Analysing the suspension system of variable-geometry oval-trajectory (VGOT) Darrieus wind turbines

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Abstract

A new computational model for the analysis of the suspension system of an innovative concept in vertical-axis wind turbines is introduced. We used this model to study a new concept in extra-large wind-power plants: the VGOT (variable-geometry oval-trajectory) Darrieus wind turbine. In a traditional Darrieus turbine, the blades rotate around a central vertical axis. In the VGOT concept each blade slides over rails, mounted on a wagon formed by a reticulated structure supported by standard train bogies. The blade-wagon is subject to fluctuating aerodynamic loads in the direction perpendicular to the rails. Thus, its suspension system should absorb not only the vertical oscillating loads due to the weight and the irregularities of the rails, but also the cross-rail oscillations induced by the fluctuating aerodynamics. We gave our dynamical model the capacity of dealing with these particular features of the VGOT design. Here, we show the numerical results of a test conducted on a typical VGOT configuration.