Commercialization of a diffuser augmented wind turbine for distributed generation

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Introduction

The falling price of solar photovoltaic modules and battery storage is driving the need to improve small wind turbine efficiencies and system costs [1].

Diffuser augmented wind turbines (DAWTs) utilize a cylindrical shroud to increase the mass flow rate across the rotor plane [2-4]. Despite theoretical efficiency gains there is a substantial gap in commercializing this technology for consumer use.

Methodology

Manufacturing challenges include; high stiffness-to-weight ratio requirements, high geometrical surface tolerances, fatigue resistance, and the unfavourable economics of low-volume production.

A range of manufacturing techniques were employed; polymer rotor molding, carbon fiber injection molding, aluminum sand casting (Fig 1).

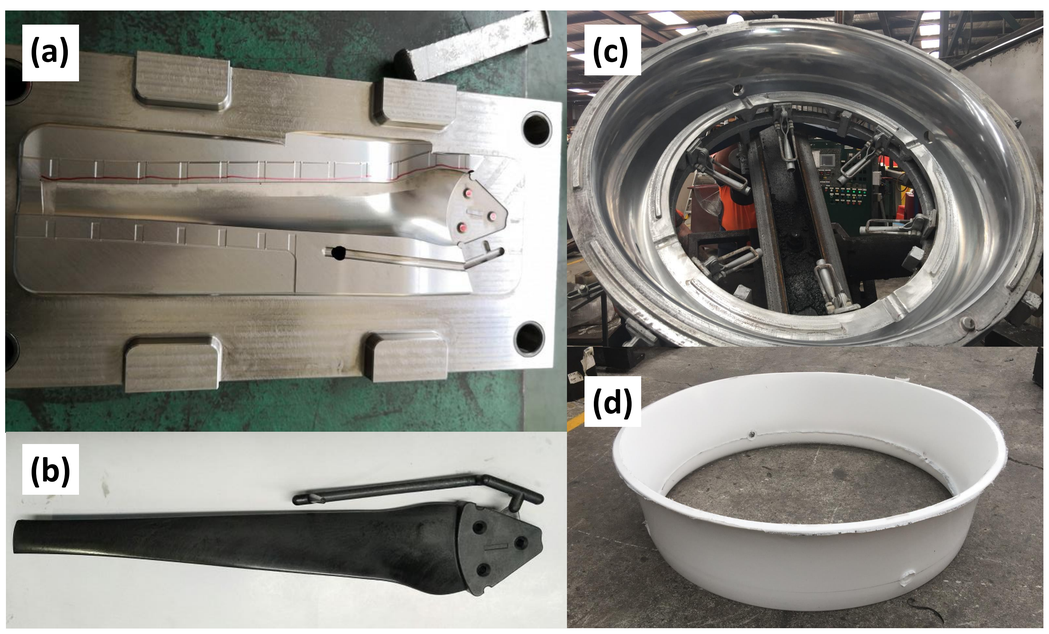

Figure 1: Blade mold (a) and completed blade (b), diffuser mold (c) and rotor molded part (d).

A bespoke MPPT controller was engineered for PMG operation at low-voltages and comparatively higher currents.

Conclusions and discussion

A commercial unit has been installed at a telecommunications site. This location has existing diesel generation, solar PV, and battery systems. Results have shown a 25% reduction in diesel usage.

Due to the challenges of accessing remote locations, the DAWT system should be as simple to install as possible, ideally in a single site visit (Fig 2).

Figure 2: Installation at a telecommunication site.

References

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