production system, consisting of four chamber furnaces for moving the load during heat treatment along with a three-stage heat exchanger to optimize energy efficiency

Heat Exchangers

The principle of the counterflow heat exchanger is to use the hot exhaust gas coming from the furnace to pre-heat the cold fresh air channelled into the furnace. In many cases, there is no need anymore for a separate fresh air preheating unit. Such a system is recommended if the process requires continuous air exchange in the furnace chamber, such as when tempering silicone, or during drying processes that are covered by the EN 1539 industrial standard.

Recuperator Burners

Large gas-heated heat treatment furnaces are especially advantageous for the installation of recuperator burners. Recuperator burners also use hot exhaust gas; to pre-heat the combustion air. Depending on the furnace model and the process, substantial energy savings of as much as 25 % can be realized by using recuperator burners so that there is a short pay-back time for the additional purchase costs.

Heat Transfer Chambers

Heat transfer chambers, which can also be described as cooling/heating chambers, offer two enormous advantages. For one, they help save energy, and for another, using a heat transfer chamber increases productivity.

The load is removed from the furnace while it is still hot and placed in the heat transfer chamber. The chamber also has room for a new, cold charge. Circulating the air cools the hot charge and, at the same time, preheats the cold charge before it is put into the furnace. Consequently, the furnace heating does not have to provide the thermal energy and through-put capacity of the furnace is increased of the same time.

The above systems for enhancing energy efficiency are only a few examples of technical alternatives.

Counterflow heat exchanger for the forced convection chamber furnace N 2560/26 ACLS

Heat transfer between a hot and a cold charge

Recuperator burner for aluminum melting furnaces 16 x TBR 110/12 and 2 x TBR 180/12