The Factors Influences of pH or Acidity Level in The Urban Area

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Abstract

This research aims to study the acidity or the water's pH in Bekasi, Bogor, Depok and East Jakarta. The purpose is to determine what kind of factors influence the pH intensity in the above mentioned cities. This research methods are performed by taking water samples in residentials, or industrial areas to be investigated with the pH measuring instruments. This research will analyze any factors that cause changes in water condition of these cities. pH values at residential areas: Bekasi 7.4, Bogor 7.5, Depok 7.7 and East Jakarta 7.8 and at industrial areas, of the same cities show a remarkable difference such as: Bekasi 8.7, Bogor 8.2, Depok 8.3 and East Jakarta 8.2. These water pH differences are influenced by industries factor, household waste, or the traffic intensity in any of these cities.

Key words: Waters Industries Acidity Water quality Urban area

INTRODUCTION

Bekasi is a city located in the province of West Java, Indonesia, and are in a geographical location 106°48'28" - 107°27'29" East Longitude and 6°10'6" - 6°30'6" East Latitude. This city has an area of 210.49 km², a population of 2.333.871 inhabitants with a density of 11.000/km². These days, Bekasi has evolved into a urban area as well as a center for industries [1-3].

Bogor is located in the Southern city of Bekasi and is in a geographical location 106°43'30" - 106°51'00" East longitude and 30°30" - 6°41'00" South latitude. This city has an area of 118.50 km², a population of 1,030,720 million inhabitants with a density of 8,019/km². It is geographically close to the capital city of Indonesia, Jakarta, making it a strategic city in the development and growth of economic activity [4-5].

Depok is located in the Southern city of Bekasi and is in a geographical location 106°49'39"- 106°49'48" East longitude and 6°23'24" North latitude - 6,39° South latitude. This city has an area of 200.29 km², a population of 1,738,570 million inhabitants with a density of 8,746/km². Depok is a buffer city [3].

East Jakarta is located in the Eastern city of Bekasi and is in a geographical location 106°49'35" East longitude and 06°10'37" South latitude. This city has an area of 187.75 km², a population of 2,693,896 inhabitants with a density of 1,434.314 people/km², makes it the largest municipality in the province of Jakarta Special Capital Region [6-7].

The cities listed above have a fast growing population and industries. In such circumstances, water is one of the commodities that need to be considered, because it involves a very vital human need. If the water is polluted, and has a pH value below normal due to contamination from waste produced by industries, households and transportation, the water becomes unfit for consumption by local people [5,8] especially according to the open space to reduce pollution [9]. In the other hand, some studies have been reported regarding to these urban pollution and surrounding it in separated research [10-15]. Since the environments are growing so fast, the studies have to do regularly to examine the effect of population and industries to the acidity of water.

Methodology:

a. Time and Place of Research are divided 4 places:

1) Place of research:

a) Bekasi

Residential : Cibitung, Cikarang, Karang Bahagia, Tambun

Industries : PT. Bryte Polymer, PT. Jati Sempurna, PT. Sunstar, PT. Yuri, Cikarang Industrial Area

b) Bogor

Residential : Cilebut, Cileungsi, Gunung Putri

Industries : Novel Industry, Cileungsi, Cicadas

c) Depok

d) East Jakarta

Industries : PT. Kalbe,

PT. Pasifik

2) Time of research:

September 5, 2016 – November 13, 2016.

b. Tools and materials

Tools that used for pH measurement in the river flow water sample and groundwater are pH meters.

Results:

Fig. 1: Water pH intensity in Bekasi residential area

Fig. 2: Water pH intensity in Bekasi industrial area

Fig. 3: Water pH in Bogor residential area

Fig. 4: Water pH in Bogor industrial area

Fig. 5: Water pH in Depok residential area

Fig. 6: Water pH in Depok industrial area

Fig. 7: Water pH in East Jakarta residential area

Fig. 8: Water pH in The East Jakarta industrial area

Discussion:

a. Bekasi:

Based on the results obtained, the residential area has maximum water pH of 7.9 on September 17, 2016 and the minimum water pH is 7.2 on November 4, 2016 and in the industrial area, the maximum water pH is 9.8 on October 6, 2016 and pH water minimum of 7.8 on November 1, 2016. It has an average pH value of water in residential areas at 7.4 and 8.7 in the industrial area.

The measurements of water pH in residential areas showed instability during the study period and ranges of a pH values between 7.2 to 7.4 pH. In the other hand, the measurements of water pH in industrial areas had decreased and the range of the acidity was between 8.2 to 9 [16]. In residential areas, the pH of water is still in accordance with the standards for using water in daily activities.

b. Bogor:

Based on the results obtained in the residential sector, the maximum water pH is 8 on October 9, 2016 and the minimum water pH is 7.5 on November 3, 2016. In the other hand, the maximum water pH in the industrial area is 8.9 on October 31, 2016 and the minimum pH water is around 7.2 on September 5, 2016. It has an average water pH in the residential areas is 7.5 and the industrial is 8.2.

The movement of water pH in a residential area during the study period showed an increase every day and ranged from 7.6 to 8 while the pH of the water in the industrial area tend to be unstable and ranged from 7.8 to 8.4. It was determined, that in the residential and industrial areas pH values of the water were still in accordance with the pre-established standards pH values, because there are still many open green spaces in this town [17-18]. In addition to water catchment areas, trees and plants exist and help in the absorption of CO₂ gases produced by the local industries, and traffic, so that the pH of the water remains normal [17, 19].

c. Depok:

Based on the results obtained, in the residential areas, the maximum water pH of 7.9 on October 30, 2016 and the minimum water pH is 7.7 on November 1, 2016 and in the industrial area, the maximum water pH is at 8.3 on September 15, 2016 and the minimum water pH is 7.2 on November 9, 2016. The average pH value in the residential is 7.7 and the industrial area is at 8.3. The measurements of pH in residential areas during the study period tended to be stable and ranged between 7.8 to 7.9 pH, while those pH measurements in industrial areas tend to be unstable with the range from 7.4 to 7.8.

In the residential and industrial areas pH value of the water are still in accordance with the pre established pH standard values, because there are many trees that absorb the pollution. Additionally, Depok has a vast green open space and a good waste's management system in the industrial areas. Therefore, the final waste is disposed of just prior to filtration so as not to cause contamination or reduce the water quality [20-21].

d. East Jakarta:

Based on the results obtained, the maximum water pH in residential area is 8 on October 23, 2016 and the minimum water pH is 7.7 on November 3, 2016. For the industrial areas, the maximum water pH is 8.4 on September 5, 2016 and the minimum pH of the water is 8 on September 15, 2016. And it has an average pH value of water 7.8 in residential areas and 8.2 in the industrial ones. The measurements of water pH in residential areas during the study period tended to be stable and ranged from 7.8 to 8. However the pH of the water measurements in the industrial area tend to be unstable and ranges from 8.2 to 8.4.

Due to the many green open space, which can help absorb pollution from various waste produced, pollution levels are not too high for both areas [14]. Additionally, many industrial areas have a good waste management and control to save the environment [13].

In general, in residential areas, the highest average pH of 7.8 was shown in East Jakarta, while the lowest pH of 7.4 at Bekasi. Bogor has an average pH of 7.5 and Depok has an average pH of 7.7. The Regulation of the Minister of Health, No. 416/MEN.KES/PER/IX/1990 about the terms and Water Quality Monitoring mentioned that the standard pH of the water for health consumption is in the range value from 6.5 to 8.5 [22-23]. Based on these regulations, the surface water in residential areas of these cities fulfills the requirements for drinking water quality and is within the healthy chemical limits requirements for safe water consumption [23].

In the industrial areas, the highest average of pH is 8.7 at Bekasi, while the lowest average pH is 8.2 at Bogor and Jakarta. Depok is only a bit higher than Bogor and East Jakarta, pH at 8.3. Based on the government regulations, river water and surface water in the industrial areas of Bekasi city do not fulfill the requirements of drinking water quality and do not fulfill the requirements of the standard chemical clean water. Oppositely, Bogor, Depok and East Jakarta are still in a good standard of pH water so that fulfill the requirements of drinking water quality.

Conclusion:

- a. On Bekasi, Bogor, Depok, and East Jakarta residential, have a normal pH value, such as. 7.4; 7.5; 7.7 and 7.8, respectively.
- b. In Bogor, Depok, and East Jakarta industrial area, have a normal pH value, such as. 8.2; 8.3 and 8.2, respectively.
- c. On Bekasi industrial area, has polluted pH value, 8.7.
- d. The open space and the government control are two important ways to save the environment.

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