

Enhanced Heat Transfer Utilizing Wire-Coil Inserts for High-Heat-Load Applications*

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Abstract

Enhanced heat transfer techniques, used to significantly reduce temperatures and thermally induced stresses on beam-strike surfaces, are routinely used at the APS in all critical high-heat-load components. A new heat-transfer enhancement technique being evaluated at the APS involving the use of wire-coil inserts proves to be superior to previously employed techniques. Wire coils, similar in appearance to a common spring, are fabricated from solid wire to precise tolerances to mechanically fit inside standard 9.5-mm-diameter cooling channels. In this study, a matrix of wire coils, fabricated with a series of different pitches from several different wire diameters, has been tested for heat-transfer performance and resulting pressure loss. This paper reviews the experimental data and the analytical calculations, compares the data with existing correlations, and interprets the results for APS front-end high-heat-load components.

Keywords: heat transfer, high heat load, wire coil, front end

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