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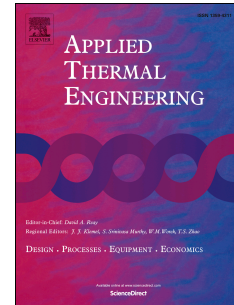
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Title: Efficiency improvement through waste heat reduction

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Abstract:

This paper aims at proposing a simplified method for the evaluation of the potential heat energy saving in existing industrial systems through technology optimisation and improved heat recovery. For this purpose heat network analysis is carried out using guided redesign of the technology based on Process Integration. This results in an improvement in the internal heat exchange consequently minimising the exit exergy and in this way reducing the energy supply. For further efficiency improvement the application of enhanced low-grade heat recovery is proposed using direct phase contact heat exchange and pre-humidification of the boiler combustion air at the expense of waste heat.

The application of the method and the resulting potential efficiency improvement is presented. A medium-sized company which produces sliced cooked meats is used as an example. This is a very typical case study for the food industry, represented mainly by Small and Medium-sized Enterprises (SMEs), which have relatively low energy efficiency due to non-optimisation of the heat network and substantial waste heat and effluent emissions.

A substantial energy efficiency improvement is achieved resulting in about 30% heat saving at 12.1% reduced fuel consumption. Further hot water production at 70 °C corresponding to 61% of the original steam production is available without additional fuel consumption, if required. Finally a reduction of 1.9 times effluent and up to 2.7 times NO_x gas emissions is estimated.

Highlights:

- Comparative exergy analysis for potential waste heat reduction is discussed.
- Simplified method for efficiency improvement is proposed.
- The method is applied to an industrial case study.
- Improved low grade waste heat recovery technique is presented.

Key words: Energy efficiency, Heat recovery, Process Integration, Exergy, Low grade heat

1. Introduction

Energy efficiency is a key word in modern industry being a basic factor of competitiveness, sustainability and environment protection. At the same time it is estimated [1] that as much as 20 % to 50 % of all industrial energy consumption is

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