Equipment Depreciation

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Manufacturers use various methods of spreading the cost they incur from the purchase of new machinery for the purpose of reporting in their annual financial statements. The cost is spread over the useful life of the new equipment. Several methods are used to calculate the amount deducted each year.

Methods of Depreciation

1. Constant rate of depreciation.
2. Constant percent rate of depreciation.

Constant Rate of Depreciation.

Let v(t) be the value of the machinery t years from the date of purchase, T the length of the useful life of the machinery, and Δv be the average change in the value of the equipment per year.

$$\Delta V = \frac{V(T) - V(0)}{T - 0}$$ 100% depreciation over T years $V(T) = 0$

$$\Delta V = \frac{(1 - 0.8)V(T) - V(0)}{T - 0}$$ 80% depreciation over T years $V(T) = 0.2V$

And the value of the machinery at time t, $V(t)$ is given by the equation

$$V(t) = \Delta V t + V(0)$$

A machine shop plans to depreciates the value of a Vertical Mill that costs \$45,000 down to its salvage value of \$10,000 over a period of 10 years.

$$\Delta V = \frac{V(T) - V(0)}{T - 0} = \frac{45{,}000 - 10{,}000}{10 - 0} = 3{,}500$$

The table below gives the value of the machine for the first 4 years

Year	Depreciation	Value in \$
0	0xΔV = 0	V(0) = 45,000
1	1xΔV = 3,500	V(1) = 41,500
2	2xΔV = 7,000	V(2) = 38,000
3	3xΔV = 10,500	V(2) = 34,500
4	4xΔV = 14,000	V(4) = 31,000

Constant Percent Rate of Depreciation.

Let P be the percent rate of depreciation, and V (t) be the value of the equipment t years from time of purchase, and T be the useful life of the machinery.

The average rate of deprecation over the interval $[t_i, t_{i-1}]$

$$\Delta V = \frac{V(t_i) - V(t_{i-1})}{t_i - t_{i-1}} \qquad i=1,2,3,...,T$$

The Value of the Equipment of the Equipment V, after t years with P percent depreciation per year.

After 0 years $V = V$

After 1 year $V = V - PV = V(1-P)$

After 2 years $V = V(1-P) - PV(1-P) = V(1-P)^2$

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After n Years $V = V(1-p)^n$

Depreciation Value after t years with P percent depreciation per year.

After 0 years $\Delta V_0 = 0$

After 1 year $\Delta V_1 = PV$

After 2 years $\Delta V_2 = V(1-P)$

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After n years $\Delta V_n = V(1-p)^{n-1}$

The value and the depreciation of the equipment per year is given in table below

Year	Depreciation	Value in $
0	0	$V(1-p)^0$
1	PV	$V(1-p)^1$
2	$P(1-p)^1V$	$V(1-p)^2$
3	$P(1-p)^2V$	$V(1-p)^3$
4	$P(1-p)^3V$	$V(1-p)^4$

Problem

A machine shop plans to depreciates the value of a Vertical Mill that costs $45,000 down to its salvage value of $10,000 over a period of 10 years. Find the value of this machinery t years later if the machine shop utilize a yearly constant percent rate of depreciation equal 25%.

Let ΔV_i be the depreciation value at the i[th] year, with constant percent depreciation 25% per year

Year i $\Delta V_i = PV(1-.P)^{i-1}$

Year 1 $\Delta V_1 = 0.25*45{,}000(1-.025)^0 = 11{,}250.00$

Let the V be the Value of the Equipment after t years, with constant percent depreciation 25% per year

Year i $V = V(1-p)^i$

Year 1 $V = 45{,}000(1-0.25)^1 = 33{,}750.00$

The table below gives the value of the machine for the first 4 years

Year	Depreciation in $	Value in $
0	$\Delta V_0 = 0$	V(0) = 45,000.00
1	ΔV_1 =11,250.00	V(1) = 33,750.00
2	ΔV_2 = 8,437.50	V(2) = 25,312.50
3	ΔV_3 = 6,328.13	V(3) = 18,984.38
4	ΔV_4 = 4,746.10	V(3) = 14,238.28

To Generate the table, use a spread sheet or a calculator.

Dep. Values =Augment({0}, Seq(0.25*45,000(1–.25)^x, x, 0 , 9 , 1))

Machine Values = Seq(45,000(1–.25)^x, x, 0, 10 , 1)