Development of a thermo-oil operated waste heat exchanger within the hot off-gas of electric arc furnaces of steel mills

Abstract:
A thermal oil operated tube bundle heat exchanger within the off-gas from an electric arc furnace (EAF) was developed for supplying heat to an electricity generating system by empirical methods. In this process both the unsteady heat flux and the dust load of the off-gas were considered. A reference heat exchanger configuration was designed and optimized by empirical methods. Therefore in-situ experiments within the off-gas channel as well as parametric studies were undertaken. It was revealed that variations of geometric parameters have a positive impact on heat exchanger performance. The impact of the dust layer thickness on heat transfer and pressure drop was quantified. A CFD model of a section of the reference heat exchanger configuration was generated using ANSYS CFX. Thus representative results for the complete heat exchanger were calculated and compared with the analytical results. The comparison of characteristic numerical results revealed a slight underestimation of heat exchange and pressure drop compared to analytical values.

Stichworte:
Electric arc furnace (EAF) Discontinuous waste heat Particle load Tube bundle heat exchanger Fouling CFD simulation

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