MEASURING WIND SPEED AND DIRECTION USING FIBER OPTIC TECHNOLOGY

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ABSTRACT

This paper discuss about the application of propeller anemometer in practical. Some theories regarding the propeller anemometer are presented. One of the important parts of theories is regarding the dynamics theory regarding the propeller anemometer. The goal of this part is to achieve an accurate mechanical function of the speed and direction measurement of the wind. The propeller of the anemometer should be able to response with the wind velocity and give the speed value, whilst, the anemometer should also detect the direction of the wind precisely.

This paper presents an approach in signal conditioning circuit design for velocity measurement. The goal of this part is to achieve an accurate measurement of the velocity using a rotational disc and a photodetector as a sensor. A signal conditioning circuitry is used to transform the input signal into a suitable output. The light from the light source is captured by a photodetector when the disc rotated. The signals captured are then transformed to the desired output that is in term of frequency, voltage and speed in rotational per second.

This paper also presents an approach in signal conditioning circuitry design for direction measurement. The goal of this part is to achieve an accurate measurement of the direction using a photodiode as a transducer. A signal conditioning circuitry is used to transform the input signal from a sensor into a suitable output in terms of degree (°). The reflection of light is captured by a photodiode when a disc rotated. Each hole of on the disc has a unique value of depth. The signals captured at every depth and then transformed to the desired output.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

A Fiber Optic Sensor (FOS) is defined as *any device* in which variations in the transmitted power or the rate of transmission of *light* in *optical fiber* are the means of measurement or control. FOS is widely used to measure physical parameters such as strain, temperature, pressure, velocity, and acceleration. Optical fibers are strands of glass that transmit light over long distances while the light is transmitted by continuous internal reflections in optical fibers.

There are reasons why FOS has been widely applied in various fields due to its unique properties, which, will be discussed more detail in Chapter 4. The field of measurement and instrumentation, and particular sensor development, is one of that has been expanded rapidly in recent years. The need for high quality sensors to be integrated into sophisticated measurement and control is clear. In parallel with rapid advance in the development of sensors based on microelectronics, those based on optical techniques have expanded significantly over last few years.

In this research, the study about the implementation of FOS in propeller anemometer technology will be performed, since the merge of these two technology fields potentially will result a great opportunity of commercialization.