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## LNG-Relevant Experience With Plate-Fin Heat Exchangers

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### ABSTRACT

Over the last 20 years research, design and application experience has greatly extended the range of confidence with brazed aluminum, plate-fin exchangers (PFHE). Today it is commonplace for these exchangers to form the heart of complex cryogenic processes involving many streams in multi-phase, multi-component heat transfer up to and beyond critical pressures. In Air Separation Plants, the major volume user of aluminum cores in the 1990's, the PFHE has uniquely enabled process simulation engineers to achieve highly integrated, energy efficient cycles. This success has been closely coupled with the use of exchanger design and performance simulation software built around the results of extensive laboratory studies of two-phase boiling and condensation using cryogenic fluids and, of course, very reliable thermophysical property predictions. Alongside the software have been significant advances in PFHE manufacturing technology, particularly the vacuum brazing of very large and complex cores.

Extending this success to LNG-cycles requires attention to detail. Mixed-refrigerant cycles utilize the multiple entry and exit capabilities of the PFHE, and each one requires good flow distribution. Correct handling of two-phase multi-component streams is essential but may be overlooked during design. Robustness during operation has been addressed through transient simulation codes together with manufacturing and brazing technology. This paper attempts to distill some of this experience, with the aim of adding to user confidence in PFHE technology for LNG cycles.