
PERFORMANCE EVALUATION OF THE BIOLOGICAL UNIT PROCESS FOR FECAL SLUDGE SUPERNATE TREATMENT (CASE STUDY: IPLT MADUREJO SLEMAN REGENCY, SPECIAL REGION OF YOGYAKARTA)

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ABSTRACT:

IPLT Madurejo is located in Sub-village Tinjon, Madurejo Village, Prambanan District, Sleman Regency, DIY. This IPLT was built in 2017 with a capacity design of 25 m³ /day. The existing condition shows that IPLT effluent from 2021-2022 has not met the quality standards of Minister of Environment and Forestry Regulation No. 68 of 2016. Therefore it is necessary to evaluate the technical processes so that the effluent meets quality standards. The method in this evaluation is carried out through evaluating existing conditions with design criteria and recommendations, both in terms of operational and process aspects of each stabilization pond unit, namely evaluating technical criteria, evaluating capacity, evaluating efficient removal of treatment, evaluating IPLT operations and planning on alternative unit designs. The average influent discharge of IPLT Madurejo from 2021-2022 is 29 m³ /day, of which the planning design capacity is 25 m³ /day. Therefore, IPLT Madurejo has an overload capacity of 4 m³ /day. The alternatives are to add similar pools with the same volume as well as adding Holding Tanks, Grease Traps, and disinfectant pools can be used as recommendations to increase the performance of IPLT and have a high probability of successful operation.

Keywords: IPLT, Fecal Sludge, Madurejo, Biological Process Unit

INTRODUCTION

In their daily lives, humans produce domestic wastewater. Domestic wastewater is wastewater produced from various forms of household activities (Sulistia & Septisya, 2019). Most Indonesians still use the local household wastewater treatment system (on site system) in the form of septic tanks.

The discharge of liquids and solids (feces) even though it has gone through processing in septic tanks but still has a high organic content as a material that has the potential to pollute the environment, considering that fecal waste has a BOD (Biological Oxygen Demand) value, TSS (Total Suspended Solid) value and a large amount of coliform bacteria. In addition,

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the presence of fecal waste can also cause social problems, namely in terms of aesthetics, unpleasant odors, and human health impacts. (Sefentry & Masriatini, 2021).

The Madurejo fecal sludge treatment installation (IPLT) operated in March 2019, this STP is located precisely in Sembir Hamlet, Madurejo Village, Prambanan District. Fecal sludge treatment is designed using a combination of solids-liquid separation units, liquid fraction treatment units and sludge drying units (solids fractions). The series of units in the IPLT consist of SAP (Sludge Acceptance Plant) units, equalization pools, dewatering units and stabilization ponds consisting of aeration, facultative and maturation pools, and mud drying basins.

This fecal sludge treatment plant has been operating but has not been optimally shown by the effluent value from laboratory test results obtained based on the latest analysis, which is December 16, 2022. Sample testing showed: aeration pond with BOD (101.4 mg/L), COD (199.1 mg/L), Total Coliform (5800 Jml/100 mL), facultative pool with BOD (91.8 mg/L), COD (180.5 mg/L), Total Coliform (5200 Jml/100 mL) maturation pool with BOD (56.3 mg/L), COD (113.5 mg/L), Total Coliform (3400 Jml/100 mL), while based on quality standards of the Minister of Environment and Forestry Regulation No.68 of 2016 concerning Domestic Wastewater Quality Standards states that BOD5 value of 30 mg/L, COD of 100 mg/L and Total Coliform 3000 Jml/100 mL and The volume of fecal sludge entering per day exceeds capacity, which is 29 m³/day based on the results of the author's survey on December 16, 2022, in which the planned discharge is 25 m³/day of Madurejo STP.

Therefore, it is necessary to evaluate the stabilization pool. On this occasion, the author underlines the problems that arise in the fecal waste treatment system, namely effluent from the STP stabilization pond which is not in accordance with the quality standards of the Minister of Environment and Forestry Regulation No. 68 of 2016 concerning Domestic Wastewater Quality Standards. The construction of the STP is expected to accommodate depleted fecal waste before being discharged into the environment so that it does not cause health problems and environmental comfort and make efforts to improve the performance of the Fecal Sludge Treatment Plant (IPLT). The construction of this STP is useful to anticipate worse impacts due to an increase in the volume of fecal waste and is also expected to deal with the problem of fecal waste effectively. Therefore, this study raised the title "Performance Evaluation of the Biological Process Unit for the Treatment of Fecal Sludge Supernatants (Case Study) of the Madurejo Fecal Sludge Treatment Plant (IPLT), Sleman Regency, Special Region of Yogyakarta".

RESEARCH METHODS

The method used in this study is measurement and calculation, which is obtained through observations at the Madurejo STP including the data collection stage and the data analysis stage. Secondary data are data obtained from IPLT Madurejo in the form of:

- Existing data of IPLT Madurejo
- Data on fecal trucks and sludge discharge entering IPLT 2021 – 2023
- Madurejo Fecal Sludge Treatment Plant flow diagram

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Gambar 1. Diagram Unit Proses Pengolahan di IPLT Madurejo

These sludge samples were taken on March 6, 8, 10, 2023 (High entry truck variation) and March 20 – April 13, 2023 (residence time variation of each treatment unit). In a day, IPLT accommodates as many as 12-19 fecal truck tanks with a capacity of 2000-4000 liters originating from the Sleman Regency area covering the Kalasan, Berbah and Sleman areas.

Analysis of Discharge and Dimensions of IPLT Madurejo

The Madurejo Fecal Sludge Treatment Plant (IPLT) has a built-up capacity of 25 m³/day in 2017. The current condition in 2023 is that there are fecal suction trucks at the Madurejo STP, there are two (2) types of trucks, namely trucks from the private sector with a capacity of 2 m³, and Environmental Agency (DLH) trucks with a capacity of 4 m³. Within the Sleman Regency there are 49 suction truck entrepreneurs with the average ownership of suction trucks is 2 trucks with a suction truck capacity of 2 m³. While the Environmental Agency (DLH) fecal truck has 5 suction trucks with a suction truck capacity of 4 m³.

Analisa Unit Aerasi

The aeration unit at IPLT Madurejo is built in concrete with open conditions and is square-shaped has dimensions Length (m) : 6.92, Width (m) : 9.87 and depth (m) : 2.50 and freeboard 0.4 (m), For dimensional analysis of aeration ponds can be seen in the following table.

Table 4. Aeration Pond Analysis

Information	Value	Unit	Design Criteria	Analysis Results
BOD	0,041	kg/m ³	5,0	Meet
TSS	42,637	kg/m ³	20	Not yet Meet
VSS Loading (Volumetric loading)	0,117	kg VSS/ hari/ m ³	0,5	Meet
Solid Retention time	-	day	21	-
Hidrolis Retention time	2	day	21	Not yet Meet
Length: Width Ratio	6,92 : 4,85	-	2: 1	Not yet Meet
Depth	2,5	meter	1-6	Meet

Source : Analysis Results, 2023

Analysis of fecal sludge characteristics

Fecal sludge testing at each treatment unit is carried out to determine the effectiveness of the ability of IPLT to remove pollutants contained in fecal sludge. Effluent quality checks were carried out through sampling with two variations, namely carried out in the first week of March 2023 based on secondary data of many fecal trucks entering the Madurejo STP on March 6, 10 trucks, March 8, 13 trucks and March 10, 7 trucks and the third week, samples were taken based on the residence time of each unit of the Madurejo STP stabilization pool. Fecal sludge analysis was carried out at the Environmental Engineering laboratory of the Yogyakarta Institute of Technology to test wastewater parameters which include BOD, COD, TSS, pH, Fatty Oil and Total Coliform and refer to

the quality standards of domestic waste Minister of Environment and Forestry No. 68 of 2016.

Chemical Oxygen Demand (COD)

The COD test was carried out with two variations of sampling, which was carried out in the first week of March 2023 (based on secondary data, namely when the most fecal trucks entered the Madurejo STP) and the third week, namely samples were taken (based on the residence time of each unit of the Madurejo IPLT stabilization pool). The efficiency of COD removal in the first sampling variation is the week of the most fecal trucks. On March 6, 2023 (10 trucks = 20 m³) shows that the Aeration Pool with non-peak hours has a removal efficiency of 71.23% and peak hours of 67.34%. Facultative pools with non-peak hours have a removal efficiency of 8.48% and peak hours of 24,55%. Maturation ponds with non-peak hours have a removal efficiency of 55.64% and peak hours of 57.60%. On March 8, 2023 (13 trucks = 26 m³) showed an aeration pond with non hours having a removal efficiency of 71.69% and peak hours of 58.50%. Facultative pools with non-peak hours have a removal efficiency of 29.70% and peak hours of 27.44%. Maturation ponds with non-peak hours have a removal efficiency of

56.34% and peak hours of 20.86%. On March 10, 2023 (7 trucks = 14 m³) showed an aeration pond with non hours having a removal efficiency of 49.65% and peak hours of 28.60%. Facultative pools with non-peak hours had a removal efficiency of 49.71% and peak hours of 63.17%. Maturation ponds with non-peak hours have a removal efficiency of 56.01% and peak hours of 59.97%. Based on the residence time of each processing unit (8 trucks = 16 m³) shows an aeration pond with a percentage of COD reduction of 5.67%. Facultative Pool has a removal efficiency of 79.12%. The Maturation Pool has a removal efficiency of 7.19%. It can be underlined the cause of the ineffective decrease in COD concentration caused by the capacity of incoming waste exceeding the planned discharge and characteristics of COD that are high or contain organic matter that is difficult to decompose (Suoth, 2016). However, the outlet results on the COD parameter are still above the quality standards of domestic waste Minister of Environment and Forestry No. 68 of 2016.

Biological Oxygen Demand (BOD)

The effluent value of BOD in the variation of the first sampling of the aeration pond On March 6, 2023 (10 trucks

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= 20 m³) shows that the Aeration Pool with non-peak hours has a removal efficiency of 75.67% and peak hours of 72.56%. Facultative pools with non-peak hours have a removal efficiency of 20.54% and peak hours of 28.74%. Maturation ponds with non-peak hours have a removal efficiency of 56.40% and peak hours of 59.09%. Based on visual observations of the facultative pond of the Madurejo STP found a lot of mud solids and weeds on the surface of the pond. This indicates that the maintenance of the facultative pool unit, this condition can cause disruption of the aerobic process in the pool, besides that it can also cause silting of the pool or eutrophication (Purba, 2020).

On March 8, 2023 (13 trucks = 26 m³) shows an aeration pond with Non hours have a removal efficiency of 74.38% and peak hours of 58.50%. Facultative pools with non-peak hours have a removal efficiency of 33.76% and peak hours of 30.73%. Maturation ponds with non-peak hours have a removal efficiency of 62.81% and peak hours of 29.84%. The efficiency of BOD reduction is seen small in facultative pools, this problem is the same as what happened on March 6, 2023. A small

percentage is also seen at the peak hours of the maturation pond, this happens because the organic load contained in the liquid waste is too large and based on observations in the field the condition of the maturation pond there is blooming algae so that light penetration in the maturation pond is still small (Lair et al., 2005)

On March 10, 2023 (7 trucks = 14 m³) showed an aeration pond with non hours having a removal efficiency of 49.31% and peak hours of 30.32%. Facultative pools with non-peak hours had a removal efficiency of 55.48% and peak hours of 68.93%. Maturation ponds with non-peak hours have a removal efficiency of 60.83% and peak hours of 64.07%. The factor that affects the small value of the percentage of efficiency is the lack of maximum surface Aerators that function to supply air into wastewater, so that the oxygen needed by microorganisms to help the process of decomposing organic matter is less (Isnaini et al., 2019).

Based on the residence time of each processing unit (8 trucks = 16 m³) shows an aeration pond with a percentage decrease in BOD of 10.47%. Facultative Pool has a removal efficiency of 83.00%. Maturation

ponds have a removal efficiency of 8.07%. This is likely due to the seeding process aeration time of 5 hours per day is not enough to grow all existing aerobic microorganisms, so there is competition for nutrients between microbes in meeting their needs, which causes effectiveness to be less optimal (Mudatsir, 2007), for maturation ponds have the same problem as March 8, 2023. If the residence time of waste in the pond is too short, biological processes do not have enough time to eliminate BOD efficiently (Susilo, 2016) In reducing BOD levels greatly affects the effluent produced, the experiment shows a value above the quality standards of domestic waste quality standards Minister of Environment and Forestry No. 68 of 2016 but not too. However, fecal sludge effluent is not directly discharged into water bodies.

Total Suspended Solid (TSS)

TSS is a suspended material or material that causes water turbidity consisting of mud, fine sand and tiny bodies which are mainly caused by soil erosion or erosion carried by water bodies (Rudiyanti, 2009)The TSS levels in table 4.12 are primary data taken from March 6, 2023 to April 13, 2022, which totals 7 data from the

wastewater TSS test results of the Madurejo IPLT, Sleman Regency.

TSS removal efficiency in the variation of the first sampling of the aeration pond On March 6, 2023 (10 trucks = 20 m³) showed that the Aeration Pool with non-peak hours had a removal efficiency of -23.88% and peak hours of -87.40%. Facultative pools with non-peak hours had a removal efficiency of 48.01% and peak hours of 58.29%. Maturation ponds with non-peak hours have a removal efficiency of -19.84% and peak hours of 79.38%.

On March 8, 2023 (13 trucks = 26 m³) showed an aeration pond with non hours having a removal efficiency of -88.05% and peak hours of -268.93%. Facultative pools with non-peak hours have a removal efficiency of 79.00% and peak hours of 64.34%. Maturation ponds with non-peak hours have efficiency Removal by -42.10% and peak hours by 67.90%.

On March 10, 2023 (7 trucks = 14 m³) showed an aeration pond with non hours having a removal efficiency of -54.49% and a peak hour of -253.38%. Facultative pools with non-peak hours had a removal efficiency of 65.96% and peak hours of 22.55%. Maturation ponds with non-peak

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hours have a removal efficiency of 13.09% and peak hours of 59.55%.

Based on the residence time of each processing unit (8 trucks = 16 m³) shows an aeration pond with a percentage decrease in TSS of -1.291%. Facultative Pool has a removal efficiency of 81.82%. Maturation Pool has a removal efficiency of 87.82%.

It can be seen that the TSS concentration in each IPLT processing unit fluctuates, the best TSS concentration allowance is in the facultative pool because there is no increase in concentration. TSS opt-out is affected by detention time that does not meet design criteria. The results of processing in aeration ponds have increased TSS concentrations due to aeration ponds that are not drained periodically and the scum on the surface of the pool has never been cleaned and the flow entering the aeration pond does not flow continuously.

Ammonia

Ammonia is sourced from urine, feces and microbiological oxidation of organol substances derived from nature (Patty et al., 2020). High ammonia levels cause unpleasant odors, can lead to excessive growth of lichens and microalgae called eutrofication (Mariyana et al., 2015). In table

4.13. The efficiency of ammonia removal in the variation of the first sampling of the aeration pond on March 6, 2023 (10 trucks = 20 m³) shows that the Aeration Pool with non-peak hours has a removal efficiency of -36.82% and peak hours of 0.02%. Facultative pools with non-peak hours have a removal efficiency of -71.74% and peak hours of 0%. Maturation ponds with non-peak hours have a removal efficiency of -5.2% and peak hours of 0%.

On March 8, 2023 (13 trucks = 26 m³) showed an aeration pond with non hours having a removal efficiency of -38.20% and peak hours of -4.5%. Facultative pools with non-peak hours had a removal efficiency of 13.01% and peak hours of 13.07%. Maturation ponds with non-peak hours have a removal efficiency of 39.26% and peak hours of 34.42%.

On March 10, 2023 (7 trucks = 14 m³) showed an aeration pond with non hours having a removal efficiency of -155.87% and a peak hour of 1.9%. Facultative pools with non-peak hours had a removal efficiency of 30.87% and peak hours of -43.71%. Maturation ponds with non-peak hours have a removal efficiency of -19.98% and peak hours of 28.89%.

Based on the residence time of each processing unit (8 trucks = 16 m³) shows an aeration pond with a percentage of ammonia reduction of -25.83%. Facultative Pool has a removal efficiency of 99.99%. The Maturation Pool has a removal efficiency of -6.22%. In the results of the ammonia concentration test in the processing of IPLT madurejo on average has a content below the quality standard, therefore although there are fluctuations in the results of ammonia laboratory tests, the laboratory test values are safe for the environment.

Fatty Oils

Oil and fat are the main components of foodstuffs that are also widely obtained in wastewater. The content of oil and fat substances is determined through wastewater samples with hexane (Arlina, 2018). Fats belong to organic matter that is fixed and not easily broken down by bacteria. Oil can get to wastewater, most of the oil floats in wastewater, but there is also oil that settles carried by sludge.

The results of laboratory tests showed the results of testing oil and fat levels on a bribe of the fecal sludge treatment unit at the Madurejo STP. Oil and fat levels carried

out with 2 variations of this experiment found a comparison of values with far different results. In variations based on the residence time of this experiment there was an increase in concentration in the facultative pool of high fat oil in the facultative pool indicated by the mud solids present on the surface of the pool

But in the maturation pool there is a decrease in concentration. This high fat oil content is caused by the large amount of wastewater left over from kitchen activities that enter or are mixed into the septic tank which is then sucked up by the fecal tank truck so that there are high levels of oil and fat marked by deposits on the surface of the pool. High levels of oil and fat will interfere with the life of organisms in the water, this is because the oil film on the surface of the water will block the diffusion of oxygen from the air into the water so that jumlah oksigen terlarut didalam air menjadi berkurang (Pratiwi & Hendrawan, 2014)

Optimization of Technical Aspects of IPLT Madurejo

Processing Unit

Aeration Pool

The Madurejo IPLT aeration unit can operate optimally and sustainably, so from the evaluation of the aeration unit above,

the procedures for operating the aeration unit can be formulated as follows: Periodic draining of the pool for at least 1 year is carried out accompanied by the installation of sludge draining pipes and the addition of pumping units to suck sludge and cleaning scum foam, organic and inorganic waste on the surface of the pool, And in aeration ponds, aerators require full time operational time so that the mechanical aerator system functions properly.

Facultative Pool

To optimize the performance of facultative pools, several improvements are needed, among others. Periodic draining of the pool for at least 1 year is carried out accompanied by the installation of sludge draining pipes and the addition of pumping units to suck sludge deposits as well as cleaning organic and inorganic waste on the pool surface and monitoring the cleanliness of the pool so that there is no accumulation of sediment on the pool surface caused by high oil and fat levels (Hendrawan & Murase, 2008)

Maturation Pool

To optimize the performance of the maturation pool, several improvements are needed, among others. Periodic draining of

the pool is carried out for at least 1 year accompanied by the installation of sludge draining pipes and the addition of a pump unit to suck sludge deposits and cleaning scum foam, organic and inorganic waste on the surface of the pond.

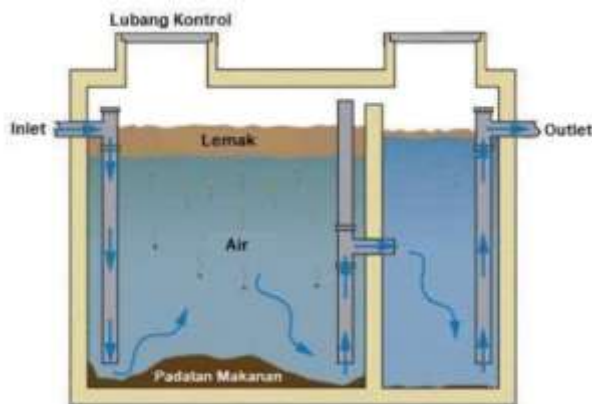
Addition of Processing Units

The addition of a processing unit in the form of a grease trap before the stabilization processing unit and the addition of a disinfection pool after the maturation pool.

Grease Trap

Oil and grease removal using grease traps is carried out at the beginning of the processing system to prevent interference with the next processing unit. In general, grease traps consist of two compartments (Dhuha, 2020). The first compartment serves to set aside different types of solids in the waste: solids with a specific gravity heavier than water will settle while solids with a specific gravity lighter than water (such as oils and fats) will float on the surface of the water. Furthermore, the second compartment serves to ensure that oil and fat remain retained in the system and are not carried away by wastewater flowing to the next treatment unit. The

retained oil and grease must be cleaned periodically to keep the unit clean and prevent clogging. The grease trap consists of two compartments, namely the first compartment (2/3 of the total length) and the second compartment (1/3 of the total length). The grease trap is equipped with a control hole (manhole) with a minimum diameter of 0.6m. Some studies say that grease traps can remove up to 80% of oils and fats (EPA, 1998), and 50-80% of BOD and TSS (DPH, 1998).



Gambar 2. Skematik Grease Trap

Planning Criteria

Flow speed : 2 -6 m/h

(Source: Directorate General of Copyright. 2018. Book A Guide to Detailed Engineering Design of Fecal Sludge Treatment Buildings, p 25. Jakarta: Ministry of Public Works and Public Housing)

Detention time : 5 – 20 minutes

(Source: Directorate General of Copyright. 2018. Book A Guide to Detailed Engineering Design of Fecal Sludge Treatment Buildings, p 25. Jakarta: Ministry of Public Works and Public Housing)

Disinfection Pool

Disinfection is the process of destroying microorganisms that can cause disease. Runoff water from the Madurejo STP treatment unit still contains coli bacteria and pathogenic bacteria (Pratiwi Y., 2019). Chlorination is one of the safety processes against pathogenic microorganisms. Of the three chlorine compounds (HOCl, OCl-, and NH₂Cl), hypochlorite acid is the most effective compound for inactivating microorganisms in water (Silvana et al., 2020). Khlor, especially HOCl, is generally very effective for pathogen inactivation. Water treatment with chlorine affixing 1 mg / l with a contact time of less than 30 minutes is generally effective for reduces bacteria in considerable quantities, up to 99%. Wastewater that comes out of the maturation basin is flowed into the chlorination bath and spiked with chlorine compounds at a certain dose and time so that all pathogenic microorganisms can be killed (Said et al., 2013).

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Some examples of the application of chlorine compound contactor units in wastewater treatment can be seen in Figure 3. Chlorine compounds injected into wastewater can be in the form of solutions (liquids) or in tablet form. An example of the cross-section of a chlorine contactor bath with chlorine compounds in the form of chlorine in tablet form can be seen in the following figure.

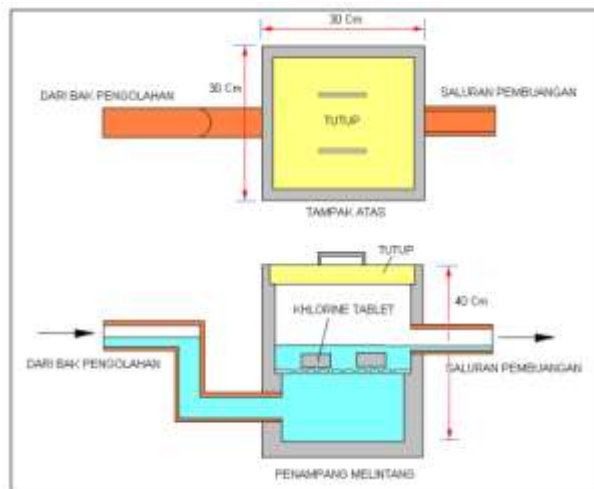


Figure 3. Cross Section of the Khlorinator Body
(source: Said et al, 2013)



Figure 4. Example of Khlorine Contactor Body for disinfection process (source: Said et al, 2013)

Ideal dimensional design for IPLT Madurejo

Based on the analysis and calculations above, it can be said that the Madurejo STP which has been operating for 4 years has not run optimally in accordance with the function of each processing unit. Therefore, it is necessary to improve and add units based on PUPR Regulation no. 04 Annex-II of 2017 so that the STP runs optimally. The ideal dimensional design for the Madurejo STP can be done by adding several similar pools to overcome the excess incoming discharge as well as extend the stay time.

Alternative IPLT Processing with the addition of Similar Pools

The Madurejo Fecal Sludge Treatment Plant (IPLT) has a built-up capacity of 25 m³/day in 2019. The current condition in 2023 is that there are fecal suction trucks at the Madurejo STP, there are two (2) types

of trucks, namely trucks from the private sector with a capacity of 2 m³, and Environmental Agency (DLH) trucks with a capacity of 4 m³. Within the Sleman Regency there are 49 suction truck entrepreneurs with the average ownership of suction trucks is 2 trucks with a suction truck capacity of 2 m³. While the Environmental Agency (DLH) fecal truck has 5 suction trucks with a suction truck capacity of 4 m³. There is a recapitulation of the average rhythm of fecal trucks entering the Madurejo STP per day in 2021, 2022 and January – March 2023.

Based on the data above, it is known that the highest average fecal sludge discharge per day that has ever entered the Madurejo STP is in 2021-2023 is 34 m³ / day to 38 m³ / day. Seeing the existing condition of the demand for suction and disposal of fecal sludge at the Madurejo STP from the request of prospective customers from private parties (fecal truck entrepreneurs) for suction and disposal of fecal sludge in Sleman Regency. Addition of similar pools carried out to overcome the excess amount of fecal sludge entering the Madurejo STP without eliminating or reducing the existing treatment pond.

Increased Fecal Sludge Capacity sourced from the Department

The role of the community or private sector is needed to assist the government in suction activities, and also help the surrounding community to find jobs so as to reduce the number of unemployment in the region.

The number of private sectors in the Sleman Regency area is very large. This number can be seen from the influx of privately owned fecal trucks entering the Madurejo STP to carry out fecal sludge flushing. From the data obtained from the Madurejo Regional Administrative Institution, the number of fecal trucks entering per day is around 29 m³ / day of private fecal trucks entering the Madurejo Regional Police, while for fecal trucks belonging to the Environmental Office (DLH) of Sleman Regency only 2-3 times per week. This is due to the lack of notification to the surrounding community regarding the existence of fecal sludge suction services owned by the Environmental Office (DLH) of Sleman Regency, it is expected to be taken into consideration for local government in improving the local government's fecal sludge suction service. The comparison

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matrix of private fecal trucks with DLH fecal trucks to Madurejo STP is as follows.

Trucks From	Total Fecal Suction Truck (Truck)	Mean Mutation (per Day)	Fecal Sludge Discharge (m3/day)	Prospective Customers at IPLT Madurejo
Private	50	10	20	32
DEBT	5	3	12	-
Total	55	-	32	-

Source : Analysis results, 2023

The existing average incoming fecal sludge discharge is 32 m³ / day (from Private Trucks and Official Trucks). However, the amount of fecal sludge discharge that enters as much as 50% of prospective customers of private fecal trucks, then the incoming fecal sludge discharge is 32 m³ / day. The total incoming sludge discharge based on the average existing of prospective customers is 64 m³ / day.

Therefore, based on the analysis above, the optimization of the capacity of the Madurejo STP should be 64 m³ / day. This is in consideration if it is estimated that 100% private fecal trucks. which enters the Madurejo STP, the fecal sludge discharge enters 64 m³ / day, so that it can accommodate 100% of the fecal trucks entering the Madurejo STP.

CONCLUSION

From the research that has been done, it can be concluded as follows:

The overall performance of the processing unit has not met the applicable criteria and is less than optimal, judging from: The allowance efficiency on the parameters of BOD, COD, TSS, Fatty oil and total coliform test still exceeds the quality standards of Minister of Environment and Forestry No. 68 of 2016. The discharge of fecal sludge entering the Madurejo STP is 29 m³ / day exceeding the capacity with the design of the fecal sludge treatment unit. The design of the Madurejo IPLT processing units mostly meets the design criteria, but the operation and maintenance of the processing units have not run well. Recommendations for improving the performance of the STP stabilization pool include: Carried out by adding SOPs or operating instructions for the IPLT unit. Briefing to workers about IPLT operations so that IPLT operations can run according to procedures. The addition of laboratory facilities or laboratory personnel in the IPLT area, so that monitoring the quality of processing of each unit can take place regularly. Addition of a pumping unit to drain sludge accumulated in the treatment unit.

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