1 SELECTING CONSTRUCTION EQUIPMENT

TYPES OF EQUIPMENT
- STANDARD EQUIPMENT
- SPECIAL EQUIPMENT

FACTORS IN SELECTING CONSTRUCTION EQUIPMENT
- DELIVERY
- VERSATILITY
- AVAILABILITY OF PARTS
- DISPOSAL

EQUIPMENT MAY BE:
- PURCHASED
- LEASED
- RENTED

2 WHY COST OF OWNING AND OPERATING CONSTRUCTION EQUIPMENT
- ECONOMIC ANALYSIS TO COMPARE DIFFERENT EQUIPMENT
- UNIT COST FOR BIDDING PURPOSES

$$\text{Unit Cost of Excavation} = \frac{\text{Hourly Cost of Owning and Operating}}{\text{Hourly Rate of Production}} = \frac{\$/\text{hr}}{\text{m}^3/\text{hr}} = \$/\text{m}^3$$

FACTORS THAT AFFECT THE COST OF OWNING AND OPERATING

- INITIAL COST اگر قیمت اولیه دستگاه بالاتر باشد معمولا هزینه مالکیت و اجرا بالاتر است
- SEVERITY OF CONDITIONS اگر شرایط عادی نباشد و با مشکلات پیش بینی نشده مواجه شویم هزینه فوق بالاتر میرود
- NUMBER OF HRS USED PER YEAR اگر دستگاه ساعت خواب داشته باشد پول از دست میدهیم و باید حداکثر استفاده را کرد
- ECONOMIC LIFE OF EQUIPMENT دستگاه کار میکند اما به علت بالارفتن هزینه های تعمیر دیگر اقتصادی نیست
- CARE IN MAINTENANCE AND REPAIR اگر مراقبت از دستگاه بالاتر باشد و رسیدگی به آن بهتر، باعث کاهش فوق میشود
- DEMAND FOR IT WHEN SOLD اگر توانایی فروش دستگاه را داشته باشیم و دستگاه در بازار خریدنی باشد باعث کاهش هزینه فوق میشویم

COST OF OWNING AND OPERATING

- FIXED COST (COST OF OWNING)
- VARIABLE COST (COST OF OPERATING)

FIXED COSTS توضیح هزینه ها و محاسبه به تفکیک در ادامه امده

standard method

- DEPRECIATION COST
- SPARE PARTS COST
- MAINTENANCE AND REPAIR COST
- INVESTMENT COST دسته بندی سازمان مهندسی امریکا به علت نوسان کم هزینه تعمیر با استفاده از دستگاه آنرا ثابت در نظر میگیرد
- TRANSPORTATION-ASSEMBLING- DISMANTLING COST

DEPRECIATION IS THE LOSS IN VALUE OF A PIECE OF EQUIPMENT OVER TIME, GENERALLY CAUSED BY WEAR AND TEAR FROM USE, DETERIORATION, OBSOLESCENCE, OR REDUCED NEED.

REASONS FOR CALCULATING DEPRECIATION

- TO ESTIMATE MARKET VALUE OF EQUIPMENT برای تعیین ارزش دستگاه در زمانی که میخواهیم دستگاه را بفروشیم
- TO ASSESS UNIT COST OF PRODUCTION
- TAX PURPOSES برای بهای تمام شده چون ارزش دستگاه در حال از دست رفتن است وما نیاز داریم

بعد از فروش دستگاه، دستگاه جدید را جایگزین کنیم و باید ارزش از دست رفته را در قیمت فروش محصول در نظر بگیریم

METHODS OF CALCULATING DEPRECIATION COST

- STRAIGHT-LINE METHOD در ساخت و ساز این متداولترین روش برای استفاده است
- DECLINING BALANCE METHOD
- SUM-OF-THE-YEARS DIGIT METHOD
- SINKING FUND METHOD
- SERVICE OUTPUT METHOD
- ACCELERATED COST RECOVERY SYSTEM (ACRS)
- MODIFIED ACRS

EXAMPLE

A CRANE WHICH HAS AN INITIAL VALUE OF $100,000 HAS AN ESTIMATED USEFUL LIFE OF 5 YEARS. THE SALVAGE VALUE AT THE END OF THESE 5 YEARS IS $10,000. CALCULATE THE YEARLY STRAIGHT LINE DEPRECIATION COST.

SOLUTION

$$\text{YEARLY SL DEPRECIATION} = \frac{1}{N}(P - S)$$

WHERE

N = DEPRECIATION PERIOD
EXPRESSED IN YEARS

P = PURCHASE PRICE OF EQUIPMENT

S = SALVAGE VALUE OF EQUIPMENT

$$\text{YEARLY DEPRECIATION} = \frac{1}{N}(P - S)$$
$$= \frac{1}{5}(100{,}000 - 10{,}000)$$
$$= \$18{,}000/\text{yr}$$

END OF YEAR	YEARLY DEPRECIATION	BOOK VALUE
0	$0	$10,000
1	$18,000	100,000 – 18,000 = $82,000
2	$18,000	82,000 – 18,000 = $64,000
3	$18,000	64,000 – 18,000 = $46,000
4	$18,000	46,000 – 18,000 = $28,000
5	$18,000	28,000 – 18,000 = $10,000

DEPRECIATION ACCOUNTING FOR CONSTRUCTION EQUIPMENT

- STRAIGHT-LINE METHOD
- NO SALVAGE VALUE
- HOURLY DEPRECIATION = P/N_1

ان یک به جای میزان سال استهلاک بر اساس ساعت مطرح میشود

LIFE OF EQUIPMENT

- ACTUAL LIFE زمانی که ماشین زنده است و زیر دست ما دوام میاورد
- USEFUL LIFE زمانی که میتوان از ماشین استفاده کرد و عمر مفیدی است که کارایی دارد
- SERVICE LIFE زمان استفاده از ماشین که از سوی فروشنده مطرح میشود
- DEPRECIATION LIFE زمانی که دستگاه استهلاکش ارزش انرا به صفر برساند
- TAXABLE LIFE
- ECONOMIC LIFE زمانی که دستگاه کار میکند اما توجیه اقتصادی ندارد

SPARE PARTS COST

- ALL PARTS ARE SUBJECT TO FAILURE AND MUST BE REPLACED WHEN BROKEN
- ALWAYS EXPRESSED AS A PERCENTAGE OF THE DEPRECIATION COST
- HOURLY SPARE PARTS COST = $0.53\ P/N_1$

MAINTENANCE AND REPAIR COST DEPENDS ON:

- TYPE OF EQUIPMENT
- SERVICE TO WHICH EQUIPMENT IS ASSIGNED
- CARE EQUIPMENT RECEIVES

MAINTENANCE AND REPAIR COST

- ALWAYS EXPRESSED AS A PERCENTAGE OF THE DEPRECIATION COST
- HOURLY COST OF MAINTENANCE AND REPAIR = $0.13\ P/N_1$

INVESTMENT COST

این هزینه میگوید اگر دستگاه را نمیخریدید هزینه های زیر را نداشتید و اینها هزینه های فرصت از دست رفته سرمایه گذاریست

- INTEREST COST
- INSURANCE COST
- STORAGE COST
- TAXES

این دوع مجموعا 0.12 مجموع استهلاک سالیانه دستگاه میباشد

این دوع مجموعا 0.08 مجموع استهلاک سالیانه دستگاه میباشد

فرمول در ادامه امده

INVESTMENT COST = $0.20 \times$ AVERAGE VALUE

چون هر سال استهلاک نیز کم میشود و این محاسبات زمانبر است میزان میانگین برای این معیار حساب میکنند

AVERAGE VALUE OF EQUIPMENT

$$\bar{P} = \frac{\overbrace{P}^{\text{سال صفر}} + [P - \frac{P}{N}] + [P - 2\frac{P}{N}] + \ldots\ldots + \underbrace{[P - \frac{(N-1)P}{N}]}_{\text{سال یک}}}{N}$$

$$\bar{P} = \frac{NP - \frac{P}{N}[1 + 2 + 3 + \ldots. + (n-1)]}{N}$$

$$\bar{P} = \frac{NP - \frac{P}{N}\frac{(N-1)(N-1+1)}{2}}{N}$$

$$\bar{P} = \frac{NP - \frac{P}{N}\frac{(N-1)N}{2}}{N}$$

$$\bar{P} = \frac{2NP - P(N-1)}{2N}$$

$$\bar{P} = \frac{2NP - NP + P}{2N}$$

$$\bar{P} = \frac{P(N+1)}{2N} \text{ per year}$$

$$\bar{P} = \frac{P(N+1)}{2Nn} \text{ per hour}$$

$$\bar{P} = \frac{P(N+1)}{2N_1} \text{ per hour}$$

AVERAGE VALUE WE USE IN INVESTMENT COST FORMULA

N= NUMBER OF YEARS WE USE THE MACHINE

n= NUMNBER OF HOURS WE USE THE MACHINE IN A YEAR

AVERAGE COST OF INVESTMENT
(NO SALVAGE VALUE) ←

$$\text{HOURLY INV COST} = 0.20\left[\frac{P(N+1)}{2N_1}\right]$$

AVERAGE VALUE OF EQUIPMENT
(SALVAGE VALUE = S)

$$\bar{P} = \frac{P(N+1) + S(N-1)}{2N_1}$$

AVERAGE COST OF INVESTMENT
(WITH SALVAGE VALUE = S) ←

$$\text{HOURLY INV COST} = 0.20\left[\frac{P(N+1) + S(N-1)}{2N_1}\right]$$

EXAMPLE

- ORIGINAL COST OF EQUIPMENT: $25,000
- ESTIMATED USEFUL LIFE: 5 yrs
- ESTIMATED HOURS OF WORK PER YEAR: 2,000
- SALVAGE VALUE: ZERO
- STRAIGHT-LINE METHOD OF DEPRECIATION
- CALCULATE AVERAGE VALUE OF EQUIPMENT
- CALCULATE AVE HOURLY INVESTMENT COST OF EQUIPMENT

ANNUAL DEPRECIATION = $25,000/5
= $5,000

START OF YEAR	ANNUAL DEPRECIATION	BOOK VALUE
1	$0	$25,000
2	$5,000	$20,000
3	$5,000	$15,000
4	$5,000	$10,000
5	$5,000	$5,000
	TOTAL	$75,000

- AVERAGE YEARLY VALUE OF EQUIPMENT:
  $75,000 / 5 yrs = $15,000/yr

- AVERAGE HOURLY VALUE OF EQUIPMENT:
  $15,000/yr / 2,000 hrs/yr = $7.50/hr

- AVERAGE HOURLY INVESTMENT COST:
  20% x $7.50/hr = $1.50/hr

TRANSPORTATION - ASSEMBLING - DISMANTLING COST

- EQUIPMENT HAVE TO BE TRANSPORTED FROM SITE TO SITE
- ALWAYS EXPRESSED AS A PERCENTAGE OF A/n
- TRANSPORTATION-ASSEMBLING-DISMANTLING COST = 0.02 P/n

n= number of hours using machine per year

OPERATING COSTS (VARIABLE COSTS)

- FUEL COST
- LUBRICATING OIL COST
- LABOR COST

FUEL COST

- DEPENDS ON HP
- HOURLY FUEL COST = (FUEL CONSUMED PER HOUR) × (UNIT PRICE OF FUEL)
- HOURLY FUEL CONSUMPTION = (UNIT CONSUMPTION in kg/HP.hr) × (HP) × (OPERATING FACTOR)

از صفحه بعد

FUEL CONSUMPTION

- FUEL CONSUMPTION WHEN ENGINE IS WORKING AT FULL POWER AND 60 MINUTES PER HOUR:
  - GASOLINE ENGINE
    0.200 kg/HP.hr
    (0.06 gal/HP.hr)
  - DIESEL ENGINE
    0.150 kg/HP.hr
    (0.04 gal/HP.hr)

OPERATING FACTOR

فاکتور زمانی که نسبت زمان استفاده در 60 دقیقه به 60 دقیقه است

- OPERATING FACTOR = (ENGINE FACTOR) × (TIME FACTOR)
- ENGINE FACTOR = AVERAGE POWER GENERATED COMPARED TO FULL POWER
- TIME FACTOR = AVERAGE TIME EQUIPMENT IS USED PER 60 MINUTE HR

EXAMPLE

CONSIDER A FRONT SHOVEL WITH A DIESEL ENGINE RATED AT 160 HP. WHEN USED TO LOAD TRUCKS, THE ENGINE OPERATES AT MAXIMUM POWER WHILE FILLING THE DIPPER, REQUIRING 5 SECONDS OUT OF A CYCLE TIME OF 20 SECONDS. DURING THE OTHER 15 SECONDS, THE ENGINE OPERATES AT HALF ITS RATED POWER. ALSO, THE SHOVEL OPERATES 50 MINUTES PER HOUR ON AVERAGE. WHAT IS THE CONSUMPTION OF FUEL?

SOLUTION

ENGINE FACTOR WHEN FILLING THE DIPPER = (5/20) × 1
= 0.250

ENGINE FACTOR IN THE REST OF THE CYCLE = (15/20) × 0.5
= 0.375

ENGINE FACTOR = 0.250 + 0.375
= 0.625

TIME FACTOR = 50/60
= 0.833

OPERATING FACTOR = (ENGINE FACTOR) × (TIME FACTOR)
= 0.625 × 0.833
= 0.520

FUEL CONSUMED PER HOUR = 160 HP × 0.520 × 0.150 kg/HP.hr
= 12.48 kg/hr

LUBRICATING OIL COST DEPENDS ON

- SIZE OF ENGINE
- CAPACITY OF THE CRANKCASE
- CONDITION OF THE PISTON RINGS
- NUMBER OF HOURS BETWEEN OIL CHANGES

CONSUMPTION OF LUBRICATING OIL

CONSUMPTION OF LUBRICATING OIL = (QUANTITY PUT DURING CHANGE) + (MAKE-UP OIL IN BETWEEN)

EMPIRICAL FORMULA:

$$q = \frac{HP \times f \times 0.006\,(\text{lbs/HP.hr})}{7.4\,(\text{lbs/gal})} + \frac{c}{t}$$

WHERE
q = QUANTITY CONSUMED (gal/hr)
HP = HORSE-POWER OF ENGINE
f = OPERATING FACTOR عين فرمول قبل
t = HRS BETWEEN OIL CHANGES
c = CRANKCASE CAPACITY (gal)

TYPICAL LUBRICATING OIL CONSUMPTION WHEN ENGINE IS WORKING AT FULL POWER AND 60 MINUTES PER HOUR:
0.003 kg/HP.hr
(0.0009 gal/HP.hr)

LABOR COST

- CONSISTS OF FOREMAN, OPERATOR, MECHANICS, OILERS
- IS NOT INCLUDED AS PART OF VARIABLE COST IN U.S. PRACTICE

COST OF OWNING AND OPERATING (PEURIFOY-SCHEXNAYDER-SHAPIRA-SCHMITT)

- OWNERSHIP COST
  - DEPRECIATION COST
  - COST OF CAPITAL
  - TAX SAVINGS
  - MAJOR REPAIRS
  - TAXES, INSURANCE, AND STORAGE
- OPERATING COST
  - FUEL
  - LUBRICANTS
  - MAINTENANCE AND REPAIR
  - TIRES AND HIGH-WEAR ITEMS

COST OF OWNING INCLUDES (PEURIFOY-SCHEXNAYDER-SHAPIRA-SCHMITT)

- DEPRECIATION
  $C_D = (P - S - T) / N.n$ T=COST OF TIRES
  or
  $C_D = [(P - T)\,(A/P, i, N) - S(A/F, i, N)] / n$

Where P = Purchase price
S = Salvage value
T = Price of the tires
N = Life of equipment (years)
n = Hours eqt is used per year

- COST OF CAPITAL

$$C_C = MARR \times \left[\frac{P(N+1) + S(N-1)}{2N_1} \right] \text{ average value of equip}$$

Where P = Purchase price
S = Salvage value
N = Life of equipment (years)
N1 = Life of equipment (hours)
MARR = Min attractive rate of return

- TAX SAVINGS

$$C_T = TAX\ RATE \times \frac{P \times \sum_{i=1}^{N} D_i}{N_1}$$

Where P = Purchase price
D = Depreciation rate in MACRS
N = Life of equipment (years)
N_1 = Life of equipment (hours) `N1=n*N`

- MAJOR REPAIRS

ANTICIPATED MAJOR REPAIRS ARE ADDED TO THE BOOK VALUE OF THE EQUIPMENT ON THE YEARS THEY HAPPEN AND THE DEPRECIATION COST, THE COST OF CAPITAL, AND THE TAX SAVING HAVE TO BE ADJUSTED ACCORDINGLY.

- TAXES, INSURANCE AND STORAGE

TAXES, INSURANCE EXPENSES AND STORAGE COSTS ARE ESTIMATED AS A PERCENTAGE OF THE AVERAGE EQUIPMENT COST.

$$C_{TIS} = PERCENT \times \left[\frac{P(N+1) + S(N-1)}{2N_1} \right]$$

DEPRECIATION PERCENTAGES FOR MACRS CLASSES

RECOVERY YEAR	3-YEAR CLASS	5-YEAR CLASS	7-YEAR CLASS	10-YEAR CLASS	15-YEAR CLASS	20-YEAR CLASS
1	33.33	20.00	14.29	10.00	5.00	3.75
2	44.44	32.00	24.49	18.00	9.50	7.22
3	14.81	19.20	17.49	14.40	8.55	6.68
4	7.41	11.52	12.49	11.52	7.70	6.18
5		11.52	8.92	9.22	6.93	5.71
6		5.76	8.92	7.37	6.23	5.28
7			8.92	6.55	5.90	4.89
8			4.46	6.55	5.90	4.52
9				6.55	5.90	4.46
10				6.55	5.90	4.46
11				3.28	5.90	4.46
12					5.90	4.46
13					5.90	4.46
14					5.90	4.46
15					5.90	4.46
16					2.95	4.46
17						4.46
18						4.46
19						4.46
20						4.46
21						2.23

COST OF OPERATING INCLUDES (PEURIFOY-SCHEXNAYDER-SHAPIRA-SCHMITT)

- FUEL COST
  CALCULATED THE SAME WAY AS BEFORE:

  AVERAGE CONSUMPTION = 0.150 kg/HP.hr (0.04 GAL/HP.HR) FOR DIESEL ENGINES
  AND
  AVERAGE CONSUMPTION = 0.200 kg/HP.hr (0.06 GAL/HP.HR) FOR GASOLINE ENGINES

- COST OF LUBRICANTS
  CALCULATED THE SAME WAY AS BEFORE:

$$q = \frac{HP \times f \times 0.006(lbs/HP.hr)}{7.4(lbs/gal)} + \frac{c}{t}$$

- MAINTENANCE AND REPAIR منظور هزینه های تعمیر و نگهداری کوچک و روتین است
  ANTICIPATED REPAIR AND MAINTENANCE COSTS OBTAINED FROM HISTORICAL RECORDS ARE DISTRIBUTED EVENLY ACROSS THE LIFE OF THE EQUIPMENT.

  CHANGES BETWEEN 50-100% OF DEPRECIATION COST.

- COST OF TIRES
  TIRES ARE REPLACED SEVERAL TIMES DURING THE LIFE OF EQUIPMENT AND ARE COSTLY.

  THEIR DEPRECIATION COST IS CALCULATED BY DIVIDING THE PURCHASE PRICE OF THE TIRES BY THE LIFE OF THE TIRES.

  THE DEPRECIATION COST OF TIRES AND THE COST OF CAPITAL FOR THE INVESTMENT IN TIRES HAVE TO BE CALCULATED.

  REPAIR COST OF TIRES IS GENERALLY EXPRESSED AS A PERCENTAGE OF THE DEPRECIATION COST

EXAMPLE
- FRONT SHOVEL
- 100-HP DIESEL ENGINE
- BUCKET CAPACITY: 1¾ cu yd
- INITIAL COST: $147,000
- SALVAGE VALUE: $0

- UNIT PRICE OF FUEL: $3.40/gal
- UNIT PRICE OF LUBR: $7.00/gal
- HOURS WORKED PER YEAR: 2,000
- USEFUL LIFE: 8 yrs
- CRANKCASE CAPACITY: 4.2 gal
- OIL CHANGES: EVERY 150 HOURS
- OPERATING FACTOR: 0.60
- COMPANY'S TAX RATE: 40%
- MAJOR REPAIRS: NONE
- MIN ATTRACTIVE RATE OF RETURN: 5%

SOLUTION 1 – STANDARD METHOD

- OWNERSHIP COST

  – DEPRECIATION COST

$$C_d = \frac{P}{N_1}$$
$$= \frac{\$147{,}000}{8\ \text{yrs} \times 2{,}000\ \text{hrs/yr}}$$
$$= \$9.19/\text{hr}$$

  – SPARE PARTS COST

$$C_{sp} = 0.53 \times \frac{P}{N_1}$$
$$= 0.53 \times \frac{\$147{,}000}{8\,\text{yrs} \times 2{,}000\,\text{hrs/yr}}$$
$$= \$4.87/\text{hr}$$

  – MAINTENANCE AND REPAIR COST

$$C_{m\&r} = 0.13 \times \frac{P}{N_1}$$
$$= 0.13 \times \frac{\$147{,}000}{8\,\text{yrs} \times 2{,}000\,\text{hrs/yr}}$$
$$= \$1.19/\text{hr}$$

– INVESTMENT COST

$$C_{inv} = \frac{0.20(N+1)P}{2N_1}$$
$$= \frac{0.20 \times (8+1) \times \$147{,}000}{2 \times 8\,\text{yrs} \times 2{,}000\,\text{hrs/yr}}$$
$$= \$8.27/\text{hr}$$

– TRANSPORTATION-ASSEMBLING-DISMANTLING COST

$$C_{t-a-d} = 0.02 \times \frac{P}{n}$$
$$= 0.02 \times \frac{\$147{,}000}{2{,}000\,\text{hrs/yr}}$$
$$= \$1.47/\text{hr}$$

OWNERSHIP COST (FIXED COST)
$C_{ow} = C_d + C_{sp} + C_{m\&r} + C_{inv} + C_{t\text{-}a\text{-}d}$
$C_{ow} = 9.19 + 4.87 + 1.19 + 8.27 + 1.47$
$C_{ow} = \$24.99$ /hr

- OPERATING COST

– FUEL COST

$$C_{fuel} = HP \times consumption \times op\,fact \times unit\,cost$$
$$= 100HP \times 0.04\text{gal/HP.hr} \times 0.60 \times \$3.40/\text{gal}$$
$$= \$8.16/\text{hr}$$

– LUBRICATING OIL COST

$$C_{lu} = \left[\frac{HP \times op\,fact \times consumption}{density} + \frac{c}{t}\right] \times unit\,cost$$
$$= \left[\frac{100HP \times 0.60 \times 0.006\,\text{lb/HP.hr}}{7.4\,\text{lb/gal}} + \frac{4.2\,\text{gal}}{150\,\text{hrs}}\right] \times \$7.00/\text{gal}$$
$$= \$0.54/\text{hr}$$

OPERATING COST (VARIABLE COST)
$C_{op} = C_{fuel} + C_{lu}$
$C_{op} = \$8.16/\text{hr} + \$0.54/\text{hr}$
$C_{op} = \$8.70$ /hr

COST OF OWNING AND OPERATING (FIXED + VARIABLE COST)

$C = C_{ow} + C_{op}$

$C = \$24.99/hr + \$8.70/hr$

$C = \$33.69\ /hr$

SOLUTION 2 – PSSS METHOD

- OWNING COST
  - DEPRECIATION COST (CONSIDERING TIME VALUE OF MONEY WITH MARR=5%)

$$C_D = \frac{P \times (A/P, i, N)}{n}$$

$$= \frac{\$147{,}000 \times (A/P, 5\%, 8\,yrs)}{2{,}000\,hrs/yr}$$

$$= \frac{147{,}000 \times 0.1547}{2{,}000}$$

$$= \$11.37/hr$$

  - COST OF CAPITAL (WITH MARR=5%)

$$C_C = MARR \times \left[\frac{P(N+1) + S(N-1)}{2N_1}\right]$$

$$= 0.05 \times \left[\frac{\$147{,}000 \times (8\ yrs + 1)}{2 \times 8\ yrs \times 2{,}000\ hrs/yr}\right]$$

$$= 0.05 \times 41.34$$

$$= \$2.07/hr$$

- TAX SAVING (7-YEAR CLASS)

$$C_T = \text{TAX RATE} \times \frac{\sum_{i=1}^{N}(P \times D_i)}{N_1}$$

$$= 0.40 \times \frac{\sum_{1}^{8}(\$147{,}000 \times 0.1429) + (\$147{,}000 \times 0.2449) + (....}{8\ \text{yrs} \times 2{,}000\ \text{hrs/yr}}$$

$$= 0.40 \times \frac{147{,}000}{16{,}000}$$

$$= \$3.68/\text{hr}$$

TOTAL OWNING COST

$C_O = C_D + C_C - C_T + C_R$

= \$11.37/hr + \$2.07/hr - \$3.68/hr + \$0/hr

= \$9.76/hr

- OPERATING COST
  - FUEL COST = \$8.16 /hr
  - LUBRICANT COST = \$0.54 /hr

no difference

  - MAINTENANCE AND REPAIR COST
    = 100% OF DEPRECIATION (\$11.37/hr)
    = \$11.37/hr

TOTAL OPERATING COST

= (FUEL COST) + (LUBRICANT COST) + (MAINTENANCE AND REPAIR COST)

= \$8.16/hr + \$0.54/hr + \$11.37/hr

= \$20.07/hr

OWNING AND OPERATING COST

= (OWNING COST) + (OPERATING COST)

= \$9.76/hr + \$20.07/yr

= \$29.83/hr

$C_{STANDARD}$ = \$33.69 /hr

C_{PSSS} = \$29.83 /hr

STANDARD METHOD MORE CONSERVATIVE