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Pulsatile flow past a single oscillating cylinder ROBINSON SEDA, ADNAN QAMAR, JOSEPH BULL, University of Michigan — The potential for oscillating fibers to modify flow within a new artificial lung design is first examined in the present fundamental fluid mechanics study of flow past a single oscillating cylinder. This new design is intended to provide better gas exchange through vorticity enhancement by oscillating microfibers (cylinders) in a pulsatile flow environment. The Keulegan-Carpenter number (Kc=Uo/Dωc) was used to describe the frequency of the oscillating cylinder (ωc) while the pulsatile free stream velocity was fixed by imposing ω/Kc=1 for all cases investigated. The parameters investigated in this study were amplitude of oscillation (0.5D<A<D), Kc corresponding to 1< ωc<3 and Reynolds number (5<Re<20), all equivalent to operating conditions of the TAL. Vorticity was enhanced up to 246% from the steady state condition for high amplitudes and low Kc for all Re. An opposite trend was observed for the drag coefficient. A "lock-in" phenomenon (cylinder oscillating frequency matching the vortex shedding frequency) was found when KC=1 for all cases. A jump in the drag coefficient was observed and attributed to this operating regime. These results suggest that this new design of the TAL could potentially enhance gas exchange through oscillation of the microfibers with a decrease in the drag coefficient if operating far from the lock-in regime. This work was supported by NIH grants R01HL69420 and R01HL089043.

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