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Planning for an Anaerobic Baffled Reactor as a Waste Water Treatment Unit at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory, Tanggul Kulon Village, Tanggul District, Jember Regency

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Abstract: The Tahfidzul Qur'an Bambu Kuning girls' dormitory is an Islamic boarding school-based educational foundation located in Tanggul Kulon Village, Tanggul District, Jember Regency. The maximum number of dormitory residents uses calculations of the space capacity in the building and the development plan for the Islamic boarding school. Based on this approach, the maximum number of boarding school residents is 320 people. So if the occupants meet the maximum capacity, the waste that will be produced is 61.44 m3/day. The handling of domestic waste (blackwater and greywater) at the Tahfidzul Qur'an Bambu Kuning girls' dormitory is still processed using a septic tank which directly absorbs into the ground and there has been no draining activity so far. This has the potential for environmental pollution, which causes the potential to increase. suffer from disease. Therefore, it is necessary to make efforts to improve sanitation, namely planning a domestic wastewater treatment plant with an Anaerobic Baffled Reactor (ABR). The planned ABR has 3 compartments with total dimensions of length, width and depth of 12.3 meters, 6.12 meters and 2.5 meters. Construction with the ABR unit produces low concentrations of BOD, COD, TSS, oil and fat, and total coliform, respectively 6.82 mg/L, 17.5 mg/L, 7.87 mg/L, 1.46 mg/ L, and 300 mg/L which meets the quality standards set by the Minister of Environment and Forestry Regulation No. 68 of 2016 concerning domestic wastewater quality.

Keywords: Anaerobic Baffled Reactor; Domestic Wastewater; Islamic boarding school; Tahfidzul Qur'an Bambu Kuning girls' dormitory

INTRODUCTION

Waste water is water that has experienced a decline in quality due to the influence of human activities such as office activities, education, households and medical services. Domestic waste is divided into 2, namely greywater and blackwater. Greywater is waste water that comes from kitchen sinks, sinks and bathroom floor drains. Greywater usually still contains fat, even dirt in the form of leftover food from the kitchen, while waste from the kitchen contains a lot of soap in it, while blackwater is waste water from the toilet which accompanies the solid waste that is thrown away, as well as water from the bidet and urinal (where you urinate) as well. included in blackwater. The emergence of domestic wastewater that accumulates over a long period of time and is not treated properly will pollute the environment. Therefore, at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory, a good domestic waste processing unit is needed to reduce the concentration of pollutants.

The Tahfidzul Qur'an Bambu Kuning girls' dormitory is one of the Islamic boarding school-based educational foundations located on Jl. Teratai No.11 Tanggul Kulon Village, Tanggul District, Jember Regency which provides a place for memorizers of the Qur'an, especially female students. The maximum number of dormitory residents uses calculations of the space capacity in the building and the development plan for the Islamic boarding school. Based on this approach, the maximum number of boarding school residents is 320 people.

The handling of domestic waste (blackwater and greywater) in the Tahfidzul Qur'an Bambu Kuning girls' dormitory is still processed using a cubluk septic tank which directly absorbs into the ground and there has been no draining activity so far. This has the potential to cause environmental pollution in the dormitory which causes increasing potential for people in the Tahfidzul Qur'an Bambu Kuning girls' dormitory to be affected by disease.

In this research, a wastewater treatment installation with an Anarobic Baffled Reactor (ABR) unit will be planned as an alternative unit for processing liquid waste produced using AutoCAD 2013 software at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory. ABR is a wastewater treatment unit which is usually used to treat domestic waste and industrial waste. ABR has the advantage that in the waste processing process these two units have high efficiency, and in terms of construction, this unit does not require a large area of land and can be built below ground level, so it is very suitable for use in the Tahfidzul Qur'an Yellow Bamboo Girls Dormitory. So, based on these advantages, this plan will use ABR as an alternative for processing liquid waste produced by the Tahfidzul Qur'an Bambu Kuning girls' dormitory.

METHOD

Research sites

The planning for the Domestic IPAL unit will be planned at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory located on Jl. Teratai No.11 Tanggul Kulon Village, Tanggul District, Jember Regency. Details of the planning location and layout of the planning location are in **Figure 1.**

Figure 1: Location of the Tahfidzul Qur'an Yellow Bamboo Girls' Dormitory in Tanggul-Jember

The planning stages that will be carried out are presented in Figure 2 below:

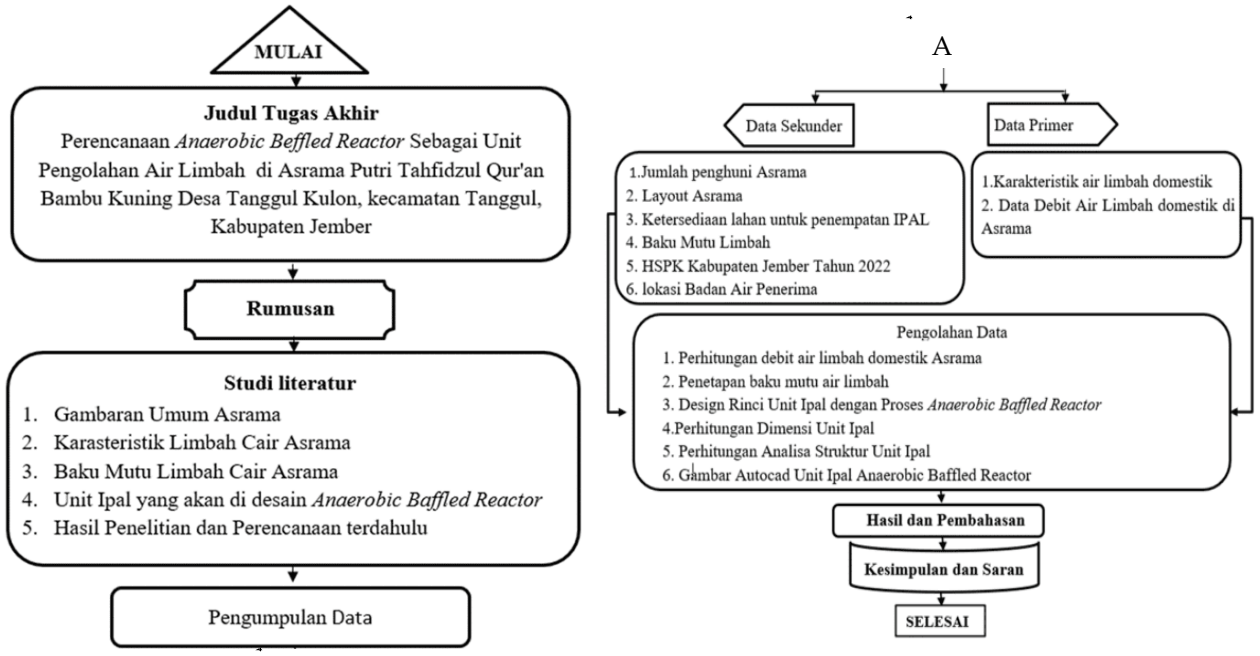

Figure 2: Planning Framework Flow Diagram

Data Type

a. Primary data

Primary data used in planning this domestic Waste Water Treatment Plant (IPAL) is in the form of testing and calculations (BOD, COD, TSS, Ammonia, pH, Total Coliform, Oil and Fat) based on the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 68 of 2016 concerning Domestic Wastewater Quality Standards and domestic wastewater discharge at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory.

b. Secondary Data

Secondary data on Waste Water Treatment Plants (IPAL) with Anaerobic Baffled Reactor units to treat domestic waste water, namely Number of dormitories, Dormitory layout, Domestic waste quality standards according to 2016 Ministry of Environment regulations, Information on IPAL land,

Data collection

The data that has been collected will be processed which will later be discussed in this final assignment. Data processing that will be carried out includes:

a. Calculation of domestic waste water discharge. Information on waste water discharge comes from calculations at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory, data on the number of residents and accumulated daily use of clean water, then information on the amount of clean water discharge can be used as data to determine the amount of domestic waste water discharge. and continued After calculating the waste water discharge, the next step is to calculate the waste water discharge at peak hours
b. Next, compare the parameters of domestic wastewater from the Dormitory WWTP effluent using domestic wastewater quality standards according to Ministry of Environment regulations. Domestic Waste Quality Standards Based on Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 68 of 2016.
c. Determination of design criteria with ABR Units.

d. The calculation of the dimensions of the WWTP is known after knowing the amount of waste water discharge produced.
e. Analyzing the Structural Planning for a Waste Water Disposal Installation with an Anaerobic Baffled Reactor (ABR) unit to treat waste water at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory.

RESULTS AND DISCUSSION

Planning for Domestic Waste Water Treatment Plants (IPAL).

The activity of planning a domestic Waste Water Treatment Plant (IPAL) must pay attention to several things such as the quantity of waste water produced, the quality of waste water and the selection of alternative treatment units that will be implemented. This plan uses wastewater quantity and quality data to help determine the treatment unit to be used. The processing unit that will be used in this planning is a wastewater treatment plant with an ABR unit as an alternative unit which has planning criteria, namely removal efficiency, construction costs, land requirements and maintenance operations. The basis for calculating the dimensions of the WWTP unit in this planning refers to several design criteria sourced from books from the Ministry of PUPR and several previous research journals.

The following **Figure 3** is a flow diagram of domestic wastewater processing produced by the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory using alternative processing:

Figure 3: Flow Chart

Domestic Wastewater Quantity

Domestic and domestic wastewater discharge at the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory.

a. Discharge for clean water needs per day in a dormitory with a capacity of 320 people = 38,400 m^3/h ari
b. Dormitory domestic wastewater generation discharge = 30.72 m^3/h ari
c. Calculation of peak hour discharge for Domestic Waste = 61.44 m^3/h ari

Domestic Wastewater Quality

Data from domestic wastewater quality test results are presented in Table 1 as follows:

Table 1: Laboratory Test Results for Domestic Wastewater Quality

No	Parameter	Unit	Test results	Quality standards	Information
A	Physical Parameters				
1	Temperature	˚C	32.0	-	Fulfil
2	TSS	Mg/L	323.5	30	Exceed
B	Chemical Parameters				
1	pH	-	5.97	6 - 9	Meet
2	COD	mg/L	6268	100	Exceed
3	Ammonia	mg/L	0.236	10	Meet
4	BOD	mg/L	2506	30	Exceed
5	Oils & Fats	mg/L	29,1	5	Exceed
C	Biological Parameters				
1	Total Coliforms	Quantity/100ml	15000	3000	Exceed

The following are several parameters that exceed the quality standard limits:

- TSS parameter = 323.5 mg/L
- COD parameter = 6268 mg/L
- BOD parameter = 2506 mg/L
- Oil and Fat Parameters = 29.1 mg/L
- Parameter Total Coliform = 15000 /100ml

There are six (5) waste water parameters that exceed quality standards and therefore require further processing so that waste water discharged into water bodies does not pollute the waters.

Calculation of WWTP Dimensions

Calculation of IPAL Dimensions Calculation of IPAL dimensions is carried out with the aim of knowing the dimensions of the IPAL building that will be planned. Calculation of WWTP dimensions refers to several predetermined design criteria. Wastewater discharge and pollutant load are one of the influencing factors in calculating the dimensions of a WWTP.

A. *Grease Trap* Unit Dimensions

Grease Trap is a waste water treatment unit which has the function of separating oil and fat in waste water. The *grease trap* unit has an oil and grease removal efficiency of up to 95%.

- **Design Criteria**

➢ Dwell Time = 30 minutes
➢ Tub length = 1.2 meters
➢ Tub depth = 1.5 meters
➢ Free Board = 0.40 meters
➢ Oil and grease removal = 95%-
➢ Flow Speed = 4.5m/hour
➢ Waste Water Discharge = 61.44 m3 / day
➢ Waste Water Discharge = 2.56m3 / hour
➢ Waste Water Discharge = 0.04m3 /minute
➢ Waste Water Discharge = 0.0007m3 /sec

- **Planned**

➢ Dwell Time = ±30 minutes
➢ Number of Compartments = 2 units
➢ Length of Compartment I = 2/3 x P meters
➢ Length of Compartment II = 1/3 x P meter
➢ Minimum Manhole = 0.6 meters
➢ Flow Speed = 2 – 6 m/hour

- **Calculation**

❖ *Grease Trap* Volume Calculation

➢ $Volume\ (\ m^3) = Debit\ Air\ Limba\ h\ (\ m^3/\ jam)\ x\ Waktu\ Tinggal\ (\ jam)$
➢ $Volume\ (\ m^3) = 2.56\ m\ 3/\ jam\ x\ 0.50\ jam$
➢ $Volume\ (\ m^3) = 1.28\ m^3$
➢ $Volume\ (\ m^3) = 1.00\ m^3$

❖ Perhitungan Luas Area Unit *Grease Trap*

➢ $Luas\ Area\ (\ m^3) = \dfrac{\text{Debit Air Limbah}\ \left(\frac{\text{m3}}{\text{jam}}\right)}{\text{Kecepatan Airan}\ \left(\frac{\text{m}}{\text{jam}}\right)}$

$$= \frac{2{,}56\frac{\text{m3}}{\text{jam}}}{4{,}50\frac{\text{m}}{jam}}$$

- $Luas\ Area\ (\ m^3\ )$

- $Luas\ Area\ (\ m^3\ )$ = 0.57 m 3
- $Luas\ Area\ (\ m^3\ )$ = 0.60 m 3

❖ Calculation of *Grease Trap Unit Dimensions* From the length and depth data that has been planned in the table above, the width of the *grease trap unit* can be determined using the calculations below:

- $Lebar\ (\ m\ ) = \frac{\text{Luas Area (m3)}}{\text{Panjang (m)}}$

- $Lebar\ (\ m\ ) = \frac{0{,}60\ \text{m3}}{1{,}20\ \text{m}}$

- $Lebar\ (\ m\ )$ = 0.50 m
- $Lebar\ (\ m\ )$ = 0.60 m

❖ Calculation of the Length of Compartment I *Grease Trap*

- $Panjang\ Kompartemen\ I\ (\ m\ )$ = 2/3 $x\ Panjang\ (\ m\ )$
- $Panjang\ Kompartemen\ I\ (\ m\ )$ = 2/3 x 1.20 m
- $Panjang\ Kompartemen\ I\ (\ m\ )$ = 0.80 m

❖ Calculation of the Length of Compartment II *Grease Trap*

- $Panjang\ Kompartemen\ II\ (\ m\ )$ = 1/3 $x\ Panjang\ (\ m\ )$
- $Panjang\ Kompartemen\ II\ (\ m\ )$ = 1/3 x 1.20 m
- $Panjang\ Kompartemen\ II\ (\ m\ )$ = 0.40 m

Between compartment I and Compartment II there is a partition with a width of 0.20 m
The oil and fat content that comes out of the *grease trap unit* and goes to the next processing unit is 1.46 mg/l.

B. Calculation of Equalization Tank Dimensions

- **Design Criteria**

- Depth of equalization tank = 1.5 - 2 meters
- Minimum manhole diameter = 0.6 meters

- **Planned**

- Active Depth = 1.5meters
- Free Board = 0.40 meters
- Length : Width = 1 : 1 -
- Waste Water Discharge = 61.44 m3 / day
- Waste Water Discharge = 2.56m3 / hour
- Waste Water Discharge = 0.04m3 /minute
- Waste Water Discharge = 0.0007m3 /sec

- **Calculation**

- Calculation of the Surface Area of an Equalization Tank

- $Luas\ Permukaan\ (\ m^2\ ) = \frac{\text{Volume Bak Ekualisasi (m3)}}{\text{Kedalaman Bak Ekualisasi (m)}}$
- $Luas\ Permukaan\ (\ m^2\ ) = \frac{5{,}59\ \text{m3}}{1{,}50\ m}$
- $Luas\ Permukaan\ (\ m^2\ )$ = 3.72 m2

➢ Calculation of Equalization Tank Dimensions

Length : width ratio = 1 : 1

Planned:

- $Panjang\ Bak\ (\ m\ ) = \sqrt{\text{Luas Permukaan Bak (m2)}}$
- $Panjang\ Bak\ (\ m\ ) = \sqrt{3{,}72\text{m}^2}$
- $Panjang\ Bak\ (\ m\ )$ = 1.93 m
- $Panjang\ Bak\ (\ m\ )$ = 1.95 m

From the calculation data of the dimensions of the equalization tank, it was found that the length of the equalization tank is 1.95 m. The ratio of length: width that is planned is 1:1, so that the width of the equalization tank = the length of the equalization tank is 1.95 m

➢ Check the Equalization Tub Volume
- $Cek\ Volume\ (\ m^3\ ) = Panjang\ (\ m\ )\ x\ Lebar\ (\ m\ )\ x\ Kedalaman\ Aktif\ (\ m\ )$
- $Cek\ Volume\ (\ m^3\ )$ = 1.95 $m\ x$ 1.95 $m\ x$ 1.50 m
- $Cek\ Volume\ (\ m^3\ )$ = 5.70 m^3

C. Calculation of Dimensions of *Anaerobic Baffled Reactor*

- **Design Criteria**

➢ Wastewater Characteristics:
➢ Average discharge = 61.44 $m^3/h\ ari$
➢ Operational hours = 24 hours
➢ Peak discharge = 2.56 m 3 /hour
➢ COD in = 6268 mg/L
➢ BOD in = 2506 mg/L
➢ TSS in = 323.5 mg/L
➢ Temperature = 32˚C
➢ COD/BOD ratio = 2.5011
➢ SS/COD Ratio = 0.45 (0.35 - 0.45)

- **Planned**

➢ Precipitation Tank Planned:
➢ HRT = 3 hours
➢ Hours Draining period = 24 Months
➢ Depth of tank = 2.5 m
➢ Freeboard = 0.3 m
➢ COD in = 6268 mg/L
➢ BOD in = 2506 mg/L
➢ TSS in = 323.5 mg/L

- **Calculation**

1. Calculate the volume of water

Water volume = HRT (hours) x peak discharge (m/hour)
= 3 hours x 2.56 m/hour
= 7.68 m^3

2. Calculate surface area

Surface area of the tank = (water volume + mud volume) (m^3)/ depth (m)
= 7.68 m3 + 117.67 m3 / 2.5 m
= 50.14 m^2

3. Calculate freeboard volume

Freeboard Volume = Surface area x 0.3 m
= 50.14 m 2 x 0.2 m
= 15.04 m^3

4. Calculate the total volume of the settling tank

Total Volume of Settling Tank = Volume of mud (m^3) + Volume of Water (m^3) + Volume of Freeboard (m^3)
= 117.67 m^3 + 7.68 m^3 + 15.04 m^3
= 140.39 m^3

5. Determining the length of the settling tank. It is planned that the depth of the settling tank is 2.5 m and the length:width ratio is 4:3, so the length and width of the settling tank can be determined as follows:

For example = x
L = pxl
50.14 = $4_x . 3_x$
50.14 = $12x^2$
$x^2 = \frac{50,14}{12}$ = 4.18
$x = \sqrt{4,18}$ = 2.04
$panjang\ 4x = 4\ x\ 2,04 = 8,4\ m2$
$Lebar\ 3x = 3\ x\ 2,04 = 6,12$ m2

6. Check the surface area of the tub
Check Surface Area = length (m) x width (m)
= 8.4 m x 6.12 m
= 51.4 m^3
7. Check the tank volume
Check Tub Volume = Surface area (m^2) x (depth (m) + freeboard (m))
= 50.14 m^2 x 2.8 m = 140.39 m3
8. Check Vs (settling speed)
Vh = Q (m3 /sec) / A (m^2)
= 30.72 $m^3/hari$ / A m^2
A= b (Width) xh (Depth)
= 6.12 x 2.5
= 15.3 m2
Vh = Q (m^3/day) / A (m^2)
= 0.0007 $m^3/hari$ / 15.3 m^2
= 0.000046 m/sec
Calculating particle diameter:

$$Vs = Vo = \frac{g\,D\,2\,(sg-1)}{18\,v}$$

$$0.001 = \frac{9{,}81D\,2\,(2{,}65-1)}{18 \times (0{,}893\times10-6)}$$

D = 0.000046 m = 0.046 mm

Check Reynolds number:

Nre = (Vs × dp) / υ
= (0.001× 0.000046) / (0.893× 10-6)
= 0.056
Cd (drag coefficient) = 18.5 / Nre0.6
= 18.5 / 0.056
= 330.35

With a temperature of 32 oC, ρ water = 996.26 kg/m3,

ρ mud is assumed = 1.024 kg/m3

Vs = (4g x (ρs – ρ/ρ) xd / 3Cd)0.5

= 0.4 m/sec.

With a value of Vs (settling velocity) higher than Vh (flow velocity) then the mud.

D. Anaerobic Baffled Reactor Dimensions

- **Design Criteria**

Is known:

- Planned HRT = 12 hours (12 - 14 hours)
- Peak discharge = 2.56 m3/hour
- Depth of tank = 2.5 m
- Width of ABR tank = Width of settling tank = $6{,}12$ m
- Number of compartments = 3 pieces
- Olr < 8 kg COD/m3.day
- Up flow velocity = < 2 m/hour
- Temperature = 28 0 c
- COD in = 4,387 mg/L
- BOD in = 1,704 mg/L
- TSS in = 97.5 mg/L
- COD/BOD ratio = 2.5745
- SS/COD Ratio = 0.45 (0.35 - 0.45)

- **Calculation**

1. Calculating ABR Compartment Length

12 Hour HRT = Total volume of ABR (m^3) / average discharge (m^3/day)
= [length (m) x width (m) x depth (m)] x number of compartments / average discharge (m^3/day)
= length (m) x $6{,}12$ mx 2.5 mx 3 / 61.44 m^3/day
Compartment length = 61.44 / 45.9
=1.338562 m = 1.3 m

2. Calculate the total volume of ABR

Total volume of ABR = length (m) x width (m) x depth (m) x number of compartments

= 1.3 m x 6.12 m x 2.5 m x 3
= 59.67 m3

3. Check OLR

Check OLR = average discharge (m3/day) x CODin (mg/L) / vol. total ABR (m3) x 1000
= 61.44 m3/day x 6268 mg/L / 59.67 m3 x 1000
= 6.474509kg COD/m^3.day

4. Check Vup flow

Check Vup = peak flow (m/hour) / compartment surface area (m2)
= 2.56 m/hour / (1.3 m x 6.12 m)
= 0.321769 m/hour (meets < 2 m/hour)

E. Disinfection Tank Unit Calculation

- **Design Criteria**
  - Dwell Time = ± 0.5 hours
  - Optimum pH = 6 - 7
  - Disinfection dose = 2 - 8 mg/l
  - Chlorine content in chlorine = 70%
  - Specific gravity of chlorine = 0.8 kg/l.
- **Planned**
  - Dwell Time =0.5 hours
  - Tub depth = 1.5m
  - Free Board = 0.40 meters
  - Disinfection dose = 2mg/l
  - Disinfection dose = 0.002 kg/m3
  - Chlorine content = 70%-
  - Waste Water Discharge = 61.44 m3/day
  - Waste Water Discharge = 2.56m3/hour
  - Waste Water Discharge = 0.04m3/minute
- **Calculation**
  - Calculation of Disinfection Tank Dimensions

Planned:

Length : Width Ratio = 1 : 1 $Volume$ (m 3)
= $Panjang$ (m) x $Lebar$ (m) x $Kedalaman$ (m)
1,01 m 3 = $Panjang$ (m) x $Panjang$ (m) x 1,5 m
Length (m) =√(1.01/1.5)
Length (m) = 0.82 m ~ 0.85 m
$Panjang$ (m) = $Lebar$ (m) $Lebar$ (m)
= 0.85 m

From the calculation results above, it can be seen that the dimensions of the length and width of the disinfection tank are 0.85 m and have a depth of 1.5 m with a freeboard of 0.4 m.

Check the volume of the disinfection tank
$Cek\ Volume$ (m 3) = $Panjang$ (m) x $Lebar$ (m) x $Kedalaman\ Aktif$ (m)
$Cek\ Volume$ (m 3) = 0.85 m x 0.85 m x 3.00 m $Cek\ Volume$ (m 3)
= 1.08 (m 3)

Check the Time and Date of the Disinfection Tub
$Waktu\ Tinggal$ (jam) = (Sink Volume (m3))/(Q Waste Water (m3/hour))
$Waktu\ Tinggal$ (jam) =(1.08 (m3))/(2.56 (m3) /hour)
$Waktu\ Tinggal$ (jam) = 0.42 jam
$Waktu\ Tinggal$ ($menit$) = 25.2 $menit$

From the calculation above, it can be seen that the total coliform content removed in the disinfection tank unit is 14700/100 mL. The total coliform content that comes out of the disinfection tank unit into the water body is 300/100 mL.

Table 2: Effluent from the Grease Trap Unit to the Disinfection Tank

No	Parameter	Unit	Test results	Quality standards	Information
A	Physical Parameters				
1	Temperature	˚C	32.0	-	Fulfil
2	TSS	Mg/L	7.87	30	Fulfil
B	Chemical Parameters				
1	pH	-	5.97	6 - 9	Fulfil
2	COD	mg/L	17.5	100	Meet
3	Ammonia	mg/L	0.236	10	Meet
4	BOD	mg/L	6.82	30	Meet
5	Oils & Fats	mg/L	1.46	5	Meet
C	Biological Parameters				
1	Total Coliform	Amount/100ml	300	3000	Meet

Processing Unit Mass Balance

The mass balance at the wastewater processing unit is used to determine effluent data from each processing unit. The mass balance is made based on the calculation of the removal efficiency for each processing unit. The following is the mass balance of the ABR WWTP shown in **Figure 4** .

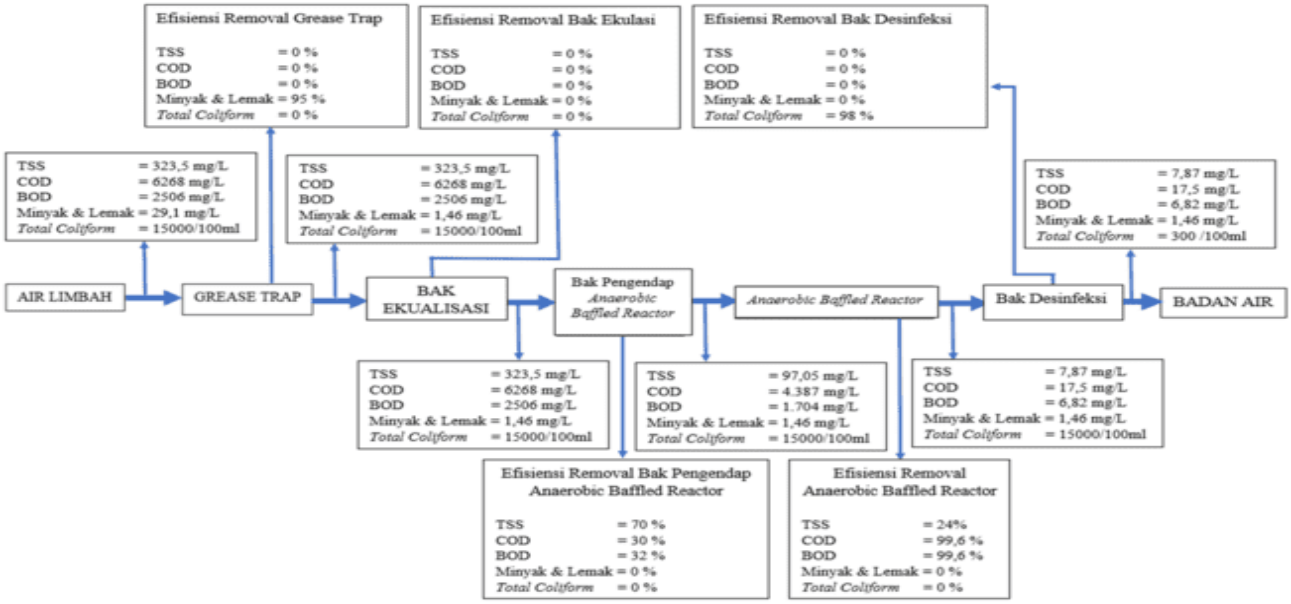

Figure 4: Mass Balance *of Anaerobic Baffled Reactor WWTP*

From the results of the calculations above, from the *grease trap unit* , to the equalization tank unit, then to the ABR unit , and finally to the disinfection tank where the test results which were initially very high became low and met the Domestic Waste Quality Standards based on the Regulation of the Minister of Environment and Republic of Indonesia Forestry No. 68 of 2016.

CONCLUSION

The domestic wastewater discharge produced by the activities of the Tahfidzul Qur'an Bambu Kuning Girls' Dormitory is 61.44 m3 / day. Calculation results of detailed design of the Waste Water Treatment Plant unit using the ABR process The dimensions of the ABR WWTP unit were obtained, including compartment I (8.4 m x 6.12 m x 2.5m), compartment II (1.3 m x 6.12 x 2.5m) with 3 compartments. From the results of

the calculation above, from the *grease trap unit* , to the equalization tank unit, then to the ABR unit , and finally to the disinfection tank where the initial test results of the waste enter with parameters TSS = 323.5 mg/L, COD = 6268 mg/L, BOD = 2506 mg/L, Oil & Fat = 29.1 mg/L, and *Total Coliform* = 15000/100ml being low and meeting Quality Standards Domestic Waste Based on Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 68 of 2016, namely TSS = 7.87 mg/L, COD = 17.5 mg/L, BOD = 6.82 mg/L, Oil & Fat = 1.46 mg/L, and *Total Coliform* = 300 /100 mL.

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