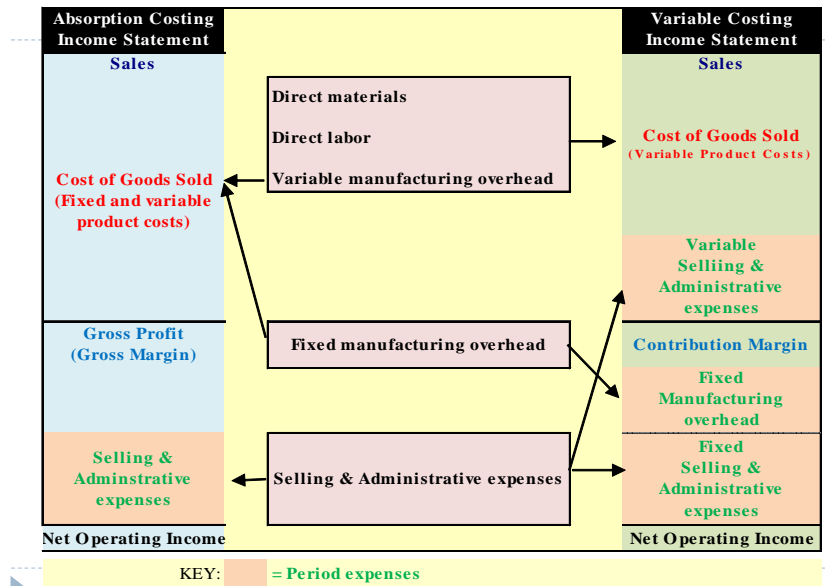


Absorption Costing and Variable Costing

Chapter 5

Objective 1: How variable costing differs from absorption costing. Compute unit product costs under each method.

Overview of Absorption and Variable Costing



1

Objective 1: How variable costing differs from absorption costing. Compute unit product costs under each method.

Unit Cost Computations

Harvey Company produces a single product with the following information available:

Number of units produced annually	25,000
Variable costs per unit:	
Direct materials, direct labor, and variable mfg. overhead	\$ 10
Selling & administrative expenses	\$ 3
Fixed costs per year:	
Manufacturing overhead	\$ 150,000
Selling & administrative expenses	\$ 100,000

2

Objective 1: How variable costing differs from absorption costing. Compute unit product costs under each method.

Unit Cost Computations

Unit product cost is determined as follows:

	Absorption Costing	Variable Costing
Direct materials, direct labor, and variable mfg. overhead	\$ 10	\$ 10
Fixed mfg. overhead (\$150,000 ÷ 25,000 units)	6	-
Unit product cost	\$ 16	\$ 10

Under absorption costing, all production costs, variable and fixed, are included when determining unit product cost. Under variable costing, only the variable production costs are included in product costs.

3

Income Comparison of Absorption and Variable Costing

Let's assume the following additional information for Harvey Company.

- ▶ 20,000 units were sold during the year at a price of \$30 each.
- ▶ There is no beginning inventory.

Now, let's compute net operating income using both absorption and variable costing.



Absorption Costing

		<u>Absorption Costing</u>
Sales (20,000 × \$30)		\$ 600,000
Less cost of goods sold:		
Beginning inventory	\$ -	
Add COGM (25,000 × \$16)	400,000	
Goods available for sale	<u>400,000</u>	
Ending inventory (5,000 × \$16)	80,000	<u>320,000</u>
Gross margin		280,000
Less selling & admin. exp.		
Variable (20,000 × \$3)	\$ 60,000	
Fixed	100,000	<u>160,000</u>
Net operating income		<u>\$ 120,000</u>

Fixed manufacturing overhead deferred in inventory is 5,000 units × \$6 = \$30,000.

Variable Costing

		<u>Variable Costing</u>
Sales (20,000 × \$30)		\$ 600,000
Less variable expenses:		
Beginning inventory	\$ -	
Add COGM (25,000 × \$10)	250,000	
Goods available for sale	<u>250,000</u>	
Less ending inventory (5,000 × \$10)	50,000	
Variable cost of goods sold	<u>200,000</u>	
Variable selling & administrative expenses (20,000 × \$3)	60,000	<u>260,000</u>
Contribution margin		340,000
Less fixed expenses:		
Manufacturing overhead	\$ 150,000	
Selling & administrative expenses	100,000	<u>250,000</u>
Net operating income		<u>\$ 90,000</u>

Variable manufacturing costs only.

All fixed manufacturing overhead is expensed.

Comparing the Two Methods

	Cost of Goods Sold	Ending Inventory	Period Expense	Total
Absorption costing				
Variable mfg. costs	\$ 200,000	\$ 50,000	\$ -	\$ 250,000
Fixed mfg. costs	120,000	30,000	-	150,000
	<u>\$ 320,000</u>	<u>\$ 80,000</u>	<u>\$ -</u>	<u>\$ 400,000</u>
Variable costing				
Variable mfg. costs	\$ 200,000	\$ 50,000	\$ -	\$ 250,000
Fixed mfg. costs	-	-	150,000	150,000
	<u>\$ 200,000</u>	<u>\$ 50,000</u>	<u>\$ 150,000</u>	<u>\$ 400,000</u>

Comparing the Two Methods

We can reconcile the difference between absorption and variable income as follows:

Variable costing net operating income	\$ 90,000
Add: Fixed mfg. overhead costs deferred in inventory (5,000 units × \$6 per unit)	<u>30,000</u>
Absorption costing net operating income	<u>\$ 120,000</u>

$$\frac{\text{Fixed mfg. overhead}}{\text{Units produced}} = \frac{\$150,000}{25,000 \text{ units}} = \$6 \text{ per unit}$$

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Extended Comparisons of Income Data Harvey Company – Year Two

Number of units produced	25,000
Number of units sold	30,000
Units in beginning inventory	5,000
Unit sales price	\$ 30
Variable costs per unit:	
Direct materials, direct labor variable mfg. overhead	\$ 10
Selling & administrative expenses	\$ 3
Fixed costs per year:	
Manufacturing overhead	\$ 150,000
Selling & administrative expenses	\$ 100,000

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Unit Cost Computations

	Absorption Costing	Variable Costing
Direct materials, direct labor, and variable mfg. overhead	\$ 10	\$ 10
Fixed mfg. overhead (\$150,000 ÷ 25,000 units)	6	-
Unit product cost	\$ 16	\$ 10

Since the variable costs per unit, total fixed costs, and the number of units produced remained unchanged, the unit cost computations also remain unchanged.

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Absorption Costing

Unit product cost.

	Absorption Costing	
Sales (30,000 × \$30)		\$ 900,000
Less cost of goods sold:		
Beg. inventory (5,000 × \$16)	\$ 80,000	
Add COGM (25,000 × \$16)	<u>400,000</u>	
Goods available for sale	480,000	
Less ending inventory	-	<u>480,000</u>
Gross margin		420,000
Less selling & admin. exp.		
Variable (30,000 × \$3)	\$ 90,000	
Fixed	<u>100,000</u>	<u>190,000</u>
Net operating income		<u>\$ 230,000</u>

Fixed manufacturing overhead released from inventory is 5,000 units × \$6 = \$30,000.

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Variable Costing

		Variable Costing
Sales (30,000 × \$30)		\$900,000
Less variable expenses:		
Beg. inventory (5,000 × \$10)	\$ 50,000	
Add COGM (25,000 × \$10)	250,000	
Goods available for sale	300,000	
Less ending inventory	-	
Variable cost of goods sold	300,000	
Variable selling & administrative expenses (30,000 × \$3)	90,000	390,000
Contribution margin		510,000
Less fixed expenses:		
Manufacturing overhead	\$ 150,000	
Selling & administrative expenses	100,000	250,000
Net operating income		<u>\$260,000</u>

Variable manufacturing costs only.

All fixed manufacturing overhead is expensed.

Comparing the Two Methods

We can reconcile the difference between absorption and variable income as follows:

Variable costing net operating income	\$ 260,000
Deduct: Fixed manufacturing overhead costs released from inventory (5,000 units × \$6 per unit)	30,000
Absorption costing net operating income	<u>\$ 230,000</u>

$$\frac{\text{Fixed mfg. overhead}}{\text{Units produced}} = \frac{\$150,000}{25,000 \text{ units}} = \$6 \text{ per unit}$$

Comparing the Two Methods

Net Operating Income			
Costing Method	1st Period	2nd Period	Total
Absorption	\$ 120,000	\$ 230,000	\$ 350,000
Variable	90,000	260,000	350,000



Summary of Key Insights

Relation between production and sales	Effect on inventories	Relation between variable and absorption income
Units produced = Units sold	No change in inventories	Absorption = Variable
Units produced > Units sold	Inventories Increase	Absorption > Variable
Units produced < Units sold	Inventories decrease	Absorption < Variable

CVP Analysis, Decision Making and Absorption costing

Absorption costing does not dovetail with CVP analysis, nor does it support decision making. It treats fixed manufacturing overhead as a variable cost. It assigns per unit fixed manufacturing overhead costs to production.

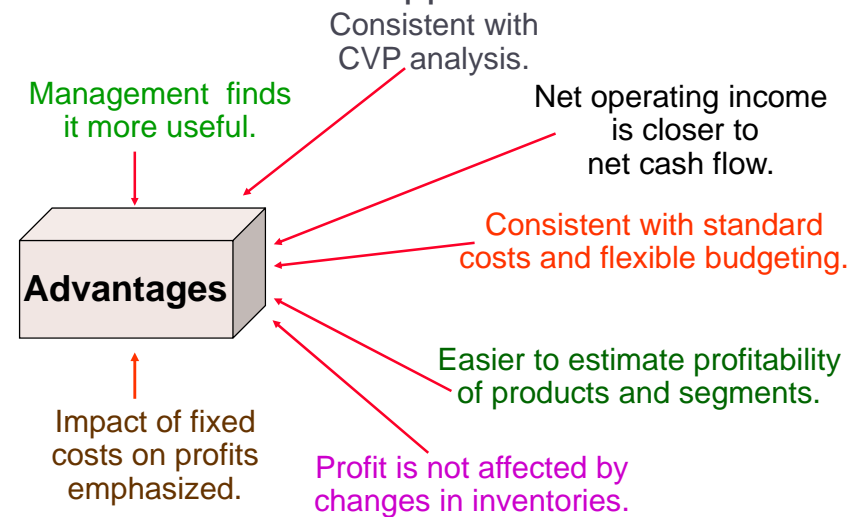
Treating fixed manufacturing overhead as a variable cost can:

- Lead to faulty pricing decisions and faulty keep-or-drop decisions.

Assigning per unit fixed manufacturing overhead costs to production can:

- Potentially produce positive net operating income even when the number of units sold is less than the breakeven point.

Advantages of Variable Costing and the Contribution Approach



Variable versus Absorption Costing

Fixed manufacturing costs must be assigned to products to properly match revenues and costs.



Absorption Costing

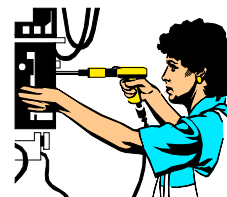
Fixed manufacturing costs are capacity costs and will be incurred even if nothing is produced.



Variable Costing

Impact of Lean Production

When companies use Lean Production . . .



Production tends to equal sales . . .



So, the difference between variable and absorption income tends to disappear.

Why Use an Allocation Base?

Manufacturing overhead is applied to products/jobs that are in process. An allocation base, such as direct labor hours, direct labor dollars, or machine hours, is used to assign manufacturing overhead to individual products/jobs.

We use an allocation base because:

1. It is impossible or difficult to trace overhead costs to particular products/jobs.
2. Manufacturing overhead consists of many different items ranging from the grease used in machines to production manager's salary.
3. Many types of manufacturing overhead costs are fixed even though output fluctuates during the period.

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Manufacturing Overhead Application

The predetermined overhead rate (**POHR**) used to apply overhead to products/jobs is determined before the period begins.

$$\text{POHR} = \frac{\text{Estimated total manufacturing overhead cost for the coming period}}{\text{Estimated total units in the allocation base for the coming period}}$$

Ideally, the allocation base is a **cost driver** that causes overhead.

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The Need for a POHR

Using a predetermined rate makes it possible to estimate total product/job costs sooner.

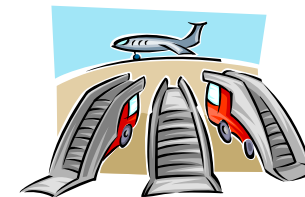


Actual overhead for the period is not known until the end of the period.

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Determining Predetermined Overhead Rates

Predetermined overhead rates are calculated using a three-step process.



- 1 Estimate the level of production for the period.
- 2 Estimate total amount of the allocation base for the period.
- 3 Estimate total manufacturing overhead costs.

$$\text{POHR} = \text{3} \div \text{2}$$

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Application of Manufacturing Overhead

Based on *estimates*, and determined before the period begins.



$$\text{Overhead applied} = \text{POHR} \times \text{Actual activity}$$

Actual amount of allocation is based upon the actual level of activity (normal costing system).

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Overhead Application Rate for the Harvey Example

$$\text{POHR} = \frac{\text{Estimated total manufacturing overhead cost for the coming period}}{\text{Estimated total units in the allocation base for the coming period}}$$

$$\text{POHR} = \frac{\$150,000}{50,000 \text{ direct labor hours (DLH)}}$$

$$\text{POHR} = \$3.00 \text{ per DLH}$$

For each direct labor hour worked on a particular product, \$3.00 of factory overhead will be applied to it. For product valuation, it must be valued by unit. In this case, assume each unit requires 2 direct labor hours. Hence, **each unit of the product absorbs \$6 predetermined overhead**. In order to match back with Harvey's example, we further assume that variable manufacturing overhead = 0. So the predetermined overhead represents only **fixed** manufacturing overhead cost as shown in slides 14 & 19.

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Predetermined Overhead Rate and Capacity

Calculating predetermined overhead rates using an estimated, or budgeted amount of the allocation base has been criticized because:

1. Basing the predetermined overhead rate upon budgeted activity results in product costs that fluctuate depending upon the activity level.
2. Calculating predetermined rates based upon budgeted activity charges products for costs that they do not use.



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Capacity-Based Overhead Rates

Criticisms can be overcome by using estimated total units in the allocation base at capacity in the denominator of the predetermined overhead rate calculation.

Let's look at the difference!



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An Example

Equipment is leased for \$100,000 per year. Running at full capacity, 50,000 units may be produced. The company estimates that 40,000 units will be produced and sold next year. What is the predetermined overhead rate?



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An Example

Equipment is leased for \$100,000 per year. Running at full capacity, 50,000 units may be produced. The company estimates that 40,000 units will be produced and sold next year.

$$\text{Traditional Method} = \frac{\$100,000}{40,000} = \$2.50 \text{ per unit}$$

$$\text{Capacity Method} = \frac{\$100,000}{50,000} = \$2.00 \text{ per unit}$$

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Income Statement Preparation – Capacity

Actual volume	40,000 cases
Selling price	\$40.00 per case
Variable production cost	\$24.00 per case
Fixed manufacturing overhead	\$100,000 per year
Capacity	50,000 cases
Predetermined overhead rate	\$2.00 per case
Fixed selling and admin. expense	\$500,000 per year
Revenue	\$ 1,600,000
Cost of goods sold	1,040,000
Gross margin	560,000
Cost of idle capacity	20,000
Selling and admin. expense	500,000
Net operating income	\$ 40,000

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Income Statement Preparation – Traditional

Actual volume	40,000 cases
Selling price	\$40.00 per case
Variable production cost	\$24.00 per case
Fixed manufacturing overhead	\$100,000 per year
Capacity	40,000 cases
Predetermined overhead rate	\$2.50 per case
Fixed selling and admin. expense	\$500,000 per year
Revenue	\$ 1,600,000
Cost of goods sold	1,060,000
Gross margin	540,000
Cost of idle capacity	-
Selling and admin. expense	500,000
Net operating income	\$ 40,000

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Problems of Overhead Application

The difference between the overhead cost applied to Work in Process and the actual overhead costs of a period is referred to as either underapplied or overapplied overhead.

Underapplied overhead exists when the amount of overhead applied to products/ jobs during the period using the predetermined overhead rate is *less than* the total amount of overhead actually incurred during the period.

Overapplied overhead exists when the amount of overhead applied to products/jobs during the period using the predetermined overhead rate is *greater than* the total amount of overhead actually incurred during the period.

Overhead Application Example

Recall the Harvey example between slides 9 and 36. Let's rename the example as **Harvey Fresh** and assume **actual overhead** for the year was **\$120,000** (instead of \$150,000 in the original Harvey example). The total direct labor hours incurred were **50,000**. The rest remains the same.

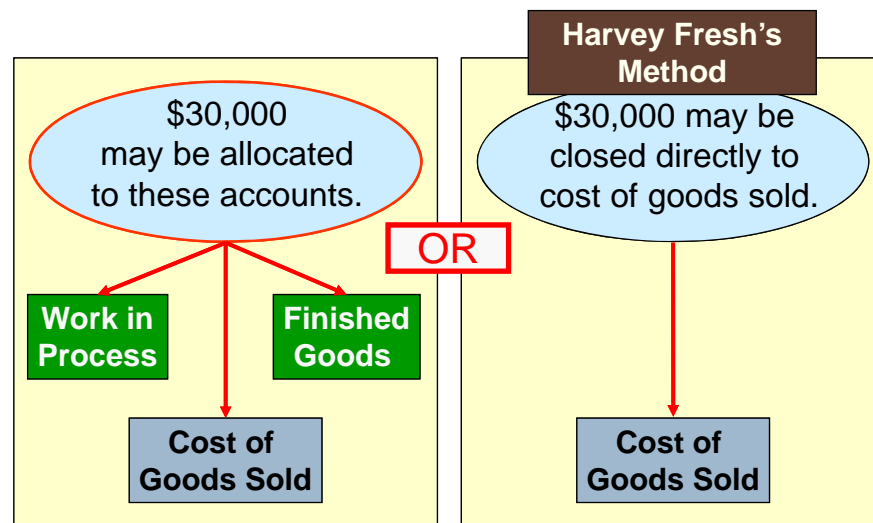
How much total overhead was applied to **Harvey Fresh's** products during the year? Use Harvey's predetermined overhead rate of \$3.00 per direct labor hour.

Overhead Applied During the Period

$$\text{Applied Overhead} = \text{POHR} \times \text{Actual Direct Labor Hours}$$

$$\text{Applied Overhead} = \$3.00 \text{ per DLH} \times 50,000 \text{ DLH} = \mathbf{\$150,000}$$

Disposition of Under- or Overapplied Overhead



Disposition of Under/Overapplied Overhead

Harvey Fresh's Cost of Goods Sold

Unadjusted Balance	
	\$30,000
Adjusted Balance	

Harvey Fresh's Mfg. Overhead

Actual overhead costs	Overhead applied to products
\$120,000	\$150,000
\$30,000	\$30,000 overapplied

Under/Overapplied Adjustment Through COGS

If Harvey Fresh's overapplied adjustment is directly through COGS, then its profit will be as follows:

Absorption Costing		Year 1	
		Produced 25,000 units	
Sales (20,000 × \$30)			\$ 600,000
Less cost of goods sold:			
Beginning inventory	\$ -		
Add COGM (25,000 × \$16)	400,000		
Overapplied adjustment	(30,000)		
Goods available for sale	370,000		
Ending inventory (5,000 × \$16)	80,000	290,000	
Gross margin			310,000
Less selling & admin. exp.			
Variable (20,000 × \$3)	\$ 60,000		
Fixed	100,000	160,000	
Net operating income			\$ 150,000

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Allocating Under- or Overapplied Overhead Between Accounts

In Year 1, Harvey Fresh's overhead applied in ending Work in Process Inventory, ending Finished Goods Inventory, and Cost of Goods Sold is shown below:

We would complete the following allocation of \$30,000 overapplied overhead:

	Amount	Percent of Total	Allocation of \$30,000 overapplied overhead
Work in process	\$ -		
Finished Goods	30,000		
Cost of Goods Sold	120,000		
Total	\$ 150,000		

GENERAL JOURNAL

Date	Description	Post. Ref.	Debit	Credit
	Manufacturing Overhead			
	Work in Process Inventory			
	Finished Goods Inventory			
	Cost of Goods Sold			

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Under/Overapplied Adjustment Through the Proportional Allocation Method

Absorption Costing		Year 1	
		Produced 25,000 units	
Sales (20,000 × \$30)			\$ 600,000
Less cost of goods sold:			
Beginning inventory	-		
Add COGM (25,000 × \$16)	400,000		
Overapplied adjustment	(30,000)		
Goods available for sale	370,000		
Ending inventory (5,000 × \$16)	\$ 80,000		
Overapplied adjustment	(6,000)	74,000	296,000
Gross margin			304,000
Less selling & admin. exp.			
Variable (20,000 × \$3)	\$ 60,000		
Fixed	100,000	160,000	
Net operating income			\$ 144,000

Net result of \$24,000 adjusted against COGS

Net Operating Income is different from the one with adjustment directly through COGS (\$150,000)

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Creating Extra Profit Without Increase In Sales

Continue with the Harvey Fresh example (slides 54, and 58 to 64). Assume the company had the same sales, revenue and cost structure but produced 35,000 units (instead of 25,000 units) to increase ending

Absorption Costing (Year 1)	Original		New	
	Produced 25,000 units		Produced 35,000 units	
Sales (20,000 × \$30)		\$ 600,000		600,000
Less cost of goods sold:				
Beginning inventory	\$ -		\$ -	
Add COGM (25,000 × \$16)	400,000		560,000	
Overapplied adjustment	(30,000)		(90,000)	
Goods available for sale	370,000		470,000	
Ending inventory (5,000 × \$16)	80,000	290,000	240,000	230,000
Gross margin		310,000		370,000
Less selling & admin. exp.				
Variable (20,000 × \$3)	\$ 60,000		\$ 60,000	
Fixed	100,000	160,000	100,000	160,000
Net operating income		\$ 150,000		\$ 210,000

Profit increased by \$60,000 without extra sales and revenue

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Overapplied adjustments required

- ▶ Harvey Fresh's actual fixed manufacturing overhead = \$120,000
- ▶ Based on the original scenario, the applied overhead was based on actual production of 25,000 units at \$6 each (slide 19), giving rise to \$150,000 being applied to the items produced. Therefore, it was overapplied by \$30,000 (\$150,000 applied - \$120,000 actual).
- ▶ Based on the new scenario, the applied overhead was based on actual production of 35,000 units at \$6 each (slide 19), giving rise to \$210,000 being applied to the production. Therefore, it was overapplied by \$90,000 (\$210,000 applied - \$120,000 actual).

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Profit Arising from Ending Inventory Value

- ▶ The additional profit (\$60,000) is the same amount as the additional overapplied adjustment (\$90,000 - \$30,000).
- ▶ The overapplied adjustment is to make good of the applied fixed overhead to match with the actual overhead spent.
- ▶ The additional profit actually arises from the additional fixed overhead (based on the predetermined overhead rate, POHR) carried forward through the change in ending inventory, amounting the same as the over/underapplied fixed overhead adjustment if the adjustment is written off directly to cost of goods sold.
- ▶ If the adjustment is done through the proportional method shown in slides 61– 64, then the increased profit will not match the overapplied adjustment.

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Value of Ending Inventory

Absorption Costing (Year 1)	Original	New
	Produced 25,000 units	Produced 35,000 units
Overapplied adjustment	(30,000)	(90,000)
Ending inventory (5,000 × \$16) (15,000 × \$16)	\$ 80,000	\$ 240,000
Net Operating Income (Absorption Costing)	\$150,000	\$210,000
Predetermined fixed manufacturing overhead rate = \$6 per unit		
Beginning Inventory (in unit)	-	-
Ending Inventory (in unit)	5,000	15,000
Increase in inventory (in unit)	5,000	15,000
Predetermined overhead rate	\$6	\$6
Same value as the overapplied (= difference in the profit using variable costing)	\$ 30,000	\$ 90,000
Net Operating Income (Variable Costing)	\$ 120,000	\$ 120,000

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Use of Variable Costing

Continue with the Harvey Fresh example but present the results using the variable costing format.

Variable Costing (Year 1)	Original	New
	Produced 25,000 units	Produced 35,000 units
Sales (20,000 × \$30)	\$ 600,000	600,000
Less variable cost of goods sold:		
Beginning inventory	\$ -	\$ -
Add COGM (25,000 × \$10)	250,000	350,000
Overapplied adjustment	-	-
Goods available for sale	250,000	350,000
Ending inventory (5,000 × \$10)	50,000	150,000
Less variable selling & admin. exp. (20,000 × \$3)	60,000	60,000
Contribution Margin	340,000	340,000
Less Fixed Manufacturing overhead	\$ 120,000	\$ 120,000
Fixed selling & Admin exp.	100,000	100,000
Net operating income	\$ 120,000	\$ 120,000

Profits remain the same despite changing quantity in production and ending inventory

Use of Variable Costing can avoid Profit inflation through producing more inventories

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Overapplied and Underapplied Manufacturing Overhead - Summary

	Harvey Fresh's Method	
If Manufacturing Overhead is . . .	Alternative 1 Close to Cost of Goods Sold	Alternative 2 Proportional Allocation
UNDERAPPLIED (Applied OH is less than actual OH)	INCREASE Cost of Goods Sold	INCREASE Work in Process Finished Goods Cost of Goods Sold
OVERAPPLIED (Applied OH is greater than actual OH)	DECREASE Cost of Goods Sold	DECREASE Work in Process Finished Goods Cost of Goods Sold

More accurate but more complex to compute.

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Multiple Predetermined Overhead Rates

Up to this point, we have assumed that there is a single predetermined overhead rate called a plantwide overhead rate.

Large companies often use multiple predetermined overhead rates.

May be more complex but . . .

May be more accurate because it reflects differences across departments.

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End of Chapter 5



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