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風力機故障原因分析-以台中 Z72 機組為例
Failure analysis of a wind turbine – a case study to the Z72 turbines in Taichung

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摘要

2015 年 8 月初，蘇迪勒颱風造成了台中港區風廠機組的嚴重破壞，造成多部機組的倒塌或損毀。為了釐清此次故障的發生原因，台電公司再生能源處成立了調查小組來深入研究。本團隊亦根據風力機組運轉資料以及事件發生時間的警告訊息清單，相互比對進行深入研究。從結果來看，雖然最後機組都是因為葉輪轉速過高，導致結構的劇烈振動，塔架連結處因此無法承受而斷裂倒塌；但是引起此事件的更根本原因卻可能是，迎風轉向系統馬達的故障跳脫所致。此一事件導致機組在颱風經過臺灣本島，風向大幅轉變後，機組無法正確迎風，風機將可能處於高風險狀態，最終無法負荷而倒下。本文對此事件做了深入探討，未來將持續進行細部的負載分析，以提出可能的因應策略，作為該風場未來可能的改善依據，以面對更嚴峻的颱風氣候。

關鍵詞：風力發電、運轉維護、轉向系統、颱風。

Abstract

In 2015, Typhoon Soudelor caused severe damages to the wind turbines in Taichung and Shi-men. In order to understand the possible root causes, detailed investigation has been conducted to the wind turbines in Taichung in this paper. The operation data and event lists shown that the final condition of the collapsed turbines were operated under an extreme over-speed state. For the turbine NO.1, the final speed is over 50 rpm which the nominal speed is only 22.4 rpm. That's why the turbine structure can't afford such a vibration and break from the first or the second section of the tower. However, the root cause to this is found to be the trip event from the yaw system. After the yaw system tripped and turned into an inhibit state, the nacelle can't and not allowed to turn to face the wind direction when the Typhoon passed Taiwan and had a sudden wind direction change. This situation is very dangerous to the wind turbine. Possible operation strategy improvement and detailed analysis to the load will be the future research issues for a safer turbine operation to this kind of extreme weather.

Keywords: Wind turbines, Operation and maintenance, Yaw system, Typhoon.