

LABOR AND EQUIPMENT COSTS

Agenda

- **Factors affecting Labor productivity**
- **Elements of labor cost**
- **Calculating labor cost per unit of work**
- **Ownership Cost:**
 - Depreciation
 - Money Cost (Investment)
 - Insurance
 - Applicable Taxes
- **Operating Cost:**
 - Operator's Cost
 - FOG: Fuel, Oil & Lubricants (Grease)
 - Maintenance & Repair Costs
 - Tires Cost

Construction Productivity

Factors Which Affect Production

1. Weather
2. Site Conditions
3. Daylight
4. Training level/Skill
5. Equipment Utilization

Construction Productivity (Cont'd)

Factors Which Effect Production (Cont'd)

6. Contractual Arrangements
7. Labor Morale
8. Labor Availability
9. Labor Culture

Labor Cost: Wages & Benefits

- Labor force is imported.
- Cost to owner is more than laborer salary
- Benefits:
 - Travel Cost
 - Medical Checkup, Visa & Residency (Iqama) cost
 - Housing Cost
 - Insurance:

Working Hours

Days/Yr.	365
Week-ends	52
Vacation	15
Holidays	13
<u>Medical</u>	<u>10</u>
Total:	275 day X 8 Hrs
	2200 Hr./yr.

Crew Cost/Productivity

- Work is normally done by a group of workers (Crew or Gang)
- The mix of Skilled/Common labor is contractor dependent
- Crew size is limited by space constraints
- Each trade has a Foreman & General Foreman
- Labor Cost = Crew Cost + Shared Foreman Cost

$$\text{Unit Cost} = \frac{\text{Crew Cost (\$/Time)}}{\text{Crew Productivity (Unit/Time)}}$$

$$\text{Activity Duration} = \frac{\text{Quantity (Units)}}{\text{Crew Productivity}}$$

Example: Which Worker is cheaper?

	Worker A	Worker B
Basic Wage	1200 SAR/Mo.	1800 SAR/Mo.
Contract Period	1 Yr	2 yr.
Transportation	2500 SAR/contract	3500 SAR/contract
Vacation	15 day/contract	30 day/contract
Room & Board	200 SAR/Mo.	250 SAR/Mo.
Holidays	10 day/yr	14 day/yr
Working Hours	8 hr/day	10 hr/day
O.T.	150%	200%

Equipment Cost

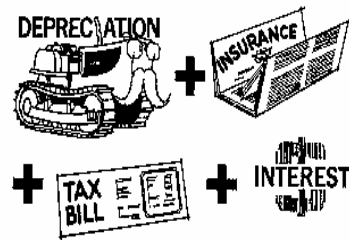
- The money a company spends for equipment is an investment which must be recovered as the machine is utilized on projects
- It consists of:
 - Ownership Cost, and
 - Operating Cost

Equipment Cost (Cont'd)

- **Ownership Cost:**
 - Cost of EQP (less consumables) over life of EQP
 - Money Cost (Investment)
 - Insurance
 - Applicable Taxes
- **Operating Cost:**
 - Operator's Cost
 - Tires Cost
 - Maintenance & Repair Costs
 - FOG: Fuel, Oil & Lubricants (Grease)

I. OWNERSHIP COST

- Regardless of how much a machine is used, the owner must pay owning cost
- Depreciation (Purchase expense)
- Investment
- Insurance
- Applicable Tax



Ownership Cost: (1) Depreciation Costs

- Straight-line method
- Declining-balance method
- Accelerated Cost Recovery System (ACRS)

Straight-line depreciation

- When the cost of depreciation is determined by this method, it is assumed that a unit of equipment will decrease in value from its original total cost at a [uniform rate](#).
- **Example** (For P=12,000; SV=2,000; and n=5 years)
Total depreciation, $\$12,000 - \$2,000 = \$10,000$
Annual cost of depreciation, $\$10,000 \div 5 = \$2,000$
Hourly cost of depreciation, $\$2,000 \div 2,000 = \1.00

Declining-balance method:

- Under this method of determining the cost of depreciation, the estimated life of the equipment in years will give the average percent of depreciation per year.
- This percent is doubled for the 200 percent declining- balance method.
- [The value of the depreciation during any given year](#) is determined by multiplying the resulting percent by the value of the equipment at the beginning of that year (BV).
- The depreciated value is not permitted to drop below a reasonable salvage value.

Example (DDB)

Total cost, \$10,000	
Estimated salvage value, \$1,000	
Estimated life, 5 years	
Average rate of depreciation, 20% per year	
Double this rate of depreciation, 2 X 20	= 40%
Cost of depreciation, first year, 0.40 x \$10,000	= \$4,000.00
Book value at the start of the second year	= 6,000.00
Cost of depreciation, second year, 0.40 X \$6,000	= 2,400.00

[See Table 11-2](#)

Modified Accelerated Cost Recovery System (MACRS)

- See Table 11.4

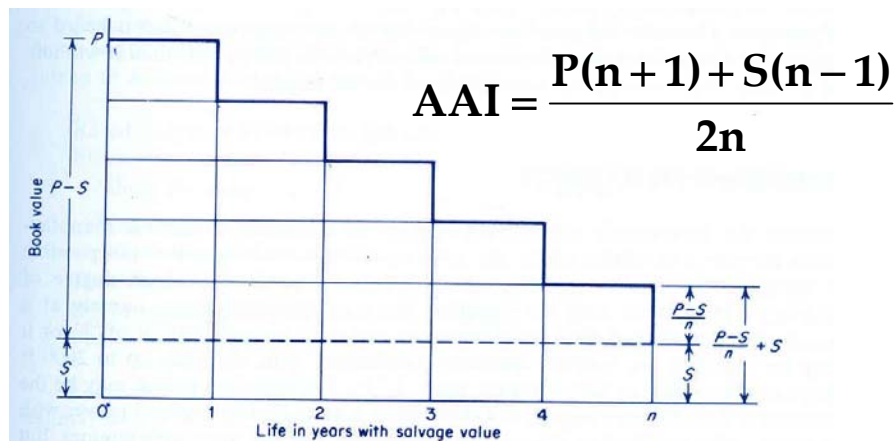
Ownership Cost: (2) Investment Costs

- These costs, which are frequently classified as investment costs, include interest on the money invested, taxes of all types which are assessed against the equipment, insurance, and storage.
- The rates for these items will vary somewhat among different owners, with location, and for other reasons.
- Even though the owner pays cash for the equipment, he should charge interest on the investment, as the money spent for the equipment could be invested in some other asset which would return interest to the owner.

Ownership Cost: Investment Costs (Cont'd)

- Some equipment owners charge a fixed rate of interest against the full purchase cost of the equipment each year it is owned. This method gives an annual interest cost which is higher than it should be.
- The average annual cost of interest should be based on the average value of the equipment during its useful life. This value may be obtained by establishing a schedule of values for the beginning of each year that the equipment will be used.

Ownership Cost: Calculation of Average Cost of Equipment per year



Ownership Cost: Calculation of Average Cost of Equipment per year

P = \$440,000

S = \$60,000

n = 5 years

$$AAI = \frac{\$440,000(5+1) + \$60,000(5-1)}{2 \times 5}$$

**Ownership Cost:
Calculation of Average
Cost of Equipment per year**

$$\text{AAI} = \frac{\$440,000(6) + \$60,000(4)}{10}$$

$$\text{AAI} = \$288,000/\text{yr}$$

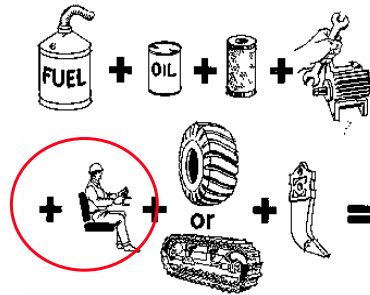
Investment Cost/hour

◆ If Number of hours per year = 2,000

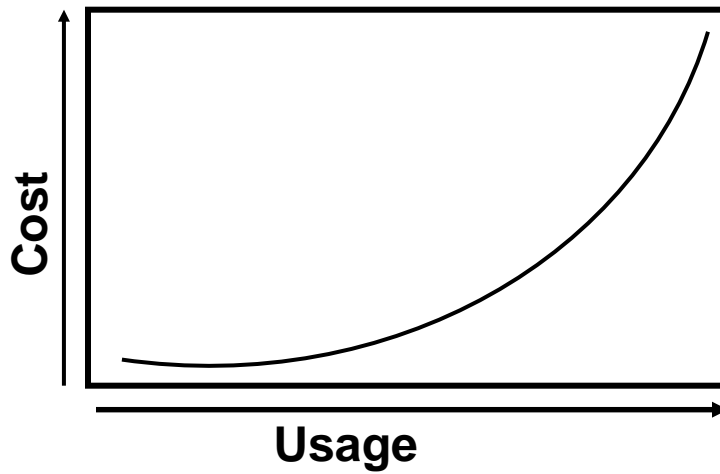
$$\frac{\$288,000 / \text{yr} \times 10\%}{2,000 \text{ hr} / \text{yr}} =$$
$$\underline{\underline{\$14.40 / \text{hour}}}$$

Operating Cost

- Consumables - fuel, oil, grease
- Maintenance & Repair
- Tires or tracks
- Operator Cost



Operating Cost



Fuel Consumed

- Gasoline engine Consumes approximately **0.06 gal (0.23 liter)** of fuel per flywheel horsepower hour.
- Diesel engine Consumes approximately **0.04 gal (0.15 liter)** of fuel per flywheel horsepower hour

Lubrication Oil

$$q = \frac{hp \times f \times 0.006 \text{ lb per hp-hr}}{7.4 \text{ lb per gal}} + \frac{c}{t}$$

$$q = \frac{hp \times f \times 0.0027 \text{ kg per hp-hr}}{0.89 \text{ kg per lit}} + \frac{c}{t}$$

q = Quantity Consumed, gal per hr, or liter per hr.

hp = Rated horsepower of engine

c = Capacity of crankcase, gal, or liter

f = Operating factor

t = Number of hours between changes

Maintenance And Repairs

- The cost of maintenance and repairs will vary considerably with the type of equipment, the service to which it is assigned, and the care which it receives.
- The annual cost of maintenance and repairs may be expressed as a percent of the annual cost of depreciation or it may be expressed independently of depreciation.
- In any event, it should be sufficient to cover the cost of keeping the equipment operating.
- The annual cost of maintenance and repairs for a power shovel may vary from 80 to 120 percent of the annual cost of depreciation, with 100 percent a fair average value.

Example

Objectives

- To achieve knowledge LOL about how to calculate labor cost.
- Achieve Knowledge LOL for elements of Equipment cost.
- Demonstrate Knowledge LOL for elements of Equipment cost.

Questions

Straight-line depreciation

$$\text{Straight Line, SL} = \frac{\text{Depreciable Value} *}{n}$$

* Depreciable Value = Purchase Price – Tires – Salvage Value



Declining-balance method:

$$\text{Double Declining Balance, DDB} = \frac{2BV}{n}$$



- P = Purchase Price
- T = Tires Cost
- S = Salvage Value
- $BV_1 = P - T$ (@ 1st yr. start - same for all methods)

