

Speech Report

Report by	Duration	Place	Speaker	Date
<i>Ataollah Mokhberdoran</i>	<i>15 min</i>	<i>Alstom Wind, Barcelona</i>	-	<i>2015/12/01</i>

The third speech during the Alstom wind visit was about the aerodynamics concept of the wind turbine. As the most recent Alstom wind turbine technology, some details of blade from Haliade™ 150-6MW offshore wind turbine were presented and discussed. The Haliade blade has a mass of 26 tone excluding flange and bolts. The Eigen frequencies of the blade are as following:

- Flap wise frequency= 0.44Hz
- Edge wise frequency= 0.87Hz

As an important mechanical parameter, the static moment of blade is equal to 5919kNm. Furthermore, the aerodynamic coefficient (C_p) is equal to 0.48 for the wind speeds in the range of 6 to 9m/s. The blade root bolt circle diameter is 3.2m and the static tower clearance is 22.1m. As another important parameter the tip ratio can be given as 90m/s.

In fact, the Haliade wind turbine is a giant engineering structure. The diameter of rotor is 150m and the length of each blade is 73.5m. Due to the enormous parts of the turbine, the transportation of the structure, especially in the offshore areas would be challenging.

As another aerodynamic feature, the Haliade employs LM08 airfoil series, which are specially designed for thick blades. The LM08 airfoil series are developed from DU and NACA airfoils. Needless to mention that, all of the airfoils are tested in LM wind tunnel. The LM08 utilization is advantageous since they can increase the relative thickness and also the blade stiffness.

In addition, it was mentioned that, the passive aerodynamic devices are also located in inboard part of the blade. Spoilers and vortex can be mentioned as the passive aerodynamic devices of the blade. Typically, the vortex generator is used to separate the air flow and generate more torque from that.

At the end, some topics about the maintenance of the wind turbine were briefly introduced. It was highlighted that the spoilers need to be inspected, frequently. It was also mentioned that the protective parts of the blade have the seven years lifetime and they have to be replaced after specific period of time.