

CC 4.2 Ch /Cg
Cost and Management Accounting –II

Unit 1: Joint Product & By product

MEANING OF JOINT PRODUCTS AND BY- PRODUCTS

Agricultural product industries, chemical process industries, sugar industries, and extractive industries are some of the industries where two or more products of equal or unequal importance are produced either simultaneously or in the course of processing operation of a main product.

In all such industries, the management is faced with the problems such as, valuation of inventory, pricing of product and income determination, problem of taking decision in matters of further processing of by-products and/or joint products after a certain stage etc. In fact, the various problems relate to

- (i) apportionment of common costs incurred for various products and
- (ii) aspects other than mere apportionment of costs incurred upto the point of separation.

Before taking up the above problems, we first define the various necessary concepts.

(i) Joint Products - Joint products represent “two or more products separated in the course of the same processing operation usually requiring further processing, each product being in such proportion that no single product can be designated as a major product”.

In other words, two or more products of equal importance, produced, simultaneously from the same process, with each having a significant relative sale value are known as joint products. For example, in the oil industry, gasoline, fuel oil, lubricants, paraffin, coal tar, asphalt and kerosene are all produced from crude petroleum. These are known as joint products.

(ii) By-Products - These are defined as “products recovered from material discarded in a main process, or from the production of some major products, where the material value is to be considered at the time of severance from the main product.” Thus by- products emerge as a result of processing operation of another product or they are produced from the scrap or waste of materials of a process. In short a by-product is a secondary or subsidiary product which emanates as a result of manufacture of the main product.

The point at which they are separated from the main product or products is known as split-off point. The expenses of processing are joint till the split –off point.

Examples of by-products are molasses in the manufacture of sugar, tar, ammonia and benzole obtained on carbonisation of coal and glycerin obtained in the manufacture of soap.

Distinction between Joint-Product and By-Product - The main points of distinction

As apparent from the definitions of Joint Products and By-Products are:

- (a) Joint products are of equal importance whereas by-products are of small economic value.
- (b) Joint products are produced simultaneously but the by-products are produced incidentally in addition to the main products.

(iii) Co-Products- Joint products and co-products are used synonymously in common parlance, but strictly speaking a distinction can be made between two. Co-products may be defined as two or more products which are contemporary but do not emerge necessarily from the same material in the same process. For instance, wheat and gram produced in two separate farms with separate processing of cultivation are the co- products. Similarly, timber boards made from different trees are co-products.

APPORTIONMENT OF JOINT COSTS

Joint product costs occur in many industries such as petroleum, oil refinery, textiles, dairy, food processing and many other process industries. The management of business concerns

require accurate and reliable cost information related with the joint products to make managerial decisions such as to process further or to sell at split-off stage. To arrive at either decision, it is necessary to know the share of joint costs to be apportioned to the different joint products.

Joint costs are the expenditures incurred upto the point of separation i.e. split-off point. The main problem faced in the case of joint products/ by-products is the apportionment of this joint costs to joint products/ or by products. For costs incurred after the split off point there is no problem, as these costs can be directly allocated to individual joint products or by-products.

METHODS OF APPORTIONMENT OF JOINT COST TO JOINT PRODUCTS

Proper apportionment of joint cost over the joint products is of considerable importance, as this affects (a) Valuation of closing inventory; (b) Pricing of products; and (c) Profit or loss on the sale of different products.

The commonly used methods for apportioning total process costs upto the point of separation over the joint products are as follows:

- (i) Physical Units Method
- (ii) Net Realisable Value at split-off point
- (iii) Using Technical Estimates

Some other methods, which managers may also use for making decisions are:

- (i) Market value at the point of separation
- (ii) Market value after further processing
- (iii) Average unit cost method
- (iv) Contribution margin method

(i) Physical Unit Method: This method is based on the assumption that the joint products are capable of being measured in the same units. Accordingly, joint costs here are apportioned on the basis of some physical base, such as weight, numbers etc. In other words, the basis used for apportioning

joint cost over the joint products is the physical volume of material present in the joint products at the point of separation. Any loss arises during the joint production process is also apportioned over the products on the same basis. This method cannot be applied if the physical units of the two joint products are different. The main defect of this method is that it gives equal importance and value to all the joint products.

(ii) Net Realisable Value at Split-off Point

Method: in this method of joint cost apportionment the followings are deducted from the sales value of joint products at final stage i.e. After processing:

- (i) Estimated profit margins,
- (ii) Selling and distribution expenses, if any, and
- (iii) Post split- off costs.

The resultant figure so obtained is known as net realisable value of joint products. Joint costs are apportioned in the ratio of net realisable value.

The net realisable value at split-off point method is widely used in the industries. This method is used when the realisable value of joint products at split-off is not known.

- (iv) Using Technical Estimates:** This method uses technical estimates to apportion the joint costs over the joint products. This method is used when the result obtained by the above methods does not match with the resources consumed by joint products or the realisable value of the joint products are not readily available.

Other Methods

The followings are the methods which are used by management for taking managerial decisions:

- (i) Market value at the point of separation:** This method is used for the apportionment of joint costs to joint products upto the split off point. It is difficult to apply this method if the market value of the products at the point of separation is not available. It is a useful method where further processing costs are incurred disproportionately.

To determine the apportionment of joint costs over joint products, a factor known as multiplying factor is determined.

This multiplying factor on multiplication with the sales values of each joint product gives rise to the proportion of joint cost.

$$\text{Multiplying factor} = \frac{\text{Joint Cost}}{\text{Total Sales Revenue}} \times 100$$

- (ii) **Market value after further processing:** Here the basis of apportionment of joint cost is the total sales value of finished products and involves the same principle as discussed above. The use of this method is unfair where further processing costs after the point of separation are disproportionate or when all the joint products are not subjected to further processing. The net realisable value method which is discussed as above overcomes the shortcoming of this method.
- (iii) **Average Unit Cost Method:** Under this method, total process cost (upto the point of separation) is divided by total

Average unit cost = Total process cost (upto the point of separation) ÷ Total units of joint product produced.

units of joint products produced. On division average cost per unit of production is obtained.

This is a simple method. The effect of application of this method is that all joint products will have uniform cost per unit. If this method is used as the basis for price fixation, then all the products may have more or less the same price. Under this method customers of high quality items are benefitted as they have to pay less price on their purchase.

- (iv) **Contribution Margin Method:** According to this method, joint costs are segregated into two parts - variable and fixed. The variable costs are apportioned over the joint products on the basis of units produced (average method) or physical quantities. In case the products are further processed after the point of separation, then all variable cost incurred be added to the variable costs determined earlier. In this way total variable cost is arrived which is deducted from their respective sales values to ascertain their contribution. The fixed costs are then apportioned over the joint products on the basis of the contribution ratios.

METHODS OF APPORTIONMENT OF JOINT COST TO BY-PRODUCTS

The following methods may be adopted for the accounting of by-products and arriving at the cost of production of the main product:

(i) **Net Realisable Value method:** The realisation on the disposal of the by-product may be deducted from the total cost of production so as to arrive at the cost of the main product. For example, the amount realised by the sale of molasses in a sugar factory goes to reduce the cost of sugar produced in the factory.

When the by-product requires some additional processing and expenses are incurred in making it saleable to the best advantage of the concern, the expenses so incurred should be deducted from the total value realised from the sale of the by-product and only the net realisations should be deducted from the total cost of production to arrive at the cost of production of the main product. Separate accounts should be maintained for collecting additional expenses incurred on:

- (a) further processing of the by-product, and
- (b) selling, distribution and administration expenses attributable to the by-product.

(ii) **Standard cost in Technical Estimates:** By-products may be valued at standard costs. The standard may be determined by averaging costs recorded in the past and making technical estimates of the number of units of original raw material going into the main product and the number forming the by-product or by adopting some other consistent basis.

This method may be adopted where the by-product is not saleable in the condition in which it emerges or comparative prices of similar products are not available.

(iii) **Comparative price:** Under this method, the value of the by-product is ascertained with reference to the price of a similar or an alternative material.

Suppose in a large automobile plant a blast furnace not only produces the steel required for the car bodies but also produces gas which is utilised in the factory. This gas can be valued at the price which would have been paid to a gas company if the factory were to buy it from outside sources.

(iv) Re-use basis: In some cases, the by-product may be of such a nature that it can be reprocessed in the same process as part of the input of the process. In that case the value put on the by-product should be same as that of the materials introduced into the process. If, however, the by-product can be put into an earlier process only, the value should be the same as for the materials introduced into the process.

TREATMENT OF BY-PRODUCT COST IN COST- ACCOUNTING

By-product cost can be dealt in cost accounting in the following ways:

(a) When they are of small total value: When the by-products are of small total value, the amount realised from their sale may be dealt in any one the following two ways:

1. The sales value of the by-products may be credited to the Costing Profit and Loss Account and no credit be given in the Cost Accounts. The credit to the Costing Profit and Loss Account here is treated either as miscellaneous income or as additional sales revenue.
2. The sale proceeds of the by-product may be treated as deductions from the total costs. The sale proceeds in fact should be deducted either from the production cost or from the cost of sales.

(b) When the by-products are of considerable total value: Where by-products are of considerable total value, they may be regarded as joint products rather than as by-products. To determine exact cost of by-products the costs incurred upto the point of separation, should be apportioned over by-products and joint products by using a logical basis. In this case, the joint costs may be divided over joint products and by-products by using relative market values; physical output method (at the point of split off) or

ultimate selling prices (if sold).

(c) Where they require further processing: In this case, the net realisable value of the by-product at the split-off point may be arrived at by subtracting the further processing cost from the realisable value of by-products.

If total sales value of by-products at split-off point is small, it may be treated as per the provisions discussed above under (a).

In the contrary case, the amount realised from the sale of by-products will be considerable and thus it may be treated as discussed under (b).