



Management Accounting – Decision Management

Tim Thompson presents a sample self-test question that explains what process costing does – and does not – tell us when it comes to evaluating joint products.

Global contact details continued from page 35.

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One of the learning outcomes of paper P2 states that candidates should be able to: "Explain why joint costs must be allocated to final products for financial reporting purposes, but why this is unhelpful when decisions concerning process and product viability have to be taken."

The official CIMA definition of process costing is: "The method applicable where goods or services result from a sequence of continuous or repetitive operations or processes. Costs are averaged over the units produced during the period, being initially charged to the operation or process."

Joint products are defined as: "Two or more products produced by the same process and separated in processing, each having sufficiently high saleable value to merit recognition as a main product."

A process is a simple concept in essence: materials are obtained, work is done on these materials and some form of product emerges. As accountants, we are particularly interested in the financial aspects of this. Again, it's straightforward in theory: we need to determine the costs of the materials and the work done, and the value that's attributable to the product. But you will recall from your earlier studies that accounting for what goes on in a process can be more complex in practice.

Here are some of the key factors that may emerge in process costing which you need to be able to handle:

- Joint products.
- By-products.
- Further processing decisions.
- Process viability.
- Equivalent units.
- Different inventory valuation methods (eg, Fifo, Avco and standard costing).

1 SAMPLE QUESTION ON PROCESS COSTING

A firm has the worldwide monopoly on the sale of all of its products. Part of its operations includes process M, which receives input material from process L and converts this to make joint products A, B and C, along with by-product Y.

Normal loss is ten per cent of the material received from process L during the month. Normal loss and any abnormal loss have no resale value. Y has a resale value of £1 per kg. The joint products may be sold immediately after process M or processed further before being sold. Details of this are as follows:

Joint product	Selling price per kg after M	Cost of further processing per kg	Selling price per kg after further processing
A	£15.50	£7.00	£23.00
B	£15.00	£9.00	£23.50
C	£14.50	£9.50	£24.20

The following data for process M is available for the month of October:

- Opening inventory: 100kg of material, 100% complete, value £1,000. The conversion of this was 60% complete, value £150.
- Closing inventory: 50kg of material, 100% complete. The conversion of this was 40% complete.
- Materials received from process L in October: 2,000kg, costing £21,000.
- Conversion costs incurred during the month were £5,200.
- Completed output: 600kg of A; 580kg of B; 540kg of C; and 90kg of Y. The example will be considered in the context of two scenarios:
 - 1 Inventory is valued using the first in, first out (Fifo) approach and joint products are valued according to the weight of output.
 - 2 Inventory is valued using weighted-average costing (Avco) and joint products are valued according to the sales value of output at the split-off point. You are required to:
 - A Prepare the process M account for both scenarios.
 - B Recommend, with supporting calculations, whether the joint products should be processed further.
 - C Analyse the viability of process M.

- Opening inventory in varying degrees of completion.
- Closing inventory in varying degrees of completion.
- Normal loss (with or without a resale value).
- Abnormal loss (with or without a resale value).
- Abnormal gain.



Try to answer the question in panel 1 (*previous page*) without referring to your study notes or the solutions that follow. Once you have done this, compare your answers with the solutions and consider what mark you might have achieved if this question had appeared in an exam.

Solution to requirement A, scenario 1

A number of items can be inserted immediately into the process M account (see *panel 2*). The next step is to balance off the two columns of weights: the larger total is 2,100kg on the debit side, as opposed to 2,060kg on the credit side. The 40kg difference is abnormal loss, which can be inserted (*in orange text on panel 2*). We can also enter both column totals for the debit side, the weight total on the credit side and values of £0 for normal loss and £90 for by-product Y (*all in orange text on panel 2*). Normal loss does not bear any of the process costs, as it's a "normal" part of the production process and has no resale value. Y does not bear any process costs, but its total resale value of £90 relieves the process costs elsewhere.

The task now is to determine how the total of £27,350 is to be shared between the items on the credit side. To do this, we need to prepare a statement of equivalent units using Fifo (see *panel 3*). The workings for this are as follows:

- a The opening inventory of 100 was 100 per cent complete in respect of process L material, so there was nothing to complete in this respect.
- b The opening inventory of 100 was 60 per cent complete in respect of conversion. Fifo assumes that the remaining 40 per cent is completed first: $100 \times 0.4 = 40$.
- c The total amount of joint product completed in the month, minus any of it that emerged from completing the opening inventory. This must be the same value for both materials and conversion: $600 + 580 + 540 - 100 = 1,620$.
- d Abnormal loss of 40 units calculated earlier.
- e The closing inventory of 50 was 100 per cent complete in respect of process L material.
- f The closing inventory of 50 was 40 per cent complete in respect of conversion: $50 \times 0.4 = 20$.
- g The value of material received from process L during the month, minus the resale value of Y: $\text{£}21,000 - \text{£}90 = \text{£}20,910$.
- h The value of conversion work done during the month.
- i $\text{£}20,910 \div 1,710 = \text{£}12.22807$.
- j $\text{£}5,200 \div 1,720 = \text{£}3.02326$.
- k $\text{£}12.22807 + \text{£}3.02326 = \text{£}15.25133$.

We can now calculate the value of the closing inventory, the value of abnormal loss and the total value of the joint products.

- Value of closing inventory: $(50 \times \text{£}12.22807) + (20 \times \text{£}3.02326) = \text{£}671$.
- Value of abnormal loss: $40 \times \text{£}15.25133 = \text{£}610$.

2 PROCESS M ACCOUNT, SCENARIO 1

		kg	£			kg	£
Opening inventory:				Closing inventory:			
material	100	1,000		material	50		
conversion		150		conversion			
Material from process L	2,000	21,000		Output:			
Conversion		5,200		joint product A	600		
				joint product B	580		
				joint product C	540		
				by-product Y	90	90	
				Normal loss	200	0	
				Abnormal loss	40		
		<u>2,100</u>	<u>27,350</u>		<u>2,100</u>		

3 STATEMENT OF EQUIVALENT UNITS, SCENARIO 1

	Process L materials	Conversion	Total
Opening inventory completed	0 ^a	40 ^a	
Started and finished in month	1,620 ^c	1,620 ^c	
Abnormal loss	40 ^d	40 ^d	
Closing inventory	50 ^e	20 ^f	
Equivalent units	<u>1,710</u>	<u>1,720</u>	
Costs incurred	£20,910 ^g	£5,200 ^g	
Cost per equivalent unit	£12.22807 ^h	£3.02326 ^h	£15.25133 ^h

- Total value of the joint products:
 Started and finished in month:
 $1,620 \times \text{£}15.25133 = \text{£}24,708$.
 Opening inventory brought forward:
 $\text{£}1,000 + \text{£}150 = \text{£}1,150$.
 Opening inventory (conversion) completed:
 $40 \times \text{£}3.02326 = \text{£}121$.
 Total: $\text{£}24,708 + \text{£}1,150 + \text{£}121 = \text{£}25,979$.
 The total value of the joint products started and finished in the month has been rounded up rather than down in order to compensate for the rounding error caused by rounding the costs per equivalent unit to only five decimal places.
 This total value of £25,979 now needs to be split between the three joint products according to the weight of output. The total weight of output is $600\text{kg} + 580\text{kg} + 540\text{kg} = 1,720\text{kg}$.
 ■ A: $\text{£}25,979 \times 600\text{kg} \div 1,720\text{kg} = \text{£}9,063$.
 ■ B: $\text{£}25,979 \times 580\text{kg} \div 1,720\text{kg} = \text{£}8,760$.
 ■ C: $\text{£}25,979 \times 540\text{kg} \div 1,720\text{kg} = \text{£}8,156$.

The value for A has been rounded up rather than down for the same reason as above.

The remaining values in the process M account can now be entered (*all in orange text on panel 4, next page*). Note that the credit and debit value column totals are equal. It's important that you can achieve this by calculating all of the component figures, rather than simply inserting numbers to make the totals balance.



4 PROCESS M ACCOUNT, SCENARIO 1

	kg	£		kg	£
Opening inventory:			Closing inventory:		
material	100	1,000	material	50	611
conversion		150	conversion		60
Material from process L	2,000	21,000	Output:		
Conversion		5,200	joint product A	600	9,063
			joint product B	580	8,760
			joint product C	540	8,156
			by-product Y	90	90
			Normal loss	200	0
			Abnormal loss	40	610
	<u>2,100</u>	<u>27,350</u>		<u>2,100</u>	<u>27,350</u>

5 STATEMENT OF EQUIVALENT UNITS, SCENARIO 2

	Process L materials	Conversion	Total
Completed in the month	1,720 ^d	1,720 ^d	
Abnormal loss	40 ^m	40 ^m	
Closing inventory	50 ⁿ	20 ^p	
Equivalent units	<u>1,810</u>	<u>1,780</u>	
Costs incurred	£21,910 ^o	£5,350 ^q	
Cost per equivalent unit	£12.10497 ^r	£3.00562 ^s	£15.11059 ^t

6 APPORTIONING COSTS TO JOINT PRODUCTS

	Sales value	Proportion	Cost
Joint product A: 600 x £15.50 =	£9,300	36.005%	£9,358
Joint product B: 580 x £15.00 =	£8,700	33.682%	£8,754
Joint product C: 540 x £14.50 =	£7,830	30.313%	£7,879
Total	£25,830	100.000%	£25,991

7 PROCESS M ACCOUNT, SCENARIO 2

	kg	£		kg	£
Opening inventory:			Closing inventory:		
material	100	1,000	material	50	605
conversion		150	conversion		60
Material from process L	2,000	21,000	Output:		
Conversion		5,200	joint product A	600	9,358
			joint product B	580	8,754
			joint product C	540	7,879
			by-product Y	90	90
			Normal loss	200	0
			Abnormal loss	40	604
	<u>2,100</u>	<u>27,350</u>		<u>2,100</u>	<u>27,350</u>

Solution to requirement A, scenario 2

Scenario 2 involves weighted-average costing and the valuation of joint products according to the sales value of output at the split-off point. These issues will affect the valuation of the joint products, the abnormal loss and the closing inventory. The other items on the process M account will be the same as in scenario 1.

The workings to obtain the statement of equivalent units for scenario 2 (see panel 5) are as follows:

- l Units completed in the month: 600 + 580 + 540 = 1,720.
- m The abnormal loss of 40 units was calculated earlier.
- n The closing inventory of 50 was 100 per cent complete in respect of process L material.
- o The closing inventory of 50 was 40 per cent complete in respect of conversion: 50 x 0.4 = 20.
- p The value of material in opening inventory plus that received from process L during the month, less the resale value of by-product Y: £1,000 + £21,000 – £90 = £21,910.
- q The value of conversion in opening inventory plus the work done during the month: £150 + £5,200 = £5,350.
- r £21,910 ÷ 1,810 = £12.10497.
- s £5,350 ÷ 1,780 = £3.00562.
- t £12.10497 + £3.00562 = £15.11059.

The closing inventory, the value of abnormal loss and the total value of the joint products can now be calculated:

- Value of closing inventory:
(50 x £12.10497) + (20 x £3.00562) = £665.
- Value of abnormal loss:
40 x £15.11059 = £604.
- Total value of the joint products:
1,720 x £15.11059 = £25,991.

The total value of the joint products has again been rounded up rather than down to compensate for the error caused by rounding the costs per equivalent unit to only five decimal places. This total can be split between A, B and C according to the sales value of output at the split-off point (see panel 6). The proportion of C has been rounded down to ensure that the total of the proportions is 100 per cent. This allows the remaining values to be entered into the process M account (all in orange text on panel 7).

Solution to requirement B

To determine whether the three joint products should be processed further or sold at the split-off point, we need to look at each product separately and consider the relevant costs. For example, A yields a selling price of £15.50 per kg at the split-off point and £23 per kg after further processing. Further processing costs of £7 per kg are incurred to obtain this extra £7.50 per kg of revenue, so further processing yields an extra relevant benefit of £0.50 per kg. Accordingly, A should be processed further.

The other two calculations are as follows:

- B: £23.50 per kg – £15 per kg – £9 per kg = – £0.50 per kg.
- C: £24.20 per kg – £14.50 per kg – £9.50 per kg = £0.20 per kg.

Paper P2 (also C1 and P1)



8 THE VIABILITY OF PROCESS M

Revenues	
A after further processing:	600 x £23.00 = £13,800
B at the split-off point:	580 x £15.00 = £8,700
C after further processing:	540 x £24.20 = £13,068
Total	£35,568

Costs	
Process M:	£25,991
Further processing of A:	600 x £7.00 = £4,200
Further processing of C:	540 x £9.50 = £5,130
Total	£35,321

So C should be processed further, while B should be sold at the split-off point. Note that the costs attributed to the joint products in process M are irrelevant, as they are incurred whether any individual joint product is processed further or not. The cost attributed to each joint product depended upon arbitrary decisions concerning inventory valuation and the two alternative ways of sharing the joint costs. These decisions have no bearing on the cash flows or on shareholder wealth creation.

Solution to requirement C

Process M has to be analysed in its entirety – the viability of the individual joint products can't be considered meaningfully. The fundamental question concerns whether process M is profitable in the long run or not. To answer this, we need to make a couple of assumptions. The first is that the abnormal loss is genuinely a one-off occurrence and doesn't reflect some long-term inefficiency that should be reflected by increasing the normal loss percentage. The second assumption is that, apart from the abnormal loss, October's data is a reliable basis for the analysis.

The total cost attributed to the three joint products for October was £25,979 under FIFO and £25,991 under AVCO. The slight difference between these two figures is a result of the minor changes in the cost of inputs linked with the inventory valuation method chosen. We will simply take the more cautious figure of £25,991 as the process M cost of the finished output.

Process M as a whole is viable if the revenues from selling the joint products exceed the costs. But we have decided to process two of the three joint products further, so we must include this in the evaluation. From the calculation in panel 8, we can see that process M yields a profit of £35,568 – £35,321 = £247. It can, therefore, be described as viable, albeit only just.

It is interesting to note here the impact that the opportunity to process the joint products further has had on the viability of process M. The incremental benefit of processing joint products A and C further is $(600 \times £0.50) + (540 \times £ 0.20) = £408$. So we can say that process M would not actually be viable if there were no opportunity to process these products further.

A further interesting perspective on the process viability issue would emerge if the company didn't have the global monopoly

9 EXAM HOWLERS

If you want to impress the examiner, here are a few things that you *shouldn't* write on your answer paper:

- "The company should stop producing joint product X and increase its production of joint product Y."
- "The company should value inventory using the FIFO method, rather than AVCO, because this would generate more shareholder wealth."
- "In a further processing decision, we can further process all joint products or none of them. It's impossible for us to process some further and not others." If you are not sure why any of these three statements are wrong, then it would be a good idea to go through this article again in detail and revisit your original study materials on process costing.

on the sale of all of its products. This would mean that it might be possible to acquire A and C from elsewhere as an alternative to manufacturing them. Given the market prices in the question, it would be more profitable to discontinue process M and simply perform the further processing on these purchased materials.

The sample question raises the following key points:

- Different methods of inventory valuation – eg, FIFO, AVCO etc – do not affect long-term profit, cash flow or shareholder wealth. They can affect the timing of the profits and as such they can have an impact on the value of short-term financial accounting profits and inventory valuation. This should not affect managerial decision-making.
- Different methods of apportioning common costs between joint products (weight of output, value of output) do not affect long-term profit, cash flow or shareholder wealth. This should not affect managerial decision-making.
- We can't choose to produce some joint products and not others. We also can't choose the volume of each joint product. We can choose whether to run the whole process or not. If we choose to run it, we must accept whatever combination of joint products emerges.
- Once the process is complete and the joint products have been split off, we can then make individual decisions about which joint products should undergo further processing and which should not. **FM**

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P2 Recommended reading

C Wilks, *Management Accounting – Decision Management Study System*, 2006 edition, CIMA Publishing, 2005.
 C Drury, *Management and Cost Accounting*, International Thomson Business Press, 2000.
 C Horngren et al, *Management and Cost Accounting*, FT/Prentice Hall, 2002.