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Turbidity Reduction by Using Ceramic Flat at Kampung Lama Orang Asli Leboh, Kangkar Senangar

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Abstract: Ceramic flats are used to treat groundwater from tube wells in the Johor districts of Kampung Lama Orang Asli Leboh, Kangkar Senangar, Parit Sulong, and Batu Pahat. People of this village have struggled to obtain clean water to drink for more than 50 years. Regardless of the development of a sand filtration system and the lack of an efficient maintenance facility, the issue of sources of clean water cannot be resolved. Water from the tube well was connected to the ceramic flat. The turbidity value was measured both before and after it had been connected to the ceramic flat. The turbidity of the filtered water was evaluated using a pHotoFlex® Turb/SET Portable LED filter photometer. The drinking water quality standard in Malaysia permits a maximum value of 5 NTU. The goal of the research is in conjunction with ceramic flats, which can have a value of less than 1 NTU. This analysis revealed that ceramic flats can cut turbidity by 97%. The ceramic flat has the ability to treat water on a routine basis and has a high percentage of turbidity reduction. The ceramic flat is able to treat the water on a regular basis and has a high rate of turbidity reduction.

Keywords: Ceramic flat, Tube well, Groundwater, Turbidity

1. Introduction

Groundwater is the water that permeates the outer layer of the earth and goes through the voids of rocks to meet the water table. Groundwater is framed when water permeates the outer layer of the earth and goes through the voids of rocks to meet the water table. Groundwater water system gives a safer source, are less vulnerable to drought, and have simpler access to individual utilization contrasted with the traditional techniques for water systems for surface water [1]. Groundwater has been gotten by digging wells and regular springs. Groundwater is one of the main regular assets that normally safeguards against pollution by channeling layers of rocks and soil [2]. A tube well is a tube or long

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pipe that is drilled or penetrated the profound into the ground. It captures at least one-layer bearing water and for the most part, has a little width.

Ceramic water flats are a flexible water filtration technique that utilizes normal media to dispose of microscopic organisms and sediment from drinking water. Artistic channels range from under-sink establishments for point-of-purpose utilization to convenient channels where you can set up camp outings to remain hydrated during your experiences. Ceramic water flats are probably the most seasoned technique for water filtration available. In 1827, creator and potter Henry Doulton found that sifting water through permeable ceramic media would eliminate waterborne microorganisms like cholera from drinking water [3].

The issue with water cannot be resolved, particularly in the village area. For more than 17 years, the Leboh Orang Asli village of Kangkar Senangar has struggled to find a reliable source of drinking water. Despite numerous requests for assistance from the government, they still face this issue. Because they did not receive attention from the authorities, the villagers were forced to drink contaminated water. Even though have a filtration system, they don't have a good maintenance system, so they can't get clean water. Additionally, the open-area filtration system makes it simple for a variety of things, such as the water tank's animal carcasses, to enter the water. Due to pressure flow, the people of Kampung Kangkar Senangar are forced to use filthy water sources, especially during wedding feasts, when the festival is insufficient to support their daily lives according to Mr. Lim Bin Abdul Rahman the head of the Kangkar Senangar village community. There are many complaints, especially from Orang Asli villagers on water, sanitation issues and not having water resources in their daily lives. This matter is still going on despite the views of the government, which broke its promise. The government must emphasize this by handling the water problem, especially in the villages, and not focus too much on the urban areas only because many victims in the villages have lived miserable life without having clean water for many years [4].

Turbidity has generally been referred to as a component of "optical water quality," which is a significant limitation in determining whether water is practical for its role in the biosphere or human environment [5]. Turbidity is perhaps the most widely used and significant boundary for determining the nature of drinking water in terms of quality management. Module-packed flat-sheet membranes can handle feeds with high rates of turbidity and are dispensable. Ceramic flat-sheet membranes can be cleaned mechanically; they can withstand backwashing, high-pressure water jet cleansing, and air scrubbing [6]. Ceramic membranes can be folded into sheets or discs. Since they have a low packing density, disc membranes can only be used in small-scale industrial, pharmaceutical, and laboratory applications [7].

2. Materials and Method

The methodological study is to describe comprehensively related to the framework work carried out in this study. This section will elaborate on the methodology, study design, work process, as well data analysis used in this study. The general project flow and the methods used to carry it out are shown in Figure 1. Referring to Figure 2, groundwater samples and water samples taken from storage tanks after ongoing the sand filtration system used in this study were taken from the tube well at Kampung Lama Orang Asli Leboh Kangkar Senangar, Batu Pahat, Johor.

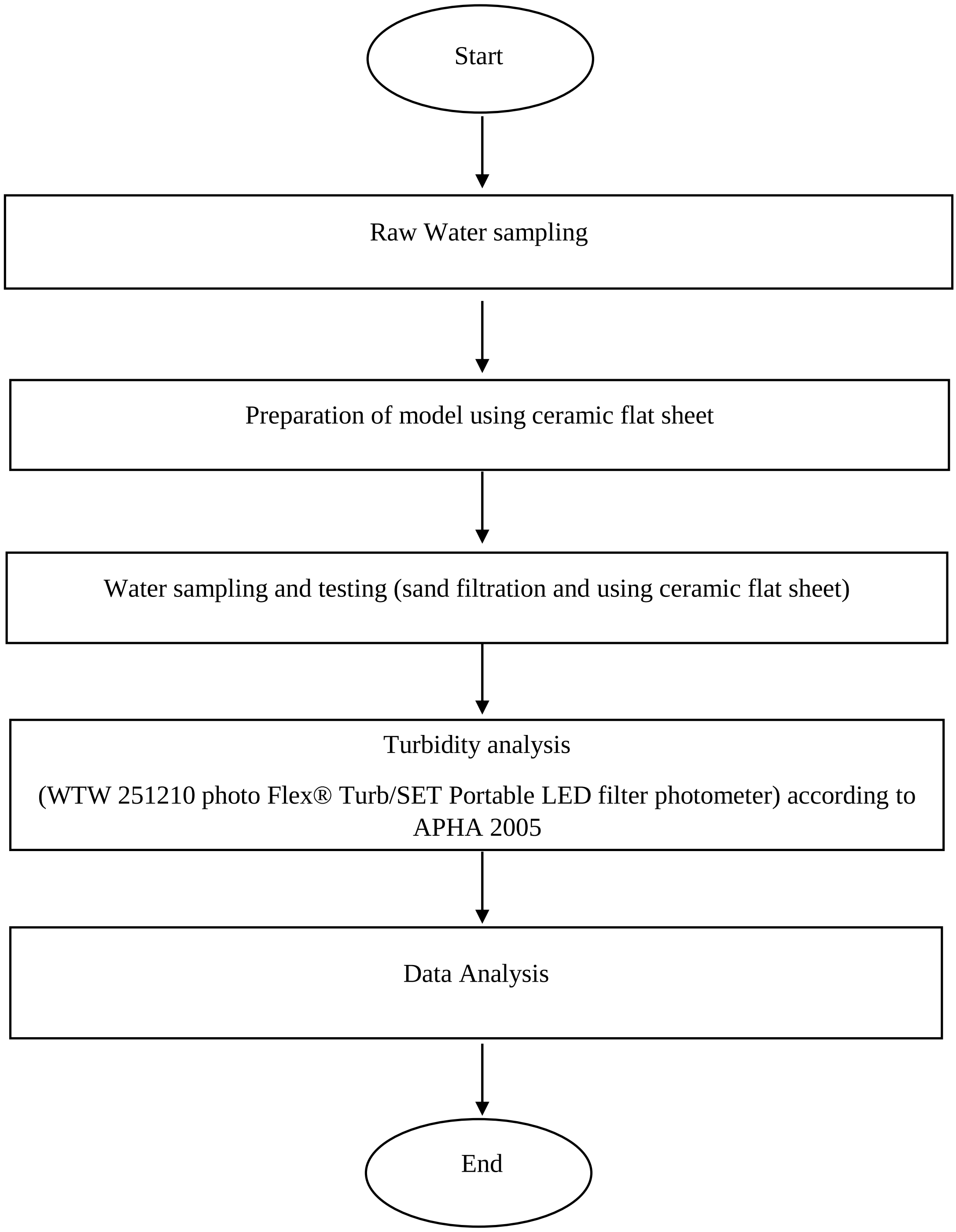

Figure 1: Study Flow Chart

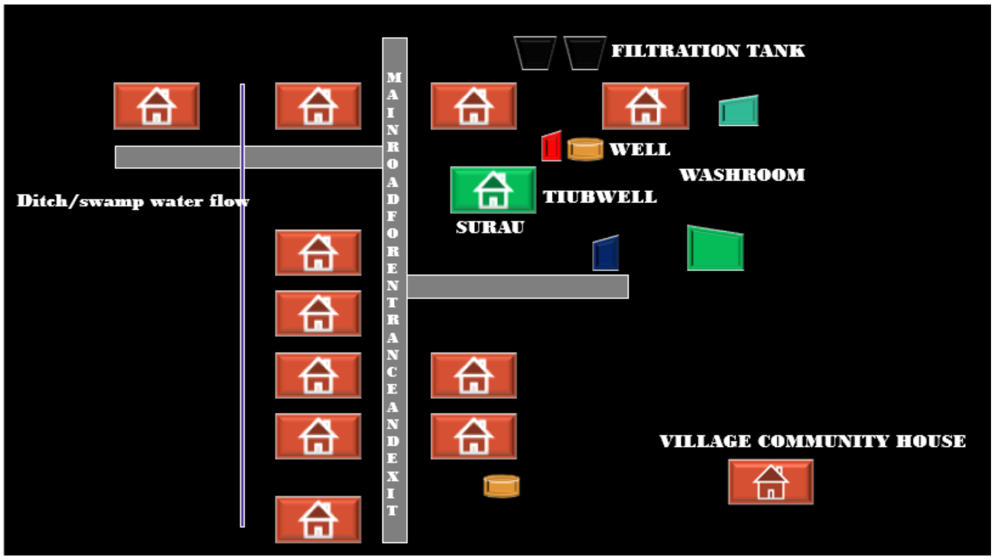

Figure 2: Location of tube well and sand filtration tanks

2.2 Materials

Ceramic Membrane (510mm x 150mm x 4mm), a 1/2-inch angle valve, a 1.5-meter (Fully Stretchable) hose, and a 35ml storage box were used to construct a small prototype as shown in Figure 3. The point valve has been associated with the tube well. A stretchable hose was then used to connect the tube to the ceramic flat and the tube well. When the water is turned on, the water flows through the tube that is provided in the ceramic flat, and the less turbid water begins to flow on the flat surface. Using the ceramic flat surface-flowing water, a turbidity test was carried out as shown in Figure 4. The turbidity of water that flows through a ceramic flat membrane was tested using pHotoFlex® Turb/SET Portable LED filter photometer according to Standard Methods for the Examination of Water and Wastewater APHA 2005 [8].

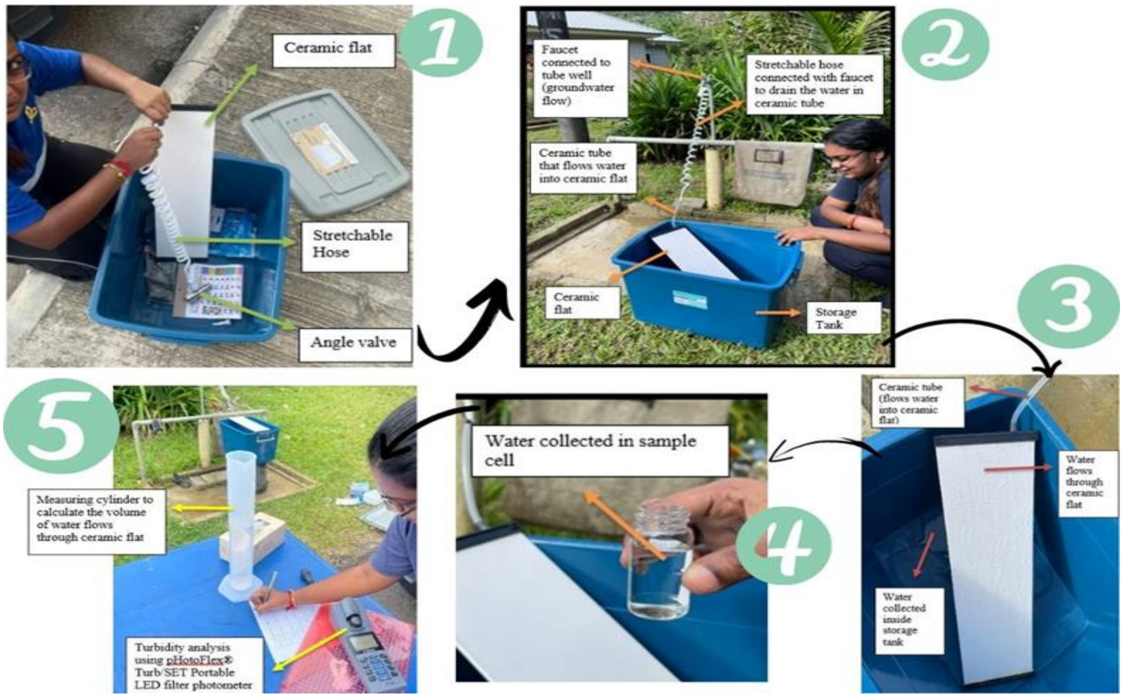

Figure 3: Sampling Preparation using ceramic flat membrane and water turbidity testing

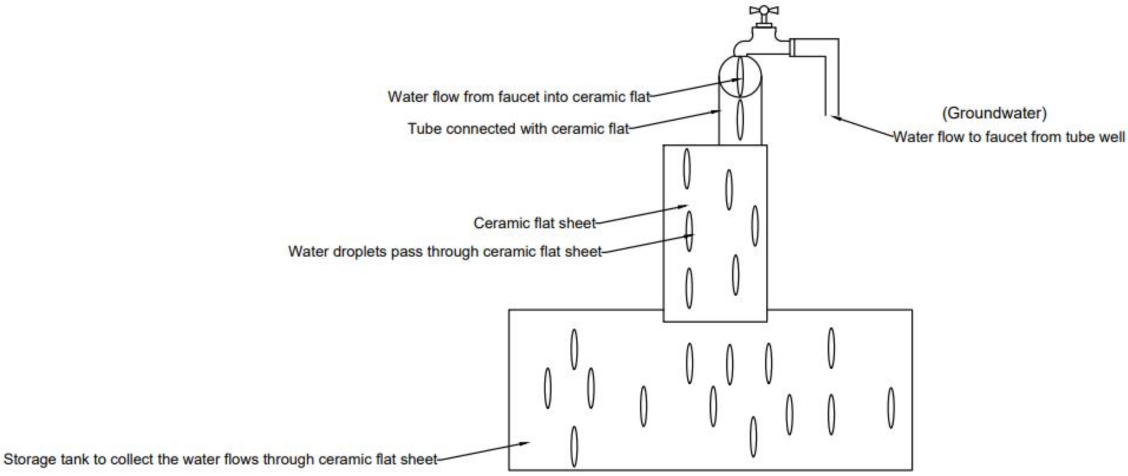

Figure 4: Schematic diagram using ceramic flat membrane connected to tube well

A water sample was collected after entering the Ceramic Flat Membrane, and the groundwater was obtained from a faucet that was connected directly to the tube well. After 20 seconds, 40 seconds, and 60 seconds, water samples were taken. Additionally, water samples were taken from the tubewell in order to compare the filtration method's turbidity efficiency. Before being sampled, the testing specimens were cleaned with distilled water. After that, the samples are put into specimens. The sample bottle is meticulously cleaned before being inserted into the WTW 251210 pHotoFlex® Turb/SET Portable LED filter photometer. The sample specimen was then positioned appropriately to minimize reading errors. To determine the flow rate, the volume of water that moves through was measured using a measuring cylinder.

3. Results and Discussion

3.1 Analysis before implementing the turbidity testing process using sand filtration and ceramic flat membrane

According to Figure 5, the turbidity was lower during earlier tube well runs. In order to evaluate the precision of the data determination, the turbidity testing was carried out 10 times respectively for 20 minutes. Turbidity concentrations are primarily influenced by a water body's flow rate [5]. Water that moves quickly can carry larger particles and sediment. Sand, silt, clay, and organic particles can be carried to surface water by heavy rains. Turbidity can also be impacted by a change in flow rate; Particulate matter from bottom sediments may be resuspended in the water if the water current's speed or direction changes [9]. Spillover is the source that can increase the turbidity in storage tanks. Particulates can enter a natural body of water in a variety of ways, resulting in an increase in turbidity. Particulate matter is picked up by the landscape as rain and melting snow flow across it. In an urban setting, this could be pollutants, dust, pet waste, and more [1]. This could be leaves or loose soil in a rural area. The velocity of rainfall entering a body of water will increase, eroding riverbanks and bringing in additional sediment. In the meantime, the storage tank had high turbidity because dead animals were found in the tank when conducted the testing. Animals can cause turbidity when they stir up silt, cause erosion, or release solid waste into the water [10].

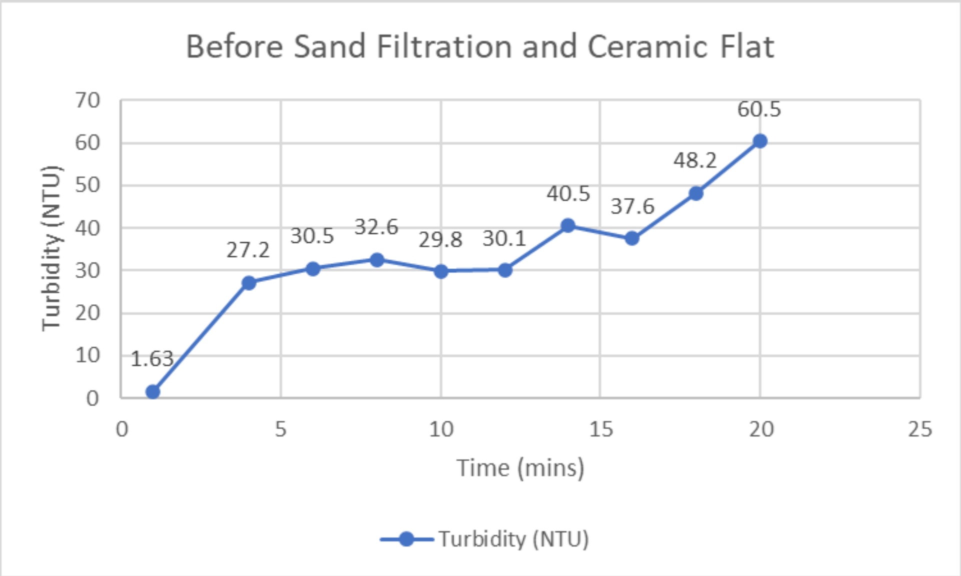

Figure 5: Raw water turbidity analysis

3.2 Analysis after implementing the turbidity testing process using sand filtration and ceramic flat sheet membrane

Following the ongoing sand filtration process, the turbidity of the water was continuously tested for twenty minutes as shown in Figure 6. The measured turbidity averaged 6.6 NTU. After the ongoing sand filtration process, it was evident that the level of turbidity in the water was still higher. The sand filtration method was shown in an open area without a closed system to keep animals and debris out of the water tanks. Additionally, the sand filtration system's maintenance system required a lot of manpower and took up more time. The sand filtration system's quality is also impacted when coarse rock, gravel, fine sand, and fish scale absorbent are removed during maintenance [11]. To keep the system from being disrupted, the system needs to be reorganized effectively once more.

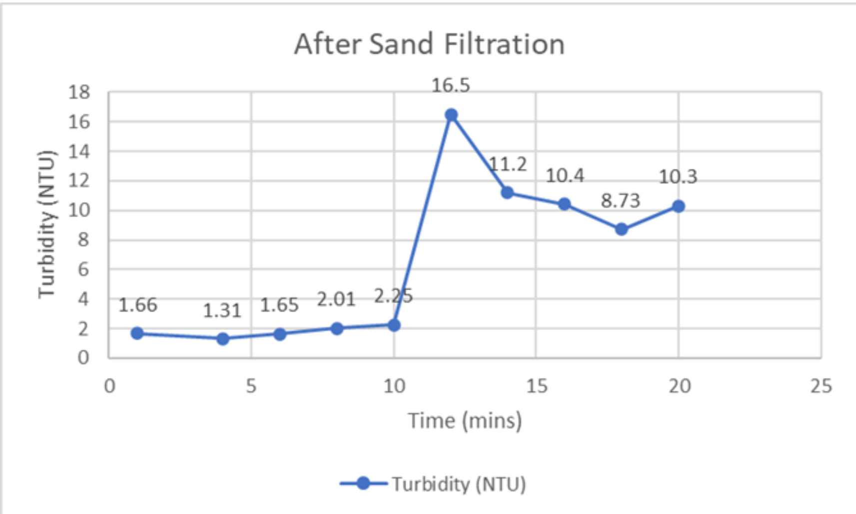

Figure 6: Turbidity analysis using sand filtration method

According to Figure 7, the effectiveness of using a ceramic flat membrane to reduce turbidity was evaluated by simultaneously testing the water from a tube well for 20 minutes. When the data obtained with the ceramic flat membrane met the criteria for the data range to be below 1 NTU, the most precise average value that was obtained was 0.80 NTU, indicating that the use of the ceramic flat in the reduction of turbidity levels results in gradual changes when the results achieved the clear level that is required by the World Health Organization (WHO) for drinking water [12].

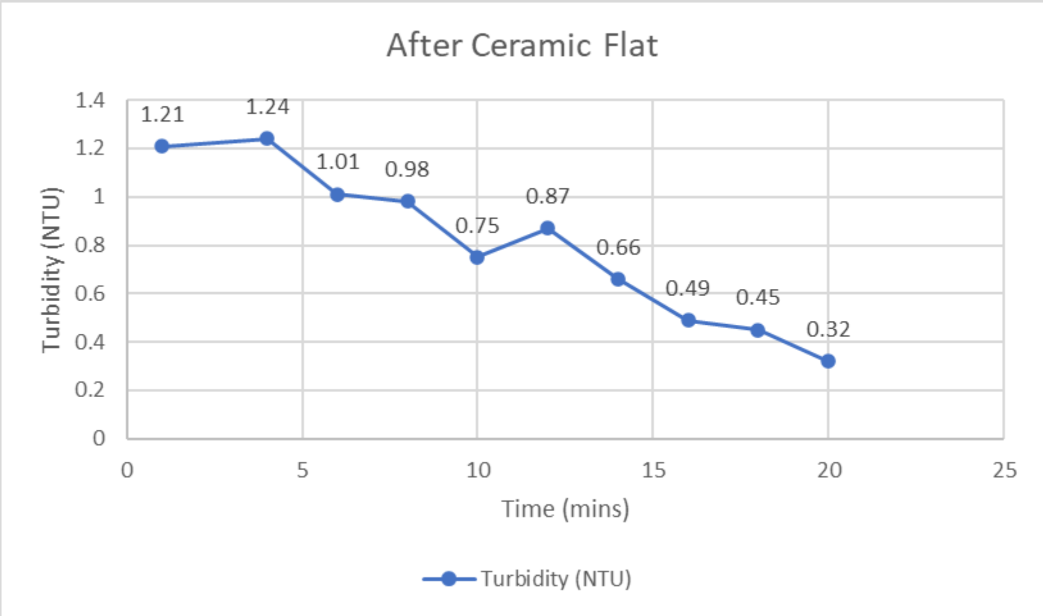

Figure 7: Turbidity analysis using ceramic flat

According to Figure 8, the flow rate of a body of water has the greatest impact on turbidity concentrations. Larger particles and sediment can be carried by moving water. Heavy rains can carry organic particles, sand, silt, clay, and other materials to surface water. A shift in flow rate can also have an effect on turbidity; If the speed or direction of the water current changes, particles from the bottom sediments may resuspend in the water [11]. In spite of the fact that negatively charged functional groups attract positively charged contaminants, the adsorption of the compound onto the surface of the adsorbent removes more turbidity [13]. After testing with a ceramic flat, all of the final results met the turbidity limit set by the Drinking Water Quality Standards, which is less than 5 NTU [14]. The movement of the soil beneath the tube well causes the turbidity in the tube well to become cloudy if the flow rate increases. With the movement of soil and sandstone, the water and residual soil will mix in the blank casing [1]. As a result, the water will be cloudy, particularly during the wet season.

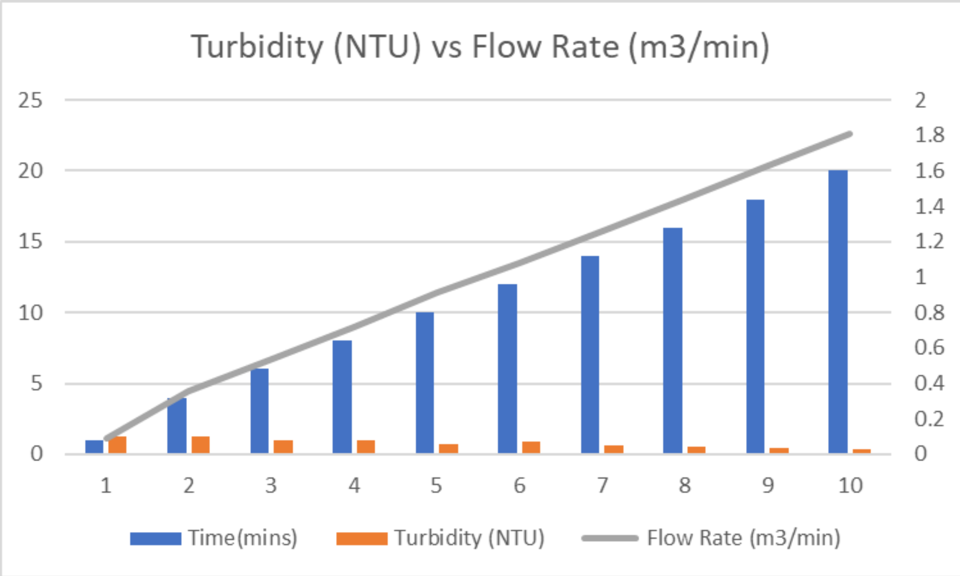

Figure 8: Turbidity vs flow rate analysis using ceramic flat

4. Conclusion

According to the findings of this study, ceramic flats can reduce turbidity by 97%. The ceramic flat's average turbidity value was 0.80 NTU, while raw water's average turbidity value was 6.6 NTU. Malaysia's drinking water quality standard states that the maximum value that is permitted is 5 NTU [15]. Using ceramic, the flat value can be less than 1 NTU, achieving the study's goal of success ceramic flat has a high rate of turbidity reduction and can be utilized for daily water treatment. The ceramic flat has a high rate of turbidity reduction and can be utilized for daily water treatment. Additionally, a ceramic flat can produce 1440000 L/day of water at a rate of 1 m^3/min. Every day, Kampung Kangkar Senangar residents require 2271 liters of water. The community there can get enough filtered water to meet their daily needs by using ceramic flats. Despite the presence of a filtration system, the data value that indicates the turbidity is extremely cloudy, posing a threat if nothing is done, as the village community is dependent on the polluted water source.

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