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Analysis Capacity And Cost Tool Heavy To Production Work (Study Case : Building Construction New SMAN 2 Bukittinggi)

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Abstract: In the implementation of quality work work very needed And will reflect production Work That alone. However, in the Building Construction project New SMAN 2 Bukittinggi does not use heavy equipment properly what have planned. Heavy equipment used produce low production so that raises impact negative for results production And cost on implementation project That alone. After do analysis calculation about capacity And cost usage tool heavy on building construction project New SMAN 2 Bukittinggi this, for can finish work in accordance with those who have planned on project, must know capacity productive in the field. Because with know capacity productivity in the field, will easy determine work in accordance with capacity And the cost. The need use capacity more production big on tool heavy, will determine production quality work.

Keywords: Analysis Capacity, Tools Weight, Production Work.

INTRODUCTION

The success of a development project can be measured from two things, namely the benefits obtained and the timely completion of the project. Both depend on careful planning of implementation methods, use of tools and scheduling job . Selection of the right equipment plays a very important role For something job . Equipment is considered to have high capacity if the equipment produces high or optimal productivity, but at a low cost but if productivity low so equipment considered own capacity low . Development and coaching means And infrastructure always faced on limited tool support or tool help , wrong only one is tools heavy , with There is his the tool _ can maximizing something job .

Building Construction Project Just SMA 2 Bukittinggi is Wrong One building to be used as place education medium above , so that it takes the completion of work quickly according to a predetermined schedule or target in order to be able to used for the learning process teach . Building Construction Project Work Just SMA 2 Bukittinggi starting with earthworks, In implementation work should needed tool more weight _ adequate And capacity high productivity _ in accordance with need job . However _ on results interview I

on supervisor building construction project Just SMA 2 Bukittinggi use tool heavy No in accordance with productivity and the required budget, resulting in low productivity , expensive costs and delays in work .

Slower And its small production work on building construction projects Just SMA 2 Bukittinggi the greater the costs that will be incurred in the project . Starting from the length of the rental fee, operator fees, fuel consumption costs, and other costs related to heavy equipment used for production work .

To reduce production low work _ as well as delays that do not cause large costs, it is necessary to calculate productivity and costs in a heavy equipment used in the project. Based on explanation such , then writer do study with title : " Capacity Analysis and Tool Costs Heavy To Production work ".

LITERATURE REVIEWS

Heavy Equipment Introduction

In the field of civil engineering, heavy equipment is used to assist humans in carrying out construction work. Currently, heavy equipment is an important factor in projects, especially large-scale construction projects. The purpose of using heavy equipment is to make it easier for humans to do their work so that the expected results can be achieved more easily in a relatively short time. Heavy equipment commonly used in construction projects includes bulldozers ; excavators such as backhoes, front shovels, clamshells , transport equipment such as loaders , trucks , and others, (Susi Fatena , 2008:01)

1. Excavators

   Excavators function Diggers consist of several types, which in operation are adapted to the type and working conditions in the field.
2. Dump Trucks

   Trucks function as a means of transporting excavated materials or for backfilling in the implementation of work, trucks provide a high level of flexibility because the number currently working can be added or reduced easily to allow modifications to the overall transport capacity of the fleet.

Factors Affecting Heavy Equipment

One reject measure what you can worn For know Good bad results work (success) a tool transfer land mechanical is magnitude possible production achieved by tool the .

For estimate with more thorough production tools that will used (Chairul Israr , 2011 : 08) influencing factors results Work tool namely :

1. Digging Resistance
2. Rolling Resistance (RR)
3. Slope Resistance (Grade Resistance)
4. Tractive Effort/Coeff of Traction
5. Rimpull (RP), Draw Bar Pull (DBP)
6. Acceleration (acceleration = a)
7. Altitude From Sea Level (Altitude)
8. Operator Efficiency
9. Unavoidable unemployment, including:
10. Development factor (Swell Factor)
11. Soil weight (Weight of Material)

Heavy Equipment Productivity

Productivity of heavy equipment is the ability of heavy equipment to produce work (production) according to the function of the equipment with certain situations and conditions of the type of work and environment (Susi Fatena , 2008:26) .

Xc Avator Heavy Equipment Productivity

$$Q = \frac{q \; x \; 3600 \; x \; E}{Cm}$$

Where: Q = production per hour of heavy equipment (m^3 / hour)
q = production capacity per cycle (m^3)
E = work efficiency
cm = cycle time (minutes) (Chairul Israr, 2011:06)

Dump Truck Heavy Equipment Productivity

1. Productivity of heavy equipment dump trucks per hour

$$P = \frac{C \; x \; 60 \; x \; Et}{Cmt}$$

Where: P = production per hour of dump truck (m3 / hour)
C = production capacity per cycle (m^3)
Et = dump truck work efficiency
Cmt = cycle time (minutes) (Susy Fatena, 2008:10)

2. Number of dump trucks in operation

$$M = \frac{waktu \; siklus \; dump \; truck}{waktu \; muat}$$

(Chairul Israr , 2011:10)

Equipment Cost

The cost of heavy equipment can be divided into two categories, the cost of owning the equipment and the cost of operating the equipment. Contractors who own heavy equipment must bear a cost known as heavy equipment ownership cost . When the heavy equipment is operated, there will be an operating cost .

1. Heavy Equipment Ownership Fee
2. Heavy Equipment Operating Costs

METHODS

article contains a discussion of the analysis of capacity and cost of heavy equipment to production work . For can analyze usage tool heavy on project This so that needed a number of step For the calculation is :

1. collection : Required data -d data related with the issues discussed can obtained from project data as well as source others can _ give required information . _
2. Determine specification tool weight to be used on project (Excavator and Dump Truck) .
3. Processing tool data heavy so that can is known productivity something tool heavy in accordance with specifications (Excavator and Dump Truck) .

4. Do calculation cost equipment , costs equipment that can counted based on ever equipment the operate For finish job .

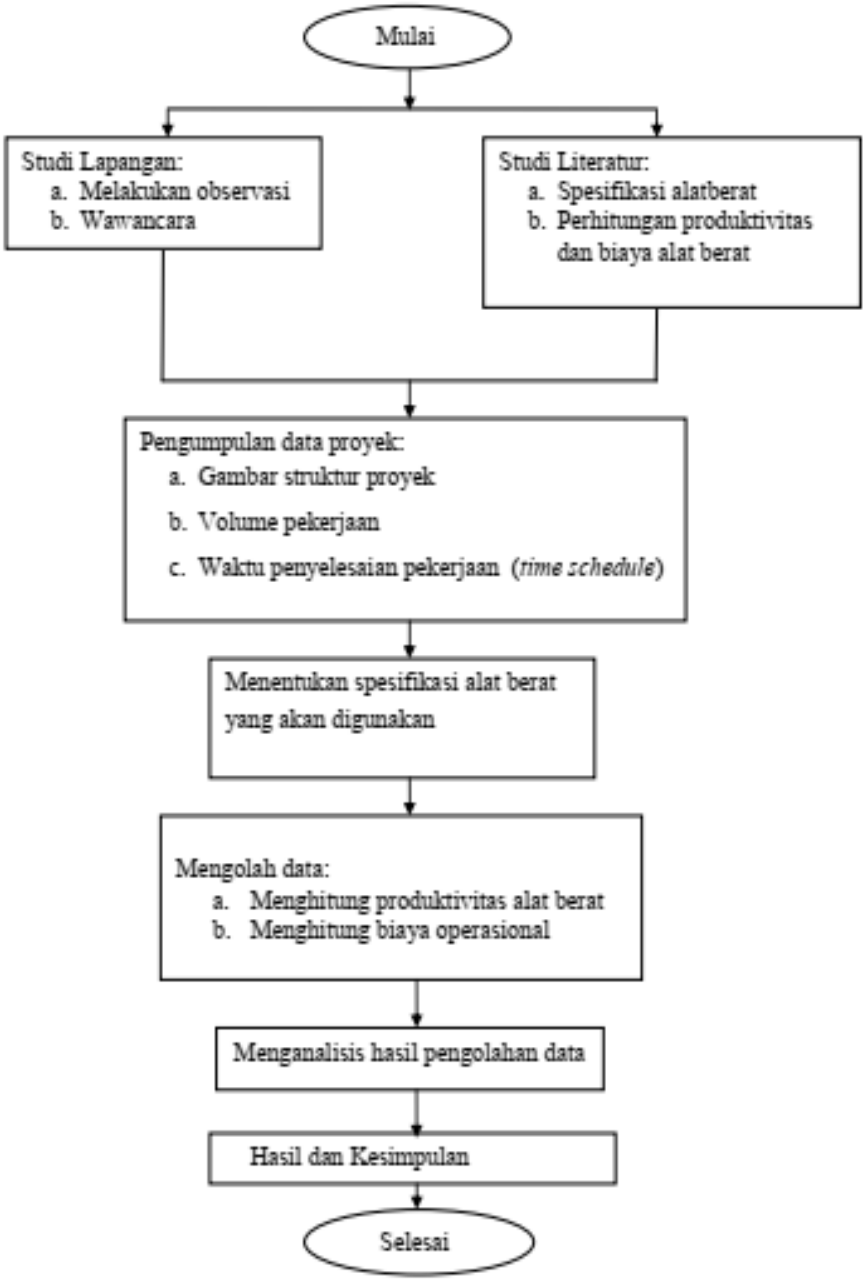

Figure 1. Chart flow Methodology Discussion

RESULTS AND DISCUSSION

Discussion Analysis Tool Heavy On Project

1. Excavators are used Caterpillar Type 320B

   Technical data tools :

   Capacity production (ql) = 0 ,9 m^3 (Specification tool)
   factor (k) = 0.8 m^3 (Table 2)
   Efficiency work (E) = 0.75 (Table 1)
   Time dig = 10 sec (Field data)
   Time waste = 20 sec (Field data)
   Time play = 13 s (Field data)

a. Count Capacity Production per Cycle (q)
q = ql xk = 0 .9 x 0.8 = 0.72 m ^{3}
b. Count Time Cycle (Cm) Cm = Time dig + (Time play x 2) + Time waste = 10 + (13 x 2) + 20 = 56 sec
c. Count Excavator Productivity (Q) $Q = \frac{q \times 3600 \times E}{Cm} = \frac{0{,}72 \times 3600 \times 0{,}75}{56} = 34{,}71\ m3/jam$

So capacity analysis caterpillar type 320 B excavator for the project is: **34.71** m^3 /hour

2. Dump trucks are used by Hino Dutro Hood 5 m ^{3}
Technical Data :
Capacity production (q) = 5 m3 (Specifications tool)
Bucket factor (K) = 0 .8 (Excavator Data)
Distance Transport (D) = 150 m (Field data)
Speed charged (V1) = 15 km/h (Condition field)
Speed without payload (V2) = 30 km/h (Condition field)
Time waste (t1) = 2 minutes (field data)
Time load (t2) = 5 minutes (Field data)
a. Count Capacity Per cycle (C) $C = nx\ q1 \times K\ n = \frac{\text{kapasitas rata" dump truck}}{\text{kapasitas bucket x faktor bucket}} = \frac{5}{0{,}7 \times 0{,}8}$ x 0.7 x 0.8 = 5 m ^{3}
b. Count Time Cycles (Cmt) Cmt = (nx Cms) + $\frac{D1}{V1}$ + t1 + $\frac{D1}{V2}$ + t2 = (9x 1) + $\frac{150}{\frac{15.000}{60}\text{menit}}$ + 2 + $\frac{150}{\frac{30.000}{60}\text{menit}}$ + 5 = 9 + 0.6 + 2 + 0.3 + 5 = 16.90 minutes
c. Count Dump Truck $\frac{C \times 60 \times Et}{Cmt}$ capacity (P) P = = $\frac{5 \times 60 \times 0{,}75}{16{,}90}$ = 13.30 m ^{3} / hour

the analysis of the production capacity of dump trucks on the project is: **13.30** m3 /hour

3. Cost Operational Caterpillar Excavator type 320 B
a. Fuel Cost (BBM) BBM = 15% x HP x Fuel Price = 15% x 12 5 x IDR 5500,- = Rp. 1 03.125 , -
b. Lubricant Cost/hour (QL) QL = 0.40 x IDR 105,600 = IDR 42,240,-
c. Tire/Chain charge per hour Tire/chain fee per hour = $\frac{\text{Harga Rantai}}{\text{Umur Ekonomi Rantai}} = \frac{\text{Rp.100.000,–}}{\text{10.000/jam}}$ = IDR 10,000
d. Operator salary/hour = Rp. 10,000, - / hour
e. Equipment Rental = Rp. 200.000,-/hour

Total :
Fuel Cost = IDR . 105,600 ,-
Cost of lubricant = Rp . 4 2,240 ,-
Tire/chain cost per hour = Rp . 10.000,-
Cost of wages/hour = Rp. 10.000,-
Equipment rental fee = Rp. 200.000,- +
Cost operational per hour = Rp . 3 67,840 ,-
Number of excavator working hours = 18268 .47 : 34.71
= 526 hours (Result rounding off)

Amount cost operations required by the excavator for the total hours worked ie = Rp . 3 67,840 x 526 hours = Rp . 1 93,483,840,-

4. Cost operational Tool Dump Truck Weight
   a. Cost Material Burn BBM = 12% x HP x Rp. 5500,- = 12% x 150 x IDR 5500,- = IDR 99000,-
   b. Cost rent tools = IDR 200,000/hour
   c. wages = Rp.8000,-/hour

   Total Operations :

   Cost material fuel = Rp . 99.000,-
   Cost rent tools = Rp . 200.000,-
   wage per hour = Rp . 8,000 ,- +
   Cost operational per hour = Rp . 307.000,-
   Number of dump truck working hours = 7107 .45 : 13.3
   = 534

   Amount cost operations required by the dump truck for the total hours worked ie = Rp . 307,000 x 534 hours = Rp . 163,938,000

Discussion analysis repeat tool heavy

Based on results project on can seen that budget that has planned And time settlement work No in accordance with timetable planning (time schedule), so cause Big cost , small capacity _ _ And Also lateness job . By because it , writer propose A solution For overcome swelling cost , low capacity _ Also overcome lateness on work Building Construction Project New SMAN 2 Bukittinggi City .

1. Analysis Excavator Komatsu PC 220

   Technical data tools :

   Capacity production (ql) = 1 ,0 m^3 (Specification tool)
   factor (k) = 0.8 m^3 (Table 2)
   Efficiency work (E) = 0.75 (Table 1)
   Time dig = 10 sec (Field data)
   Time waste = 20 sec (Field data)
   Time play = 13 s (Field data)

   a. Count Capacity Production per Cycle (q) $q = ql \times k = 1.0 \times 0.8 = 0.8\ m^3$
   b. Count Time Cycle (Cm) Cm = Time dig + (Time play x 2) + Time waste = 10 + (13 x 2) + 20 = 56 sec
   c. Count Excavator Productivity (Q) $Q = \frac{q \times 3600 \times E}{Cm} = \frac{0{,}8 \times 3600 \times 0{,}75}{56} = 38{,}57\ m3/jam$

   So capacity analysis the type of caterpillar excavator for the project is: **3 8.57** m^3 /h m

2. The dump truck used by the Toyota Dyna Rino 130 HT

   Technical Data :

   Capacity production (q) = 7 m^3 (Specification tool)
   factor (K) = 0.8 (Excavator Data)
   Distance Transport (D) = 150 m (Field data)
   Speed charged (V1) = 15 km/h (Condition field)
   Speed without payload (V2) = 30 km/h (Condition field)
   Time waste (t1) = 2 minutes (field data)
   Time load (t2) = 5 minutes (Field data)

   a. Count Capacity Per cycle (C) $C = nx\ q1 \times K\ n = \frac{\text{kapasitas rata" dump truck}}{\text{kapasitas bucket x faktor bucket}} = \frac{7}{1{,}00 \times 0{,}8} \times 1.00 \times 0.8 = 8\ m^3$

b. Count Time Cycles (Cmt) Cmt = (nx Cms) + $\frac{D1}{V1}$+ t1 + $\frac{D1}{V2}$+ t2 = (10 x 1) + $\frac{150}{\frac{15.000}{60}menit}$+ 2 + $\frac{150}{\frac{30.000}{60}menit}$+ 5 = 10 + 0.6 + 2 + 0.3 + 5 = 1 3.3 minutes

c. Count Dump Truck capacity (P) P = $\frac{C \text{ x } 60 \text{ x } Et}{Cmt}$= $\frac{7 \text{ x } 60 \text{ x } 0,75}{13,3}$= 23.68 m ^{3} / hour

So the analysis of the dump truck production capacity on the project is: **23.68** m ^{3} / hour

3. Cost Komatsu PC 220 Excavator Operations
   a. Fuel Cost (BBM) BBM = 15% x HP x Fuel Price = 15% x 12 5 x IDR 5500,- = IDR 10 3,125 ,-
   b. Lubricant Cost/hour (QL) QL = 0.40 x IDR 10 3,125 ,- = IDR 4 1,250 , -
   c. Tire/Chain charge per hour Cost of tires/chain per hour =$\frac{\text{Harga Rantai}}{\text{Umur Ekonomi Rantai}}$ =$\frac{Rp.100.000,-}{10.000/jam}$ = IDR 10,000
   d. Operator salary/hour = Rp. 10,000, - / hour
   e. Equipment Rental = Rp. 200.000,-/hour

   Operational Total:

   Fuel Cost = IDR . 1 03.125,-
   Lubricant costs = Rp. 41.250,-
   Cost of tires/chains per hour = Rp. 10.000,-
   Cost of wages/hour = Rp. 10.000,-
   Equipment rental fee = Rp. 200.000,- +
   Operational cost per hour = Rp. 364.375,-
   Number of excavator working hours = 18268.47 : 34.71
   = 526 hours (Result rounding off)

   Amount cost operations required by the excavator for the total hours worked ie = Rp . 3 6 4,375 x 526 hours = Rp . 1 9 1,661,250 ,-
4. Cost operational Tool Dump Truck Weight
   a. Cost Material Burn BBM = 12% x HP x Rp. 5500,- = 12% x 130 x IDR 5500,- = IDR 85800,-
   b. Cost rent tools = IDR 200,000/hour
   c. wages = Rp.8000,-/hour

   Total Operations :

   Cost material fuel = Rp . 85.800,-
   Cost rent tools = Rp . 200.000,-
   wage per hour = Rp . 8,000 ,- +
   Cost operational per hour = Rp . 208,085 .5 ,-
   Number of dump truck working hours = 7107 .45 : 23.68
   = 300

   Amount cost operations required by the dump truck for the total hours worked ie = Rp . 3208,085.8 x 300 hours = Rp . 62,425,740

CONCLUSION

After do analysis calculation about capacity And cost usage tool heavy on work production building construction project New to SMAN 2 Bukittinggi , the conclusions obtained are:

1. Analysis of heavy equipment capacity obtained in the New Building Development project of SMAN 2 Bukittinggi: 32.41 m ^{3} / hour for excavators and 13.30 m ^{3} / hour for dump trucks , which causes work delays and poor work production.

2. Budget costs are not as planned, due to capacity which is low and the work time is not in accordance with the work schedule, causing very large heavy equipment costs, where as for the excavator Rp. 193,483,840, - and a dump truck Rp. 163,938,000, -
3. Work production becomes worse or lower due to inadequate capacity and the cost of heavy equipment as planned.

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