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Effects pf Rounding on Flow Characteristics Past an Angulated Cylindrical Object[1] DOOHYUN PARK, KYUNG-SOO YANG, JAEHEE KIM, Inha University — In the present numerical study, we aim at elucidating the effects of rounding on flow topology past an angulated cylindrical object. Change in flow topology significantly affects flow-induced forces on the object. We consider the rounded cylinders ranging from a square cylinder of height D to a circular cylinder of diameter D by rounding the four corners of a square cylinder with a quarter circle of fixed radius (r). An immersed boundary method was adopted for implementation of the cylinder cross-sections in a Cartesian grid system. The key parameters are Reynolds number (Re) and corner radius of curvature (r). A small rounding delays the flow separation towards the trailing rounded edges, resulting in lower lift fluctuation. The minimum mean drag also occurs when the sharp edges of a square cylinder are partially rounded. The optimal edge-radius ratio (r/d) for lift fluctuation or for mean drag depends upon Re, and high-Re flow tends to be more sensitive to small rounding. The main topological changes resulting from four-edge rounding can be obtained by leading-edge rounding alone. Trailing-edge rounding, however, plays a positive role in stabilizing the flow when the two types of rounding are combined.

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Kyung Yang
Inha University

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