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Water channel experiments of a novel fully-passive flapping-foil turbine[1] MATTHIEU BOUDREAU, GUY DUMAS, Univ of Laval, MOSTAFA RAHIMPOUR, PETER OSHKAI, Univ of Victoria — Experiments have been conducted to assess the performances of a fully-passive flapping-foil hydrokinetic turbine for which the blade's motions are stemming from the interaction between the blade's elastic supports (springs and dampers) and the flow field. Previous numerical studies conducted by Peng & Zhu (2009) and Zhu (2012) have proved that a simplified version of such a turbine can extract a substantial amount of energy from the flow while offering the potential to greatly simplify the complex mechanical apparatus needed to constrain and link the blade's pitching and heaving motions in the case of the more classical flapping-foil turbine (e.g., Kinsey et al., 2011). Based on the promising numerical investigations of Veilleux (2014) and Veilleux & Dumas (2016), who proposed a more general version of this novel concept, a prototype has been built and tested in a water channel at a chord Reynolds number of 17,000. Periodic motions of large amplitudes have been observed leading to interesting energy harvesting efficiencies reaching 25% for some specific sets of structural parameters. The sensitivity of the turbine's dynamics to each of the seven structural parameters appearing in the equations of motion has been experimentally evaluated around a case close to the optimal one.

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