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Improving the performances of H-Darrieus cross-flow turbines through proper detached end plate designs[1] THIERRY VILLENEUVE, MATTHIEU BOUDREAU, GUY DUMAS, Univ of Laval, CFD LABORATORY LMFN TEAM — Previous studies on H-Darrieus cross-flow turbines have highlighted the fact that their performances are highly sensitive to the detrimental effects associated with the blades tips. Wingtip devices could be designed in order to attenuate these effects, but the benefits of such devices are always impaired by their added viscous drag since they are moving with the turbines blades. In this context, the development of fixed and detached end plates, i.e., which are not in contact with the turbines blades, could reduce the tip losses without the undesirable added drag of typical wingtip devices moving with the blades. The case of a single stationary blade with detached end plates has first been investigated with RANS simulations in order to understand the mechanisms responsible for the increase of the blades lift. An analysis of the vorticity lines dynamics provides crucial insights into the effects of the gap width between the blade and the detached end plate on the blades loading and on the intensity of the tip vortices. Based on these observations, various configurations of detached end plates are tested on cross-flow turbines via RANS and DDES simulations. Preliminary results show that appropriate detached end plates can significantly increase the turbines efficiency.

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Thierry Villeneuve
Univ of Laval

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