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Fluid dynamics at transition regions of enhanced heat transfer channels[1] JENNIFER C. CASE, NICHOLAS A. POHLMAN, Northern Illinois University — Helical wire coil inserts are used to enhance heat transfer in high heat flux cooling channels. Past research using temperature probes has sufficiently proven that wire coils increase heat transfer by factors of three to five through the disruption of the boundary layer in the channels. The coils are passive devices that are inexpensive to manufacture and easily integrate into existing heat exchangers given the limited pressure drop they produce. Most of the fluid mechanics research in flow over helical coils has focused on the dynamics and vortex structure in fully developed regions rather than the short transition region where the enhanced heat transfer is often expected. Understanding how the development of the flow occurs over the axial length of the cooling channel will determine minimum dimensions necessary for enhanced heat transfer. Results of particle-shadow velocimetry (PSV) measurements report on the flow velocities and turbulence that occurs in the transition regions at the beginning of wire coil inserts. The ability to relate parameters such as flow rate, wire diameter, coil pitch, and the total tube length will increase fundamental knowledge and will allow for more efficient heat exchanger designs.

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