DESIGN AND BUILDING OF ADJUSTABLE OIL FILLER AUTOMATIC COOKING OIL MEASURING FLOW SENSOR METHOD BASED ON ARDUINO NANO

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ABSTRACT

Cooking oil is one of the household needs, where its use is very embedded among the wider community, therefore the circulation and distribution of cooking oil plays an important role, to help its distribution through MSME businesses, whether traders, the author designed an automatic cooking oil measuring tool with the research title Design Build an adjustable oil filler that measures automatic cooking oil based on Arduino nano. In the research the tool is running normally, using Arduino as the main component and the flow sensor inputs the tool data from the amount of liquid output, in the final result of this research the tool produces data values with output accuracy values 99.44% data taken from comparing the volume output of the instrument and Matt Glass measuring instrument as a reference for the original volume and the endurance test obtained a value of 93% with 30 trials with 2 failed trials. Therefore, it can be concluded that this adjustable oil filler tool functions well and can be used.

Keywords: Arduino cooking oil meter, Adjustable cooking oil oil filler

INTRODUCTION

In the development of small home businesses such as food stalls, they are the businesses closest to the lower, middle and upper class communities who come into contact with stalls, both retail and wholesale, every day to fulfill their daily needs.[1]According to Abdul Halim, in modern times, economic growth and development play an important role in increasing regional economic income, including the prosperity of Micro, Small and Medium Enterprises (MSMEs) because they have an important role in the economic and industrial growth of a country.[2][1]. In terms of oil circulation, there are many methods that are still considered traditional, such as packaging, which usually uses transparent plastic bags, which sometimes spill oil when putting the oil in plastic containers.[3], with a manual scale in the form of a liter scale[4][5]. Moving on from these problems, the author is motivated to design a tool that can make it easier for traders to weigh cooking oil and reduce the possibility of measuring errors with more effective and modern tools for accurate results.[4][6].

LITERATURE REVIEW

Arduino Nano

Arduino nano is a hardware device that contains an electronic circuit whose components consist of the ATMega328p IC as the main chip which can be programmed with a computer.[7][3]With the program, the Arduino can read the input or output produced by the sensors in the circuit, which will then allow the Arduino to control the process.

Flow Sensors

*Flow*Sensor is a type of transducer which is useful for converting mechanical, heat, chemical, light and magnetic quantities into electric current and voltage.[8].Flow Sensor is a sensor that can be used to measure the flow of water flowing in pipes. This sensor contains a plastic valve part (valce body), a half effect sensor, and an air rotor[9]. When water flows through the rotor, the rotor will rotate and the speed will match the flow of water through the rotor.

Arduino IDE

Arduino IDE is a software that runs using Java which consists of several features such as a program editor, compiler, and uploader with a programming language such as C.[7]. Integrated Development Environment (IDE) is a special program for creating designs on a computer or program sketches for Arduiono boards[10]

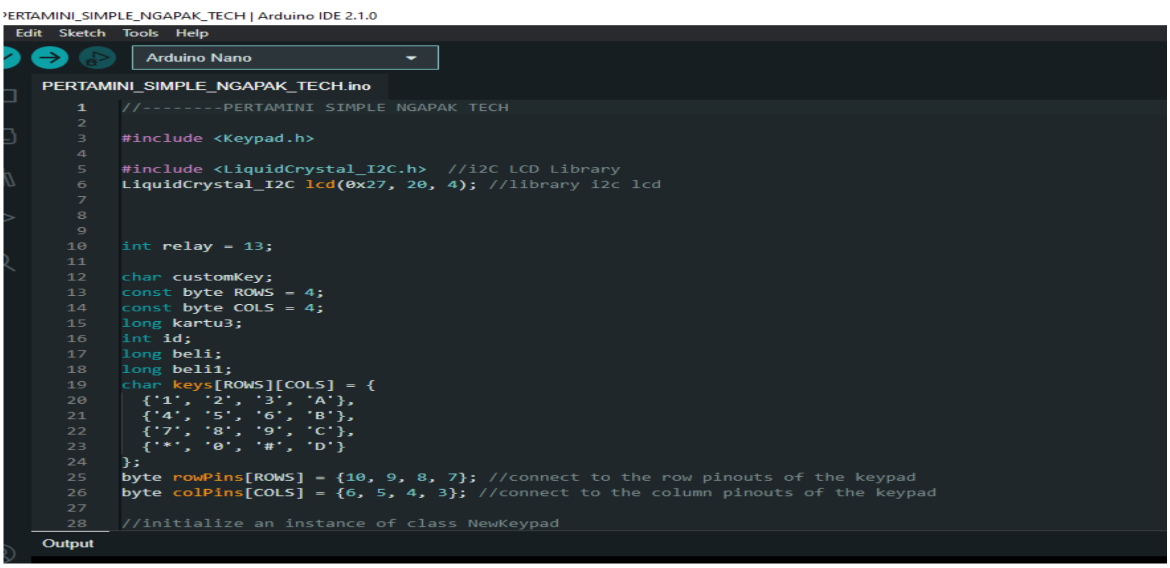

Figure 1. Arduino IDE display

4x4 Keypad

*Keypads*are push button switches arranged in a matrix that function to input data such as numbers and letters and so on. The push button switches that make up the keypad have 3 legs and 2 conditions, the first condition is that when the switch is not pressed, legs 1, 2 and 3 are not connected.

RESEARCH METHODS

Hardware Design

The hardware design of the adjustable oil filler for cooking oil can be seen in the picture below.

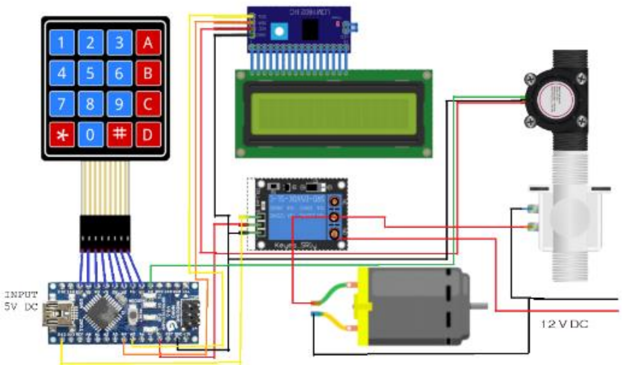

Figure 2.A series of adjustable oil fillers for cooking oil meters

In the picture above, Arduino is the main ingredient, several components such as a 20 x 4 LCD with additional I2C as a display for variable letters and numbers on the LCD layer, a 4x4 keypad for variable input, a DC pump controlled by Arduino via relay,[8] [11]*flow sensors*measuring fluid flow speed such as oil, solenoid valves and several other supporting components. The voltage needed to supply the device is 12 volts for the pump and 5 volts for the Arduino using DC / direct current voltage.[12].

Mechanism design of Adjustable Oil Filler

The mechanism of the adjustable oil filler tool is as follows:

1. 12 Volt DC Pump
2. *Solenoid Valves*12 volts DC
3. *Flow*Censorship
4. *Relays*5 Volts

5. ½ inch PVC thread
6. ½ inch water hose

The 12 volt pump is connected to a water hose which is connected to a flow sensor as well as a solenoid valve and a ½ inch thread pipe connected to each other to function as an output so that it is precise when the cooking oil dispensing process takes place.[9].

Software Design

The following is the program design for an adjustable oil filler tool for measuring cooking oil. The start menu shows the last purchase and starting amount to be selected in the form of a price variable, with the price per liter of oil having been set and stored in the device's memory.[13]. In the next menu, after determining the nominal input price, select the advanced menu for processing and the cancel menu to replace or repeat the nominal contents. If you select the advanced menu at this stage, the execution process takes place and writing appears on the LCD layer, namely the oil purchase nominal, rate amount flow speed on the flowrate sensor and volume value determined by the tool[13], At the final stage, the pump will turn on and filling will begin to take place into the container that will be filled with oil, once it is finished the pump stops and the tool shows that filling is complete, and repeats to the initial menu

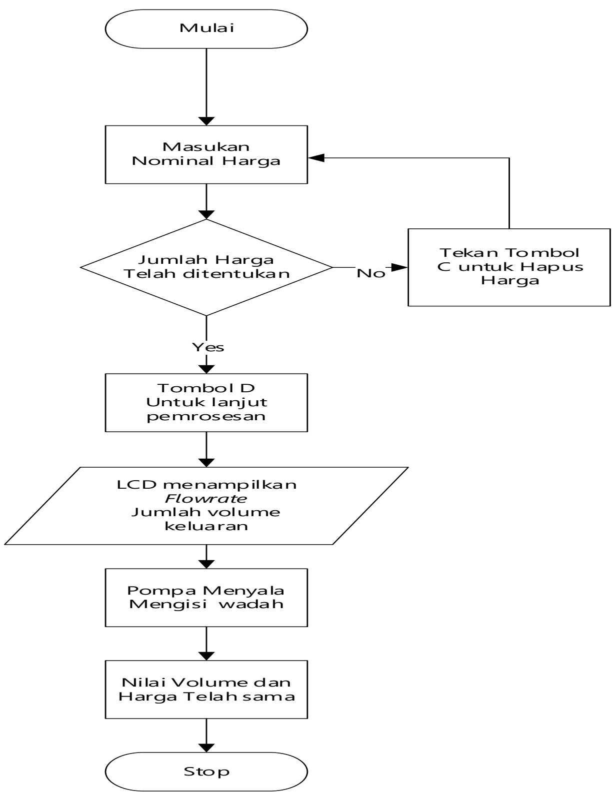

Figure 3. Adjustable Oil Filler Program Flow Diagram

RESULTS AND DISCUSSION

The tool testing stage of this research aims to determine the accuracy of the tool, using a 1000 ml Matt Glass measuring cup with a tolerance of 0.6 ml as a standard volume measuring tool. In figure 4 are the measurement results on the glass.

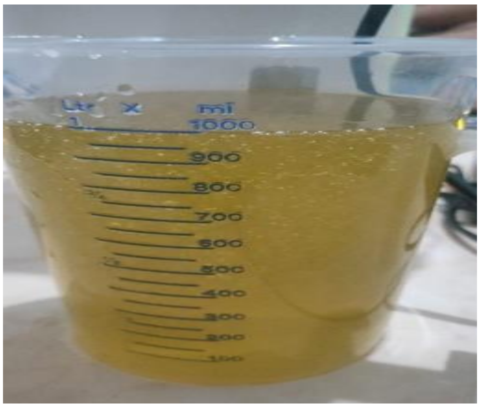

Figure 4. Results of measuring volume on a measuring cup

Data collection was carried out to measure the accuracy of the tool, namely from the results of measurements in several experiments in several with the volume released from the adjustable oil filler tool and the resulting volume was entered into a measuring cup as a reference for the actual scale. To see the comparison, see Table 1 below.

Table 1. Accuracy Data Retrieval Results

Number of Volumes Device Output (mL)	VOLUME IN MEASURING CUP (ML)	Accuracy (%)	Difference (%)
100	98	98	2
250	248	99.2	0.8
500	496	99.2	0.8
1000	997	99.7	0.3

1200	1196	99.6	0.4
1500	1497	99.8	0.2
1700	1698	99.8	0.2
2000	1996	99.8	0.2
2200	2195	99.7	0.3
2500	2492	99.6	0.4

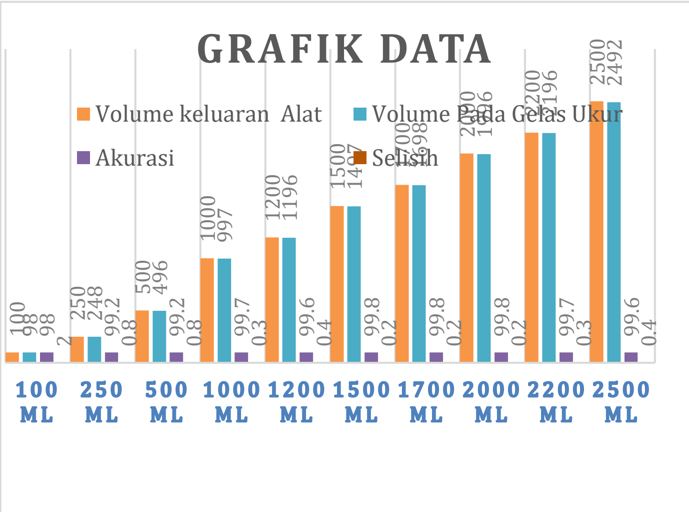

Figure 5. Comparative Data Chart of Tool Volume Measuring Results

From the presentation of data from the table and graph above, the results obtained are that the tool works well and as expected with an average percentage accuracy value of 99.44%. These results are obtained from the accuracy value in several number of experiments with the total number of results divided by the number of experiments that produced the average value. stated accuracy average. Next, we tested the durability by collecting data from several experiments operating the tool. This aims to find out what percentage of resistance the adjustable oil filler tool has, so the author carried out the experiment 30 times, there are 3 assessment factors, namely the process of turning on the tool, executing commands by the tool and if an error occurs in the tool . The data is provided in the following table.

Table 1. Tool resistance test table

Standby	Execution Process	There is an error
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Fail	yes
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Fail	yes
Yes	Succeed	No

Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No
Yes	Succeed	No

From the results of the data in the table above, it can be concluded that the experiment has been carried out effectively, this can be seen from the 30 experiments carried out with varying input volumes and the equipment resistance percentage obtained was 93% in the successful category and was indicated by the absence of errors during standby. . To calculate the percentage of success of the experiment, it can be done mathematically as follows:

$$\text{Persentase Ketahanan Alat } (\%) = \frac{\text{Total percobaan} - \text{Percobaan gagal}}{\text{Total percobaab}} \text{x} 100\%$$

CONCLUSION

Based on the data generated from the testing phase of the adjustable oil filler tool for measuring cooking oil, the author can conclude that the tool produces good results, with an accuracy of 99.44% accuracy, and 93% durability using a measuring cup / Matt Glass with a capacity of 1000 ml as a standard measuring volume reference.

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