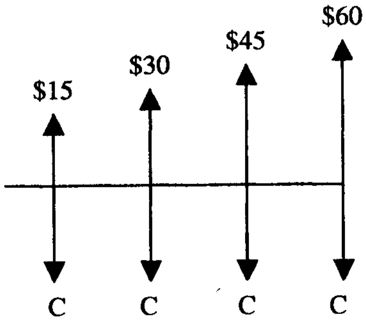
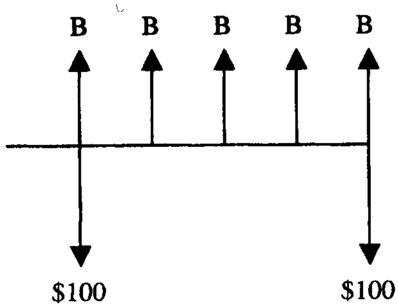
Chapter 6: *Annual Cash Flow Analysis*

6-1



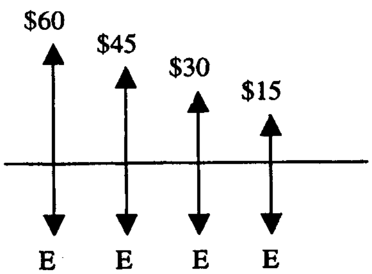
C = \$15 + \$15 (A/G, 10%, 4)
= \$15 + \$15 (1.381) = <u>\$35.72</u>

6-2



B = [\$100 + \$100 (F/P, 15%, 4)] (A/F, 15%, 5)
= [\$100 + \$100 (1.749)] (0.1483) = <u>\$40.77</u>

6-3



E = \$60 - \$15 (A/G, 12%, 4)
= \$60 - \$15 (1.359) = <u>\$39.62</u>

6-32

	Around the Lake	Under the Lake
First Cost	$75,000	$125,000
Maintenance	$3,000/yr	$2,000/yr
Annual Power Loss	$7,500/yr	$2,500/yr
Property Taxes	$1,500/yr	$2,500/yr
Salvage Value	$45,000	$25,000
Useful Life	15 years	15 years

Around the Lake

EUAC = $75,000 (A/P, 7%, 15) + $12,000 - $45,000 (A/F, 7%, 15)
= $75,000 (0.1098) + $12,000 - $45,000 (0.0398)
= $18,444

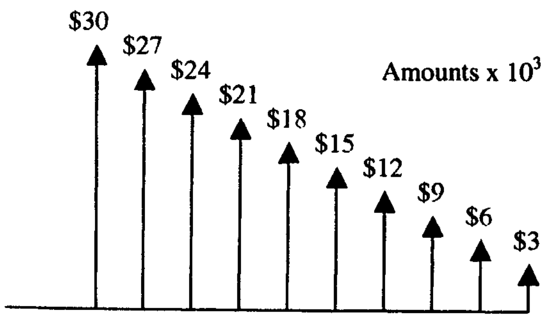
Under the Lake

EUAC = $125,000 (A/P, 7%, 15) + $7,000 - $25,000 (A/F, 7%, 15)
= $125,000 (0.1098) + $7,000 - $25,000 (0.0398)
= $19,730

Go around the lake.

6-33

Engineering Department Estimate



EUAC = $30,000 - $3,000 (A/G, 8%, 10)
= $30,000 - $3,000 (3.871)
= $18,387

Hyro-clean's offer of $15,000/yr is less costly.

Alternative A
EUAB – EUAC = \$845 - \$3,000 (0.30672) = -\$75.16

Alternative B
EUAB – EUAC = \$1,400 - \$5,000 (0.30672) = -\$133.60

To maximize (EUAB – EUAC) choose alternative A, (less negative value).

6-37

Machine X
EUAC = \$5,000 (A/P, 8%, 5)
= \$5,000 (0.2505)
= \$1,252

Machine Y
EUAC = (\$8,000 - \$2,000) (A/P, 8%, 12) + \$2,000 (0.08) + \$150
= \$1,106

Select Machine Y.

6-38

Annual Cost of Diesel Fuel = [\$50,000km/(35 km/l)] x \$0.48/l = \$685.71
Annual Cost of Gasoline = [\$50,000km/(28 km/l)] x \$0.51/l = \$910.71

$EUAC_{diesel}$ = (\$13,000 - \$2,000) (A/P, 6%, 4) + \$2,000 (0.06)
+ \$685.71 fuel + \$300 repairs + \$500 insurance
= \$11,000 (0.2886) + \$120 + \$1,485.71
= \$4,780.31

$EUAC_{gasoline}$ = (\$12,000 - \$3,000) (A/P, 6%, 3) + \$3,000 (0.06)
+ \$910.71 fuel + \$200 repairs + \$500 insurance
= \$5,157.61

The diesel taxi is more economical.

6-39

Machine A
EUAC = \$1,000 + P_i
= \$1,000 + \$10,000 (A/P, 10%, 4) - \$10,000 (A/F, 10%, 4)
= \$1,000 + \$1,000
= \$2,000

6-42

Seven year analysis period:

Alternative A

EUAB – EUAC $= \$55 – [\$100 + \$100 (P/F, 10\%, 3) + \$100 (P/F, 10\%, 6)] (A/P, 10\%, 7)$
$= \$55 – [\$100 + \$100 (0.7513) + \$100 (0.5645)] (0.2054)$
$= +\$7.43$

Alternative B

EUAB – EUAC $= \$61 – [\$150 + \$150 (P/F, 10\%, 4)] (A/P, 10\%, 7)$
$= \$61 – [\$150 + \$150 (0.683)] (0.2054)$
$= \underline{+\$9.15}$

Choose B.

Note: The analysis period is seven years, hence one cannot compare three years of A vs. four years of B, If one does, the problem is constructed so he will get the wrong answer.

6-43

$EUAC_{gas} = (P – S) (A/P, i\%, n) + SL + \text{Annual Costs}$
$= (\$2,400 - \$300) (A/P, 10\%, 5) + \$300 (0.10) + \$1,200 + \$300$
$= \$2,100 (0.2638) + \$30 + \$1,500$
$= \$2,084$

$EUAC_{electr} = (\$6,000 - \$600) (A/P, 10\%, 10) + \$600 (0.10) + \$750 + \$50$
$= \$5,400 (0.1627) + \$60 + \$800$
$= \$1,739$

Select the electric motor.

6-44

EUAC Comparison

Gravity Plan

Initial Investment: $= \$2.8$ million $(A/P, 10\%, 40)$ $= \$2.8$ million (0.1023)	$= \$286,400$
Annual Operation and maintenance	$= \$10,000$
Annual Cost	$= \$296,400$

Pumping Plan

Initial Investment: = \$1.4 million (A/P, 10%, 20)
= \$1.4 million (0.1023) = \$143,200

Additional investment in 10th year:
= \$200,000 (P/F, 10%, 10) (A/P, 10%, 40)
= \$200,000 (0.3855) (0.1023) = \$7,890

Annual Operation and maintenance = \$25,000

Power Cost: = \$50,000 for 40 years = \$50,000

Additional Power Cost in last 30 years:
= \$50,000 (F/A, 10%, 30) (A/F, 10%, 40)
= \$50,000 (164.494) (0.00226) = \$18,590

Annual Cost = \$244,680

Select the Pumping Plan.

6-45

Use 20 year analysis period.

Net Present Worth Approach

$$
\begin{aligned}
NPW_{Mas.} &= -\$250 - (\$250 - \$10)\,[(P/F, 6\%, 4) + (P/F, 6\%, 8) + (P/F, 6\%, 12) \\
&\quad + (P/F, 6\%, 16)] + \$10\,(P/F, 6\%, 20) - \$20\,(P/A, 6\%, 20) \\
&= -\$250 - \$240\,[0.7921 + 0.6274 + 0.4970 + 0.3936) \\
&\quad + \$10\,(0.3118) - \$20\,(11.470) \\
&= -\$1{,}031
\end{aligned}
$$

$$
\begin{aligned}
NPW_{BRK} &= -\$1{,}000 - \$10\,(P/A, 6\%, 20) + \$100\,(P/F, 6\%, 20) \\
&= -\$1{,}000 - \$10\,(11.470) + \$100\,(0.3118) \\
&= -\$1{,}083
\end{aligned}
$$

Choose Masonite to save \$52 on Present Worth of Cost.

Equivalent Uniform Annual Cost Approach

$$
\begin{aligned}
EUAC_{Mas.} &= \$20 + \$250\,(A/P, 6\%, 4) - \$10\,(A/F, 6\%, 4) \\
&= \$20 + \$250\,(0.2886) - \$10\,(0.2286) \\
&= \$90 \\
EUAC_{BRK} &= \$10 + \$1{,}000\,(A/P, 6\%, 20) - \$100\,(A/F, 6\%, 20) \\
&= \$10 + \$1{,}000\,(0.872) - \$100\,(0.0272) \\
&= \$94
\end{aligned}
$$

Choose Masonate to save \$4 per year.