Neutralization, coagulation and filtration process in peat water

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Abstract. The research purpose is to find out about neutralization, coagulation and filtration processes in peat water. Water is an environmental component that has a considerable role and the requirements in terms of quality and quantity. This research method uses experimental design and the variables are the processes of neutralization, coagulation, and filtration of peat water. Descriptive statistical analysis is an analysis carried out to assess the characteristics of a data. The results of the research were from the initial test obtained pH = 4.32. There are some changes from all parameters starting from dark black water colour (1088 PtCo) to 179 PtCo, high turbidity (13,2 NTU to 6,55 NTU), high iron content (1,68 mg/L) to 0,26 mg/L, high chromium (0,093 mg/L) to 0,023 mg/L), low acidity (pH) (4,32) to pH 5,57 and high sulphate (744 mg/L) to 24 mg/L. The conclusion is that the results of processed Rasau Jaya Umum village peat water is feasible in accordance with the quality standards of the Regulation of the Minister of Health of the Republic of Indonesia No. 492/MENKES/PER/IV/2010, that the levels of iron, chromium and sulfate are already at a value permitted, but the turbidity of the water is still high and the pH of the water shows that the water is still acidic, amounting to 1080 PtCo. Therefore, water variations in the amount of material used in the peat water installation process still need to be improved in order to obtain maximum results.

1. Introduction
Rasau Jaya Umum village is one of villages in Rasau Jaya district with total area of 12,484 ha. which is approximately 38,29 % of the district total area. Most of the village land is a peat soil with around 1,00 m until 3,00 m in depth. With population of 5,320 people, the village has the largest paddy field which is domestically cultivated compared to the other villages in this district. Rasau Jaya Umum village has a rice field area of 930 (Ha), 227 plantations (Ha) and other land area of 1,130 (Ha). Rasau Jaya I village has a rice field area of 790 (Ha), a plot of 279 (Ha) and other land area of 1,065 (Ha). Rasau Jaya II Village has a rice field area of 790 (Ha), a plot of 279 (Ha) and other land area of 1,129 (Ha). Rasau Jaya II has a paddy field area of 873 (Ha), 340 fields (Ha) and other land area of 1,129 (Ha). Rasau Jaya III has an area of 830 paddy fields (ha), a yard of 188 (ha) and other land area of 999 (ha). Bintang Mas
Village has a rice field area of 546 (Ha), a 113 (Ha) yard and other wide land 641 (Ha) and Pematang Tengah village has a wide. Most village, which is passed by the river, use water directly from the river in order to fulfill the household needs such as for taking a bath, washing clothes, and other activities. For drinking water, the people use rain water which has already put in large water containers. Water in peat environment is considered a shortcoming. This is due to peat water is surface water with apparent characteristics such as brownish red color, high organic contain, high acidity (pH 2-5) and low water hardness [1].

The necessity of water in Rasau Jaya Umum village is one of the environment problems facing by the people. The environment condition is the significant and dominant factor in determining public health. Water, one of the environment components, has important role. Water used by the people should fulfill quality and quantity requirements. Considering that clean water is an urgent public necessity, it is important to make the people participate in the process of creating clean water by introducing simple technology. The presentation of clean water treatment is very valuable for people in overcoming the lack of clean water. The water source is coming from the river and peat water well. Besides that, the limited amount of rain water in drought season can be solved by using water from wells.

2. Method
Data analysis uses descriptive statistical analysis which are methods related to the collection and presentation of a data group so as to provide useful information. With the variables used, namely neutralization, coagulation and filtration in peat water. The stages in data analysis techniques are:

- Acidity (pH) neutralization process, lime mix.
- Coagulation, flocculation, absorption and sedimentation stage.
- Mixing substances, coagulation by means of lime, alum, clay, and the powder of kelor (*Moringa oleifera*) seed.
- Filtration stage, the filtration with rapid sand apparatus.

![Figure 1. Water treatment process.](image)

The water treatment process uses simple apparatus such as two plastic water tanks as a container during the process.
The treatment process uses simple apparatus one of which two plastic water tanks as container. The first tank is used in neutralization process of peat water by using lime. This tank has capacity of 300 L and equipped by stirring rod. The peat water that has been already mixed with 20 grams (4 spoonful) of lime is left undisturbed for 30 minutes in order to neutralize the acidity (pH). The second stage in this tank is coagulation and flocculation process by using 15 grams of polyaluminium chloride (PAC) and 10 grams of alum in order to make the water clearer and clean. This process is lasting for 30 minutes. The second tank is used for filtration process. The tank contains several layers including gravel, palm-fibres, quartz sand, and charcoal. The position of the first tank and the second tank is determined such that the water flow from the first tank to the second tank is slow enough leading to effective filtration process [2-3].

3. Results and discussion

Another related research is the research conducted by Ardy Rubinatta, Rizky and Kiki from the Faculty of Engineering, University of Tanjungpura entitled "Planning tools for processing simple peat water into household scale drinking water". The design of peat water treatment equipment becomes drinking water by neutralization, coagulation, sedimentation, filtration and disinfection. The design of the tool was built in the Sungai Raya district of Kubu Raya. The quality of the processing water on average for the physical and chemical parameters of peat water has improved, pH rises which initially 5.5 becomes neutral (pH 6.8), color parameters decrease 97.12% (347 PtC0 to 10 Pt-Co), parameters Turbidity fell 76.21% (28.3 NTU to 6.7 NTU), iron parameters dropped to 62.09% (0.62 mg/L to 0.23 mg/L) and high sulfate (8 mg/L to 2 mg/L) [4-6].

While the water source used in this activity is peat water taken from Rasau Jaya river which pass through Rasau Jaya Umum village. The existing raw water condition has undesirable property to be used as clean water. Several indicators are used to determined the raw water so it can be processed as drinking water or clean water. Based on Laboratory test of PDAM Khatulistiwa (West Kalimantan National Water Board) production department, it is obtained as following:

Some indicators are used to determine raw water so that it can be processed as drinking water or clean water. The parameters used are color, turbidity, iron chrome, acidity and sulfate levels.

Regarding the laboratory test of the Khatulistiwa PDAM production department (West Kalimantan National Water Board). The parameters seen from the test state that the water in peat environment has
several apparent characteristics, namely Dark black colored (1088 PtCo) from limit 15 PtCo, High turbidity (13.2 NTU) from limit 5 NTU, High iron content (1.68 mg/L) from limit 0.3 mg/L, High Chromium (0.093 mg/L) from limit 0.05 mg/L, Low acidity (pH) (4.32) from limit pH 6.5 – 8.5 and High Sulphate (744 mg/L) from limit 250 mg/L. Therefore, the water in peat environment is known for its dark color, high acidity and high iron content. The acidity is said to be neutral if it has value of 7.00 but from initial test it is gained that pH = 4.32. It means that the water is acid. The testing of peat water after installation process is carried out shows parameters as following:

The pH value is said to be neutral if it is at the value = 7.00, but from the results of the initial test, the pH value = 4.32 means the acidic water condition (pH value below 7.00). If the water pH value is> 7.00, then water tends to be alkaline. Therefore, water in the peat environment is known for its dark color, high acidity, and high iron content. Acidity is said to be neutral if it has a value of 7.00 but from the initial test it was found that pH = 4.32. That means the water is acidic. Testing of peat water after the installation process is carried out shows unequal parameters. There were a number of changes in the final test results after the installation process was carried out, there was a significant change of all parameters, starting from pitch black water (1088 PtCo) to 179PtCo, high turbidity (13.2 NTU) to 6.55 NTU, iron content high (1.68 mg/L) to 0.26 mg/L, High Chromium (0.093 mg/L) to 0.023 mg/L, low acidity (pH) (4.32) to pH 5.57 and High Sulfate (744 mg/L) to 24 mg/L. From the results of the final test, there were significant changes in all existing water parameters. However, some parameters still cannot meet the requirements set by the Republic of Indonesia PERMENKES No. 816 / Menkes / Per / IX / 1990 [7-10]. The installation process still have not reached average value of 15 PtCo, although visually the water seems to be clean enough (Figure 3).

4. Conclusions
The research was carried out in the village of Rasau Jaya Umum by using variable neutralization, coagulation and filtration on peat water. Activities that are used with a household scale can be used as a source of clean water during the dry season and to meet the daily needs of clean water. The Rasau Jaya Umum Village Government has provided support for this activity. In carrying out activities, the team made a model that was carried out with the village community. The results of testing of water samples prior to processing show that peat water has poor parameters as a source of clean water. The processing of peat water that has been carried out results in the improvement of several parameters and shows that
Peat water has the potential to be used as a raw water source to be processed into clean water and drinking water.

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