ADVANCED CAPITAL BUDGETING DECISIONS

CLASS 12-HW-Q30

Topic Replacement Project

Question 30:

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

Required: When should the company replace the machine?
(Notes: Present value of an annuity of Re. 1 per period for 8 years at interest rate of 15%: 4.4873; present value of Re. 1 to be received after 8 years at interest rate of 15% : 0.3269).

(Source: ICAI)

ANSWER:

Equivalent cost of (EAC) of new machine

Cost of new machine now	90,000
Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	44,873
	1,34,873
Less: PV of salvage value at the end of 8 years (₹20,000 × 0.3269)	6,538
	1,28,335
Equivalent annual cost (EAC) (₹ 1,28,335/4.4873)	28,600

PV of cost of replacing the old machine in each of 4 years with new machine

Scenario	Year	Cash Flow	PV @ 15%	PV
		(₹)		(₹)
Replace Immediately	0	(28,600)	1.00	(28,600)
		40,000	1.00	40,000
				11,400
Replace in one year	1	(28,600)	0.870	(24,882)
	1	(10,000)	0.870	(8,700)
	1	25,000	0.870	21,750

				(11,832)
Replace in two years	1	(10,000)	0.870	(8,700)
	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	11,340
				(34,102)
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	6,580
				(55,799)
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	(22,880)
				(82,799)

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Alternatively, optimal replacement period can also be computed using the following table:

Scenario	Year	Cashflow	PV at 15%	PV
Replace immediately	0	(40,000)	1	(40,000)
	1 to 4	28,600	2.855	81,652
				41,652
Replace after 1 year	1	10,000	0.870	8,696
	1	(25,000)	0.870	(21,739)
	2 to 4	28,600	1.985	56,783
				43,739
Replace after 2 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	2	(15,000)	0.756	(11,342)
	3 and 4	28,600	1.229	35,157
				47,633
Replace after 3 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	3	(10,000)	0.658	(6,575)

	4	28,600	0.572	16,352
				53,321
Replace after 4 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	4	40,000	0.572	22,870
				66,414

ALTERNATIVE SOLUTION

{HW. Q. 30} Computation of EAC of existing machine :-

Particulars	CF	D.f. @15%	Disc. CF	P.V. of CF if replaced after 1 yr	2 yrs	3 yrs	4 yrs.
S.V. forgone (opportunity cost)	40000	1	40000	40000	40000	40000	40000
Maintenance cost-							
Year 1	10000	0.87	8700	8700	8700	8700	8700
Year 2	20000	0.756	15120		15120	15120	15120
Year 3	30000	0.658	19740			19740	19740
Year 4	40000	0.572	22880				22880
				48700	63820	83560	106440
Salvage value-							
Year 1	25000	0.87	21750	(21750)	-	-	-
Year 2	15000	0.756	11340	-	(11340)	-	-
Year 3	10000	0.658	6580	-	-	(6580)	-
Year 4	-	0.572	-	-	-	-	-
				26950	52480	76980	106440
Annuity factor				0.87	1.626	2.283	2.855
EAC				30977	32276	33719	37282

- Calculation of EAC of new machine-

Cost of new m/c	90000
(+) P.V. of 8 yrs maintenance (10000 × 4.4873)	44873
(-) S.V. (20000 × 0.3269)	(6538)
	128335
Annuity factor (8 yrs)	4.4873
EAC	28600

∴ Co. should replace the m/c immediately, since EAC ↓