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Control of Costs and Working Time of Road Improvement Kh. Syafi'i

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Abstract

This study aims to analyze the optimum time and cost of completing the work after the acceleration of the duration of the KH Road Improvement Project. Syafi'i in Suci Village, Manyar District, Gresik Regency using the Microsfot Project. Acceleration analysis by adding working hours and considering the resulting critical path. This research is also to find out the project performance compared to the initial project plan in terms of cost and time, to find out the estimated final cost of the project needed after the acceleration of implementation.

Keywords:
Project, Microsoft Project, project cost and time

1. Introduction

1.1. Research Background

Time and cost are important in a project because the costs incurred during the developmentprocess are closely related to the time required for completion. When the work is in progress, the planned work schedule and the realization often run out of sync, resulting in an increase in implementation time and cost overruns so that project completion is hampered. Some of the causes that are a factor in the delay of a project, both in terms of nature in the form of weather, can be from a technical perspective in the form of changes inthe volume of work, or in the form of human resources, namely the lack of workers to complete the work.

It is necessary to accelerate the duration, because some projects should not be late and cannot be delayed with the aim that the project can be used immediately as needed. Although the duration is accelerated, the costs incurred are not infrequently too expensivedue to the addition of equipment or changes in implementation methods aimed at shortening the project implementation time. Given the limited manpower, an alternative that can be used to accelerate the implementation of project work is to increase the workinghours and increase the workforce so that it affects the total project cost.

1.2. Problem Formulation

The formulation of the problem to be discussed is:

1. How is the project performance compared to the initial project plan in terms of cost and time as a result of the effect of increasing project progress on project costs
2. How much is the estimated final project cost needed for project completion if the project implementation conditions are like during the review

2. Literatur Review

The first previous research conducted by Ariany Frederika in 2010 with the title "Analysis of the Acceleration of Implementation by Adding Optimum Working Hours on Construction Projects".

The problem discussed in this research is that the Super Villa Construction Project was chosenas the object of research because it experienced delays in its implementation, namely 24% dueto late material supply, and design changes made by the owner. To overcome these delays, efforts are needed to accelerate project completion with an analysis that is tried from one hourto four working hours using the Time Cost Trade Off Analysis Method. The conclusions of Ariany Frederika's research are:

1. The optimum cost is obtained by adding one working hour, with a cost reduction of Rp.784,104.16 from the normal total cost of Rp.2,886,283,000.00 to Rp.2,885,498,895.84, with a reduction of 8 days from normal time 284 days to 276 days.
2. The optimum time is obtained by adding two hours of work, by reducing the time for 14 days from the normal time of 284 days to 270 days, with a reduced cost of Rp. 700,377.35 from the normal cost of Rp. 2,886,283,000.00 which becomes Rp. 2,885,582. 622.65.

Research II – Sumaryani (2010)

The second previous research conducted by Sumaryani in 2010 with the title "Analysis of the Concept Value of Results in the Construction Project of the 4-Story Two-wheeled Parking Building UMS with the 2007 Microsoft Project Program".

The problems discussed in this research are how much cost has been spent for the implementation of this project and how much is the estimated total cost and time for project completion. Sumaryani's research conclusions are:

The amount of costs that have been spent until the 27th week for the implementation of this project is Rp. 3,146.038,880.92

Estimated total project completion cost is 17 August 2010 (295.15 days)

3. Research Method

3.1. Data Source

The source of the data in this study was obtained from the Department of Public Works andSpatial Planning of Gresik Regency for the Highways Sector. The data - the data needed inthe work of this research are:

1. Project planning drawings
2. Project time schedule
3. Budget plan (RAB) and unit price analysis

3.2. Data Analysis Method

Efforts are being made to speed up the execution time of the work by increasing the workinghours, so that labor productivity increases. The implementation of TCTO requires the calculation of crash duration and crash cost. To calculate crash cost and crash duration, it isnecessary to take the following steps:

1. Preparation of network diagrams
2. Analyze remaining work activities
3. Application of crashing
4. Application of time and cost exchange analysis
5. Evaluate the results of TCTO analysis

4. Analysis and Discussion

The following is the scope of work for KH Road Improvement. Syafi'i, which is located in theHoly Village, Manyar District, Gresik Regency

Picture 1. KH Syafi'i Road Improvement Work Items

No	DESCRIPTION	UNIT	QUANTITY
1	2	3	4
	General Division 1		
-	Pas. Direksi Keet	Unit	01.00
-	Measurement and Installation of Blow Plank	Ls	01.00
-	Pas. Project Nameplate	Bh	01.00
-	Traffic Security	Ls	01.00
-	Mobilization Demobilization Tools	Ls	01.00
-	Cleaning	Ls	01.00
-	Cleaning Quality Control Bending Pavement	Ls	01.00
-	Quality Control Precast Channel	Ls	01.00
	Number of Division 1 (Entry On Recapitulation of Quantity and Price List)		
	Division 2 Drainage		
-	U-Ditch Uk Channel Procurement. 100x100x120cm K-350 G.10	Pos	638.00
-	Installation of U-Ditch UK Channel. 100x100x120cm K-350 G.10	Pos	638.00
-	Procurement of U-Ditch Cover 100x120 K-350 G. 10 T (Fabrication)	Pos	638.00
-	Installation of U-Ditch Cover 100x120 K-350 G. 10 T (Fabrication)	Pos	638.00
-	Procurement of Monolith Box 120,120,120 cm K-350 G. 20 T (fabrication)	Pos	14.00
-	Installation of Monolith Box 120.120.120 cm K-350 G. 20 T (fabrication)	Pos	14.00

	Number of Division 2 (Entry On Recapitulation of Quantity and Price List)		
	Division 3 Earthworks and Geosynthetics		
3.1.(1)	Regular excavation (using heavy equipment)	M3	1624.14
-	Hard Soil Excavation	M3	53.09
-	Solid Sand Urugan	M3	98.28
3.2.(2)	Urugan Choice (sirtu)	M3	279.32
03.03	Road Body Preparation	M2	1183.23
3.4.(2)	Felling of Trees	Bh	52.00
-	Tree Planting	Bh	52.00
3.5.(3)	Installation of Geotextile Woven 250gr/m2	M2	2310.37
	Number of Division 3 (Entry On Recapitulation of Quantity and Price List)		
	Division 5 Grained Pavement		
5.1(2)	Grade B Aggregate Foundation Layer> 65%	M3	473.32
5.6(1)	Foundation Layer With Cement Treated Base (CBT)	M3	742.62
	Number of 5th Division (Included In The Recapitulation Of Quantity and Price List)		
	Division 6 Pavement Asphalt		
6.1(1)	Fastening Absorbent Layer (1Liter = 1.25m2)	Liter	2163.84
6.1.(2)	Adhesive Coating (1Liter = 2.5m2)	Liter	1081.92
6.3.(5)	Laston Wear Coating (AC-WC) = 4cm	M2	2676.80
-	Laston Lapis Aus (AC-WC) = 5cm	M2	28.00
6.3(6a)	Laston Intermediate Layer (AC-BC)	M3	160.61
	Number of 6th Division (Entry On Recapitulation of Quantity and Price List)		
	Division 7 Structure		
-	Concrete K-225	M3	11.94
-	Reinforcing Stell 24 Plain	Kg	249.53
-	Reinforcing Steel 32 Thread	Kg	425.54
-	Provision and Erection of Bamboo Crushed Foundations	M1	168.00
-	Reinforcing Stell Wiremesh M10-150	M2	28.00
	Number of Division 7 (Entry On Recapitulation of Quantity and Price List)		
	Division 9 Daily Work and Other Occupations		
-	Thermoplastic Road Markings	M2	110.38
-	Road Utility Pole Removal	Ls	7.00
	Number of 9th Division (Entry On Recapitulation of Quantity and Price List)		
-	PEKERJAAN K3 (KESEHATAN KESELAMATAN KERJA)		30.00
-	Helmet	Bh	30.00
-	Mask	Bh	30.00
-	Glove	Psg	30.00
-	Safety Shoes	Psg	30.00
-	P3K	Set	1.00
-	BPJS	Ls	1.00

From the results of the analysis of the work above using the Ms. software. Project, the criticalpath is obtained as follows:

ID	JOB DESCRIPTION	NORMAL DURATION (Day)
2	Pas. Direksi Keet	14
5	Pengamanan Lalu Lintas	150
7	Mobilisasi Demobilisasi Alat	14
8	Pembersihan	150
10	Quality Control Perkerasan Lentur	7
11	Quality Control Saluran Precast	7
12	Quality Control Saluran Precast	7
14	Pengadaan Saluran U-Ditch Uk. 100x100x120 cm K-350 G-10 (Fabrikasi)	63
21	Galian Tanah Biasa (Menggunakan Alat Berat)	63
23	Urugan Pasir Padat	63
24	Urugan Pilihan (Sirtu)	21
45	Marka Jalan Thermoplastic	7

Source : Ms. Project

The calculation of the duration for the acceleration of work on the critical path obtained from the output of Ms. The project planer can be described as follows:

aa. Normal working time: 8 hours/day
bb. Acceleration by using shift work: 3 shifts

For example for Solid Sand Backfill work:

1. Number of workers = coefficient x volume of work
   5. Foreman = 6. 0,139 7. x 8. 98,2 9. = 10. 13,69
   11. Worker = 12. 2,625 13. x 14. 98,2 8 15. = 16. 257,9 9
2. Number of jobs per day = Number of workers: duration
   17. Foreman = 18. 13,69 19. : 20. 63 21. = 22. 0,22
   23. Worker = 24. 257,99 25. : 26. 63 27. = 28. 4,10
3. Wages of labor = Wages x Number of workers
   29. Foreman = 30. 32.143 31. x 32. 0,22 33. = 34. 6.985
   35. Worker = 36. 17.857 37. x 38. 4,10 39. = 40. 73.125
4. Wages for 3 shift workers = Wages for labor x 3 shifts
   41. Foreman = 42. 6.985 43. x 44. 3 45. = 46. 20.955
   47. Worker = 48. 73.125 49. x 50. 3 51. = 52. 219.375
5. Average work productivity per day = Volume: normal duration
   53. = 54. 98,28 55. 56. 6 57. = 58. 1,56 59. m3/day 3
6. Average work productivity per day = Volume: normal duration
   60. = 61. 1,56 62. : 63. 8 64. = 65. 0,20 66. m3/hour
7. Accelerated duration = 2 shifts x hourly work productivity
   67. = 68. 16 69. x 70. 0,20 71. = 72. 3,12 73. m3/hour
8. 3 shift work productivity = work productivity per day + accelerated duration
   74. = 75. 1,56 76. + 77. 3,12 78. = 79. 4,68 80. m3/day
9. Duration of acceleration = volume of work: work productivity 3 shifts
   81. = 82. 98,28 83. : 84. 4,68
   85. = 86. 21,00 87. day 88.
10. Acceleration duration results in normal duration with acceleration duration
    89. = 90. Normal duration 91. - 92. Acceleration duration
    93. = 94. 63 95. - 96. 21,00
    97. = 98. 42,00 99. da y 100.
11. Normal Cost = Total labor wage x duration

Foreman = 101. 85 6.9 102. 103. 3 (104. 105. 9 440.04
Worker = 106. 125 73. 107. 108. 3 (109. 110. 874 4.606.
111. 112. 113. 114. 115. 923 5.046.

12. Acceleration Cost = Acceleration duration x 3 shift labor wages

Foreman =	42,00	x	20.955	=	880.097
Worker =	42,00	x	219.375	=	9.213.749
					10.093.846

$$\text{Cost slope} = \frac{Acceleration\ Fee - Normal\ Fee}{Normal\ duration - acceleration\ durati}$$

$$\frac{10.093.846 - 5.046.923}{63 - 42,00}$$

240.330

4.1. Calculation of Time and Cost Differences Normal Time Duration and Accelerated Time Duration

With the help of the Microsoft Project program, an analysis of the time and cost exchange was carried out by compressing or accelerating the critical path until the duration and cost of the project were obtained after accelerating.

This acceleration is intended so that the project completion can be in accordance with the planned schedule, namely in the 21st week, on the KH Road Improvement project. Syafi'i, the direct costs incurred are Rp. Rp3,629,707,782.19 With a duration of 150 days to complete the work.

Table 2. Total quick costs of activities on the critical path

ID	NORMAL DURATION (DAY)	ACCELERATION DURATION (DAY)	NORMAL COST (RUPIAH)	ACCELERATION COST (RUPIAH)	COST SLOPE
21	63	42	5.899.109	11.798.217	280.910
23	63	42	5.046.923	10.093.846	240.330
24	21	7	12.557.737	25.115.474	1.793.962
45	7	2	1.980.855	3.961.710	848.938

From the table above, it can be seen that with the project duration after acceleration, weget:

1. Completion duration : 150 day
   Total completion duration : Rp 3.629.707.782,19
2. Duration after accelerated : 109 day
   Total after accelerated : Rp. 3.632.871.922,19
3. Acceleration duration : Completion duration – acceleration duration
   : 150 – 109
   : 41 day
4. Acceleration Cost : Acceleration fee – completion fee
   116.:Rp3.629.707.782,19 - Rp3.632.871.922,19
   : Rp 3.164.140,00

5. Conclusion and Suggestions

Based on the results of the analysis that has been carried out in this writing, there are the following conclusions:

1. The results of the development schedule for the improvement of Jalan KH. Syafi'i Gresik Regency with the TCTO (Time Cost Trade Off) method, the completion time due to acceleration is 109 days from the initial schedule it takes 150 days to complete the project, there are 41 days to complete the project with no critical path

2. The costs obtained after accelerating the project are Rp. 3,632,871,922.19 of the original project value of Rp. 3,629,707,782.19. There was an additional project cost of Rp. 3.164.140.00 to complete the project on time with no critical path / path in it. In future research, it is expected to develop research related to the TCTO (Time Cost Trade Off) method, for example by increasing the number of workers and analyzing the calculation of materials used to accelerate the completion of project work

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