

WE_09

核研所 25kW 水平軸風機發電特性與表面保護研究 A study of aero-performance and surface protection on the INER 25kW horizontal axis wind turbine

林彥廷^{1*}、黃金城¹、莊高樹²

¹ 行政院原子能委員會 核能研究所 機械及系統工程專案

² 台灣中油股份有限公司綠能科技研究所

Yan-ting Lin^{1*}, Chin-Cheng Huang¹, Jhuang Gao Shu²

¹Mechanical and System Engineering Program, Institute of Nuclear Energy Research

²Green Technology Research Institute, CPC Corporation

yantinglin@iner.gov.tw

摘要

本研究主要量測核研所 25kW 水平軸風機氣動力特性與表面保護研究。量測方法採用 IEC61400 標準。量測設備為 CESVA 公司之 SC310 手持式聲壓波噪音量測儀，並使用 1/3 八音度量測功能與每秒平均聲噪紀錄。研究結果顯示在相同的風速下，較低的傾角呈現出較高的轉速與發電功率，在當傾角位在待機 80 度位置時，風速的增加將造成背景噪音由 47 dB(A)提升到 56.5 dB(A)。而採用最低傾角 5 度運轉時氣動力噪音則再增加 1.5 dB(A)達到 58 dB(A)。傾角 15 度所產生的發電功率低於傾角 5 度之功率約 35%，但所產生的氣動力噪音呈現相近數值。風機本體表面保護漆採用中油研發之環氧樹脂與金屬粉末塗料，並經 6 道工藝塗裝通過 ISO 20340 技術規範驗證。

關鍵詞：水平軸風機、氣動力噪音、發電效率、實驗量測、塗裝系統

Abstract

The aim of this investigation is to measure the aero-acoustic noise of INER 25kW horizontal axis wind turbine (HAWT). The measure methods were based on IEC61400 standards and EPA regulations. The SC310 from CESVA of type 1 integrating sound level meter using 1/3-octave bands and one second average recording functions were used as measure facility. The measure results showed the specific relations between loading power of inverter and RPM from 25kw wind turbine under automatic model, and output power increase as pitch angles decrease on the constant wind speed. The background acoustic noise increased from 47 dB(A) to 56.5 dB(A) with increasing of environmental wind speed under the fixed pitch angle of 80 degree. For the sake of lowest pitch angle of 5 degree, the acoustic noise of 1.5 dB(A) are increased to 58 dB(A). The output power under pitch angle of 15 degree were 35% lower than that of pitch angle of 5 degree, but the acoustic noise were indicated in similar values. The surface protections of the wind turbine are coated by epoxy with metal powder from CPC coating system. The six coating processes are implemented to approach technical certification of ISO20340.

Keywords: horizontal axis wind turbine, aero-acoustic noise, power performance, experimental measurements, coating system