UNIVERSITI TEKNIKAL MALAYSIA MELAKA

NOTABLE LIQUID SENSOR DEVELOPMENT USING FIBER OPTIC SENSOR APPLICATIONS FOR BRAKE OIL TEST

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunications) with Honours

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Electronic Telecommunication) with Honours. The member of the supervisory is as follow:

…………………………………….

(Mr. Md Ashadi Bin Md Johari)

ABSTRACT

In 60 year, sensor fiber optics had ended up a standout amongst the best and most intense application for both optic fiber furthermore innovation for sensor. Some of the earliest uses of optical fibers were for chemical detection and measurement. The field of fiber optic chemical sensing has grown to include a wide variety of measurement environments and estimation strategies. Passive remote spectroscopy, and chemically-augmented active sensing have been used in formats ranging from extrinsic to intrinsic, and at length sales ranging from sub microscopic to multi-kilometre. This talk discusses the relative strengths of the most prevalent fiber optic chemical sensors, both scientific and commercial, and speculates on the future of this burgeoning field. With higher execution and flexibility, space usage that is little likewise is one of the present patterns for optic fiber sensor. This project to analyse power measurement value in brake oil concentration that is distinctive and utilizing this fiber optic detector is to know which detector over finder affectability. This analysis might be valuable for innovation in oil and mechanical gas.

ABSTRAK

Dalam masa 60 tahun , sensor gentian optik telah berakhir sehingga orang yg menonjol di kalangan permohonan yang terbaik dan paling sengit untuk kedua-dua serat optik tambahan pula inovasi untuk sensor. Beberapa kegunaan terawal gentian optik adalah untuk mengesan bahan kimia dan pengukuran. Bidang fiber optik penderiaan kimia telah berkembang untuk merangkumi pelbagai persekitaran pengukuran dan strategi anggaran. spektroskopi jauh pasif, dan kimia ditambah sensing aktif telah digunakan dalam format yang terdiri daripada ekstrinsik kepada intrinsik , dan pada jualan panjang antara bentuk submicroscopic kepada pelbagai kilometer. Ceramah ini membincangkan kekuatan relatif sensor gentian optik kimia yang paling lazim , kedua-dua sains dan perdagangan, dan membuat spekulasi mengenai masa depan bidang ini berkembang. Dengan pelaksanaan yang lebih tinggi dan fleksibiliti, penggunaan ruang yang kecil juga merupakan satu daripada corak hadir untuk optik sensor gentian Projek ini untuk menganalisis kuasa nilai pengukuran kepekatan minyak brek yang tersendiri dan menggunakan ini pengesan gentian optik adalah untuk mengetahui yang pengesan lebih pencari affectability . Analisis ini mungkin berharga untuk inovasi dalam bidang minyak dan gas mekanikal.

DEDICATIONS

This humble effort specially dedicated to my beloved parents, family, lecturers and friends, whose love can never be forgotten for their support, guidance and encouragement upon completing this project and report.

Special dedicated to my family

MOHD AZHA BIN AWANG @ ABI SOFIAN

RAMLAH BINTI JAHAYA

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

dB	-	decibel
FOS	-	fiber optic sensor
EMI	-	electromagnetic interference
RFI	-	radio frequency interference
MMF	-	multi-mode fibers
SMF	-	single-mode fibers
ft	-	foot
LAN	-	local area network
WAN	-	wide area network
TV	-	television
km	-	kilometres
Tb	-	terabytes
POTS	-	plain old telephone service
LECs	-	local exchange carriers
FTTH	-	fiber to the home
HDTV	-	high-definition television
FBG	-	fibre brag grating

LED	-	light emitting diode
Laser	-	light amplification by stimulated emission of radiation
LED	-	light emitting diode
LHM	-	liquid hydraulique mineral
DOT	-	department of transportation
U.S.	-	United States
SAE	-	Service Advisor Engine
STP	-	Scientifically Treated Petroleum
ZDDP	-	zinc dialkyldithiophosphate
ITU	-	International Telecommunications Union
FSM	-	finite-state machine
OSA	-	optical spectrum analyser
ASE	-	amplified spontaneous emission
CWDM	-	Course wavelength division multiplexing
DWDM	-	dense wavelength division multiplexing
ISS	-	interpolation source subtractions
ST	-	Straight Tip
FC	-	fiber-optic connector
UPC	-	Universal Product Code
APC	-	Armoured Personnel Carrier
LHM	-	liquidehydraulique mineral
nm	-	nanometres

CHAPTER 1

INTRODUCTION

1.0 Project Background

In the previous 60 years, fiber-optical detecting has been a standout amongst the best and capable utilizations of both fiber optics and detecting innovation [Spillman, 2001]. Fiber optic detecting is encouraged by its remarkable components, which make it conspicuous among other detecting strategies. These fiber optic sensors effectively meet the prerequisites like high affectability and speedy reaction in detecting distinctive assortment and physical variables. Utilizing optical fiber detecting gadgets one can gauge or screen diverse physical and compound parameters as far as one of the essential parameters that portrays the light shafts. These primary parameters incorporate light power, stage, polarization and wavelength. The trademark highlights and promising abilities of fiber optic sensors make them alluring and put them in the cutting edge of the Photonics innovation. In the fiber optic detecting framework, the detected sign is insusceptible to electromagnetic obstruction (EMI) and radio recurrence impedance (RFI). Since optical strands offer low misfortune to the sign spreading through it we can utilize this strategy for remote detecting applications.

In this project would help mechanical industry as additional information for brake system which can determine the activation level of various brake oil. This project purpose to research and develop a New Brake Oil Sensor by using Fiber Optic Sensor (FOS) for Brake Functional purpose. This project is mainly use to determine the activation level of various brake oil from low concentration to high concentration. Brake oil is sort of water driven liquid utilized as a part of pressure driven brake and pressure driven grasp applications in vehicles, cruisers, light trucks, and a few bikes. It is utilized to move power into weight, and to enhance braking power. It works since fluids are not apparently compressible in their characteristic express the part particles do not have inside voids and the atoms pack together well, so mass powers are straightforwardly exchanged to pack the liquid's synthetic bonds.

Later on, this venture can work in vehicle that utilization Brake Oil and give change in mechanical industry. The innovation and utilizations of optical filaments have advanced quickly as of late. The upsides of fiber optic sensors are flexibility from Electromagnetic Interference, wide data transfer capacity, conservativeness, geometric adaptability and economy. By and large, FOS is described by high affectability sensor when contrasted with different sorts of sensors. There are the variety types of fiber optic sensors. These can be named force of tweak and demodulation amplitude process, physical sensor or substance sensor for estimation, extrinsic or intrinsic sensor, and in conclusion arranged because of their estimations focuses.

1.1 Objectives

a) To understand fiber optic sensor (FOS) operation.
b) To develop fiber optic sensor (FOS) for Brake Oil detection in concentration.
c) To analyse performance of fiber optic sensor (FOS) for concentration detection activity.

1.2 Problem Statement

Nowadays, the mechanical business is going up quickly. There have numerous of technology that have been produce to make human life better and less demanding. Brake oil is lubricant made particularly for transmissions, exchange cases, and differentials in automobiles, trucks, and other materials. Break oils is used in engine operation. Thus, consumer does not know when the break oil is expired. The problem occur in our world is consumer do not know when the brake oil turn out to be high concentration and should to be trade because of the spot of brake oil in the engine. Generally, consumer totally depends on expired date stated on the bottle label that has been altered by industrialist. This project is implementation using the application of fiber optical sensor to detect the concentration of brake oil. Reason why we must detect different concentration? It is because to ensure the performance of brake oil and it will tell consumer whether the brake oil still can be use or should be replace immediately.

1.3 Scope of Work

The scope of this project is to study and develop fiber optic sensor for brake oil concentration detection which focus recognition from low concentration to high concentration. This project is to guarantee that the task is in the right heading to accomplish its goals. The scopes of this project are to study and develop the Fiber Optical Sensor, Fiber Optical Sensor for Liquor and also Concentration of Brake oil.

1.4 Limitation

The limitations of the study are those attributes of configuration or approach that affected or impacted the understanding of the finding from a research. They are the limitations on sum up capacity, applications to task, and or utility of discoveries that are the aftereffect of the courses in which there at first planned the study and or the strategy used to build up inside and outer legitimacy. Some of limitations are:

a) Fiber optical sensor is going too used.
b) Sensor can detect the brake oils.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This part explains of the literature reviews about the most Fiber optic put consideration into the design and the type of analysis performed on structure. It includes the design and analysis of Fiber Optic Sensor applications for brake oil test. This parts also consists of components should be taken into consideration into and to be made as reference or studies for further project improvement.

2.1 Fiber Optic

The fiber optic is a flexible, transparent fiber made by drawing glass, silica or plastic to a diameter slightly thicker than that of a human hair. Fiber optic are used most often as a means to transmit light between the two ends of the fiber and find wide usage in fiber-optic communications, where they permit transmission over longer distances and at higher bandwidths data rates than wire cables. Fibers are used instead of metal wires because signals travel along them with lesser amounts of loss; in addition, fibers are also immune to electromagnetic interference, a problem from which metal wires suffer excessively. Fibers are also used for illumination, and are wrapped in bundles so that they may be used to carry images, thus allowing viewing in confined spaces, as in the case of a fiberscope. Specially designed fibers are also used for a variety of other applications, some of them being fiber optic sensors and fiber lasers.

Fiber optic typically include a transparent core surrounded by a transparent cladding material with a lower index of refraction. Light is kept in the core by the phenomenon of total internal reflection which causes the fiber to act as a waveguide. Fibers that support many propagation paths or transverse modes are called multi-mode fibers (MMF), while those that support a single mode are called single-mode fibers (SMF). Multi-mode fibers generally have a wider core diameter and are used for short-distance communication links and for applications where high power must be transmitted. Single-mode fibers are used for most communication links longer than 1,000 meters (3,300 ft) [Chris Woodford, 2016].

An important aspect of a fiber optic communication is that of extension of the fiber optic cables such that the losses brought about by joining two different cables is kept to a minimum. Joining lengths of optical fiber often proves to be more complex than joining electrical wire or cable and involves careful cleaving of the fibers, perfect alignment of the fiber cores, and the splicing of these aligned fiber cores. For applications that demand a permanent connection a mechanical splice which holds the ends of the fibers together mechanically could be used or a fusion splice that uses heat to fuse the ends of the fibers together could be used. Temporary or semi-permanent connections are made by means of specialized optical fiber connectors.

2.1.1 Optical Technology

Figure 2.1: A section of 144-strand fiber-optic cable

A fiber-optic link is comprised of unbelievably thin strands of glass or plastic known as optical fibres one link can have as few as two strands or upwards of a few hundred. Every strand is not exactly a tenth as thick as a human hair and can convey something like 25,000 phone calls, so a whole fiber-optic link can without much of a stretch convey a few million calls [Chris Woodford, 2016].

Fiber-optic links convey data between two spots utilizing completely optical (light-based) innovation. Assume you needed to send data from your PC to a companion's home down the road utilizing fiber optics. You could attach your PC to a laser, which would change over electrical data from the PC into a progression of light heartbeats. At that point you'd fire the laser down the fiber-optic link. In the wake of going down the link, the light pillars would rise at the flip side. Your companion would require a photoelectric cell (light-identifying segment) to transform the beats of light over into electrical data his or her PC could get it. So the entire mechanical assembly would resemble a truly flawless, hello there tech form of the sort of phone you can make out of two prepared bean jars and a length of string [Chris Woodford, 2016].

2.1.2 Fiber optics works

Light travels down a fiber-optic cable by bouncing repeatedly off the walls. Each tiny photon (particle of light) bounces down the pipe like a bobsleigh going down an ice run. Now you might expect a beam of light, traveling in a clear glass pipe, simply to leak out of the edges. But if light hits glass at a really shallow angle less than 42 degrees, it reflects back in again—as though the glass were really a mirror. This phenomenon is called total internal reflection. It's one of the things that keep light inside the pipe [Chris Woodford, 2016].

The other thing that keeps light in the pipe is the structure of the cable, which is made up of two separate parts. The main part of the cable in the middle is called the core and that's the bit the light travels through. Wrapped around the outside of the core is another layer of glass called the cladding. The cladding's job is to keep the light signals inside the core. It can do this because it is made of a different type of