# Standard Costs and Variances

## Chapter 11

# Objective 1

Explain how and why standard costs
are developed

# Reviews

- **Chapter 9:** prepare master budget

- **Chapter 10:** compare actual to budgeted revenues and costs- flexible budgets- volume variance & flexible budget variance.

- **This chapter:** further separating the flexible budgets variance into two additional variance: (1) a price variance and (2) a quantity or efficiency variance.

# Standard Costs

- A budget for a single unit of product.

- A company that produces many different products will develop a standard cost for each type of product.

- Benchmark for evaluating actual costs

# Types of Standards

- **Ideal (perfection) standards**
  - Are standards based on perfect or ideal conditions
  - Do *not* allow for any inefficiencies, for example no poor-quality raw material; no waste in the production process, no machine break-down; or any other inefficiencies.

- **Practical (attainable) standards**
  - Allow for *normal amounts* of waste and inefficiency

# Information Used to Develop and Update Standards

- *Past:* the amount of material and labor used on each unit produced.

- *Current:* cost of inputs like negotiated labor rates and raw materials prices.

- *Future:* changes in economy or in the manufacturing process.

# Computing Standard Costs

- Compute for:
  - Direct Materials (DM)
  - Direct Labor (DL)
  - Manufacturing Overhead (MOH)

# Standard Cost Calculations

- **Direct Materials:**

  Standard quantity of DM x standard price of DM = standard cost of DM

- **Direct Labor:**

  Standard hours of DL x standard rate for DL = standard cost of DL

# Standard Cost Calculations (cont.)

- **Manufacturing Overhead:**

Total estimated variable MOH / total estimated amount of the allocation base = variable MOH rate

Standard quantity of allocation base x variable MOH rate = standard variable MOH per unit

Total estimated fixed MOH / total estimated amount of the allocation base = fixed MOH rate

Standard quantity of allocation base x fixed MOH rate = standard fixed MOH per unit

# Standard Cost Calculations (Example)

Standard Quantity of DM × Standard Price of DM = Standard Cost of DM per Case

5 lbs      ×      $1.50/pound      =      $7.50

Standard Quantity of DL × Standard Price of DL = Standard Cost of DL per Case

0.05 DL hours      ×      $22.00/DL hour      =      $1.10

Total estimated variable MOH ÷ Total estimated amount of the allocation base = Variable MOH rate

$1,000,000      ÷      40,000 machine hours      = $25/machine hour

Standard Quantity of MH × Variable MOH rate = Standard Variable MOH per Case

0.10 machine hours      × $25/machine hours      =      $2.50

Total estimated fixed MOH ÷ Total estimated amount of the allocation base = Fixed MOH rate

$360,000      ÷      40,000 machine hours      = $9/machine hour

Standard Quantity of MH × Fixed MOH rate = Standard Fixed MOH per Case

0.10 machine hours      × $9/machine hour =      $0.90

Inc.

# Exhibit 11-1: Standard Cost of Producing One Unit of Product

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Manufacturing Cost | Standard Quanitity (SQ) | | | Standard Price (SP) | | | Standard Cost per Case |
| 2 | Direct Materials | 5.00 | pounds | × | $ 1.50 | per pound | = | $ 7.50 |
| 3 | Direct Labor | 0.05 | DL hours | × | $ 22.00 | per DL hour | = | 1.10 |
| 4 | Variable MOH | 0.10 | machine hours | × | $ 25.00 | per machine hour | = | 2.50 |
| 5 | Fixed MOH | 0.10 | machine hours | × | $ 9.00 | per machine hour | = | 0.90 |
| 6 | Total | | | | | | | $ 12.00 |
| 7 | | | | | | | | |

# Using Standard Costs to Develop the Flexible Budget (Exhibit 11-2)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | **Flexible Budget Performance Report for Variable Production Costs** | **Standard Cost per Case** | **Actual Cost for 31,000 cases** | **Flexible Budget for 31,000 Cases** | **Flexible Budget Variance** | |
| 2 | Direct materials | $ 7.50 | $ 224,000 | $ 232,500 | $ 8,500 | F |
| 3 | Direct labor | $ 1.10 | $ 34,875 | $ 34,100 | $ 775 | U |
| 4 | Variable MOH | $ 2.50 | $ 85,200 | $ 77,500 | $ 7,700 | U |
| 5 | | | | | | |

# Now turn to S11-1

Hodge Confections is known for its creamy milk chocolate fudge. Hodge sells its fudge to local retailers. A "unit" of fudge is a 10-pound batch. The standard quantities of ingredients for a batch include 7 cups of sugar, 23 ounces of chocolate chips, 16 ounces of butter, and 18 ounces of evaporated milk. The standard costs for each of the ingredients are as follows: $0.17 per cup of sugar, $0.18 per ounce of chocolate chips, $0.11 per ounce of butter, and $0.14 per ounce of evaporated milk. Calculate the standard direct material cost per batch of fudge.

# S11-1: Calculate the Standard Direct Material Cost

|  | Quantity | Price | Cost |
|---|---|---|---|
| Sugar per cup | 7 | $ 0.17 | $ 1.19 |
| Chocolate chips per ounce | 23 | $ 0.18 | $ 4.14 |
| Butter per ounce | 16 | $ 0.11 | $ 1.76 |
| Evaporated milk per ounce | 18 | $ 0.14 | $ 2.52 |
| Standard DM cost per batch |  |  | $ 9.61 |

# Objective 2

Compute and evaluate direct material variances

# Recall

- Flexible budget reflects the total cost that *should have been incurred, given the actual volume achieved.*

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Flexible Budget Performance Report for Variable Production Costs | Standard Cost per Case | Actual Cost for 31,000 cases | Flexible Budget for 31,000 Cases | Flexible Budget Variance | |
| 2 | Direct materials | $ 7.50 | $ 224,000 | $ 232,500 | $ 8,500 | F |
| 3 | Direct labor | $ 1.10 | $ 34,875 | $ 34,100 | $ 775 | U |
| 4 | Variable MOH | $ 2.50 | $ 85,200 | $ 77,500 | $ 7,700 | U |
| 5 | | | | | | |

- **Paid** less for the material than expected or **used** less material than expected, or a combination of two.

# Direct Material Variances

- When the **amount of materials purchased** is the same as the amount used, one can split the flexible budget:
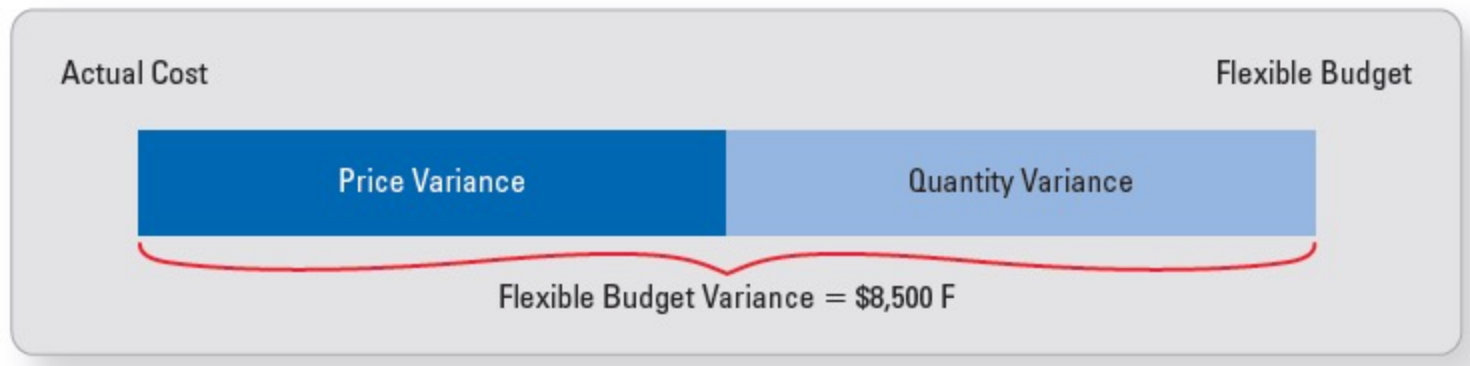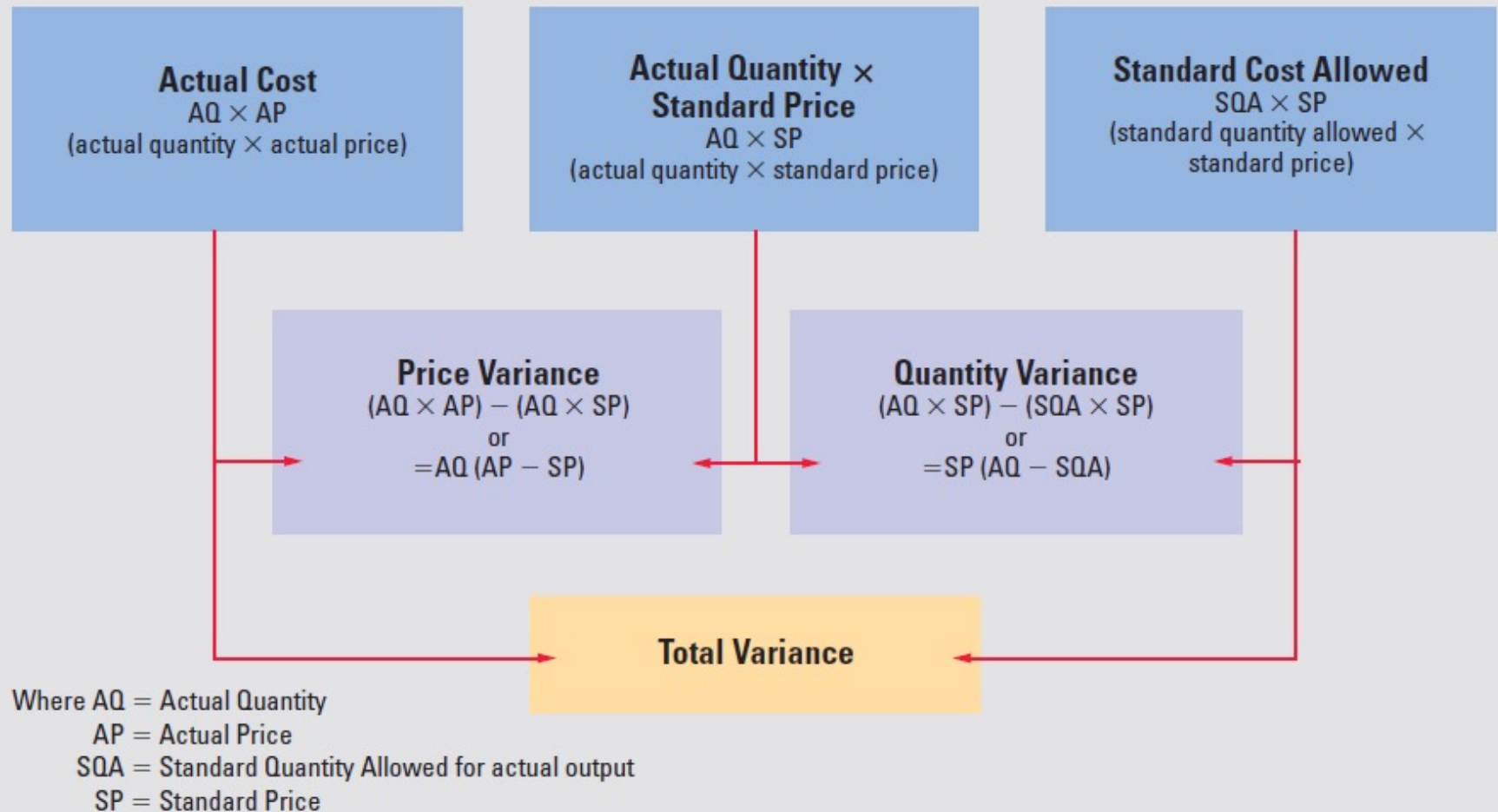
# Exhibit 11-4: DM Variances If DM Purchased Equals DM Used



**Actual Cost**
$AQ \times AP$
(actual quantity × actual price)

**Actual Quantity × Standard Price**
$AQ \times SP$
(actual quantity × standard price)

**Standard Cost Allowed**
$SQA \times SP$
(standard quantity allowed × standard price)

**Price Variance**
$(AQ \times AP) - (AQ \times SP)$
or
$= AQ (AP - SP)$

**Quantity Variance**
$(AQ \times SP) - (SQA \times SP)$
or
$= SP (AQ - SQA)$

**Total Variance**

Where AQ = Actual Quantity
AP = Actual Price
SQA = Standard Quantity Allowed for actual output
SP = Standard Price

# Direct Material Variances

- Comprised of
  - Direct materials *price* variance

  How much of the total variance is due to paying a higher or lower price than expected for the direct materials it purchased.

  - Direct materials *quantity* variance

  How much of the total variance is due to using a larger or smaller quantity of direct materials than expected.

# DM Price Variance

- How much of total variance is due to paying a higher/lower price than expected for the DM purchased

- Formula:

    DM price variance = AQ (AP – SP)

    OR

    **DM price variance = AQP (AP – SP)**

- DM price variance is the price differential multiplied by the quantity of direct materials *purchased*

# Mark here

- AQP: Actual Quantity Purchased

- AQU: Actual Quantity Used

- Later on, we will encounter situation which AQP differs from AQU

# DM Quantity Variance

- How much of the total variance is due to using a larger/smaller quantity of DM than expected
- Formula:

**DM quantity variance = SP x (<span style="color:red">AQU</span> – SQA)**

- It tells managers how much of the total direct materials variance is due to using more or less materials than anticipated by the standards.

# Computing DM Variances when the Quantity of DM Purchased Differs from the Quantity of DM Used

- DM price variance
  = **AQP** x (AP – SP)

- DM quantity variance
  = SP x (**AQU** – SQA)

# Computing DM Variances when the Quantity of DM Purchased Differs from the Quantity of DM Used

- The DM price variance will be based on the quantity of DM *purchased* (AQP)

- The DM quantity variance will be based on the quantity of DM *used* (AQU)

- The DM price and quantity variances will no longer sum (or net) to the total flexible budget variance.

# Now turn to S11-3

Dolphin Ceramics produces large planters to be used in urban landscaping projects. A special earth clay is used to make the planters. The standard quantity of clay used for each planter is 24 pounds. Dolphin uses a standard cost of $2.00 per pound of clay. Dolphin produced 3,125 planters in May. In that month, 78,125 pounds of clay were purchased and used at the total cost of $150,000.

## Requirements
1. Calculate the direct material price variance.
2. Calculate the direct material quantity variance.

# S11-3: Calculate the DM Price and Quantity Variance

| DM Quantity Variance = | SP          X | (AQU – SQA) |
|---|---|---|
| ? | $2.00 per pound of clay | (78,125 – 75,000) |
| 6,250 U | $2.00    X | 3,125 |

| DM Price Variance  = | AQP          X | (AP-SP) |
|---|---|---|
| ? | 78,125 | ($1.92 – $2.00) |
| 6,250 F | 78,125       X | $.08 |

# Objective 3

Compute DL variances

# Direct Labor Variances

- Almost identical to the model used for direct materials variances.
- Comprised of:
  - Direct labor *rate* variance
  - Direct labor *efficiency* variance

# DL Rate Variance

- How much of the total labor variance is due to paying a higher/lower wage rate than anticipated

- Formula:

**DL rate variance**

**= Actual Hours x Actual Rate - Actual Hours x Standard Rate**

**= AH x AR - AH x SR**

**= AH x (AR- SR)**

# DL Efficiency Variance

- How much of the total labor variance is due to using a greater/lesser amount of time than anticipated

- Formula:

    **DL efficiency variance**

 **= Actual Hours x Standard Rate – Standard Hours Allowed for actual output x Standard Rate**

 **= AH x SR – SHA x SR**

 **= SR x (AH – SHA)**

**\* SHA = actual units produced x standard amount of time allowed per unit**

# DL Variance
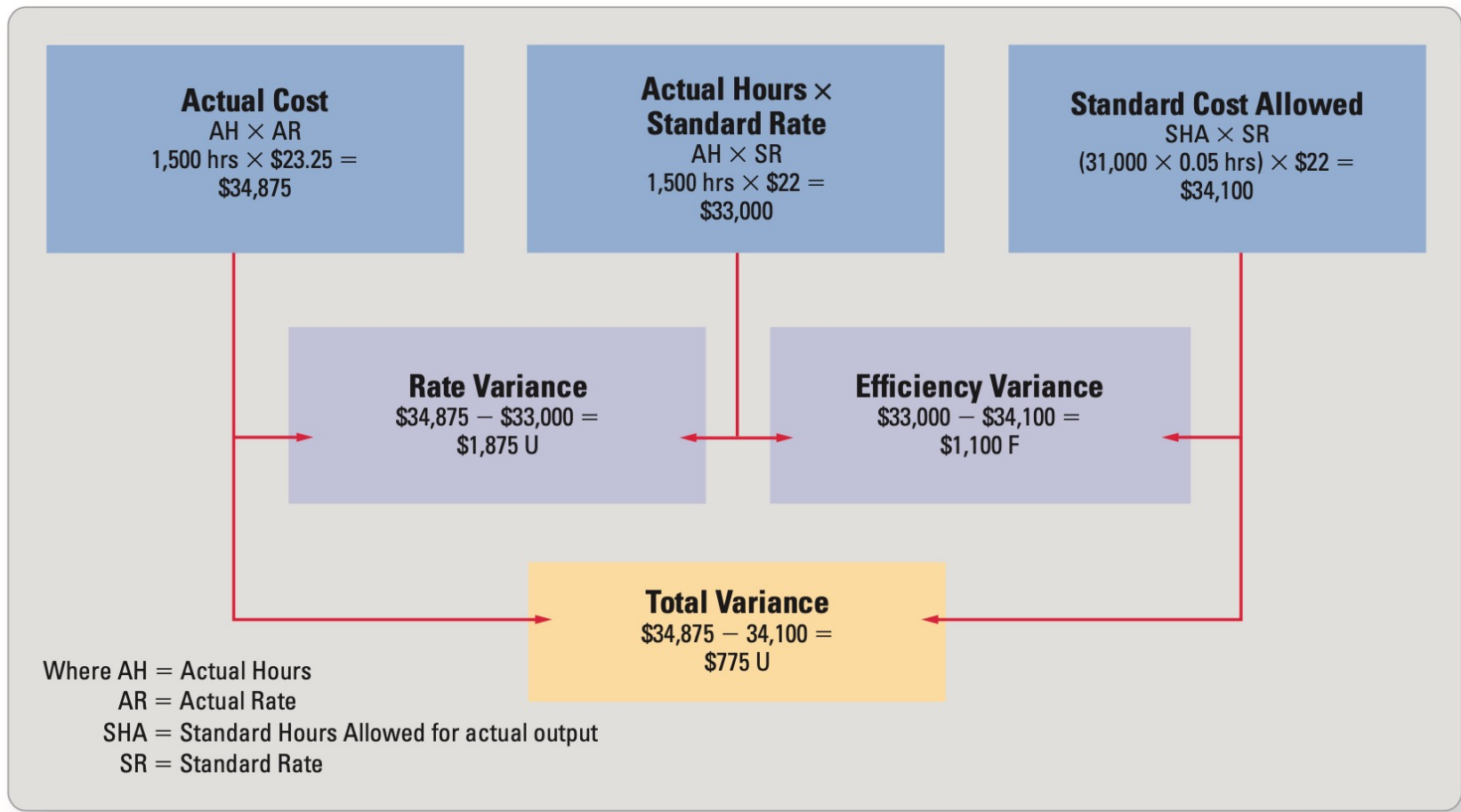
# Exhibit 11-9: Summary of DM and DL Variances

| Variance | Formula | Inquire with... |
|---|---|---|
| Direct Materials Price Variance | = Actual Quantity Purchased × (Actual Price − Standard Price) <br> = AQP × (AP − SP) | Purchasing Supervisor |
| Direct Materials Quantity Variance | = Standard Price × (Actual Quantity Used − Standard Quantity Allowed) <br> = SP × (AQU − SQA) | Production Supervisor |
| Direct Labor Rate Variance | = Actual Hours × (Actual Rate − Standard Rate) <br> = AH × (AR − SR) | Human Resources and Production Supervisors |
| Direct Labor Efficiency Variance | = Standard Rate × (Actual Hours − Standard Hours Allowed) <br> = SR × (AH − SHA) | Production Supervisor |

# Now turn to S11-5

Campa Oil performs oil changes. The standard wage rate for oil change technicians is $20 per hour. By analyzing its past records of time spent on oil changes, Casta Oil has developed a standard of 21 minutes (or 0.35 hours) per oil change.

In July, 800 oil changes were performed at Campa Oil. Oil change technicians worked a total of 260 direct labor hours at an average rate of $23 per hour.

## Requirements

1. Calculate the direct labor rate variance.
2. Calculate the direct labor efficiency variance.

# S11-5: Calculate the Direct Labor Rate and Efficiency Variance

| DL Rate Variance = | AH      X | (AR – SR) |
|---|---|---|
| ? | 260 | ($23 – $20) |
| 780   U | 260      X | $3 |

| DL Efficiency Variance = | SR      X | (AH – SHA) |
|---|---|---|
| ? | $20 | (260 – 280) |
| 400   F | $20      X | 20 |

# Objective 4

Explain the advantages and disadvantages of using standard costs and variances

# Advantages

- Cost benchmarks
- Usefulness in budgeting
- Motivation
- Standard costing systems simplify bookkeeping

# Disadvantages

- Outdated of inaccurate standards
- Lack of timeliness
- Focus on operational performance measures and visual management
- Lean thinking
- Increase in automation and decrease in DL
- Unintended behavioral consequences

# Objective 5

Compute and evaluate variable overhead variances

# Variable Overhead Variances

- Two parts
  - Variable overhead *rate* variance
  - Variable overhead *efficiency* variance

# Variable Overhead Rate Variance

- Also called: Variable overhead spending variance

- Tells whether more/less was spent on variable overhead than expected for the hours worked

- Formula:

  **= Actual Hours x Actual Rate – Actual Hours x Standard Rate**

  **= Actual Hours x (Actual Rate – Standard Rate)**

  **= AH x (AR – SR)**

# Variable Overhead Efficiency Variance

- Tells how much of the total variable MOH variance is due to using more/fewer hours of the allocation base than anticipated for the actual volume of output

- Formula:

  **= Standard Rate x Actual Hours – Standard Rate x Standard Hours Allowed**

  **= Standard Rate x (Actual Hours - Standard Hours Allowed)**

  **= SR x (AH – SHA)**

# Now turn to S11-7

Simmons Industries produced 3,000 tables last month. The standard variable manufacturing overhead (MOH) rate used by the company is $18 per machine hour. Each table requires 0.5 machine hours. Actual machine hours used last month were 1,550 and the actual variable MOH rate last month was $17.00.

**Requirements**
1. Calculate the variable overhead rate variance.
2. Calculate the variable overhead efficiency variance.

# S11-7: Calculate Variable Overhead Rate and Efficiency Variance

| VOH Rate Variance = | AH     X | (AR − SR) |
|---|---|---|
| ? | 1,550 | ($17 − $18) |
| 1,550 F | 1,550     X | $1 |

| VOH Efficiency Variance = | SR     X | (AH − SHA) |
|---|---|---|
| ? | $18 | (1,550 − 1,500) |
| 900   U | $18     X | 50 |

# Objective 6

Compute and evaluate fixed overhead variances

# Fixed Overhead Budget Variance

- **Comprised of**
  - Fixed overhead *budget* variance
  - Fixed overhead *volume* variance

# Fixed Overhead Budget Variance

- Also called: Fixed overhead spending variance
- Measures the difference between actual fixed overhead costs incurred and budgeted fixed overhead costs
- Formula:
  - **Fixed overhead budget variance = actual fixed overhead – budgeted fixed overhead**

# Fixed Overhead Volume Variance

- Difference between the budgeted fixed overhead and the standard fixed overhead cost allocated to produc

- Formula:
  - Fixed overhead volume variance = budgeted fixed overhead – standard overhead cost allocated to production
  - **Fixed overhead volume variance**
  **= budgeted fixed overhead – (SHA x SR)**

# Fixed Overhead Volume Variance

- Fixed overhead volume – Budgeted Fixed Overhead – Standard Overhead Cost Allocated to Production

- Standard Overhead Cost Allocated to Production

= Standard Hours Allowed x Standard Rate

# Fixed Overhead Volume Variance (cont.)

- In essence, measures the utilization of the fixed capacity costs
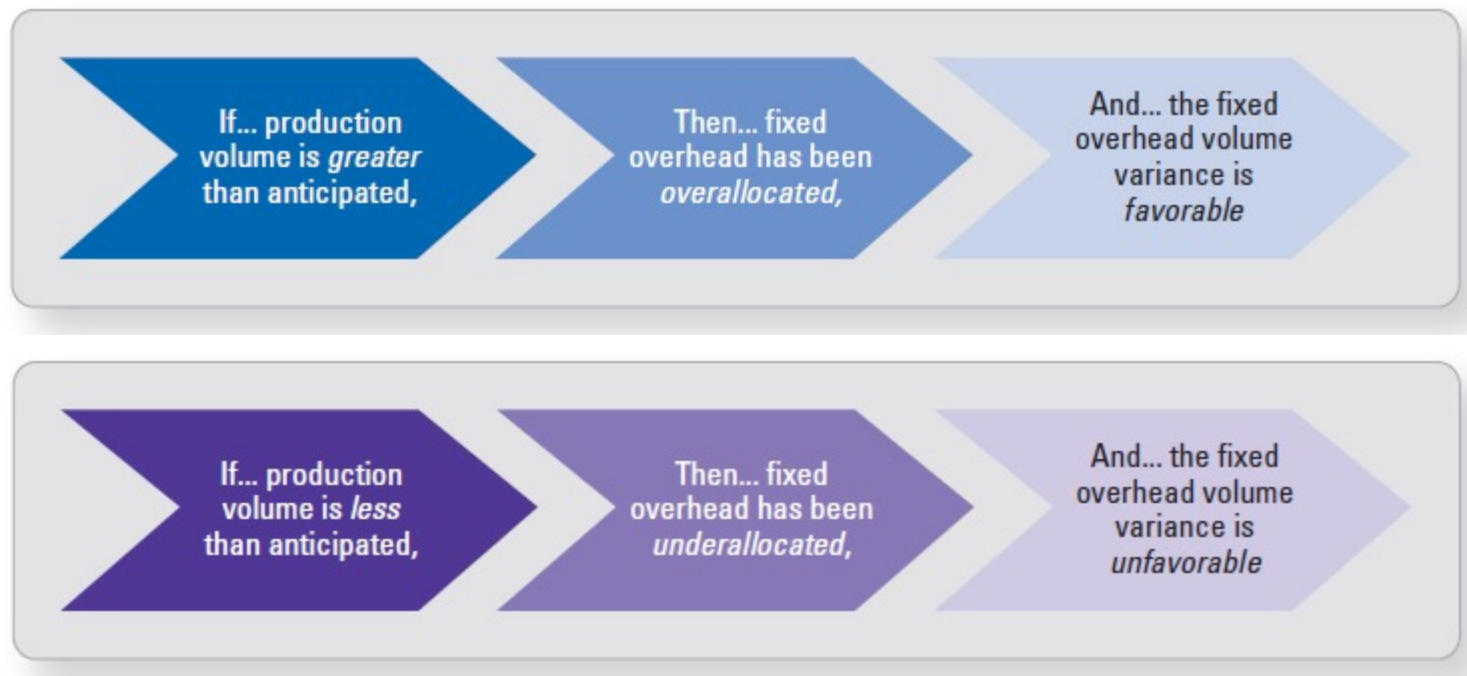
# Now turn to S11-8

Bentley Manufacturing produces premium dog houses. Each dog house requires 1.0 hours of machine time for its elaborate trim and finishing. For the current year, Bentley calculated its predetermined fixed manufacturing overhead (MOH) rate to be $21 per machine hour. The company budgets its fixed MOH to be $14,000 per month. Last month, Bentley produced 1,000 dog houses and incurred $17,000 (actual) of fixed MOH.

**Requirements**
1. Calculate the fixed overhead budget variance.
2. Calculate the fixed overhead volume variance.

# S11-8: Calculate the Fixed Overhead Budget and Volume Variance

| Fixed OH Budget Variance= | Actual Fixed OH  - | Budgeted Fixed OH |
|---|---|---|
| 3,000 U | $17,000    – | $14,000 |

| Fixed OH Volume Variance= | Budgeted Fixed OH - | (SHA X SR) |
|---|---|---|
| ? | $14,000 | (1,000 * $21) |
| 7,000   F | $14,000    – | $21,000 |

# End of Chapter 11