

**WATER TURBIDITY MEASUREMENT USING FIBRE OPTIC  
AND NEURAL NETWORK**

**INSTITUT PENYELIDIKAN, PEMBANGUNAN DAN  
PENGKOMERSILAN  
UNIVERSITI TEKNOLOGI MARA  
40450 SHAH ALAM, SELANGOR  
MALAYSIA**

**By**

**RUHIZAN LIZA BINTI AHMAD SHAURI  
ROZITA JAILANI  
MAHANIJAH MD KAMAL**

**MARCH 2006**



# UNIVERSITI TEKNOLOGI MARA

## FAKULTI KEJURUTERAAN ELEKTRIK

40450 Shah Alam, Selangor Darul Ehsan

Tarikh : 26hb Jun 2004  
Surat Kami :

Cik Ruhizan Liza Binti Ahmad Shauri  
Pensyarah  
Fakulti Kejuruteraan Elektrik  
Universiti Teknologi MARA  
40450 Shah Alam.

Puan

### TAJUK PROJEK: 'THE MEASUREMENT OF WATER TURBIDITY USING OPTICAL FIBRE SENSOR AND ARTIFICIAL NEURAL NETWORK'

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa Jawatankuasa Penyelidikan, Pembangunan dan Pengkomersilan di peringkat Fakulti telah membuat keputusan:

- i. Bersetuju meluluskan cadangan penyelidikan yang dikemukakan oleh puan serta Pn Rozita Jailani dan Pn Mahanijah Ma Kamal.
- ii. Tempoh projek penyelidikan ini ialah 12 bulan, iaitu mulai 1 hb Julai 2004 hingga 30 hb Jun 2005.
- iii. Kos yang diluluskan ialah sebanyak RM18,500.00 sahaja.
- iv. Penggunaan geran yang diluluskan hanya akan diproses setelah perjanjian ditandatangani.
- v. Semua pembelian peralatan yang kosnya melebihi RM500.00 satu item perlu menggunakan Pesanan jabatan Universiti Teknologi MARA (LO). Pihak puan juga dikehendaki mematuhi peraturan penerimaan peralatan. Panduan penerimaan peralatan baru dan pengurusannya dilampirkan bersama.
- vi. Kertaskerja boleh dibentangkan di seminar setelah 75% deraf awal laporan akhir projek dihantar ke Institut Penyelidikan, Pembangunan dan Pengkomersilan (IRDC) untuk semakan. Walau bagaimana pun, puan perlu membuat permohonan kepada IRDC.

03-55435000  
 03-55435001  
 03-55435002  
 03-55435003  
 03-55435004  
 03-55435005  
 03-55435006  
 03-55435007  
 03-55435008  
 03-55435009  
 03-55435010  
 03-55435011  
 03-55435012  
 03-55435013  
 03-55435014  
 03-55435015  
 03-55435016  
 03-55435017  
 03-55435018  
 03-55435019  
 03-55435020  
 03-55435021  
 03-55435022  
 03-55435023  
 03-55435024  
 03-55435025  
 03-55435026  
 03-55435027  
 03-55435028  
 03-55435029  
 03-55435030  
 03-55435031  
 03-55435032  
 03-55435033  
 03-55435034  
 03-55435035  
 03-55435036  
 03-55435037  
 03-55435038  
 03-55435039  
 03-55435040  
 03-55435041  
 03-55435042  
 03-55435043  
 03-55435044  
 03-55435045  
 03-55435046  
 03-55435047  
 03-55435048  
 03-55435049  
 03-55435050  
 03-55435051  
 03-55435052  
 03-55435053  
 03-55435054  
 03-55435055  
 03-55435056  
 03-55435057  
 03-55435058  
 03-55435059  
 03-55435060  
 03-55435061  
 03-55435062  
 03-55435063  
 03-55435064  
 03-55435065  
 03-55435066  
 03-55435067  
 03-55435068  
 03-55435069  
 03-55435070  
 03-55435071  
 03-55435072  
 03-55435073  
 03-55435074  
 03-55435075  
 03-55435076  
 03-55435077  
 03-55435078  
 03-55435079  
 03-55435080  
 03-55435081  
 03-55435082  
 03-55435083  
 03-55435084  
 03-55435085  
 03-55435086  
 03-55435087  
 03-55435088  
 03-55435089  
 03-55435090  
 03-55435091  
 03-55435092  
 03-55435093  
 03-55435094  
 03-55435095  
 03-55435096  
 03-55435097  
 03-55435098  
 03-55435099  
 03-55435100

## TABLE OF CONTENTS

ACKNOWLEDGEMENT .....	ii
LIST OF TABLES .....	vii
LIST OF FIGURES .....	viii
LIST OF ABBREVIATIONS .....	x
ABSTRACT .....	xi
CHAPTER 1 .....	1
INTRODUCTION .....	1
1.1 Objective of Project .....	1
1.2 Thesis Structure .....	3
CHAPTER 2 .....	4
LITERATURE REVIEW .....	4
2.1 Water Pollution .....	4
2.2 Water Quality .....	5
2.2.1 Turbidity .....	7
2.2.2 Importance of Turbidity .....	9
2.2.3 Standards for Turbidity .....	10
2.3 Water Quality Measurement System .....	12
2.3.1 Transducers As Part of A Measurement or Control System .....	14

## ABSTRACT

Turbidity of water is a measurement of water clarity to show how clear the water appears. The amount of total suspended solids (TSS) in water contributes proportionally to the value of turbidity. Insoluble particles impede the passage of light through water by scattering and absorbing the rays. Thus, the interference to the passage of light could be used for turbidity measurement using a turbidity index.

The current existing method of measuring turbidity of water could come in bulky size or small portable turbidity meter. The ability to handle many samples and implementation of on-line monitoring is limited for such devices while some do not support this feature. Taking measurements would be laborious and time consuming especially when the sources of samples are located in remote places which are difficult to be accessed by human.

In this research, an alternative turbidity measurement system called the “Fibre Optic Turbidity Measurement System” is designed and its performance is analysed and compared to the measurement from a standard turbidity meter. The concept of the proposed measurement system is to make the turbidity measurement remote, easy to handle and more flexible. Furthermore, the application of fibre optic enables measurement taken at the source of sample but could be remotely controlled from other place by the user. The design for the fibre optic set-up, transmitter circuit, receiver circuit and signal

conditioning circuit were covered. A Peripheral Interface Controller (PIC) was used to display the measured data on an LCD. Consequently, measured turbidity from the proposed system in different parameters is trained and tested using Artificial Neural Network (ANN) programming to produce a model that could give good predictions on water turbidity for LCD display.