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Near-Field Characteristics of Wall Jets with Tabs

Numerical and experimental investigations of wall jets with tabs are performed. The tabs were rectangular thin metal plates placed at the jet outlet, either at the top mid boundary, or at the mid-sections of the three unbounded boundaries, perturbing into the jet. The numerical analyses and experimen ts were carried out ata maximum mean velocity of 15 m/sec. which corresponds to an approximate jet Reynolds number based on the vertical jet dimension of 13027. The numerical analyses were performed with the STAR-CCM+ commercial software wi th the Wilcox K-? tur bule nce model. The e xperi mental me asurements were performed using a single hot wire in conjunction wi th a TSI IFA-100 constant temperature anemometer. Measurements were made at various streamwise and spanwise locations for the plane jet, the jet wi th one tab, and the jet with three tabs. Computational results include variation of the mean velocity, velocity vector, turbulent kinetic energy and vorticity. Results indicate that with a single tab, the spanwise entrainment is enhanced while with the three tabs, both the vertical and spanwise entrainments are increased. The increase in the spanwise entrainment should result in enhanced film cooling applications.

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