Journal of Visualization, Vol. 8, No.1 (2005) 3

Visualization of Vortex Shedding and Particle Dispersion in Two-phase Plate Wake

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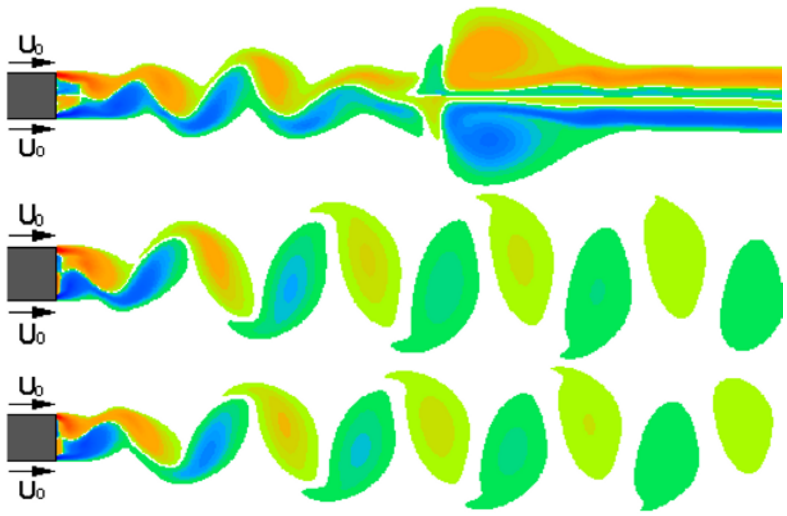

Fig. 1. Vortex shedding in a plate wake at different times (a) T=25; (b) T=50; (c) T=75.

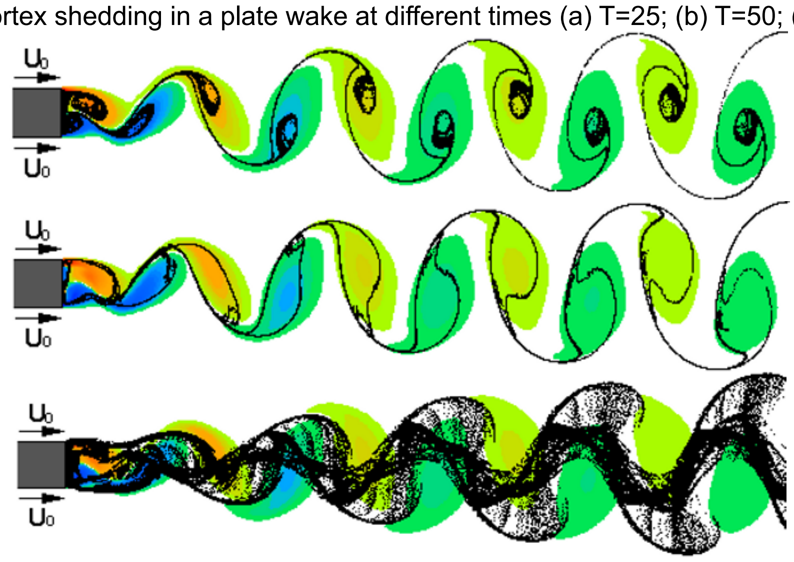

Fig. 2. Particle dispersion patterns at different Stokes numbers (a) St=0.15; (b) St=1.4; (c) St=15.

Large eddy simulation of a gas-solid two-phase plate wake was performed. The hybrid Euler-Lagrangian method was used. The velocity of free stream U_0=3.3 m/s and the Reynolds number Re=6500. At first, a big bubble forms behind the plate. Then with the vortex shedding, a typically counter-rotating vortex street presents in the wake. The vortex street is stable arrangement and alternately forms from the near wall region, as shown in Fig. 1.

The dispersion of dispersed solid particles takes on self-organized manners. Particle Stokes number is a key parameter. Particles with smaller Stokes number of 0.15 congregate densely in the vortex core regions of the large-scale vortex structures. Particles with Stokes number of 1.4 focus globally on the outer boundary regions of the vortex structures. However, particles with larger Stokes number of 15 assemble in the vortex braid regions and the rib regions between adjoining vortex structures, as shown in Fig. 2.

*Supported by the National Natural Science Key Foundations of China (No. 50236030)