FORMULATIONS FOR THE OPTIMAL DESIGN OF RC WIND TURBINE TOWERS

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ABSTRACT

The production of electrical energy from the wind energy is one of the most important projects to reduce the emissions of carbonic gas, preserve the environment and earn carbon credits. Around one thousand towers will be installed in Brazil from 2006 until 2010. We intend in this work to present some results of the development of procedures minimize the cost of these kind structures. Several problems were proposed and solved. The objective of the formulations was to find optimal results taking into consideration the cost, computational time, construction techniques and precision of structural models. We considered RC towers subjected to dynamic wind loads and the effects of the vibration due to the components of the wind energy generator. The structure was discretized in finite elements and the concept effective stiffness of RC structures was used in one non-linear dynamic model to accomplish the structural analysis. The design variables are geometrical properties and reinforcement steel area of the structural elements. To compute the cost function we consider the costs of concrete and steel. Constraints related to stress, displacements and frequencies of vibration are applied. To solve the optimizations problems we used the augmented Lagrangian Method for dynamic structural problems. Directions for future studies are presented.