Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

The effects of passive foil flexibility on the energy extraction performance of an oscillating foil operating at low reduced frequencies ALEXANDER D. TOTPAL, FIRAS F. SIALA, JAMES A. LIBURDY, Oregon State University — With a goal to improve energy extraction efficiency from an oscillating foil, direct aerodynamic force measurements are used to study the effect of surface flexibility of an oscillating foil operating in the energy harvesting regime. The experiments are conducted in a closed-loop wind tunnel at a low reduced frequencies range of 0.04 -0.06. The pitching amplitude was varied from 45 to 90 degrees and the phase shift between pitching and heaving motions was varied from 30 to 120 degrees. Three different airfoil configurations were tested: fully rigid, flexible leading edge and flexible trailing edge. In addition, phase-locked particle image velocimetry (PIV) measurements were taken at the higher efficiency cases, and are used to help interpret trends seen in the force measurement data. The timing and position of the leading edge vortex along the foil, which has been shown to be crucial to energy extraction, is investigated in order to help explain why certain operating conditions yield larger efficiencies.

Alexander Totpal
Oregon State University

Date submitted: 27 Jul 2016 Electronic form version 1.4