EIP-wide heat exchange network at a central location

S.K. Nair¹, M. Soon², I.A. Karimi*¹

¹NATIONAL UNIVERSITY OF SINGAPORE, Singapore
²National University of Singapore, Singapore

Abstract

Heating and cooling needs form a major component of total industrial energy consumption. Hence, intra-plant heat integration has been widely studied with the objective to reduce the total utility consumption in a plant. However, opportunities also exist to reduce the total utility consumption in different enterprises located in close proximity, such as enterprises in an eco-industrial park (EIP). This inter-plant heat integration involves several diverse challenges compared to intra-plant heat integration in terms of locating exchangers, confidentiality of streams, additional capital and operating expenses, and flexibility in the operation of individual plants. [1] To overcome these challenges, the possibility of locating the exchangers at a central shared location is studied.

We earlier developed a mixed integer non-linear programming (MINLP) model to synthesize the heat exchanger network for an eco-industrial park. [2] The network is optimized based on the utility costs, exchanger and piping costs, and pumping expenses using a single objective function, net present value (NPV). In this work, the formulation is simplified by removing the possibility of a stream using two utility exchangers. For a case study, the net present value for the centralised heat exchanger project is $1.8 million with an energy savings of 9916 kW. The study also highlighted the importance of piping expenses in inter-plant heat integration. Also, the temperature drop of the streams over distances can be incorporated in the model.