TABLE OF CONTENTS

ABSTRACT

Spirometers are typically used in a clinical setting to diagnose pulmonary disease. These tools measure the amount of air expired, and in some cases, can show the change in flow rate over time. Current spirometers on the market often have retail prices of over $1,000. As a result of this high cost, many physicians practicing in developing countries lack the resources to purchase spirometry equipment. The development of a low-cost, reliable spirometer would allow these physicians to make more quantitative assessments of their patients' pulmonary health. This simple, low cost spirometer allows for a rough calculation of the volume of air expired from the lungs over a period of time.

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBREVIATIONS

S.No	ABBREVIATION	EXPANSION
1.	LCD	Liquid Crystal Display
2.	CT	Current Transformer

CHAPTER 1

INTRODUCTION

1.1 Introduction

Spirometry is a type of pulmonary function test. It determines how well your lungs work by measuring how much air goes into and out of your lungs when you breathe. A spirometry test measures the flow of air through your lungs and estimates the amount of air in your lungs.

1.2 Necessity

Spirometry determines if your lungs are functioning at their expected levels. It also helps to diagnose lung and airway diseases, including:

- Asthma.
- Chronic obstructive pulmonary disease (COPD).
- Cystic fibrosis.
- Pulmonary fibrosis.

1.3 Scope of the work

This project deals with energy consumption values acquired from the energy provider. These standard values help energy utilities and consumers to know their energy consumption of each appliances.People will be aware by knowing the power consumption of each appliances .Future savings which consists in determining when to use which appliance can be done .This may show greater impacts on end user.

CHAPTER 2

SYSTEM MODEL

2.1 Introduction

This spirometer comprises pf Arduino Nano which act as a interface.Other components are

1. Arduino Nano
2. Pressure sensor
3. LCD
4. Tubes
5. Jumper wires
6. Battery

2.2 Block Diagram

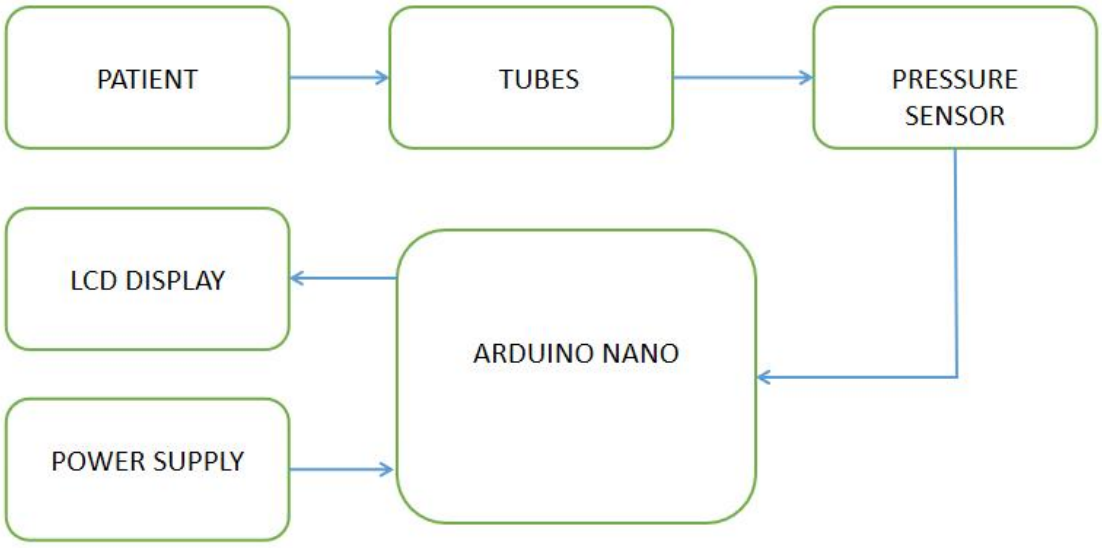

Fig:2.1 Block diagram of the system

2.3 Description of Various blocks

Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008.

Pressure Sensor

A pressure sensor is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area.

CHAPTER 3

HARDWARE DESCRIPTION

3.1 Introduction

Solder the resistors and capacitor directly onto the CT so that they cannot come loose.The LCD screen shield already picks up on the analogue inputs but only A0 is used by the shield.Once you have connected all of your components, you need to connect your sensor onto what you want to monitor.If you are wanting to monitor a couple of appliances then you should connect the CT onto the input lead of a multi-plug, anything you plug into the multi-plug with then be counted. Either way, you need to put the CT around one of the supply cables, preferably the red “live” cable.

3.2 Circuit diagram

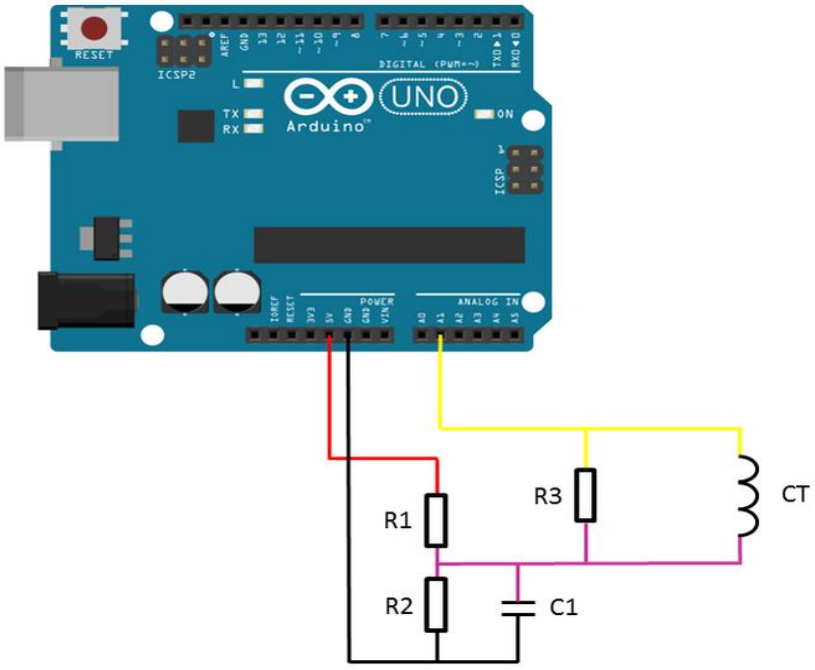

Fig:3.1 Circuit diagram of the system

3.3 COMPONENT DESCRIPTION AND COST

S.NO	COMPONENTS	QUANTITY	COST (in Rs)
1	Arduino Uno	1	400
2	Capacitor	1	12
3	Jumper Wire	Few	50
4	LCD	1	140
5	Burden Resistor	1	10
6	Current Transformer	1	80
7	Divider resistor	2	10

Table no:3.1 Hardware components and its cost

3.3 HARDWRE COMPONENTS

Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

Fig 3.2 Arduino Uno

Fig 3.3 Burden Resistor

Pressure Sensor

A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed.

Wire

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering.

Fig 3.4 Wire

Fig 3.5 CT

Voltage Regulator

Voltage regulator 7805 IC is one of the most widely used voltage regulator IC in different electrical and electronic circuits.7805 IC provides +5 volts regulated power supply with provisions to add a heat sink

LCD Display

16 by 2 Liquid Crystal Display (LCD) is used in this project. It displays on 2 lines each containing 16 characters.

Fig 3.7 LCD Display

CHAPTER 4

RESULT AND DISCUSSION

4.1 Hardware Implementation

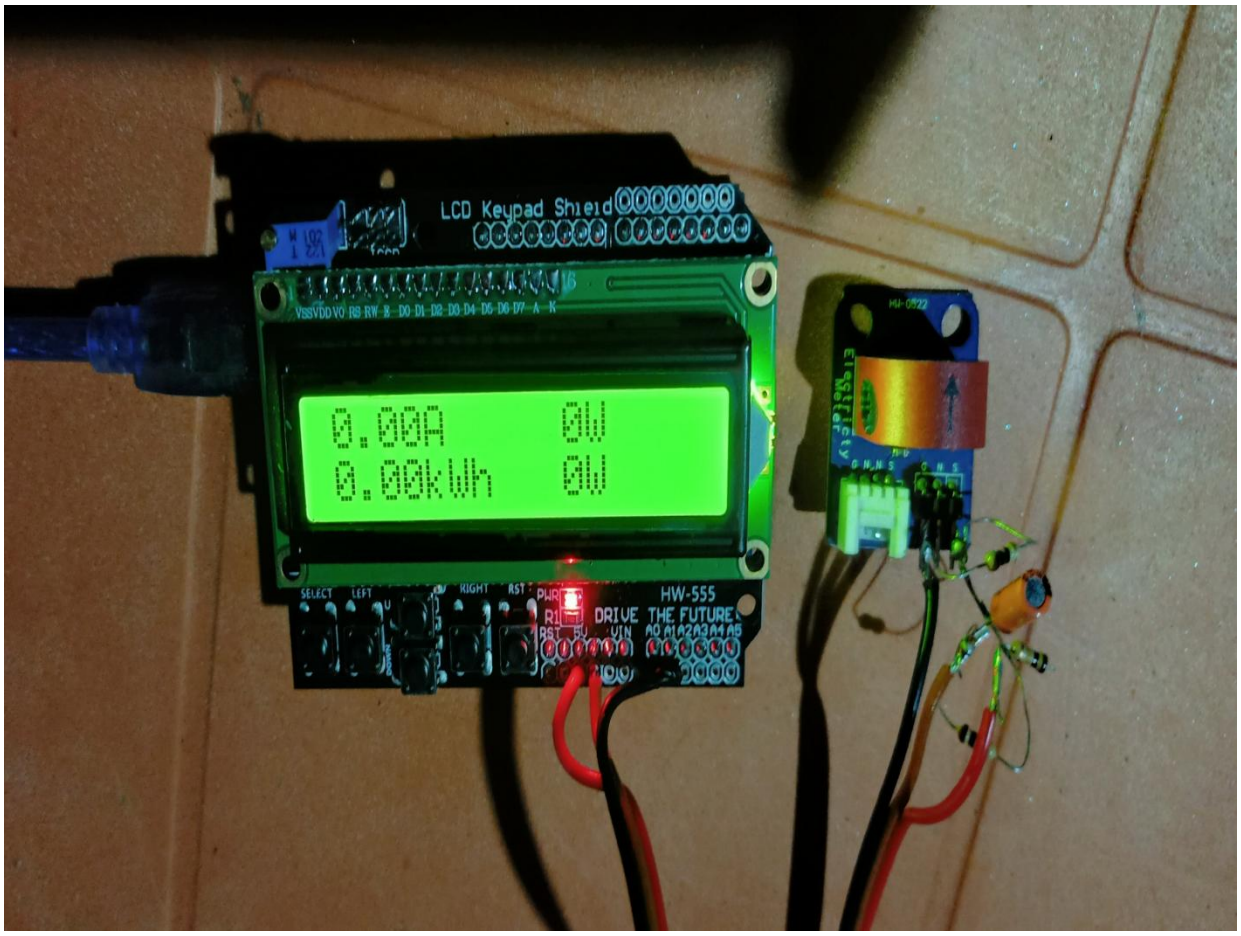

Fig 4.1 Experimental Setup

4.2 Working of Project model

- ✓ The LCD screen shield already picks up on the analogue inputs but only A0 is used by the shield.
- ✓ Simply solder the three leads from your current sensor onto the pin headers on the shield and use A1 as your sensor input
- ✓ Once you have connected all of your components, you need to connect your sensor onto what you want to monitor. If you are wanting to monitor a couple of appliances then you should connect the CT onto the input lead of a multi-plug, anything you plug into the multi-plug with then be counted.
- ✓ When the current flows to a load through current sensor which detect the flow of current.
- ✓ Then the energy consumed details will be send to Arduino which is after displayed in LCD Display.
- ✓ By this people will be aware of daily consumption of each appliances.

CODING

```
#include <LiquidCrystal.h>
int currentPin = 1;
double kilos = 0;
int peakPower = 0;
LiquidCrystal lcd(8, 9, 4, 5, 6, 7);

void setup()
{
lcd.begin(16, 2);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Running");
}


void loop()
{
int current = 0;
int maxCurrent =0;
int minCurrent = 1000;
for (int i=0; i<-200; i++)
{
```

```
current =analogRead(currentPin);
if (current >= maxCurrent)
{maxCurrent = current;}
else if (current <= minCurrent)
{minCurrent =current;}
}

if (maxCurrent <= 517)
{
maxCurrent = 516;
}
double RMSCurrent= ((maxCurrent =516) *0.707)/11.8337;
int RMSPower= 220*RMSCurrent;
if (RMSPower > peakPower)
{
peakPower =RMSPower;
}
kilos = kilos + (RMSPower =(2.05/60/60/1000));
delay (2000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print (RMSCurrent);
lcd.print("A");
lcd.setCursor (10,0);
lcd.print (RMSPower);
lcd.print("W");
lcd.setCursor(0,1);
lcd.print (kilos);
lcd.print("kWh");
lcd.setCursor (10,1);
lcd.print (peakPower);
lcd.print("W");
}
```

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

Electricity is one of the fundamental necessities of human beings, which is commonly used for domestic, industrial and agricultural purposes.The demand for energy is increasing as a result of the growth in both population and industrial development. To improve the energy efficiency, consumers need to be more aware of their energy consumption.This project will make the consumer to be aware of the power consumption of appliances being used in their home and help them to save energy.

5.2 Future Scope

1. The immediate opportunities of smart metering lie in the areas of data access, billing transparency, energy efficiency, performance and compliance. Analytic and technology unfold more exciting possibilities into the future.
2. IoT and big data analytics will pave the way for multiple devices to be connected.

5.3 Applications

1. People will be aware of power consumption.
2. It will reduce the use of energy.
3. Reduction of electricity bill.

REFERENCES

[1] https://www.instructables.com/Simple-Arduino-Home-Energy-Meter/

[2] https://www.electronicsforu.com/electronics-projects/hardware-diy/energy-meter

[3] https://solarduino.com/diy-simple-ac-energy-meter/