Replacement analysis using economic life

- Three years ago a chemical processing plant installed a system at a cost of $ 20,000 to remove pollutants from waste water that is discharged into a nearby river. The present system has **no present salvage value** and will cost **$14500 to operate next year**, with the operating cost expected **to increase at the rate of $500 per year** thereafter.
- A new system has been designed **to replace** the existing system **at a cost of $10000**. The new system is expected to have **first year operating of $9000** with these costs **increasing at the rate of $1000 per year.** The new system is estimated to have a useful life of 12years. The salvage values of **both** the **system at any future time** are expected to **be zero**. If the interest rate is 12% conduct replacement analysis based on the economic life of the asset.

SOLUTION

The equation for finding the total equivalent annual cost (EUAC) for the existing system can be written as,

EUAC= CR (i) + Equivalent Annual Operating Costs (Eq. AOC)

Since the present system has no salvage value at present or in future, P=F=0

Therefore, EUAC= 14500 + 500 (A/G, i, n)

For n=1,

EUAC= 14500 + 500 (A/G, i, n) → EUAC= 14500 + 500 (A/G, 12, 1)

=14500/- $/yr

For n=2,

EUAC= 14500 + 500 (A/G, i, n) → EUAC= 14500 + 500 (A/G, 12, 2)

=14736/- $/yr

For n=3,

EUAC= 14500 + 500 (A/G, i, n) → EUAC= 14500 + 500 (A/G, 12, 3)

=14962/- $/yr

- It can be seen that since the present system has no present and future salvage value its equivalent annual costs consists of only Eq. AOC.
- Hence the EUAC will increasing every year.
- Therefore the economic life of this is ONE year with EUAC = 14500

The equation for finding the total equivalent annual cost (EUAC) for the new system can be written as,

EUAC= CR (i) + Equivalent Annual Operating Costs (Eq. AOC)

Therefore, EUAC= (P-F) (A/P, i, n) + Fi + 9000 + 1000 (A/G, i, n)

P= 10,000; F= 0; i= 12%

For n=1,

EUAC= 10,000 (A/P, 12, 1) +9000 + 1000 (A/G, 12, 1)

=20,200/- $/yr

For n=2,

EUAC= 10,000 (A/P, 12, 2) +9000 + 1000 (A/G, 12, 2)

=15,389/- $/yr

For n=3,

EUAC= 10,000 (A/P, 12, 3) +9000 + 1000 (A/G, 12, 3)

=14,089/- $/yr

For n=4,

EUAC= 10,000 (A/P, 12, 4) +9000 + 1000 (A/G, 12, 4)

=13,651/- $/yr

For n=5,

EUAC= 10,000 (A/P, 12, 5) +9000 + 1000 (A/G, 12, 5)

=13,549/- $/yr

For n=6,

EUAC= 10,000 (A/P, 12, 6) +9000 + 1000 (A/G, 12, 6)

=13,604/- $/yr

For n=7,

EUAC= 10,000 (A/P, 12, 7) +9000 + 1000 (A/G, 12, 7)

=13,742/- $/yr

The economic life of the new system is FIVE years with EUAC = 13549

The Results can be tabulated as follows

	Present System	New system
Economic Life	n=1	n= 5
EUAC	14500	13549

Conclusion: From the economic life and EUAC the existing system should be replaced by new system