

POLITECNICO DI TORINO
SECOND SCHOOL OF ARCHITECTURE
Master of Science in Architecture
Honors theses

The wind that shakes the light. Structural and architectural design of an illuminating pole powered by wind energy and aeroelastic oscillations for vortex shedding

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Many natural phenomena are perceptible mainly through touch, hearing and smell by humans and they manifest themselves visually only by the effects they generate on surrounding environment. Wind can be felt when it touches our skin or it messes up our hair, when its breath on our ears produces that particular hiss or when it carries particular scents and smells. Air currents per se are not visible but can be perceived by sight when they, during the day, move particles, substances, bodies or natural structures and man-made artifacts. Wind becomes difficult to see in the night, unless its flow involves lighting fixtures or luminaires able to undergo displacements due to its action.

This thesis has set as its goal the concept design of a self-powered illuminating pole that works thanks to energy produced by oscillations induced by wind. For this purpose, the structure has been intentionally designed to return large deformations: the intent is to visually indicate the presence of windy weather and to convert the kinetic energy into electrical energy. Making use of the flowing wind against the rod, it is possible to take advantage of the oscillations generated by aeroelastic phenomena transforming them into electricity using special piezoelectric devices applied to the structure. The energy, suitably transformed and stored, is used to feed, at night, a series of lighting fixtures placed on top of the pole so the system would be able to visibly report the presence of wind, even in dark conditions.

Another interesting achieved goal was the use of the conceived object in an urban regeneration project: basing on the concept that a set of right designed lighting poles, if arranged in ribbon or areal compositional criteria, under certain wind actions, can return fluctuations comparable to non-correlated oscillations of trees rows or those of a grass field, showing the wind distribution in space and time. Variations of wind energy may also induce changes in brightness and / or color of the LEDs in the lighting fixtures as a function of the electrical power that is converted according to the direction and amplitude of oscillations of the structure and in function of the wind strength. The result is a sort of wind vane diffused to architectural or urban scale.



Rendering of the ribbon of lighting poles at “Fiera di Genova” breakwater

The area chosen to host the series of designed lighting poles regards the exhibition center “Fiera di Genova”: this site is characterized by particular wind conditions that are favorable for the exploitation of vortex shedding phenomenon by the conceived harvesting system. The developed project idea is proposed to ideally combine the urban hubs of “Piazza della Vittoria” and “Fiera di Genova” creating a theme accompanying visitors to the “Foce” district, from near the “Genova Brignole” railway station, developing along “Viale delle Brigate Partigiane”, to reach and envelop the fairgrounds area. Evoking the “bright reedbed” concept, the created path trait d’union is an installation that brings back memories of the land natural signs cleared the human activity in the course of centuries.



The bright reedbed from “Fiera di Genova” to “Genova Brignole” railway station



The bright reedbed: night simulation

More info here: <http://ivancalvopro.wix.com/design#!portfolio/c1t44>

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