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Modification on the wake of a cylinder: Effect of small amplitude surface modification ALIS EKMEKCI, DONALD ROCKWELL, Lehigh University — Substantial changes in the structure of the near-wake of a stationary and oscillating cylinder at a Reynolds number of 10,000 can be induced by a wire(s) having a diameter two orders of magnitude smaller than the cylinder diameter, and oriented parallel to the axis of the cylinder. A technique of high-image-density particle image velocimetry allows characterization of the instantaneous and averaged patterns of the flow structure. As the placement angle of the wire is altered, relative to the forward stagnation point of the cylinder, ordered patterns of asymmetry of the near-wake structure are induced over a defined range of angles. Existence of the wire produces significantly higher values of Reynolds stress in the separating shear layer, which is the genesis of the asymmetry. Moreover, the vortex formation length of vortices from both sides of the cylinder can be substantially altered when the wire is placed on only one side. These findings provide a basis for interpreting the wake structure for the more complex case of a helical wire pattern about the surface of the cylinder.

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