MODULE – 4

DEPRECIATION

Any equipment which is purchased today will not work for ever. This may be due to wear and tear of the equipment or obsolescence of technology. Hence, it is to be replaced at the proper time for continuance of any business. The replacement of the equipment at the end of its life involves money. This must be internally generated from the earnings of the equipment. The recovery of money from the earnings of an equipment for its replacement purpose is called *depreciation fund* since we make an assumption that the value of the equipment decreases with the passage of time. Thus, the word "depreciation" means *decrease* in value of any physical asset with the passage of time.

METHODS OF DEPRECIATION

There are several methods of accounting depreciation fund. These are as
follows:

1. Straight line method of depreciation
2. Declining balance method of depreciation
3. Sum of the years—digits method of depreciation
4. Sinking-fund method of depreciation
5. Service output method of depreciation

These are now discussed in detail.

9.2.1 Straight Line Method of Depreciation

In this method of depreciation, a fixed sum is charged as the depreciation amount throughout the lifetime of an asset such that the accumulated sum at the end of the life of the asset is exactly equal to the purchase value of the asset. Here, we make an important assumption that inflation is absent.

Let

P = first cost of the asset, F = salvage value of the asset, n = life of the asset,

B_t = book value of the asset at the end of the period t, D_t = depreciation amount for the period t.

The formulae for depreciation and book value are as follows:

$D_t = (P - F)/n$

$B_t = B_{t-1} - D_t = P - t\_[(P - F)/n]$

EXAMPLE 1: A company has purchased an equipment whose first cost is Rs. 1,00,000 with an estimated life of eight years. The estimated salvage value of the equipment at the end of its lifetime is Rs. 20,000. Determine the depreciation charge and book value at the end of various years using the straight line method of depreciation.

Solution

P = Rs. 1,00,000. F = Rs. 20,000, n = 8 years

$D_t = (P - F)/n$

= (1,00,000 – 20,000)/8 = Rs. 10,000

In this method of depreciation, the value of D_t is the same for all the years. The calculations pertaining to B_t for different values of t are summarized in Table.

End of year (t)	Depreciation (D_t)	Book value ($B_t = B_{t-1} - D_t$)
0		1,00,000
1	10,000	90,000
2	10,000	80,000
3	10,000	70,000
4	10,000	60,000
5	10,000	50,000
6	10,000	40,000
7	10,000	30,000
8	10,000	20,000

If we are interested in computing D_t and B_t for a specific period (t), the formulae can be used. In this approach, it should be noted that the depreciation is the same for all the periods.

Declining Balance Method of Depreciation

In this method of depreciation, a constant percentage of the book value of the previous period of the asset will be charged as the depreciation amount for the current period. This approach is a more realistic approach, since the depreciation charge decreases with the life of the asset which matches with the earning potential of the asset. The book value at the end of the life of the asset may not be exactly equal to the salvage value of the asset. This is a major limitation of this approach.

Let

P = first cost of the asset, F = salvage value of the asset, n = life of the asset, B_t = book value of the asset at the end of the period t, K = a fixed percentage, and D_t = depreciation amount at the end of the period t.

The formulae for depreciation and book value are as follows:

$D_t = K \_ B_{t-1}$

$B_t = B_{t-1} - D_t = B_{t-1} - K \_ B_{t-1} = (1 - K) \_ B_{t-1}$

The formulae for depreciation and book value in terms of P are as follows:

$D_t = K(1 - K)_{t-1} \_ P$

$B_t = (1 - K)_t \_ P$

While availing income-tax exception for the depreciation amount paid in each year, the rate K is limited to at the most $2/n$. If this rate is used, then the corresponding approach is called the *double declining balance method of depreciation.*

EXAMPLE 2: Consider Example 9.1 and demonstrate the calculations of the declining balance method of depreciation by assuming 0.2 for K.

Solution

P = Rs. 1,00,000, F = Rs. 20,000, n = 8 years, K = 0.2

The calculations pertaining to D_t and B_t for different values of t are

$D_t = K \_ B_{t-1}$

$B_t = B_{t-1} - D_t$

End of year (n)	*Depreciation* (D_t)	*Book value* (B_t)
0		1,00,000.00
1	20,000.00	80,000.00
2	16,000.00	64,000.00
3	12,800.00	51,200.00
4	10,240.00	40,960.00
5	8,192.00	32,768.00
6	6,553.60	26,214.40
7	5,242.88	20,971.52
8	4,194.30	16,777.22

Sum-of-the-Years-Digits Method of Depreciation

In this method of depreciation also, it is assumed that the book value of the asset decreases at a decreasing rate. If the asset has a life of eight years, first the sum of the years is computed as Sum of the years

= 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8

= 36 = $n(n + 1)/2$

The rate of depreciation charge for the first year is assumed as the highest and then it decreases. The rates of depreciation for the years 1–8, respectively are as follows:

8/36, 7/36, 6/36, 5/36, 4/36, 3/36, 2/36, and 1/36.

For any year, the depreciation is calculated by multiplying the corresponding rate of depreciation with $(P – F)$.

D_t = Rate _ $(P – F)$

$B_t = B_{t–1} – D_t$

The formulae for D_t and B_t for a specific year t are as follows:

$$D_t = \frac{n - t + 1}{n(n + 1)/2} (P - F)$$

$$B_t = (P - F) \frac{(n - t)}{n} \frac{(n - t + 1)}{(n + 1)} + F$$

EXAMPLE 3: Consider Example 1 and demonstrate the calculations of the sum-of-the-years-digits method of depreciation.

Solution

P = Rs. 1,00,000, F = Rs. 20,000, n = 8 years

Sum = $n(n + 1)/2 = 8$ _ $9/2 = 36$

The rates for years 1–8, are respectively 8/36, 7/36, 6/36, 5/36, 4/36, 3/36, 2/36 and 1/36.

The calculations of D_t and B_t for different values of t are summarized in Table using the following formulae:

D_t = Rate _ $(P – F)$

$B_t = B_{t–1} – D_t$

End of year (n)	*Depreciation* (D_t)	*Book value* (B_t)
0		1,00,000.00
1	17,777.77	82,222.23
2	15,555.55	66,666.68
3	13,333.33	53,333.35
4	11,111.11	42,222.24
5	8,888.88	33,333.36
6	6,666.66	26,666.70
7	4,444.44	22,222.26
8	2,222.22	20,000.04

If we are interested in calculating D_t and B_t for a specific t, then the usage of the formulae would be better.

Sinking Fund Method of Depreciation

In this method of depreciation, the book value decreases at increasing rates with respect to the life of the asset. Let P = first cost of the asset, F = salvage value of the asset, n = life of the asset, i = rate of return compounded annually, A = the annual equivalent amount, B_t = the book value of the asset at the end of the period t, and D_t = the depreciation amount at the end of the period t.

The loss in value of the asset ($P - F$) is made available the form of cumulative depreciation amount at the end of the life of the asset by setting up an equal depreciation amount (A) at the end of each period during the lifetime of the asset.

$A = (P - F) \_ [A/F, i, n]$

The fixed sum depreciated at the end of every time period earns an interest at the rate of i% compounded annually, and hence the actual depreciation amount will be in the increasing manner with respect to the time period. A generalized formula for D_t is

$D_t = (P - F) \_ (A/F, i, n) \_ (F/P, i, t - 1)$

The formula to calculate the book value at the end of period t is

$B_t = P - (P - F) (A/F, i, n) (F/A, i, t)$

The above two formulae are very useful if we have to calculate D_t and B_t for any specific period. If we calculate D_t and B_t for all the periods, then the tabular approach would be better.

EXAMPLE 4: Consider Example 9.1 and give the calculations regarding the sinking fund method of depreciation with an interest rate of 12%, compounded annually.

Solution

P = Rs. 1,00,000, F = Rs. 20,000, n = 8 years, i = 12%

$A = (P - F) \_ [A/F, 12\%, 8]$

= (1,00,000 – 20,000) _ 0.0813 = Rs. 6,504

In this method of depreciation, a fixed amount of Rs. 6,504 will be depreciated at the end of every year from the earning of the asset. The depreciated amount will earn interest for the remaining period of life of the asset at an interest rate of 12%, compounded annually. For example, the calculations of net depreciation for some periods are as follows:

Depreciation at the end of year 1 (D_1) = Rs. 6,504.

Depreciation at the end of year 2 (D_2) = 6,504 + 6,504 *0.12 = Rs. 7,284.48

Depreciation at the end of the year 3 (D_3)

= 6,504 + (6,504 + 7,284.48) *.12 = Rs. 8,158.62

Depreciation at the end of year 4 (D_4)

= 6,504 + (6,504 + 7,284.48 + 8,158.62) *0.12 = Rs. 9,137.65

These calculations along with book values are summarized in Table

End of year t	*Fixed depreciation* (Rs.)	*Net depreciation* D_t (Rs.)	*Book value* B_t (Rs.)
0	6,504	–	1,00,000.00
1	6,504	6,504.00	93,496.00
2	6,504	7,284.48	86,211.52
3	6,504	8,158.62	78,052.90
4	6,504	9,137.65	68,915.25
5	6,504	10,234.17	58,681.08
6	6,504	11,462.27	47,218.81
7	6,504	12,837.74	34,381.07
8	6,504	14,378.27	20,002.80
		$B_t = B_{t-1} - D_t$	

Service Output Method of Depreciation

In some situations, it may not be realistic to compute depreciation based on time period. In such cases, the depreciation is computed based on service rendered by an asset. Let P = first cost of the asset F = salvage value of the asset X = maximum capacity of service of the asset during its lifetime x = quantity of service rendered in a period. Then, the depreciation is defined per unit of service rendered:

Depreciation/unit of service = $(P - F)/X$

Depreciation for x units of service in a period = $\frac{P-F}{X}(x)$

EXAMPLE 5: The first coat of a road laying machine is Rs. 80,00,000. Its salvage value after five years is Rs. 50,000. The length of road that can be laid by the machine during its lifetime is 75,000 km. In its third year of operation, the length of road laid is 2,000 km. Find the depreciation of the equipment for that year.

Solution

P = Rs. 80,00,000, F = Rs. 50,000, X = 75,000 km, x = 2,000 km

Depreciation for year 3 = Rs. 2,12,000

MODULE – 4

Breakeven analysis:

What is a Break-Even Analysis?

A break-even analysis is a financial tool which helps you to determine at what stage your company, or a new service or a product, will be profitable. In other words, it's a financial calculation for determining the number of products or services a company should sell to cover its costs (particularly fixed costs). Break-even is a situation where you are neither making money nor losing money, but all your costs have been covered. Break-even analysis is useful in studying the relation between the variable cost, fixed cost and revenue. Generally, a company with low fixed costs will have a low break-even point of sale. For an example, a company has a fixed cost of Rs.0 (zero) will automatically have broken even upon the first sale of its product.

Components of Break Even Analysis

Fixed costs

Fixed costs are also called as the overhead cost. These overhead costs occur after the decision to start an economic activity is taken and these costs are directly related to the level of production, but not the quantity of production. Fixed costs include (but are not limited to) interest, taxes, salaries, rent, depreciation costs, labour costs, energy costs etc. These costs are fixed no matter how much you sell.

Variable costs

Variable costs are costs that will increase or decrease in direct relation to the production volume. These costs include cost of raw material, packaging cost, fuel and other costs that are directly related to the production.

Calculation of Break-Even Analysis

The basic formula for break-even analysis is driven by dividing the total fixed costs of production by the contribution per unit (price per unit less the variable costs). Contribution Per Unit = Selling Price – Variable cost per unit

Break Even Point (BEP) = FC / Contribution Per Unit

Break Even Point (BEP) = FC / (P-VC)

FC: Total Fixed Costs

VC: Variable Cost per Unit

P: Average Price per Unit

Example:

Variable costs per unit: VC= Rs. 400

Sale price per unit: P= Rs. 600

Desired profits: Rs. 4,00,000

Total fixed costs: FC= Rs. 10,00,000

First, we need to calculate the break-even point per unit

Break Even Point (BEP) = Rs.10,00,000 / (600-400) = 5000 units

Break Even Sales = 5000 * 600 = Rs. 30,00,000

Contribution Margin

Break-even analysis also deals with the contribution margin of a product. The excess between the selling price and total variable costs is known as contribution margin. For an example, if the price of a product is Rs.100, total variable costs are Rs. 60 per product and fixed cost is Rs. 25 per product, the contribution margin of the product is Rs. 40 (Rs. 100 – Rs. 60). This Rs. 40 represents the revenue collected to cover the fixed costs. In the calculation of the contribution margin, fixed costs are not considered.

When is Break even analysis used?

Starting a new business: If you wish to start a new business, a break-even analysis is a must. Not only it helps you in deciding, whether the idea of starting a new is viable, but it will force you to be realistic about the costs, as well as guide you about the pricing strategy.

Creating a new product: In the case of an existing business, you should still do a break-even analysis before launching a new product—particularly if such a product is going to add a significant expenditure.

Changing the business model: If you are about to the change your business model, like, switching from wholesale business to retail business, you should do a break-even analysis. The costs could change considerably and this will help you to figure out the selling prices need to change too.

Breakeven analysis is useful for the following reasons:

- It helps to determine remaining/unused capacity of the concern once the breakeven is reached. This will help to show the maximum profit on a particular product/service that can be generated.
- It helps to determine the impact on profit on changing to automation from manual (a fixed cost replaces a variable cost).
- It helps to determine the change in profits if the price of a product is altered.
- It helps to determine the amount of losses that could be sustained if there is a sales downturn.

Additionally, break-even analysis is very useful for knowing the overall ability of a business to generate a profit. In the case of a company whose breakeven point is near to the maximum sales level, this signifies that it is nearly impractical for the business to earn a profit even under the best of circumstances.

Therefore, it's the management responsibility to monitor the breakeven point constantly. This monitoring certainly reduces the breakeven point whenever possible.

Ways to monitor Break even point

- **Pricing analysis:** Minimize or eliminate the use of coupons or other price reductions offers, since such promotional strategies increase the breakeven point.
- **Technology analysis:** Implementing any technology that can enhance the business efficiency, thus increasing capacity with no extra cost.
- **Cost analysis:** Reviewing all fixed costs constantly to verify if any can be eliminated can surely help. Also, review the total variable costs to see if they can be eliminated. This analysis will increase the margin and reduce the breakeven point.
- **Margin analysis:** Push sales of the highest-margin (high contribution earning) items and pay close attention to product margins, thus reducing the breakeven point.
- **Outsourcing:** If an activity consists of a fixed cost, try to outsource such activity (whenever possible), which reduces the breakeven point.

Benefits of Break-even analysis

Catch missing expenses: When you're thinking about a new business, it's very much possible that you may forget about few expenses. Therefore, if you do a break-even analysis you have to review all your financial commitments to figure out your break-even point. This analysis certainly restricts the number of surprises down the road.

Set revenue targets: Once the break-even analysis is complete, you will get to know how much you need to sell to be profitable. This will help you and your sales team to set more concrete sales goals.

Make smarter decisions: Entrepreneurs often take decisions in relation to their business based on emotion. Emotion is important i.e. how you feel, though it's not enough. In order to be a successful entrepreneur, your decisions should be based on facts.

Fund your business: This analysis is a key component in any business plan. It's generally a requirement if you want outsiders to fund your business. In order to fund your business, you must prove that your plan is viable. Furthermore, if the analysis looks good, you will be comfortable enough to take the burden of various ways of financing.

Better Pricing: Finding the break-even point will help in pricing the products better. This tool is highly used for providing the best price of a product that can fetch maximum profit without increasing the existing price.

Cover fixed costs: Doing a break-even analysis helps in covering all fixed cost.