Vol 01 2021, pp 30-36
e-ISSN: XXXX-XXXX
DOI: https://doi.org/10.54482/IJEBIIITS/vol01-iss1/5

INTERNATIONAL JOURNAL
Of Ethnoscience, Bio-Informatic, Innovation, Invention and Techno-Science

SMART FILTERING SYSTEM BASED ON COOKING OIL MICROCONTROLLER AS A HEALTHY SOLUTION FOR FRIED TRADERS ON THE ROADSIDE

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ABSTRACT

Cooking oil is one of the basic human needs as a means of processing foodstuffs. The need for cooking oil is increasing along with the increasing population in Indonesia, so that the used cooking oil produced is also increasing. The fact that has happened so far is that most street food vendors use cooking oil over and over again, even until the oil runs out. Even though the cooking oil is no longer suitable for use and will have an impact on health if it is still consumed. Purification of used cooking oil can be done by adsorption process using an adsorbent to maintain the quality of the oil so that it can be reused. The adsorption process is carried out by adding the adsorbent and mixing it into the oil then stirred and filtered. The most widely used adsorbent is activated charcoal. Activated charcoal is one of the advanced products of shell charcoal which has a relatively high economic value, which is about 10 times the economic value of charcoal. Based on the explanation above, the author took the initiative to develop a prototype of cooking oil purification using natural absorbent materials that are ergonomic for the community, in addition to oil purifiers, this tool will also be equipped with sensors that will help traders to get what they want. level of clarity through the circulation process controlled via the Arduino Mega 2560.

Keywords: Cooking oil, adsorption, charcoal, prototype

1 INTRODUCTION

1.1 Background

Cooking oil is one of the basic human needs as a means of processing food ingredients. The need for cooking oil is increasing with the increasing number of people in Indonesia, so that the usedcooking oil produced is increasing as well. The fact that has happened so far is that most fried food vendors on the street use cooking oil repeatedly, even until the oil runs out. Even though the cooking oil is no longer suitable for use and will have an impact on health if it is still consumed. Damaged oil during the frying process will affect the quality and nutritional value of fried food ingredients, damaged oil will produce ingredients with an unattractive appearance and unpleasant taste, as well as damage to vitamins and essential fattyacids contained in the oil.

The main cause of damaged oil is due to oxidation events, the result of which is the formation of peroxides and aldehydes. Free fatty acids formed in used cooking oil or used cooking oil are caused by the hydrolysis process that occurs during the processing

Frying is usually carried out at a temperature of 160-200oC. The water vapor produced in the frying process can cause hydrolysis of triglycerides and produce free fatty acids diglycerides, monoglycerides, and glycerol which is indicated by the acid number(Mardina, 2012).

The high acid number of a used cooking oil indicates the poor quality of the used cooking oil, so that used cooking oil that is disposed of as waste will disturb the environment and clog waterways. So that used cooking oil can be reused, it is tried to regenerate the oil by reducing the acid number, namely reducing the free fatty acid content.

Water, peroxide, free fatty acids, aldehydes and ketones contained in used cooking oil are separated so that the purification process occurs. Purification of used cooking oil can be done by adsorption process using an adsorbent to maintain the quality of the oil so that it can be

reused. The adsorption process is carried out by adding the adsorbent and mixing it into the oil then stirring and filtering it.

The most widely used adsorbent is activated charcoal. Activated charcoal is one of the advanced products of shell charcoal which has a relatively high economic value, which is about 10 times the economic value of charcoal. There are several ways to activate charcoal, for example by dry distillation of coconut shell which is known as physical activation, then chemical activation using chemical substances as activators, namely phosphoric acid (H3PO4), potassium carbonate (K2CO3) or zinc chloride (ZnCl2) (Pakiding, et al., 2014)

Then the other adsorbent is banana peel, according to the research results of Neni Sri Wahyuni (2014) Banana peel has a cellulose content of 14.4%, and organic compounds that have the potential to provide a fairly good calorific value. become a highly usable product. Kepok banana peel can be used to adsorb impurities in cooking oil. The results of this study provide a lighter color and are effective in reducing the water content of used cooking oil.

Repeated use of cooking oil causes changes due to the oxidation process and the more often it is used, the higher the level of damage. The damage caused includes: rancid smell and taste, increased levels of peroxides and free fatty acids, the appearance of oil viscosity, foam formation and the presence of impurities from the spices used and fried ingredients. The use of oil repeatedly will result in the oil getting dirty and brown in color as well as an undesirable taste in fried food ingredients and will cause it to be unhealthy for human health if consumed.

Based on the explanation above, the author took the initiative

For develop a prototype to purify cooking oil using natural absorbents that are ergonomic for the community, in addition to oil purification, this tool will also be equipped with sensors that will help traders toget the desired level of clarity through a circulation process controlled via Arduino Mega 2560.

1.2 Purpose of Writing

The purpose of this paper is to overcome unrest in the community by producing a prototype that is useful for producing clarity of used cooking oil in order to produce healthy food for the community.

The expected outputs of this tool are:

1. The creation of a prototype cooking oil filter tool
2. Articles in accredited national journals
3. Registration of Intellectual Property Rights (IPR) at DIRJEN DJKI regarding thistool
4. Progress reports as authentic evidence
5. Make a final report.

2. LITERATURE REVIEW

2.1 Cooking Oil

Cooking oil is oil derived from plants or vegetable oils such as corn oil, vegetable oil, and ghee that have been purified and can be used as cooking oil for food. Generally, cooking oil serves as an introduction to heat, a savory taste enhancer, and an increase in the calorific value of foodstuffs. The quality of cooking oil is determined by its smoke point, which is the heating temperature of the oil until unwanted acrolein is formed and can cause itching in the throat. The higher the smoke point, the better the quality of the cooking oil. Fat or oil that has undergone frying will reduce the smoke point due to hydrolysis of fat molecules. In general, the frying temperature is between 177-221ºC.

2.2 Activated Charcoal

Activated charcoal is a carbon that has good absorption ability against anions, cations, and molecules in the form of organic and inorganic compounds, both in the form of solutions and gases. Some materials that contain a lot of carbon and especially those with porescan be used to make activated charcoal. Activated charcoal is made through the activation process of charcoal

by physical or chemical means in the retort. Differences in raw materials and activation methods used can cause different properties and qualities of activated charcoal. Activated charcoal is used, among others, in the industrial sector (water treatment, food and beverage, cigarettes, chemicals, soaps, scrubs, shampoos, paints and adhesives, masks, refrigeration equipment, automotive), health (absorb toxins in the digestive tract and medicines).), environment (metal sorbent in wastewater,

Figure 2.1. Activated Charcoal
Source: https://akurat.co/gaya Hidup/id-1207933-read-yuk- ketahui-hasilarang-aktif-yang-justru-bisa-make-kulit-glowing

2.3 Banana Peel

Not only the fruit that contains many health benefits, banana peels also have a variety of benefits that are good for humans, including banana peels that contain 68.9 g of water, 18.5 g of KH, 0.32 g of protein, 2.11 g of fat, Calcium 715 mg, Phosphorus 117 mg, iron 1.6 mg, vitamin B 0.12 mg, and vitamin C 17.5 mg. flavonoids, as well as other phenolic compounds besides containing lots of carbohydrates, minerals, such as potassium and sodium, and cellulose. Where flavonoids and phenolic compounds are bioactive compounds that show various useful activities, such as antioxidants, antidermatosis, anticancer, and antiviral.

Figure 2.2. Banana peel
Source: https://health.detik.com/diet/d-4828351/correct-eating-skin-banana-can-help-lose-weight

2.4 TCS230 . color sensor

The TCS230 color sensor is a sensor that is often used in microcontroller applications as a detector of a color object or the object being monitored. This sensor can also be used as a motion reader sensor, where the sensor reads and detects the motion of an object. Basically this sensor, is a series ofphoto diodes arranged in a matrix array 8x8 with 16 pieces configuration photo diode that has a function as a blue filter, 16 configurations photo diode which has a function as a red

filter, 16 configurations photo diode without color filter. The TSC230 sensor is a sensor that is assembled in achips 8 pin DIP with a transparent front as a place to receive colored light intensity.

Figure 2.3. TCS230 . color sensor
Source : https://www.jualarduinojogja.com/tcs230-color-sensor/

2.5 Microcontroller
2.5.1. Understanding Microcontroller
Microcontroller is a computer system that all or most of its elements are packaged in one IC chip, so it is often called a single chip microcomputer. Microcontroller is a computer system that has one or several very specific tasks, different from PCs (Personal Computers) which have various functions. Another difference is the very different ratio of RAM and ROM between computers and microcontrollers. In a microcontroller, ROM is much larger than RAM, while in a computer or PC, RAM is much larger than ROM. (Wahyudin, 2006:3)

2.5.2. Arduino Mega 2560
Arduino is a microcontroller-based board or an open source electronic circuit board in which the main component is a microcontroller chip with the AVR type from the Atmel company. The microcontroller itself is a chip or IC (integrated circuit) that can be programmed using a computer. The purpose of embedding the program on the microcontroller is so that the electronic circuit can read the input, process the input and then produce the desired output. So the microcontroller is on duty as the brain that controls the input and output processes of a electronic circuit.

Figure 2.2. Arduino mega2560
Source:https://www.amazon.com/Arduino-Mega-MEGA-2560- Board/dp/B004A7H3DG

2.6 Seven Segment
Seven Segment Display (7 Segment Display) Indonesia is called the Seven Segment Screen In Language is component Electronics that can display decimal numbers through combinations of their segments. Seven Segment Display has 7 Segments where each segment is controlled ON and OFF to display the desired number. The numbers from 0 (zero) to 9 (Nine) can be displayed

using several combinations of Segments. Other than 0–9. Segments or elements onSeven Segment Display is set to the shape of the number "8" which is slightly tilted to the right in order to make it easier to read.

Figure 2.3. Seventh Segment Display
Source : https://ktechnics.com/shop/lcds-displays/7-segment-led-display-2/

2.7 PIR Sensor

PIR (Passive Infrared Receiver) is an infrared based sensor. However, unlike most infrared sensors, which consist of an IR LED and a phototransistor. PIR doesn't emit anything like IR LED. As the name implies 'Passive', this sensor only responds to energy from passive infrared rays that are owned by every detected object.

2.8 Electric Fuel Pump

Generally the electric pump is installed in the fuel tank. High pressure/low volume pump or better known as Fuel Injection Pump (FIP). This pump is in the fuel injection system serves to pump fuel at high pressure for supply to the
injector

Source: https://www.tokopedia.com/hprsparepartindo/electric-fuel-pump- universal-pump-diesel-petrol-electric-hep-02a

2.9 Filters / Filters

A filter is a circuit designed to drain a certain frequency band and eliminate frequencies different from this band. Another term for a filter is a circuit that can select a frequency in order to stream the desired frequency and hold, or discard another frequency

Source: https://encryptedtbn0.gstatic.com/images?q=tbn:ANd9GcSfW_Mx5GTfzIGvW0z101OqpkB3_mnDbKnuWBw&usqp=CAU

3.0 Return Hose

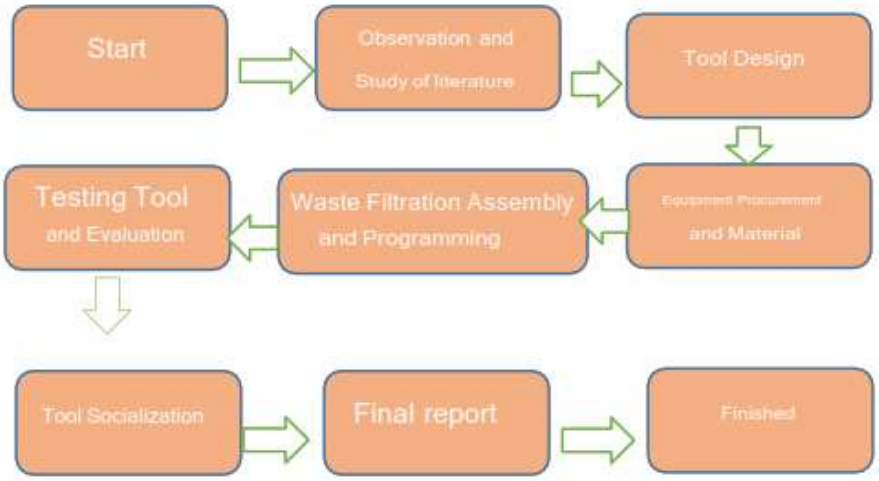
The function of the return hose is to drain the oil to be put back (circulation) into the tank. Hosethis is necessary because In this oil purification process, we will carry out a continuous filtering process until the level of oil clarity is reached

3.1. Pump Motor

The pump motor is a device for conveying fluid under pressure. This motor makes it possible to carry fluids where they have different heights.

3. IMPLEMENTATION STAGE

3.1. Implementation Stage



3.2 Conducting Observations and Literature Studies

Observations were made to see how much cooking oil wasused in daily life and to find problems with this cooking oil.

Indonesian society is known for the use of cooking oil in every food, especially the Minang people. In addition, many street snacks are fried in oil, resulting in a lot of used cooking oil. The next step is the study of literature, looking for books and journals related to the innovation of used cooking oil.

3.3 Tool Design

The design of this application uses the Microsoft Word 2010 application. In designing, we measure the measurements and layout of each component to be assembled, as well as any sensors that support theused cooking oil purification process.

3.4 Procurement of Tools and Materials

The selection of electronic components and the procurement of supporting equipment are the initial stages that must be carried out before the assembly process prototypeUlter Filtration.

3.5 Assembling the Waste Waste Filtration and Programming prototype

The process of assembling the used cooking filtrate is carried out by dividing the tasks with each member. The assembly was carried out by the FT Automotive Workshop, Padang State University. The steps that need to be carried out in the assembly process are as follows: preparing the work support equipment and materials needed, making a mechanical prototype of the waste cooking filtration and assembling it. The next step after being assembled is to create a program on the used waste filtration prototype. The purpose of making this program is so that Waste Waste Filtration can operate as desired.

3.6 Absorbent Preparation (Banana Peel and Activated Charcoal)

The process of making absorbents for used cooking oil is intended as an absorbent for both color, colloidal suspension and oil degradation such as peroxide.

3.7 Tool Testing and Evaluation

After the assembly and programming is complete, then we do a test of the tool and then if there is an error in the tool, it is immediately evaluated.

3.8 Tool Socialization

If the trial is successful, the tool will be socialized to residents and street food sellers such as fried foods, crackers, meatballs and soon.

3.9 Final Report

Making a final report is made when all stages are completed so that the results obtained from making the tool can be explained in detail.

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