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:

<table>
<thead>
<tr>
<th>Product</th>
<th>Yield</th>
<th>Sales Value at Split-off Point</th>
<th>Added Costs</th>
<th>Price per lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>200 lbs.</td>
<td>$1.25</td>
<td>.50 per lb.</td>
<td>$2.00</td>
</tr>
<tr>
<td>Sugar</td>
<td>200 lbs.</td>
<td>.80</td>
<td>.30 per lb.</td>
<td>1.30</td>
</tr>
<tr>
<td>Meal</td>
<td>500 lbs.</td>
<td>.40</td>
<td>.20 per lb.</td>
<td>.60</td>
</tr>
<tr>
<td>Chaff</td>
<td>100 lbs.</td>
<td>.10</td>
<td>—</td>
<td>.10</td>
</tr>
</tbody>
</table>

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:

\[
\begin{align*}
\text{Oil} & \quad \frac{200}{1000} \times 380 = 76 \\
\text{Sugar} & \quad \frac{200}{1000} \times 380 = 76 \\
\text{Meal} & \quad \frac{500}{1000} \times 380 = 190 \\
\text{Chaff} & \quad \frac{100}{1000} \times 380 = 38 \\
\end{align*}
\]

$380

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

\[
\begin{align*}
\text{Oil} & \quad (1.25) \times (200) = 250 \quad (250/620) \times (380) = 153 \\
\text{Sugar} & \quad (.80) \times (200) = 160 \quad (160/620) \times (380) = 98 \\
\text{Meal} & \quad (.40) \times (500) = 200 \quad (200/620) \times (380) = 123 \\
\text{Chaff} & \quad (.10) \times (100) = 10 \quad (10/620) \times (380) = 6 \\
\end{align*}
\]

$620

$380
3. Allocate by NRV:

\[
\begin{align*}
\text{Oil} & \quad (2.0 - .5)(200) = 300 \quad (300/710)(380) = 161 \\
\text{Sugar} & \quad (1.3 - .3)(200) = 200 \quad (200/710)(380) = 107 \\
\text{Meal} & \quad (.6 - .2)(500) = 200 \quad (200/710)(380) = 107 \\
\text{Chaff} & \quad (.1 - 0)(100) = 10 \quad (10/710)(380) = 5 \\
\end{align*}
\]

\[
\begin{align*}
\text{Total} & \quad 710 \\
\text{Total} & \quad 380 \\
\end{align*}
\]

4. Constant GM%

\[
\begin{align*}
\text{Total Sales Value} & \quad 970 \\
\text{Costs:} & \\
\text{Joint} & \quad 380 \\
\text{Separable} & \quad 260 \\
\text{GM} & \quad 330 \\
\end{align*}
\]

so the GM ratio is 33/97.

\[
\begin{align*}
\text{Sales Value} & \quad 400 \quad 260 \quad 300 \quad 10 \\
\text{GM (33/97)} & \quad 136 \quad 88 \quad 102 \quad 4 \\
\text{CoGS} & \quad 264 \quad 172 \quad 198 \quad 6 \\
\text{Sep. Costs} & \quad 100 \quad 60 \quad 100 \quad - \\
\text{Allocated Joint Costs} & \quad 164 \quad 112 \quad 98 \quad 6 \\
\end{align*}
\]
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

- **NRV of C**: $10 \times 10,000 = 100,000$
- **NRV of D**: $5 \times 4,000 = 20,000$,

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

- **NRV of E**: $10 \times 4,000 = 40,000$
- **NRV of F**: $20 \times 20,000 = 400,000$,

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:

- **(C)** \(\frac{5}{6}(80,000) = \frac{66,667}{10,000} = 6.6667\)
- **(D)** \(\frac{1}{5}(80,000) = \frac{13,333}{4,000} = 3.3333\)
- **(E)** \(\frac{4}{11}(280,000) = \frac{25,454}{4,000} = 6.3635\)
- **(F)** \(\frac{10}{11}(280,000) = \frac{254,546}{20,000} = 12.7273\)

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.