



Quality Turbines for New Zealand

The IEC Certification Process



Presentation by Emma Patrick
Windflow Technology Limited

Quality Turbines for NZ – The IEC Certification Process



Introduction to Windflow

Windflow Technology Limited

- New Zealand company
- Wind turbine designer and manufacturer

Windflow 500 wind turbine

- 500 kW wind turbine
- Product undergoing IEC certification

Quality Turbines for NZ – The IEC Certification Process



Introduction

IEC Type Certification

- System WT 01:2001
- Class 1A
 - Highest wind speeds
 - Most turbulent conditions

Overview

- ISO 9001 Certification
- Design Evaluation
- Type Testing
- Manufacturing Evaluation



Quality Turbines for NZ – The IEC Certification Process



Windflow's IEC Certification Application

The People Involved

Applicant: Windflow Technology Ltd (All Windflow Staff)

Certification Body: Lloyds Register (Glasgow / Houston)

Windflow's Technical Advisor: Garrad Hassan & Partners Ltd (UK)

Testing Parties: University of Canterbury
Industrial Research Limited (IRL)

The Timeline

Began: 2002

Proposed Completion: September 2007

Quality Turbines for NZ – The IEC Certification Process

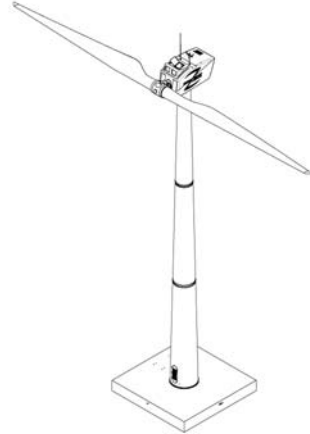


Design Evaluation

Purpose: Evaluate design and documentation against standards and technical requirements

Windflow's Experience

- Working to IEC 61400-1 Edition 3
- Garrad Hassan & Partners
- Bladed
 - Run design load cases
 - C501
 - Industry proven
 - Interface with Programmable Logic Controller (PLC)
- Design Documentation



Quality Turbines for NZ – The IEC Certification Process

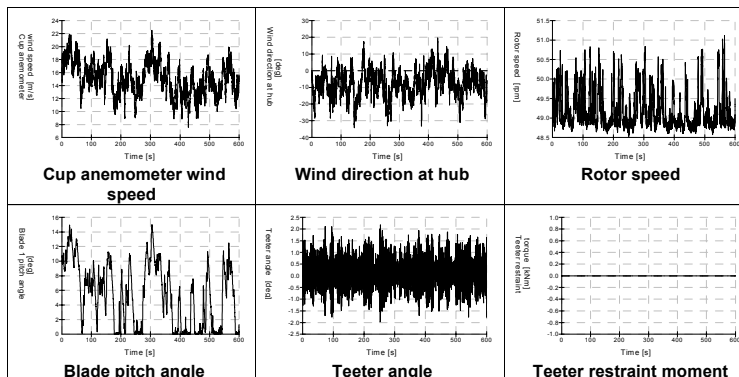


Design Evaluation – Bladed Output

Typical “Bladed” output for the Windflow 500

- 10 minutes simulated running in gusty, gale force winds

IEC certification requires thousands of such runs



Quality Turbines for NZ – The IEC Certification Process



Manufacturing Evaluation

Purpose: Assure manufacture in accordance with design documentation

Process:

- Quality system evaluation
 - Covered by ISO 9001 certification
- Manufacturing inspection
 - Inspect Windflow's major suppliers
 - Inspect assembly



Quality Turbines for NZ – The IEC Certification Process



Type Testing

Purpose: Validate turbine design by physical testing

University of Canterbury

- Safety and function testing
- Power performance measurements
- Load measurements
- Static blade testing
- Power quality measurements (optional)
- Acoustic measurements (optional)

Industrial Research Limited (IRL)

- Blade fatigue testing

Quality Turbines for NZ – The IEC Certification Process



Type Testing - Static Blade Testing

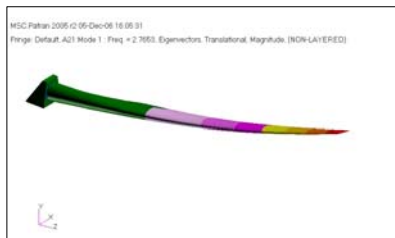


- Testing Party:** University of Canterbury
- Purpose:** Determine the ultimate strength of the blade
- Process:**
- Determine test loads
 - Design and build test set-up
 - Test (completed 2002)

Quality Turbines for NZ – The IEC Certification Process



Type Testing - Blade Fatigue Testing



- Testing Party:** Industrial Research Limited (IRL)
- Purpose:** Test the full life of the Windflow 500 blade
- Process:**
- Finite Element Analysis by Matrix Applied Computing Ltd
 - Design and build test rig and exciter
 - Determine test load
 - Testing (currently underway)

Quality Turbines for NZ – The IEC Certification Process



Type Testing - Site Calibration

Location: Gebbies Pass

Complex terrain

- Unlike typical overseas sites
- Typical of New Zealand
- Hard to understand wind conditions
- Requires site calibration

Site Calibration

- Approximately 3 months
- Correlation



Quality Turbines for NZ – The IEC Certification Process



Type Testing – Onsite Testing

Testing Party: University of Canterbury



Process:

- Set-up turbine for testing
 - Strain gauge calibration
- Testing campaign
- Data collection
 - Design software system
 - Estimating 3 months
- Manual testing
 - Safety and function
 - Load measurements
- Additional characteristics
 - Power quality
 - Acoustics

Quality Turbines for NZ – The IEC Certification Process



Lessons Learnt



1. Preparation is 80% of the work
 - Systems
 - Test regime specifications
2. We can carry out this process in New Zealand
 - Huge learning curve
 - Limited resources
3. This is an important step forward for the New Zealand wind energy industry

Quality Turbines for NZ – The IEC Certification Process



Conclusion



Quality Turbines for NZ – The IEC Certification Process