Capital Cost Targeting of Total Site Heat Recovery

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Abstract

Heat recovery on Total Site level can provide a considerably high potential for energy saving. It offers additional degrees of freedom for heat recovery and cogeneration. A key issue in Total Site heat recovery is to select the minimum allowed temperature difference (ΔT_{min}) specifications on a site to enable obtaining realistic and useful heat recovery targets for the individual processes and the entire Total Site. The ΔT_{min} specifications are part of the trade-off between the rate of heat recovery and the involved capital cost, most often represented by the expenditure for heat transfer area.

Several works enable the evaluation of this trade-off for an individual process, accepting a single ΔT_{min}specification. Methods for targeting capital and total cost of Heat Exchanger Networks were initially developed by Townsend and Linnhoff (1984) and elaborated by others (Ahmad et al., 1990; Colberg and Morari, 1990; Linnhoff and Ahmad, 1990; Kravanja et al., 1997). A recent work (Fodor et al., 2010) has explored Total Site heat recovery targeting using multiple ΔT_{min} specifications for individual processes and process-utility interfaces. It is also possible to define and use the ΔT_{min} contributions of individual process streams in a process (Kravanja et al., 1997).

The current work deals with additional components enabling the estimation of the trade-off between heat recovery and capital cost targets for Total Sites – the evaluation of the capital costs for the generation and use of the site utilities (e.g. steam, hot water, cooling water). The paper presents the construction of the Total Site Profiles and Site Utility Composite Curves, the identification of the various utility generation and use regions at the profile-utility interfaces of the curves, followed by the identification of the relevant enthalpy intervals within those interfaces. Further, the estimation of the required minimum heat transfer surface area is performed alongside the minimum required number of utility generation and utility supply heat exchangers.