

## **Synthesis and Optimization of Steam System Networks. 2. Multiple Steam Levels**

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### **Abstract**

The use of steam in heat exchanger networks (HENs) can be reduced by the application of heat integration with the intention of debottlenecking the steam boiler and indirectly reducing the water requirement [Coetzee and Majazi. *Ind. Eng. Chem. Res.* **2008**, *47*, 4405-4413]. By reducing the steam flow rate, the return condensate temperature to the boiler is compromised which adversely affects the boiler operation. A means of maintaining efficient boiler operation is to reheat the return flow to the boiler. Steam systems typically employ turbines of which the exhaust is frequently used as a heating utility in the background process. Since turbines operate at various steam levels, a means for incorporating these steam levels into the HEN optimization framework is necessary. Consequently this paper concerns the restructuring of all steam system heat exchangers using conceptual and mathematical analysis to create a series HEN with the aim of reducing the overall steam flow rate, while maintaining the boiler efficiency. In an example problem, it was found that the steam flow rate could be reduced by up to 26.3% while still maintaining the boiler efficiency.