

Cfd Simulation for Urban Environment for Evaluation of a Wind Energy Potential of a Building or a New Urban Planning

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Abstract : This paper presents an analysis method of airflow at the periphery of several typologies of architectural volumes. To understand the complexity of the urban environment on the airflows in the city, we compared three sites at different architectural scale. The research sets a method to identify the optimal location for the installation of wind turbines on the edges of a building and to achieve an improvement in the performance of energy extracted by precise localization of an accelerating wing called "aero foil". The objective is to define principles for the installation of wind turbines and natural ventilation design of buildings. Instead of theoretical winds analysis, we combined numerical aerolic simulations using STAR CCM + software with wind data, over long periods of time (greater than 1 year). If airflows computer fluid analysis (CFD) simulation of buildings are current, we have calibrated a virtual wind tunnel with wind data using in situ anemometers (to establish localized cartography of urban winds). We can then develop a complete volumetric model of the behavior of the wind on a roof area, or an entire urban island. With this method, we can categorize: - the different types of wind in urban areas and identify the minimum and maximum wind spectrum, - select the type of harvesting devices - fixing to the roof of a building, - the altimetry of the device in relation to the levels of the roofs - The potential nuisances around. This study is carried out from the recovery of a geolocated data flow, and the connection of this information with the technical specifications of wind turbines, their energy performance and their speed of engagement. Thanks to this method, we can thus define the characteristics of wind turbines to maximize their performance in urban sites and in a turbulent airflow regime. We also study the installation of a wind accelerator associated with buildings. The "aerofoils which are integrated are improvement to control the speed of the air, to orientate it on the wind turbine, to accelerate it and to hide, thanks to its profile, the device on the roof of the building.

Keywords : wind energy harvesting, wind turbine selection, urban wind potential analysis, CFD simulation for architectural design

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