The money a company ***spends*** for equipment is an ***investment*** which must be recovered as the machine is utilized on projects.
Ownership Cost
- Ownership cost accrue whether or not the equipment is used
  - Capital cost (purchase price)
  - Salvage value
  - Depreciation tax shield
  - Overhead expenses

Under the tax system of U.S., an owner can reduce the company’s tax burden and thereby lessen net machine cost by depreciating a machine’s loss in value with age.
**Depreciation** is used to recover capital expenses for most tangible business assets.

**Tangible property** is property that can be felt or touched. Its physical features are what make it useful to you - a machine.

**Basis** is a way of measuring your investment in an asset for tax purposes.
Ownership cost or cost basis includes amounts paid for:

- Purchase
- Sales tax on purchase
- Freight
- Installation and testing

**Like-kind Exchange**

- You **exchange** a machine having a book value of $50,000 for a new machine having a fair market value of $80,000.
- The basis of the new machine is $50,000.
- This is the basis (value) for tax depreciation purposes.
COST BASIS
Property Plus Cash

• If you **trade** a machine and pay money, the basis of the machine you receive is the basis of the machine you traded increased by the money paid.

COST BASIS
Property Plus Cash

• If you **trade** a machine and pay money:

• Basis (new) machine =

  basis old machine + money paid + $
COST BASIS
Sale and Purchase

• If you sell a machine as a separate transaction you would pay tax on the cash received which is greater than the basis (book value).

• If you sell a machine as a separate transaction and the amount received is less than the basis (book value), it is your lost.
CHAPTER 3c. EQUIPMENT COST

COST BASIS

Sale and Purchase

• If your sale of the old machine and purchase of the new are dependent on each other, the transactions are considered an exchange.

COST BASIS

Repairs

• If a repair increases the value of your machine, makes it more useful, or lengthens its life, the repair cost must be capitalized and depreciated.
**COST BASIS**

**Repairs**

- The *repair cost* must be capitalized and depreciated.
- You increase the basis of the machine by the cost of the repair.

---

**DEPRECIATION TAX SHIELD**

- The tax saving from depreciation is influenced by
  - the disposal method
  - the value received for the old machine
  - the initial value of the new machine
  - class life
  - the tax depreciation method
For situation where there is no gain on the exchange:

\[
\text{Total tax shield} = \sum_{n=1}^{N} t_c D_n \quad (4)
\]

Where

- \( N \) = individual yearly time periods within a life assumption of \( N \) years
- \( t_c \) = corporate tax rate
- \( D_n \) = annual depreciation amount in the \( n \)th time period

For situation where a gain results from exchange:

a. like-kind exchange, Eq. 4 is applicable.

b. Third-party sale:

\[
\text{Total tax shield} = \sum_{n=1}^{N} t_c D_n - \text{gain} \times t_c \quad (5)
\]

Gain is the actual salvage amount received at the time of disposal minus the book value.
**DEPRECIATION TAX METHOD**

- The Modified Accelerated Cost Recovery System (MACRS) is the US tax code depreciation rule. It applies to all tangible property placed in service after 1986.

---

**Property Classes**

- Property classes & Recovery periods
  - 5 year property - automobiles and trucks
  - 7 year property - any property that does not have a class life
CHAPTER 3c. EQUIPMENT COST

DEPRECIATION METHOD

- 200% declining balance or straight line method for 3, 5, 7, and 10 year property
- 150% declining balance method or straight line method for 15, and 20 year property

DEPRECIATION RATES

Table 1 (Table 3.1 Text)

<table>
<thead>
<tr>
<th>Year of life</th>
<th>3-yr property</th>
<th>5-yr property</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.33</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>0.45</td>
<td>0.32</td>
</tr>
<tr>
<td>3</td>
<td>0.22</td>
<td>0.24</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.16</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.08</td>
</tr>
</tbody>
</table>

Cars and light-duty trucks are classified as 3-yr property. Most other pieces of construction equipment are 5-yr.
Example 8

A 5-yr life class machine is purchased for $125,000. It is sold in the third year after purchase for $91,000. What are the depreciation amounts and what is the book value of the machine when it is sold? Will there be income tax, if so in what amount?

Example 8 (cont’d)

Using tax rates of Table 1:

$125,000 \times 0.20 = $25,000 \text{ depreciation at end of first year}

$125,000 \times 0.32 = $40,000 \text{ depreciation at end of second year}

$65,000

Value when sold = $125,000 - $65,000 = $60,000

Amount of gain (There will tax) = $91,000 - $60,000 = $31,000
Example 9

A company having a cost of capital rate of 8% purchases a $300,000 tractor. This machine has an expected service life of 4 years and will be used 2,500 hr per year. The tires on this machine cost $45,000. The estimated salvage value at the end of 4 years is $50,000. Calculate the hourly tax saving resulting from depreciation. Assume that the machine is a 5-yr type property and that there had been no gain on the exchange that procured the machine. The company’s tax rate is 37% under the tax code.

First calculate the annual depreciation amounts for each of the years. In this case, the tax code depreciation rate must be used to calculate depreciation:
Example 9 (cont’d)

- Annual Depreciation amounts of all for each of the years

<table>
<thead>
<tr>
<th>Year</th>
<th>5-yr property rates</th>
<th>$BV_{n-1}$</th>
<th>$D_n$</th>
<th>$BV_n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$0$</td>
<td>$0$</td>
<td>$0$</td>
<td>$300,000$</td>
</tr>
<tr>
<td>1</td>
<td>0.20</td>
<td>3000,000</td>
<td>60,000</td>
<td>240,000</td>
</tr>
<tr>
<td>2</td>
<td>0.32</td>
<td>240,000</td>
<td>96,000</td>
<td>144,000</td>
</tr>
<tr>
<td>3</td>
<td>0.24</td>
<td>144,000</td>
<td>72,000</td>
<td>72,000</td>
</tr>
<tr>
<td>4</td>
<td>0.16</td>
<td>72,000</td>
<td>48,000</td>
<td>24,000</td>
</tr>
<tr>
<td>5</td>
<td>0.08</td>
<td>24,000</td>
<td>24,000</td>
<td>0</td>
</tr>
</tbody>
</table>

Using Eq. 4, the tax shielding effect for the machine’s service life would be

- Using Eq. 4, the tax shielding effect for the machine’s service life would be

<table>
<thead>
<tr>
<th>Year</th>
<th>$D_n$</th>
<th>Shielded amount*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$60,000$</td>
<td>$22,200$</td>
</tr>
<tr>
<td>2</td>
<td>96,000</td>
<td>35,520</td>
</tr>
<tr>
<td>3</td>
<td>72,000</td>
<td>26,640</td>
</tr>
<tr>
<td>4</td>
<td>48,000</td>
<td>17,760</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$102,120$</td>
</tr>
</tbody>
</table>

* $D_n \times 37\%$

Tax saving from depreciation = \(\frac{102,120}{4 \text{yr}(2,500 \text{ hr/yr})} = 10.21/\text{hr}\)
This exercise illustrates how to calculate the a machine cost using the methods and approaches discussed in this chapter.

Determine the probable cost per hour of owning and operating a scraper given the following conditions:
- Engine 350HP diesel
- Overall cost of money 10%
PRACTICAL EXERCISE

- Useful life 5 years
- Hours used per year 2000
- Initial cost $470,000
- Cost of tires $30,000
- Estimated salvage value $60,000

PE-COST OF MONEY
(INTEREST RATE)

Sources of capital funds:
- Borrow
- Earnings
- Equity
PE - Ownership Cost

Time Value Method

- Deduct tire cost from the delivered price for large machines.
- Tires are considered a wear item and are treated as an operating cost.

---

Initial cost $470,000
Cost of tires $30,000

$440,000

Need to calculate the uniform series required to replace a present value of $440,000

*Uniform series capital recovery factor*
PE - Ownership Cost
Time Value Method

- Overall cost of money 10%
- Time 5 years
- **Uniform series capital recovery factor**

\[ A = P \left[ \frac{i(1+i)^n}{(1+i)^n - 1} \right] \]

**Example:**
- **Overall cost of money 10%**
- **Time 5 years**

\[ A = \$440,000 \left[ \frac{0.10(1+0.10)^5}{(1+.10)^5 - 1} \right] \]

\[ A = \$116,071 \text{ per year} \]
PE - Ownership Cost
Time Value Method

- Estimated salvage value
  $60,000
- Need to calculate the uniform series required to replace an end of period amount of $60,000

*Uniform series sinking fund factor*

||
|---|---|
|**Overall cost of money** | 10% |
|**Time** | 5 years |

*Uniform series sinking fund factor*

\[
A = F \left[ \frac{i}{(1+i)^n - 1} \right]
\]
**PE - Ownership Cost**

**Time Value Method**

- Overall cost of money 10%
- Time 5 years

\[
A = \frac{0.10}{(1 + 0.10)^5 - 1} \left[ \frac{60,000}{10.00} \right]
\]

\[
A = \$9,828 \text{ per year}
\]

\[
\frac{116,071 - 9,828}{2,000 \text{ hr / yr}} = \$53.12 / \text{ hour}
\]
PE - Ownership Cost

A\(I\) = \(\frac{P(n + 1) + S(n - 1)}{2n}\)

\(A\(I\)\) = average annual investment method
\(P\) = purchase price
\(S\) = salvage value
\(n\) = life in years

\[A\(I\) = \frac{$440,000(5 + 1) + $60,000(5 - 1)}{2 \times 5}\]

\(P\) = $440,000
\(S\) = $60,000
\(n\) = 5 years
PE - Ownership Cost

AAI

\[
AAl = \frac{\$440,000 \times 6 + \$60,000 \times 4}{10} = \$288,000/yr
\]

Investment Cost

\[
\text{Investment Cost} = \frac{\$288,000/\text{yr} \times 10\%}{2,000 \text{ hr/yr}} = \$14.40/\text{hour}
\]
**PE - Ownership Cost**

**AAI**

- **Depreciation**
  - $470,000
  - $30,000 tires
  - $60,000 salvage
  - **Total Depreciation: $380,000**

- **Hourly Depreciation**
  \[
  \frac{\$380,000}{5 \text{ yr} \times 2,000 \text{ hr / yr}} = \$38.00 / \text{hr}
  \]
CHAPTER 3c.  EQUIPMENT COST

PE - Ownership Cost

◆ Hourly Depreciation

$14.40 + $38.00 = $52.40/hr

PE - OWNERSHIP COST

◆ Comparison

Time Value Method $53.12/hr
Average Annual Investment Method $52.40/hr

Difference between the methods $0.72
PE - OPERATING COST

- Annual cost of repairs equals 70% of straight Line depreciation
- Operating factor, 0.5
- Cost of fuel $1.02 per gal.

- Crankcase capacity, 14 gal
- Time between oil changes, 200 hr
- Cost of lube oil $2.50 per gal
- Cost of other oils and grease $0.45 per hour
CHAPTER 3c. EQUIPMENT COST

PE - OPERATING COST

- Repairs to tires 14% of tire depreciation
- Life of tires 4,000 hours

PE - OPERATING COST

Repair

- Hourly depreciation $38.00
- $38.00 X 70% = $26.60 per hour
**OPERATING COST**

**Fuel**

- Operating factor, 0.5
- Cost of fuel $1.02 per gal

\[ 0.04 \times 350\text{hp} \times 0.5 = 7 \text{ gal/hr} \]

\[ 7 \text{ gal} \times 1.02/\text{gal} = \$7.14/\text{hr} \]

**Oil & Grease**

\[ q_{oc} = \frac{\text{hp} \times f \times 0.006 \text{ lb/hp-hr}}{7.4 \text{ lb/gal}} + \frac{c}{t} \]

- What the engine burns
- Oil changes

\[ q_{oc} = \frac{350\text{hp} \times 0.5 \times 0.006}{7.4} + \frac{14 \text{ gal}}{200 \text{ hr}} \]

\[ q_{oc} = 0.1418919 + 0.070 = 0.212 \text{ gal/hr} \]
**OPERATING COST**

### Oil & Grease

- Cost of lube oil $2.50 per gal
- Cost other oils and grease $0.45/hr

\[
0.212 \text{ gal/hr} \times \$2.50/\text{gal} = \$0.53/\text{hr}
\]

Other oils and grease = $0.45/hr

Total cost O&G = $0.98/hr

---

### Tire Repair

- Tire repairs 14% of tire depreciation
- Life of tires 4,000 hours

\[
\frac{\$30,000}{4,000 \text{ hr}} = \$7.50 \text{ per hour}
\]

\[
\$7.50 \times 14\% = \$1.05 \text{ per hour}
\]
OPERATING COST
Tire Depreciation

How many tire replacements?

- Life of tires 4,000 hours

\[
5 \text{ yr} \times \frac{2,000 \text{ hr}}{\text{yr}} = 2.5 \text{ sets}
\]

Therefore 3 sets

OPERATING COST
Tire Depreciation

First set: (purchased at time 0)

Spread the cost over the life of the machine

- Uniform series capital recovery factor

\[
\$30,000 \times \frac{0.10(1 + 0.10)^5}{(1 + 0.10)^5 - 1} = \$? / \text{hr}
\]

\[
\frac{2,000 \text{ hr}}{}
\]
OPERATING COST

Tire Depreciation

First set: (purchased at time 0)

\[
\frac{\$30,000 \times 0.2637975}{2,000 \text{ hr}} = \$3.96 / \text{hr}
\]

Second set: (purchased at time 2 yr) must first calculate value at time zero.

\[
P = \frac{\$30,000}{(1 + i)^n}
\]

\[
P = \frac{\$30,000}{(1 + 0.10)^2} = \$24,793
\]
OPERATING COST

Tire Depreciation

Second set: (purchased at time 2 yr)

Spread the cost over the live of the machine

--- Uniform series capital recovery factor

\[
\frac{\$24,793 \times 0.2637975}{2,000 \text{ hr}} = \$3.27 / \text{hr}
\]

OPERATING COST

Tire Depreciation

Third set: (purchased at time 4 yr)

must first calculate value at time zero.

\[
P = \frac{\$30,000}{(1 + i)^n}
\]

\[
P = \frac{\$30,000}{(1 + 0.10)^4} = \$20,490
\]
**OPERATING COST**

**Tire Depreciation**

Third set: (purchased at time 4 yr)
Spread the cost over the live of the **machine**

--- Uniform series capital recovery factor

\[
\frac{\$20,490 \times 0.2637975}{2,000 \text{ hr}} = \$2.70 / \text{hr}
\]

---

**OPERATING COST**

**Tire Depreciation**

- First set: $3.96/hr
- Second set: $3.27/hr
- Third set: $2.70/hr

Total Tire Dep. $9.93/hr
PE Operating Cost

- Repair $26.60/hr
- Fuel 7.14
- Lube Oils 0.98
- Tire repair 1.05
- Tire dep. 9.93
- Total Oper $45.70/hr

PE – SCRAPER COST

- Total Scraper Cost

COST = Ownership Cost + Operating Cost

Scraper Cost = $53.12/hr + $45.70/hr = $98.82/hr