

chapter 8

Joint Cost Allocation and Variable Costing



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Learning Objectives

After studying Chapter 8, you will be able to:

- Use three different methods to allocate joint product costs.
- Explain how to handle situations involving byproducts and scrap.
- Recast absorption costing income statements into variable costing income statements.
- Reconcile the differences between absorption costing net income and variable costing net income.
- Understand arguments supporting both variable costing and absorption costing.

Chapter Outline

8.1 Joint Cost Allocation

- Physical Measures of Output
- Relative Sales Value
- Net Realizable Value
- Byproducts and Scrap

8.2 Variable Costing

- Characteristics of Variable Costing
- Comparing Variable Costing and Absorption Costing
- Reconciliation of Variable and Absorption Costing
- Arguments for Either Costing Method
- Effects of New Manufacturing Environments

Should We Hide the Joint Cost Assigned to Hides?

Dianne Leader, president of Toco Hills Meatpackers, has just received the first quarter financial statements from her vice-president and controller, Bruce Berger. She immediately sees that while profits from the various meat products are up from the previous quarter, the profits from hides are down considerably. She calls Bruce and asks, "Can you tell me why costs for the hides appear to be so high?" Bruce responds, "No, but I'll look into it and get an answer for you by tomorrow at this time."

Like clockwork, Bruce knocks on the president's door, enters, and hands Dianne a one-page report. "Ah, the joint cost allocation to hides seems to be out of line," Dianne says with a frown. "You know," Dianne tells Bruce, "if I had to bet on it, I'd wager some big bucks that you changed the way joint costs are assigned to our products."

Indeed, the way joint costs are assigned to joint products that are produced by a company can greatly affect the reported profits from the various products. So, how should these costs be assigned?

8.1 Joint Cost Allocation

Production processes can sometimes spawn multiple products from common inputs and processing. These are called **joint products**. An example is a refinery where crude oil is processed into joint products of gasoline, heating oil, and motor oil. The costs of materials and processing up until individual products are identifiable are referred to as **joint costs**. This point at which the individual products become identifiable is known as the **split-off point**. Until this point, the common input is a single product. The joint costs are allocated to the joint products for some product costing purposes such as external financial statement presentation and product pricing. In previous chapters, we have allocated costs using cost drivers that measure inputs such as labor hours or machine hours. However, input measures are not feasible for allocating joint costs since the joint products are not

individually distinguishable until the split-off point, and hence, one cannot identify the amount of input associated with each product that emerges at the split-off point. Three common joint cost allocation methods—all based on outputs—are discussed next.

Physical Measures of Output

Physical measures of output reflect some quantifiable physical characteristics of the joint products. Examples include number of units, weight, liquid volume, and length. The joint costs would be allocated in proportion to each product's output measure. Consider the Vexler Mining Company, which mines ore, and after separating the ore in a smelter, sells the individual outputs to jewelry and industrial manufacturers. Suppose that \$400,000 in materials, labor, and overhead was incurred to mine a total of 100,000 ounces of the following three metals:

<u>Mineral</u>	<u>Amount</u>
Gold	10,000 ounces
Silver	20,000 ounces
Copper	70,000 ounces

The joint cost allocations would be as follows:

$$\text{Allocation to gold: } (10,000 \div 100,000) \times \$400,000 = \$40,000$$

$$\text{Allocation to silver: } (20,000 \div 100,000) \times \$400,000 = \$80,000$$

$$\text{Allocation to copper: } (70,000 \div 100,000) \times \$400,000 = \$280,000$$

This method is generally simple to use, but has two potential major drawbacks. First, the outputs may have different units of measure. For instance, consider a petroleum refinery that produces gasoline and paraffin from a joint process. A common measure for gasoline, a liquid, would be gallons; for paraffin, a solid, a common measure would be pounds.

A second limitation is that physical measures may be unrelated to the profitability of the joint products. Why is this an important consideration? The reason relates to why joint costs are incurred. Since joint costs are incurred because of the value that will be received from selling the joint products, the allocation of these joint costs should be related to the products' values. For Vexler Mining Company, 70 percent of the joint cost was allocated to copper. Suppose, however, that gold accounts for 90 percent of the three metals' total revenues. Clearly, the gold is what motivates Vexler to spend \$400,000 to mine the ore, yet it receives only 10 percent of the joint costs, while copper is charged with seven times as much.

Relative Sales Value

The **relative sales value (RSV)** approach allocates joint costs in proportion to the joint products' total sales values at the split-off point. Assume the following sales values for Vexler Mining Company's joint products:

<u>Mineral</u>	<u>Sales values</u>
Gold	\$500,000
Silver	200,000
Copper	100,000

Under the RSV method, the joint cost allocations would be as follows:

$$\text{Allocation to gold: } (\$500,000 \div \$800,000) \times \$400,000 = \$250,000$$

$$\text{Allocation to silver: } (\$200,000 \div \$800,000) \times \$400,000 = \$100,000$$

$$\text{Allocation to copper: } (\$100,000 \div \$800,000) \times \$400,000 = \$50,000$$

Net Realizable Value

A potential problem with the RSV approach is that sales prices at the split-off point may not be readily available. Moreover, there might not even be a market for one or more of the joint products at the split-off point. Further processing may be necessary to sell some products. **The net realizable value (NRV)** method uses approximations of sales values at the split-off point. NRV is the total sales revenue of the product in its final form less any **separable costs**. The latter consist of costs incurred after the split-off point, and as such, can be traced to the individual products. Separable costs include processing costs, selling costs, and disposal costs.

Suppose that after Vexler Mining Company smelts its ore, it incurs some costs to get the metals ready for sale to manufacturers. These separable costs, the products' revenues, and the resulting NRVs are as follows:

<u>Mineral</u>	<u>Separable costs</u>	<u>Revenues</u>	<u>NRV</u>
Gold	\$10,000	\$550,000	\$540,000
Silver	12,000	252,000	240,000
Copper	15,000	135,000	120,000

For the NRV method, the joint cost allocations would be as follows:

$$\text{Allocation to gold: } (\$540,000 \div \$900,000) \times \$400,000 = \$240,000$$

$$\text{Allocation to silver: } (\$240,000 \div \$900,000) \times \$400,000 = \$106,667$$

$$\text{Allocation to copper: } (\$120,000 \div \$900,000) \times \$400,000 = \$53,333$$

Occasionally, a situation may arise where a product's NRV is negative. When this happens, none of the joint cost should be allocated to that product.

Byproducts and Scrap

Byproducts and scrap are products that emerge with joint (main) products but have minor sales value compared to the joint products. **Byproducts** are often processed after the split-off point, while **scrap** is usually discarded. The accounting treatment, though, is the same for both byproducts and scrap. Joint costs are not allocated to byproducts or scrap. The rationale for this treatment is that joint costs are incurred to produce the main products—not byproducts or scrap.

Revenue from byproducts or scrap is usually handled in one of two ways:

1. Recognize miscellaneous income from the NRVs of byproducts and scrap.
2. Deduct the NRVs of byproducts and scrap from the joint costs that are allocated to the main products.

The rationale for the second approach builds on the argument we mentioned for not allocating joint costs to byproducts or scrap. That is, the joint production process is undertaken for the profits to be earned from main products—not byproducts or scrap. Therefore, no profit should be recognized on byproducts or scrap. In effect, the second method shifts any profit (NRV) on byproducts and scrap to the main products by reducing the joint costs assigned to the main products.

As an example, suppose that sulphur is a byproduct at Vexler Mining Company. Using the RSV method, together with the RSVs given earlier for the three joint products, suppose now that sulphur could be sold at the split-off point for \$8,000 after incurring separable costs of \$2,000. With the miscellaneous income approach, \$6,000 (\$8,000 - \$2,000) in miscellaneous income would appear on Vexler's income statement from the sale of sulphur. Under the alternate approach, joint costs of \$394,000 (\$400,000 - \$6,000) would be allocated to the main products as follows:

$$\text{Allocation to gold: } (\$500,000 \div \$800,000) \times \$394,000 = \$246,250$$

$$\text{Allocation to silver: } (\$200,000 \div \$800,000) \times \$394,000 = \$98,500$$

$$\text{Allocation to copper: } (\$100,000 \div \$800,000) \times \$394,000 = \$49,250$$

8.2 Variable Costing

Variable costing (also known as **direct costing**) is an approach to product costing that assigns only variable manufacturing costs (direct materials, direct labor, and variable factory overhead) to items produced. Thus, inventoriable costs are limited to the variable manufacturing costs, and period costs include all fixed costs and variable nonmanufacturing costs. **Absorption costing** (also known as **full costing**), the method typically used for external income statement reporting, allocates all manufacturing costs (variable and fixed) to products. This section compares these two costing methods.



Contemporary Practice 8.1

Usage of Variable Costing

In a survey of 148 German and 130 U.S. companies in a cross section of industries, far more German companies labeled their costing system as variable costing—52 percent versus 21 percent. The director of cost accounting and internal audit at Cliffstar remarked, “We like variable costing because it doesn’t ‘muddy up’ the waters with less controllable fixed overhead.” (Krumwiede & Suessmair, 2007, p. 50).

Variable costing, like absorption costing, can be used in conjunction with actual, normal, or standard costing systems. For simplicity, we will restrict our discussion in this chapter to situations in which actual costing is used.

Characteristics of Variable Costing

The two costing methods vary as to the cost elements for product costs, the difference in inventory values, and the difference in profits. These differences all result from one basic item—the treatment of fixed manufacturing costs. Absorption costing includes these costs in product costs while variable costing considers them as period costs to be included with the operating expenses. The following summary contrasts the two costing approaches:

<u>Cost category</u>	<u>Variable costing</u>	<u>Absorption costing</u>
Direct materials	Product	Product
Direct labor	Product	Product
Variable factory overhead	Product	Product
Fixed factory overhead	Period	Product
Marketing expenses	Period	Period
Administrative expenses	Period	Period

Variable costing typically uses a contribution margin approach as a reporting format. Variable marketing and administrative costs are included in the computation of the contribution margin. However, variable marketing and administrative costs are not product costs. While we will portray variable costing income statements using the contribution format, we will use the traditional format for the absorption costing income statements. A comparison of the two approaches appears below:

<u>Variable costing</u>	<u>Absorption costing</u>
Sales revenue	Sales revenue
– Variable cost of goods sold	<u>– Cost of goods sold</u>
<u>– Other variable costs</u>	= Gross margin
= Contribution margin	<u>– Selling & administrative expenses</u>
– Fixed manufacturing costs	= Net income
<u>– Fixed nonmanufacturing costs</u>	
= Net income	

Deciding between variable costing and absorption costing has an impact on inventory values and profits because of the variation in the treatment of fixed factory overhead. Although the profit can differ between the two costing methods, profit under variable costing is not always higher or lower than absorption costing. The difference between profits under the two methods is determined by the relationship of production to sales. Assuming that the fixed manufacturing costs per unit remain the same from one period to the next, we have three possibilities, as follows:

	<u>Net Income</u>
Production units equal sales units	AC = VC
Production units greater than sales units (building inventory)	AC > VC
Production units less than sales units (liquidating inventory)	AC < VC
AC = Absorption costing	VC = Variable costing

The magnitude of any difference in profits is a function of the fixed manufacturing costs per unit and the changes in inventory levels, as we will discuss later.

Comparing Variable Costing and Absorption Costing

Let's assume that Morris the Florist sells one type of floral arrangement. In its first year, 2014, Morris the Florist produced 100,000 arrangements and sold 75,000 at \$25 each. The costs for the year are:

<u>Production costs (per unit):</u>	
Materials	\$3.00
Labor	8.00
Variable overhead	5.00
Fixed overhead (\$200,000/100,000 units)	2.00
<u>Marketing and administrative costs:</u>	
Variable	\$1.00 per unit sold
Fixed	\$150,000

The absorption costing income statement that reflects these results is as follows:

<u>Absorption costing income statement</u> <u>for the year ended December 31, 2014</u>			
Sales revenue (\$25 × 75,000)			\$1,875,000
Cost of sales:			
Variable (\$16 × 75,000)	\$1,200,000		
Fixed (\$2 × 75,000)	150,000	<u>1,350,000</u>	
Gross profit	\$525,000		
Marketing and administrative expenses:			
Variable (\$1 × 75,000)		\$75,000	
Fixed		<u>150,000</u>	<u>225,000</u>
Net Profit			<u>\$300,000</u>

A variable costing income statement would be as follows:

<u>Variable costing income statement</u> <u>for the year ended December 31, 2014</u>			
Sales revenue (\$25 × 75,000)			\$1,875,000
Variable Costs:			
Production (\$16 × 75,000)	\$1,200,000		
Marketing and administrative (\$1 × 75,000)	<u>75,000</u>	<u>1,275,000</u>	
Contribution margin			\$600,000
Fixed costs:			
Production		\$200,000	
Marketing and administrative	<u>150,000</u>	<u>350,000</u>	
Net Profit			<u>\$250,000</u>

Notice that the variable costing profit is lower than the profit from absorption costing. Why does this happen? The next section answers this question.

Reconciliation of Variable and Absorption Costing

The difference in net profit figures between absorption costing and variable costing is due solely to the treatment of fixed production costs. Absorption costing includes those costs in the inventory costs; variable costing treats them as expenses to be charged to the period incurred. During any given time period, the amount of fixed costs in inventory will increase or decrease as production differs from sales. If production is greater than sales (as is the case with Morris the Florist in 2014), fixed costs in the ending inventory are deferred to future periods under absorption costing. Alternatively, all fixed costs are expensed under variable costing. Therefore, absorption costing will show a higher net profit. Conversely, if sales are greater than production, fixed costs in the beginning inventory are expensed in the current period and added to the fixed costs incurred during the current period. Therefore, fixed costs in the income statement under absorption costing are higher than under variable costing, and the result is a lower net profit for absorption costing.

In the simplified case in which fixed overhead costs per unit are the same in beginning and ending inventories, the difference in net profits is exactly equal to the change in inventory units times the fixed overhead rate per unit. For Morris the Florist, the change in inventory is:

Units produced	100,000
Units sold	<u>75,000</u>
Increase in inventory	<u>25,000</u>

Using a fixed overhead rate of \$2 per unit, the difference in net profits is: $\$2 \times 25,000$ units = \$50,000. Let's check this result:

Absorption costing net profit	\$300,000
Variable costing net profit	<u>250,000</u>
Difference	<u>\$50,000</u>

When the fixed overhead rates are different in beginning and ending inventories, the reconciliation of net profit figures is performed as follows:

Absorption costing net profit	
+ Fixed overhead in beginning inventory	
<u>Fixed overhead in ending inventory</u>	
= Variable costing net profit	

To illustrate, suppose that in 2015, Morris the Florist produces 80,000 floral arrangements and sells 100,000. We will presume the same total fixed costs, unit variable costs, and selling price as in 2014. Morris the Florist uses a FIFO cost flow. As a result, the fixed overhead per unit produced during 2015 is \$2.50 ($\$200,000/80,000$).

The 2015 absorption costing income statement would be as follows:

<u>Absorption costing income statement</u> <u>for the year ended December 31, 2015</u>		
Sales revenue ($\$25 \times 100,000$)		\$2,500,000
Cost of sales:		
Variable ($\$16 \times 100,000$)	\$1,600,000	
Fixed [$(\$2 \times 25,000) + (\$2.50 \times 75,000)$]	<u>237,500</u>	<u>1,837,500</u>
Gross Profit		\$ 662,500
Marketing and administrative expenses:		
Variable ($\$1 \times 100,000$)	\$100,000	
Fixed	<u>150,000</u>	<u>250,000</u>
Net profit		<u>\$412,500</u>

Note that the fixed portion of cost of sales is consistent with the FIFO cost flow assumption. The first 25,000 units come from 2014 production, which had a unit cost of \$2 for fixed overhead; the remaining 75,000 units come from 2015 production, which had a unit cost of \$2.50 for fixed overhead.

The 2015 variable costing income statement would be as follows:

<u>Variable costing income statement</u> <u>for the year ended December 31, 2015</u>		
Sales revenue ($\$25 \times 100,000$)		\$2,500,000
Variable costs:		
Production ($\$16 \times 100,000$)	\$1,600,000	
Marketing and administrative ($\$1 \times 100,000$)	<u>100,000</u>	<u>1,700,000</u>
Contribution margin		\$ 800,000
Fixed costs:		
Manufacturing	\$200,000	
Marketing and administrative	<u>150,000</u>	<u>350,000</u>
Net profit		<u>\$450,000</u>

We reconcile the 2015 net profits as follows:

Absorption costing net profit	\$412,500
+ Fixed overhead in beginning inventory ($\$2 \times 25,000$)	50,000
– Fixed overhead in ending inventory ($\$2.50 \times 5,000$)	<u>(12,500)</u>
= Variable costing net profit	<u>\$450,000</u>

The reconciliation of net profits between the two costing methods is independent of inventory cost flow assumptions. A company can use FIFO, LIFO, or some average cost method; the reconciliation of net profits follows the same procedures.

Another observation about the difference between the two methods relates to the profit patterns over time with respect to production and sales strategies. Let's consider the case of a constant production schedule over time while sales fluctuate each period. The absorption costing net income will fluctuate up and down with sales, but the constant production will have a leveling effect on the swings. The peaks will not be as high nor as low as the corresponding sales changes. Variable costing net income, on the other hand, will have swings that match those of sales, in both direction and relative magnitude. For the situation where production fluctuates while sales remain rather constant, a different picture appears. Absorption costing net income will fluctuate with production, in both direction

and relative magnitude. Variable costing net income will remain constant, corresponding with sales levels.

While absorption and variable costing methods yield different profit figures during periods when units sold do not equal units produced, these are timing differences. If over the course of several time periods, aggregate production equals aggregate sales, then the aggregate profits will be the same for both costing methods despite differences in profits during specific periods.

Arguments for Either Costing Method

Neither variable costing nor absorption costing is correct or incorrect. Their usefulness correlates with management's attitudes and with philosophies of organizational behavior. Some companies will find variable costing extremely useful, while other companies will find it less meaningful. Any manager can make a valid case for either variable or absorption costing. The primary arguments, for and against, are discussed next.

Short Term Versus Long Term. Those who favor variable costing—let's call them the "variable costers"—believe it focuses on the short-term consequences of accounting and is more realistic of the way managers make decisions. Those who favor absorption costing—let's call them the "absorption costers"—assume that long-run performance is more important and that absorption costing more appropriately reflects long-term consequences.

Unethical Behavior By Managers. Variable costers assume that managers can easily adapt to a new accounting method with little additional cost. They further argue that managers will be rewarded for playing games with absorption costing reports. They specifically refer to a manager's ability to manipulate net profit by increasing or decreasing inventory levels that are valued under absorption costing. The absorption costers admit that occasional short-term decisions (e.g., amount of ending inventory to hold) will be made incorrectly. However, over the long term, the mistakes will be more obvious, and the "games" will be discovered by competent superiors. Absorption costers might assert that unethical managers cannot be suddenly rehabilitated by a change in accounting methods.



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Earnings Manipulation with Absorption Costing

An experiment with individuals in graduate and executive education managerial accounting classes, who averaged about six years of full-time work experience, tested whether they would manipulate earnings in an absorption costing setting. Specifically, unit costs could be lowered by merely producing unneeded units. This would lower cost of goods sold, and in turn, increase the reported profit. The study estimated that about 51 percent of the participants would intentionally overproduce in order to meet a targeted pretax income figure. (Schneider, 2004)

Variable Versus Fixed Costs. Variable costers believe that costs can be easily and meaningfully divided into variable and fixed categories and that using a contribution margin is much more useful for planning and decision making and for control and performance evaluation. Since absorption costing is primarily for external reporting purposes, absorption costers do not see this distinction as meaningful for reports. They will also argue that managers can still make the cost behavior distinctions for internal purposes. They also point out that the variable/fixed split is not easily made in practice.

External Versus Internal Reports. Financial statement reporting using generally accepted accounting principles, as well as tax reporting for the Internal Revenue Service, require absorption costing. Variable costers argue that allowing external reporting requirements to dominate how useful and meaningful information should be reported is not a valid philosophy for competent management. Since information should be geared to the needs of management, external requirements should not drive the internal accounting system. Absorption costers argue that to have one set of requirements for external reporting and another set for internal reporting gives managers conflicting and inconsistent information. It also forges an image that the company is hiding something in the two approaches.

Effects of New Manufacturing Environments

Since the major variation between the two methods is the treatment of fixed costs as product or period costs, the difference in net profits disappears when little or no inventory of work in process or finished goods exists. For companies implementing JIT production procedures, inventories will be eliminated or substantially reduced. Hence, the particular costing method chosen loses significance in this environment. Also, this controversy is irrelevant to service organizations that do not carry inventories.

In automated production environments, whether JIT or not, the bulk of labor and factory overhead costs is fixed. Variable costs represent a low percentage of total manufacturing costs. In these environments, therefore, variable costing loses much of its appeal because the product cost will be a small fraction of the total manufacturing cost.

Chapter Summary

Joint costs are allocated to joint products using either physical measures of output, the relative sales value method, or the net realizable value method. No joint costs are allocated to byproducts or scrap, and their net realizable values are either treated as miscellaneous income or as deductions from the costs allocated to the main products.

Variable costing includes only variable manufacturing costs as an element of product cost. The traditional method of income statement preparation is called absorption costing. It includes fixed manufacturing costs as an element of product cost. As a result of this difference, net profit under the two methods will not necessarily be the same. Anytime production exceeds sales, absorption costing yields a higher net profit; when sales exceeds

production, variable costing yields a higher net profit. The arguments for and against using either costing method apply to individual situations and management philosophy. Neither method is inherently correct or incorrect.

Problem for Review

Capland Company processes tobacco into cigarettes and cigars. The normal volume of tobacco that can be processed per month is 30,000 pounds. Including the cost of tobacco, the variable cost in the process is \$0.60/lb. The monthly fixed costs are \$5,000 for the processing department.

The process yields 70% unfiltered cigarettes, 20% cigars, and 10% waste. The unfiltered cigarettes are fitted with filters in the assembly department to obtain finished cigarettes. A pound of tobacco is combined with 0.2 pounds of filtering material to obtain 1.2 pounds of cigarettes. Including the filtering material, the variable cost of processing a pound of cigarettes in the assembly department is \$0.25. The assembly department's fixed cost is \$2,100 per month.

The cigars must be assembled as well. The variable cost of assembling cigars amounts to \$0.45/lb., while the fixed costs are \$700 per month. The finished cigarettes are sold to a packaging company for \$1.40/lb. and the cigars are sold for \$1.62/lb.

Question:

Use the NRV method to determine the amount of joint cost that would be assigned to the output from a 30,000 pound batch of tobacco.

Solution:

The total amount of joint cost is determined as follows:

$$(\$0.60 \times 30,000) + \$5,000 = \$23,000$$

This cost is allocated to the 6,000 pounds of cigars (.2 × 30,000) and 25,200 pounds of cigarettes (.7 × 30,000 × 1.2), but not to the 3,000 pounds of waste (.1 × 30,000). The NRVs are calculated as follows:

$$\text{NRV of cigarettes} = [25,200 \times (\$1.40 - \$0.25)] - \$2,100 = \$26,880$$

$$\text{NRV of cigars} = [6,000 \times (\$1.62 - \$0.45)] - \$700 = \$6,320$$

The allocation of the joint cost is performed as follows:

$$\text{Allocation to cigarettes} = \$23,000 \times (\$26,880 / \$33,200) = \$18,622$$

$$\text{Allocation to cigars} = \$23,000 \times (\$6,320 / \$33,200) = \$4,378$$

Key Terms

absorption costing A product costing method that allocates all manufacturing costs (variable and fixed) to products.

byproducts Products produced from a joint manufacturing process that have minor sales value and are typically processed further beyond the split-off point.

direct costing A product costing method that allocates only variable manufacturing costs to items produced.

full costing A product costing method that allocates all manufacturing costs (variable and fixed) to products.

joint costs The costs of materials and processing common to the production of multiple products that emerge from the joint production process.

joint products The products that emerge from a process where there are common inputs so that the individual products are initially indistinguishable.

net realizable value (NRV) The revenue from the final product less its total separable costs.

relative sales value (RSV) An approach which allocates joint costs based on revenues that can be received from selling the products at the split-off point.

scrap Products produced from a joint manufacturing process that have minor sales value and are not processed further beyond the split-off point.

separable costs Costs incurred beyond the split-off point.

split-off point The point at which the individual products can be identified.

variable costing A product costing method that allocates only variable manufacturing costs to items produced.

Questions for Review and Discussion

1. Name the three methods for allocating joint costs.
2. Explain the practical problem that sometimes prevents the use of the relative sales value method.
3. Differentiate between variable costing and absorption costing.
4. How is it possible to increase net profit using absorption costing when sales are not increasing?
5. A company had a highly labor-intensive manufacturing process. Recently it implemented robotics and a number of other technological changes that made the process capital intensive. What impact would this change make on the inventory valuations for variable costing and for absorption costing?

Exercises

- 8-1. Joint Costs Allocated to Services.** Ron Morray & Associates, a CPA firm, provides audit, tax, and consulting services. The firm spent \$800 recruiting a particu-

lar client, Bernard Birnbaum, who contracted for all three services after a round of golf, a sumptuous meal, and a bottle of fine wine. After the firm's work for Birnbaum was completed, the following information was available:

<u>Service</u>	<u>Fees Charged</u>	<u>Traceable Costs</u>	
		<u>Labor</u>	<u>Overhead</u>
Audit	\$14,000	\$5,200	\$4,000
Tax	10,000	3,000	2,300
Consulting	22,000	9,100	5,500

Question:

- Using the NRV method, allocate the joint cost to the three services.
- 8-2. Joint Cost Allocations and Ending Inventories.** Falk Corporation crushes and refines mineral ore into three products in a joint operation. There were no beginning inventories of any products. Joint costs are \$420,000, resulting in the production of 20,000 pounds of Adelia, 60,000 pounds of Dalewood, and 100,000 pounds of Bramble. Adelia is processed further at a cost of \$100,000 and Dalewood is processed further at a cost of \$200,000. Bramble does not require any further processing.

The results for the current year are:

Adelia: 19,000 lbs. sold at \$20/lb.
 Dalewood: 59,000 lbs. sold at \$6/lb.
 Bramble: 99,000 lbs. sold at \$1/lb.

Question:

- Determine the cost of the ending inventories using the NRV method to allocate joint costs.
- 8-3. Joint Cost Allocation and Income Statements.** Lowenstein Promotions, Inc. produces rock concerts across the country. A recent concert by The Twins was also recorded as a CD. The live concert attracted 9,000 people who paid \$35 per ticket and the CD is projected to sell 26,000 units at \$11 each. Joint costs of the concert and CD amounted to \$300,000. Separable costs are \$2 per ticket and \$3 per unit for the CDs.

Questions:

- Comment on the feasibility of allocating the joint costs based on physical measures.
- Using the NRV method, compute the amount of joint costs to allocate to the live concert and to the CDs.
- Prepare product-line income statements for the live concert and for the CDs.

8-4. Absorption Costing. Leff Corporation incurred the following costs during the year:

Direct Materials	\$10,000	
Direct Labor	30,000	
Other Costs:	<u>Variable</u>	<u>Fixed</u>
Manufacturing	\$15,000	\$25,000
Marketing	5,000	2,000
Administrative	1,000	6,000

Question:

- Under absorption costing, determine the amount that would be classified as product costs.

8-5. Determining Ending Inventory. Natalie Industries uses an absorption costing system. The following data pertain to June:

Operating Income	\$70,000
Beginning Inventory	12,000 units
Fixed Overhead Application Rate	\$2 per unit (May and June)

Michael Ross, the owner, has determined that the operating income would be \$90,000 under variable costing.

Question:

- How many units are in the June ending inventory?

8-6. Inventory and Cost of Goods Sold. Karchava Industries is headquartered in Tbilisi, Republic of Georgia, and has three manufacturing plants near the Black Sea. Nino Aladashvili, the company's cost accountant, reports the following data for October:

Units:	Beginning inventory	135,000
	Production	?
	Sales	250,000
	Ending inventory	142,000
Costs (in lari):	Beginning inventory	7,000,000
	Variable manufacturing costs	19,000,000
	Fixed manufacturing costs	8,000,000
	Variable selling & administrative costs	9,000,000

Questions:

1. Compute the unit cost of the inventory produced during October using variable costing.
 2. Compute the unit cost of the inventory produced during October using absorption costing.
 3. If the company uses absorption costing and assumes a FIFO cost flow, what is the cost of goods sold for October?
- 8-7. Variable Costing Income Statement.** Nahmias Bee Hives produces honey for sale to various food manufacturers. The income statement for last year, prepared on an absorption costing basis, is as follows:

Number of containers produced and sold	<u>250,000</u>
Sales revenue	\$2,000,000
Cost of goods sold	<u>1,500,000</u>
Gross profit	\$ 500,000
Operating expenses (includes variable costs of \$125,000)	<u>225,000</u>
Profit before income taxes	\$ 275,000
Income taxes	<u>110,000</u>
Profit after income taxes	<u>\$ 165,000</u>

The fixed production cost per container of honey was \$2.00.

Question:

1. Revise the income statement on a variable costing basis.
- 8-8. Variable Costing and Inventory Decrease.** Gershon Memory Chips reduced its finished goods inventory in 2013 from 80,000 units at the beginning of the year to 50,000 units at the end of the year. Fixed manufacturing overhead of \$1,360,000 was incurred, and 170,000 units were produced during the year. The fixed overhead cost per unit was the same as in 2012. Variable manufacturing cost per unit was \$9. Each unit of product was sold for \$20.

Questions:

1. Prepare an income statement for the manufacturing operation in 2013 using absorption costing.
2. Prepare an income statement for the manufacturing operation in 2013 using variable costing.
3. Provide a reconciliation for the difference in profit between the two methods. Comment.

Problems

8-9. Joint Cost Allocation Methods. Wooly Jumbuck Enterprises purchases raw materials and processes them into more refined products. In July, Wooly Jumbuck purchased raw materials for \$40,000. Conversion costs of \$60,000 were incurred up to the split-off point, at which time two salable products were produced: Product A and Product B. Product B can be further processed into Product C. The July production and sales information were:

	<u>Production</u>	<u>Sales</u>	<u>Sales price</u>
Product A	1,200 tons	1,200 tons	\$50 per ton
Product B	800 tons		
Product C	500 tons	500 tons	\$200 per ton

All 800 tons of Product B were further processed, at an incremental cost of \$20,000, to yield 500 tons of Product C. There were no byproducts or scrap from this further processing of Product B.

There is an active market for Product B. Wooly Jumbuck could have sold all of its July production of Product B for \$75 per ton.

Questions:

1. Allocate the joint costs using the relative sales value method.
2. Allocate the joint costs using the physical measures method.
3. Allocate the joint costs using the net realizable value method.

8-10. Joint Cost Allocation and Inventory Costs. Jerry's Wine Garden produces three wine products (Red, White, and Rose) as the result of initial joint processing plus separable processing after the split-off point. Records for July show the following:

	<u>Red</u>	<u>White</u>	<u>Rose</u>	<u>Total</u>
Materials used	–	–	–	\$150,000
Direct labor				70,000
Production overhead cost	–	–	–	100,000
Separable processing costs	\$50,000	\$80,000	\$70,000	–
Bottles produced	6,000	12,000	6,250	–
Bottles sold	4,000	9,000	4,250	–
Sales price	\$50.00	\$37.50	\$40.00	–

Question:

1. Compute the total cost of the ending inventory for each product, assuming no beginning inventory and using the NRV method for joint cost allocation.

8-11. Joint Costs and Divisional Profits. Feldman & Son Products has two divisions, B and J. The company buys its major input for both divisions jointly. Currently, it buys this material in 600-pound lots for \$2,000. The material is first passed through a separator process. After separation, Division B gets 300 pounds of chemical Ilan and Division J gets 200 gallons of Emanuel.

Division B incurs separate processing costs of \$150 to get the chemical ready for sale. Division J incurs a cost of \$250 to bottle and package the Emanuel as a shampoo. After the additional processing, Division B sells the 300 pounds of chemicals for \$5 per pound and Division J sells the shampoo for \$7 per gallon.

Question:

1. Compute the profit to be reported by each division if joint costs are allocated on a NRV basis.

8-12. Determination of Sales Value at Split-Off. J. Pepper Industries manufactures three products from a joint process: X, Y, and Z. The following information is provided by the plant manager, Rick Halpern:

	<u>Product X</u>	<u>Product Y</u>	<u>Product Z</u>	<u>Total</u>
Units produced	4,000	2,000	1,000	7,000
Joint cost	\$36,000	?	?	\$60,000
Sales value at split-off	?	?	\$15,000	\$100,000
Separable costs	\$7,000	\$5,000	\$12,000	\$24,000
Sales value of final product	\$75,000	\$30,000	\$20,000	\$125,000

Joint costs are allocated using the relative sales value method.

Question:

1. Calculate the sales value at the split-off point for Product X.

8-13. Operating Incomes for Two Periods. Schumer Motors manufactures cars and sells them for \$24,000 each. The controller, Dick Peppy, provided the following data for November and December:

	<u>November</u>	<u>December</u>
Number of cars:		
Beginning inventory	0	?
Production	500	400
Sales	350	520
Variable costs:		
Mfg. cost per car produced	\$10,000	\$10,000
Marketing cost per car sold	\$3,000	\$3,000
Fixed costs:		
Mfg. costs	\$2,000,000	\$2,000,000
Marketing costs	\$600,000	\$600,000

1. Calculate operating income for November using:
 - (a) Variable costing
 - (b) Absorption costing
 2. Assuming a LIFO cost flow, calculate operating income for December using:
 - (a) Variable costing
 - (b) Absorption costing
- 8-14. Variable Costing and Two Product Lines.** Presupuesto Co. manufactures lawn rakes and shovels at its San Juan, Puerto Rico, plant. Data with respect to sales and production have been estimated by Javier Clemente, the controller, for next year as follows:

	<u>Rakes</u>	<u>Shovels</u>
Estimated units to be sold	240,000	160,000
Unit selling price	\$3.50	\$6.00
Unit variable cost of manufacturing	\$1.75	\$2.75
Production time per unit of product	10 min.	30 min.

The fixed factory overhead of the San Juan plant is apportioned to the products at the rate of \$3 per production hour. Total corporate fixed overhead of \$300,000 has been apportioned to the San Juan plant, but this is not apportioned to the products.

Questions:

1. Assuming a variable costing approach, prepare an income statement that will show for each product line and in total:
 - (a) The contribution margin.
 - (b) The apportioned fixed factory overhead.
 - (c) The profit for each product.
 - (d) The final profit after recognizing apportionment of the corporate fixed overhead.
 2. What is the expected total unit cost of each product line without apportioning the corporate fixed overhead?
 3. Apportion corporate fixed overhead to each product on the basis of production time. Now, what is the expected total unit cost of each product line?
 4. Which unit cost number would be best to use in establishing a cost-based selling price? Why?
- 8-15. Conversion of Absorption Costing to Variable Costing.** Yaffe Electrical Supply Company manufactures electric switches and timing devices in three operating divisions: Utility, Household, and Commercial. An income statement, showing the results for each division, is given for 2014. The company had total fixed manufacturing overhead of \$8,900,000. Inventories were increased during the year in anticipation of more sales volume in 2015.

Yaffe Electrical Supply Company
income statement for the year 2014 (in thousands)

	<u>Utility</u>	<u>Household</u>	<u>Commercial</u>	<u>Total</u>
Net sales	\$6,200	\$5,150	\$6,300	\$17,650
Costs of goods sold:				
Inventory, beginning	\$540	\$240	\$150	\$930
Production cost	<u>5,400</u>	<u>4,000</u>	<u>4,200</u>	<u>13,600</u>
Cost of goods available for sale	\$5,940	\$4,240	\$4,350	\$14,530
Less inventory, ending	<u>900</u>	<u>640</u>	<u>900</u>	<u>2,440</u>
Cost of goods sold	<u>\$5,040</u>	<u>\$3,600</u>	<u>\$3,450</u>	<u>\$12,090</u>
Manufacturing profit	<u>\$1,160</u>	<u>\$1,550</u>	<u>\$2,850</u>	<u>\$5,560</u>

The plant controller, Jennifer Barry, believes that profits may be higher than they would be otherwise because of fixed costs being carried over to the next year as a part of inventory. She would like to have the statement revised to a variable costing basis and would like to know the manufacturing contribution margin for each division.

Additional analyses show the units and unit variable costs as follows. There are no partially completed units.

	<u>Utility</u>	<u>Household</u>	<u>Commercial</u>
Units in beginning inventory	30,000	15,000	10,000
Units produced	300,000	250,000	280,000
Units in ending inventory	50,000	40,000	60,000
Unit variable manufacturing cost	\$6	\$6	\$5

Questions:

1. Prepare an income statement on a variable costing basis that shows a contribution margin and direct profits by division and in total.
2. Prepare a reconciliation between the variable costing and absorption costing income statements. This reconciliation should show results by division and in total.
3. How much of the fixed cost was carried over to 2015 as a part of ending inventory cost for each division?

8-16. Conversion of Absorption Costing to Variable Costing. Silver Spring Pet Shops purchase a variety of household pets (mostly dogs), and they also breed their own pets, for sale to customers. The following income statement for July 2015 was prepared by the corporate controller, Kay Nyne, using absorption costing:

Sales (200 pets)		\$22,000
Cost of sales:		
July 1 inventory	\$5,000	
Breeding and purchase costs	10,000	
July 31 inventory	<u>(2,500)</u>	<u>12,500</u>
Gross Margin		\$9,500
Fixed selling and administrative expenses		<u>(3,700)</u>
Operating income		<u>\$5,800</u>

During 2015, the average unit variable costs have not changed, and fixed “production” overhead has remained at \$2,000 per month. During July, 160 pets were either born or purchased by the store owner, Myrna Goldman. Assume that all inventories of pets are “finished”—there is no beginning or ending “work in process.”

Questions:

1. Prepare an income statement for July using variable costing.
2. Reconcile the absorption and variable costing operating incomes.

Case: Linsider Cosmetics

Linsider Cosmetics has four manufacturing plants where it processes a chemical, Arborvista, into three products. The process works in such a way that Arborvista is broken down into a high-grade facial cleanser (FC) and a low-grade chemical. The low-grade chemical is then processed into a liquid bath soap (LBS) and a moisturizing skin cream (MSC). All three products are sold to wholesalers that distribute them to retailers, hospitals, and various other institutions.

Linsider Cosmetics used 12,000 gallons of Arborvista last month. It cost \$300,000 in materials, labor, and overhead to procure Arborvista and turn it into the FC and low-grade chemical. The total cost of producing LBS and MSC from the low-grade chemical was \$70,000. The breakdown of production for the month was as follows:

FC	10,000 ounces
LBS	20,000 ounces
MSC	50,000 ounces

The sales price of FC is \$40 an ounce; of LBS, \$10 an ounce; and of MSC, \$1 an ounce. Additional processing and selling costs, entirely separate and traceable to each product, amounted to \$20,000 for FC, \$160,000 for LBS, and \$40,000 for MSC.

When joint costs are allocated, the net realizable value method is used. There were no beginning or ending inventories in any of the four manufacturing plants. All of the production was sold during the month.

(continued)

Case: Linsider Cosmetics (*continued*)

Question:

1. Prepare product line income statements through gross profit for each of the three products.

