

HEAT EXCHANGER DESIGN HANDBOOK WEBINAR SERIES

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DEVELOPING A ROUTE TO NET-ZERO CARBON EMISSIONS FOR THE PROCESS INDUSTRY

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Abstract

The commitment by most countries to achieve net-zero carbon emissions by either 2050 or 2060 present significant challenges to manufacturing, and the process industry in particular. Solving the energy trilemma of low carbon, affordable and secure supply of energy will require a complete rethinking of future energy systems. A sensible first step in achieving this goal is to make energy systems as efficient as economically possible. Process integration is now a well-established tool to increase the efficiency of energy systems. This uses a holistic approach to the improvement of energy systems, rather than focusing on individual operations. Although the history of process integration is relatively short, it is well established and has by now seen many successful industrial applications. Unfortunately, the resulting decrease in carbon emissions from maximising energy efficiency using process integration techniques, even to their full potential, falls well short of the target for net-zero emissions. On most processing sites the largest single energy consumer is the utility system, which produces the heat and power necessary for the site, perhaps with some power import or export. The energy from these utility systems is currently from fossil fuels. The move to net-zero carbon emissions requires a fundamental change in the way process utility systems are designed and operated. Simply making the systems more efficient will not achieve the required reduction in greenhouse gas emissions. There needs to be a complete paradigm change involving a switch to renewables and waste-to-energy systems. The evolution of current designs of utility systems to achieve the target of net-zero requires a systematic approach to create a roadmap from current designs to the net-zero designs of the future. This requires cost optimisation but must also integrate life-cycle analysis. The resulting multi-objective optimisation needs to use Pareto fronts to examine the trade-off between cost and environmental impact to allow the identification of designs where there can be significant improvements in environmental performance and marginal economic penalty. This webinar will discuss a new approach to solve this problem.



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Professor Robin Smith is Director of the Centre for Process Integration in the Department of Chemical Engineering of the University of Manchester. He has extensive industrial experience with Rohm & Haas in process investigation, production and process design, and with ICI in process modelling and process integration. He has acted extensively as a consultant to industry in process integration projects. He is a Fellow of the Royal Academy of Engineering, a Fellow of the Institution of Chemical Engineers in the UK and a Chartered Engineer. He has published widely in the field of process integration and is author of "Chemical Process Design and Integration", published by Wiley. In 1992 he was awarded the Hanson Medal of the Institution of Chemical Engineers, UK for his work on waste minimisation. In 2018 he was awarded the Sargent Medal of the Institution of Chemical Engineers for work on process integration. He has co-founded three spin-out companies from the University of Manchester, the latest of which is Advanced Process Integration Ltd.