

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Characteristics of vortices associated with a non-buoyant elevated jet in crossflow.¹ JYOTI GUPTA, ARUN K. SAHA, Indian Institute of Technology Kanpur, Kanpur India — Jet emission from elevated stack draws attention towards environmental field and its industrial applications which include smoke exhausting from stack into atmosphere and sewage water disposal in deep-ocean. In the present work, the dynamics of elevated jet issuing into crossflow are studied using the streak image of dye visualization and the mean velocity measured using Laser Doppler Velocimetry (LDV). The crossflow environment is generated in a water tunnel where the jet discharge same fluid as that of crossflow making it non-buoyant. The experiments have been performed for axisymmetric round jet of aspect ratio of 9.0 with the velocity ratio varying from 0.16-1.5 to unveil the physics of vortex formation at a Reynolds number (calculated based on free stream crossflow velocity and jet external diameter) of 2000. Result shows the formation of K-H instability at the upstream jet shear layer along with other vortices found to vary on velocity ratio: (i) clockwise vortices (for velocity ratio ranging from 0.16-0.4), (ii) backward rolling vortices (for velocity ratio having range 0.5-0.67), (iii) swing induced mushroom vortices (for velocity ratio of 0.74-1.0) and (iv) jet like vortices (for velocity ratio ranging from 1.1-1.5).

¹Water Tunnel Facility Lab, Indian Institute of Technology Kanpur, Kanpur India

Jyoti Gupta
Indian Institute of Technology Kanpur, Kanpur India

Date submitted: 01 Aug 2020

Electronic form version 1.4