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Prevention Strategy Of The Delivery Of Construction Projects In Feces Mud Processing Infrastructure Development

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ABSTRACT: *Fecal Treatment Plant (IPLT) is a wastewater treatment designed to only accept and treat sludge originating from local systems that are transported by means of transporting sludge. In the construction of the IPLT Infrastructure there was a delay in development that occurred in 3 places of the IPLT construction, namely the IPLT of Tanah Bumbu Regency, IPLT in the City of Banjarbaru, and the IPLT of the Tapin Regency. Of all the constraints that occurred in the IPLT, the duration of the work was separated from the planned construction of the IPLT infrastructure.*

The purpose of this study was to find out the factors that caused the delay in the IPLT development project and the prevention strategy of the project delay. In connection with these objectives, the study was conducted using questionnaires and interviews as a tool for collecting data distributed to respondents. Respondents were chosen from people who were directly involved in the construction of the IPLT.

From the results of the analysis that has been conducted, it can be concluded that the factors causing delays in the IPLT infrastructure development project are caused by 6 variables. These factors are material (material), factors of skilled labor, equipment factors, project owners (PPK), technical factors of IPLT and environmental factors. From these factors, the prevention strategy of the delay in the IPLT project is good and progressive scheduling, good workforce organization, availability of equipment by contractors, the need for good coordination between government agencies and conducting re-surveys and conducting intensive supervision.

Keyword: *IPLT, Feces, Project Delays, Prevention Strategies*

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I. PRELIMINARY

Fecal Treatment Plant (IPLT) is a wastewater treatment designed to only accept and treat sludge originating from local systems that are transported by means of transporting sludge. Construction of the IPLT to anticipate further environmental pollution due to the management of sludge that is not in accordance with the standard of health. The mud will be processed into dry mud called cake and processed / effluent water that is safe will be discarded or reused. For dry mud can be used as fertilizer and effluent can be used for irrigation purposes.

In the construction of the IPLT there were several problems in the construction of the IPLT including elevation problems between connecting ponds, the environment where IPLT was built and leaks that often arose as a result of not meeting the relationship between the previous casting surface and the next casting surface. The more stages of casting, the more the weak points against the leakage circle. To overcome this problem is done by using water stop on the casting stage connection. In table 1, it can be seen that the IPLT development projects are experiencing delays.

Table 1. The infrastructure development projects of the ITL which have been delayed

No	Project	Planning (Day)	Delay from Planning
1.	IPLT Infrastructure Development Project Tanah Bumbu Regency	180	5 %
2.	IPLT Infrastructure Development Project Banjarbaru Regency	210	5 %
3.	IPLT Infrastructure Development Project Tapin Regency	210	5 %

There are several aspects that can cause delays in the project. One of the studies (Proboyo, 1999) resulted in the main factor that caused the delay was the Request for Amendment to Work that was Completed, which was caused by the project owner and Poor Managerial Technical and Qualifications of Personnel in the Contracting Work Organization. Research (Suyatno, 2010) found that the causes of delay were shortages of labor and subsequently errors in planning and specifications. Research (Sihombing, 2014) found that the causes of project delays were Factors of Materials (Materials), Equipment Factors, Project Owners, Technical Factors, and Environmental Factors. Research conducted by (Al-Kharashi & Skitmore, 2009) concluded that the delay that occurred from the contractor's side caused the project completion time to be longer, the overhead costs increased and caused the contractor to be trapped in the project.

In this study, we will analyze the factors that cause delays in the implementation of the IPLT infrastructure development project. Analysis of the factors that cause delay is important so that service providers and parties involved in construction services can take appropriate steps and solutions to overcome the problem of delays in the implementation of jobs that often recur and result in increased costs.

II. RESEARCH METHOD

In this study took a sample of 23 people who were directly involved in the construction of the IPLT. The sample consisted of 7 people from KDP and technical teams, 10 people from contractors, and 6 people from supervisory consultants.

The variables in this study are explained in Table 2.

Table 1. Research Variable

No	Variable		Indicator	Code
1.	Material Factor	1.	Material changes in form, function and specifications	X_1
		2.	The exact delivery schedule for materials	X_2
		3.	The incompatibility of fabrication of building materials	X_3
		4.	Inaccurate order	X_4
2.	Skilled Workers Factors	1.	Lack of Builders	X_5
		2.	Lack of Workers	X_6
		3.	Lack of artisan head	X_7
		4.	Workforce Ability	X_8
3.	Equipment factor	1.	Equipment damage	X_9
		2.	Availability of equipment	X_{10}
		3.	The ability of the foreman or operator	X_{11}
		4.	Equipment productivity	X_{12}
		5.	Error management of equipment	X_{13}
4.	Project owner (PPK)	1.	Too late in providing land	X_{14}
		2.	Hold job changes	X_{15}
		3.	Changes in design by the owner	X_{16}
5.	Technical Factors IPLT	1.	Changes in the condition of the IPLT project location	X_{17}
		2.	Elevation between sludge treatment ponds	X_{18}
		3.	Accurate installation of Water stop in processing ponds	X_{19}
		4.	There is a building supporting the IPLT	X_{20}
6.	Environmental factor	1.	Effect of environmental security on the construction of the Project	X_{21}
		2.	Effect of weather on construction activities	X_{22}

To measure the desired variable, the researcher used a Likert scale. With a Likert scale, the variables to be measured are translated into variable indicators. Then the indicator is used as a benchmark for compiling instrument items that can be in the form of questions or statements.

Table 2. Likert rating scale

No	Deskription	Positive Score
1.	Very Agree	5
2.	Agree	4
3.	Enough	3
4.	Not Agree	2
5.	Very Not Agree	1

Data Testing

After obtaining data from the questionnaire results, the data will be tested for validity and reliability.

Data analysis

Data analysis in this study used analysis by descriptive method with index analysis. The results of this analysis will provide an overview of the characteristics of the research respondents. In addition, the opinions of respondents related to the object of research can also be used as material for discussion of the results of quantitative research analysis. This analysis is also used to answer research objectives, especially in determining variables that are more influential in the delay in the construction of infrastructure for sewage treatment plants (IPLT). In addition, this analysis aims to determine strategic steps in overcoming the delay in the construction of infrastructure for sewage treatment plants in other areas.

III. RESULTS AND DISCUSSION

From the results of the questionnaire data tabulation was obtained at Table 4.

Table 3. Questionnaire results data on each indicator

Res	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	Total
1	5	5	5	5	4	5	5	4	5	5	5	5	5	5	5	5	4	5	4	5	5	5	106
2	4	5	4	5	4	5	4	4	5	5	5	4	4	5	4	4	4	4	4	4	5	5	97
3	3	4	3	4	3	5	4	5	5	4	4	3	3	4	3	3	5	4	5	3	5	4	86
4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4	89
5	3	5	4	5	3	5	5	4	5	5	5	3	3	5	3	3	4	3	4	3	5	5	90
6	5	4	5	4	5	4	4	4	4	4	4	5	5	4	5	5	4	5	4	5	4	4	97
7	4	5	4	5	4	5	5	5	5	5	5	4	4	5	4	4	5	4	5	4	5	5	101
8	4	5	4	4	4	5	4	4	5	5	5	4	4	4	4	4	4	4	4	4	5	4	94
9	3	4	3	4	3	4	4	4	4	4	4	3	3	4	3	3	3	3	3	3	4	4	77
10	4	5	4	4	4	5	4	5	5	4	4	4	4	4	4	4	5	4	5	4	5	4	95
11	3	4	3	4	3	4	4	4	4	4	4	3	3	4	3	3	4	3	3	3	4	4	78
12	3	5	3	4	3	5	4	5	5	4	4	3	3	4	3	3	5	3	5	3	5	4	86
13	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	4	4	5	4	4	91
14	4	4	4	3	4	4	3	3	4	3	3	4	4	3	4	4	3	4	3	4	4	3	79
15	3	5	3	4	3	5	4	3	5	4	3	4	3	4	3	3	3	3	3	3	5	4	80
16	5	5	5	4	5	5	4	5	5	4	4	5	5	4	5	5	5	5	5	5	5	4	104
17	4	5	4	5	4	5	5	4	5	5	5	4	4	5	4	4	4	4	4	4	5	5	98
18	3	4	3	4	3	4	4	3	5	4	4	3	3	4	3	3	3	3	3	3	4	4	77
19	3	5	3	5	3	5	5	4	5	5	5	3	3	5	3	3	4	3	4	3	5	5	89
20	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	4	4	4	4	4	5	94
21	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	110
22	3	5	3	5	3	5	5	5	5	5	5	4	4	5	4	3	5	3	5	3	5	5	95
23	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	4	107

Validity test

The following is the data processing output using the SPSS program. Data can be seen in Table 4.

Table 4. The results of the variable validity test caused the Delay of the IPLT project in Banjarbaru City

No	Variable		Indicator	Correlation Value
1.	Material Factor	1.	Material changes in form, function and specifications	0,799
		2.	The exact delivery schedule for materials	0,569
		3.	The incompatibility of fabrication of building materials	0,808
		4.	Inaccurate order	0,621
2.	Skilled Workers Factors	1.	Lack of Builders	0,758
		2.	Lack of Workers	0,525
		3.	Lack of artisan head	0,593
		4.	Workforce Ability	0,599
3.	Equipment factor	1.	Equipment damage	0,394
		2.	Availability of equipment	0,600
		3.	The ability of the foreman or operator	0,650
		4.	Equipment productivity	0,789
		5.	Error management of equipment	0,790
4.	Project owner (PPK)	1.	Too late in providing land	0,512
		2.	Hold job changes	0,838
		3.	Changes in design by the owner	0,756
5.	Technical Factors IPLT	1.	Changes in the condition of the IPLT project location	0,634
		2.	Elevation between sludge treatment ponds	0,783
		3.	Accurate installation of Water stop in processing ponds	0,710
		4.	There is a building supporting the IPLT	0,756
6.	Environmental factor	1.	Effect of environmental security on the construction of the Project	0,525
		2.	Effect of weather on construction activities	0,512

Realibility Test

Table 5. Realibility Test

Reliability Statistics	
Cronbach's Alpha	N of Items
0,758	23

Alpha r value is 0.758, so it can be concluded that the research variable is reliable so that the response of responses from respondents will vary because each has a different opinion, not because the questionnaire is confusing and multiple interpretations.

Analysis of the Causes of Delay

Examples of calculation of index analysis and intervals on material (material) variables, indicators of improper material delivery schedules (X2) are done as follows:

Interval index = (Highest weight - lowest weight) / Highest weight
= (5 – 1) / 5
= 0,80 (then labeled on table 6)

Table 6. Categories of index intervals

Categories	Index Intervals
Very influential	4,21 – 5,00
More influential	3,41 – 4,20
Take effect	2,61 – 3,40
Less influential	1,81 – 2,60
No effect	1,00 – 1,80

Index Analysis = {(fss x 5) + (fs x 4) + (fc x 3) + (fts x 2) + (fsts x 1)} / N
= {(14 x 5) + (9 x 4) + (0 x 3) + (0 x 2) + (0 x 1)} / 23
= 4,61 (then labeled on table 8)

Table 7. Variable categories of index intervals

No	Variabel	Indikator	Nilai Indeks	Kategori
1.	Material Factor	X1	3,83	More influential
		X2	4,61	Very influential
		X3	3,87	More influential
		X4	4,39	Very influential
2.	Skilled Workers Factors	X5	3,78	More influential
		X6	4,65	Very influential
		X7	4,35	Very influential
		X8	4,22	Very influential
3.	Equipment factor	X9	4,70	Very influential
		X10	4,48	Very influential
		X11	4,39	Very influential
		X12	3,91	More influential
		X13	3,83	More influential
4.	Project owner (PPK)	X14	4,35	Very influential
		X15	3,87	More influential
		X16	3,87	More influential
5.	Technical Factors IPLT	X17	4,22	Very influential
		X18	3,87	More influential
		X19	4,13	More influential
		X20	3,87	More influential
6.	Environmental factor	X21	4,65	Very influential
		X22	4,35	Very influential

From Table 7, there are two categories of each indicator which are more influential and very influential. But the concern is the category that is very influential on each variable.
The description of each variable is described as follows:

1. Material factor variable has 2 indicators that are very influential, namely the inaccurate material delivery schedule (X2) and the inaccurate order (X4). In the construction of the IPLT there are Water stop materials installed in processing ponds. According to observations in 3 IPLT development projects, Water stop materials often experience delays because orders must be made outside the South Kalimantan area. This is a major factor in the delay in the construction of the IPLT based on material (material) variables
2. The skilled labor factor variable has 3 very influential indicators, namely Worker Deficiency (X6), Lack of artisan head (X7) and Workforce Ability (X8). Construction of the IPLT requires workers who have the ability to install Water stop materials and make elevations in processing ponds. in the construction of the IPLT of Tanah Bumbu Regency, the implementers paid little attention to the expertise of workers to make elevations in accordance with the planning and in the construction of the IPLT in the City of Banjarbaru, the contractors paid little attention to the installation of Water stop. So this causes an error in making elevation and installation of Water stop in processing ponds. As a result of these errors the implementer needs additional time to make improvements.
3. Equipment factor variables have 3 very influential indicators, namely equipment damage (X9), equipment availability (X10) and foreman or operator capability (X11). In the construction of the IPLT of the City of Banjarbaru and the construction of the IPLT Tanah Bumbu Regency the contractor carried out sub-work related to heavy equipment for excavation and land use activities, consequently the contractor did not pay attention to the history of the equipment, resulting in a lack of anticipation in the event of equipment damage work on items of the construction of the IPLT.
4. Variables of the project owner (PPK) only have 1 indicator that is very influential, namely the delay in the provision of land (X14). The land for the construction of the IPLT in Tanah Bumbu Regency, Banjarbaru City and Tapin Regency is adjacent to the Final Disposal Site (TPA), so that the handover for the IPLT development land requires coordination between government agencies. The main factor is the lack of coordination between government agencies regarding the position of land for the IPLT development. Sometimes the PPK has issued a construction work contract for contractors but on the other hand, there has been no handover of land from other agencies for the construction of the IPLT.
5. The IPLT technical factor variable has 2 very influential indicators, namely the change in the condition of the IPLT project location (X17) and the accuracy of the installation of Water stop in processing ponds (X19). In this variable it is closely related to the relationship of skilled labor and the influence of weather on the construction activities of the IPLT, where installation of Water stop requires expertise from workers. Meanwhile for the influence of the weather, the flow from the rain brings additional material to the existing elevation conditions of the IPLT, so that there is a need to realign the land for the IPLT. Due to the rearrangement, the contractor needs time to analyze the additional work that is happening due to this change. Contractors tend to analyze too long, causing delays in the construction of the IPLT.

6. Environmental variables have all very influential indicators, namely the influence of environmental security on project development (X21) and the effect of weather on construction activities (X22). Due to the IPLT of Tanah Bumbu Regency, Banjarbaru City and Tapin Regency, it was placed on the TPA, resulting in environmental security problems. The problem that occurs is the free of individuals (scavengers) who come in and out of the landfill. Besides that, the lack of security personnel by contractors is related to the wages that must be paid by the contractor. While for the influence of weather refers to the technical factors of the IPLT.

Strategy for Analysis of the Causes of Delay

The prevention strategies are as follows:

1. Material factor
   When viewed in general, then the one that affects the delay from the material factor is a scheduling mechanism that is not good, so it needs a good and progressive scheduling strategy. Apart from good and progressive scheduling, another strategy is needed, namely:
   a. Knowing the material needs of the week.
   b. Direct check on material location
   c. Ensure material in the condition ready to send from the supplier.
   d. Determine the number of suppliers more than one.
2. Factors of skilled labor
   From all the very influential indicators, it can be concluded that the factors that occur in the skilled labor variable are the lack of organization of workers and SKT checks owned by the workforce. In this case, the strategies that can be carried out are:
   a. Organizing a good workforce (recalculating the effectiveness of workers' personnel, how much is needed so that additional workers and artisan heads can be efficient)
   b. The need for HCS checks is carried out by the supervisor and PPK consultants.
   c. Scheduling overtime hours.
3. Equipment factors
   Judging from the problems for this variable, it can be concluded that the causes of delay are lack of management of equipment availability, tool maintenance management and HCS for operators. The strategy to prevent this delay is needed:
   a. Exposure of equipment availability by contractors at PCM.
   b. There is monitoring of tool maintenance history.
   c. The need for HCS checks is carried out by the supervisor and PPK consultants
4. Project owner (KDP)
   In this indicator, the delay prevention strategy is the need for good coordination between government agencies regarding the handover of land before the signature of the IPLT development work contract.
5. Technical factors of the IPLT
   Due to the lack of completion of land for the construction of the IPLT, it usually causes a change in the condition of the IPLT project site, even though this change in conditions is not significant but can affect the planned placement of the IPLT building.
   The strategy of this indicator is PPK, the contractor and supervisory consultant conducts a re-survey and calculates changes from the work plan or work plus less than a short time (at least 7 days after the survey). And for the correct installation of Water stop in the processing pool prevention strategies can be carried out in the form of intensive supervision of the installation of Water stop so as not to occur or minimize errors in the installation of Water stop.
6. Environmental factors
   a. The strategy to deal with environmental security issues is to work with TPA security to help environmental security in the IPLT development project.
   b. The strategy for the problem of weather influences on construction activities can be prevented in the form of:
      • Make rainfall data, where the data is taken from rainfall data by the local BMKG, by making rainfall data, we can create a scheduling system when it is the best time to do some type of work that cannot be done when it rains in bad weather.
      • Creating a drainage channel when it rains, this channel is expected to be able to overcome the stagnant water that occurs when or after rain falls.

IV. CONCLUSION

From the results of the analysis that has been done, it can be concluded that the factors causing delays in the IPLT infrastructure development projects are caused by 6 variables, which of these variables are taken very influential indicators to be used as a strategy to prevent delays in delaying the next IPLT infrastructure development project

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