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Research Article

Evaluation of Regional Domestic Waste Water Treatment Plant Performance in Cimahi City

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Abstract
Domestic wastewater treatment plant performance (WWTP) currently refers to stringent wastewater quality standards (Minister of Environment and Forestry Regulation No. 68 of 2016) considering potential environmental degradation because of pollutants in the wastewater. This study evaluated the performance of the Regional Domestic WWTP in Cimahi City. Cimahi has 10 WWTPs which were operated by an Anaerobic Baffled Reactor system. Periodic monitoring only measured the wastewater characteristics after treatment with parameters: total suspended solids (TSS), ammonia, chemical oxygen demand(COD), biological oxygen demand(BOD), and oil and grease. Therefore, wastewater characteristics were measured before and after treatment at selected WWTP during peak and non-peak hours, with TSS, ammonia, and COD. Important hydraulic factors were also measured: flow velocity at peak and non-peak hours, hydraulic detention time, and sludge height. Effluent from all WWTPs did not meet the standard. However, WWTPs with detention time >2 days produced parameter concentrations closed to the maximum value. The selected WWTP has a 5.7days detention time with removal efficiency for COD 57.52%, and TSS 42.56%, during peak period and COD 60.19% and TSS 34.84% for a non-peak period, but ammonia concentration did not decrease. Overall, WWTP has not been able to meet quality standards and the quality.

Keywords: regional WWTP, domestic wastewater, removal efficiency, hydraulic detention time, sludge height

1. Introduction
Indonesia is a country with the 4th largest population in the world (UN, 2019). The population in 2020 is 270.2 million people and is estimated to reach 344.6 people in the coming 2045 (BPS, 2020). At present, almost 57% of the total population lives in urban areas, and the population living in urban areas is estimated to reach 67% of the total population by 2045 (BPS, 2020). This condition is the main factor that encourages meeting water needs and an excellent domestic wastewater management system to ensure proper sanitation in urban areas. The Indonesian government has responded to the importance of controlling domestic wastewater pollution to meet public health requirements. This is done by determining the fulfillment of the target of 100% of community access to proper and sustainable sanitation by 2030 and enacting the Minister of Environment and Forestry Regulation (Permen LHK) No 68 of 2016 concerning effluent quality standards for domestic wastewater treatment plants (WWTP). . The value of the quality standard for wastewater quality stipulated in the Minister of

Environment and Forestry Regulation No.68 of 2016 is much tighter than the previous regulations (Kepmen LH No 112, 2003).

Sanitation problems related to the domestic wastewater management system are still among the main environmental problems in Indonesia's big cities. Domestic wastewater that is not treated correctly can cause pollution to the water environment (Soemirat, 2011), both groundwater and surface water which are the primary sources of raw drinking water (Sururi, Notodarmojo, & Roosmini, 2019; Sururi et al. ., 2020). Poor ground and surface water quality due to domestic wastewater pollution is the leading cause of disease through water agents such as diarrhea, cholera, and typhoid (Jin *et al.,* 2018; Nienie *et al.,* 2018). Water-borne diseases in Indonesia are estimated to be the cause of death for 31% of children under five years of age (Ministry of Health, 2020) and economic losses that reach 2.3% of the annual figure for the national gross domestic product (World Bank, 2013). Apart from hurting human health and the economy, insufficient quality raw water will also complicate the drinking water processing process (Sururi *et al*,.2019; Sururi *et al.,* 2020). Thus, an excellent domestic wastewater treatment system will be able to protect public health from water-borne diseases.

Domestic activities are a wastewater source that significantly pollutes river water in West Java (EPA, 2020), the province with the largest and most populous population in Indonesia (BPS, 2020). Domestic wastewater management in urban areas with high population density, such as in West Java, is carried out by improving and developing an area-scale centralized domestic wastewater management system (CDWMS). PAPs in the area-scale CDWMS generally apply anaerobic processing systems. This is due to the low costs for maintenance and operation because it does not require energy for the aeration process, can produce relatively small amounts of sludge, does not require a lot of nutrients, and the possibility of using the methane produced as an energy source (Aqaneghad & Moussavi, 2016). However, the area scale WWTP's performance is very dependent on the effectiveness and efficiency of the WWTP in removing contaminants or pollutants in the wastewater. Besides, the results of previous studies show that the communal wastewater distribution system does not fully function as a Plug Flow Reactor, so that the process of removing pollutant compounds in the pipes is minimal (Sururi *et al*., 2017), resulting in a considerable processing load on WWTP. Besides, most of the CDWMS areas in several cities in West Java were built in the 2013-2016 period, namely before the latest regulation on domestic wastewater management (Permen LHK No 68, 2016) was enacted.

On the other hand, currently, the Minister of Environment and Forestry Regulation No. 68/2016 applies which regulates the standard quality value of wastewater quality which is more stringent, so it is feared that the existing domestic PAPs work under design standards or criteria. Besides, daily fluctuations in the amount of treatment load and wastewater characteristics can affect the wastewater treatment process's success (Reynaud, 2016). Therefore it is essential to evaluate the performance of the WWTP in the CDWMS Kawasan by paying attention to daily fluctuations (at peak hours and not peak) and to determine the success rate of the WWTP in removing pollutant compounds and factors that affect the ability of WWTP removal, and ensuring the effluent of processing results is not. Harmful to the environment and society.

The purpose of this study is to determine the ability to remove pollutant compounds at peak and non-peak processing load conditions at WWTP at the regional scale in urban areas with high population density in Indonesia. Studies that consider daily fluctuations in the quality and quantity of wastewater are still very rarely carried out to the best of our knowledge, even being the first to be carried out on an area-scale WWTP. This study's results are expected to provide input for policymakers in determining improvement strategies for PAPs at regional scale CDWMS in urban areas in Indonesia, especially Cimahi City.

2. Methods

2.1. Location

Cimahi City is one of the fastest-growing cities in West West Java and is astronomically located between 107° 30' 30 '' - 107° 34' 30'' East Longitude and 6° 50' 00'' - 6° 56' 00'' LS. With an area of 40.2 km2 and a population of 614,304 people, Cimahi City is one of the most densely populated areas (153 people/ha) in 2019 in West Java Province. Cimahi City is at an elevation of ± 685 - 1,040 m above sea level with a total area of 4,182 Ha which is divided into 15.07% for residential land (630,418 Ha), the remaining 3,551,582 Ha is land designated for agriculture and plantation, industry, offices, and others (BPS City of Cimahi, 2020).

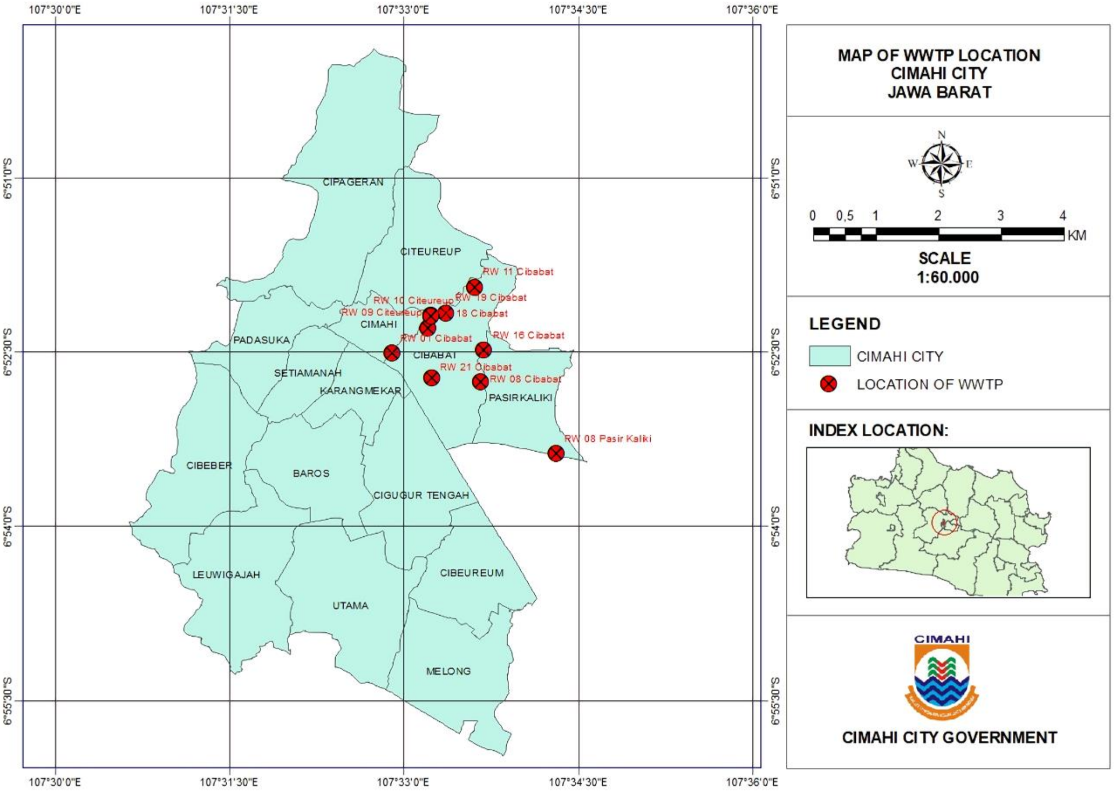


Figure 1. Cimahi city CDWMS location distribution map in 2019

Cimahi City has ten regional-scale CDWMSs built-in 2013 to 2016 and managed by the Regional Technical Implementation Unit for Wastewater Treatment (UPTD PAL) of the Cimahi City Housing and Settlement Areas (DPKP). The distribution of the ten regional CDWMS locations in Cimahi City can be seen in Figure 1. The total number of house connections (SR) served by the Regional CDWMS in Cimahi City ranges from 160-401 SR, with 383-1017 individual services. The largest CDWMS is in RW 09 Citereup with a service coverage of 401 SR, and the number of people served is 1017 people, while the smallest CDWMS is in RW08, with a total service of 160 people (Figure 2).

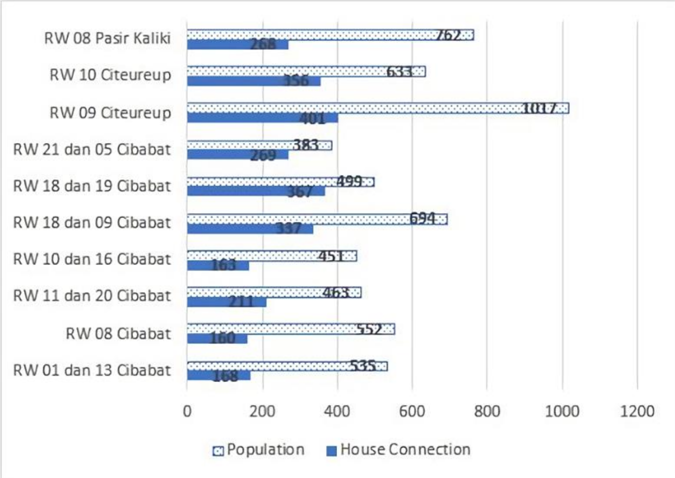


Figure 2. Service coverage of each cimahi city communal WWTP

The processing method for ten communal domestic WWTPs in Cimahi City uses the Anaerobic Baffled Reactor (ABR) system. This ABR system is a system with an excellent anaerobic reactor configuration and is suitable for use in developing countries (Aqaneghad & Moussavi, 2016) and allows naturally occurring separation of microorganisms hydrolysis acidogenesis and methanogenesis (Hahn & Figueroa, 2015). In principle, wastewater is treated under anaerobic conditions where wastewater flows to a reactor consisting of several compartments installed in series. Vertical bulkheads separate each compartment. Thus, wastewater will flow up and down, from the inlet to the outlet.

2.2. Data Analysis

2.2.1. Secondary Data

Secondary data collected consisted of: (1) regulations related to domestic waste management; (2) characteristics of Cimahi City, which include the number and rate of population growth, population density, physical and geographical conditions as well as maps related to the domestic wastewater management system; (3) Figure and location of CDWMS area and wastewater treatment technology applied to WWTP; (4) Regional characteristics of regional CDWMS services; (5) wastewater distribution network system and WWTP obtained from the as-built drawing document; and (6) the results of monitoring the quality of wastewater effluent from each WWTP at 10 CDWMS areas in Cimahi City for 2019. Data regarding the quality of the effluent is obtained from the results of monitoring the quality of wastewater, which is carried out periodically by the Cimahi City DPKP Office for effluent quality parameters in the form of total suspended solid (TSS), free ammonia, oils, and fats, biochemical oxygen demand (BOD), and chemical oxygen demand (COD).

2.2.2. Primary Data

2.2.2.1 Location and Sampling Time

In order to be able to evaluate the ability of WWTP removal more thoroughly and identify the factors that affect WWTP performance, several primary and essential data were collected, including: (1) the results of wastewater quality sampling before and after treatment; (2) the existing condition of the WWTP obtained by direct observation at each WWTP; (3) WWTP flow rate and detention time; and (4) mud height at WWTP. Periodic monitoring of wastewater characteristics is only carried out for treated wastewater or waste effluent. Therefore, in this study, measurements and sampling were carried out to determine the characteristics of wastewater before and after treatment, detention time, hydraulic factor WWTP, and sludge height were carried out at one of the selected WWTPs. The WWTP selected as the sampling location is the WWTP which generally produces waste effluent with the concentration of wastewater quality parameters closest to the quality standard value of wastewater quality according to Permen LHK No. 68/2016.

2.2.2.2 Wastewater Measured

The characteristics of wastewater are determined based on the concentration level of the critical parameters in wastewater consisting of COD, ammonia, and TSS. COD examination was carried out following the Standard Method 5220 C, TSS followed the Standard Method 2540 D, and TSS used the Standard Method 2540 D (APHA, 2005). A sampling of wastewater was carried out at the inlet and outlet of the WWTP to determine the ability or efficiency of removal of each wastewater quality parameter, which is calculated by the following equation (Tchobanoglous & Burton, 2003):

$$E = \frac{C_0 - C}{C} \times 100\% \quad (1)$$

Note: E is the removal efficiency of a parameter, Co is the concentration of a parameter at the WWTP inlet (before processing), and C is the final concentration of a parameter at the WWTP outlet (after processing).

Wastewater samples were taken during peak hours and non-peak hours to obtain a figure on the difference in WWTP processing load at different periods and determine the effect of differences in processing load on WWTP performance. The peak hour (07.00 - 09.00 am) is the highest wastewater discharge period because domestic activities, especially feces disposal and other domestic activities, occur at the highest in that period. Meanwhile, the non-peak hour is the minor wastewater discharge period, which is 10:00 - 12:00. All samples were analyzed at the Environmental Engineering Laboratory, Bandung National Institute of Technology.

2.2.2.3 Hydraulic Factor Measurement

The main hydraulic factors reviewed in evaluating WWTP performance are wastewater's speed at the inlet and outlet of the WWTP and the total detention time. Ladu et al. (2014) stated that the WWTP removal ability with an anaerobic system is strongly influenced by the WWTP's detention time. Measurement of wastewater velocity is also carried out at peak and non-peak hours (10.00 - 12.00 WIB) at the WWTP inlet and outlet and refers to SNI 8066: 2015, especially the procedure for measuring discharge and flow velocity using afloat. The wastewater velocity at the WWTP inlet is calculated by dividing the distance between the last manhole to the inlet by the time. This measure was taken from the manhole to the inlet. The distance between the last manhole to the inlet is measured directly, while the time to reach the inlet is measured by recording the time required by a ping pong ball that functions as a buoy from the manhole until the ball reaches the inlet using a stopwatch. The WWTP outlet's wastewater velocity is calculated based on the discharge measurement results at the outlet, which is then converted to the hydraulic manning equation by paying attention to the water level in the outlet pipe. This data is also used to estimate detention time and identify wastewater in the WWTP unit.

2.2.2.4 Sludge Measurement

One of the other essential factors influencing the WWTP allowance performance is the mud height in each WWTP compartment. The higher the sludge, the smaller the space available for processing to make the allowance less optimal. The mud height is measured in each WWTP compartment and is the difference between the WWTP base height using a one-meter-long light-colored cloth wrapped around a stick. Stick is then dipped to the bottom of the WWTP compartment and slowly lifted after one minute. Mud particles will stick to the cloth so that the height of the mud can be measured. This measurement procedure refers to measuring the thickness of the mud, according to the Direktorat Jenderal Pekerjaan Umum (2012).

3. Result and Discussion

3.1 Overview of WWTP in Cimahi City CDWMS

General description of 10 WWTPs in Cimahi City configured based on the effluent characteristics of the processing results and the hydraulic retention time of each WWTP. The results of periodic monitoring for the characteristics of the waste effluent for the parameters of TSS, oil and grease, BOD, COD, and ammonia from each WWTP for the period May - October 2019 respectively can be seen in Figure 3.While the hydraulic detention time for each -Each WWTP shown in Table 1.

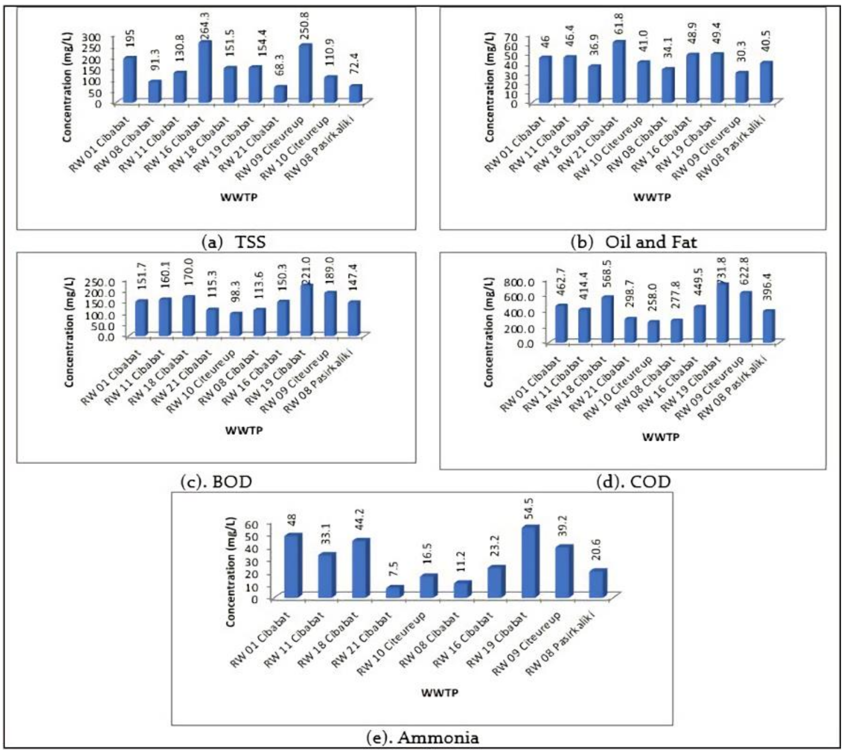


Figure 3. Concentration - average crucial parameters of 2019 domestic waste effluent

Table 1. Hydraulic detention time 10 regional WWTPs in cimahi city CDWMS

No	WWTP	Waktu Detensi (td)
1	RW 08 Cibabat	5,72
2	RW 16 Cibabat	3,03
3	RW 08 Pasir Kaliki	4,79
4	RW 21 Cibabat	3,15
5	RW 11 Cibabat	2,61
6	RW 18 Cibabat	1,42
7	RW 10 Citeureup	Tidak ada data
8	RW 01 Cibabat	1,79
9	RW 09 Citeureup	0,74
10	RW 19 Cibabat	1,92

In general, all WWTPs produce waste effluents that do not meet the domestic wastewater quality standards according to Permen-LHK No. 68/2016. The average concentration level for TSS in 2019 at 10 WWTPs varied considerably in the range between 68.3 and 264.3 mg / L, with the highest TSS concentration produced by WWTP RW 16 Cibabat and the lowest produced by WWTP RW 21 Cibabat. TSS or measured total suspended solids represent the content of inorganic compounds or mineral pollutants and is colloid and discrete matter that can precipitate directly (Azema, 2002). High TSS concentrations can cause wastewater turbidity to increase, reduce dissolved oxygen concentrations, and lead to silting in the treatment unit, reducing residence time so that the pollutant removal process is not optimal (Sumantri & Cordova, 2011). The content of organic compounds in wastewater can be determined based on BOD and COD concentrations' measured levels. In particular, the concentration of COD is the amount of total oxygen demand to be able to oxidize organic compounds chemically (George Tchobanoglous & Burton, 2003), while BOD shows the amount of dissolved oxygen demand so that organic matter can be broken down by microorganisms (George Tchobanoglous & Burton, 2003). The monitoring results showed that the range of BOD concentrations measured at 10 WWTPs was 98.3 - 221.0 mg / L, and COD concentrations were 258.0 - 731.8 mg / L, which indicates the high content of organic compounds in the effluent of wastewater treatment results. Nitrogen content in feces or urine can be determined based on the level of concentration of measured ammonia parameters. Ammonia content indicates new contaminants entering the system, generally from sanitation facilities (Sawyer & McCarty, 1978). Ammonia concentrations were measured quite varied, ranging from 7.5 to 54.5 mg / L and exceeding the standard quality value according to PerMenLHK No.68 / 2016 (5 mg / L).

Things that must be considered in particular are the parameters of oils and fats that are hydrophobic and insoluble in water and usually come from cooking activities in the kitchen (Friedler, 2004). Nadayil, Mohan, Dileep, Rose, & Parambi, 2015). The concentration level of oil and fat parameters from 10 WWTPs was 30.3 - 61.8 mg / L, exceeding the required quality standard (5 mg / L). This phenomenon is also a problem that must be considered because the quantity of oil and fat increases and pollutes water bodies (Jameel, Muyubi, Karim, & Alam, 2011). The activity of microorganisms in degrading waste can be disrupted if the concentration of oil and fat in domestic wastewater is high enough (Usman, Salama, Arif, Jeon, & Li, 2020), affecting the efficiency of the removal of organic compounds.

The study results showed that, in general, WWTP with longer hydraulic detention time (> 2.5 days) resulted in better wastewater quality than WWTP, which had a shorter detention time. These results indicate that a longer hydraulic detention time provides a longer contact time between anaerobic microorganisms and waste so that the ability to remove pollutant parameters is better. These results are consistent with previous studies (Braz 2014), which found that the efficiency of removing pollutant parameters in wastewater, especially COD, was higher if the WWTP hydraulic detention time was more than 60 hours.

3.2. WWTP Performance Evaluation

The results of monitoring the quality of wastewater effluent at 10 WWTPs showed that all wastewater quality parameters did not meet quality standards. Further evaluation was carried out on one of the WWTPs with the best elimination capabilities (WWTP RW 08 Cibabat) to obtain an overview of the factors that affect WWTP performance. Aspects considered in this WWTP performance evaluation include sludge height in the WWTP compartment, wastewater flow velocity, WWTP allowance efficiency for COD, TSS, and ammonia parameters in peak non-peak conditions.

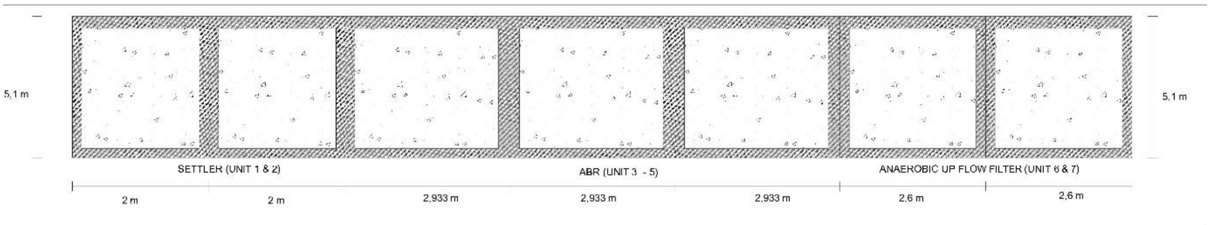
3.2.1 High Mud

Figure 4 shows the WWTP schematic from inlet to outlet, including sludge height in each WWTP compartment. Based on the dimensional analysis contained in the as-built drawing document, it is known that the hydraulic detention time at this WWTP is 5.72 days. According to anaerobic treatment standards, especially ABR, it must have a minimum contact time of 2 days, so that the contact time between waste and microorganisms will be sufficient so that the wastewater is treated optimally (Karya, 2018). The measured mud height in each compartment of the WWTP anaerobic unit reaches 5-78 cm so that the existing height is reduced by between 2.9-31.2%.

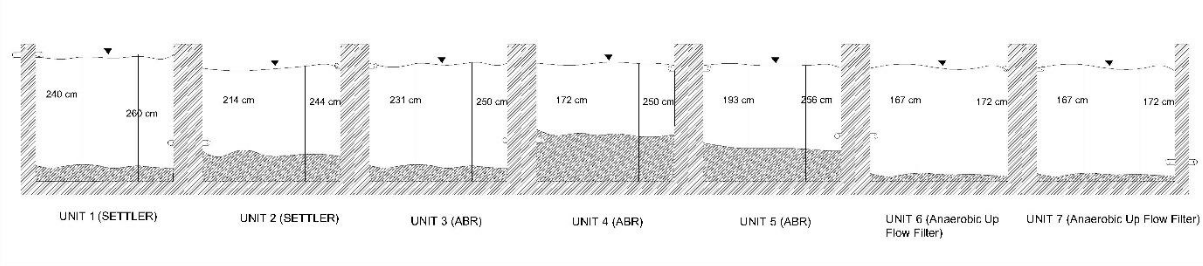
3.2.2 Flow Speed

The velocity measurement results at the WWTP RW 08 Cibabat inlet and outlet can be seen in Figure 5. The average speed at the inlet is 0.54 m / s, which is close to the minimum speed according to the standard, which is 0.6 m / s. The highest speed at the inlet occurs at 10:47 a.m., namely 0.81 m/s; the speed decreases to below the average speed and reaches a minimum of 0.40 m / s at 13 o'clock. At

WWTP outlets, the maximum outlet speed is measured to be only 0.004 m / second, whereas as shown in Figure 6, the maximum speed at the outlet only reaches 0.006 m / sec at 13:36.

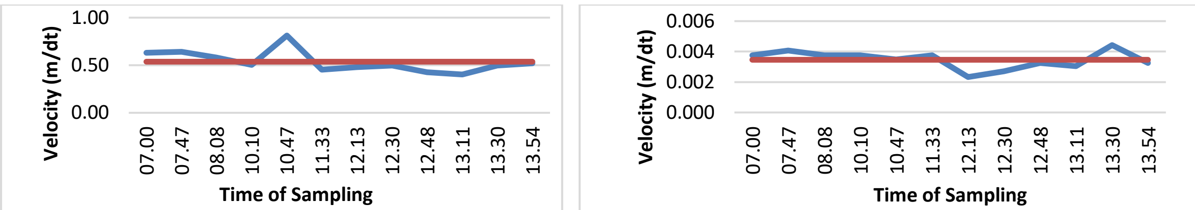


(a) Scheme of WWTP RW 08 cibabat, cimahi



(b) WWTP RW 08 cibabat crosscut scheme

Figure 4. WWTP scheme RW 08 cibabat village, cimahi



(a) Inlet WWTP (a) Outlet WWTP

Figure 5. Fluctuation of waste flow rate of WWTP RW 08 cibabat, cimahi city

The difference in the measured waste flow velocity at the WWTP inlet and outlet is closely related to the hydraulic detention time. Hydraulically, the wastewater flow's detention time for 5.72 days affects the decrease in speed at the WWTP outlet and provides a long enough retention time or provides sufficient storage for anaerobic microorganisms to degrade the substrate present in the wastewater.

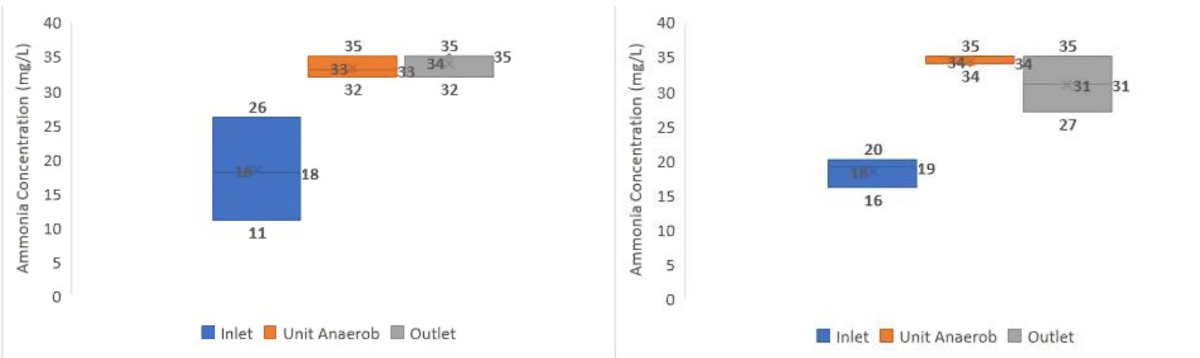
3.2.3 Efficiency of WWTP Provision

Measured concentration levels for COD, ammonia, and TSS parameters before and after processing at WWTP RW 08 Cibabat at peak and non-peak conditions can be seen in Figures 7, 8 9, respectively. COD content in wastewater shows the material fraction. Organic can be degraded by microorganisms or which is difficult to degrade biologically. COD represents the need for oxygen for all chemical oxidation processes (including biochemical processes) (Sawyer & McCarty, 1978; Tchobanoglous & Burton, 2003). COD itself is an organic parameter classified as lability because it measures organic material that can be degraded by strong oxidizers (Roosmini *et al.*, 2018).

(a) Peak condition (b) Non-peak condition

Figure 7. COD concentrations in the inlet, anaerobic treatment unit, and outlet at (a) peak conditions; and (b) non-peak conditions

After biological treatment and WWTP outlet, the level of COD concentration at peak conditions and not peak at the inlet. The average COD concentration in the inlet was 492 mg/L, then in the anaerobic unit, the average COD concentration when not the peak was 262 mg / L (46.74% efficiency), and at the outlet, the average COD concentration was measured at 209 mg / L so that the efficiency from inlet to outlet is 57.52%. At non-peak times, the average COD concentration reaches 520 mg / L, and becomes 194 mg / L after biological treatment (62.69% efficiency), and at the outlet it rises to 207 mg / L (60.19% efficiency). The COD removal range at WWTP RW 08 Cibabat strengthens previous research, stating that the COD removal range with UASB reaches 32-75% (Heffernan *et al.*, 2011), and the efficiency value of this study is in this range. However, the percentage allowance has not been able to bring WWTP performance until the COD concentration meets the quality standard (100 mg / L). Domestic wastewater that enters the WWTP consists of black and gray water from toilets, washing places, and even kitchens. This condition causes the COD concentration in the influent WWTP at peak and not peak in the range 492-520 mg / L and falls into the medium strength category (> 430 mg / L) (George Tchobanoglous & Burton, 2003). The COD concentration value in a hybrid system, especially in the presence of a wastewater source from the kitchen, will increase the COD concentration value (George Tchobanoglous & Burton, 2003), and this condition will reduce the ability of anaerobic WWTP to remove COD (Gomec, 2010). In the waters, the source of ammonia is the breakdown of organic nitrogen (protein and urea) and inorganic nitrogen in the wastewater that enters the WWTP, where the decomposition of organic matter by microbes (ammonification) occurs.



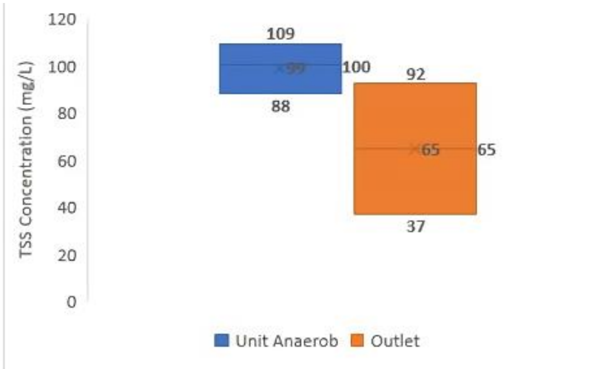
(a) Peak condition (b) Non-peak condition

Figure 8. Ammonia concentration in inlet, anaerobic treatment unit and outlet at: (a) peak conditions; and (b) non-peak condition

At peak conditions, the average ammonia concentration in the inlet is 18 mg / L, while the anaerobic unit has an average ammonia concentration of 33 mg / L, and not a peak, the average ammonia concentration in the inlet is 19 mg / L. There was an increase in the anaerobic and outlet units with mean ammonia concentrations of 34 mg / L and 31 mg / L, respectively. Ammonia concentration values at the inlet are in the low strength category (> 12 mg / L), and at the outlet, the status changes to medium strength (> 25 mg / L). The increase in ammonia concentration from the inlet to the outlet occurs because the system that works is an anaerobic system resulting in a denitrification process (Tchobanoglous & Burton, 2003). Ammonia removal is usually done by applying an anaerobic system by transferring oxygen-filled air into the system (Cruz *et al.,* 2018). This condition must be addressed immediately because ammonia is an essential element of nitrogen in domestic wastewater which can cause eutrophication (Kim, Gorski, & Logan, 2018). An important physical parameter in wastewater is a total suspended solid (TSS), a solid that is retained on 0.45 μm filter paper (Tchobanoglous *et al*., 2003).

At the peak, the average TSS concentration in the anaerobic unit was 112 mg / L, while at the outlet, the TSS concentration fell to an average of 64.33 mg / L. At non-peak times, the TSS concentration in the anaerobic unit was 99 mg / L, and at the outlet, the average TSS concentration was 64.5 mg / L. The inlet's TSS concentration value is classified as below low strength (<120 mg / L), and the process on anaerobic WWTP can remove TSS up to 34.84-42.56%, but is still above the quality standard of 30 mg / L. This indicates that the TSS in wastewater has not been wholly degraded or is not heavy enough to become Biofloc which can be removed. The primary mechanism of TSS removal is the deposition and enmeshment between particles in the sludge blanket in each UASB compartment (Hahn & Figueroa, 2015), but this mechanism does not work well in the applied anaerobic system.

(a) Peak condition



(b) Non-peak condition

Figure 9. TSS concentration in inlet, anaerobic treatment unit and outlet in (a) peak conditions; and (b) non-peak conditions

Previous researchers wrote that the percentage of TSS removal was usually much more significant than that of COD (Hahn & Figueroa, 2015). However, WWTP RW 08 has the same percentage, and this indicates that COD removal can be increased if TSS can be better set aside. This shows that although it can function to remove target pollutants (COD and TSS), the anaerobic system applied to WWTP Kawasan has not removed these pollutants to meet quality standards. This study shows that the applied anaerobic treatment system increases the ammonia concentration. One of the things that become an obstacle is the decrease in volume due to high sludge to reduce the retention time of the processing carried out. Besides, the modification of the process with an anaerobic-aerobic system should be considered to improve the WWTP performance in the CDWMS Kawasan built before the Minister of Environment and Forestry Regulation No. 68 of 2016 was enacted. Apart from smoothing the flow as discussed in section 3.2.2 above. With a long enough retention time (5 days), WWTP ABR can even out the quality of wastewater at the outlet, especially for COD, TSS, and ammonia parameters.

4. Conclusions

The communal WWTP of the area in Cimahi City meets the hydraulic criteria, namely sufficient detention time, and the difference in speed between the inlet and outlet at peak reaches 0.74 m / sec, and in non-peak conditions 0.39 m / sec. The wastewater quality evaluation results show that the WWTP has not been able to process wastewater until it meets the required quality standards. Apart from being designed to meet the currently applicable quality standards (Permen LHK No 68 of 2016), WWTP has to work harder because the influent quality of organic compounds (COD) must be processed as medium TSS is classified as low strength. This condition occurs because the incoming wastewater comes from mixed sources such as toilets and even kitchens. It takes a more well-scheduled desludging effort and an effort to modify the process and add a processing unit so that the WWTP used can produce an effluent that meets quality standards.

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