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RELEVANT TO MA2

## **Process costing – joint products**

This is the third and final article in a series that has considered various aspects of the accounting for process costs.

This article deals with the situation where joint (two or more) products emerge from a single process. Joint products are not separately identifiable until a certain stage is reached in the processing operations. This stage is the 'split-off point'. Costs incurred prior to this point are common costs.

There are two main aspects to the accounting for joint products:

- (i) How the common process costs should be apportioned between the joint products at the split-off point.
- (ii) Whether it is more profitable to sell joint products at the split-off point or whether to process products further (in situations where both of these opportunities arise).

### **(i) APPORTIONMENT OF COMMON PROCESS COSTS**

There are two main methods of apportioning the common process costs at the split-off point:

- Physical measurement (weight or volume) of output.
- Market value (sales or net realisable value) of output.

The apportionment of common process costs between joint products is arbitrary whichever method is used. Apportionment is required for inventory valuation of each product but decisions about the viability of the joint products can only be taken on the basis of the process as a whole.

Physical measurement is the most straightforward method of common cost apportionment. The weighting of the physical output of each joint product is applied to the common costs. Each of the joint products will have the same cost per unit.

Market value is also a relatively straightforward method of common cost apportionment when the joint products can be sold at the split-off point. The output of each product is multiplied by their selling price at the split-off point to provide the respective weighting to be applied to the common costs. Unit costs vary between products, but the result of using the market value for apportionment of common costs is that the gross profit percentage margin of each product at split-off point is the same.

It is only in a situation where the joint products cannot be sold at the split-off point (ie they have to be processed further to produce saleable products) that

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calculation of the net realisable value is required (if market value, rather than physical measurement, is to be used as the basis of common process cost apportionment). The net realisable value is the sales value after further processing less the further processing costs after the split-off point.

Illustrations of each of the methods and situations described above are provided below.

### **Apportionment of common costs using physical measurement**

A typical two-mark examination question follows:

*Joint products A and B result from a single manufacturing process. Common costs totalled \$192,000 in a period during which output was 2,500 units of product A and 3,000 units of product B. Products A and B can be sold at the split-off point for \$40 and \$80 per unit respectively.*

*What amount of the common process costs will be apportioned to product B on the basis of physical measurement?*

Answer:

The proportion of the process costs apportioned to product B is  $3,000 / (2,500 + 3,000)$ .

Thus,  $\$192,000 \times 3/5.5 = \underline{\$104,727}$ .

Such a question may be set, in a computer-based exam, as a number entry question or as a multiple-choice question with four options.

If the question is multiple choice, the distractors are likely to be based on using the wrong product and/or incorrectly using market value as the basis of apportionment.

### **Apportionment of common costs using market value (1)**

Using the same question scenario as above, the question requirement may instead be:

*What amount of the common process costs will be apportioned to product B on the basis of market value?*

Answer:

The proportion of the process costs apportioned to product B is  $[(3,000 \times 80) / (2,500 \times 40) + (3,000 \times 80)]$ .

Thus,  $\$192,000 \times 24/34 = \underline{\$135,529}$ .

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If the question is multiple choice, rather than number entry, the distractors may be based on incorrectly using selling prices (rather than total revenue), using the wrong product or using physical measurement.

NB. Using selling prices (rather than total sales value) is a very common error made by candidates – ie:

$$\$192,000 \times 80 / (40 + 80) = \$128,000.$$

This incorrect answer only reflects the market values per unit rather than the total market value of each product's output.

### **Apportionment of common costs using market value (2)**

The following further information is added to the above question scenario:

*Products A and B can also be processed further. After further processing, products A and B have selling prices of \$60 and \$104 respectively.*

*What amount of the common process costs will be apportioned to product B on the basis of market value?*

- A**     \$135,529
- B**     \$128,000
- C**     \$129,662
- D**     \$121,756

Answer:

The correct answer remains \$135,529 (option A) because where there is a market value at the split-off point, it is irrelevant what happens in any further processing. In any case, the net realisable values cannot be calculated because the costs of the further processing are not given in the question.

Distractors:

Option B – this distractor incorrectly uses the selling prices of the two products at the split-off point rather than the total sales values at that point (see calculation above).

Option C – this distractor incorrectly uses the market values of the two products after further processing (rather than before further processing). The calculation is  $\$192,000 \times [(3,000 \times 104) / (2,500 \times 60) + (3,000 \times 104)]$ .

Option D – this distractor uses the selling prices of the two products after further processing. The calculation is  $\$192,000 \times 104 / (60 + 104)$ .

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**Apportionment of common costs using market value (3)**

The following illustration is based on the previous question scenario, except that it is now assumed that products A and B cannot be sold at the split-off point and further processing costs are given. Thus, the question scenario becomes:

*Joint products A and B result from a single manufacturing process. Common costs totalled \$192,000 in a period during which output was 2,500 units of product A and 3,000 units of product B. Each of the joint products is further processed to provide saleable output.*

*Further processing costs of \$12 per unit and \$16 per unit are incurred for products A and B respectively and the products are sold for:*

Product A	\$60 per unit
Product B	\$104 per unit

*What amount of the common process costs will be apportioned to product B on the basis of market value?*

Answer:

Market value in this situation requires the calculation of the net realisable value of each product because the joint products cannot be sold at the split-off point.

The net realisable value per unit of product A is \$48 (selling price \$60 less \$12 further processing cost) and of product B is \$88 (selling price \$104 less \$16 further processing cost). The proportion of the process costs apportioned to product B is  $[(3,000 \times 88)/(2,500 \times 48) + (3,000 \times 88)]$ . Thus,  $\$192,000 \times 264/384 = \underline{\$132,000}$ .

If the question is multiple choice, rather than number entry, the distractors may be based on incorrectly using selling prices (either final price or net of further processing costs) or using total market values based on the final selling prices.

**(ii) WHETHER OR NOT TO PROCESS FURTHER**

In situations where a decision has to be made, as to whether joint products are sold at the split-off point or alternatively processed further before being sold, relevant cost principles apply. Candidates often have difficulty with the approach that is required.

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Key principles are:

- the apportionment of common costs is irrelevant in decisions concerning whether or not to process individual products further. Common costs are only relevant to decisions about the process as a whole
- decisions about whether or not to process further should be made on the basis of incremental revenue (final sales value after further processing less the sales value at the split-off point) less incremental cost (the cost of processing further).

**Example**

*Joint products A and B result from a single manufacturing process. Each product could be sold at the split-off point or alternatively processed further.*

*The following data about the two products are available:*

	<i>Product A</i>	<i>Product B</i>
	<i>\$ per unit</i>	<i>\$ per unit</i>
<i>Share of common costs from joint process</i>	<i>25.20</i>	<i>25.20</i>
<i>Selling price at split-off point</i>	<i>24.00</i>	<i>38.40</i>
<i>Cost of further processing</i>	<i>8.60</i>	<i>12.20</i>
<i>Selling price after further processing</i>	<i>32.00</i>	<i>48.40</i>

*Which product(s) should be sold at the split-off point?*

- A**    *Both products*  
**B**    *Product A only*  
**C**    *Product B only*  
**D**    *Neither product*

Answer:

A product should be sold at the split-off point if there is not any incremental profit from processing the product further. As long as the process as a whole is profitable, it is irrelevant if an individual product is not profitable. It has to be assumed, in this example, that the process as a whole is profitable.

The incremental profit/(loss) from further processing is calculated as:

	Product A	Product B
	\$ per unit	\$ per unit
Incremental revenue	8.00 (32.00 – 24.00)	10.00 (48.40 – 38.40)
Incremental cost	<u>8.60</u>	<u>12.20</u>
Incremental profit/(loss)	<u>(0.60)</u>	<u>(2.20)</u>

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Both products, therefore, should be sold at the split-off point (option A) because further processing of either product is not financially justified.

Further analysis (which is not required for the decision) may have influenced candidates' option choices:

	Product A \$ per unit	Product B \$ per unit
Line 1: profit/(loss) at split-off point	(1.20) (24.00 – 25.20)	13.20 (38.40 – 25.20)
Line 2: profit/(loss) after further processing	<u>(1.80)</u> (32.00 – 33.80)	<u>11.00</u> (48.40 – 37.40)
Incremental profit/(loss)	<u>(0.60)</u>	<u>(2.20)</u>

Distractors:

Choosing Option C could have been based on the calculation of the Line 1 figures above – ie influenced by the fact that only product B makes a profit at split-off point. But what then happens to product A? It is a joint process, which means that both products will be manufactured as long as the process as a whole is profitable.

As already stated this must be assumed, although the profitability of the process would seem to be confirmed anyway by the above analysis – ie the profit per unit on product B is much greater than the loss per unit on product A.

Choosing Option B could have been based on the calculation of the Line 2 figures above – ie influenced by the fact that product A makes a loss after further processing, whereas product B makes a profit.

Choosing option D meant assuming neither product would be sold at the split off point.

**Written by a member of the management accounting examining team**