

F5 June 2011 Question 2

- 2 Heat Co specialises in the production of a range of air conditioning appliances for industrial premises. It is about to launch a new product, the 'Energy Buster', a unique air conditioning unit which is capable of providing unprecedented levels of air conditioning using a minimal amount of electricity. The technology used in the Energy Buster is unique so Heat Co has patented it so that no competitors can enter the market for two years. The company's development costs have been high and it is expected that the product will only have a five-year life cycle.

Heat Co is now trying to ascertain the best pricing policy that they should adopt for the Energy Buster's launch onto the market. Demand is very responsive to price changes and research has established that, for every \$15 increase in price, demand would be expected to fall by 1,000 units. If the company set the price at \$735, only 1,000 units would be demanded.

The costs of producing each air conditioning unit are as follows:

	\$
Direct materials	42
Labour	12 (1.5 hours at \$8 per hour. See note below)
Fixed overheads	6 (based on producing 50,000 units per annum)
Total cost	<u>60</u>

Note

The first air conditioning unit took 1.5 hours to make and labour cost \$8 per hour. A 95% learning curve exists, in relation to production of the unit, although the learning curve is expected to finish after making 100 units. Heat Co's management have said that any pricing decisions about the Energy Buster should be based on the time it takes to make the 100th unit of the product. You have been told that the learning co-efficient, $b = -0.0740005$.

All other costs are expected to remain the same up to the maximum demand levels.

Required:

- (a) (i) Establish the demand function (equation) for air conditioning units; (3 marks)
- (ii) Calculate the marginal cost for each air conditioning unit after adjusting the labour cost as required by the note above; (6 marks)
- (iii) Equate marginal cost and marginal revenue in order to calculate the optimum price and quantity. (3 marks)
- (b) Explain what is meant by a 'penetration pricing' strategy and a 'market skimming' strategy and discuss whether either strategy might be suitable for Heat Co when launching the Energy Buster. (8 marks)

(20 marks)

2 The Energy Buster

(a) Profit

In order to ascertain the optimum price, you must use the formula $P = a - bQ$

Where P = price; Q = quantity; a = intersection (price at which quantity demanded will be nil); b = gradient of the demand curve.

The approach is as follows:

(i) Establish the demand function

b = change in price/change in quantity = $\$15/1,000 = 0.015$.

We know that if price = \$735, quantity = 1,000 units.

Establish 'a' by substituting these values for P , Q and b into our demand function:

$$735 = a - 0.015Q$$

$$15 + 735 = a$$

$$\text{Therefore } a = 750.$$

Demand function is therefore $P = 750 - 0.015Q$

(ii) Establish marginal cost

The labour cost of the 100th unit needs to be calculated as follows:

Formula = $y = ax^b$.

$$a = 1.5$$

Therefore, if $x = 100$ and $b = -0.0740005$, then $y = 1.5 \times 100^{-0.0740005} = 1.0668178$

Therefore cost per hour = $1.0668178 \times \$8 = \$8.5345$

Total cost for 100 units = \$853.45.

If $x = 99$, $y = 1.5 \times 99^{-0.0740005} = 1.0676115$

Therefore cost per hour = \$8.5408

Total cost for 99 = \$845.5483

Therefore cost of 100th unit = $\$853.45 - \$845.5483 = \$7.90$.

Therefore total marginal cost = $\$42 + \$7.90 = \$49.90$.

Fixed overheads have been ignored as they are not part of the marginal cost.

(iii) Find profit

(1) Establish the marginal revenue function

$$MR = a - 2bQ$$

$$MR = 750 - 0.03Q$$

(2) Equate MC and MR

$$49.90 = 750 - 0.03Q$$

$$0.03Q = 700.1$$

$$Q = 23,337$$

(3) Find optimum price

$$P = 750 - (0.015 \times 23,337)$$

$$= \$399.95$$

(b) (i) Penetration pricing

With penetration pricing, a low price would initially be charged for the Energy Buster. The idea behind this is that the price will make the product accessible to a larger number of buyers and therefore the high sales volumes will compensate for the lower prices being charged. A large market share would be gained and possibly, the Energy Buster might become accepted as the only industrial air conditioning unit worth buying.

The circumstances that would favour a penetration pricing policy are:

- highly elastic demand for the Energy Buster i.e. the lower the price, the higher the demand. The preliminary research does suggest that demand is elastic.
- if significant economies of scale could be achieved by Heat Co, then higher sales volumes would result in sizeable reductions in costs. This is not the case here, since learning ceases at 100 units.
- if Heat Co was actively trying to discourage new entrants into the market. In this case, new entrants cannot enter the market anyway, because of the patent.

- if Heat Co wished to shorten the initial period of the Energy Buster's life cycle so as to enter the growth and maturity stages quickly. We have no evidence that this is the case for Heat Co, although it could be.

From the above, it can be seen that this could be a suitable strategy in some respects but it is not necessarily the best one.

	Marks
2 (a) Profit using demand-based approach	
(i) Establish demand function:	
Find b	1
Find a	1
Write out demand function	1
	3
(ii) Find MC:	
Average cost of 100	1
Total cost of 100	1
Average cost of 99	1
Total cost of 99	1
Difference	1
Correct total MC excluding fixed cost	1
	6
(iii) Establish MR function	0.5
Equate MC and MR	1
Find optimum price	0.5
Calculate profit:	
Calculate fixed cost	0.5
Final profit figure	0.5
	3
(b) Market based strategies	
Penetration pricing	
Each valid point	1
Max	4
Market skimming	
Each valid point	1
Max	4
Total marks	20