

DEVELOPMENT OF THE FIRST COMMERCIAL 750KW WIND TURBINE IN KOREA

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This paper presents development of the first commercial medium-sized wind turbine in Korea. The wind turbine, UNISON U50, is a gearless type wind turbine having a capacity of 750kW, and designed for the type class 1A in accordance with the IEC 61400-1. For the development of U50, UNISON formed a consortium with Bokuk electric IND., HANKUK Glass Fiber, and POSTECH in 2001. U50 was developed from Dec. 2001 to Dec. 2004 by the UNISON consortium under the sponsorship of the Korean government.

Approach : UNISON U50 is direct-driven pitch regulated, and is more suitable for the high power conversion efficiency. The overall efficiency of the generator is increased by using permanent magnet excitation without external excitation. And such adaptation contributes to the increase in the energy yield consequently. The turbine has adopted AC/DC/AC/ Inverter system for the grid connection. The system provides stability to the grid, and solves power quality problem. The fluctuation of power output is reduced with the torque control by the electrical power converter.

Innovation and Relevance : The PM synchronous generator with multi-pole is located considering the mass distribution of the system, to behind of the nacelle, and connected to the rotor shaft by using clamp sets. The nacelle frame of U50 is compact in its size and weight. The welding structure of the frame consists of a cylindrical section with a horizontal bedplate and a skewed top plate. Two housing act as a support for the bearings of the main shaft so that the support structure is lighter. For design of the yaw system, the external slewing bearing is applied for load transfer path from the nacelle to the tower. The brake system of U50 adopts the aerodynamic brake system by full feathering of blades and the mechanical brake system by the fail-safe hydraulic disc brake.

Result : UNISON U50 can achieve high efficiency, and produce high quality power. Such efficiency and quality is based on the features which are characterized by the variable speed, the pitch regulation, the PMSG(Permanent Magnet Synchronous Generator) and the grid connection with AC/DC/AC Inverter. The maximum reliability can be achieved by elimination of high-speed gearbox and adaptation of the small top head mass. And such reliability of U50 can guarantee the highest availability for a long life time.

Conclusion : UNISON U50 is a gearless type wind turbine having a capacity of 750kW. And it is the first commercial medium-sized wind turbine in Korea. UNISON has completed on fabricating U50, and also approved its design assessment certification from GL. Currently, the field test and measurement of the performance and structural safety of U50 is on the planning stage.