ALTA PROCESS SOLUTIONS

AFFILIATED TO ALTA ENERGY SOLUTIONS CORPORATION

ALTIUS CENTRE – SUITE 2500 – 500 4th AVE SW CALGARY, AB, T2P 2V6 CANADA

INFO@ALTAENERGY.CA | WWW.ALTAENERGY.CA | WWW.ALTAPROCESS.CA

SCIENTIFIC & RESEARCH PROJECTS

Project No.: 05 **Year:** 2004

Project Field: Heat Exchanger Networks (HENs)

Publisher: Journal of Chemistry & Chemical Engineering, Vol. 23, No. 2, pp. 89-100, 2004

Project Title:

Cost Effective Heat Exchanger Network Design with Mixed Materials of Construction

Abstract:

This paper presents a simple methodology for cost estimation of a near optimal heat exchanger network, which comprises mixed materials of construction. In traditional pinch technology and mathematical programming it is usually assumed that all heat exchangers in a network obey a single cost model. This implies that all heat exchangers in a network are of the same type and use the same materials of construction (an assumption that is unwarranted). The method introduced in this article enables the designer to decomposes the total cost of a heat exchanger into two elements, namely cost of the tubes and cost of the shell, thereby predict a more reliable cost for the network. By subsequent use of the binary variables and evaluation of the physical conditions of the streams, one can assign the streams to pass either through shell or tubes. Whereby, shell and tubes can be of different materials and therefore different cost models can be applied. Another advantage of the approach is that the pressure drop in each side of the exchanger (shell or tubes) can be assessed leading to more accurate evaluation of corresponding heat transfer coefficient for each individual stream.

Finally an objective function (total cost) can be defined based on mixed materials of construction and different values of heat transfer coefficients. The proposed model has been utilized in three different case studies and the results are compared with those of a commercially available software (SUPERTARGET). The comparison shows reductions of more than 17% and 14% in total annual costs in the two cases, and 2.5% reduction in third, confirming the fact that more accurate evaluation of heat transfer coefficient for each individual stream can lead to better network design.