CHARACTERIZATION OF FIBER BRAGG GRATING AS TEMPERATURE SENSOR FOR PIPELINE WATER LEAKAGE INSPECTION

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ABSTRACT

In this work, Fiber Bragg Grating (FBG) was characterized as temperature sensor for pipeline water leakage inspection. This is because FBG is sensitive to temperature, thus make it a potential device to perform pipeline water leakage inspection. Bragg wavelength λ_B was measured by Tunable Laser Source (TLS) as light source and optical spectrum analyzer (OSA) to observe the reflected Bragg Wavelength at temperature from 24 °C to 40 °C. Analysis is performed to define the relationship of λ_B with temperature based on the collected data. The temperature sensitivity of is 9.2 pm/°C and 9.8 pm/°C was obtained for FBG1 and FBG2 respectively.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter presents an overall overview of this project. Besides that, the objectives, scope of work and outline of the thesis were also provided.

1.2 PROJECT OVERVIEW

Maintenance and regular inspection of pipelines are performed in order to ensure its condition are undamaged as well as to prevent water leakage. Currently, there is several inspections to the pipelines employing pipe crawlers, pipe inspection pigs and similar vehicles for inspection in piping systems [1, 2]. Typically such devices include testing probes, sensor or camera that mount on the vehicles through pipeline inspection. Common technologies that available are ultra sound, radiography and acoustic [3].

In this project, Fiber Bragg Grating (FBG) is proposed to substitute the common method to perform pipeline inspection. FBG is an optical passive device which has a space periodic refractive index distribution in the fiber core. The Bragg wavelength is a nanometer scale range and capable to change or control its spread behavior of light in the region. The changes of physical effects like temperature, stress and pressure and displacement can give perception of the signal precision of the FBG [4]. The advantages of FBG are small in size, lightweight, high sensitivity, wide bandwidth, and low power [5], which can resolve the limitation issues that exists in current inspection technology. In addition, FBG is relatively immunity to electromagnetic interference which is more efficient as well as environmentally friendly. The most