



Scheduled Desludging of Human Waste at Lowokwaru District of Malang

Cahyani Ainin Azizah* and BiebyVoijant Tangahu

Post Graduate Program Environmental Sanitation Engineering, Environmental Engineering Department, SepuluhNopember Institute of Technology (ITS) Surabaya, Indonesia

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ABSTRACT

This Study aimed to know the existing and Adequacy Capacity of Supit Urang's Fecal Sludge Treatment Installation (IPLT), and the ability of social communities in the research area to support the implementation of Scheduled Desludging of Human Waste (LLTT). The existing condition of Supiturang's IPLT recently shows that the installed IPLT has 50 m³/day capacity, while the utilized capacity based on its maximum average of wasted fecal sludge discharge in 2014-2016 is 18.8 m³/day. At the moment, 60-70 % of Supit Urang's IPLT are in idle capacity, so it is very supportive of LLTT at Malang City. Research methods in the form of descriptive method which includes the existing conditions of fecal sludge management service. The results showed that LLTT in Lowokwaru district which could be conducted based on its preparation, the number of LLTT customers can be counted around 20 householders/day, with rotation circulation need, 10 rotation/day which needs 5 truck. This technical aspect analysis can be a basic consideration to design LLTT planning for 4 years 27 day periods in Lowokwaru district which can be done by using current installed capacity in SupitUrang, which is 30 m³/day, based on the result of questionnaire collection shows that 98% of people are ready to pay for 5,000 – 10,000 rupiahs retribution. This data can support to immediately implement LLTT

KEYWORDS: Capacity, Fecal Sludge, LLTT, Lowokwaru district, Supit Urang's IPLT.

INTRODUCTION

Based on a Review of Wastewater Master Plan 2015 in Malang City, access to waste water of Malang was 89.43%, while defecation carelessly (BABS) is 10.57%. As for the on site access of Malang was 86.26% and off site access amounted to 3.17%. Sanitation development plan for the next 20 years that includes short-term (2016-2019) and improve on site access of Malang became 95% and off site access to 5%. [1]

Lowokwaru district is located in the western region of Malang city, East Java which has 22.6 km² total area. In 2013, the population of this district reaches up to 214,087 inhabitants with 92 inhabitant/Ha for its population density. Lowokwaru district is one of pilot project region for scheduled desludging of human waste in Malang city. It becomes a preferred district because among other districts in Malang, Lowokwaru has high population density and is the first zone that should be prioritized in improving its on-site sanitation access based on the Review of Wastewater Master Plan in Malang City in 2015. [1]

The existing condition of Supiturang's IPLT recently, shows that the installed IPLT has 50 m³ /day capacity, while the utilized capacity based on its maximum average of wasted fecal sludge discharge in 2014-2016 is 18.8 m³/day. At the moment, 60-70 % of SupitUrang's IPLT are in idle capacity (30 m³/day) due to internal problems occurred in UPT PSAL-DKP (waste and wastewater management section of cleanliness and landscaping department). Besides its technical problems—such as the unit that can be used only Solid Separation Chamber (SSC), Anaerobic Baffled Reactor (ABR), and Sludge Drying Bed (SDB) — the minimum cost management provided by regional government, the absence of standard operating procedure (SOP), and the minimum human resources to manage

*Corresponding Author: Cahyani Ainin Azizah, Post Graduate Program Environmental Sanitation Engineering, Environmental Engineering Department, SepuluhNopember Institute of Technology (ITS) Surabaya, Indonesia. email: cahyani.beau@gmail.com

SupitUrang's IPLT—which only has 4 staffs, The other greatest problem is the lack of people's awareness to live in a clean and healthy lifestyle, particularly to regularly drain the septic tank. [2].

This study aimed to know the existing and Adequacy Capacity of SupitUrang's IPLT, and social communities in the research area are able to support the implementation of LLTT Program.

METHODS

This research needs primary data taken from observation result by carrying out interview with related parties, distributing questionnaire for 100 respondents. While secondary data was taken from related institutions. The overview of this research include the conditions of services domestic waste management in particular by waste and wastewater management section of cleanliness and landscaping department (UPT PSAL-DKP) and water supply company (PDAM) in Malang City, so we can do an analysis in accordance with the approach of the concept. Based on such analysis, is expected to produce a strategy to minimize the problem.

Interview conducted on the entire relevant stakeholders namely PDAM Malang City, UPT PSAL-DKP, SupitUrang's IPLT, (Development Of Environmental Health of the settlement) PPLP in Surabaya City.

Method used in this research is technical aspect with measure the need of transport infrastructure, drain period based on potential customer of LLTT, social aspect with questionnaire which can be calculated by using random sampling formula to measure willing to participate and ability to pay for the LLTT cost

RESULTS AND DISCUSSION

Existing Conditions in SupitUrang's IPLT

SupitUrang's IPLT consists of several buildings with functions is:

a. Preliminary Sedimentation Ponds

Function to unloading fecal sludge from truck to processing unit and then separate the liquid from fecal sludge. The filter solid object is too big, so solid object can't be filtered well.



Figure 1. (a) unloading process, (b) filter solid object

b. Solid Separation Chamber (SSC)

Function to separate the liquid from fecal sludge, almost the same functionality with Preliminary Sedimentation Ponds

Process occurs on the unit is:

- Separate the sludge and liquid, and then the sludge flowed into Sludge Drying Bed.
- Liquid that reduced the levels of precipitation due to sludge than flowed into Anaerobic Baffled Reactor.

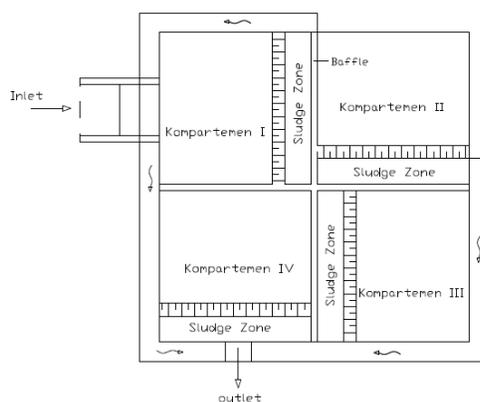


Figure 2. SSC Design [3]

Design of SSC has 4 of compartment that the same size of each other, there is sludge zone for settles of sludge.

- c. Anaerobic Baffled Reactor (ABR)
Waste treatment unit that accommodates the fluid from SSC and Preliminary Sedimentation Ponds to cultivate liquid with anaerobic process will reduce organic substances in liquid. ABR has 5 compartments with the dimensions of each are different.
- d. Aeration Pond
Function of the aeration pond is to adding liquid oxygen process the liquid from ABR, in order for the next process in wetland pond can take place optimally. Based on observation in study area there is a technical error that is the height of elevation from ABR and aeration pond is the same, so aeration pond may not work.
- e. Wetland Pond
Processing that occurs on a Wetland Pond is process of BOD reduction from the liquid that flows from Aeration Pond, however in the study area can't function because the Aeration Pond is also not working properly.
- f. Sludge Drying Bed (SDB)
SDB received sludge from SSC and ABR, SDB is still functioning properly but with limited capacity, function of the SSC and ABR is not optimal, so domestic waste that processed from ABR to SDB still has a high liquid content. As a result the function of SDB is not optimal.

Processing unit IPLT SupitUrang can still be functioning only SSC, ABR and SDB, while other units are still exists but is not functioning because of technical errors in the manufacturing process.

Table 1. Conditions of services domestic waste water management in SupitUrang's IPLT

Unit Name	Function	Problems
Preliminary Sedimentation Pond	Separating solids from the fecal sludge	This unit is able to separate solid well
Solid Separation Chamber (SSC)	Separating the liquid from the fecal sludge	Sludge and liquids are still mixed result of a filter that is too large
Anaerobic Baffled Reactor (ABR)	Hold the liquid from SSC unit for processed in anaerobic, to reducing Biochemical Oxygen Demand (BOD) in the liquid.	The sludge with liquids has not been perfect in the pond with separate before, so that the process can't take place optimally.
Aeration Pond	Adding liquid oxygen from ABR, in order to make the process of wastewater treatment in aerobic at the next wetland pond can take place optimally	Technical error that is the height of the ABR and Aeration practically, so fluid cannot flow toward the pond of aeration, so that the building does not work
Wetland Pond	Reduction process of the BOD liquid that flows from the Aeration Pond.	Does not work because the aeration Pond is not functioning
Sludge Drying Bed (SDB)	Receive the sludge of SSC and ABR	Function properly

The measurement results from water quality Laboratories against the effluent from processing Unit in Supit Urang's IPLT that content of BOD, Chemical Oxygen Demand(COD), Oil and Fats doesn't match the raw waste water quality standards [3], It can be concluded that the fecal sludge treatment in SupitUrang's IPLT less than optimally.

Questionnaire Results

Determined the number of samples refers to regulation of Minister The Ministry of Public Works number 18 of 2007. [4] The Formula is:

$$n = \frac{Np(1-p)}{(N-1)D+p(1-P)} \quad (1)$$

$$D = \frac{B^2}{t^2} \quad (2)$$

Description:

- n = number of samples
- N = number of homes
- p = ratio from element that has the desired properties (p = 0.5)
- B = error rate of each sample (6%)
- t = trust level (95%)

The Data:

- N = 44,117 householders
- P = 0.5
- B = 6 %
- t = 95 %

then, can be calculated by:

$$D = \frac{0.05^2}{0.95^2} = \frac{0.0009}{0.9025} = 0.0025$$

$$n = \frac{44,117 \times 0.5 \times (1 - 0.5)}{(44,117 - 1) \times 0.0025 + 0.5 \times (1 - 0.5)}$$

$$n = \frac{11,029.25}{110.54}$$

$$n = 99.776 = 100 \text{ Sample}$$

For sampling is needed in Lowokwaru District by using random sampling method, so that the resulting calculations is:

Table 2. Calculation of Total Sample

Number	District	Sub District	Number of Population	Number of Householders	Percentage (%)	Number of Sample
I	Lowokwaru	Tunggulwulung	7,169	2,014	4.6	5
		Merjosari	17,199	4,534	10.3	10
		Tlogomas	14,331	4,476	10.1	10
		Dinoyo	16,165	3,562	8.1	8
		Sumbersari	14,652	3,183	7.2	7
		Ketawanggede	8,322	2,047	4.6	5
		Jatimulyo	20,924	4,158	9.4	9
		Tunjungsekar	16,906	4,231	9.6	10
		Mojolangu	24,245	4,691	10.6	11
		Tulusrejo	17,374	3,543	8.0	8
		Lowokwaru	19,369	6,162	14.0	14
		Tasikmadu	6,853	1,516	3.4	3
		TOTAL NUMBER			183,509	44,117

Based on the result from 100 sample of questionnaire collection, it reveals that the total number of PDAM customer is 73%, the potential level of septic tank ownership for PDAM in Lowokwaru is 87%. From the questionnaire results, it shows 94% of the PDAM customers are willing to participate LLTT. This result indicates a good chance to conduct LLTT program. This is because of highly appreciation from society that is indicated by the data showing people's ability to pay for the LLTT cost in every month. The data also shows that 98% of people are ready to pay for 5,000 – 10,000 rupiahs retribution. This data can support to immediately implement LLTT, because the community is starting to understand the danger of pollution from domestic waste.

Adequacy Capacity of SupitUrang's IPLT

Potential customers of PDAM are 24,051 householders based on these data can be done the calculations for planning LLTT program. Planned capacity of Supit Urang's IPLT currently can still be used to plan a program of LLTT is the difference to the capacity unused and installed capacity is:

Planned Capacity of LLTT	: $50 \text{ (m}^3\text{/day)} - 20 \text{ (m}^3\text{/day)} = 30 \text{ (m}^3\text{/day)}$
Septic Tank Drained	: $30 \text{ (m}^3\text{/day)} : 1.5 \text{ (m}^3\text{/householders)}$ [5]
	: 20 householders/day
Required Rotation	: $20 \text{ (householders /day)} : 2 \text{ (householders /rotation)}$ [5]
	: 10 (rotation/day)
Truck needed	: $10 \text{ (rotation/day)} : 2 \text{ (rotation/truck/day)}$ [5]
	: 5 trucks

The planned period can be calculated from the number of PDAM that potential customers divided the number of Septic Tanks can be drained is 4 years 27 days period.

CONCLUSION

Conclusion of the analysis result that LLTT Program in Lowokwaru District can be done by using current installed capacity ($30 \text{ m}^3\text{/day}$) of SupitUrang's IPLT, and social communities in the research area are able to support the implementation of LLTT Program.

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