



LIFE CYCLE COSTING

Economic Evaluation of Facilities (Life Cycle Costing)

By

Dr. Abdul Mohsen Al-Hammad,

College of Environmental Design,
King Fahd University of Petroleum & Minerals,
Dhahran, Saudi Arabia



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- **The Concept of the Time Value of Money**
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INTRODUCTION 1/3

- In the past, economic assessment of alternative designs, constructions, or other investments has been based on initial (first) cost which ignores the total cost incurred for the investment throughout its lifetime.
- The concept of life cycle costing provides an economic tool which takes into account total costs for an investment during its life span.



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INTRODUCTION 2/3

- The life cycle costing can be defined as follows:
an economic assessment of alternatives designs, construction, or other investment considering all significant costs of initial costs and ownership costs over economic life of each alternative, expressed in equivalent economic units.



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INTRODUCTION 3/3

- O The life cycle costing analysis can not be carried out without considering the followings:
 - A - Total Costs
 - B - The concept of the time value of money



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TOTAL COSTS 1/2

- A - Total Costs
 - Initial costs
 - Owner costs
- O Initial costs. They include the followings:
 - initial construction costs
 - design costs
 - land costs
 - finance costs



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TOTAL COSTS 2/2

- O Owner costs. They include the followings:
 - Operating costs
 - o maintenance costs
 - o utility bills
 - o staffing fee
 - Replacement costs
 - o cost of replacement the project after it runs its economic life.



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THE CONCEPT OF THE TIME VALUE OF MONEY 1/2

- B - The concept of the time value of money
 - o The value of money today is not equal to the same amount of money in the past or in the future.
 - o The concept of the time value of money considered the following:
 - initial costs (P) (present value)
 - discount or interest rate (i%)
 - life time of an investment (n)



THE CONCEPT OF THE TIME VALUE OF MONEY 2/2

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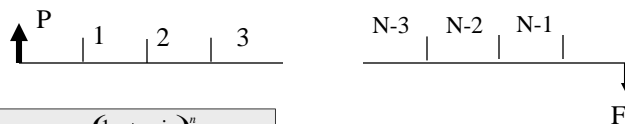
- o To make an equivalent value of money for an assessment along its economic life, many methods can be used such as:
 1. Present worth method
 2. Uniform annual method



1. Present Worth Method

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- In this case, all costs or savings (cash flows) which occur during the life time of an investment are discounted to the present value of money.



$$(a) F = p(1 + i)^n, \text{ or}$$

$$p = F \frac{1}{(1 + i)^n}$$

- (b) Alternative method, instead of using the above formula, use of interest tables with the following notations.

- (F/P, I %, n) → find F given P, or
 (P/F, I %, n) → find P given F.



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2. Uniform Annual Worth Method 1/2

- In this case, all costs or savings (cash flows) which occur during the life time of an investment are discounted to a uniform annual series of cash flows over the life time of the investment.



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



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2. Uniform Annual Worth Method 2/2

- (b) Alternative method, instead of using the above formula, use of interest tables with the following notations.

(P/A, i %, n) \longrightarrow find P given A

(A/P, i % n) \longrightarrow find A given P

(F/A, i % n) \longrightarrow find F given A

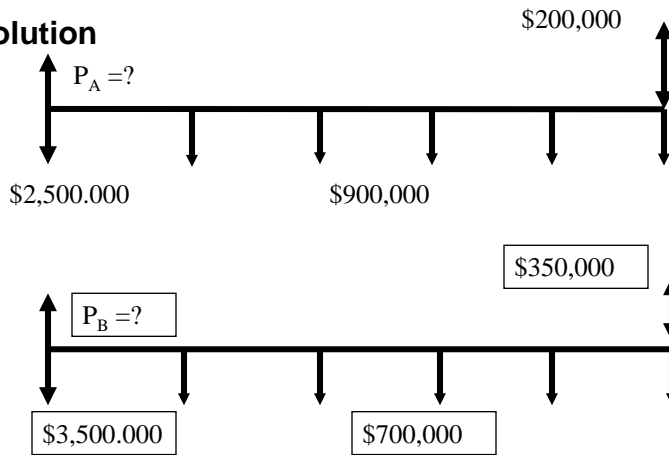
(A/F, i % n) \longrightarrow find A given F

- ❖ Sample tables of interest rates of $i = 8\%, 10\%, 12\%$ are given in Appendix A.



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Solution



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Life Cycle Costing Examples 4/10

$$P_A = \$2,500,000 + 900,000 (P/A, 10\%, 5) - 200,000 (P/F, 10\%, 5)$$

$$= \$5,788,000$$

$$P_B = \$3,500,000 + 700,000 (P/A, 10\%, 5) - 350,000 (P/F, 10\%, 5)$$

$$= \$5,936,000$$

Type A should be selected since $P_A < P_B$

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B- Present-worth Comparison of Different Live-alternatives

- ❖ The previous procedure for equal lived can be used except the alternatives must be compared over the same number of years.
- ❖ That is, the cash flow for one “cycle” of an alternative must be duplicated for the least common multiple of years, so that service is compared over the total life for each alternative.



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2- Using Uniform annual Worth Method

- ❖ The major advantage of this method is that it is not necessary to make the comparison over the same number of years when the alternatives have different lives.
- ❖ The reasons for that, this method is an equivalent annual cost over the life of the project.



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An Illustrated Example:

	Project A	Project B
First Cost	\$26,000,000	\$36,000,000
Annual Maintenance Cost	\$800,000	\$300,000
Annual Labor Cost	\$11,000,000	\$7,000,000
Extra Income Taxes	---	\$2,600,000
Salvage Value	\$2,000,000	\$3,000,000
Life, Years	6	10

If the minimum required rate of return is 15% , which project should be selected ?

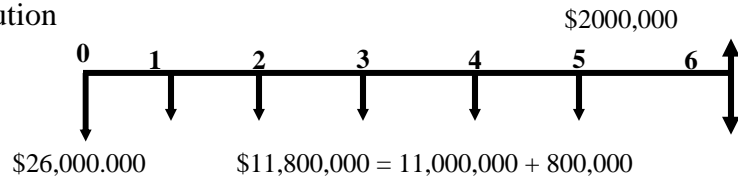
Using Uniform Annual Worth Method

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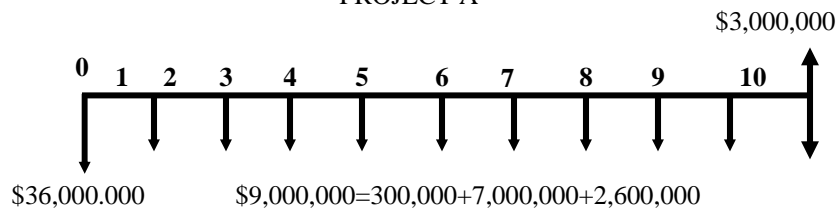


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Solution



PROJECT A



PROJECT B

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