<u>**Equivalent – Uniform Annual Worth**</u>
<u>**Evaluation**</u>

      The AW method is commonly used for comparing alternatives. The Aw means that all incomes and disbursements (irregular and uniform) are converted into an equivalent uniform annual (end of period/amount, which is the same each period. The major advantage of this method overall the other methods is that it does not require making the comparison over the least common multiple (LCM) of years when the alternatives have different lives. That is the AW value of the alternative is calculated for one life cycle only.

Ex: $I = 22\%$

Find the Aw for one life cycle (i.e. 3 years):
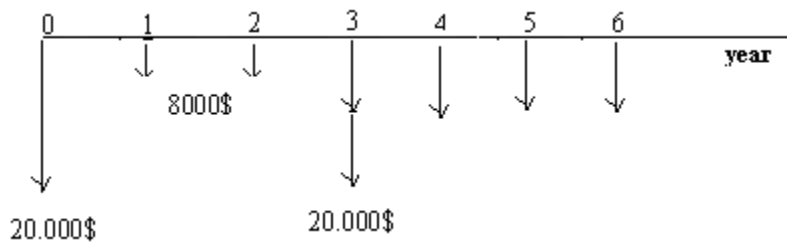
For one life cycle

$AW = -20.000\ (A/P, 22\%, 3) - 8000 = -17.793\$$
The AW for two life cycles is calculated as
$AW = -20.000\ (A/P, 22\%, 6) - (20.000)\ (P/F, 22\%, 3)\ (A/P, 22\%, 6) - 8000 = -17,793\$$

The AW value for the first life cycle is exactly the same as that for two life cycles.

      This same AW will be obtained when three, four, or any other number of life cycles are evaluated. Thus, the AW for one life cycle of an alternative represents the equivalent uniform annual worth of that alternative every time the cycle is repeated.

      AW by the salvage sinking – fund method:
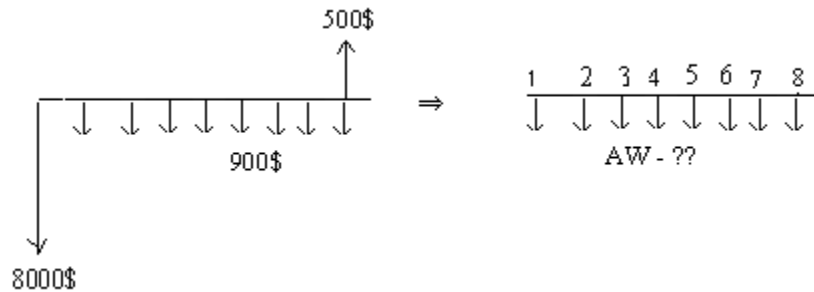$AW = -P\ (A/P, i, n) + SV\ (A/F, i, n)$

Ex:
Calculate the AW of a machine that has an initial cost of 8000$ and a salvage value of 500$ after 8 years. Annual operating costs for the machine are estimated to be 900$ and an interest rate of 20% per year is applicable.

Solution:
The cash-flow diagram indicates that

$$AW = A_1 + A_2$$

Where A_1 – annual cost of initial investment with salvage value considered.
$$= -8000 \, (A/P, 20\%, 8) + 500 \, (A/F, 10\%, 8) = -2055\$$$
$$A_2\text{-annual operating cost} = -900\$$$

The annual worth for the attachment is

$$AW = -2055\text{-}900 = -2955\$$$

AW by the salvage present-worth method:
$$AW = [-P+SV \, (P/F, i, n)] \, [A/P, i, n]$$

Ex:
Compute the AW in above ex. Using the salvage present worth method

$$AW = [-8000 + 500 \, (P/F, 20\%, 8)] \, [A/P, 20\%, 8] - 900 = -2955\$$$

AW by the capital – recovery plus interest method:

$$AW = - (P\text{-}SV) \, (A/P, i, n) - SV \, (i)$$

Ex:
Above ex.
$$AW = -(8000\text{-}500) \, (A/P, 20\%) - 500 \, (0.2) - 900 = -2955\$$$

The steps to be followed for this method are as follows:
1- Reduce the initial cost by the amount of the salvage value.

2- Annualize the value in step 1 using the A/P factor.
3- Multiply the savage value by the interest rate.
4- Combine the values obtained in steps 2 and 3.
5- Combine any uniform annual amounts.
6- Convert all other cash flows into equivalent uniform amounts and combine them with the value from step 5.

Comparing Alternatives by Annual worth:

Ex.

	Machine A	Machine B
First cost, $	26.000	36000
Annual maintenance cost $	800	300
Annual Labor cost $	11.000	7.000
Extra annual income taxes $	-	2600
Salvage value, $	2000	3000
Life, years	6	10

AW_A = -26.000 (A/P, 15%, 6) + 2000 (A/F, 152.6)-
    -11800 = -18442$

AW_B = 36.000 (A/P, 15%, 10) + 3000 (A/F, 15%, 10) − 99005 = -16925$

Select machine B, since the AW of costs is smaller.

AW of a permanent investment:
    This section discusses the annual-worth equivalent of the capitalized cost.
    $A = Pi$