Techet, A. H.; **Hover, F. S.**; **Triantafyllou, M. S.**

Vortical patterns behind a tapered cylinder oscillating transversely to a uniform flow. (English) Zbl 0967.76510

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Summary: Visualization studies of the flow behind an oscillating tapered cylinder are performed at Reynolds numbers from 400 to 1500. The cylinder has taper ratio 40:1 and is moving at constant forward speed U while being forced to oscillate harmonically in the transverse direction. It is shown that within the lock-in region and above a threshold amplitude, no cells form and, instead, a single frequency of response dominates the entire span. Within certain frequency ranges a single mode dominates in the wake, consisting of shedding along the entire span of either two vortices per cycle ('2S' mode), or four vortices per cycle ('2P' mode); but within specific parametric ranges a hybrid mode is observed, consisting of a '2S' pattern along the part of the span with the larger diameter and a '2P' pattern along the part of the span with the smaller diameter. A distinct vortex split connects the two patterns which are phase-locked and have the same frequency. The hybrid mode is periodic, unlike vortex dislocations, and the location of the vortex split remains stable and repeatable, within one to two diameters, depending on the amplitude and frequency of oscillation and the Reynolds number.

MSC:

76-05 Experimental work for problems pertaining to fluid mechanics
76D99 Incompressible viscous fluids

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