DESIGN AND CONSTRUCTION OF WATER FILTER MODEL WITH ZEFAR MEDIA AND BACKWASH METHOD FOR MEDIA CLEANING

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ABSTRACT

From the results of research that has been done previously, which is entitled "RESEARCH OF THE INFLUENCE OF FILTER MEDIA COMPOSITION ON THE QUALITY OF FILTERED WATER" followed by the design of a water filter device model by utilizing ZEFAR filter media (Zeolite, Ferrolite and Activated Charcoal) with a frame using elbow steel with joints bolts and equipped with a backwash system, which is a system that aims to extend the service life of the media and make it easier to clean the media without having to remove it from the main tube. The design of this filter model aims to make it easier to test the quality of water filters with different compositions and types and ratios of filter media so that the best filtering days can be obtained.

***Keywords:** design, construction, zefar media, filter model, backwash system.*

Preliminary

Background

A water filter or water filter is already a major requirement to get water quality that is suitable for use, especially for areas where the water quality is not suitable for use, many have made water filters and have even been traded freely by utilizing various kinds of filter media and compositions. different, but no one has guaranteed the results of the filter to produce the best quality. Therefore, to continue the results of the previous research

entitled "RESEARCH OF THE INFLUENCE OF FILTER MEDIA COMPOSITION ON THE QUALITY OF FILTERED WATER" we tried to design a model of a water filter equipped with a backwash system. The aim is to make it easier to do further research both in terms of media composition, media type, media ratio and required capacity, maybe even the installation system[1, 2].

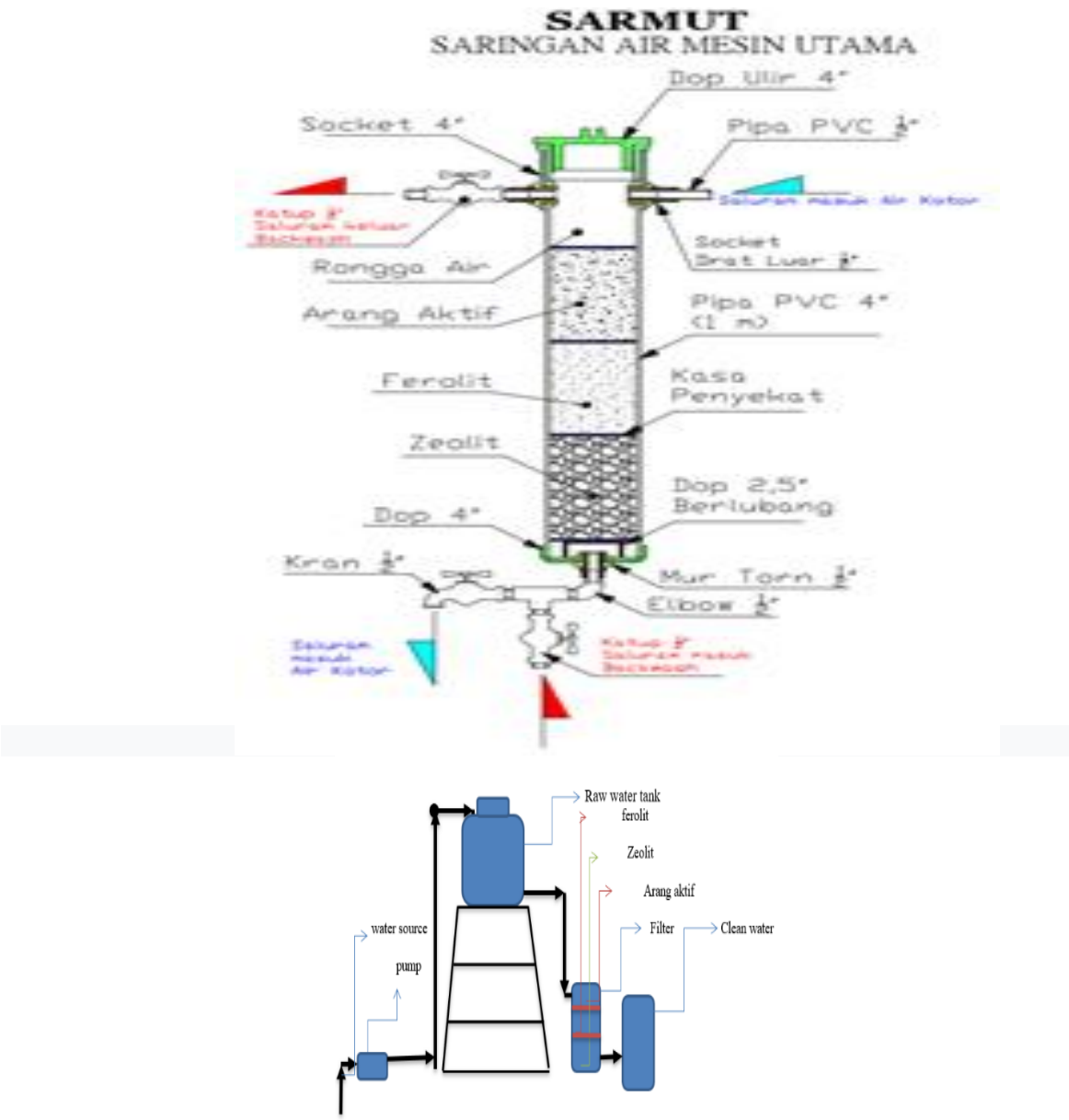

Fig. 2. Water Filter Installation

2. Purpose

The purpose of the design of this water filter model is to facilitate further research both in terms of media composition, media type, media ratio, required water capacity and even the installation system. In addition, it is hoped that by making this model it can assisting the community in making a water filter using the backwash method (cleaning the media

by utilizing the opposite direction of the incoming dirty water) [3]which is easy, cheap, and effective

Methodology

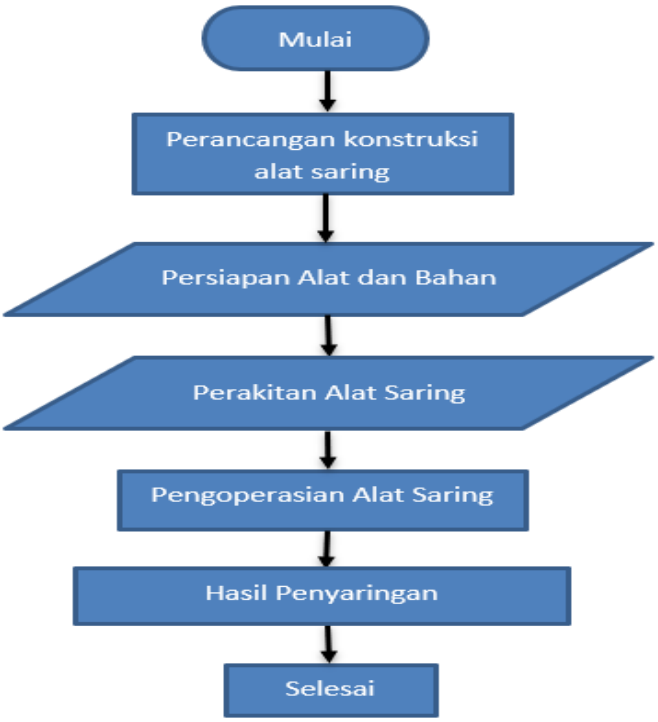

Fig.3. Process Flowchart

The design of this water filter model follows the flow diagram as above, after designing the construction, it is continued by preparing the tools

Water Filter Design

This filter has a filtering capacity of 4.6 seconds per liter using a main tube measuring 4 inches with a length of half a meter and using 3 kinds of filter media, namely zeolite, fibrolite, and activated charcoal, designed with a semi-automatic cleaning or rinsing system called the system. Backwash is by providing a flow that is opposite to the incoming water so that the dirty media is rinsed to remove dirt from the media which does not require the process of disassembling the media, simply by giving the water flow from the opposite direction using clean water[4].

Tools and materials used

Tools:

Fig.4. Tool

The above tools consist of:
1. Hacksaw
2. Scissors
3. Drilling machine
4. Drill bit
5. Steel ruler
6. Ruler elbow
7. Tool sets
8. Wrench
9. Wrench
10. Seal Tape
11. Digital scales

Material :

1. Paralon pipe with a diameter of 4 inches and a length of 0.5 m

Fig. 5. Paralon Pipe Para4 inch

The filter media consists of:

- *Zeolite*

Fig. 6. *Zeolite*

Ferrolite

Fig. 7. *Ferrolite*

- Activated charcoal

- Fig. 8. Activated charcoal

2. Paralon pipe for conduit with a diameter of 0.5 inches

Fig. 9. 0.5 inch PVC pipe

3. Stop faucet with a size of 0.5 inches crank type

Fig. 10. Stop Faucet 0.5 inch

4. Valve with 0.5 inch ukuran

Fig. 11. 0.5 inch valve

5. Submersible pump

Fig. 12. Submersible Pump

6. Pipe connection – L

Fig. 13. L . Connection

7. Pipe connection – T

Fig. 14. T . Connection

8. Converter connention 3/4” to 1/2”

Picture. 15. Converter connection
3/4” to 1/2“

9. Camp C

Fig. 16. 4 inch Pipe Clamp

10. Sandpaper

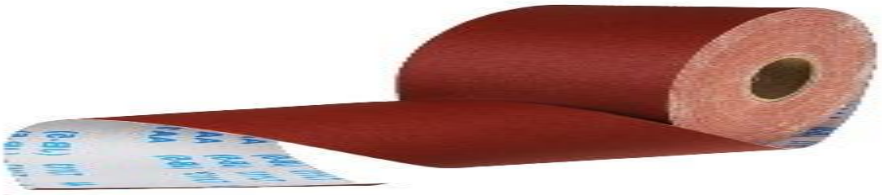

Fig.17. Sandpaper

11. Nuts and bolts

Figr. 18. Nuts and bolts

12. Outer and inner threaded socket

Figr.19. Outer and inner threaded socket

13. *Cable ties*

Fig. 20. Cable ties

14. Sponge Filter media using filter foam

Fig. 21. Spon Filter

15. Elbow Steel Plate

Fig.22. Elbow Steel Plate

16. Reinforcing elbow

Fig.23. Reinforcing elbow

17. Water Mur

Fig.24. Water mur

18. Inner threaded shock and outer threaded hubcap

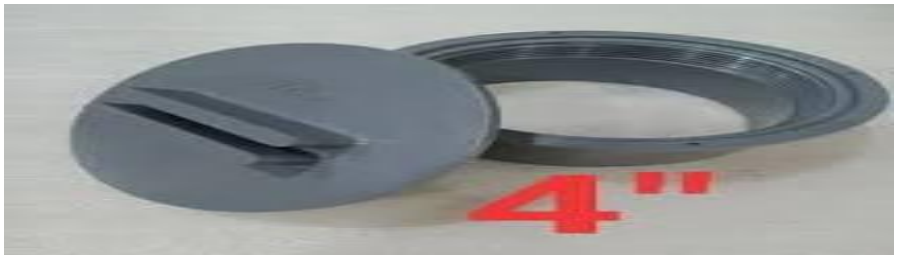

Fig.25. Inner threaded shock and outer threaded hubcap

19. Cap Close

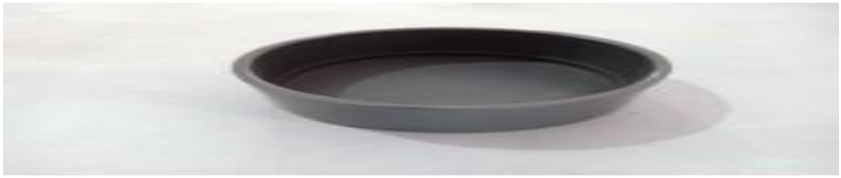

Fig. 26. Cap Close

20. Torn nut

Fig.27.Torn nut

21. Filter hubcap

Fig.28. Filter hubcap

22. PVC Glue

Fig.29. PVC Glue

23. Water Tub

Fig. 30. Water Tub

Water filter model construction

This filter model tool as a whole consists of several main parts, namely:
1. Frame
2. Main tube filter media.
3. Piping system
4. Water Tub
5. Water Pump

1. Frame

The frame is a part of the support and holder of this filter model as can be seen in number 1. in Figure 31 below.

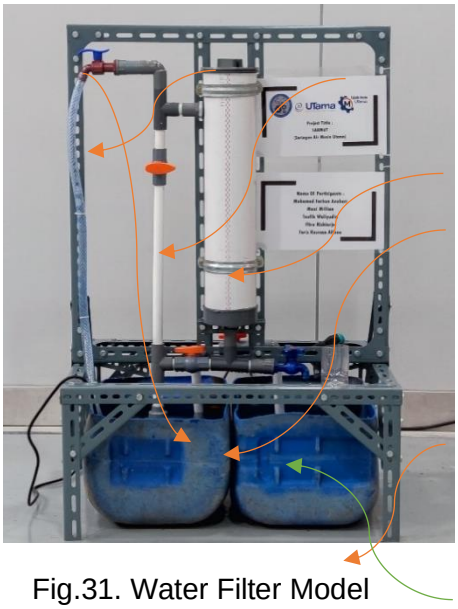

Fig.31. Water Filter Model

Fig.32. Water Filter Model

This frame is made of angled steel which is composed of 8 angled steel rods with a size of 3.5 x 3.5 x 75 cm, size 3.5 x 3.5 x 50 cm for 2 bars, 3.5 x 3.5 x 20 cm as many as 12 sticks and measuring 3.5 x 3.5 x 30 cm as many as 4 sticks.

2***. Main Tube Filter media***

This tube is a holder for filter media made of PVC pipe with a size of 4" x 50 cm, as in picture number two in picture.31. This tube contains a filter media consisting of activated charcoal, ferrolite and zeolite as well as an insulating sponge.

This filter media before being put in the main tube must be washed first until clean and dried again by drying. The composition of the filter media is the lowest Zeolite, the next is

ferrolite and the top is activated charcoal between each media is insulated with a sponge in order to avoid mixing the media, at the top is installed an upper bulkhead to hold the sponge so as not to be dragged by the flow of water during backwash, on the bottom is installed with a bottom bulkhead to avoid the filter media being carried away by the flow of water so that it can clog the drain pipe.

At the bottom of this tube is closed with a hubcap cover and at the top it is closed with an inner screw cap so that it is easy to open making it easier when changing media or controlling.

The media installation process is as shown in Figure 33 below.




3. Piping system

This piping system is a series of 1/2" pipes which are connected with various kinds of connections that are tailored to the needs with the main function being to drain water from the filter pump when filtering or backwashing. As shown in Figure 31 component 3.

3. Water tub

The water tank consists of two tubs whose function is one for collecting dirty water and the other for storing clean water, each of which has a size of 40 x 30 x 25 cm. As shown in Figure 31 component 4. Tubs a. for clean water reservoirs and tubs b. for holding dirty water.

4. Water Pump

The water pump functions to suck water and enter the main filter during filtering and presses water from the opposite direction to enter the filter during backwashing[5].

1. How the Water Filter Model Works.

The workings of this water filter model are as follows:

The working function of the water filter model consists of 2 functions, namely:

1. This tool serves to filter the impurities contained in the water so that the resulting water becomes clean.
2. The second function of this tool is to clean the filter media without having to remove the main filter tube media but simply by flowing it in the opposite direction to the water inlet when it functions to filter which is known as the backwash system.

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Fig.34. Water Filter Model

The working steps are as follows:

1. Filtering step For this filtering step, it can be seen from Figures 31,32 and 34.

First of all connect the pump power to the power source then open valve 11 and close valve 10, close valve 7, open valve six, close valve 8, and open valve 9 so that dirty water from the dirty water tank (tub b) will be sucked into the tube. the main filter so that it passes through the filter media and flows into the clean water bath (tub a).

2. Media cleaning step (backwash)

As with the filtering step, we also see the steps for cleaning the media or back wash from Figures 31,32 and 34.

Connect the pump power to a power source then open valve 10, close valve 11, close valve 6, open valve 7, and close valve 9 so that water flows from the clean water tank through the main filter tube from the opposite direction to the filtering direction which results in sticky dirt on the media will be carried away by the flow of water and into the dirty water tub.

6. Screening Results

From the dirty water filtering process that we carried out using a filter model with ZEFAR media, namely zeolite, ferrolite and activated charcoal, we produced cleaner and odorless water after going through the filtering process. The following is the result of the water after being filtered:

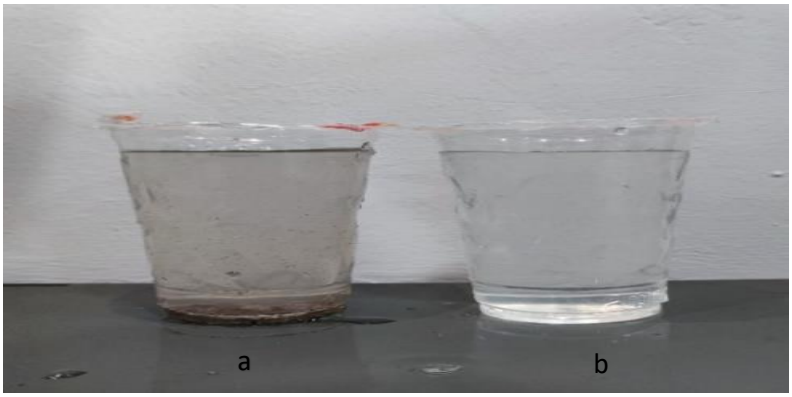

Figure 12.a. Water Before Filtration Process Figure 12.b. After going through the filtering process

Conclusion

From the results of the operation of the filter that we made, it can be seen that the quality of the water filtered using ZEFAR media (zeolite, ferrolite and activated charcoal) with a composition ratio of zeolite, ferrolite and activated charcoal 75%, 75% and 90% of a volume of 1 kg and a discharge of 0, 5 turns of the faucet, it can be concluded:

1. The most influential is the debit and
   the ratio of filter media
2. The filter affects the quality and clarity of the water
3. The more media, the better the filtering quality
4. Variations in media composition affect the quality of filtered water.

It is necessary to do research for various media compositions to obtain better results.

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