

Total Quality Management

1. A company has a continuous manufacturing process involving an output of 6 tonnes per hour valued at ₹ 70 per tonne. Process wages cost ₹ 60 per hour and raw materials is ₹ 35 per tonne of the product. Regular maintenance cost is ₹ 750 per week.

The company is experiencing breakdowns due to mechanical faults averaging 25 hours a week, costing ₹ 7,500 to repairs. It is estimated that these breakdown can be reduced or eliminated if additional maintenance on the following scale were undertaken.

Breakdown hours per week	0	5	10	15	20
Maintenance costs (Rs)	23,000	13,000	6,500	3,000	1,500
Repairs costs (₹)	0	2,500	3,000	5,000	6,500

Process Labour during stoppages can be used elsewhere up to 10 hours per week. You are required to:

- The optimum amount of maintenance to be undertaken each week:
 - Compute the additional net revenue that will be resulting from the optimal level, compared with the present level.
2. Tarty Inc. sells 3,00,000 V-262 valves to the automobile and trade industry. It has a capacity of 1,10,000 machine hours and can produce three valves per machine-hour. V-262's contribution margin per unit is ₹ 8 Tarty sells only 3,00,000 valves because 30,000 valves (10% of the good valves) need to be reworked. It takes 1 machine-hour to rework 3 valves so that 10,000 hours of capacity are lost in the rework process. Tarty's rework costs are ₹ 2,10,000, consisting of:
- | | |
|--|--------------|
| Direct materials and Direct rework Labour (Variable costs) | ₹ 3 per unit |
| Fixed costs of equipment, rent, and overhead allocation | ₹ 4 per unit |

Tarty's process designers have come up with a modification that would maintain the speed of the process and would ensure 100% quality and no rework. The new process would cost ₹ 3,15,000 per year. Decide.

3. A manufacture has an order for one lakh units. With his present equipment they cost 80 paise each to make and there is a 6% fraction defective. However he may install special controls which together with their cost of development, cost ₹ 18,000. His variable cost per unit, then falls to 60 paise each; but the process may be less reliable. How much less reliable can the process be, before he should reject the special controls ?

4. A company producing and selling a range of consumer durable appliances has its after-sales service work done by local approved sub-contractors.

Some of the appliances are so large and bulky that repair / service work can only be done at the customers' homes. Other are small enough for sub-contractors to take them back to their local repair shop, and re-deliver them to the customer.

There is a list price to customer for the labour content of any work done and for materials used. However, the majority of the after-sales service work is done under an annual maintenance contract taken out by customers on purchasing the product; this covers the labour content of any service work to be done, but customers pay for materials used.

Any labour or material needed in the first six months are provided to customer free of charge under the company's product guarantee and sub-contractors are allowed by the company a fixed

sum of 3.5% of the selling price for each appliances to cover this work. These sums allowed proved closely in line with the work needed over the past few years. The price structure is ;

Materials : Price to sub-contractor : Company cost plus 10%
 Price to customer : Sub-contractor's price plus 25%

For labour : Price to sub-contractor :
 Work done under maintenance contract : : 90% of list price
 Ad hoc work (i.e. work with out maintenance contract) : 85% of list price

Records show that 60% by value of the work has to be carried out at customers' homes, while the remainder can be done anywhere appropriate. The annual income that the company currently receives from sub-contractors for the area in which the experiment is to take place is :

Labour-- under maintenance contract	30,000
-- ad hoc	12,000
Materials-- under maintenance contract	18,000
-- ad hoc	<u>6,000</u>
	<u>66,000</u>

The company expects the volume of after-sales work in this yr. will remain same as of last year.

The company is considering the following options :

1. Set up a local service centre at which it can service small appliances only. Work at customers' houses would continue to be done under sub-contract.
2. Set up a local centre to act only as a base for its own employees who would only service appliances at customers' homes. Servicing of small applicant would continued to be done under sub-contract.
3. Set up a local combined service centre plus base for all work. No work would be sub-contracted.

If the company were to do service work, annual fixed costs are budgeted to be:

	Option-1	Option-2	Rs('000) Option-3
Establishment costs	40	15	45
Management costs	20	15	30
Storage staff costs	10	10	15
Transport costs	8	65	70
Repair / service staff	<u>70</u>	<u>180</u>	<u>225</u>
Total	<u>148</u>	<u>285</u>	<u>385</u>

You are required

- (a) to recommend which of the three options the company should adopt.
- (b) comment critically in respect of non-financial feature.

5. Burdoy plc has a dedicated set of production facilities for component X. A just-in-time system is in place such that no stock of materials; work in progress or finished goods are held. At the beginning of period 1, the planned information relating to the production of component X through the dedicated facilities is as follows:

- (i) Each unit of component X has input materials; 3 units of materials A at ` 18 per unit and 2 units of materials B at ` 9 per unit.
- (ii) Variable cost per unit of component X (excluding materials) is ` 15 per unit worked on.

- (iii) Fixed costs of the dedicated facilities for the period: ₹ 1,62,000.
- (iv) It is anticipated that 10% of the units of X worked on in the process will be defective and will be scrapped.
- (v) It is estimated that customers will require replacement (free of charge) of faulty units of component X at the rate of 2% of the quantity invoiced to them in fulfillment of orders.

Burdoy plc is pursuing a total quality management philosophy. Consequently all losses will be treated as abnormal in recognition of a zero defect policy and will be valued at variable cost of production.

Actual statistics for each periods 1 to 3 for component X are shown in Appendix below. No changes have occurred from the planned price levels from materials, variable overhead or fixed overhead costs.

Required:

- (a) Prepare an analysis of the relevant figures provided in Appendix to show that the period 1 actual results were achieved at the planned level in respect of (i) quantities and losses and (ii) units cost levels for material and variable costs.
- (b) Use your analysis from (a) in order to calculate the value of the planned level of each of internal and external failure costs for period 1
- (c) Actual free replacement of components X to customers were 170 units and 40 units in periods 2 and 3 respectively. Other data relating to periods 2 and 3 is shown in Appendix

Burdoy plc authorized additional expenditure during period 2 and 3 as follows:

Period 2: Equipment accuracy checks of ₹ 10,000 and staff training of ₹ 5,000.

Period 3: Equipment accuracy checks of ₹ 10,000 plus ₹ 5,000 of inspection costs; also staff training costs of ₹ 3,000 on extra planned maintenance of equipment.

Required:

- (i) Prepare an analysis for EACH of periods 2 and 3 which reconciles the number of components invoiced to customers with those worked – on in the production process. The analysis should show the change from the planned quantity of process losses and changes from the planned quantity of replacement of faulty components in customer hands; (All relevant working notes should be shown)
- (ii) Prepare a cost analysis for EACH of periods 2 and 3 which shows actual internal failure costs, external failure costs, appraisal costs and prevention costs;
- (iii) decide whether the quality costs are to be incurred or not in period 2 & 3.

Appendix : Actual statistics for component X

	Period 1	Period 2	Period 3
Invoiced to customers (units)	5,400	5,500	5,450
Worked on in the process (units)	6,120	6,200	5,780
Total costs:			
Materials A and B (₹)	4,40,640	4,46,400	4,16,160
Variable costs of production (Rs) (excluding materials costs)	91,800	93,000	86,700
Fixed costs (₹)	1,62,000	1,77,000	1,85,000