



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF A LOW COST FLOW METER**

**USING ULTRASONIC SENSOR CONCEPT**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Automation and Robotic) with Honours.

by

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## **APPROVAL**

This report is submitted to the Faculty Electrics and Electronics Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Automation and Robotic) with Honours. The member of the supervisory is as follow:

Signature: .....

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## **ABSTRAK**

*“Ultrasonic Flow Meter” ialah sebuah alat yang sering digunakan khususnya di peringkat industri untuk mengukur nilai cecair yang melalui saluran paip. Sepasang “Ultrasonic Sensor” yang satunya sebagai “transmitter” dan satu lagi sebagai “receiver” berfungsi dengan tindak balas melalui frekuensi atau tempoh masa terhadap kelajuan cecair di dalam saluran paip tersebut. “Development a Low Cost Flow Meter Using Ultrasonic Sensor Concept” di cipta untuk mengurangkan kos bagi mereka yang ingin memilikinya kerana harganya dipasaran agak tinggi. Alat ini direka secara mudah alih menggunakan sepasang sensor yang di sambung pada paip berserta litar yang disambung kepada Arduino UNO sebagai cip pintar. Alat ini mampu untuk membaca nilai frekuensi cecair yang melalui saluran paip. Melalui system kiraan Matematik, nilai dalam bentuk “Flow rate” mampu di hasilkan.*

## **ABSTRACT**

"Ultrasonic Flow Meter" is a commonly equipment used especially at industry to measure the value of flow rate liquids through the pipeline. Another pair of Ultrasonic Sensors as a "transmitter" and another "receiver" works with the reaction through the frequency or duration of the liquid velocity within the pipeline. "Development a Low Cost Flow Meter Using Ultrasonic Sensor Concept" is designed to reduce costs for those who want to have it because the price is relatively high. The flow meter is designed on a portable using a pair of connectors connected to the pipe with a circuit connected to Arduino UNO as a Microcontroller. This devices is able to read the value of the liquid frequency through the pipeline. Through the Mathematical calculation system, values in the form of "Flow rate" can be generated.

## **DEDICATION**

I acknowledge my sincere dedication, honors and gratitude to both of my parents for their love, encouragement, supports and sacrifices throughout whole of my life. Without their sacrifices and encouragement, I cannot possibly reach this stage. Special gratitude also dedication to all my sister which always support and advise me in whatever I do in my life. Very special thanks to all of lecturers who has though and guided me throughout my studies. Not be forgotten, all of my friends who always been with me and help me to complete every task along the studies and throughout this joyful journey. There is no words can express my sincere appreciation to all of you.

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## **LIST OF ABBREVIATION, SYMBOLS AND NOMENCLATURE**

UFM - Ultrasonic Flow Meter

USB - Universal Serial Bus

IDE - Integrated Development Environment

LCD - Liquid Crystal Display

DC - Direct Current

PVC - Premature Ventricular Contraction

TDC – Time to Digital Converter

LIFA – LabVIEW Interface to Arduino



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

In this chapter 1, it will representing the introduction about this project. This chapter will cover about the project background, problem statement, objectives, work scope on conclusion of Development of a Low cost Flow meter Using Ultrasonic Sensor Concept.

### 1.2 Project Background

Flow measurement is important to numerous different industries for example oil, power, water and waste treatment. These industries need that they know precisely how much fluid is passing through a point at any given point. Flow meters assist to determine value of fluid flow through to determine how much cash should be billed or how much product is being produced. The flow meter is the device used to measure linear flow, non-linear, mass or liquid volumetric or gas.

Most of flow meters operate by forcing flow through a known confined space and to specify the liquid flow rate by measuring different properties. Samples of measured properties include pressure, thermal, magnetic and etc. As example for different types of flow meters include Coriolis, Differential Pressure, Magnetic, Positive Displacement, Variable area and Ultrasonic flow meter.

Over of past year ago, Ultrasonic Flow meter extensively used both application in industrial and medical. There are surely flow meter method similar vortex flow meter, magnetic flow meter and Coriolis flow meter. Nevertheless, the non-invasive and high accuracy of characteristic give the ultrasonic flow meter more popular and suitable based on according annual flow meter sales in over of past year ago. Figure 1.1 shows example the ultrasonic flow meter using in industrial.



**Figure 1.1: Example of Ultrasonic Flow meter**

Ultrasonic flow meter using transit time differential method utilizes the fact that the propagation velocity of sound wave within a fluid is directly influenced by the velocity of that fluid. Ultrasonic flow measurement utilizing the transit time effect is based on this simple physical fact.

Besides that, the process of transmitted ultrasonic signal that require a measurement of time taken from a single sensor by transit time differential flow meters method. A second sensor will receive signal of ultrasonic through a pipe. Upstream and downstream measurements are compared. The transit time will be the same in both directions with no temporary flow if the flow sound will move faster towards the flow and slow down the flow. Since the ultrasonic signal must cross the pipe to the transducer receiver, the liquid should not contain the foam or solid concentration to be considered.

Generally the high frequency sound will be weakened and excessively frail, making it impossible to cross the pipe.

Although the cost of ultrasonic flow meter is expensive or high cost, it remains an option of many industry to use it. So, this project focus to develop a low cost flow meter using ultrasonic sensor concept.

### **1.3 Problem Statement**

Nowadays, we can see that there are so many small industries and community have been deceived by the dealer or seller in the affairs of the sale and purchase of liquid goods such as palm oil, petrol oil and so on. This is because no products are used for reference like flow meter sensor to buyers (small industries and community). In the market, the price of flow meter is relatively expensive for small industries and community to get it. So, this project a low cost flow meter using ultrasonic sensor develop to solve small industries and community problem. Besides that, it can use to measure a liquid flow through the pipe line and easy to know value of liquid when put in closed tank.

### **1.4 Objective**

The main objective of this project is:-

- To develop a low cost flow meter using ultrasonic sensor concept
- To measure the flow of liquid through the pipe line
- To compare value of flow rate with another flow meter