

CHAPTER 10

Solved Problems

P.10.22 The Indo Metal Works (IMW) Ltd manufactures products such as cooler shelving, stocking carts and bakery racks. Most of its products are directly sold to shops, super markets and hotels.

The IMW is currently using a manual system which was purchased 2 years ago for Rs 20 crore and has a remaining useful life of 6 years and zero salvage value. In order to gain competitive advantage by adopting new technology for higher level of profitability with improved quality of products and productivity, the managing director of IMW has under consideration the replacement of the manual system with a robotics manufacturing system. It would require an initial investment of Rs 56 crore as purchase and Rs 7 crore as installation cost. To work out the cost-benefit analysis of the proposal, he assigns the task to a committee consisting of the controller, the marketing director and the production director.

The controller supplies the given facts relating to the expected revenues and expenses (in lakh of rupees):

Year	Sales	Variable costs (excluding depreciation)	Fixed costs
1	4,000	2,280	720
2	4,500	2,360	730
3	4,750	2,445	800
4	5,150	2,705	880
5	5,550	2,810	960
6	5,800	2,864	1,000

The AIDE 900 robotic system has the capability to weld stainless steel and aluminum used by the IMW as raw materials and can be programmed to adjust the path, angle and speed of the torch. The production director is excited as the system would eliminate the need to hire welders who are so expensive and the market for welders seems perpetually tight.

Since the robotics welding is likely to provide better quality products and product scheduling and avoid late deliveries, the marketing director is convinced that the annual sales would increase by 40 per cent compared to the existing manual system of equipment. It is also anticipated that there would be reduction to the extent of 25 per cent in variables costs and 10 per cent in fixed costs (excluding depreciation).

The existing manual system can be sold for Rs 3 crore. Due to replacement, the management estimates the working capital requirement of Rs 7 crore.

Assuming 12 per cent cost of capital and 35 per cent tax, prepare a financial analysis report for the committee of directors of IMW to be submitted to the managing director. What recommendation would you make? The IMW uses written down value method of depreciation. The new system like the existing manual system will be subject to 25 per cent depreciation. It is expected to have useful economic life of six years with Rs 5 crore as salvage value. The company has several other plants in the asset block of 25 per cent depreciation.

Solution

Financial analysis whether to adopt AIDE 900 robotic system (Rs in lakh)

<i>Cash outflows (incremental):</i>		
Cost of AIDE 900 system		5,600
Installation costs		700
Working capital		700
Less: Sale value of existing manual system		300
		6,700

Determination of incremental CFBT (in lakh of rupees)

Year	Manual system				Robotic system				Differential
	Sales	– VC	– FC	= CFBT	Sales	– VC	– FC	= CFBT	CFBT
1	4,000	2,280	720	1,000	5,600	2,394 *	648	2,558	1,558
2	4,500	2,360	730	1,410	6,300	2,478	657	3,165	1,755
3	4,750	2,445	800	1,505	6,650	2,567	720	3,363	1,858

4	5,150	2,705	880	1,565	7,210	2,840	792	3,578	2,013
5	5,550	2,810	960	1,780	7,770	2,950	864	3,956	2,176
6	5,800	2,864	1,000	1,936	8,120	3,007	900	4,213	2,277

*(Existing VC ratio \times 0.75 \times sales under robotic system)

Determination of CFAT and NPV (amount in lakh of rupees)

Particulars	Years					
	1	2	3	4	5	6
CFBT	1,558	1,755	1,858	2,013	2,176	2,277
Incremental Depreciation	1,500	1,125	844	633	475	231
Taxable income	58	630	1,014	1,380	1,701	2,046
Less: Taxes	20.3	220	355	483	595	716
EAT	37.7	410	659	897	1,106	1,330
CFAT	1,537.7	1,535	1,503	1,530	1,581	1,561
Add: SV + Release of WC (500 + 700)						1,200
× PV factor (0.12)	0.893	0.797	0.712	0.636	0.567	0.507
PV	1,373	1,223	1,070	973	896	1,400
Total PV ($t = 1 - 6$)						6,935
Less: Cash outflows						6,700
NPV						235

Recommendation Since the NPV is positive, IMW is advised to switch to robotic system.

Working Notes

(i) WDV of existing machine in the beginning of year 3 (*Rs in lakh*):

Cost of machine	2,000
Less: Depreciation: year 1	500
2	375
	1,125

(ii) Depreciation base of new robotic system (*Rs in lakh*):

WDV of existing system	1,125
Add: Cost of new robotic system	6,300
Less: Sale value of existing system	300
	7,125

(iii) Base for incremental depreciation: Rs 7,125 lakh – Rs 1,125 lakh = Rs 6,000 lakh.

Incremental depreciation ($t = 1 - 6$) (*Rs in lakh*)

Year	Increment asset cost base	Depreciation
1	6,000	1,500
2	4,500	1,125
<i>(Contd.)</i>		
3	3,375	844
4	2,531	633
5	1,898	475
6	1,423	231*

* $0.25 \times$ (Rs 1,423 lakh – Rs 500 lakh, salvage value)

P.10.23 Company Y is operating an elderly machine that is expected to produce a net cash inflow of Rs 40,000 in the coming year and Rs 40,000 next year. Current salvage value is Rs80,000 and next year's value is Rs 70,000. The machine can be replaced now with a new machine, which costs Rs 1,50,000 but is much more efficient and will provide a cash inflow of Rs 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons.

Solution (i) Determination of Equivalent Annual NPV if an elderly (Existing) Machine is Replaced Now (at time = 0 period)

(a) Cash outflows (incremental)

Cost of new machine	Rs 1,50,000
Less: Salvage value of an elderly machine	80,000
	70,000

(b) NPV of cash inflows

Year	Incremental cash inflows	PV factor at 10%	Total PV
1	Rs 40,000	0.909	Rs 36,360
2	40,000	0.826	33,040
3	80,000	0.751	60,080
Total PV of incremental cash inflows			1,29,480
Less: Incremental cash outflows			70,000
Net present value			59,480

(c) Equivalent annual net present value (Rs 59,480 ÷ 2.487 PVF for 3 years at 10 per cent) 23,916.37

(ii) Determination of Equivalent Annual NPV if an Elderly Machine is replaced next year (at time = 0 period)

(a) Incremental cash outflows

Cost of new machine (Rs 1,50,000 × 0.909)	Rs 1,36,350
Less: Salvage value of an elderly machine (Rs 70,000 × 0.909)	63,630
	72,720

(b) NPV of cash inflows

Year	Incremental cash inflows	PV factor at 10%	Total PV
2	Rs 40,000	0.826	Rs 33,040
3	80,000	0.751	60,080
4	80,000	0.683	54,640
			1,47,760
Less: PV of cash outflows at t = 0			72,720
NPV at t = 0			75,040

(c) Equivalent annual NPV (Rs. 75,040 ÷ 2.487) Rs 30,172.90

Recommendation Company Y is advised to replace the machine one year from now as it promises a higher equivalent annual NPV.

P.10.24 A software company is considering installing an air conditioning plant, for the entire company. It has two options, X and Y.

Plant X costs Rs 5,00,000 to purchase and install. It has 5 years of useful life and will be depreciated over this period on a straight-line basis to a book value of Rs 25,000. However, the management hopes to sell it for Rs 40,000. Maintenance and other operating costs of running the plant are Rs 2,50,000 per year.

Plant Y has a 10 year life but costs Rs 7,00,000 to purchase and install. It will be depreciated over 8 years on a straight-line basis to zero book value. However, at the beginning of year 7 and is expected to cost Rs 1,00,000; it is not to be capitalized but to be expended. At year-end 10, the plant is expected to have a salvage value of Rs 30,000, which is likely to be equivalent to the removal cost of the plant. Plant Y is less expensive to run than Plant X as it requires Rs 2,20,000 per year to operate.

Corporate tax rate is 35 per cent; cost of capital is 12 per cent. Assuming straight-line method of depreciation as well as the time period of depreciation are acceptable for tax purposes, advise which plant should be purchased by the company.

Solution

Determination of equivalent annual cost of plants X and Y

Particulars	Year	COBT	COAT	PV factor at 0.12	Total PV
Plant X					
Purchase cost	0	Rs 5,00,000	Rs 5,00,000	1.000	Rs 5,00,000
Operating costs	1-5	2,50,000	1,62,500 ¹	3.605	5,85,812
Tax advantage on depreciation	1-5	—	(33,250 ²)	3.605	(1,19,866)
Salvage value	5	40,000	(34,750 ³)	0.567	(19,703)
Total cost					9,46,243
Divided by annuity PV factor at 12% corresponding to life of plant, 5 years					3.605

Equivalent annual cost					2,62,481
Plant Y					
Purchase costs	0	7,00,000	7,00,000	1.000	7,00,000
Operating costs	1-10	2,20,000	1,43,000 ⁴	5.650	8,07,950
Tax advantage on depreciation	1-8	—	(30,6255)	4.968	(1,52,145)
Overhaul cost	7	1,00,000	65,000 ⁶	0.507 ⁷	32,955
Total cost					13,88,760
Divided by annuity PV factor at 12% for 10 years					5.650
Equivalent annual cost					2,45,798

- Rs 2,50,000 (1-tax rate 0.35) = Rs 1,62,500
- $[(Rs\ 5,00,000 - Rs\ 25,000)/5\ years] \times tax\ rate, 0.35 = Rs\ 33,250$
- Rs 40,000 – Tax payment on gain i.e., Rs 15,000 \times 0.35 = Rs 34,750
- Rs 2,20,000 (1 – 0.35) = Rs 1,43,000
- $(Rs\ 7,00,000/8\ years) \times 0.35 = Rs\ 30,625$
- Rs 1,00,000 \times 0.65 = Rs 65,000
- PV factor at year-end 6 at 12% (as per Table A-3).

Recommendation Buy plant Y as its EAC is lower.

Review Questions

10.15 The Micro-Tech International (MTI) Ltd is a computer and software supplier company. It also conducts training programmes particularly for school and college students.

The Innovative Academy which is a leading senior secondary school wishes to add computer activities but is faced with serious financial constraints. It has approached the MTI with a proposal to extend the computer literacy to its students (presently of three classes). The main elements of the proposal are listed below:

- Space for the computer laboratory will be provided by the Academy.
- There will be three sections in each class with an average size of 50 students.
- Every year one extra class will be added for 2 years.
- Electricity bill will be paid and computer diskette, ribbon and computer papers will be supplied by the Academy.
- Rs 200 per student per month for 5 years will be paid to MTI. At the end of the project after 5 years, all the printers and computers will be sold to the Academy at 10 per cent of their original cost.

The managing director of MTI desires the finance manager to spell out the operating parameters on the basis of which a rigorous financial analysis should be carried out before accepting the proposal. On the basis of extensive discussion, he has identified the undermentioned parameters:

- Investment cost:** In order to cater to the requirements of the Academy, 15 computers and two printers will have to be acquired in the first year at a cost of Rs 50,000 and Rs 25,000 per computer and per printer respectively. In addition, the cost of cables and connectors would amount to Rs 2,000 per computer; the cost of cables and installation would be borne by the Academy itself.
- Operating cost:** Two instructors and one supervisor and one additional instructor would have to be hired in the first and second years respectively at a monthly salary of Rs 5,000 for each instructor and Rs 3,000 for each supervisor. In the third year, there would be an increase in the salary of 10 per cent for instructors as well as supervisor. The other associated costs would be (1) spare parts, Rs 3,000 per computer per annum, (2) transportation, Rs 25,000 yearly and (3) insurance, 1 per cent of investment cost. The cost of spare parts and transportation is anticipated to increase by 20 per cent in the third year.

From the foregoing information and assuming 35 per cent tax, WDV method of depreciation at 25 per cent and 15 per cent required rate of return, should the proposal under consideration be accepted on the basis of financial viability? The MTI has other assets in the block of 25 per cent depreciation.

10.16 The unit cost break-up of a product of a company is as follows:

Direct labour	Rs 80
Direct material	60
Other variable expenses	50

Fixed overhead (excluding depreciation)	40
Total	230

The product is currently being produced on a machine that has a book value of Rs 1,00,000. It was purchased for Rs 1,50,000 five years ago and originally had a projected life of 15 years and was to be depreciated straight line for tax purposes to the zero salvage value.

The machine has a capacity of producing 1,000 units. At present, it is working at its full capacity. The units produced are sold at Rs 300 per unit. The original manufacturer has offered to accept the old machine as a trade-in for a new version.

The new machine would cost Rs 1,80,000 after allowing Rs 60,000 for the old equipment. The seller also agrees to allow one year credit for making the payment of the balance. The costing department of the company has furnished the following projected costs associated with the new machine:

Direct labour	Rs 50
Direct material	60
Other variable expenses	40
Fixed overheads (excluding depreciation)	40
	190

The fixed overhead costs are allocations from other departments plus the depreciation of the equipment. The maintenance expenses for both the machines are the same.

The existing machine is in good working condition and can be used for its remaining life of 10 years. The new machine has an expected life of 10 years with no salvage value.

The company's tax rate is 35 per cent. Its cost of capital is 10 per cent.

The management of the company seeks your advice whether the new machine should be acquired? The management expects that the future production and sales of the product will remain at 1,000 units per year. Assume that the loss on the existing machine can be claimed as short-term capital loss in the current year itself.

10.17 The following statements give quantitative considerations relevant for the ranking of projects A and B:

<i>Criteria</i>	<i>Project A</i>	<i>Project B</i>
Investment	Rs 400	Rs 300
Internal rate of return	0.18	0.20
Present value at 6 per cent discount factor (DF)	542.7	421.2
Net present value at 6 per cent DF	142.7	121.2
Net present value at 12 per cent DF	60.5	60.5

Project A required an investment of Rs 400 and was expected to have cash inflow of Rs 110, Rs 120, Rs 130, Rs 140 and Rs 150 over its 5 years economic life. Project B involved an investment of Rs 300 and was expected to have a cash inflows of Rs 100 each over its five year economic life.

Which of the two projects will you select if cost of capital is (i) 10 per cent (ii) 12 per cent and (iii) 15 per cent? Give reasons in support of your decision.

Answers

10.15 NPV: Rs 20,86,312. MTI should accept offer of Innovative Academy.

10.16 NPV is Rs 40,260. Purchase the new machine.

10.17 Project A should be preferred when $k = 10$ per cent. If $k = 12$, Project B should be preferred. Project B is recommended when $k = 15$ per cent.