Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Flow Instability Past A Rounded Cylinder[1] DOOHYUN PARK, KYUNG-SOO YANG, Inha University, Korea — Numerical simulation of flow past a rounded cylinder has been performed to study the effects of rounding corners of an angulated cylinder on the primary (2D) and the secondary (3D) instabilities associated with the corresponding flow configuration. 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). Firstly, the characteristics of the primary instability such as critical Reynolds number (Re_c), force coefficients, and Strouhal number for vortex shedding are reported against r. It was found that Re_c is maximum at r/D =0.25, meaning that this flow is more stable than the two extreme cases of the square and circular cylinders. Furthermore, there are the optimal values of r/D for force coefficients, which vary with Re. Secondly, we studied the onset of 3D instabilities by using Floquet stability analysis. It turned out that the criticalities of 3D instability modes are significantly affected by r.

[1]This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIP) (No. 2012R1A2A2A01013019).

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Date submitted: 17 Jul 2014 Electronic form version 1.4