Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

A passive amplification of VIV through a semi-hollow cylinder for Reynolds number 200[1] SUNGMIN RYU, Incheon National University, SEUNGMIN KANG, Hanyang University, VIV CONTROL TEAM — Since the demonstration that the kinetic energy generated by vortex-induced vibrations (VIVs) can be converted into electricity, the amplification of VIV has been of significant interest. For this practical relevance, we present a passive method to amplify VIVs of a circular cylinder for Reynolds number 200. We employ an empty space inside a solid circular cylinder and place an orifice on the stagnation point to embody a concept of passive control, considering a potential combination with existing passive devices. We quantified the performance of the semi-hollow model via two-dimensional simulations for a range of reduced velocity $3 \leq U_{red} \leq 8$, and these are compared to solid cylinder counterparts. We show that significant elevations of the transverse force and the dynamic response are achieved by the semi-hollow body under the synchronization condition as well as otherwise ones. In addition, the transverse net force acting on the inner surface of the semi-hollow cylinder is shown to be developed in time as a consequence of internal flow circulations, and this is asserted as a key role for the amplification.

[1]This work was supported by the National Research Foundation of Korea (NRF) grants (No. 2017R1D1A1B03032117)

Sungmin Ryu
Incheon National University

Date submitted: 27 Jul 2019 Electronic form version 1.4