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Spanwise structures in the wake of a rotationally oscillating tapered cylinder SOUMARUP BHATTACHARYYA, Phd, Aerospace Engineering, Indian Institute of Technology, Kanpur, YASH AGRAWAL, Student, Department Aerospace Engineering, Indian Institute of Technology, Kanpur, SANJAY KUMAR, KAMAL PODDAR, Professor, Department Aerospace Engineering, Indian Institute of Technology, Kanpur — A linearly tapered cylinder executing rotational oscillations is studied experimentally at a Re number (based on mean diameter) of 250. The tapered cylinder is forced to perform rotational oscillations at various oscillation amplitudes and normalized forcing frequencies, FR, ranging from 0 to 4. Hydrogen bubble technique is used for visualizing the wake structure. The cylinder used in the present study has a taper ratio of 70:1 (ratio of length to difference between cylinder end-diameters) and wetted length (L) of 280 mm. The mean diameter of the cylinder is 8mm. Oblique shedding (with oblique angle of 13.5 degrees) is observed for the stationary cylinder. The oblique angle gradually reduces and eventually modifies to parallel shedding with increase of forcing frequency up to a certain FRT (this FRT value comes out to be different for different case of oscillation amplitude). Further increase in FR again transitions to oblique shedding for oscillation amplitude of 45 degs, whereas for other oscillation amplitudes, it remains parallel. Cellular structures are found to be formed for some specific forcing parameters. For oscillation amplitude of 135 degs and forcing frequency of 2, a new 3-D mode is observed with the span-wise wavelength of 1.6.

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