

LOW COST OPTICAL FIBRE MEASURING INSTRUMENT

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RASHID BIN JUNUS
Department of Electrical Engineering
INSTITUT TEKNOLOGI MARA
40450 Shah Alam, Malaysia
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ABSTRACT

The main objective of this project is to develop a low-cost solid-state instrument to use with optical fibre physical or chemical sensor (e.g. temperature, colour, pressure, pH etc.). This portable instrument employs opto-electronic devices such as light emitting diode (LED) as a light source and semiconductor photodiode (PD) as a photodetector. A Fibre optic cable is used as a media or transmission line to link between light sources, sensor and photodetector. The project instrument has an internal reference to correct the changes in the signal intensity due to fibre bending or fibre connection and environmental effects. The resolutions of this project is 0.1 mm. For this project, an optical fibre displacement sensor was fabricated since the basic concept of displacement sensor can be applied for many type of sensors. This same sensor can also be used to measure colours.

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1. INTRODUCTION

Telecommunications have been revolutionised by fibre optic technology. New revolution is emerging as designers combine the product outgrowths of fibre optic telecommunications with optoelectronic devices to create fibre optic sensors and their measuring systems.

The measuring system can be developed by using solid-state light sources such as light emitting diodes (LEDs), laser diodes (LDs) and semiconductor photodetector. This allows the measuring system to be small, portable, low cost and low power consumption. The use of modulated sources allows the sensors to be used without any shielding from ambient light. A reference system is incorporated to compensate for any optical losses due to fibre coupling or bending. [1]

Fibre optic sensors offer an all-passive dielectric approach that is often crucial to successful applications, including electrical isolation of patients in medicine, elimination of inductive paths in high-voltage environments and compatibility with placement in materials. The light weight and small size of these devices are critical in such areas as aerospace and provide substantial advantages.[2] Electro-optical technologies have recently played an important role in the instrumentation for diagnostics in many fields of application, ranging from aerospace, industry and process control to security, military and biomedicine.[3]