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A low-speed corona jet for internal spot cooling of tubes MAJID MOLKI, REZA BAGHAEI LAKEH, Southern Illinois University Edwardsville — A high electric potential applied to a wire electrode at the centerline of a circular tube may cause gas ionization and corona discharge, leading to formation of secondary flows and a corona jet within the tube. A computational model was implemented to show that the corona jet appears only if the electrode is slightly off-center with respect to the tube. The computations indicate that the jet is oriented in the direction of electrode-tube offset, and it may be suitable for target-cooling of thermal components mounted on the inner surface of the tube. Because the direction of the coronal jet is adjusted by the orientation of the electrode, this arrangement may be used to focus the jet on specific areas for a more efficient and effective cooling of electronic components. In this study, the effectiveness of the aforementioned technique is investigated by reporting the local Nusselt number and rate of heat transfer. In addition, the corona-enhanced cooling is compared with the less efficient buoyancy-driven heat transfer in circular tubes. Variations of local dimensionless temperature, Nusselt number, and flow fields are among the presented results.

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