



Guyed Towers for Wind Turbines – the Taller the Better

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Martin Jespersen, born 1988, received his Master degree in civil engineering from the Technical Univ. of Denmark 2013. His master thesis "Guyed Wind Turbine Towers for Onshore Applications" form a solid background and supplement for the new tower concept.

Summary

Guyed towers for wind turbines make it possible to construct cost effective towers for wind turbines with large hub heights. In many areas as for instance the inlands of Norway, Sweden and Finland there is plenty of space for wind power parks. However these locations often have forest and undulating terrain which creates turbulence in the wind which again will reduce the power production from wind turbines and increase fluctuating loads. Therefore tall towers are desirable as the wind speed in both higher and less turbulent the higher from the terrain.

Keywords: guyed towers; fatigue loadings; eigenfrequencies; structural damping; aerodynamic damping; wind turbine; climbing crane.

1. Introduction

The wind power industry is constantly looking for cost reductions. For onshore wind parks there is a desire to have the wind turbines placed as high as possible as this increase the production. Also the best locations are already occupied so new wind parks have to be placed for instance in wooden areas with rather big turbulence – again the turbine should be located as high as possible.

However the implementation of tall towers is expensive and the traditional tubular steel towers has many problems onshore: steel consumption increases dramatically with height, the diameter of the lower part of the tower becomes too large for transportation, the installation of tower and turbine requires large mobile cranes, foundations becomes very big and expensive, etc. The industry has been quite active to develop new tower concepts that can bring down the cost for high towers.

Through the experience gathered over 70 years of engagement in analysis, design and construction of tall guyed masts for broadcasting, is developed a solution with a guyed cylindrical tower that dramatically reduces the steel consumption for tall towers, makes transportation cheaper, and requires cheaper foundations.

In addition to the new tower concept is also developed a method to install towers and turbine without using a big mobile crane.

The paper describes the concept, the ultimate and the fatigue loadings and structural details design.