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Fluid-membrane dynamics of energy harvesting eel immersed in a square cylinder wake YING ZHENG LIU, YUE LONG YU, School of Mechanical Engineering, Shanghai Jiao Tong University — A comprehensive study was performed of fluid-membrane dynamics of energy harvesting eel placed behind a square cylinder. A low aspect-ratio of PVDF membrane was employed for the experiments in a low-speed wind tunnel; simultaneous measurements of the closed loop voltage and the flapping motion were made by using a digital oscilloscope and a high-speed camera, respectively. The experimental Reynolds number based on the width of the cylinder was Re= 1,000-10,000. Influence of electric resistances on the power output was determined by varying the electric resistances in the closed loop. A state-of-the-art algorithm of image analysis, which was proposed for accurately identifying arbitrarily moving and deforming boundary, was performed on the consecutively recorded membrane, resulting in the digitized data of the flapping membrane. The pattern of the flapping membrane under different Reynolds numbers and electric resistances was compared. Time history of the membrane tip deflection, power spectral determined at different locations along the length of the membrane, spectral feature of the voltage were demonstrated for correlation analysis.

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