CHAPTER 9
MICRO WIND TURBINE

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9.1 INTRODUCTION

The needs of electricity, cables, and batteries to support lightings such as emergency light or road light in highway roads are very high and costly. This product project is taking a step forward to decrease the use of electricity, cables, and batteries. This project reviews the design process and the fabrication of a micro wind power system model to generate electricity. The vertical axis wind turbine (VAWTs) is chosen compared to horizontal axis wind turbine (HAWTs) due to the suitability of the turbine to the intended study place. The objective of this project is to design a micro VAWT for small resolution and that can be placed in confined spaces along the highway roads.

9.1.1 Problem Statement

Highways use electricity, cables, and batteries to supply lightings along the roads. This is very costly. There is a need to create a system that can provide power by using a natural resource, especially the one that is available along the highways the wind.

9.1.2 Objective

The objective of this study is to produce a design of a micro wind-power system for use along highways.

9.1.3 Scope and Limitation

The scope of this study is focusing on:
(1) Studying the existence of wind power systems for confined spaces.
(2) IP search for the existence of micro wind power systems.
(3) Producing a suitable design for the wind power system.
(4) Fabricating a model and test.

9.2 DESIGN PROCESS

This section explains the conceptual design process.

9.2.1 Problem Identification

Problems are identified by performing critical background research and by understanding concepts from similar products. The focus is on vertical and horizontal axes wind turbines, the wind properties and behaviour, and the power capacities needed for lighting use along the highways.

9.2.2 Product Design Specification

To get the best solution for the micro wind turbine, product design specification (PDS) needs to be constructed to be a guideline for the design specification. The manufacturing must follow BS 1098–2 and BS 328–1:1993 standards. Table 9.1 shows the PDS for this study.

Table 9.1 Product design specification

Specification	Description
Performance	(1) Efficient, reliable, stable and safe. (2) The generator must be able to gain 500 Watts to 1000 Watts rated output. (3) The blade, a maximum of four, must be able to turn in any wind direction. (4) Blade design to minimise the vibrations. (5) Able to work at optimum performance in all kinds of weather
Material	(1) Lightweight. (2) Cheaper or recyclable material is encouraged to use. (3) Strong, durable, corrosion and weather resistant.
Cost	(1) < RM2,500.00
Weight	(1) Lightweight, especially the blades where less inertia causes the blades to turn easier. (2) < 200 kg. (3) Maximum three adult men are required to assemble and transport the device.
Size and Portability	(1) Compact. (2) Height less than 3m. (3) Convenient for handling and shipping. (4) Can be separate into several parts for portability. (5) Easy assembly.
Environment	(1) Quiet with decibel level of 70 or lower. (2) Able to resist corrosion due to weather. (3) Able to withstand any changes coming from the weather.
Maintenance	(1) Easy maintenance. (2) Six months of maintenance duration. (3) Check-up for the joint part at least three months post the last service.
Installation	(1) Easy and user-friendly installation. (2) Easy to mount and stable.
Safety	(1) Safety elements must be considered. (2) Warning or hazard labels. (3) High safety management. (4) Automatic mechanical brake system for the blade.

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