

Additional Problems: Chapter Seven: Replacement Decisions

7S.1

A Canadian company owns a machine that cost \$26 000 ten years ago. A new machine is available that costs \$11 000 and will save \$2 000 per year. If the new machine is bought, the old machine can be sold for \$8 000, and the new machine can itself be sold for \$1 000 salvage five years hence. If the old machine is retained, it will be scrapped in five years, for no salvage value. The MARR for the company is 20%. Should the old machine be replaced now?

*7S.2

A British industrial robot has a current salvage value of £10 000. Its remaining physical life is four years. If it is continued in service, it will result in the operating savings for each year shown in the table below; the salvage values at the end of each year are also shown. If the firm owning the robot has an MARR of 15%, when should the equipment be retired from service?

<i>Year</i>	<i>Operating savings in Year</i>	<i>Salvage Value at End of Year</i>
1	£5 000	£6 000
2	£4 000	£4 000
3	£3 000	£2 000
4	£2 000	0

7S.3

You own a diamond mine in South Africa. You have a fleet of ten heavy trucks, all of which will be worn out at the end of ten years. Each truck requires an annual expenditure of R 10 000 to keep it running, and you expect this to go up by 10% every year. The replacement trucks cost R 100 000 each, and will have negligible maintenance costs. They lose value at 10% per year.

The company's profits are sufficient to replace one truck per year. You could replace your entire fleet of trucks at once by borrowing R 1 000 000 from the bank, but the bank will charge interest at 30%. You can pay this loan off at R 100 000/year. Your MARR is 20%.

Bearing all the available options in mind, what should you do?

*7S.4

You run a CAD/CAM consultancy in South Korea. You employ ten analysts, each on an annual salary of ₩1 000 000, and have an ageing collection of ten workstations of various kinds. You are considering four possible strategies: replace all the workstations with new, low-end workstations costing ₩500 000 each; rent ten low-end workstations at ₩200 000 per year each; buy five high-end workstations at ₩1 500 000; or carry on with your current equipment, in which case you can expect an annual total repair bill of ₩1 000 000, going up by 20% per year. If you buy the high-end workstations,

you can retire one of your analysts at once. The same four options are available to you every year over the next five years; after that, the technology will have changed too much to make any useful predictions. Your current workstations have zero salvage value; the cost of the low-end workstations will drop by 40% per year, while the high-end workstations cost drops at 30% per year. Rental costs stay the same from year to year. Your company's MARR is 20%. What is the best strategy?

7S.5

Mr Patel, a retired economist, owns a small store in Mumbai. In one corner of the store is a video-game machine. Ten years ago, it cost him Rs 5 000, but lately it has been breaking down more frequently. Last year he had to spend Rs 500 on repairs, and he expects the repair bill to go up by about 10% every year from now on. Also, it has been bringing in less money every year; he empties the coin box every month, and on average it contains about Rs 100. He expects the annual income to go down by Rs 100 every year from now on. If he got rid of the machine, he could use the space to stock more goods, and he expects this would increase his annual profit by Rs 500. But the machine is not worth anything as scrap, and he will have to pay Rs 200 to have it taken away. Mr Patel's MARR is 10%.

He carries out a replacement analysis, treating all the cash flows as discrete and annually compounded. What conclusion does he reach?

After he has completed his analysis, his teenage daughter Rajni says, "Kaka, you are forgetting something. Usually when a boy comes in to play the machine, he will also buy a soda, and you make as much profit from selling the soda as the boy puts into the machine. You should do your analysis again!" So he does the analysis again. Does his conclusion change?