Performance Analysis of Costs Implementation Using the EVM Method (Earned Value Method) on the Work of Expanding the Distribution Pipeline Network in Samarinda City

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Abstract: In implementing a project, it is often found that implementation does not conform to the plan. Where the problems raised in this research relate to the cost performance of implementing the Samarinda City distribution pipe network expansion project. With the increasing need for clean water and the increasing population, PDAM Kota Samarinda must be able to meet demand with quality, quantity, continuity and accessible prices, as well as adequate water pressure. In an effort to provide clean water services, the government must pay special attention to developing the distribution network. The previous distribution piping network in Samarinda City is considered to need to be expanded to meet the need for clean water, especially during the dry season where there is a shortage of clean water in the Samarinda area. Based on this problem, it is necessary to analyse the condition of the distribution pipe network for clean water services based on the population and calculations for the current year and projections at PDAM Kota Samarinda. Therefore, it is necessary to carry out research related to cost performance analysis on the Samarinda City distribution pipe network expansion work project to determine the position of the project in relation to costs from the monitoring carried out. The research method uses calculations and analysis using the Earned Value Method. Based on the analysis of the data obtained, it can be concluded that the cost performance is not in accordance with the budget and the estimated cost until the project is completed is IDR. 20,583,636,709, greater than the planned IDR. 16,566,678,000.

Keywords: Cost Control, Earned Value Method

INTRODUCTION

Construction projects are complex activities, do not occur routinely, require significant investment costs and have specification limitations. This project aims to satisfy stakeholders. However, often in the implementation process, there are obstacles that result in failure to achieve the expected goals together (Marleno et al., 2018). In the implementation of a project there are several obstacles or barriers that often occur in the implementation process, in the form of an insufficient number of resources (costs, people and equipment), the experience of the implementing team with the type of project being carried out, their experience in using equipment, and Some of these things cause delays and deviations from plans in the implementation of the project. To avoid these things, a project control analysis is needed (Hidayat, 2017).

Research related to EVM was also carried out by Muniroh M, Kempa M Buyang, (2021) with the title Controlling Costs and Time with the Earned Value Concept in Building Arrangement Projects. This research uses the BCWS, BCWP, ACWP, CPI, and SPI indicators to evaluate project costs and time, as well as EAC and EAS indicators to view projected costs and project completion time. The increase in population in Samarinda City has had an impact on increasing demand for clean water.

Due to this increasing need in the future, PDAM Kota Samarinda must be able to meet demand with quality, quantity, continuity and accessible prices, as well as adequate water pressure. In an effort to provide clean water services, the government must pay special attention to developing the distribution network. This is important because the distribution network, especially pipes, is the route for clean water. The previous distribution piping network in Samarinda City is considered to need to be expanded to meet clean water needs, especially during the dry season where clean water shortages occur in the Samarinda area.

Based on this problem, it is necessary to analyze the condition of the distribution pipe network for clean water services based on the population and calculations for the current year and projections at PDAM Kota Samarinda. From the description above, it is necessary to carry out research related to cost performance analysis using the Earned Value Method on a work project to expand the distribution piping network in Samarinda City to determine the position of the project regarding costs from monitoring carried out using the Earned Value concept. Apart from that, to avoid losses in the project, we can forecast the cost of completing the project using the Earned Value Analysis concept for the Samarinda City distribution pipeline network expansion work project.

METHODOLOGY

The research design is a comprehensive plan for the research including the things that the researcher will do. This research design starts from identifying the problem which then becomes a formulation for achieving the research objectives. Based on the objectives of the research, a review of the literature with data collected in the form of RAB Data, Time Schedule, Daily Reports was seen. The research results were obtained using Earned Value Method data analysis. The research results are then analyzed and conclusions are drawn. Quantitative research is carried out in cases where it is important for a researcher to have conclusions about statistical data management and statistics in gathering actionable insights. In descriptive research design, a researcher is solely interested in describing the situation or case under his research study. This is a theory-based research design created by collecting, analyzing and presenting the collected data. By implementing an in-depth research design like this, a researcher can provide insight into the why and how of research. The location of this research is work on expanding the distribution piping network in Samarinda City. The following is a flow chart in this research:
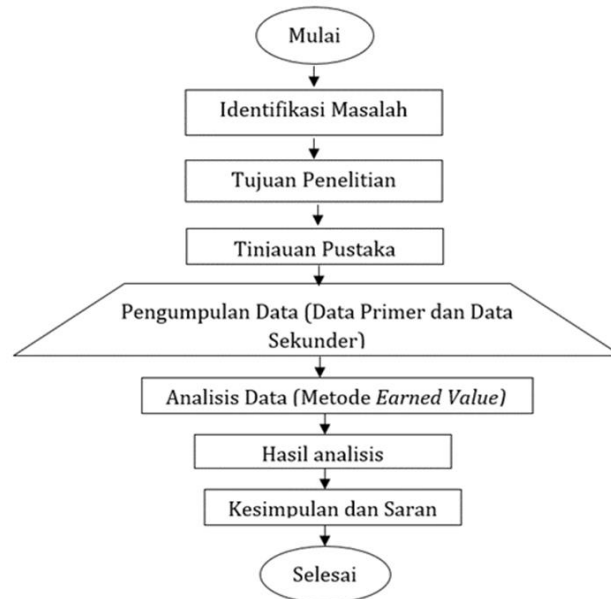
Figure 1. Flow diagram

RESULTS AND DISCUSSION

Cost Variance (CV) Calculation

CV is obtained from subtracting BCWP from ACWP:

CV calculation for the 3rd week of the period 15 July 2023 – 22 July 2023

CV = (BCWP) - (ACWP)

CV = (Rp 35.932.719) - (Rp 150.756.770)

CV = - Rp 114.824.051

Table 1. Cost Variants (CV)

Week to	Cumulative BCWP (Rp)	Cumulative ACWP (Rp)	CV (Rp)	
1	6.626.671	6.626.671		0
2	31.476.688	31.476.688		0
3	35.932.719	150.756.770	-	114.824.051
4	40.388.750	631.190.432	-	590.801.682
5	1.584.061.350	1.770.977.878	-	186.916.528
6	3.127.733.950	2.904.138.653		223.595.297
7	3.352.949.875	4.050.552.771	-	697.602.896
8	3.467.129.394	5.190.340.217	-	1.723.210.823
9	3.649.922.042	6.330.127.664	-	2.680.205.622
10	4.111.551.314	7.453.348.432	-	3.341.797.118

11	4.972.574.552	8.576.569.201	-	3.603.994.648
12	6.649.122.366	9.699.789.969	-	3.050.667.603
13	7.994.336.620	10.728.580.673	-	2.734.244.053
14	9.946.265.909	11.931.321.496	-	1.985.055.586
15	11.705.290.826	13.134.062.318	-	1.428.771.493
16	12.129.174.928	14.336.803.141	-	2.207.628.213
17	12.430.756.933	15.539.543.964	-	3.108.787.031
18	13.176.257.443	16.379.474.539	-	3.203.217.096
19	13.327.014.213	16.560.051.329	-	3.233.037.116
20	13.333.640.884	16.566.678.000	-	3.233.037.116

Calculation of Cost Performance Index (CPI)

Table 2. Cost Performance Index (CPI)

Week to	CPI = EV (BCWP) / AC (ACWP)		
	Cumulative BCWP (Rp)	Cumulative ACWP (Rp)	CPI
1	6.626.671	6.626.671	1,000
2	31.476.688	31.476.688	1,000
3	35.932.719	150.756.770	1,138
4	40.388.750	631.190.432	1,167
5	1.584.061.350	1.770.977.878	1,093
6	3.127.733.950	2.904.138.653	1,007
7	3.352.949.875	4.050.552.771	1,006
8	3.467.129.394	5.190.340.217	1,009
9	3.649.922.042	6.330.127.664	1,057
10	4.111.551.314	7.453.348.432	1,052
11	4.972.574.552	8.576.569.201	0,991
12	6.649.122.366	9.699.789.969	0,851
13	7.994.336.620	10.728.580.673	0,745
14	9.946.265.909	11.931.321.496	0,834
15	11.705.290.826	13.134.062.318	0,891
16	12.129.174.928	14.336.803.141	0,846
17	12.430.756.933	15.539.543.964	0,800
18	13.176.257.443	16.379.474.539	0,804
19	13.327.014.213	16.560.051.329	0,805

| 20 | 13.333.640.884 | 16.566.678.000 | 0,805 |

Calculation of Remaining Costs (Estimate to Complete)

ETC is obtained from BCWP divided by BCWS:

ETC calculation for week 1 of the period 15 July 2023 – 22 July 2023:

ETC = (Total Budget – BCWP) / CPI

ETC = (Rp.16.566.678.000 - Rp 6.626.671) / 1,000

ETC = Rp 16.560.051.329

Table 3. Remaining cost (Estimate to Complete)

ETC = (Contract value- BCWP) / CPI				
Week to	Contract value	Cumulative BCWP (Rp)	CPI	ETC (Rp)
1	16.566.678.000	6.626.671	1,000	16.560.051.329
2	16.566.678.000	31.476.688	1,000	16.535.201.312
3	16.566.678.000	35.932.719	1,138	14.521.685.238
4	16.566.678.000	40.388.750	1,167	14.161.487.675
5	16.566.678.000	1.584.061.350	1,093	13.702.078.587
6	16.566.678.000	3.127.733.950	1,007	13.345.632.062
7	16.566.678.000	3.352.949.875	1,006	13.137.845.537
8	16.566.678.000	3.467.129.394	1,009	12.982.748.569
9	16.566.678.000	3.649.922.042	1,057	12.224.884.595
10	16.566.678.000	4.111.551.314	1,052	11.843.547.828
11	16.566.678.000	4.972.574.552	0,991	11.701.925.257
12	16.566.678.000	6.649.122.366	0,851	11.647.276.674
13	16.566.678.000	7.994.336.620	0,745	11.504.276.143
14	16.566.678.000	9.946.265.909	0,834	7.941.700.514
15	16.566.678.000	11.705.290.826	0,891	5.454.777.933
16	16.566.678.000	12.129.174.928	0,846	5.245.171.939
17	16.566.678.000	12.430.756.933	0,800	5.170.266.590
18	16.566.678.000	13.176.257.443	0,804	4.214.649.526
19	16.566.678.000	13.327.014.213	0,805	4.025.582.756
20	16.566.678.000	13.333.640.884	0,805	4.016.958.709

Calculation of Total Final Project Costs (Estimate at Complete)

EAC = ACWP + ETC

EAC calculation for week 1 of the period 15 July 2023 – 22 July 2023:

EAC = (Rp. 6.626.671) + (Rp 16.560.051.329)

EAC = Rp. 16.566.678.000

Table 4. Estimate at Complete

Week to			
	EAC = ACWP + ETC		
	Cumulative ACWP (Rp)	ETC (Rp)	EAC (Rp)
1	6.626.671	16.560.051.329	16.566.678.000
2	31.476.688	16.535.201.312	16.566.678.000
3	150.756.770	14.521.685.238	14.672.442.008
4	631.190.432	14.161.487.675	14.792.678.106
5	1.770.977.878	13.702.078.587	15.473.056.466
6	2.904.138.653	13.345.632.062	16.249.770.715
7	4.050.552.771	13.137.845.537	17.188.398.308
8	5.190.340.217	12.982.748.569	18.173.088.786
9	6.330.127.664	12.224.884.595	18.555.012.259
10	7.453.348.432	11.843.547.828	19.296.896.260
11	8.576.569.201	11.701.925.257	20.278.494.458
12	9.699.789.969	11.647.276.674	21.347.066.643
13	10.728.580.673	11.504.276.143	22.232.856.816
14	11.931.321.496	7.941.700.514	19.873.022.010
15	13.134.062.318	5.454.777.933	18.588.840.252
16	14.336.803.141	5.245.171.939	19.581.975.080
17	15.539.543.964	5.170.266.590	20.709.810.554
18	16.379.474.539	4.214.649.526	20.594.124.065
19	16.560.051.329	4.025.582.756	20.585.634.085
20	16.566.678.000	4.016.958.709	20.583.636.709

CONCLUSION

The cost performance of the Samarinda City Distribution Pipeline Network Expansion Work project costs seen from the calculation of CPI < 1 is not good. In the 11th week to the 20th week, the project work costs exceeded the budgeted costs. At the end of the review period, namely week 20, an estimate of the final total cost of the project was obtained at Rp. 20,583,636,709. If the trend of project performance conditions is the same as at the end of the review, namely week 20, the estimated value exceeds the initial project plan cost, namely IDR 16,566,678,000.

The suggestion given is that this research still needs improvement so that future researchers can complete the project at a cost that is in accordance with the plan and for the contractor company to pay close attention to the additional costs incurred.

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