Joint Costs

1. Definitions

Joint Cost Allocation: A cost allocation problem arises when two or more products (frequently intermediate products) emerge from a single production process. This situation is common in the manufacture of chemicals, semiconductors, and agricultural products.

Split-off Point: the stage of production at which the different individual products can be identified.

Joint Costs: all manufacturing costs incurred prior to the split-off point.

By-product: Products with relatively low sales value that are simultaneously produced in the manufacture of the main product(s).

This note is based on a note by Nahum Melumad.

2. Methods of Joint Cost Allocation

There are four commonly used methods for allocating joint costs:

1. *Physical Measure Method*: Some common physical measure is used to describe the "quantity" of each product produced. This may be weight, volume, or BTUs (a measure of thermal energy). The joint costs are then allocated in proportion to the chosen physical measure at split-off point.

2. *Sales Value at Split-off Point Method*: If a market price can be established for the (intermediate) products at the split-off point, the joint costs can be allocated in proportion to the sales value of the products. These values are calculated by multiplying the prices by the quantities that the joint process yields.

3. *Net-Realizable Value (NRV) Method*: Here, we focus on the sales value of the *finished* products; we take into consideration the incremental costs incurred subsequent to the split-off point. The net-realizable value of a product is the final sales price minus incremental processing costs. Under this method, joint costs are allocated in proportion to their net-realizable values.

   NOTE: Complications might arise when there is more than one split-off point. See Appendix II.

4. *Constant Gross Margin Percentage NRV Method*: This method allocates the joint costs such that overall gross margin percentage is identical for each individual product. To achieve this we follow the following three steps:

   Step 1: Compute overall GM%.

   Step 2: For each product, deduct GM from sales value to get the Cost of Goods Sold (CGS).

   Step 3: Deduct separable costs from the CGS (calculated in step 2) to get the joint cost allocation.

3. Key Point

Any method for assigning joint costs to joint products or by-products is useful *only* for the purpose of product costing; any such allocation is *useless* for planning or control purposes.

4. Accounting Methods for By-products and Scrap

- Recognition at point of production
- Recognition at point of sale

For an illustration of these methods via journal entries see Appendix I.

5. Example

The Happy Wimp Co. is in the business of processing corn into oil, sugar, meal, and chaff. Each month the Happy Wimp Co. processes 20,000 pounds. The yields, additional processing costs, and selling prices are:

Product	*Yield*	*Sales Value at Split-off Point*	*Added Costs*	*Price per lb.*
Oil	200 lbs.	$1.25	.50 per lb.	$2.00
Sugar	200 lbs.	.80	.30 per lb.	1.30
Meal	500 lbs.	.40	.20 per lb.	.60
Chaff	100 lbs.	.10	—	.10

Joint processing costs per 1,000 pounds are: raw materials $100, labor $80, and depreciation $4,000/20 = $200; Total $380.

REQUIRED: Allocate the total joint costs to the different products according to the four allocation methods. Treat chaff as a main product.

Answer:

1. Allocate by physical volume:

Oil	(200/1000)(380)	=	76
Sugar	(200/1000)(380)	=	76
Meal	(500/1000)(380)	=	190
Chaff	(100/1000)(380)	=	38
			$380

2. Allocate by relative sales value at split-off point:

Oil	(1.25) × (200)	=	250	(250/620) × (380)	=	153
Sugar	(.80) × (200)	=	160	(160/620) × (380)	=	98
Meal	(.40) × (500)	=	200	(200/620) × (380)	=	123
Chaff	(.10) × (100)	=	10	(10/620) × (380)	=	6
			$620			$380

3. Allocate by NRV:

Oil	$(2.0 - .5)(200)$	=	300	$(300/710)(380)$	=	161
Sugar	$(1.3 - .3)(200)$	=	200	$(200/710)(380)$	=	107
Meal	$(.6 - .2)(500)$	=	200	$(200/710)(380)$	=	107
Chaff	$(.1 - 0)(100)$	=	10	$(10/710)(380)$	=	5
			\$710			\$380

4. Constant GM%

Total Sales Value	\$970
Costs:	
Joint	380
Separable	260
GM	\$330

so the GM ratio is 33/97.

	Oil	*Sugar*	*Meal*	*Chaff*
Sales Value	400	260	300	10
GM (33/97)	136	88	102	4
CoGS	264	172	198	6
Sep. Costs	100	60	100	—
Allocated Joint Costs	164	112	98	6

APPENDIX I: By-products and Scrap

1. *Recognition at point of production*

   a. At production

Chaff Inventory*	$10	
WIP (oil, sugar, meal)**		10

* Valued at NRV — net of disposal cost when applicable.
** Or credit Joint Cost if we have such an account.

   b. At sale of Chaff

CGS	10	
Chaff Inventory		10
Cash	10	
Revenue		10

2. *Recognition at point of sale (of Chaff)*

   a. At production

   no entries

   b. At sale

Cash	10	
Revenue		10

APPENDIX II

NRV under Multiple Split-Off Points: An Example of the Backward-Forward Method

Department 1 has costs of \$100,000 that are to be allocated between intermediate joint products A and B. Product A is processed further in Department 2 which has costs of \$60,000; final products C and D emerge. Similarly, product B is processed further in Department 3 which has costs of \$200,000; final products E and F emerge. The net realizable value method is to be used for joint cost allocation by all three departments. There are no established market prices for A and B.

Although one could immediately allocate the cost of Departments 2 and 3, another approach is to determine the net realizable value (NRV) of A and B so that the cost of Department 1 can be allocated first:

$$\text{NRV of } A: \quad (\$10 \times 10{,}000) + (\$5 \times 4{,}000) - \$60{,}000 = \$60{,}000$$
$$\text{NRV of } B: \quad (\$10 \times 4{,}000) + (\$20 \times 20{,}000) - \$200{,}000 = \$240{,}000$$

Hence, $\frac{60}{300}$ (i.e., $\frac{1}{5}$) of Department 1's cost of \$100,000 is allocated to product A and $\frac{240}{300}$ (i.e., $\frac{4}{5}$) to product B. Thus, Department 2's cost should be revised to

$$\$60{,}000 + \frac{1}{5}(\$100{,}000) = \$80{,}000$$

and Department 3's should be revised to

$$\$200{,}000 + \frac{4}{5}(\$100{,}000) = \$280{,}000.$$

Since

$$\begin{aligned}&\text{NRV of } C\text{:} && \$10 \times 10{,}000 = \$100{,}000\\ &\text{NRV of } D\text{:} && \$5 \times 4{,}000 = \$20{,}000,\end{aligned}$$

product C is allocated $\frac{100}{120}$ of \$80,000 and D the remaining $\frac{20}{120}$. Similarly, for D3,

$$\begin{aligned}&\text{NRV of } E\text{:} && \$10 \times 4{,}000 = \$40{,}000\\ &\text{NRV of } F\text{:} && \$20 \times 20{,}000 = \$400{,}000,\end{aligned}$$

so E is allocated $\frac{40}{440}$ of \$280,000 and F the remaining $\frac{400}{440}$. The final per-unit costs of C, D, E, and F are therefore as follows:

$$\text{(C)} \qquad \frac{\frac{5}{6}(\$80{,}000)}{10{,}000 \text{ units}} = \frac{\$66{,}667}{10{,}000} = \$6.6667$$

$$\text{(D)} \qquad \frac{\frac{1}{6}(\$80{,}000)}{4{,}000 \text{ units}} = \frac{\$13{,}333}{4{,}000} = \$3.3333$$

$$\text{(E)} \qquad \frac{\frac{1}{11}(\$280{,}000)}{4{,}000 \text{ units}} = \frac{\$25{,}454}{4{,}000} = \$6.3635$$

$$\text{(F)} \qquad \frac{\frac{10}{11}(\$280{,}000)}{20{,}000 \text{ units}} = \frac{\$254{,}546}{20{,}000} = \$12.7273$$

This method can always be successfully applied, provided (1) we are given the final sales value and the costs of each department and (2) there are no "loops," that is, products originating at prior split-off points and are later recombined.