Chapter 10

JUST-IN-TIME AND BACKFLUSHING

MULTIPLE CHOICE

D **1.** **One of the requirements for a JIT system to be successful is:**
- **A. cyclical production**
- **B. adequate inventory stock**
- **C. coupling it with job order costing**
- **D. high quality and balanced work loads**
- **E. all of the above**

A **2.** **All of the following are terms used to describe the JIT effort to reduce inventories of work in process and raw materials, *except:***
- **A. backflush production**
- **B. stockless production**
- **C. lean production**
- **D. ZIP production**
- **E. none of the above are appropriate terms**

C **3.** **The JIT production ideal is a batch size of:**
- **A. one hundred**
- **B. ten**
- **C. one**
- **D. zero**
- **E. none of the above**

C **4.** **The objective of reducing inventory to zero is possible if all of the following conditions are present, *except:***
- **A. low or insignificant setup costs**
- **B. minimum lead times**
- **C. long setup times**
- **D. balanced and level work loads**
- **E. no interruptions due to stockouts**

D **5.** **The continuing reduction of inventories is achieved by all of the following steps *except:***
- **A. inventories are reduced until a problem is discovered**
- **B. once the problem is defined the inventory level is increased to keep the system operating smoothly**
- **C. the problem is analyzed and practical ways are identified to reduce it**
- **D. once the problem is removed, the inventory level is increased until another problem is discovered**
- **E. all of the above steps are required**

B **6.** **In a JIT system, velocity is inversely related to:**
- **A. backflushing**
- **B. throughput time**
- **C. acceleration**
- **D. zero inventory production**
- **E. none of the above**

D **7.** **If 500 units are produced per day and 2,000 units are in process at any time, the throughput time is:**
- **A. 1/2 day**
- **B. 1/4 day**
- **C. two days**
- **D. four days**
- **E. none of the above**

SUPPORTING CALCULATION:

$$\frac{2{,}000}{500} = 4 \text{ days}$$

D **8.** **In a JIT system, if the rate of output is doubled while the number of units in process is cut in half, then the speed of the system has been:**
- **A. reduced by 25%**
- **B. doubled**
- **C. reduced by 50%**
- **D. quadrupled**
- **E. none of the above**

A **9.** **Of the following, the only activity that adds value to a product is:**
- **A. processing time**
- **B. moving time**
- **C. waiting time**
- **D. inspection time**
- **E. all of the above**

B **10.** **If the annual carrying cost percentage is 30% and average work in process is $300,000 and management plans to use JIT to double the velocity of work in process without changing total annual output, the savings in annual carrying costs will be:**
- **A. $90,000**
- **B. $45,000**
- **C. $150,000**
- **D. $180,000**
- **E. none of the above**

SUPPORTING CALCULATION:

30% x 1/2 x $300,000 = $45,000

A **11.** **If Step 1 in a production process processes each unit and sends it to await Step 2, and 500 units are waiting between Steps 1 and 2, how many defective units might Step 1 produce before the problem is detected in Step 2?**

A. 500
B. an unlimited number
C. 250
D. 1,000
E. none of the above

C **12.** **Assume that a company plans a reduction in work in process levels of 50% and has an annual inventory carrying cost of 20% and a past average cost of work in process of $75,000. The 50% reduction in work in process would be expected to produce annual savings of:**

A. $37,500
B. $15,000
C. $7,500
D. $3,750
E. none of the above

SUPPORTING CALCULATION:

50% x 20% x $75,000 = $7,500

E **13.** **Alpha Company has 10 work stations where work in process is held, 100 average units in work in process per station, an average cost of a unit in work in process of $75, and an annual inventory carrying cost of 20%. If Alpha plans a 50% reduction in work in process levels, the expected annual savings in carrying costs would be:**

A. $37,500
B. $15,000
C. $30,000
D. $3,750
E. none of the above

SUPPORTING CALCULATION:

50% x 20% x (10 x 100 x $75) = $7,500

B **14.** **Beta Company has an average dollar loss per defective unit of $25, a planned reduction in number of defective units produced per out-of-control condition of 5, and the number of out-of-control conditions not discovered immediately is 250. The expected savings in cost of defects would be:**

A. $1,250
B. $31,250
C. $6,250
D. $125
E. none of the above

SUPPORTING CALCULATION:

$25 x 5 x 250 = $31,250

B 15. Beta Company has an average dollar loss per defective unit of $25, a planned reduction in work in process levels of 50%, and an average number of units in work in process per station of 100. Assume that the total number of instances in which some work station goes out of control limits and produces defects is expected to be 500 annually and that in half those instances the out-of-control condition is not discovered immediately and enters 10% of the units produced. The expected annual savings in cost of defective units would be:

A. $1,250
B. $31,250
C. $6,250
D. $125
E. none of the above

SUPPORTING CALCULATION:

$25 x (50% x 100 x 10%) x (1/2 x 500) = $31,250

D 16. The costs to be offset against the savings from lower work in process levels in a JIT system include all of the following, *except:*

A. handling a larger number of small batches of work in process
B. the higher probability of shutdowns due to the smaller safety stock
C. the possibility that setup costs cannot be reduced enough to offset the larger number of setups
D. the possibility of customer dissatisfaction due to slower response time to orders
E. all of the above

A 17. Advantages that result from reducing raw materials inventory include all of the following *except:*

A. a decreased possibility of not being able to produce a unit when required
B. a need for less storage space
C. a reduced risk of obsolescence
D. a reduced risk of damaged materials
E. all of the above are advantages

C 18. Under a JIT approach to purchasing, the ideal number of vendors for each material is:

A. two
B. less than six
C. one
D. as many as can supply quality goods
E. none of the above

E 19. All of the following are obstacles to JIT purchasing, *except:*

A. the layout of the production process
B. the frequency of schedule changes
C. the attitudes of purchasing agents and suppliers
D. the distance from suppliers
E. all of the above are obstacles

B 20. JIT purchasing eliminates all of the following documents, *except:*
- **A. purchase requisitions**
- **B. blanket purchase orders**
- **C. receiving reports**
- **D. materials requisitions**
- **E. all of the above are eliminated**

B 21. All of the following statements apply to a JIT work cell *except* that:
- **A. a cell is responsible for the entire production of a product or part**
- **B. every worker in the cell specializes in a single task**
- **C. a cell's workers may be evaluated and rewarded as a team**
- **D. all workers in a cell are responsible for product quality**
- **E. all of the above statements apply**

A 22. All of the following are JIT performance measures, *except:*
- **A. capacity utilization**
- **B. cycle time efficiency**
- **C. inventory turnover**
- **D. unscheduled maintenance downtime**
- **E. number of defects**

E 23. The cost accounting system that is noted for its lack of detailed tracking of work in process during the accounting period is:
- **A. process costing**
- **B. job order costing**
- **C. standard costing**
- **D. actual costing**
- **E. backflush costing**

A 24. The cost accounting system that would be most apt to use a single inventory account entitled Raw and In Process (RIP) would be:
- **A. backflush costing**
- **B. process costing**
- **C. job order costing**
- **D. historical costing**
- **E. standard costing**

D 25. To backflush materials cost from Raw and In Process (RIP) to Finished Goods, the calculation would be:
- **A. materials in ending RIP inventory plus materials received during the period minus materials in the beginning RIP inventory**
- **B. materials in ending finished goods inventory plus materials cost transferred from RIP minus materials in beginning finished goods inventory**
- **C. materials in beginning finished goods inventory plus materials cost transferred from RIP minus materials in ending finished goods inventory**
- **D. materials in beginning RIP inventory plus materials received during the period minus materials in ending RIP inventory**
- **E. none of the above**

B 26. Cheeta Company has materials cost in the June 1 Raw and In Process of $10,000, materials received during June of $205,000 and materials cost in the June 30 Raw and In Process of $12,500. The amount to be backflushed from Raw and In Process to Finished Goods at the end of June would be:

A. $215,000
B. $202,500
C. $207,500
D. $217,500
E. none of the above

D 27. In backflush costing, if the conversion cost in the Raw and In Process was $500 on July 1 and $1,000 on July 31, the account to be credited at the end of July for the $500 increase would be:

A. Raw and In Process
B. Finished Goods
C. Raw Materials
D. Cost of Goods Sold
E. none of the above

A 28. In backflush costing, if the conversion cost in Raw and In Process was $1,000 on March 1 and $400 on March 31, the account to be credited for the $600 decrease would be:

A. Raw and In Process
B. Finished Goods
C. Raw Materials
D. Cost of Goods Sold
E. none of the above

PROBLEMS

PROBLEM

1.

Cost Savings From Smaller Inventory. Automated Assembly Company maintains a WIP inventory at each of 15 work stations, and the average size of the inventory is 200 units per station. The physical flow of units into and out of each WIP location is first-in, first-out. The total number of instances in which some work station goes out of its control limits is expected to be 100 during the coming year. In 80% of these instances, the out-of-control condition is expected to be discovered immediately by the operator at that station; in the other 20% of these instances, a defect will enter 10% of the units produced. These defective units enter WIP between stations, where they will be discovered by the next station's operator. Every out-of-control condition is corrected as soon as it is discovered. The average cost of a unit in WIP is $40, and the average loss from an out-of-control condition is $20 per defective unit produced. The annual cost of carrying WIP is 33% of the cost of the inventory.

Management plans to reduce the number of units held at every work station by 50%. The rate of final output will be unchanged, and no other changes will be made in the system.

Required:

(1) Calculate the expected carrying cost savings from the change planned by the management.
(2) Calculate the expected savings in cost of defects if the changes are implemented.

SOLUTION

(1) Carrying cost savings = 33% x reduction in average cost of WIP
= 33% x 50% x past average cost of WIP
= .33 x .5 x (15 x 200 x $40)
= $19,800

(2) Savings in cost of defects = $20 x reduction in the number of defective units
= $20 x (50% x 200 x 10%) x (.20 x 100)
= $20 x 10 x 20
= $4,000

PROBLEM

2.

Inventory Size, Velocity, and Lead Time. Probtype Incorporated requires an average lead time of 45 days on customer orders that require parts not kept in stock. When such a customer order is received, the parts order is placed with a vendor immediately by telephone, and the parts are received in an average of 21 days. The parts are inspected and put into production an average of three days after receipt. The average time spent in production is 16 days. After production is completed, the order goes through final inspection in two days and arrives at the customer's site after an additional three days, on average.

Management plans to leave the rate of final output unchanged, induce vendors to reduce their total lead time by one-third, and reduce the average size of WIP to one-fourth of its present level.

Required: **Assuming management's plans are implemented successfully, calculate the average lead time on customer orders that require parts not kept in stock.**

SOLUTION

The average lead time will be 26 days, calculated as follows:

Reduction of vendor lead time = 1/3 x 21 days = 7 days

Reduction of time in WIP = 3/4 of present time in WIP
= 3/4 x 16 days
= 12 days

New lead time = present lead time - reductions
= 45 days - (7 days + 12 days)
= 26 days

PROBLEM

3.
Comparison of Process Costing and Backflushing; Unit Cost Calculations. BF Company had 35 units in process, 50% converted, at the beginning of a recent, typical month; the conversion cost component of this beginning inventory was $525. There were 40 units in process, 50% converted, at the end of the month. During the month, 5,000 units were completed and transferred to finished goods, and conversion costs of $250,000 were incurred.

Required:

(1) Carrying calculations to three decimal places, find the conversion cost per unit for the month:

(a) by the average cost method as used in process costing.

(b) by dividing the total conversion cost incurred during the month by the number of units completed during the month (do not calculate equivalent units).

(c) by dividing the total conversion cost incurred during the month by the number of units started during the month.

(2) Using the three unit costs from Requirement (1), calculate three amounts for the total conversion cost of the ending inventory of work in process to the nearest dollar.

(3) In light of the results of Requirement (2), which of the three methods of calculating unit conversion cost would you recommend for the purpose of inventory costing, 1(a), 1(b), or 1(c)? Why?

SOLUTION

(1) (a) Equivalent production = 5,000 + (.50 x 40) = 5,020 units

$$\frac{\$250,525}{5,020} = \$49.905 \text{ per unit}$$

(b) $$\frac{\$250,000}{5,000} = \$50 \text{ per unit}$$

(c) Units started = 5,000 + 40 - 35 = 5,005

$$\frac{\$250,000}{5,005} = \$49.950 \text{ per unit}$$

(2) 40 x .50 x 49.905 = 998
40 x .50 x 50.000 = 1,000
40 x .50 x 49.950 = 999

(3) Considering that the results of Requirement (2) were within two dollars of each other, then method 1(b) would be recommended because of its ease and simplicity.

PROBLEM

4.
Backflush Costing With a Finished Goods Account. The LanFat Manufacturing Company uses a Raw and In Process (RIP) inventory account and expenses all conversion costs to the cost of goods sold account. At the end of each month, all inventories are counted, their conversion cost components are estimated, and inventory account balances are adjusted accordingly. Raw material cost is backflushed from RIP to Finished Goods. The following information is for the month of August:

Beginning balance for RIP account, including $4,800 of conversion cost	**$ 43,500**
Raw materials received on credit	**680,000**
Ending RIP inventory per physical count, including $5,300 conversion cost estimate	**47,200**

Required: **Prepare all journal entries involving the RIP account.**

SOLUTION

Journal entries involving the RIP account are:

Raw and In Process	**680,000**	
Accounts Payable		**680,000**

This is a summary entry for all receipts of raw materials during the period. As direct materials are used, no entry is needed, because they remain a part of RIP.

Finished Goods	**676,800**	
Raw and In Process		**676,800**

This entry backflushes material cost from RIP to Finished Goods. This is a postdeduction. The calculation is:

Material in August 1 RIP balance	**$ 38,700**
Material received during August	**680,000**
	$ 718,700
Material in August 31 RIP, per physical count	**41,900**
Amount to be backflushed	**$ 676,800**

Raw and In Process	**500**	
Cost of Goods Sold		**500**

Conversion cost in RIP is adjusted from the $4,800 of August 1 to the $5,300 estimate at August 31. The offsetting entry is made to Cost of Goods Sold, where all conversion costs were charged during August.

PROBLEM

5.
Backflush Costing With No Finished Goods Account. The ATM Manufacturing Company produces only for customer order, and most work is shipped within twenty-four hours of the receipt of an order. ATM uses a Raw and In Process (RIP) inventory account and expenses all conversion costs to the cost of goods sold account. At the end of each month, inventory is counted, its conversion cost component is estimated, and the RIP account balance is adjusted accordingly. Raw material cost is backflushed from RIP to Cost of Goods Sold. The following information is for the month of June:

Beginning balance of RIP account, including $900 of conversion cost	**$ 8,500**
Raw materials received on credit	**187,000**
Ending RIP inventory per physical count, including $1,100 conversion cost estimate	**7,900**

Required: **Prepare all journal entries involving the RIP account.**

SOLUTION

Journal entries involving the RIP account are:

Raw and In Process	**187,000**	
Accounts Payable		**187,000**

This is a summary entry for all receipts of raw materials during the period. As direct materials are used, no entry is needed because they remain a part of RIP.

Cost of Goods Sold	**187,800**	
Raw and In Process		**187,800**

This entry backflushes material cost from RIP to Cost of Goods Sold. This is a postdeduction. The calculation is:

Material in June 1 RIP balance	**$ 7,600**
Material received during June	**187,000**
	$ 194,600
Material in June 30 RIP, per physical count	**6,800**
Amount to be backflushed	**$ 187,800**

Raw and In Process	**200**	
Cost of Goods Sold		**200**

Conversion cost in RIP is adjusted from the $900 of June 1 to the $1,100 estimate at June 30. The offsetting entry is made to Cost of Goods Sold, where all conversion costs were charged during June.

PROBLEM

6.
Backflush Costing; Entries in RIP and Finished Goods. The Clifton Manufacturing Company has a cycle time of 1.5 days, uses a Raw and In Process (RIP) account, and charges all conversion costs to Cost of Goods Sold. At the end of each month, all inventories are counted, their conversion cost components are estimated, and inventory account balances are adjusted. Raw material cost is backflushed from RIP to Finished Goods. The following information is for May:

Beginning balance of RIP account, including $600 of conversion cost	**$ 5,500**
Beginning balance of finished goods account, including $2,000 of conversion cost	**6,000**
Raw materials received on credit	**173,000**
Ending RIP inventory per physical count, including $850 conversion cost estimate	**6,200**
Ending finished goods inventory per physical count, including $1,550 conversion cost estimate	**4,900**

Required: **Prepare all the journal entries that involve the RIP account and/or the finished goods account.**

SOLUTION

Raw and In Process	**173,000**	
Accounts Payable		**173,000**
Finished Goods	**172,550**	
Raw and In Process		**172,550**

To backflush material cost from RIP to Finished Goods. This is a postdeduction. The calculation is:

Material in May 1 RIP balance	**$ 4,900**
Material received during May	**173,000**
	$ 177,900
Material in May 31 RIP, per physical count	**5,350**
Amount to be backflushed	**$ 172,550**

Cost of Goods Sold	**173,200**	
Finished Goods		**173,200**

To backflush material cost from Finished Goods to Cost of Goods Sold. This is a postdeduction. The calculation is:

Material in May 1 finished goods	**$ 4,000**
Material backflushed from RIP	**172,550**
	$ 176,550
Material in May 31 finished goods, per physical count	**3,350**
Amount to be backflushed	**$ 173,200**

Cost of Goods Sold	**200**	
Raw and In Process	**250**	
Finished Goods		**450**

Conversion cost in RIP is adjusted from $600 of May 1 to the $850 estimate at May 31. Conversion cost in Finished Goods is adjusted from the $2,000 at May 1 to the $1,550 estimate at May 31.