**CHAPTER 3**

**PREDETERMINED OVERHEAD RATES, FLEXIBLE BUDGETS, AND ABSORPTION/VARIABLE COSTING**

**QUESTIONS**

1. Although both variable and mixed costs change in total with activity measure changes, the difference is that variable costs change in direct proportion to such activity changes and mixed costs do not. Since a mixed cost has both a fixed and variable component, the cost per unit at different activity levels is not constant as it is with a variable cost.
2. No, these are not always the best points of observation. First, the points must be within the relevant range of activity. Second, to be useful, the points must be reflective of the entire data set of observation points. If the high and low points do not meet these two conditions, alternative points should be selected.
3. There are several reasons for using predetermined overhead rates. First, the company does not need to wait to assign overhead costs to products or services until the end of the period when actual costs are known. Second, such rates eliminate overhead cost fluctuations that have nothing to do with volume levels. Third, predetermined overhead rates provide a means to control distortions in product costs caused by changes in volume between or among periods, and the resulting product/service cost changes caused by differences in fixed cost per period.
4. Departmental overhead rates are superior to plantwide overhead rates in that overhead application bases can be identified that more accurately reflect the causes of costs in each department. In effect, use of departmental rates permit more cost drivers to be identified and used as allocation bases.

Separation of variable and fixed costs allows managers to make decisions that rely on knowledge of cost behavior. For example, some decisions require that a manager identify costs that will change if a particular decision alternative (such as whether to manufacture and sell additional units) is implemented. Total variable cost responds differently from total fixed cost to managerial actions. Use of a total overhead rate does not easily allow managers to determine the impact of such differences.

1. The two differences between absorption and variable costing relate to the treatment of fixed factory overhead and the presentation of costs/expenses on the income statement. Absorption costing treats fixed factory overhead as a product cost and allocates it to the units produced during the period; variable costing treats fixed overhead as a period expense and charges the full amount incurred to the income of the period. Absorption costing presents costs on the income statement in functional categories without regard to cost behavior; variable costing presents costs on the income statement first as product or period, secondly by cost behavior (variable or fixed), and possibly by functional categories.

The underlying cause of the difference between absorption and variable costing is found in the definition of an asset. Asset cost should include all costs necessary to get an item into place and ready for sale or use. Absorption costing considers fixed overhead to be inventoriable (part of asset cost) because products could not be made without the basic manufacturing capacity represented by fixed overhead cost. Variable costing proponents, however, believe that fixed overhead is not inventoriable because it is incurred regardless of whether production occurs or not. The “correct” answer cannot be determined because both positions have logical and rational arguments to support them.

1. Functionally classifying a cost refers to classification based on where the cost was incurred (production, selling, or administrative area) and for what purpose (wages, salaries, utilities, etc.). Behaviorally classifying a cost refers to classification based on the reaction that the cost has to a change in underlying activity (such as production or sales volume) and, thus, as variable or fixed. A company is concerned about behavioral classification because (as long as the company is operating in the relevant range of activity) variable costs will change in a direct relationship with changes in some underlying activity measure, but fixed costs will remain constant. If variable and fixed costs are combined and shown merely as functional categories, management will not be able to see how each functional category of cost will change with changes in activity.
2. Absorption costing is required for external reporting. The rationale is that fixed manufacturing overhead is traditionally viewed as a product cost, and thus, it should be added to variable production cost and assigned to inventory. The total cost per unit will be shown as an expense only in the period in which the related products are sold.
3. Use of monetary, quantitative information varies greatly between external and internal users. External users emphasize profitability potential; internal users emphasize information that helps make sales, production, and capital expenditure decisions.

Both absorption and variable costing have a place in decision making. Accountants and decision makers need to understand the applications and limitations of the two techniques within the context of past, present, and future cost information needs. No matter which type of costing a firm uses, the firm’s total revenue must cover all costs—both variable and fixed—and also generate a satisfactory profit if a firm is to survive in the long run.

The methods of cost accumulation and cost presentation used for reporting are determined by what is acceptable to the parties for whom the reports are intended. External reporting is guided by the characteristics of reliability, uniformity, and consistency. Internal reporting is guided by flexibility in helping managers with planning, controlling, decision making, and performance evaluations.

1. When production exceeds sales volume, absorption costing income will be higher than variable costing income because some of the fixed factory overhead incurred during the period will be deferred into inventory rather than appearing on the income statement. Since no fixed overhead is inventoried under variable costing, there will be a larger expense on the income statement under variable costing than under absorption costing.

When production is less than sales volume, some of the fixed overhead deferred in previous periods will be charged against income as part of cost of goods sold under absorption costing in addition to all of the current period fixed overhead. Thus, there will be a higher income statement charge under absorption costing than under variable costing (which will only expense the current period fixed overhead). Therefore, under this circumstance, absorption costing income will be less than variable costing income.

1. The regression method has the major advantage of using all points in the data set to determine the fixed and variable cost elements of the mixed costs. This is in contrast to the high–low method, which uses only two points in the data set. It is possible that the use of only two points could include outliers, if they are not recognized as such by the user.

**EXERCISES**

1. a. (1) At any level, the variable cost is $2 per machine hour. Since four hours are needed to make one unit, the variable rate is $8 per unit. At production of 10,000 units, the fixed rate is $325,000 ÷ 10,000 or $32.50 per unit.
2. At any level, the variable cost is $2 per machine hour. At production of 10,000 units, the fixed rate per machine hour = $32.50 ÷ 4 = $8.125 per machine hour.
   1. (1) Combined rate = $8 + $32.50 = $40.50 per unit
3. Combined rate = $2 + $8.125 = $10.125 per unit
   1. At actual production of 11,000 units and applying OH on units of production:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Expected =  Actual | Applied | | Under/Over  Applied |
| VOH (11,000 × $8) | $ 88,000 | (11,000 × $8) = $ 88,000 | | $ 0 | |
| FOH | 325,000 | (11,000 × $32.50) = 357,500 | | 32,500 overapp. | | |
|  |  | |  |  | |

1. a. Applied VOH = 900 × $8 = $7,200
   1. Applied FOH = 900 × $32.50 = $29,250
   2. VOH: Actual VOH – Applied VOH = $7,500 – $7,200 = $300 underapplied

FOH: Actual FOH – Applied FOH = $26,500 – $29,250 = $2,750 overapplied

1. a. Expected overhead = ($42,900 × 12) + ($6 × 78,000)

= $514,800 + $468,000

= $982,800

Predetermined overhead rate = $982,800 ÷ 78,000 = $12.60 per DLH

Overhead per unit = $12.60 × 1.5 hours per unit = $18.90

|  |  |  |
| --- | --- | --- |
| 1. Manufacturing Overhead | 128,550 |  |
| Various accounts |  | 128,550 |
| Work in Process Inventory (6,390 × $12.60) | 80,514 |  |
| Manufacturing Overhead |  | 80,514 |
|  |  |  |

1. 6,390 DLHs ÷ 1.5 = 4,260 units should have been produced
   1. a. Jan. $180,000 × 2.50 = $450,000

Feb. $165,000 × 2.50 = $412,500

Mar. $170,000 × 2.50 = $425,000

|  |  |  |
| --- | --- | --- |
| 1. Jan. Actual – Applied = $440,000 – $450,000 = | $10,000 overapplied | |
| Feb. Actual – Applied = $420,400 – $412,500 = | $ 7,900 underapplied |
| Mar. Actual – Applied = $421,000 – $425,000 = | $ 4,000 overapplied | |
| Total for quarter | $ 6,100 overapplied | |

* 1. a. ($600,400 + $199,600) ÷ (10,000 + 40,000) = $800,000 ÷ 50,000 = $16.00 per DLH
  2. ($600,400 + $199,600) ÷ (76,000 + 4,000) = $800,000 ÷ 80,000 = $10.00 per MH
  3. Assembly: $600,400 ÷ 76,000 = $7.90 per MH

Finishing: $199,600 ÷ 40,000 = $4.99 per DLH

* 1. Overhead assigned using answer from (a): 1 × $16.00 = $16.00

Overhead assigned using answer from (b): 5 × $10.00 = $50.00

Overhead assigned using answer from (c): (5 × $7.90) + (1 × $4.99)

= $39.50 + $4.99 = $44.49

1. a. Manufacturing Overhead 66,000

Cost of Goods Sold 66,000

b. Manufacturing Overhead 66,000

Work in Process Inventory 21,120

Finished Goods Inventory 5,280

Cost of Goods Sold 39,600

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| WIP | | $ 384,000 | 384,000 ÷ 1,200,000 = 32% | 0.32 × $66,000 = | $21,120 |
| FG | | 96,000 | 96,000 ÷ 1,200,000 = 8% | 0.08 × $66,000 = | 5,280 |
| CGS | | 720,000 | 720,000 ÷ 1,200,000 = 60% | 0.60 × $66,000 = | 39,600 |
| Total | | $1,200,000 |  |  |  |
|  |  | |  |  |  |

1. The method in (b) would be more appropriate in this instance because of the amount. Overapplied overhead is 5.5 percent of the total balances in all of the accounts containing overhead, so to close it directly to cost of goods sold would cause a distortion of the costs remaining in inventory and cost of goods sold.
2. a. Predetermined overhead rate = Applied overhead ÷ Actual DLHs

= $120,000 ÷ 5,000 = $24.00 per DLH

1. Overhead is underapplied by ($121,500 – $120,000) or $1,500
2. Because the amount of underapplied overhead is only about 0.5 percent of total production costs for the month, the underapplied balance could be closed only to Cost of Goods Sold without distorting product costs. The journal entry would be as follows:

Cost of Goods Sold 1,500

Manufacturing Overhead 1,500

1. a. Using the information in the WIP Inventory account, the rate is $20,000 ÷ $10,000 or 200 percent of direct labor cost.
   1. The amount ($40,000) should be prorated because it is large relative to the balances in Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold.
   2. Work in Process Inventory: $40,000 × ($ 50,000 ÷ $520,000) = $ 3,846

Finished Goods Inventory: $40,000 × ($200,000 ÷ $520,000) = 15,385

Cost of Goods Sold: $40,000 × ($270,000 ÷ $520,000) = 20,769

Total $40,000

1. A debit balance in the manufacturing overhead account can be the result of several causes including: (1) paying higher prices than budgeted for the resources comprising actual overhead, (2) using more overhead resources than attached to inventory for actual output, (3) producing at less capacity than the planned level of activity upon which the predetermined overhead rate was based, or (4) a combination of the prior three causes.
2. a. The choice of capacity measure affects the amount of under- or overapplied overhead only for fixed overhead costs. Because the total amount of overhead that is expected to be incurred is unaffected by the volume of production (as long as it is within the relevant range), the per-unit cost of fixed overhead varies inversely with the level of actual production. If the actual capacity differs dramatically from the capacity chosen to allocate overhead, the result is likely to be large amounts of under- or overapplied fixed overhead. If actual capacity is significantly below (above) the capacity used to develop the fixed overhead rate, the result is likely to be a significant amount of underapplied (overapplied) fixed overhead.
3. Expected capacity would likely result in the least amount of under- or overapplied overhead because expected capacity reflects the most likely level of capacity utilization for 2013.
4. If Milltown is in a cyclical industry, it might choose normal capacity to allocate overhead costs. Normal capacity is based on a consideration of long-term activity that can accommodate an entire cycle in an industry. The annual capacity reflects the average of the long-term activity level.
5. a. VOH rate (can be calculated at either level): $1,250,000 ÷ 100,000 MHs = $12.50 per MH or $1,875,000 ÷ 150,000 MHs = $12.50 per MH
   1. FOH rate: $1,440,000 ÷ 180,000 = $8.00 per MH
   2. Expected capacity = 2/3 × 180,000 = 120,000 MHs

FOH rate: $1,440,000 ÷ 120,000 = $12.00 per MH

* 1. At 110,000 MHs:

Total VOH applied = 110,000 × $12.50 = $1,375,000

Total FOH applied (practical capacity rate): 110,000 × $8.00 = $880,000

Total FOH applied (expected capacity rate): 110,000 × $12.00 = $1,320,000

Total OH applied (practical) ($1,375,000 + $880,000) $ 2,255,000

Actual OH (2,710,000)

Underapplied OH $ (455,000)

Total OH applied (expected) ($1,375,000 + $1,320,000) $ 2,695,000

Actual OH (2,710,000)

Underapplied OH $ (15,000)

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| 1. a. | | |  | MHs | Total Cost | = | Variable Cost | + | Fixed Cost | | |
|  | High activity | | 34,000 | $12,200 |  | $5,440 |  | $6,760 | |
|  | Low activity | | 31,000 | 11,720 |  | 4,960 |  | 6,760 | |
|  | Differences | | 3,000 | $ 480 |  |  |  | |  |

Variable rate = $480 ÷ 3,000 MHs = $0.16 per MH

High activity variable cost = 34,000 × $0.16 = $5,440

Low activity variable cost = 31,000 × $0.16 = $4,960

Fixed cost at high activity = $12,200 − $5,440 = $6,760

Fixed cost at low activity = $11,720 − $4,960 = $6,760

Budget formula: TC = FC + VC(X)

TC = $6,760 + $0.16 MH

1. TC = $6,760 + $0.16(31,250) = $6,760 + $5,000 = $11,760

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| --- | --- | --- | --- | --- |
| 1. a. | | Shipments Received | | Cost of Reports |
| High activity | | 60 | $202 |
| Low activity | | 35 | 142 |
| Differences | | 25 | $ 60 |
|  | |  |  |

Variable cost = $60 ÷ 25 = $2.40

Fixed cost (high point) = $202 – (60 × $2.40) = $58

*y* = $58 + $2.40X

1. *y* = $58 + ($2.40 × 72)

*y* = $230.80

1. The most significant problem is that 72 shipments is far larger than the largest number of shipments in the data used to develop the equation. Thus, 72 may be outside of the relevant range for the equation. Other concerns are those associated with use of the high–low method including only two of the seven data points were used to develop the equation.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. a. | |  | MHs | Total Cost | | | = | Variable Cost | + | Fixed Cost |
|  | High activity | | 9,000 | $ 880 |  | | | $(1,620) |  | $2,500 |
|  | Low activity | | 3,000 | 1,960 |  | | | (540) |  | 2,500 |
|  | Differences | | 6,000 | $(1,080) | |  | |  |  |  |
|  |  | |  |  | | |  |  |  |  |
|  | Variable rate = $(1,080) ÷ 6,000 MHs = $(0.18) per MH | | | | | | | | | |
|  |  | | | | | | | | | |

High activity variable cost = 9,000 × $(0.18) = $(1,620)

Low activity variable cost = 3,000 × $(0.18) = $(540)

Fixed cost at low activity = $1,960 – $(540) = $2,500

Total maintenance cost = $2,500 – $0.18 MH

1. The variable cost component is negative, which implies that, as the number of machine hours increases, the amount of maintenance costs declines. Such a relationship is implausible. One explanation that would account for the perceived inverse relationship would be that the company performs the maintenance chores when there is idle time available. As business activity increases, less and less time is available to perform maintenance activities.
2. For a cost prediction formula to work effectively, a positive relationship between the activity measure and the cost pool is not required. Thus, the formula developed in (a) might function effectively. However, one cannot interpret the parameters of the model (–$0.18, $2,500) as variable and fixed costs, respectively.

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| 1. a. | |  | MHs |  | Total  Cost | = | Variable  Cost | + | Fixed  Cost |
|  | High activity | | 1,900 |  | $1,160 |  | $760 |  | $400 |
|  | Low activity | | 1,250 |  | 900 |  | 500 |  | 400 |
|  | Differences | | 650 |  | $ 260 |  |  |  |  |

Variable rate = $260 ÷ 650 MHs = $0.40 per MH

Cost formula: *y* = $400 + $0.40 MH

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| --- | --- | --- | --- | --- | --- |
| b. | | | 1,325 | 1,500 | 1,675 |
| Variable utility cost @ $0.40 per MH | | $ 530 | $ 600 | $ 670 |
| Fixed utility cost | 400 | 400 | 400 |
| Expected total utility cost | $ 930 | $1,000 | $1,070 |
|  |  |  |  |

1. a. If the purpose is to control costs, the comparison is inappropriate. Actual cost should be compared with flexible budget cost *at the same level* of output as that of the actual cost—in this case 17,600 units (not 16,000 units). A flexible budget formula allows the determination of costs at any level of activity.
   1. Variable rate (b) (at any point) = $4 (for example, $80,000 ÷ 20,000 units)

Fixed amount (a) (given) = $32,000

The flexible budget for 17,600 units is:

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| --- | --- |
| Variable (17,600 × $4) | $ 70,400 |
| Fixed | 32,000 |
| Total | $102,400 |
|  |  |

A comparison with the budget follows:

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| --- | --- | --- | --- | --- |
|  | | Budget | Actual | Variances |
| Variable | $ 70,400 | | $ 69,000 | $1,400 F |
| Fixed | 32,000 | | 32,800 | 800 U |
| Total | $102,400 | | $101,800 | $ 600 F |
|  | |  |  |  |

The company did well controlling variable costs, but fixed costs were $800 over the budgeted amount.

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| **26.** a. | | 250 | 300 | 350 | 400 | |
| Variable costs: | |  |  |  |  | |
| Supplies @ $4.00 per DLH | | $1,000 | $1,200 | $1,400 | $1,600 | |
| Direct labor @ $7.00 per DLH | | 1,750 | 2,100 | 2,450 | 2,800 | |
| Utilities @ $5.40 per DLH | | 1,350 | 1,620 | 1,890 | 2,160 | |
| Fixed costs: | |  |  |  |  | |
| Direct labor | | 500 | 500 | 500 | 500 | |
| Utilities | | 350 | 350 | 350 | 350 | |
| Rent | | 450 | 450 | 450 | 450 | |
| Advertising | | 75 | 75 | 75 | 75 | |
| Total cost | | $5,475 | $6,295 | $7,115 | $7,935 | |
|  | |  |  |  |  | |
| b. Cost per DLH | $21.90 | | $20.98 | $20.33 | $19.84 |

* 1. $20.33 × 1.4 = $28.46 hourly charge

$28.46 × 1.25 hours per repair = $35.58 or $36 per customer repair

1. a. (18,000 – 16,560) × $22.00 = 1,440 × $22.00 = $31,680
2. (18,000 – 16,560) × ($22.00 – $4.00) = 1,440 × $18.00 = $25,920
3. Absorption costing would have produced the higher net income because it would have required $5,760 (1,440 × $4.00) of fixed manufacturing overhead to be inventoried rather than to be charged against income.
4. The variance between variable and absorption net income is caused by the difference in treatment of fixed manufacturing overhead.

|  |  |  |
| --- | --- | --- |
| Fixed overhead expensed: |  |  |
| Variable costing |  | $ 500,000 |
| Absorption costing [$500,000 × (21,000 ÷ 25,000)] | | (420,000) |
| Net income difference |  | $ 80,000 |
|  |  |  |

The company’s net income would have been $80,000 higher under absorption costing.

1. a. Ingredients $ 228,800

Labor 104,000

Variable overhead 197,600

Total variable cost $ 530,400

Divided by units ÷ 104,000

Variable cost per unit $ 5.10

Total variable cost $ 530,400

Fixed overhead 98,800

Total cost $ 629,200

Divided by units ÷ 104,000

Absorption cost per unit $ 6.05

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| --- | --- | --- |
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1. Variable cost of goods sold = 100,000 × $5.10 = $510,000
2. Absorption cost of goods sold = 100,000 × $6.05 = $605,000
3. Ending inventory (variable costing) = 4,000 × $5.10 = $20,400

Ending inventory (absorption costing) = 4,000 × $6.05 = $24,200

1. Fixed overhead charged to expense (variable costing) = $98,800

Fixed overhead charged to expense (absorption costing) = $95,000

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. a. | | Income – Variable costing | | $188,000 |
|  | | Deduct increase in CGS [FOH out of inventory ($8 × 9,600)] | | (76,800) | |
|  | | Income – Absorption costing | | $111,200 |
|  | |  | |  |
| b. | Income – Variable costing | | $188,000 |
|  | | Add decrease in CGS [FOH inventoried ($8 × 3,000)] | | 24,000 |
|  | | Income – Absorption costing | | $212,000 |
|  | |  |  | |

**31.** a. (1) Fabio’s Fashions

Income Statement (Absorption Costing Basis)

For the Month Ended April 30, 2013

|  |  |
| --- | --- |
| Sales ($14,400,000 ÷ $144 = 100,000 units sold) | $ 14,400,000 |
| Cost of goods sold ($102 × 100,000) | (10,200,000) | |
| Production volume variance ($30 × 42,500)\* | (1,275,000) | |
| Gross margin | $ 2,925,000 |
| Fixed selling & administrative expenses | (2,400,000) | |
| Income before taxes | $ 525,000 |
| \*Total production (100,000 units sold + 7,500 units inventoried) | 107,500 |
| Expected production | (150,000) | |
| Units creating volume variance | 42,500 | |
|  |  | |

1. Differences in incomes = $300,000 – $525,000 = $(225,000)

This amount is equal to the increase in inventory of 7,500 units × $30 per unit fixed overhead deferred in ending inventory under absorption costing.

* 1. Caffrey should find the variable costing approach to income determination desirable for many reasons, including the following:
     + Variable costing income varies with units sold, not units produced.
     + Fixed manufacturing overhead costs are charged against revenue in the period in which they are incurred; consequently, manufacturing cost per unit does not change with a change in production level.
     + The contribution margin offers a useful tool for marketing decisions that consider changes in relationships among costs, volume levels, and profit figures.

*(CMA adapted)*

**32**. a. Budgeted fixed overhead = $0.40 × 100,000 = $40,000

|  |  |
| --- | --- |
| b. Actual (and budgeted) fixed overhead | $40,000 |
| Applied fixed overhead (45,000 × $0.40) | 18,000 |
| Underapplied fixed overhead (absorption) | $22,000 |
|  |  |

There is no underapplied or overapplied fixed overhead under variable costing because fixed overhead is not applied to units of product.

|  |  |  |
| --- | --- | --- |
|  | Direct material | $3.60 |
|  | Direct labor | 1.00 |
|  | Variable overhead | 0.60 |
|  | Cost per unit (variable) | $5.20 |
|  | Fixed overhead | 0.40 |
|  | Cost per unit (absorption) | $5.60 |
|  |  |  |
| d. Absorption cost of goods sold (48,750 × $5.60) | | |  | $273,000 |
| Plus underapplied overhead (55,000 × $0.40) | | |  | 22,000 |
| Adjusted cost of goods sold | | |  | $295,000 |
| Selling and administrative costs: | | |  |  |
| Variable (48,750 × $0.40) | | | $ 19,500 |  |
| Fixed | | | 150,000 | 169,500 |
| Total expense (absorption) | | |  | $464,500 |
|  | | |  |  |
| Variable cost of goods sold (48,750 × $5.20) | | | $253,500 |
| Variable selling expenses (48,750 × $0.40) | | | 19,500 |
| Fixed overhead | | | 40,000 |
| Fixed selling and administrative expenses | | | 150,000 |
| Total expense (variable) | | | $463,000 |
|  | | |  |

1. Income is higher under variable costing because the sales level is greater than the production level. Income will be higher by the fixed overhead per unit ($0.40) times the change in inventory (3,750 unit decline) or $1,500.
2. Each student will have a different answer, but the following points should be addressed. The debate surrounding the use of variable costing versus absorption costing for valuing inventory hinges on whether the incurrence of fixed overhead creates an asset. A cost incurred to create an asset, as opposed to a cost that is an expense of the period, must be capitalized and should not be charged against revenues (expensed) until its related benefit is recognized in income. Since inventory is an asset, any costs that are incurred to create that asset, including fixed overhead, should be considered for capitalization. This is the argument for use of absorption costing.

However, proponents of variable costing argue that the incurrence of fixed overhead relates more to the capacity to produce than to production. Accordingly, these people argue that fixed overhead is not directly related to production sufficiently to be considered an inventoriable cost.

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| --- | --- | --- | --- | --- |
| **34.** a. | *x* | *y* | *xy* | *x2* |
|  | 50 | $ 175 | $ 8,750 | 2,500 |
|  | 44 | 162 | 7,128 | 1,936 |
|  | 40 | 154 | 6,160 | 1,600 |
|  | 35 | 142 | 4,970 | 1,225 |
|  | 53 | 185 | 9,805 | 2,809 |
|  | 58 | 200 | 11,600 | 3,364 |
|  | 60 | 202 | 12,120 | 3,600 |
|  | 340 | $1,220 | $60,533 | 17,034 |
|  |  |  |  |  |

*y* $55.29 + $2.45 (# of shipments)

1. *y* = $55.29 + $2.45(165) = $459.54

Note that one would be cautious to use this prediction because 165 may be substantially greater than the relevant range of activity.

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| --- | --- | --- | --- |
| **35.** *x* | *y* | *xy* | *x2* |
| 200 | $ 300 | $ 60,000 | 40,000 |
| 325 | 440 | 143,000 | 105,625 |
| 400 | 480 | 192,000 | 160,000 |
| 410 | 490 | 200,900 | 168,100 |
| 525 | 620 | 325,500 | 275,625 |
| 680 | 790 | 537,200 | 462,400 |
| 820 | 840 | 688,800 | 672,400 |
| 900 | 900 | 810,000 | 810,000 |
| 4,260 | $4,860 | $2,957,400 | 2,694,150 |
|  |  |  |  |

*y* $144.23 + $0.87 MH

**PROBLEMS**

**36.** a. OH rate = Allocated overhead ÷ Actual hours

= ($80,000 + $16,000 + $4,000) ÷ (8,000 + 1,600 + 400)

= $10.00 per DLH

1. OH rate = $100,000 ÷ (800 + 2,400 + 12,800) = $6.25 per MH
2. GW1: 800 × $6.25 = $5,000

GW4: 2,400 × $6.25 = $15,000

GW7: 12,800 × $6.25 = $80,000

1. The overhead allocations differ dramatically because most of the direct labor hours are expended on the production of GW1 and most of the machine hours are expended on GW7. GW4 is allocated similar amounts of overhead under the two schemes only because its production requires a balance of machine and labor time.

The better allocation cannot be determined based on the available information. However, identifying the better allocation requires that the costs comprising overhead be examined to determine whether they are more closely associated with labor time or machine time. Alternatively, an overhead allocation scheme could be devised that would use two overhead rates: one using direct labor to allocate the labor-driven overhead costs and the other uses machine hours to allocate the machine-driven portion of overhead.

|  |  |  |  |
| --- | --- | --- | --- |
| **37.** a. | | Fixed Costs | Variable Costs |
| Indirect material |  | $2.00 |
| Indirect labor | $144,000 | 2.50 |
| Utilities | 6,000 | 0.04 |
| Repairs & maintenance | 20,000 | 0.34 |
| Material handling | 16,000 | 0.12 |
| Depreciation | 210,000 |  |
| Rent on plant building | 50,000 |  |
| Insurance on plant building | 12,000 |  |
| Totals | $458,000 | $5.00 |

*y* = $458,000 + $5*X*

1. Capacities computed:

Theoretical = 50,000 units

Practical = 50,000 × 0.80 = 40,000 units

Normal = 50,000 × 0.80 × 0.80 = 32,000 units

Expected capacity = 30,000 units

Overhead application rates (per unit):

Theoretical: ($458,000 ÷ 50,000) + $5 = $14.16

Practical: ($458,000 ÷ 40,000) + $5 = $16.45

Normal: ($458,000 ÷ 32,000) + $5 = $19.31 (rounded)

Expected: ($458,000 ÷ 30,000) + $5 = $20.27 (rounded)

1. Actual cost = $458,000 + ($5 × 35,000) = $633,000

Applied overhead:

Theoretical rate: $14.16 × 35,000 = $495,600

Practical rate: $16.45 × 35,000 = $575,750

Normal rate: $19.31 × 35,000 = $675,850

Expected rate: $20.27 × 35,000 = $709,450

Under/Overapplied amounts:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Applied | Actual | (Under-) Overapplied Amount | | |
| Theoretical: | $495,600 | $633,000 | $(137,400) | |
| Practical: | 575,750 | 633,000 | (57,250) | |
| Normal: | 675,850 | 633,000 | 42,850 |
| Expected: | 709,450 | 633,000 | 76,450 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **38.** a. | |  | | Expected | Normal | Practical | | | Theoretical |
|  | |  | | 72,000 | 76,000 | 80,000 | | | 100,000 |
|  | Variable costs: | | |  |  |  | | |  |
|  | | Indirect material | | $180,000 | $190,000 | $200,000 | | | $250,000 |
|  | | Indirect labor | | 216,000 | 228,000 | 240,000 | | | 300,000 |
|  | | Factory utilities | | 1,440 | 1,520 | 1,600 | | | 2,000 |
|  | | Machine maintenance | | 36,000 | 38,000 | 40,000 | | | 50,000 |
|  | | Material handling | | 8,640 | 9,120 | 9,600 | | | 12,000 |
|  | | Machine depreciation | | 2,160 | 2,280 | 2,400 | | | 3,000 |
|  | Total variable costs | | | $444,240 | $468,920 | $493,600 | | | $617,000 |
|  | Fixed costs: | | |  |  |  | | |  |
|  | | Factory utilities | | $ 3,000 | $ 3,000 | $ 3,000 | | | $ 3,000 |
|  | | Machine maintenance | | 10,000 | 10,000 | 10,000 | | | 10,000 |
|  | | Material handling | | 8,000 | 8,000 | 8,000 | | | 8,000 |
|  | | Building rent | | 12,000 | 12,000 | 12,000 | | | 12,000 |
|  | | Supervisors’ salaries | | 72,000 | 72,000 | 72,000 | | | 72,000 |
|  | | Factory insurance | | 6,000 | 6,000 | 6,000 | | | 6,000 |
|  | Total fixed costs | | | $111,000 | $111,000 | $111,000 | | | $111,000 |
|  |  | | |  |  |  | | |  |
|  | Variable OH rate per unit | | | $6.17 | $6.17 | $6.17 | | | $6.17 |
|  | Fixed OH rate per unit | | | $1.54 | $1.46 | $1.39 | | | $1.11 |
|  |  | | |  |  |  | | |  |
| 1. (1) | | | Variable Manufacturing Overhead | | | 175,000 | | |  |
|  | | | Raw Material (Supplies) Inventory | | |  | | | 175,000 |
|  | | | *To record indirect material at $2.50 per unit*  *produced* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Variable Manufacturing Overhead | | | 210,000 | | |  |
|  | | | Wages Payable (or Cash) | | |  | | | 210,000 |
|  | | | *To record indirect labor at $3.00 per unit produced* | | | | |  |  |
|  | | |  | | |  | | |  |
|  | | | Variable Manufacturing Overhead | | | 1,400 | | |  |
|  | | | Fixed Manufacturing Overhead | | | 3,000 | | |  |
|  | | | Utilities Payable (or Cash) | | |  | | | 4,400 |
|  | | | *To record factory utilities* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Variable Manufacturing Overhead | | | 35,000 | | |  |
|  | | | Fixed Manufacturing Overhead | | | 10,000 | | |  |
|  | | | Cash (or Supplies) | | |  | | | 45,000 |
|  | | | *To record factory maintenance* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Variable Manufacturing Overhead | | | 8,400 | | |  |
|  | | | Fixed Manufacturing Overhead | | | 8,000 | | |  |
|  | | | Cash | | |  | | | 16,400 |
|  | | | *To record material handling charges* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Variable Manufacturing Overhead | | | 2,100 | | |  |
|  | | | Accumulated Depreciation | | |  | | | 2,100 |
|  | | | *To record depreciation at $0.03 per unit produced* | | | |  | |  |
|  | | |  | | |  | | |  |
|  | | | Fixed Manufacturing Overhead | | | 12,000 | | |  |
|  | | | Cash | | |  | | | 12,000 |
|  | | | *To record building rent* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Fixed Manufacturing Overhead | | | 72,000 | | |  |
|  | | | Salaries Payable (or Cash) | | |  | | | 72,000 |
|  | | | *To record supervisors’ salaries* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Fixed Manufacturing Overhead | | | 6,000 | | |  |
|  | | | Cash (or Prepaid Ins. or Ins. Payable) | | |  | | | 6,000 |
|  | | | *To record factory insurance* | | |  | | |  |
|  | | |  | | |  | | |  |
|  | | | Work in Process Inventory | | | 539,700 | | |  |
|  | | | Variable Manufacturing Overhead | | |  | | | 431,900 |
|  | | | Fixed Manufacturing Overhead | | |  | | | 107,800 |
|  | | | *To apply variable and fixed manufacturing overhead to WIP* | | |  | | |  |

|  |  |  |
| --- | --- | --- |
|  | Actual fixed overhead | $111,000 |
|  | Applied fixed overhead (70,000 × $1.54) | 107,800 |
|  | Underapplied fixed overhead | $ 3,200 |
|  |  |  |

1. Use of expected capacity would create costs that would more closely match actual production costs. However, use of practical capacity would help indicate to management the costs of unused capacity.

**39.** a. Total overhead = $635,340 + $324,000 = $959,340

Total MHs = 72,000 + 9,300 = 81,300

OH rate per MH = $959,340 ÷ 81,300 MH = $11.80 per MH

Applied overhead = $11.80 × 10.30 = $121.54

|  |  |  |
| --- | --- | --- |
| 1. Fabrication: $635,340 ÷ 72,000 MHs = $8.82 per MH × 10 | | $ 88.20 |
| Finishing: $324,000 ÷ 48,000 DLHs = $6.75 per DLH × 2 | 13.50 |
| Total OH applied per unit using departmental rates | $101.70 |
|  |  |

1. Because each department is so different in the type of work being performed (machine intensive vs. labor intensive), plantwide rates will not accurately attach overhead costs.
2. a. (1) Total DLHs = 27,000 + 3,000 = 30,000

OH rate per DLH = $993,000 ÷ 30,000 DLHs = $33.10 per DLH

* + 1. Total MHs = 2,100 + 65,800 = 67,900

OH rate per MH = $993,000 ÷ 67,900 MHs = $14.62 per MH

1. Cutting: $385,500 ÷ 27,000 DLHs = $14.28 per DLH

Assembly: $607,500 ÷ 65,800 MHs = $9.23 per MH

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| c. | | |  | RW22SKI | | SD45ROW |
|  | | Direct material | | $ 34.85 | $ 19.57 | |
|  | | Direct labor—Cutting (6 × $20.00; 4.8 × $20.00) | | 120.00 | 96.00 | |
|  | | Direct labor—Assembly (0.03 × $8.00; 0.05 × $8.00) | | 0.24 | 0.40 | |
|  | | Total cost other than overhead | | $155.09 | $115.97 | |
|  | 1. Overhead (plantwide rate using DLHs) | | |  |  | |
|  | | | (6.03 × $33.10; 4.85 × $33.10) | 199.59 | 160.54 | |
|  | | | Total cost | $354.68 | $276.51 | |
|  | | |  |  |  | |
|  | 1. Total cost other than overhead | | | $155.09 | $115.97 | |
|  | | | Overhead (plantwide rate using MHs) |  |  | |
|  | | | (5.96 × $14.62; 9.45 × $14.62) | 87.14 | 138.16 | |
|  | | | Total cost | $242.23 | $254.13 | |
|  | | |  |  |  | |
|  | 1. Total cost other than overhead | | | $155.09 | $115.97 | |
|  | | | Cutting Department overhead |  |  | |
|  | | | (6 × $14.28; 4.8 × $14.28) | 85.68 | 68.54 | |
|  | | | Assembly Department overhead |  |  | |
|  | | | (5.9 × $9.23; 9.3 × $9.23) | 54.46 | 85.84 | |
|  | | | Total cost | $295.23 | $270.35 | |
|  | | |  |  | |  |

1. Given that a competitor sells the similar product for $310, management would probably conclude that production of RW22SKI was not feasible if the cost determined from a plantwide overhead rate based on DLHs was used; competing on price would create a “loss” per unit. Using the cost determined from a plantwide rate based on MHs might cause management to undercut the competitor’s price substantially, believing that a significant profit margin could be made. Using the cost determined from departmental rates (which is the most accurate of the three costs) would allow management to meet the competition’s price but would provide a small 5 percent profit margin ($310 – $295.23 = $14.77; $14.77 ÷ $310 = 0.05). Possibly management needs to determine if the product could be produced more efficiently.

|  |  |  |
| --- | --- | --- |
| 1. a. Variable indirect labor | | $100,000 |
| Variable indirect material | 20,000 |
| Variable utilities | 80,000 |
| Variable portion of other mixed costs | 120,000 |
| Total variable OH costs | $320,000 |
|  |  |

Total variable OH costs ÷ Number of MHs = Variable OH rate per MH

$320,000 ÷ 50,000 MHs = $6.40 per MH

|  |  |
| --- | --- |
| Fixed machinery depreciation | $ 62,000 |
| Fixed machinery lease payments | 13,000 |
| Fixed machinery insurance | 16,000 |
| Fixed salaries | 75,000 |
| Fixed utilities | 12,000 |
| Total fixed overhead OH costs | $178,000 |
|  |  |

Total fixed OH costs ÷ Number of MHs = Fixed OH rate per MH

$178,000 ÷ 50,000 MHs = $3.56 per MH

|  |  |  |  |
| --- | --- | --- | --- |
|  | Variable Manufacturing Overhead | 273,600 |  |
|  | Various accounts |  | 273,600 |
|  | *To record actual VOH costs* |  |  |
|  |  |  |  |
|  | Fixed Manufacturing Overhead | 185,680 |  |
|  | Various accounts |  | 185,680 |
|  | *To record actual FOH costs* |  |  |
|  |  |  |  |
|  | Work in Process Inventory (53,000 MHs × $6.40) | 339,200 |  |
|  | Variable Manufacturing Overhead |  | 339,200 |
|  | *To apply VOH to production* |  |  |
|  |  |  |  |
|  | Work in Process Inventory (53,000 MHs × $3.56) | 188,680 |  |
|  | Fixed Manufacturing Overhead |  | 188,680 |
|  | *To apply FOH to production* |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Actual VOH | | | $273,600 | Actual FOH | | | | | $185,680 | |
|  | Applied VOH | | | 339,200 | Applied FOH | | | | | 188,680 | |
|  | Overapplied VOH | | | $ 65,600 | Overapplied FOH | | | | | $ 3,000 | |
|  |  | | |  |  | | | | |  | |
|  | Fixed Manufacturing Overhead | | | | | 3,000 | | | |  | |
|  | Cost of Goods Sold | | | | |  | | | | 3,000 | |
|  | *To close FOH at year-end* | | | | |  | | | |  | |
|  |  | | | | |  | | | |  | |
|  |  | Balance | Proportion | | | | % | | Overapp. OH | | Adj. | |
|  | WIP | $ 234,000 | $234,000 ÷ $1,560,000 | | | | 15 | $65,600 | | | $ 9,840 | |
|  | FG | 390,000 | 390,000 ÷ $1,560,000 | | | | 25 | $65,600 | | | 16,400 | |
|  | CGS | 936,000 | 936,000 ÷ $1,560,000 | | | | 60 | $65,600 | | | 39,360 | |
|  | Total | $1,560,000 |  | | | | 100 |  | | | $65,600 | |

|  |  |  |
| --- | --- | --- |
| Variable Manufacturing Overhead | 65,600 |  |
| Work in Process Inventory |  | 9,840 |
| Finished Goods Inventory |  | 16,400 |
| Cost of Goods Sold |  | 39,360 |
|  |  |  |

1. a. Indirect material: variable; at either level, $6.40 per animal day

Indirect labor: mixed; $8,000 + $12.00 per animal day

|  |  |  |
| --- | --- | --- |
| at | 6,000 days | $ 80,000 |
| at | (4,000) days | (56,000) | |
|  | 2,000 | $ 24,000 |
| $24,000 ÷ 2,000 = $12 per animal day | | | | | |  | |
|  | | | | | | |  | |
| Total cost | | | | | | $80,000 | |
| Variable ($12 × 6,000 animal days) | | | | | | 72,000 | |
| Fixed | | | | | | $ 8,000 | |
|  | | | | | |  | |

Maintenance: mixed; $4,000 + $1.60 per animal day

|  |  |  |
| --- | --- | --- |
| at | 6,000 days | $ 13,600 |
| at | (4,000) days | (10,400) | |
|  | 2,000 | $ 3,200 |

|  |  |
| --- | --- |
| $3,200 ÷ 2,000 = $1.60 per animal day |  |
|  |  |
| Total cost | $13,600 |
| Variable ($1.60 × 6,000 animal days) | (9,600) | |
| Fixed | $ 4,000 |
|  |  |

Utilities: variable; at either level, $2.00 per animal day

All other: mixed; $2,400 + $3.20 per animal day

|  |  |  |
| --- | --- | --- |
| at | 6,000 days | $ 21,600 |
| at | (4,000) days | (15,200) | |
|  | 2,000 | $ 6,400 |

|  |  |
| --- | --- |
| $6,400 ÷ 2,000 = $3.20 per animal day |  |
|  |  |
| Total cost | $ 21,600 |
| Variable ($3.20 × 6,000 animal days) | (19,200) | |
| Fixed | $ 2,400 |
|  |  |

Total fixed cost = $8,000 + $4,000 + $2,400 = $14,400

Total variable cost = $6.40 + $12.00 + $1.60 + $2.00 + $3.20 = $25.20

Total OH cost formula: $14,400 + $25.20 per animal day

1. $14,400 ÷ ($26.80 − $25.20) = 9,000 animal days
2. $26.80 × 9,000 = $241,200

|  |  |  |
| --- | --- | --- |
| d. | VOH rate remains constant at | $25.20 |
|  | FOH rate ($14,400 ÷ 12,000) | 1.20 |
|  | Total OH rate at 12,000 animal days | $26.40\* |
|  |  |  |

\*This rate assumes that 12,000 days is still within the relevant range of activity and, therefore, no variable costs will change per unit and no fixed costs will change in total.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **43.** a. | | |  | MHs | | Total Cost | | = | Variable Cost | | + | Fixed Cost | | |
|  | | High activity | | 2,700 | $13,160 | |  | | $8,640 |  | | $4,520 |
|  | | Low activity | | (1,400) | | (9,000) |  | | 4,480 |  | | 4,520 |
|  | Differences | | | 1,300 | $ 4,160 | |  | |  |  | |  | |
|  |  | | |  |  | | |  |  | |  |  | | |

Variable rate = $4,160 ÷ 1,300 MHs = $3.20 per MH

High activity variable cost = 2,700 × $3.20 = $8,640

Low activity variable cost = 1,400 × $3.20 = $4,480

Fixed cost at low activity = $9,000 – $4,480 = $4,520

Total R&M cost = $4,520 + $3.20 MH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *x* | *y* | *xy* | *x2* |
|  | 1,400 | $ 9,000 | $ 12,600,000 | 1,960,000 |
|  | 1,900 | 10,719 | 20,366,100 | 3,610,000 |
|  | 2,000 | 10,900 | 21,800,000 | 4,000,000 |
|  | 2,500 | 13,000 | 32,500,000 | 6,250,000 |
|  | 2,200 | 11,578 | 25,471,600 | 4,840,000 |
|  | 2,700 | 13,160 | 35,532,000 | 7,290,000 |
|  | 1,700 | 9,525 | 16,192,500 | 2,890,000 |
|  | 2,300 | 11,670 | 26,841,000 | 5,290,000 |
|  | 16,700 | $89,552 | $191,303,200 | 36,130,000 |

*y* $4,012.25 + $3.44 MH

1. Part (b) computations provide the better answer. The least squares regression approach takes into consideration all of the available data and employs a mathematical algorithm to minimize the variance around the fitted regression line.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **44.** a. | |  | DIRECT LABOR HOURS | | | |
|  | | |  | 550 | 600 | 650 | 700 |
|  | | Variable costs: | |  |  |  |  |
|  | | Supplies | | $ 2,200 | $ 2,400 | $ 2,600 | $ 2,800 |
|  | | Direct labor | | 6,600 | 7,200 | 7,800 | 8,400 |
|  | | Overhead | | 550 | 600 | 650 | 700 |
|  | | Total variable costs | | $ 9,350 | $10,200 | $11,050 | $11,900 |
|  | | Variable cost per DLH | | $ 17.00 | $ 17.00 | $ 17.00 | $ 17.00 |
|  | | Fixed costs: | |  |  |  |  |
|  | | Overhead | | $ 8,000 | $ 8,000 | $ 8,000 | $ 8,000 |
|  | | Fixed costs per DLH | | $ 14.55 | $ 13.33 | $ 12.31 | $ 11.43 |
|  | | Total cost | | $17,350 | $18,200 | $19,050 | $19,900 |
|  | |  | |  |  |  |  |
| b. Total cost per DLH | | | | $ 31.55 | $ 30.33 | $ 29.31 | $ 28.43 |
|  | |  | |  |  |  |  |

1. Price = (1.45 × $29.31) + [0.4 × (1.45 × $29.31)] = $59.50 (rounded)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **45.** a. | | | ACTIVITY IN MHs | | | | | |
|  | |  | Low | |  | | High | |
|  | |  | 2,500 | 3,000 | | 3,500 | |
|  | Production overhead costs: | |  |  | |  | |
|  | Variable | | $ 10,125 | $ 12,150 | | $ 14,175 | |
|  | Fixed | | 95,400 | 95,400 | | 95,400 | |
|  | Total | | $105,525 | $107,550 | | $109,575 | |
|  |  | |  | |  | |  | |
|  |  | | ACTIVITY IN DLHs | | | | | |
|  |  | | 6,000 | 7,000 | | 8,000 | |
|  | Installation overhead costs: | |  |  | |  | |
|  | Variable | | $ 85,500 | $ 99,750 | | $114,000 | |
|  | Fixed | | 73,800 | 73,800 | | 73,800 | |
|  | Total | | $159,300 | $173,550 | | $187,800 | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Number of pools: 8 |  | |  |
|  | Production (25 MHs per pool): |  | |  |
|  | Variable (8 × 25 × $4.05) | $ 810 | |  |
|  | Fixed (monthly amount) | 7,950 | |  |
|  | Total production overhead |  | | $ 8,760 |
|  | Installation (60 DLHs per pool): | |  |  |
|  | Variable (8 × 60 × $14.25) | $6,840 | |  |
|  | Fixed (monthly amount) | 6,150 | |  |
|  | Total installation |  | | 12,990 |
|  | Total |  | | $21,750 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Number of pools: 120 |  | |  |
|  | Production (25 MHs per pool): |  | |  |
|  | Variable (120 × 25 × $4.05) | $ 12,150 | |  |
|  | Fixed | 95,400 | | $ 107,550 |
|  | Installation (60 DLHs per pool): | |  |  |
|  | Variable (120 × 60 × $14.25) | $102,600 | |  |
|  | Fixed | 73,800 | | 176,400 |
|  | Total overhead |  | | $ 283,950 |
|  | Budgeted capacity |  | | ÷ 120 |
|  | Overhead cost per pool |  | | $2,366.25 |
|  |  |  | |  |

**46.** You would likely tell Snider that he should provide to his superior the equation for each cost that provides the most accurate prediction of the cost. To make this determination, you could advise Snider to use each of the two equations to predict costs in past periods. The equation that produces the least error in the prediction would be the best equation to use in the budgeting process. Since Snider used the high-low method to develop his equations, he used only two months of data in the estimation process. Other monthly data could be used to assess the accuracy of each equation. Your initial bias would favor the model based on machine hours because that model produces a much lower fixed cost (cost unexplained by the *x* variable in the model).

**47.** a. Georgia Shacks

Income Statement (Absorption)

For the Year Ended December 31, 2013

|  |  |  |
| --- | --- | --- |
| Sales |  | $ 3,750,000 |
| Cost of goods sold—variable | $1,950,000 |  |
| Fixed overhead [($1,500,000 ÷ 2,000) × 1,500] | 1,125,000 | (3,075,000) | |
| Gross profit |  | $ 675,000 | | |
| Variable selling & administrative | $ 270,000 |  |
| Fixed selling & administrative | 190,000 | (460,000) | |
| Net income |  | $ 215,000 | | |
|  |  |  |

1. The difference in the amounts is equal to the fixed overhead of ($1,500,000 ÷ 2,000 units) or $750 per unit times the 500 units produced but not sold during the year. This $375,000 is contained in ending inventory under absorption costing, whereas it appears as part of total fixed overhead expense on the variable costing income statement.
2. It is not only ethical, but it is also required for the statements to be in conformity with generally accepted accounting principles.
3. (1) Georgia Shacks

Income Statement (Variable)

For the Year Ended December 31, 2014

|  |  |  |  |
| --- | --- | --- | --- |
| Sales (2,200 × $2,500) |  | | $ 5,500,000 |
| Variable cost of goods sold (2,200 × $1,300) |  | | (2,860,000) | |
| Product contribution margin |  | | $ 2,640,000 |
| Variable selling & administrative ($180 × 2,200) | |  | (396,000) | |
| Contribution margin |  | | $ 2,244,000 |
| Fixed overhead | $1,500,000 | |  |
| Fixed selling & administrative | 190,000 | | (1,690,000) | |
| Net income |  | | $ 554,000 |
|  |  | |  |

1. Georgia Shacks

Income Statement (Absorption)

For the Year Ended December 31, 2014

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sales |  | | |  | | $ 5,500,000 | |
| Cost of goods sold—variable |  | | | $2,860,000 | |  | |
| Fixed overhead [($1,500,000 ÷ 2,000) × 2,200] | | |  | 1,650,000 | | (4,510,000) | | |
| Gross profit |  | | |  | | $ 990,000 | |
| Variable selling & administrative |  | | | $ 396,000 | |  | |
| Fixed selling & administrative |  | | | 190,000 | | (586,000) | | |
| Net income |  | | |  | | $ 404,000 | |
|  |  | | |  | |  | |
| 1. Net income under variable costing | | | $ 554,000 | | | |  |  | |
| Net income under absorption costing | | | (404,000) | | |  |  | |
| Difference in net incomes | | $ 150,000 | | | |  |  |

The difference in the net incomes is equal to the incremental decrease in the ending balances of the inventory accounts when compared to the beginning balances. Another way to look at this more easily is to multiply the 200 units sold in excess of the 2,200 units produced by the fixed overhead application rate of $750 per unit (200 × $750 = $150,000).

The decrease in income in absorption costing is due to previously inventoried costs now hitting the income statement. This happens because the number of units sold exceeds the number of units produced.

**48.** Bird’s Eye View

Income Statements (Absorption)

For the Years Ended December 31, 2013 and 2014

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 2013 (10,000 units) | | | 2014 (12,000 units) | |
| Sales (units × $500) |  | $ 5,000,000 |  | | $ 6,000,000 |
| CGS (units × $270) | $2,700,000 |  | $3,240,000 | |  |
| Underapplied FOH | 0 | (2,700,000) | | 90,000 | (3,330,000) | |
| Gross profit |  | $ 2,300,000 |  | | $ 2,670,000 |
| S&A: |  |  |  | |  |
| Variable (units × $50) | $ 500,000 |  | $ 600,000 | |  |
| Fixed | 180,000 | (680,000) | | 180,000 | (780,000) | |
| Income before taxes |  | $ 1,620,000 |  | | $ 1,890,000 |

Bird’s Eye View

Income Statements (Variable)

For the Years Ended December 31, 2013 and 2014

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 2013 (10,000 units) | | | | 2014 (12,000 units) | |
| Sales (units × $500) |  | | | $ 5,000,000 |  | $ 6,000,000 |
| CGS (units × $210) |  | | | (2,100,000) |  | (2,520,000) | |
| Product CM |  | | | $ 2,900,000 |  | $ 3,480,000 |
| Variable S&A (units × $50) | |  | | (500,000) |  | (600,000) | |
| Total CM |  | | | $ 2,400,000 |  | $ 2,880,000 |
| Fixed costs: |  | | |  |  |  |
| Factory | $750,000 | |  | | $750,000 |  |
| S&A | 180,000 | | (930,000) | | 180,000 | (930,000) | |
| Income before taxes |  | | | $ 1,470,000 | $ 1,950,000 | |

|  |  |  |
| --- | --- | --- |
|  | 2013 | 2014 |
| Net income (absorption) | $1,620,000 | $1,890,000 |
| Net income (variable) | 1,470,000 | 1,950,000 |
| Difference in income | $ 150,000 | $ (60,000) | |
|  |  |  | |
| Difference equals inventory change | + 2,500 | − 1,000 |
| Times FOH application rate | × $60 | × $60 |
| Difference in income | $ 150,000 | $ (60,000) | |
|  |  |  |

**49.** a. Akron Aviation

Income Statement (Variable)

For the Year Ended December 31, 2014

|  |  |  |  |
| --- | --- | --- | --- |
| Sales |  | $1,015,000 | |
| Variable cost of goods sold: |  |  | |
| Work in process 1/1/14 | $ 46,400 |  | |
| Finished goods 1/1/14 | 16,950 |  | |
| Manufacturing costs incurred | 650,600 |  | |
| Total costs available | $713,950 |  | |
| Work in process 12/31/14 | (61,900) | |  |
| Finished goods 12/31/14 | (13,180) | | (638,870) | |
| Product contribution margin |  | $ 376,130 | |
| Variable selling expenses |  | (50,750) | | |
| Contribution margin |  | $ 325,380 | |
| Fixed expenses: |  |  | |
| Factory overhead | $ 42,300 |  | |
| Selling | 44,250 |  | |
| Administrative | 75,000 | (161,550) | | |
| Operating Income |  | $ 163,830 | |
|  | |  |  | |

Supporting calculations

|  |  |  |  |
| --- | --- | --- | --- |
| Variable finished goods inventory at 1/1/14: | | | |
| Absorption finished goods inventory | | $18,000 | |
| Less fixed overhead (1,050 hours × $1 per hour) | | (1,050) | | |
| Variable finished goods inventory | | $16,950 | |
|  |  | | |
| Variable work in process inventory at 1/1/14: | | | |
| Absorption work in process inventory | | $48,000 | |
| Less fixed overhead (1,600 hours × $1 per hour) | | (1,600) | | |
| Variable work in process | | $46,400 | |
|  |  | | |
| Variable manufacturing costs incurred during 2014: | | | |
| Direct material | | $370,000 | |
| Direct labor (23,000 hours × $6 per hour) | | 138,000 | |
| Variable overhead (23,000 hours × $6.20 per hour) | | | 142,600 |
| Variable manufacturing costs | $650,600 | | |
|  |  | | |

The direct labor rate is ($150,000 ÷ 25,000 hours) or $6.00 per hour. The variable overhead rate is ($155,000 ÷ 25,000 hours) or $6.20 per hour.

|  |  |
| --- | --- |
| Variable work in process inventory at 12/31/14: | |
| Absorption work in process inventory | $64,000 |
| Less fixed overhead (2,100 hours × $1) | (2,100) | |
| Variable work in process inventory | $61,900 |

|  |  |
| --- | --- |
| Variable finished goods inventory at 12/31/14: | |
| Absorption finished goods inventory | $14,000 |
| Less fixed overhead (820 hours × $1) | (820) | |
| Variable finished goods inventory | $13,180 |
|  |  |
|  |  |

Variable selling expenses = Sales × 5% = $1,015,000 × 5% = $50,750

|  |  |  |
| --- | --- | --- |
| Fixed selling expenses: |  | |
| Total selling expenses | | $ 95,000 |
| Less variable selling expenses | | (50,750) |
| Fixed selling expenses | | $ 44,250 |
|  |  | |

1. The main advantage of variable costing is that it reveals the marginal cost of production. That is, variable costing facilitates making decisions about pricing, changes in volume, and changes in cost structure. Variable costing also facilitates identification of the break-even point. Further, variable costing does not lend itself to managerial manipulation of income. The major disadvantage is that variable costing treats fixed overhead as a period cost and, therefore, may violate the matching principle if one believes fixed manufacturing overhead is a product cost.

**50.** a. Increasing production, relative to sales or relative to prior plans, has the effect of moving fixed manufacturing overhead from the income statement to the balance sheet. By producing substantially more units than are required to meet sales demand, a significant portion of the fixed manufacturing overhead cost incurred can be put into inventory and the result is a lower Cost of Goods Sold than would otherwise be reported.

1. Because the increase in production is not matched by an increase in sales, finished goods, and perhaps in process, inventories would increase. Also, the costs of manufacturing would rise as production increases. The rising costs could be realized in the form of higher accounts payable balances, lower cash balances, or higher loan balances. Assuming the firm operates within its relevant range, only the total variable costs of production would increase with increases in production. The total amount of fixed manufacturing overhead incurred would not be affected by the decision to increase production.
2. The CFO’s plan is not ethical. The intent of the increase in production is to distort the reported profit earned by the firm. By reporting a higher profit, the CFO would likely personally benefit through bonus compensation and, perhaps, stock options.
3. The effects of the CFO’s plan should be detectible by analyzing the financial statements. The effects to identify are described in the answer to (b). Of all the effects of the plan, the rise in inventory levels is likely the most prominent flag.

**51.** a. Tomm’s T’s

Income Statement (Variable)

For the Year Ended December 31, 2013

|  |  |  |
| --- | --- | --- |
| Sales (40,000 × $22) |  | $ 880,000 |
| Variable cost of goods sold (40,000 × $8.25) |  | (330,000) | |
| Contribution margin |  | $ 550,000 |
| Fixed costs: |  |  |
| Production | $120,000 |  |
| Selling & administrative | 130,000 | (250,000) | |
| Income before taxes |  | $ 300,000 |
|  |  |  |

1. Tomm’s T’s

Income Statement (Absorption)

For the Year Ended December 31, 2013

|  |  |  |
| --- | --- | --- |
| Sales (40,000 × $22) |  | $ 880,000 |
| Cost of goods sold (40,000 × $10.25) | $410,000 |  |
| Underapplied fixed overhead\* | 24,000 | (434,000) | |
| Gross margin |  | $ 446,000 |
| Less selling and administrative costs |  | (130,000) | |
| Income before taxes |  | $ 316,000 |
|  |  |  |

Number of units in ending FG inventory = 4,000 + 48,000 – 40,000 = 12,000

FOH: $120,000 ÷ 60,000 = $2.00 per unit

Underapplied FOH = $2.00 × (60,000 – 48,000) = $2.00 × 12,000 = $24,000

1. Inventory increased from 4,000 to 12,000 units or by 8,000 units. Each added unit absorbs $2.00 in allocated fixed overhead or a total of $16,000. The presumption in the problem is that the books are maintained on a variable costing basis. Assuming only the current year needs to be adjusted (the beginning inventory of 2013 was charged with the appropriate fixed overhead), then the entry would be:

|  |  |  |
| --- | --- | --- |
| Inventory (8,000 × $2.00) | 16,000 |  |
| Cost of Goods Sold (40,000 × $2.00) | 80,000 |  |
| Underapplied Overhead | 24,000 |  |
| Fixed Factory Overhead |  | 120,000 |
|  |  |  |

1. Advantages:
   * The fixed costs are reported at incurred values (and not applied), thus increasing the likelihood of better control of those costs.
   * Profits are directly influenced by changes in sales volume (and not influenced by building inventory).
   * The impact of fixed costs on profits is emphasized.
   * Product line, territory, etc., marginal contribution is emphasized and more readily ascertainable.

Disadvantages:

* + Total costs may be overlooked when considering problems.
  + Distinction between fixed and variable cost is arbitrary for many costs.
  + Emphasis on variable cost may cause managers to ignore fixed costs.

1. Advantages:
   * Statements would readily reflect the direct impact of sales volume on profits.
   * The consequences of fixed costs would be more obvious.
   * Inventory swings would not influence profits.

Disadvantages:

* + Costs are not matched with revenues.
  + The difficulty in separating fixed and variable costs might cause statements to be misleading.
  + Statements would confuse investors used to absorption costing statements.
  + Confidential information (on the nature of costs) could be disclosed to competitors.

*(CMA adapted)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. a. | *x* | | *y* | | *xy* | *x2* | |
|  | 10 | $ 8,000 | | $ 80,000 | | 100 |
|  | 14 | 9,200 | | 128,800 | | 196 |
|  | 22 | 12,000 | | 264,000 | | 484 |
|  | 28 | 14,200 | | 397,600 | | 784 |
|  | 40 | 18,500 | | 740,000 | | 1,600 |
|  | 62 | 28,000 | | 1,736,000 | | 3,844 |
|  | 100 | 34,000 | | 3,400,000 | | 10,000 |
|  | 90 | 30,000 | | 2,700,000 | | 8,100 |
|  | 80 | 24,000 | | 1,920,000 | | 6,400 |
|  | 446 | $177,900 | | $11,366,400 | | 31,508 |

*y* $6,327 + $271.18 (# of charters)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *x* | *y* | *xy* | *x2* |
|  | $ 12,000 | $ 8,000 | $ 96,000,000 | 144,000,000 |
|  | 18,000 | 9,200 | 165,600,000 | 324,000,000 |
|  | 26,000 | 12,000 | 312,000,000 | 676,000,000 |
|  | 36,000 | 14,200 | 511,200,000 | 1,296,000,000 |
|  | 60,000 | 18,500 | 1,110,000,000 | 3,600,000,000 |
|  | 82,000 | 28,000 | 2,296,000,000 | 6,724,000,000 |
|  | 120,000 | 34,000 | 4,080,000,000 | 14,400,000,000 |
|  | 100,000 | 30,000 | 3,000,000,000 | 10,000,000,000 |
|  | 96,000 | 24,000 | 2,304,000,000 | 9,216,000,000 |
|  | $550,000 | $177,900 | $13,874,800,000 | 46,380,000,000 |
|  |  |  |  |  |

*y* $5,405.56 + $0.235 (gross receipts)