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Mixing of cold jets in cross flow into exhaust gases for cryogenic CO₂ capture ROBERT DIBBLE, FRANCISCO HERNANDEZ PEREZ, HONG IM, King Abdullah University of Science and Technology — For over a century, the widely accepted route for removal of CO₂ from a gas stream has been absorption by amines. The liquid amine is sprayed downward in a vertical tower in which the exhaust stream is coming upward. In this counter-current flow, the falling amine droplets absorb CO₂. The CO₂-rich droplets collected at the bottom of the tower are pumped to a boiler, after which pure CO₂ is extracted by heat. A new emerging process is the cryogenic carbon capture (CCC) process, in which the exhaust stream is cooled to near -90C and a cold fluid, such as methane, at -150C, is injected into the exhaust stream. The cold methane mixing with the exhaust gases forms CO₂ in the "dry ice snow" form as the temperature rapidly descends below the sublimation point of CO₂ (about -100C). The CO₂ snow is easily collected. The methane can be injected into the exhaust duct, from the wall, creating a classic "jet in cross flow" configuration. We find that more rapid mixing occurs if the methane is injected at 45 degree angle to duct wall, in both the flow direction and orthogonal to flow direction. The present study aims to explore the effect of the two angles on the mixing effectiveness. Simulations using LES show most rapid mixing is achieved by the 45/45 degrees configuration.

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