Development of a Simplified Process Integration Methodology for application in Medium-Size Industries

Achieving significant energy savings is fundamental for reaching the ambitious EU 20-20-20 environmental targets. Several methodologies based on the Pinch concept have proved to be highly effective for identifying and assessing energy savings possibilities in the industrial sector. However, saving opportunities may be missed in the case of medium-size industries. Applying these methods may indeed be costly and time consuming, as it can require large engineering efforts, e.g., for data acquisition. This paper presents a methodology based on process integration techniques, termed "Specific Savings Potential method" (SSP), to depict and promote energy savings in intermediate-size industries for plant retrofit. It builds on the idea that only few of the process streams in a factory should be considered for efficiency measures implementation with regards to economic and operational aspects. Three screening tools are introduced. They are used to reduce the problem size before applying the traditional design procedure. They are based on engineering experience and simple mathematical criteria, including both thermodynamic and economic considerations. Moreover, possibility of using less accurate data or estimates is discussed, since data acquisition is a severely time-consuming task in retrofit projects. This novel methodology is applied to a Danish dairy factory: the results and the method itself are compared with conventional pinch analysis. The findings show that the SSP method is a tool able to simplify and shorten the conventional pinch technique, while depicting the most promising savings opportunities: in the case study a reduction in energy use of 24% is achieved when only considering 24 process streams out of 62. In this sense, it has the potential of promoting the application of PI tools in the industry, especially in medium-size industries where budgets for external consultants are generally low.