JURNAL ONLINE SKRIPSI
MANAJEMEN REKAYASA KONSTRUKSI POLINEMA

Journal homepage: http://jos-mrk.polinema.ac.id/ **ISSN: 2722-9203 (media online/daring)**

OHS ANALYSIS TO UNSAFE ACTION IN KERTOSONO – JOMBANG – MOJOKERTO – GEMPOL ROAD AND BRIDGE PRESERVATION PROJECT

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ABSTRACT

Road preservation project is one of the large-scale construction activities. PT Abipraya is one of the well-known contractors that carries out the project, therefore a proper OHS (Occupational Health and Safety) regulations are very important to establish. In this study an analysis of several OHS factors will be carried out which are considered to reduce the occurrence of unsafe acts. The factor used is the variable X1 namely "OHS understanding" and X2 namely "Implementation of OHS" as the independent variable, and the Y1 variable namely "Worker Behaviour" as the dependent variable. Data anlysis will be done by using IBM SPSS statistics with validity tests, reliability tests, correlation tests, and multiple linear regression tests. The results show that the correlation value between the variables X1 and X2 is 0.771 included in the "strong" category, the X1 and Y1 variables are 0.274 included in the "weak" category, the X2 and Y1 variables are 0.464 included in the "moderate" category. The "t" test is used to show the partial effects between each independent variables to the dependent variables, and the result of the "t" value between variables X1 and Y1 of -0.887 which does not meet the requirements so that it does not have a significant impact on reducing unsafe acts. The result of the "t" value between the variables X2 and Y1 is 2,676 which already meets the requirements so that it has an impact on reducing unsafe acts. For the "F" test is used to show whether both independents variables have a simultaneous impact to the dependent variable, and the "F" value shows a result of 5,295 which meets the requirements so that variables X1 and X2 simultaneously have an impact on variable Y1. Based on the result, the value of OHS cost estimation already set as much as Rp. 2,491,303,048.96.

Keywords *: safety, preservation, questionnaire, correlation, regression*

1. INTRODUCTION

The implementation of construction activities is one of the activities that involves several human resources (HR) within a structured organizational scope. Broadly speaking, it can be mentioned that those involved in this activity are owners, consultants, and contractors. Some personnel involved in this construction activity also have duties and obligations to carry out their work directly in thefield where construction activities are carried out. Every construction activity must have applicable rules and authorities, and must always receive strict supervision so that there are no mistakes or things that deviate from these rules so that they can have an impact on reducing productivity, comfort, security, and even safety during work.

The effort that must be made by the company or organizer of construction activities is to establish a good and correct occupational health and safety (OHS) management system. Occupational Health and Safety is a method used to achieve a comfortable and safe working situation, so that the productivity of the work itself can always be at the best level. The existence of this occupational Safety and Health system is very important to be obeyed by all personnel where the OHS rules apply. Therefore, the understanding of all construction worker personnel to the OHS rule is very important in order to avoid all mistakes and omissions that can affect their own safety and also the surrounding environment.

The road preservation project is a large - scale construction activity, one example is the Kertosono – Jombang – Mojokerto – Gempol Road and Bridge Preservation Project. This project is engaged in roadwork which includes 4 types of work, namely drainage work, major rehab, reconstruction, and prevention. This project was carried out by Abipraya – Gala Karya on a KSO basis

or Operation Cooperation with a long stretch of road that was carried out along approximately 38 KM. Of course, this project has a high risk of work accidents, seeing the condition of the site where the construction work carried out is on the provincial highway which is always crowded with various kinds of motor vehicles. It is still often found in the office area and also in the field that there are a lot of activities or negligence on the part of workers which lead to unsafe actions which eventually lead to work accident. Some of the risks that can occur in this construction activity are the risk of being hit by a vehicle that crosses the road, being hit by heavy equipment machinery, being hit by material, shortness of breath due to material dust, and so on.

Based on these problems, it is necessary to analyze what OHS factors can reduce the emergence of unsafe actions from the workers themselves. So that later it can be determined what OHS factors must continue to run as they should or even have to be improved

The purpose of this research is :

1) To know the workers's level of understanding towards the Occupational Health and Safety system that applies to road preservation projects
2) To know what OHS factors can reduce the risk of workers taking unsafe actions on road preservation project
3) To know how to reduce the risk of such unsafe actions
4) To know the OHS Budget Plan for the project.

2. METHOD

This research was conducted the ongoing projects, namely the Kertosono – Jombang – Mojokerto – Gempol Road and Bridge Preservation Project. This project is held starting in 2021 and is planned to be completed in 2023.

The method that was used in this research is by distributing questionnaires which later the results of the questionnaire fill out will be used as primary data to be analyzed in this study. The variables used in the questionnaire are Variable X1 for "*Pemahaman K3*" (Understanding of OHS), Variable X2 for "*Penerapan K3"* (Appliance of OHS) for the independent variable, and Variables Y1 for "*Sikap Pekerja*" (Worker's Behaviour) as the dependent variable. Whereas for journals, government regulations, as well as documents from this project will be used as secondary data to support the research.

After the data from filling out the questionnaire has been obtained, the next step will be an analysis to find the results of the existing problems. The first procedure is to tabulate the data using Microsoft Excel, after that a statistical test is carried out using SPSS Program (Statistical Product and Service Solutions) in the form of a validity and reliability test to show whether the statement items on the questionnaire are valid and reliable so that they can be used for testing. While the correlation test and multiple linear regression test are used to assess which OHS factors will have an effect on reducing the occurrence of unsafe actions. After all testing is done, an OHS budget plan will be formed according to the analysis of the test results. The flowchart below shows the procedure of this research.

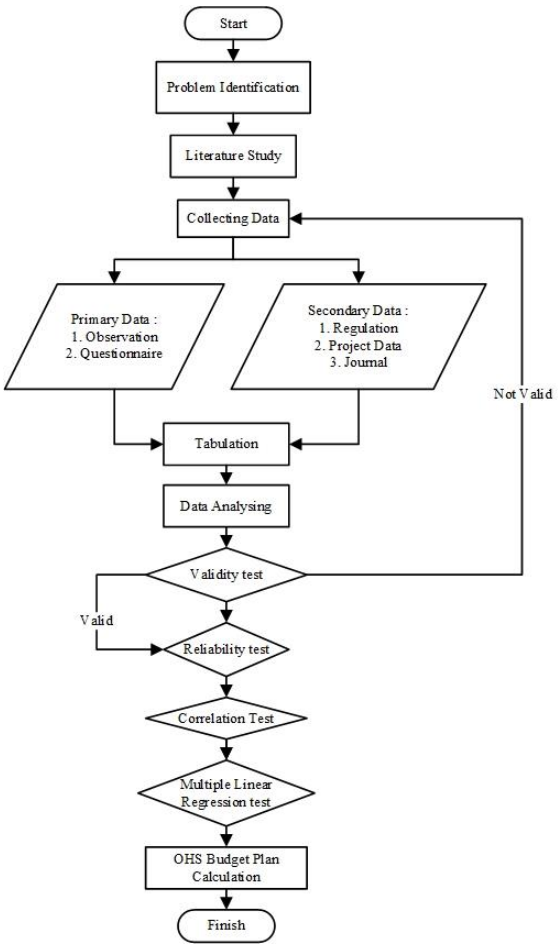

Figure 1. 1 Research Flowchart

3. ANALYSIS AND DISCUSSION

1) There are 50 questionnaires have been prepared and distributed, but only 38 questionnaires have been filled in by respondents consisting of Project Managers, Site Managers, technical staff, OHS staff, administrative staff, quality staff, workers, and road users and have returned to the authors
2) Validity test

   This validity test analysis uses the Pearson Correlation value as a significance R value of 5% (Dian, 2019), In this study, there were 38 respondents, so the value of the conditional R count should not be less than the R table, which is 0.32

Table 1. 1 Reuslt of Validity test

Variable X1	R result value	Requirement	Sig. Value	Requirement	Information
X1.01	**.677****	> 0.32	**0.000**	< 0.05	**VALID**
X1.02	**.541****	> 0.32	**0.000**	< 0.05	**VALID**
X1.03	**.787****	> 0.32	**0.000**	< 0.05	**VALID**
X1.04	**.743****	> 0.32	**0.000**	< 0.05	**VALID**

X1.05	**.411***	> 0.32	**0.010**	< 0.05	**VALID**
Variable X2					
X2.01	**.491****	> 0.32	**0.002**	< 0.05	**VALID**
X2.02	**.604****	> 0.32	**0.000**	< 0.05	**VALID**
X2.03	**.570****	> 0.32	**0.000**	< 0.05	**VALID**
X2.04	**.751****	> 0.32	**0.000**	< 0.05	**VALID**
X2.05	**.747****	> 0.32	**0.000**	< 0.05	**VALID**
X2.06	**.689****	> 0.32	**0.000**	< 0.05	**VALID**
X2.07	**.616****	> 0.32	**0.000**	< 0.05	**VALID**
X2.08	**.738****	> 0.32	**0.000**	< 0.05	**VALID**
X2.09	**.638****	> 0.32	**0.000**	< 0.05	**VALID**
X2.10	**.645****	> 0.32	**0.000**	< 0.05	**VALID**
Variable Y1					
Y1.01	**.634****	> 0.32	**0.000**	< 0.05	**VALID**
Y1.02	**.596****	> 0.32	**0.000**	< 0.05	**VALID**
Y1.03	**.482****	> 0.32	**0.002**	< 0.05	**VALID**
Y1.04	**.678****	> 0.32	**0.000**	< 0.05	**VALID**
Y1.05	**.617****	> 0.32	**0.000**	< 0.05	**VALID**
Y1.06	**.498****	> 0.32	**0.001**	< 0.05	**VALID**
Y1.07	**.386***	> 0.32	**0.017**	< 0.05	**VALID**
Y1.08	**.416****	> 0.32	**0.009**	< 0.05	**VALID**
Y1.09	**.668****	> 0.32	**0.000**	< 0.05	**VALID**
Y1.10	**.724****	> 0.32	**0.000**	< 0.05	**VALID**

Source : Personal Analysis

Based on the table above, all data items of variables are valid and eligible to be analysed further

3) Reliability test

This test is also has it's own condition which is the statement items are declared reliable if the Cronbach's alpha value is > 0.60 (Rusmana, Martini, Harini, 2019).

Table 1. 2 Result of Reliability Test

Variable	Cronbach's Alpha Value	Requirement	Information
X1	**0.635**	> 0.6	**Reliable**
X2	**0.840**	> 0.6	**Reliable**
Y1	**0.764**	> 0.6	**Reliable**

Source : Personal Analysis

Based on the table above, all data items of variables are reliable and eligible to be analysed further

4) Correlation test

This test intends to assess whether the independent variable that has been determined, namely "Understanding of K3" as variable X1 and "Implementation of K3" as variable X2 has a unidirectional influence on the dependent variable that has been determined, namely "Worker Behaviour" that has the interpretation to reduce the unsafe action.

The conditions that must be met in this analysis are if the significance value is < 0.05 then there is a correlation, otherwise if the significance value is > 0.05 then there is no correlation, while the rate of the correlation can be analysed by looking on the Pearson's Value (Jabnabillah, Margina, 2022).

Table 1. 3 Result of Correlation test

CORRELATION BETWEEN VARIABLE X1 AND X2				
Sig. Value	**Req.**	**Information**	**Pearson's value**	**Correlation**
0.000	< 0.05	**SIGNIFICANT**	**0.771**	**STRONG**
CORRELATION BETWEEN VARIABLE X1 AND Y1				
Sig. Value	**Req.**	**Information**	**Pearson's value**	**Correlation**
0.096	< 0.05	**NOT SIGNIFICANT**	**0.274**	**WEAK**
CORRELATION BETWEEN VARIABLE X2 AND Y1				
Sig. Value	**Req.**	**Information**	**Pearson's value**	**Correlation**
0.003	< 0.05	**SIGNIFICANT**	**0.464**	**MEDIUM**

Source : Personal Analysis

Based on the table above, there are two tests that have fulfilled the criteria, namely the correlation test variables X1 and X2 which show the sig. value of **0.000** and Pearson's value of 0.771 which in accordance to guideline table for the degree of relationship this value has a definition of a "**strong"** correlation, as well as the correlation test of variables X2 and Y1 which shows the results of the sig. value of **0.003** and Pearson's value of 0.464 which in accordance to guideline table for the degree of relationship this value has a definition of a "**medium"** correlation. It can be said that the two correlation test values have fulfilled the requirements, which are smaller than the **0.05** sig value. While In the correlation test the variables X1 and Y1 show the results of the sig. value of **0.096** where this value is greater than the sig. value is **0.05** which means there is no correlation between these two variables. For the Pearson's Correlation value between the two variables shows a result of **0.274** which is in accordance with the guideline table for the degree of relationship, if there is a correlation then the correlation level is "**low**".

5) Multiple Linear Regression Test

This test intends to assess whether there is a significant influence of two or more independent

variables on the dependent variable. This test requires hypotheses which will later be used as a reference for assessing the interpretation of the results of the data that has been analyzed. In this multiple linear regression test includes 2 results of analysis, namely the analysis of the t test for checking whether there are a partial effect from the independent variables to the dependent variable. This analysis is said to be correct if the test results meet the requirements, namely, the t count > t table and the significance value < 0.05. the second one is the analysis of the f test for checking whether there are a simultaneous effect from the independent variables to the dependent variable. This analysis is said to be correct if the test results can meet the requirements, namely, the calculated f value > f table and the significance value < 0.05 (Natalia, Pratawijaya, Mirani, 2017).

The hypotheses for each test is as follows :

- t test :
  a. Variable X1 :
     i. H0 : partially, OHS understanding has an influence on workers' behaviour to reduce unsafe action
     ii. H1 : partially, OHS understanding has no influence on workers' behaviour to reduce unsafe action
  b. Variable X2 :
     i. H0 : partially, OHS Appliance has an influence on workers' behaviour to reduce unsafe action
     ii. H1 : partially, OHS Appliance has no influence on workers' behaviour to reduce unsafe action
- F test
  i. H0 : Simultaneously the variables understanding OHS and implementing OHS have an influence on workers' behaviour to reduce unsafe action
  ii. H1 : Simultaneously the Understanding of OHS and Appliance of OHS variables have no effect on workers' behaviour to reduce unsafe action

Table 1. 4 Result of t test

Variables	T Result value	Req.	Info	Sig. Value	Req.	Info
X1	**-0.887**	> 2,030	**NOT EFFECTIVE**	**0.381**	< 0.05	**NOT EFFECTIVE**
X2	**2.676**	> 2,030	**EFFECTIVE**	**0.011**	< 0.05	**EFFECTIVE**

Source : Personal Analysis

For t test, the t table value needed if there are 2 variables used is 2,030. Based on the table above the t value result for variable X1 to Variable Y1 is **-0.887** which is smaller than the requirement, then it can be said that H0 hypothesis is rejected and the H1 hypothesis is accepted, which is partially, OHS understanding **has no influence** on workers' behaviour to reduce unsafe action. For the t value result for variable X2 to variable Y1 is **2.676** which is bigger than the requirement, then it can be said the H0 hypothesis is accepted which is partially, the application of OHS **has an influence** on workers' behaviour to reduce unsafe action and the H1 hypothesis is rejected.

Table 1. 5 Result of F test

Variable	F Value	Req.	Sig. Value	Req.	Info
X1 and X2	**5.295**	> 3,26	**0.01**	< 0.05	**HAS EFFECT**

Source : Personal Analysis

For F test, the F table value if there are 2 variables used is 3.26. Based on the table above the calculated f value is **5,295** which is **greater** than the provisions of **3.26**, and a significance value of **0.010** which is **smaller** than the provisions of **0.05**, both of these test factors have fulfilled the requirements and it can be said that the testing of variable X1 "Understanding of OHS" and variable X2 "Appliance of OHS" simultaneously has a positive influence on variable Y1 "Worker's Attitude" to reduce unsafe action.

6) OHS Budget Plan

Budget Plan is one of the most important factors in the implementation of construction projects. The size of this cost is also directly proportional to the scale of the construction project itself, the bigger the construction, the more budget that must be prepared. Even though it has been well planned, this budget plan cannot be in accordance with reality for one reason or another, so it is necessary to control this plan. Therefore, in this study a OHS budget will be planned that adjusts to the analysis of the results of the

previous data. Based on the results of analysis, an OHS Budget Plan can be formed as it follows :

Table 1. 6 OHS Budget Plan

OHS BUDGET PLAN FOR KERTOSONO - JOMBANG - MOJOKERTO - GEMPOL ROAD PRESERVATION PROJECT

No.		Job Description	Measurement Units	Quantity	Unit Price (Rp.)	Total Price (Rp.)
1	RKK Preparation					
	a	Construction Safety Plan Document Creation	Set	1	Rp 1,500,000.00	Rp 1,500,000.00
	b	Creation of work procedures and instructions	Pg	30	Rp 10,000.00	Rp 300,000.00
	A	Sub-total RKK preparation				**Rp 1,800,000.00**
2	Socialisation promotion, and training					
	a	Safety OHS Induction and briefing	Prs	30	Rp 30,000.00	Rp 900,000.00
	b	Safety talk / toolbox meeting	Prs	30	Rp 10,000.00	Rp 300,000.00
	d	OHS training :				
	1	Use of chemicals (MSDS)	Prs	10	Rp 10,000.00	Rp 100,000.00
	2	Occupational safety analysis	Prs	10	Rp 10,000.00	Rp 100,000.00
	3	Safety-based behavior (OHS culture)	Prs	10	Rp 10,000.00	Rp 100,000.00
	4	P3K	Prs	10	Rp 10,000.00	Rp 100,000.00
	e	HIV / AIDS Socialisation	Prs	10	Rp 10,000.00	Rp 100,000.00
	f	OHS Simulation	Prs	30	Rp 25,000.00	Rp 750,000.00
	g	Banner	Pcs	5	Rp 100,000.00	Rp 500,000.00
	h	Poster	Pcs	5	Rp 10,000.00	Rp 50,000.00
	i	OHS information board	Pcs	10	Rp 200,000.00	Rp 2,000,000.00
	B	Sub total socialization, promotion, and training				**Rp 5,000,000.00**
3	Work Protective Equipment and Personal Protective Equipment					
	a	Work Protective Equipment				
	1	Safety net	Wd	1	Rp 5,000,000.00	Rp 5,000,000.00
	2	Life line	Wd	1	Rp 1,000,000.00	Rp 1,000,000.00
	3	Guard railing	Wd	1	Rp 4,000,000.00	Rp 4,000,000.00
	4	Area Restriction	Pcs	1	Rp 4,000,000.00	Rp 4,000,000.00
	b	APD				
	1	Safety helmet	Pcs	50	Rp 40,000.00	Rp 2,000,000.00
	2	Eye covers (googles, spectacles)	Pcs	50	Rp 35,000.00	Rp 1,750,000.00
	3	Ear plug, ear muff	Set	20	Rp 75,000.00	Rp 1,500,000.00
	4	Mask	Set	100	Rp 3,000.00	Rp 300,000.00
	5	Safety glovess	Pcs	20	Rp 8,000.00	Rp 160,000.00
	6	Safety shoes	Pcs	40	Rp 250,000.00	Rp 10,000,000.00
	7	Safety vest	Pcs	40	Rp 50,000.00	Rp 2,000,000.00
	C	Sub total of Work Protective Equipment and Personal Protective Equipment				**Rp 31,710,000.00**
4	Insurance and Permit					
	a	Insurance	Set	1	##########	Rp 2,131,160,653.60
	b	Operating Permit (Surat Izin Layak Operasi)	Pcs	4	Rp 1,500,000.00	Rp 6,000,000.00
	c	Operator Competency Letter issued by the authorized institution / agency in accordance with the law	Pgs / tools	4	Rp 3,000,000.00	Rp 12,000,000.00
	D	Sub total insurance and licensing				**Rp 2,149,160,653.60**
5	OHS Construction Personnel					

	a	Construction OHS Expert	Prs	1	Rp 36,189,300.00	Rp 36,189,300.00
	b	Construction OHS Officer	Prs	4	Rp 2,000,000.00	Rp 8,000,000.00
	c	OHS Officers	Prs	2	Rp 2,000,000.00	Rp 4,000,000.00
	d	Flagman	Prs	4	Rp 2,000,000.00	Rp 8,000,000.00
	E	Sub total OHS personnel				**Rp 56,189,300.00**
6	Health facilities, facilities and infrastructure					
	a	OHS equipment (OHS box, Stretcher, wound medicine, bandage)	Set	1	Rp 1,500,000	Rp 1,500,000.00
	b	OHS room (patient bed, oxygen cylinder, stethoscope, weight scale)	Wd	1	Rp 5,000,000.00	Rp 5,000,000.00
	c	Fumigation Equipment (fogging)	Pcs	1	Rp 1,500,000.00	Rp 1,500,000.00
	d	Obat pengasapan	Ls	1	Rp 300,000.00	Rp 300,000.00
	F	Sub total health facilities, facilities and infrastructure				**Rp 8,300,000.00**
7	Necessary signs					
	a	Signpost instructions	Pcs	5	Rp 200,000.00	Rp 1,000,000.00
	b	Prohibitory signs	Pcs	3	Rp 200,000.00	Rp 600,000.00
	c	Warning signs	Pcs	3	Rp 200,000.00	Rp 600,000.00
	e	Information signs	Pcs	3	Rp 200,000.00	Rp 600,000.00
	f	Temporary work signs	Pcs	2	Rp 200,000.00	Rp 400,000.00
	h	Traffic Light Stick	Bh	3	Rp 75,000.00	Rp 225,000.00
	i	Traffic cone	Bh	25	Rp 150,000.00	Rp 3,750,000.00
	j	Rotarty lamp	Bh	2	Rp 250,000.00	Rp 500,000.00
	k	Traffic hose lights (LED Strip light)	Ls	4		Rp -
	G	Sub total signs - necessary signs				**Rp 7,675,000.00**
8	Consultation with experts regarding construction safety					
	a	Environmentalist	Prs	1	Rp 37,912,600.00	Rp 37,912,600.00
	H	Sub total consultation with experts related to construction safety				**Rp 37,912,600.00**
9	Others related to the control of construction safety risks					
	a	Light fire extinguisher (APAR)	Bh	2	Rp 200,000.00	Rp 400,000.00
	b	Siren	Bh	2	Rp 173,000.00	Rp 346,000.00
	c	OHS flag	Bh	3	Rp 55,000.00	Rp 165,000.00
	d	Emergency lamp	Bh	5	Rp 115,000.00	Rp 575,000.00
	g	Internal inspection and audit program	Ls	1	Rp 3,000,000.00	Rp 3,000,000.00
	h	Incident reporting and investigation	Ls	1	Rp 500,000.00	Rp 500,000.00
	I	Sub total of others related to the control of construction safety risk				**Rp 4,986,000.00**
					Total Value of OHS Budget Plan	**Rp 2,264,820,953.60**
					Overhead + Profit 10%	Rp 226,482,095.36
					Total	**Rp 2,491,303,048.96**

4. CONCLUSION

Based on the results of the analysis and discussion of the research that has been done, the following conclusions can be formed :

1. The results of the correlation test show that the correlation between the X1 variable "Understanding of OHS" and the X2 variable "Appliance of OHS" reaches 0.771, which is a

"strong" correlation category according to the relationship degree guidelines. So that it can be said that the workers' knowledge of OHS understanding and OHS appliance that applies on the project is good.

2. The results of correlation and multiple linear regression tests show that the correlation value between the X2 variable "Appliance of OHS" and the Y1 variable "Worker Behaviour" reaches **0.464** which is included in the "**moderate**" correlation category according to the guidelines for the degree of relationship, as well as the value of the t test results of **2,676** which complies with the requirements and indicates that variable X2 can **significantly reduce unsafe acts**. While the correlation value between the X1 variable "Understanding of OHS" and the Y1 variable "Worker Behahviour" reaches **0.274** which is included in the "**weak**" correlation category according to the guidelines for the degree of relationship, and the t test result value is **- 0.887** which is in accordance with the provisions is not fulfilling the requirements but indicating that variable X1 can still reduce unsafe acts but **less significant**.
3. The results of multiple linear regression testing in the F test section show a value of **5,295**, which means that the X1 variable "Understanding of OHS" and the X2 "Appliance of OHS" variable, simultaneously **affect** the Y1 variable "Worker's Behaviour" to reduce unsafe actions. Therefore, from all the tests that have been carried out, it can be concluded that the variable factor X2, namely Application of OHS, such as using complete PPE, placing signs in accordance with OHS rules, implementing traffic OHS regulation, and applying other OHS regulations has the most significant influence in reducing unsafe acts.
4. Based on the results of the analysis of all the variables that have been tested, an OHS Budget Plan that has been adapted to the analysis can be made. The OHS Budget Plan value that has been made is equal to **Rp 2,491,303,048.96.**

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