**Synthesis of Flexible Heat Exchanger Networks Considering Fouling Resistance**

Y. Bai\(^1\), L. Liu\(^1\), S. Gu\(^1\), J. Du*\(^1\)

\(^1\)Dalian University of Technology, China

**Abstract**

The conventional synthesis of heat exchanger network (HEN) is performed under nominal conditions with fixed operating parameters. However, it is inevitable for the network configuration to be disturbed by uncertain operating conditions (for example, feed temperatures, heat capacity flow rates, etc.). At the same time, fouling is a non-negligible factor, which will cause sustained decrease to the overall heat transfer coefficient due to the growth of deposit over the heat transfer surface of the heat exchange units. In practice, the fouling resistance is often fixed to its maximum value instead of considering its dynamic growth. In order to make the synthesis more controllable and operable, this paper presents a flexible synthesis method, in which uncertain operating conditions and the growth of the fouling resistances are considered simultaneously.

The methodology is sequentially implemented in two steps: the flexibility analysis and the flexible synthesis. By searching the critical directions, the improved flexibility analysis method for evaluating the flexibility index is proposed, which can reflect the simultaneous influence of uncertain operating conditions and fouling resistances. Then, the flexible HEN synthesis method based on the critical operating points identified by the aforementioned flexibility analysis method is presented, with the target of decreasing the complexity of the HEN to avoid over-synthesis and minimizing the total annual cost (TAC) simultaneously. The effectiveness of the methodology is demonstrated by a case study.