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**Optimal viscous damping of vibrating porous cylinders** SAEED JAFARI KANG, HASSAN MASOUD, Michigan Tech — We theoretically study small-amplitude oscillations of permeable cylinders immersed in an unbounded fluid. Specifically, we examine the effects of permeability and oscillation frequency on the damping coefficient, which is proportional to the power required to sustain the vibrations. Cylinders of both circular and non-circular cross-sections undergoing transverse and rotational vibrations are considered. Our calculations indicate that the damping coefficient often varies non-monotonically with the permeability. Depending on the oscillation period, the maximum damping of a permeable cylinder can be many times greater than that of an otherwise impermeable one. This might seem counter-intuitive at first since generally the power it takes to steadily drag a permeable object through the fluid is less than the power needed to drive the steady motion of the same but impermeable object. However, the driving power (or damping coefficient) for oscillating bodies is determined by not only the amplitude of the cyclic fluid force experienced by them but also by the phase shift between the force and their periodic motion. An increase in the latter is responsible for excess damping coefficient of vibrating porous cylinders.

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