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Martins Manufacturing Inc.: An Advanced Activity Based Costing Case, with Activity Based Management and Strategic Considerations

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Abstract:

A hypothetical manufacturing scenario is introduced in this case which focuses on costing system design in which the firm's costing system evolves from a simple Volume-Based-Costing (VBC) system to an Activity-Based-Costing (ABC) system involving multiple stage allocations. System design is viewed from both a costing perspective (ABC) and a managerial perspective (ABM). GAAP compliance is addressed along with strategic consequences.

Keywords:

Product Costing, Activity-Based-Costing, Volume-Based-Costing, Activity-Based-Management, Absorption Costing, Strategic Costing.

Targeted Students:

This case addresses several costing issues and can serve as a comprehensive product costing case for intermediate level students. The most appropriate course for this case would be an intermediate Cost and/or Managerial Accounting course. This case could also be utilized in an MBA or Masters of Accounting Managerial Accounting course.

Martins Manufacturing Case

For many years, Martins Manufacturing Inc. (MMI) manufactured a single product (P-A) which involved two manufacturing departments, Department 1 and Department 2. P-A competes in a very competitive market, which places a great deal of pressure on its margins. Due to the success of P-A, last year in 2010, the company increased production capacity by automating Department 2 and introduced a second, more complex product (P-B) which because of its distinctive characteristics would be able to earn much better margins than P-A. Prior to the introduction of P-B, there was no formal allocation of indirect manufacturing costs since all production costs were absorbed by the production of P-A. In 2010 MMI began to allocate manufacturing overhead (MOH) using an actual plant-wide overhead allocation rate using direct labor hours (DLHs).

MMI had expected to produce and sell 40,000 units of P-A and 10,000 units of P-B in 2010. However, actual production and sales of P-A were only 20,000 and were also 20,000 for P-B. Sales prices for P-A and P-B are set by marking up their calculated costs. Due to the highly competitive market P-A competes in, MMI uses a 10% markup while P-B, due to its distinctive characteristics, is marked up 30%. Assume no changes over time in input prices or productivity.

Actual cost information for 2010 is presented in Table 1.

Required:**PART A**

1. Determine the actual plant-wide MOH allocation rate utilizing DLHs.
2. Determine the manufacturing costs per unit for P-A and P-B.
3. Prices for P-A and P-B were marked up from calculated production costs based on the actual sales mix. Determine the calculated sales prices for P-A and P-B.
4. Determine the per unit gross profit for P-A and P-B.

PART B

Despite the popularity of the new P-B, company profits have declined steadily since Department 2 was automated. Management is beginning to think that there may be a problem with the costing system. Consequently, in 2011 management has decided to improve their cost accounting system by moving from the use of the actual plant-wide overhead rate to a normal or predetermined plant-wide overhead rate. Budgeted information for 2011 is presented in Table 2.

Required:

5. Determine the normal plant-wide MOH allocation rate utilizing DLHs.
6. Determine the manufacturing costs per unit for P-A and P-B.
7. Determine any amount of under/over applied MOH.
8. Prices for P-A and P-B were marked up from calculated production costs based on the budgeted sales mix. Determine the calculated sales prices for P-A and P-B.
9. Determine the per unit gross profit for P-A and P-B.
10. Comment on any differences in calculated product costs and gross margins to products P-A and P-B due to using an actual plant-wide MOH allocation rate vs. a normal plant-wide MOH allocation rate.

PART C

As profits continue to decline management decides to further improve their cost accounting system by moving from the use of the one normal plant-wide overhead rate to two normal departmental overhead rates for 2012. Since Department 1 is labor intensive, MOH is will be allocated to job orders on the basis of direct labor hours (DLHs). Since Department 2 is capital intensive, MOH will be allocated to job orders on the basis of machine hours (MHs).

Management also differentiates between the two operating departments and the support costs related to occupancy, purchase orders and energy costs. In this stage one allocation, these costs will be allocated to the two operating departments and then those departmental costs will be allocated in a stage two allocation to products P-A and P-B. There is some debate within MMI about whether the direct or step-down method should be used.

Required:

11. Allocate support costs to the two operating departments using the direct method.
12. Determine the normal departmental MOH allocation rates.
13. Determine the manufacturing costs per unit for P-A and P-B.
14. Determine any amount of under/over applied MOH.
15. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.
16. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.
17. Allocate support costs to the two operating departments using the step-down method.
18. Determine the normal departmental MOH allocation rates.
19. Determine the manufacturing costs per unit for P-A and P-B.
20. Determine any amount of under/over applied MOH.
21. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.
22. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.
23. Comment on any differences in calculated product costs and gross margins to products A and B due to using the direct allocation method vs. the step-down allocation method and with respect to using the single plant-wide MOH rate versus the two departmental MOH rates.

PART D

As of 2013 profits are still suffering and the new chief accountant, Daniel Michaels advocates utilizing an Activity-Based-Costing (ABC) system. Michaels determines that there are three resource pools and twelve activity pools. He specifies the following first and second stage allocations.

STAGE ONE ALLOCATIONS TO INTERMEDIATE COST OBJECTS		
RESOURCE POOL	COST OBJECT	RESOURCE ALLOCATION BASE
Occupancy	Departments	Square feet occupied
Energy	Departments	Kilowatt hour
Purchasing	Materials	Purchase Orders

STAGE TWO ALLOCATION TO FINAL COST OBJECTS		
ACTIVITY POOL	COST OBJECT	ACTIVITY ALLOCATION BASE
Indirect Labor – department 1	Products	Indirect Labor Hours (IDLHs)
Indirect Labor – department 2	Products	Indirect Labor Hours (IDLHs)

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Inspections – department 1	Products	Inspections
Inspections – department 1	Products	Inspections
Setups – department 1	Products	Setups
Setups – department 1	Products	Setups
Energy – department 1	Products	Machine Hours (MHs)
Energy – department 2	Products	Machine Hours (MHs)
Machine Related – department 1	Products	Machine Hours (MHs)
Machine Related – department 1	Products	Machine Hours (MHs)
Occupancy – department 1	Products	Machine Hours (MHs)
Occupancy – department 2	Products	Machine Hours (MHs)

Required:

24. Determine the normal activity allocation rates.
25. Determine the manufacturing costs per unit for P-A and P-B.
26. Determine any amount of under/over applied MOH.
27. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.
28. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.
29. Comment on any differences in calculated product costs and gross margins to products A and B due to using the ABC model versus the departmental model.

PART E

The adaption of the ABC system provides significant insights into resource consumption but also significantly increases the “cost” of operating the costing system as a result of increased information demands. Can the ABC system be streamlined to provide the same level of accuracy in costing products but reducing the “cost” of operating the system? Setup and inspection activities exclusively utilize indirect labor.

Required:

30. Streamline/redesign the ABC system.
31. Determine the normal activity allocation rates.
32. Determine the manufacturing costs per unit for P-A and P-B.
33. Determine any amount of under/over applied MOH.
34. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.
35. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.
36. Comment on any differences in calculated product costs and gross margins to products A and B due to using the original ABC system with the streamlined ABC system. Under what scenarios would each system be most appropriate?
37. All the costing systems developed have been designed to comply with GAAP. If MMI were to relax this constraint, in what way might the ABC system be modified.
38. Compare the GAAP based and non-GAAP based ABC systems, and comment on any differences.

PART F

39. Comment on the potential strategic consequences for P-A and P-B resulting from the use of an inaccurate product costing system.

TABLE 1: ACTUAL

Cost Component	P-A	P-B	Both	Cost
Actual Production and Sales	20,000	20,000	40,000	
Direct Material (DM) used				
DM-X (lbs)	80,000	80,000	160,000	\$1,080,000.00
DM-Y (lbs)	0	200,000	200,000	\$2,250,000.00
DL used:				
Operating Department 1 (D1)				
Direct Labor (DLHs)	50,000	6,000	56,000	\$672,000.00
Indirect Labor (IDLHs)	10,000	20,000	30,000	\$450,000.00
Operating Department 2 (D2)				
Direct Labor (DLHs)	10,000	12,000	22,000	\$396,000.00
Indirect Labor (IDLHs)	2,000	8,000	10,000	\$200,000.00
Machine Hours (MH) used:				
Department 1 (MHs)	10,000	20,000	30,000	\$750,000.00
Department 2 (MHs)	10,000	40,000	50,000	\$1,700,000.00
Setups				
Department 1 (Setups)	8	8	16	\$12,000.00
Department 2 (Setups)	10	10	20	\$32,000.00
Inspections				
Department 1 (Inspections)	200	200	400	\$150,000.00
Department 2 (Inspections)	400	400	800	\$400,000.00
Power used (kilowatts):				\$683,200.00
Department 1 (kHw)			1,200,000	
Department 2 (kHw)			11,000,000	
Total kWhs:			12,200,000	
Purchase Orders:	DM-X	DM-Y		\$277,600.00
Number of Purchase Orders	320	1,000	1,320	
Building Occupancy				\$1,570,000.00
Depreciation			\$1,500,000.00	
Property Taxes			\$40,000.00	
Insurance			\$30,000.00	
			\$1,570,000.00	
Square feet occupied: sq ft:	550,000			
Purchasing			20,000	
Power			30,000	
Department 1			200,000	

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Department 2

300,000
<u>550,000</u>
<u>\$10,622,800.00</u>

TABLE 2: BUDGETED

Cost Component	P-A	P-B	Both	Cost
Budgeted Production and Sales	40,000	10,000	50,000	
Direct Material (DM)				
DM-X (lbs)	160,000	40,000	200,000	\$1,350,000.00
DM-Y (lbs)	0	100,000	100,000	\$1,125,000.00
Operating Department 1 (D1)				
Direct Labor (DLHs)	100,000	3,000	103,000	\$1,236,000.00
Indirect Labor (IDLHs)	20,000	10,000	30,000	\$450,000.00
Operating Department 2 (D2)				
Direct Labor (DLHs)	20,000	6,000	26,000	\$468,000.00
Indirect Labor (IDLHs)	4,000	4,000	8,000	\$160,000.00
Machine Costs				
Department 1 (MHs)	20,000	10,000	30,000	\$750,000.00
Department 2 (MHs)	20,000	20,000	40,000	\$1,360,000.00
Setups				
Department 1 (Setups)	16	4	20	\$15,000.00
Department 2 (Setups)	20	5	25	\$40,000.00
Inspections				
Department 1 (Inspections)	400	100	500	\$187,500.00
Department 2 (Inspections)	800	200	1,000	\$500,000.00
Power used (kilowatts):				\$560,000.00
Department 1 (kHw)			1,200,000	
Department 2 (kHw)			<u>8,800,000</u>	
Total kWhs:			10,000,000	
Purchase Orders:	DM-X	DM-Y		\$182,000.00
Number of Purchase Orders	400	500	900	
Building Occupancy				\$1,570,000.00
Depreciation			\$1,500,000.00	
Property Taxes			\$40,000.00	
Insurance			<u>\$30,000.00</u>	

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		\$1,570,000.00	
Square feet occupied: sq ft:	550,000		
Purchasing		20,000	
Power		30,000	
Department 1		200,000	
Department 2		300,000	
		<u>550,000</u>	
			<u>\$9,953,500.00</u>

TEACHING NOTE: Martins Manufacturing Inc.: An Advanced Activity Based Costing Case, with Activity Based Management and Strategic Considerations

PART A: Actual plant-wide MOH rate

1. Determine the actual plant-wide MOH allocation rate utilizing DLHs.

Actual MOH		
Indirect labor		
Department 1:	\$450,000	
Department 2:	\$200,000	\$650,000
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Machine		
Department 1:	\$750,000	
Department 2:	\$1,700,000	\$2,450,000
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Setups		
Department 1:	\$12,000	
Department 2:	\$32,000	\$44,000
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Inspections		
Department 1:	\$150,000	
Department 2:	\$400,000	\$550,000
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Power		\$683,200
Building		\$1,570,000
Purchasing		\$277,600
Total		<u>\$6,224,800</u>

Actual Plant-wide MOH rate	Actual MOH	Actual DLHs	Actual MOH rate/DLH
Total DLHs = Dept. 1 + Dept. 2	\$6,224,800	78,000	<u>\$79.8051</u> /DLH

2. Determine the manufacturing costs per unit for P-A and P-B.

VBC – Actual Plant-wide Rate: Total Calculation	P-A 20,000	P-B 20,000
DM-X:		
P-A units	\$540,000	
P-B units		\$540,000
DM-Y:		
P-A units	\$0	
P-B units		\$2,250,000
DL:		
Department 1:	\$600,000	\$72,000
Department 2:	\$180,000	\$216,000
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Total Direct Costs	\$1,320,000	\$3,078,000
Allocation Rate		

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MOH	\$79.8051	CAB Qty	CAB Qty
P-A DLHs		60,000	\$4,788,308
P-B DLHs			18,000
Total cost			\$1,436,492
			\$4,514,492
Number of units		20,000	20,000
Cost per unit		<u>\$305.42</u>	<u>\$225.72</u>

VBC Actual Plant-wide Rate: Unit Calculation		P-A	P-B
DM-X	\$27.00		\$27.00
DM-Y	\$0.00	\$27.00	\$112.50
DL-D1	\$30.00		\$3.60
DL-D2	\$9.00	\$39.00	\$10.80
Total Direct Costs		\$66.00	\$153.90
Overhead	Allocation Rate	CAB Qty	CAB Qty
Total Allocated MOH	\$79.81	3.00	0.9
		\$239.42	\$71.82
Total Unit Cost		<u>\$305.42</u>	<u>\$225.72</u>

3. Prices for P-A and P-B were marked up from calculated production costs based on the actual sales mix. Determine the calculated sales prices for P-A and P-B.

		P-A	P-B
Calculated Cost		\$305.42	\$225.72
Markup	10%	\$30.54	30%
SP marked up on calculated costs		\$335.96	\$293.44

4. Determine the per unit gross profit for P-A and P-B.

	P-A	P-B
SP	\$335.96	\$293.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Plant-wide	(\$239.42)	(\$71.82)
Total Costs	(\$305.42)	(\$225.72)
Gross Profit	\$30.54	\$67.72

PART B: Normal/Predetermined/Budgeted plant-wide MOH rate

5. Determine the normal plant-wide MOH allocation rate utilizing DLHs.

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Budgeted MOH		
Indirect labor		
Department 1:	\$450,000	
Department 2:	\$160,000	\$610,000
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Machine		
Department 1:	\$750,000	
Department 2:	\$1,360,000	\$2,110,000
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Setups		
Department 1:	\$15,000	
Department 2:	\$40,000	\$55,000
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Inspections		
Department 1:	\$187,500	
Department 2:	\$500,000	\$687,500
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Power		\$560,000
Building		\$1,570,000
Purchasing		\$182,000
Total		<u>\$5,774,500</u>

Normal Plant-wide MOH rate	Budgeted MOH	Budgeted DLHs	Actual MOH rate/DLH
Total DLHs = Dept. 1 + Dept. 2	\$5,774,500	129,000	<u>\$44.7636</u> /DLH

6. Determine the manufacturing costs per unit for P-A and P-B.

VBC – Normal Plant-wide Total Calculation	P-A	20,000	P-B	20,000
DM-X:				
P-A units		\$540,000		
P-B units				\$540,000
DM-Y:				
P-A units		\$0		
P-B units				\$2,250,000
DL:				
Department 1:	\$600,000		\$72,000	
Department 2:	\$180,000	\$780,000	\$216,000	\$288,000
Total Direct Costs		<hr/>		<hr/>
		\$1,320,000		\$3,078,000
Allocation Rate				
Normal MOH Rate	\$44.76	CAB Qty	CAB Qty	
P-A DLHs		60,000		\$2,685,814
P-B DLHs			18,000	\$805,744
Total cost		<hr/>		<hr/>
		\$4,005,814		\$3,883,744
Number of units		20,000		20,000
Cost per unit		<u>\$200.29</u>		<u>\$194.19</u>

VBC Departments -Unit Calculation		P-A	P-B
DM-X	\$27.00	\$27.00	\$27.00
DM-Y	\$0.00	\$27.00	\$112.50
DL-D1	\$30.00		\$3.60
DL-D2	\$9.00	\$39.00	\$10.80
Total Direct Costs		\$66.00	\$153.90
Overhead	Allocation Rate	CAB Qty	CAB Qty
Total Allocated MOH	\$44.76	3.00	0.9
Total Unit Cost		\$200.29	\$194.19

7. Determine any amount of under/over applied MOH.

	Normal Rate	Actual DLHs	
Allocated MOH to A	\$44.7636	60,000	\$2,685,814
Allocated MOH to B	\$44.7636	18,000	\$805,744
Actual MOH			\$6,224,800
Underallocated MOH			<u>(\$2,733,242)</u>

8. Prices for P-A and P-B were marked up from calculated production costs based on the budgeted sales mix. Determine the calculated sales prices for P-A and P-B.

	P-A	P-B
Calculated Cost	\$200.29	\$194.19
Markup	10% \$20.03	30% \$58.26
SP marked up on calculated costs	\$220.32	\$252.44

9. Determine the per unit gross profit for P-A and P-B.

	P-A	P-B
SP	\$220.32	\$252.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Plant-wide	<u>(\$134.29)</u>	<u>(\$40.29)</u>
Total Costs	(\$200.29)	(\$194.19)
Gross Profit	\$20.03	\$58.26

10. Comment on any differences in calculated product costs and gross margins to products A and B due to using an actual MOH allocation rate vs. a normal MOH allocation rate.

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The actual plant-wide MOH rate is \$79.81/DLH. The normal plant-wide MOH rate is nearly half of that at \$44.76. This significant change in the plant-wide MOH rate is due to two effects both related to the change in budgeted product mix of 40,000 units of A and 20,000 units of B, to the actual product mix of 20,000 units of A and 20,000 units of B, a 50% reduction in sales of P-A and a 100% increase in sales of P-B.

P-A is a less complex and more labor intensive product compared to P-B. Consequently the reduction in production of P-A significantly reduced the actual quantity of the cost allocation base (CAB) DLHs from the budgeted 128,000 DLHs to 78,000 DLHs. If budgeted DLHs are viewed as a measure of capacity, then the actual 78,000 DLHs reflects an underutilization of this capacity and we would consequently expect to see under allocated MOH which in fact was the case.

The increase in the more complex P-B would result in an increase in actual MOH incurred, i.e., budgeted MOH was \$5,774,400 (based on the budgeted sales mix) but actual MOH was \$6,224,800.

The actual plant-wide MOH of \$79.81/DLH reflects the higher actual plant-wide MOH costs incurred and the lower actual DLHs incurred as compared to the normal plant-wide MOH rate of \$44.76/DLH.

An additional issue arises regarding the marked up sales prices for P-B and especially P-A. There are two effects causing a much greater change in calculated price for P-A than for P-B. The first concerns the absolute amount of MOH allocated to each products. In the actual costing scenario (PART A) all production costs will be absorbed by the actual production. In the normal costing scenario (PART B), MOH is allocated using the lower normal MOH rate which combined with the change in sales mix resulted in significantly fewer DLHs utilized which resulted in underallocated MOH. P-A is labor intensive, utilizing more than three times the DLHs of P-B.

The second effect concerns the relative amount of MOH allocated to each product. Allocated MOH is 2-3 times the direct costs for P-A, while it is only about half the direct costs for P-B, therefore the relative impact is much greater for P-A than for P-B.

PART C: Normal departmental MOH rates using Direct method and Step-down method

11. Allocate support costs to the two operating departments using the direct method.

SUPPORT DEPARTMENTS/POOLS	
Building	\$1,570,000.00
Power	\$560,000.00
Purchasing	\$182,000.00

ALLOCATIONS TO OPERATING DEPARTMENTS			
DIRECT METHOD (order based on \$ amount)			
Building Occupancy: Cost / Sqare Footage.	\$1,570,000	500,000	<u>\$3.1400</u> /sq ft
Department 1:		200,000	\$628,000.00

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Department 2:		300,000		\$942,000.00
		<u>500,000</u>		<u>\$1,570,000</u>
Power: Power Cost / kWh		\$560,000	10,000,000	<u>\$0.0560 /kWh</u>
Department 1:			1,200,000	\$67,200.00
Department 2:			<u>8,800,000</u>	<u>\$492,800.00</u>
			10,000,000	<u>\$560,000</u>
Purchasing: Purchasing Cost / Purchase Orders		\$182,000	900	<u>\$202.2222 /PO</u>
		DM-X	DM-Y	
Department 1		320	80	\$64,711.11
Department 2		<u>0</u>	<u>500</u>	<u>\$117,288.89</u>
		320	580	900 <u>\$182,000</u>

12. Determine the normal departmental MOH allocation rates.

DEPARTMENT 1 - DLHs CAB	
Building - Allocated	\$628,000.00
Power - Allocated	\$67,200.00
Purchasing - Allocated	<u>\$64,711.11</u>
	\$759,911.11
Indirect Labor	\$652,500.00
Machine	<u>\$750,000.00</u>
	\$1,402,500.00
	<u>\$2,162,411.11</u>
Department 1 - DLHs	103,000
Depart 1 Rate / DLHs	<u>\$20.99</u>

DEPARTMENT 2 - MHs CAB	
Building - Allocated	\$942,000.00
Power - Allocated	\$492,800.00
Purchasing - Allocated	<u>\$117,288.89</u>
	\$1,552,088.89
Indirect Labor	\$700,000.00
Machine	<u>\$1,360,000.00</u>
	\$2,060,000.00
	<u>\$3,612,088.89</u>
Department 2 - MHs	40,000

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Depart 2 Rate / MHs	<u>\$90.30</u>
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13. Determine the manufacturing costs per unit for P-A and P-B.

Product Costing Per ABC -Total Calculation		P-A		20,000	P-B		20,000
DM-X			\$540,000		\$540,000		
DM-Y			\$0	\$540,000	\$2,250,000		\$2,790,000
DL-D1			\$600,000		\$72,000		
DL-D2			\$180,000	\$780,000	\$216,000		\$288,000
Total Direct Costs				\$1,320,000			\$3,078,000
	Allocation Rate	CAB Qty			CAB Qty		
MOH-D1 (DLHs)	\$20.99	50,000	\$1,049,714		6,000	\$125,966	
MOH-D2 (MHs)	\$90.30	10,000	\$903,022		40,000	\$3,612,089	
Total Allocated MOH				\$1,952,736			\$3,738,055
				\$3,272,736			\$6,816,055
Number of units				20,000			20,000
Cost per unit				<u>\$163.64</u>			<u>\$340.80</u>

VBC Departments -Unit Calculation		P-A		P-B	
DM-X		\$27.00		\$27.00	
DM-Y		\$0.00	\$27.00	\$112.50	\$139.50
DL-D1		\$30.00		\$3.60	
DL-D2		\$9.00	\$39.00	\$10.80	\$14.40
Total Direct Costs			\$66.00		\$153.90
Overhead	Allocation Rate	CAB Qty		CAB Qty	
Department 1	\$20.99	2.50	\$52.49	0.30	\$6.30
Department 2	\$90.30	0.50	\$45.15	2.00	\$180.60
Total Allocated MOH			\$97.64		\$186.90
Total Unit Cost			<u>\$163.64</u>		<u>\$340.80</u>

14. Determine any amount of under/over applied MOH.

	P-A	P-B	Total
D-1	\$1,049,714.13	\$125,965.70	
D-2	\$903,022.22	\$3,612,088.89	
Total Allocated MOH	<u>\$1,952,736.35</u>	<u>\$3,738,054.58</u>	\$5,690,790.94

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Actual MOH	\$6,224,800.00
Underallocated MOH	(\$534,009.06)

15. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.

	P-A	P-B
Sales Price	\$305.42	\$293.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Normal Dept Rates - Direct method	(\$97.64)	(\$186.90)
Total Costs	(\$163.64)	(\$340.80)
Gross Profit	\$141.78	(\$47.36)

16. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.

	P-A	P-B
Sales Price	\$220.32	\$252.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Normal Dept Rates - Direct method	(\$97.64)	(\$186.90)
Total Costs	(\$163.64)	(\$340.80)
Gross Profit	\$56.68	(\$88.36)

17. Allocate support costs to the two operating departments using the step-down method.

SUPPORT DEPARTMENTS/POOLS	
Building	\$1,570,000.00
Power	\$560,000.00
Purchasing	\$182,000.00

ALLOCATIONS TO OPERATING DEPARTMENTS

STEP DOWN METHOD (order based on \$ amount)

Building Occupancy: Cost / Square Footage.	\$1,570,000.00	550,000	<u>\$2.8545</u> /sq ft
Power		30,000	\$85,636.36
Purchasing		20,000	\$57,090.91
Department 1:		200,000	\$570,909.09
Department 2:		300,000	\$856,363.64
		<u>550,000</u>	<u>\$1,570,000.00</u>
Power: Power Cost / kWh	\$645,636.36	10,000,000	<u>\$0.0646</u> /kWh

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Department 1:	1,200,000		\$77,476.36
Department 2:	8,800,000		\$568,160.00
	<u>10,000,000</u>		<u>\$645,636.36</u>
Purchasing: Purchasing Cost / Purchase Orders	\$239,090.91	900	<u>\$265,6566</u> /PO
	DM-X	DM-Y	
Department 1	320	80	\$85,010.10
Department 2	0	500	\$154,080.81
	<u>320</u>	<u>580</u>	900 <u>\$239,090.91</u>

18. Determine the normal departmental MOH allocation rates.

DEPARTMENT 1 - DLHs CAB	
Building - Allocated	\$570,909.09
Power - Allocated	\$77,476.36
Purchasing - Allocated	\$85,010.10
	<u>\$733,395.56</u>
Indirect Labor	\$652,500.00
Machine	\$750,000.00
	<u>\$1,402,500.00</u>
	<u>\$2,135,895.56</u>
Department 1 - DLHs	103,000
Depart 1 Rate / DLHs	<u>\$20.74</u>

DEPARTMENT 2 - MHs CAB	
Building - Allocated	\$856,363.64
Power - Allocated	\$568,160.00
Purchasing - Allocated	\$154,080.81
	<u>\$1,578,604.44</u>
Indirect Labor	\$700,000.00
Machine	\$1,360,000.00
	<u>\$2,060,000.00</u>
	<u>\$3,638,604.44</u>
Department 2 - MHs	40,000
Depart 2 Rate / MHs	<u>\$90.97</u>

19. Determine the manufacturing costs per unit for P-A and P-B.

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Product Costing Per ABC -Total		P-A	20,000	P-B	20,000
DM-X		\$540,000		\$540,000	
DM-Y		\$0	\$540,000	\$2,250,000	\$2,790,000
DL-D1		\$600,000		\$72,000	
DL-D2		\$180,000	\$780,000	\$216,000	\$288,000
Total Direct Costs			\$1,320,000		\$3,078,000
	Allocation Rate	CAB Qty		CAB Qty	
MOH-D1 (DLHs)	\$20.74	50,000	\$1,036,843	6,000	\$124,421
MOH-D2 (MHs)	\$90.97	10,000	\$909,651	40,000	\$3,638,604
Total Allocated MOH			\$1,946,494		\$3,763,026
Total Cost			\$3,266,494		\$6,841,026
Number of units			20,000		20,000
Cost per unit			<u>\$163.32</u>		<u>\$342.05</u>

VBC Departments -		P-A	P-B
DM-X		\$27.00	\$27.00
DM-Y		\$0.00	\$112.50
			\$139.50
DL-D1		\$30.00	\$3.60
DL-D2		\$9.00	\$10.80
			\$14.40
Total Direct Costs		\$66.00	\$153.90
Overhead	Allocation Rate	CAB	CAB
Department 1	\$20.74	2.50	\$51.84
Department 2	\$90.97	0.50	\$45.48
Total Allocated MOH			\$97.32
Total Unit Cost			<u>\$163.32</u>
			\$188.15
			<u>\$342.05</u>

20. Determine any amount of under/over applied MOH.

	P-A	P-B	Total
D-1	\$1,036,842.50	\$124,421.10	
D-2	\$909,651.11	\$3,638,604.44	
Total Allocated MOH	\$1,946,493.61	\$3,763,025.54	\$5,709,519.16
Actual MOH			\$6,224,800.00
Underallocated MOH			(\$515,280.84)

21. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.

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	P-A	P-B
Sales Price	\$305.42	\$293.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Normal Dept Rates - Direct method	(\$97.32)	(\$188.15)
Total Costs	(\$163.32)	(\$342.05)
Gross Profit	\$142.10	(\$48.61)

22. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.

	P-A	P-B
Sales Price	\$220.32	\$252.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
Normal Dept Rates - Direct method	(\$97.32)	(\$188.15)
Total Costs	(\$163.32)	(\$342.05)
Gross Profit	\$57.00	(\$89.61)

23. Comment on any differences in calculated product costs and gross margins to products A and B due to using the direct allocation method vs. the step-down allocation method and with respect to using the single plant-wide MOH rate versus the two departmental MOH rates.

The impact of using the direct method versus the step-down method to allocate support costs is insignificant. However, the consequence of separating support costs from operating costs and using two normal departmental MOH (PART C) rates versus simply accumulating all MOH costs into one plant-wide pool (PART A & B) is significant. Specifically costs allocated to P-A have decreased significantly while costs allocated to P-B have increased significantly.

PART D: Activity Based Costing

24. Determine the normal activity allocation rates.

Indirect labor (IDLHs CAB)	
Department 1 Budgeted IDL Costs	\$450,000.00
Budgeted IDLHs	30,000
Department 1 - IDL rate	<u>\$15.0000</u>
Department 2 Budgeted IDL Costs	\$160,000.00
Budgeted IDLHs	8,000
Department 2 - IDL rate	<u>\$20.0000</u>

Machinery-related (MHs CAB)

Department 1 Budgeted Machine Costs	\$750,000.00
Budgeted MHs	30,000
Department 1 - Machine Rate	<u>\$25.0000</u>

Department 2 Budgeted Machine Costs	\$1,360,000.00
Budgeted MHs	40,000
Department 2 - Machine Rate	<u>\$34.0000</u>

Setups (departmental setups)

Department 1 Budgeted Setup Costs	\$15,000.00
Budgeted Setups	20
Department 1 - Setup Rate	<u>\$750.0000</u>

Department 2 Budgeted Setup Costs	\$40,000.00
Budgeted Setups	25
Department 2 - Setup Rate	<u>\$1,600.0000</u>

Inspections(departmental inspections)

Department 1 Budgeted Inspection Costs	\$187,500.00
Budgeted Inspections	500
Department 1 - Inspection Rate	<u>\$375.0000</u>

Department 2 Budgeted Inspection Costs	\$500,000.00
Budgeted Inspections	1,000
Department 2 - Inspection Rate	<u>\$500.0000</u>

Power (MHs CAB)

Department 1 Allocated Power Costs	\$77,476.36
Budgeted MHs	30,000
Department 1 - Power rate	<u>\$2.5825</u>

Department 2 Allocated Power Costs	\$568,160.00
Budgeted MHs	40,000
Department 2 - Power rate	<u>\$14.2040</u>

Building occupancy (MHs CAB)

Department 1 Allocated Building Costs	\$570,909.09
Budgeted MHs	30,000
Department 1 - Building Rate	<u>\$19.0303</u>

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Department 2 Allocated Building Costs	\$856,363.64
Budgeted MHs	40,000
Department 2 - Building Rate	<u>\$21.4091</u>

Purchasing (Unit CAB)	
Purchase Costs Allocated to DM-X	\$106,262.63
DM-X Purchase Orders	400
DM-X Purchase Order Rate	<u>\$265.6566</u>
Purchase Costs Allocated to DM-Y	\$132,828.28
DM-X Purchase Orders	500
DM-X Purchase Order Rate	<u>\$265.6566</u>

25. Determine the manufacturing costs per unit for P-A and P-B.

Product Costing Per ABC -Total			P-A	20,000	P-B		20,000
DM-X			\$540,000			\$540,000	
DM-Y			\$0	\$540,000		\$2,250,000	\$2,790,000
DL-D1			\$600,000			\$72,000	
DL-D2			\$180,000	\$780,000		\$216,000	\$288,000
Total Direct Costs				\$1,320,000			\$3,078,000
MOH	Allocation Rate	CAB Qty			CAB Qty		
Indirect Labor							
Dept 1	\$15.0000	10,000	\$150,000.00		20,000	\$300,000.00	
Dept 2	\$20.0000	2,000	\$40,000.00	\$190,000.00	8,000	\$160,000.00	\$460,000.00
Machine Costs							
Dept 1	\$25.0000	10,000	\$250,000.00		20,000	\$500,000.00	
Dept 2	\$34.0000	10,000	\$340,000.00	\$590,000.00	40,000	\$1,360,000.00	\$1,860,000.00
Setups							
Dept 1	\$750.0000	8	\$6,000.00		8	\$6,000.00	
Dept 2	\$1,600.0000	10	\$16,000.00	\$22,000.00	10	\$16,000.00	\$22,000.00
Inspections							
Dept 1	\$375.0000	200	\$75,000.00		200	\$75,000.00	
Dept 2	\$500.0000	400	\$200,000.00	\$275,000.00	400	\$200,000.00	\$275,000.00
Power							
Dept 1	\$2.5825	10,000	\$25,825.45		20,000	\$51,650.91	
Dept 2	\$14.2040	10,000	\$142,040.00	\$167,865.45	40,000	\$568,160.00	\$619,810.91
Occupancy							
Dept 1	\$19.0303	10,000	\$190,303.03		20,000	\$380,606.06	
Dept 2	\$21.4091	10,000	\$214,090.91	\$404,393.94	40,000	\$856,363.64	\$1,236,969.70

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Purchases							
DM-X	\$265.6566	160	\$42,505.05		160	\$42,505.05	
DM-Y	\$265.6566	0	\$0.00	\$42,505.05	1,000	\$265,656.57	\$308,161.62
Total Allocated MOH				\$1,691,764.44			\$4,781,942.22
Total product costs				\$3,011,764.44			\$7,859,942.22
Number of units				20,000			\$20,000
Cost per unit				<u>\$150.59</u>			<u>\$393.00</u>

ABC -Unit Calculation	Rate	CAB Qty		P-A	CAB Qty		P-B
DM-X	\$6.75	4	\$27.00		4	\$27.00	
DM-Y	\$11.25	0		\$27.00	10	\$112.50	\$139.50
DL-D1	\$12.00	2.5	\$30.00		0.3	\$3.60	
DL-D2	\$18.00	0.5	\$9.00	\$39.00	0.6	\$10.80	\$14.40
Total Direct Costs				\$66.00			\$153.90
Allocated MOH							
IDL-D1 (IDLHs CAB)	\$15.00	0.50	\$7.50		1.00	\$15.00	
IDL-D2 (IDLHs CAB)	\$20.00	0.10	\$2.00	\$9.50	0.40	\$8.00	\$23.00
MH-D1 (MHs CAB)	\$25.00	0.50	\$12.50		1.00	\$25.00	
MH-D2 (MHs CAB)	\$34.00	0.50	\$17.00	\$29.50	2.00	\$68.00	\$93.00
Setup-D1(Setup)	\$15.00	0.02	\$0.30		0.02	\$0.30	
Setup-D2(Setup)	\$20.00	0.04	\$0.80	\$1.10	0.04	\$0.80	\$1.10
Inspections-D1(Inspections)	\$15.00	0.25	\$3.75		0.25	\$3.75	
Inspections-D2(Inspections)	\$20.00	0.50	\$10.00	\$13.75	0.50	\$10.00	\$13.75
Power-D1 (MH CAB)	\$2.58	0.50	\$1.29		1.00	\$2.58	
Power-D2 (MH CAB)	\$14.20	0.50	\$7.10	\$8.39	2.00	\$28.41	\$30.99
Purchasing-DM-X	\$0.53	4.00	\$2.13		4.00	\$2.13	
Purchasing-DM-Y	\$1.33	0	\$0.00	\$2.13	10.00	\$13.28	\$15.41
Building-D1 (MH CAB)	\$19.03	0.50	\$9.52		1.00	\$19.03	
Building-D2 (MH CAB)	\$21.41	0.50	\$10.70	\$20.22	2.00	\$42.82	\$61.85
Total Allocated MOH				\$84.59			\$239.10
Total Unit Cost				<u>\$150.59</u>			<u>\$393.00</u>

26. Determine any amount of under/over applied MOH.

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	P-A	P-B	Allocated MOH	Actual MOH	(Under)/Over Allocated
Indirect Labor					
Dept 1	\$150,000.00	\$300,000.00			
Dept 2	\$40,000.00	\$160,000.00	\$650,000.00	\$650,000.00	\$0.00
Machine Costs					
Dept 1	\$250,000.00	\$500,000.00			
Dept 2	\$340,000.00	\$1,360,000.00	\$2,450,000.00	\$2,450,000.00	\$0.00
Setups					
Dept 1	\$6,000.00	\$6,000.00			
Dept 2	\$16,000.00	\$16,000.00	\$44,000.00	\$44,000.00	\$0.00
Inspections					
Dept 1	\$75,000.00	\$75,000.00			
Dept 2	\$200,000.00	\$200,000.00	\$550,000.00	\$550,000.00	\$0.00
Power					
Dept 1	\$25,825.45	\$51,650.91			
Dept 2	\$142,040.00	\$568,160.00	\$787,676.36	\$683,200.00	\$104,476.36
Occupancy					
Dept 1	\$190,303.03	\$380,606.06			
Dept 2	\$214,090.91	\$856,363.64	\$1,641,363.64	\$1,570,000.00	\$71,363.64
Purchases					
DM-X	\$42,505.05	\$42,505.05			
DM-Y	\$0.00	\$265,656.57	\$350,666.67	\$277,600.00	\$73,066.67
Total Allocated MOH	\$1,691,764.44	\$4,781,942.22	\$6,473,706.67	\$6,224,800.00	\$248,906.67

27. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.

	P-A	P-B
Sales Price	\$305.42	\$293.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
ABC	(\$84.59)	(\$239.10)
Total Costs	(\$150.59)	(\$393.00)
Gross Profit	\$154.83	(\$99.56)

28. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.

	P-A	P-B
Sales Price	\$220.32	\$252.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		

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ABC	(\$84.59)	(\$239.10)
Total Costs	(\$150.59)	(\$393.00)
Gross Profit	\$69.73	(\$140.56)

29. Comment on any differences in calculated product costs and gross margins to products A and B due to using the ABC model versus the departmental model.

Allocated MOH has shifted from under-allocated using the normal departmental rates to over-allocated using the ABC activity rates. In the departmental model, due to the change in the sales mix, department 1 costs would be under-allocated due to the reduction in actual DLHs and department 2 costs would be over-allocated due to the increase in actual MHs.

The ABC system and use of activity rates eliminates the distortions in department 1 and 2 allocations. Furthermore there are no under/over allocations of indirect labor, machine costs, setups or inspections. This is because these are variable costs (indirect labor and machine costs are unit level costs whereas setup and inspection are batch level costs) and assuming no change in input costs or productivity, the amounts allocated would be equal to the actual amounts incurred. Power and purchases are also variable costs but they are allocated based on MHs which increased due to the change in sales mix, so that would lead to over-allocation. Occupancy costs are facility sustaining costs which are also allocated on MHs and which were consequently over-allocated. This illustrates the fact that allocated costs, regardless of their cost behavior, are "flexed" and treated as variable costs, in this case allocated based on MHs.

PART E: Activity Based Costing vs Activity Based Management

30. Streamline/redesign the ABC system.

The two batch activities of setups and inspections exclusively utilize IDLHs, therefore these activity pools can be merged into the indirect labor activity pool. The power and occupancy activity pools are allocated using MHs so they can be merged into the machine cost activity pool. The first stage allocation of occupancy, purchasing and power resource pools remains the same. There are now only six second stage activity pools: indirect labor for each department, machine costs for each department, and purchasing for each product.

31. Determine the normal activity allocation rates.

FIRST STAGE ALLOCATIONS				
Building Occupancy: Cost / Sqare Footage.	\$1,570,000.00	550,000	<u>\$2.8545</u>	/sq ft
Purchasing	\$2.8545	20,000		\$57,090.91
Power	\$2.8545	30,000		\$85,636.36
Department 1	\$2.8545	200,000		\$570,909.09
Department 2	\$2.8545	300,000		\$856,363.64
		550,000		<u>\$1,570,000.00</u>

Purchasing: Direct costs + Allocated building occupancy	\$239,091	900	<u>\$265.6566</u>	/PO
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Purchasing Cost / Purchase Orders		Pur Orders	Alloc Cost
Material X:	\$265.6566	400	\$106,262.63
Material Y:	\$265.6566	500	\$132,828.28
		<u>900</u>	<u>\$239,090.91</u>

Power: Direct costs + Allocated building occupancy	\$645,636	10,000,000	<u>\$0.0646</u> /kWh
Power Cost / kWh		Power	Alloc Cost
Department 1:	\$0.0646	1,200,000	\$77,476.36
Department 2:	\$0.0646	8,800,000	\$568,160.00
		<u>10,000,000</u>	<u>\$645,636.36</u>

Indirect labor (IDLHs CAB)

Department 1 Budgeted IDL Costs	\$652,500.00
Budgeted IDLHs	43,500
Department 1 - IDL rate	<u>\$15.0000</u>

Department 2 Budgeted IDL Costs	\$700,000.00
Budgeted IDLHs	35,000
Department 2 - IDL rate	<u>\$20.0000</u>

Machinery-related (MHs CAB)

Department 1 Budgeted Machine Costs	\$750,000.00
Allocated Power Costs	\$77,476.36
Allocated Occupancy Costs	\$570,909.09
Total Department 1 Costs	\$1,398,385.45
Budgeted MHs	30,000
Department 1 - Machine Rate	<u>\$46.6128</u>

Department 2 Budgeted Machine Costs	\$1,360,000.00
Allocated Power Costs	\$568,160.00
Allocated Occupancy Costs	\$856,363.64
Total Department 1 Costs	\$2,784,523.64
Budgeted MHs	40,000
Department 2 - Machine Rate	<u>\$69.6131</u>

Purchasing (Unit CAB)

Purchase Costs Allocated to DM-X	\$106,262.63
DM-X Purchase Orders	400
DM-X Purchase Order Rate	<u>\$265.6566</u>

Purchase Costs Allocated to DM-Y	\$132,828.28
DM-X Purchase Orders	500

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DM-X Purchase Order Rate

\$265.6566

32. Determine the manufacturing costs per unit for P-A and P-B.

Product Costing Per ABC -Total Calculation			P-A	20,000	P-B	20,000
DM-X			\$540,000		\$540,000	
DM-Y			\$0	\$540,000	\$2,250,000	\$2,790,000
DL-D1			\$600,000		\$72,000	
DL-D2			\$180,000	\$780,000	\$216,000	\$288,000
Total Direct Costs				\$1,320,000		\$3,078,000
MOH	Allocation Rate	CAB Qty			CAB Qty	
Indirect Labor						
Dept 1	\$15.0000	15,400	\$231,000.00		25,400	\$381,000.00
Dept 2	\$20.0000	12,800	\$256,000.00	\$487,000.00	18,800	\$376,000.00
Machine Costs						
Dept 1	\$46.6128	10,000	\$466,128.48		20,000	\$932,256.97
Dept 2	\$69.6131	10,000	\$696,130.91	\$1,162,259.39	40,000	\$2,784,523.64
Purchases						
DM-X	\$265.6566	160	\$42,505.05		160	\$42,505.05
DM-Y	\$265.6566	0	\$0.00	\$42,505.05	1,000	\$265,656.57
Total Allocated MOH				\$1,691,764.44		\$4,781,942.22
Total product costs				\$3,011,764.44		\$7,859,942.22
Number of units				20,000		\$20,000
Cost per unit				<u>\$150.59</u>		<u>\$393.00</u>

ABC -Unit Calculation	Rate	CAB Qty	P-A	CAB Qty	P-B
DM-X	\$6.75	4	\$27.00	4	\$27.00
DM-Y	\$11.25	0	\$27.00	10	\$112.50
DL-D1	\$12.00	2.5	\$30.00	0.3	\$3.60
DL-D2	\$18.00	0.5	\$9.00	0.6	\$10.80
Total Direct Costs			\$66.00		\$153.90
Allocated MOH					
IDL-D1 (IDLHs CAB)	\$15.00	0.77	\$11.55	1.27	\$19.05
IDL-D2 (IDLHs CAB)	\$20.00	0.64	\$12.80	0.94	\$18.80
MH-D1 (MHs CAB)	\$46.61	0.50	\$23.31	1.00	\$46.61

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MH-D2 (MHs CAB)	\$69.61	0.50	<u>\$34.81</u>	\$58.11	2.00	<u>\$139.23</u>	\$185.84
Purchasing-DM-X	\$0.53	4.00	\$2.13		4.00	\$2.13	
Purchasing-DM-Y	\$1.33	0	<u>\$0.00</u>	\$2.13	10.00	<u>\$13.28</u>	\$15.41
Total Allocated MOH				\$84.59			\$239.10
Total Unit Cost				\$150.59	-		\$393.00

33. Determine any amount of under/over applied MOH.

	P-A	P-B	Total
Indirect Labor			
Dept 1	\$231,000.00	\$381,000.00	\$612,000.00
Dept 2	\$256,000.00	\$376,000.00	\$632,000.00
Machine Costs			
Dept 1	\$466,128.48	\$932,256.97	\$1,398,385.45
Dept 2	\$696,130.91	\$2,784,523.64	\$3,480,654.55
Purchases			
DM-X	\$42,505.05	\$42,505.05	\$85,010.10
DM-Y	\$0.00	\$265,656.57	\$265,656.57
Total Allocated MOH	\$1,691,764.44	\$4,781,942.22	\$6,473,706.67
Actual MOH			\$6,224,800.00
Overallocated MOH			\$248,906.67

34. Determine the per unit gross profit for P-A and P-B using the sales prices from #3.

	P-A	P-B
Sales Price	\$305.42	\$293.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		
ABC	<u>(\$84.59)</u>	<u>(\$239.10)</u>
Total Costs	(\$150.59)	(\$393.00)
Gross Profit	\$154.83	(\$99.56)

35. Determine the per unit gross profit for P-A and P-B using the sales prices from #8.

	P-A	P-B
Sales Price	\$220.32	\$252.44
Direct Costs	(\$66.00)	(\$153.90)
MOH		

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ABC	(\$84.59)	(\$239.10)
Total Costs	(\$150.59)	(\$393.00)
Gross Profit	\$69.73	(\$140.56)

36. Comment on any differences in calculated product costs and gross margins to products A and B due to using the original ABC system with the streamlined ABC system. Under what scenarios would each system be most appropriate?

There are two objectives to product costing. The first is to accurately capture resource consumption and the second is to provide information for process improvement, i.e., the first is to “cost” the cost object and the second is to “manage the cost”.

Which ABC system MMI should use depends on what it’s objective is. The calculated costs for P-A and P-B are identical in both ABC systems and therefore if the objective is simply to “cost” the products then the streamlined ABC system is most appropriate. However if the objective is to understand the demand which products make on activities (Activity-Based-Management) then original ABC system should be used.

37. All the costing systems developed have been designed to comply with GAAP. If MMI were to relax this constraint, in what way might the ABC system be modified.

Occupancy costs are facility sustaining costs and are “driven” by the fact that the facility exists. Therefore there is no appropriate allocation base and the use of any allocation, such as square footage as in this case, will be arbitrary and will simply distort the calculated product costs. The larger the cost the greater the distortion. In this case occupancy costs are 25% of MOH costs.

The ABC system’s accuracy would be improved by not treating occupancy costs as a product cost to be allocated to the product.

38. Compare the GAAP based and non-GAAP based ABC systems, and comment on any differences.

FIRST STAGE ALLOCATIONS

Purchasing:	\$182,000	900	<u>\$202.2222</u> /PO
Purchasing Cost / Purchase Orders		Pur Orders	Allocated Cost
Material X:	\$202.2222	400	\$80,888.89
Material Y:	\$202.2222	500	\$101,111.11
		<u>900</u>	<u>\$182,000.00</u>

Power:	\$560,000	10,000,000	<u>\$0.0560</u> /kWh
Power Cost / kWh		Power	Allocated Cost
Department 1:	\$0.0560	1,200,000	\$67,200.00
Department 2:	\$0.0560	8,800,000	\$492,800.00
		<u>10,000,000</u>	<u>\$560,000.00</u>

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Second stage activity allocation rates:

Indirect labor (IDLHs CAB)	
Department 1 Budgeted IDL Costs	\$652,500.00
Budgeted IDLHs	43,500
Department 1 - IDL rate	<u>\$15.0000</u>
Department 2 Budgeted IDL Costs	\$700,000.00
Budgeted IDLHs	35,000
Department 2 - IDL rate	<u>\$20.0000</u>

Machinery-related (MHs CAB)	
Department 1 Budgeted Machine Costs	\$750,000.00
Allocated Power Costs	\$67,200.00
Total Department 1 Costs	\$817,200.00
Budgeted MHs	30,000
Department 1 - Machine Rate	<u>\$27.2400</u>
Department 2 Budgeted Machine Costs	\$1,360,000.00
Allocated Power Costs	\$492,800.00
Total Department 1 Costs	\$1,852,800.00
Budgeted MHs	40,000
Department 2 - Machine Rate	<u>\$46.3200</u>

Purchasing (Unit CAB)	
Purchase Costs Allocated to DM-X	\$80,888.89
DM-X Purchase Orders	400
DM-X Purchase Order Rate	<u>\$202.2222</u>
Purchase Costs Allocated to DM-Y	\$101,111.11
DM-X Purchase Orders	500
DM-X Purchase Order Rate	<u>\$202.2222</u>

Manufacturing costs per unit for P-A and P-B.

Product Costing Per ABC -Total Calculation	P-A	20,000	P-B	20,000
DM-X	\$540,000		\$540,000	
DM-Y	\$0	\$540,000	\$2,250,000	\$2,790,000
DL-D1	\$600,000		\$72,000	
DL-D2	\$180,000	\$780,000	\$216,000	\$288,000
Total Direct Costs		\$1,320,000		\$3,078,000

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MOH	Allocation Rate	CAB Qty			CAB Qty		
Indirect Labor							
Dept 1	\$15.0000	15,400	\$231,000.00		25,400	\$381,000.00	
Dept 2	\$20.0000	12,800	\$256,000.00	\$487,000.00	18,800	\$376,000.00	\$757,000.00
Machine Costs							
Dept 1	\$27.2400	10,000	\$272,400.00		20,000	\$544,800.00	
Dept 2	\$46.3200	10,000	\$463,200.00	\$735,600.00	40,000	\$1,852,800.00	\$2,397,600.00
Purchases							
DM-X	\$202.2222	160	\$32,355.56		160	\$32,355.56	
DM-Y	\$202.2222	0	\$0.00	\$32,355.56	1,000	\$202,222.22	\$234,577.78
Total Allocated MOH				\$1,254,955.56			\$3,389,177.78
Total product costs				\$2,574,955.56			\$6,467,177.78
Number of units				20,000			\$20,000
Cost per unit				<u>\$128.75</u>			<u>\$323.36</u>

ABC -Unit Calculation	Rate	CAB Qty		P-A		CAB Qty		P-B
DM-X	\$6.75	4	\$27.00			4	\$27.00	
DM-Y	\$11.25	0		\$27.00		10	\$112.50	\$139.50
DL-D1	\$12.00	2.5	\$30.00			0.3	\$3.60	
DL-D2	\$18.00	0.5	\$9.00	\$39.00		0.6	\$10.80	\$14.40
Total Direct Costs				\$66.00				\$153.90
Allocated MOH								
IDL-D1 (IDLHs CAB)	\$15.00	0.77	\$11.55			1.27	\$19.05	
IDL-D2 (IDLHs CAB)	\$20.00	0.64	\$12.80	\$24.35		0.94	\$18.80	\$37.85
MH-D1 (MHs CAB)	\$27.24	0.50	\$13.62			1.00	\$27.24	
MH-D2 (MHs CAB)	\$46.32	0.50	\$23.16	\$36.78		2.00	\$92.64	\$119.88
Purchasing-DM-X	\$0.40	4.00	\$1.62			4.00	\$1.62	
Purchasing-DM-Y	\$1.01	0	\$0.00	\$1.62		10.00	\$10.11	\$11.73
Total Allocated MOH				\$62.75				\$169.46
Total Unit Cost				<u>\$128.75</u>				<u>\$323.36</u>

Below is a comparison of the calculated products costs including occupancy costs (ABC-GAAP) and excluding them (ABC- non GAAP). There is the obvious reduction in costs by excluding occupancy costs, but the more important issue is how much does that reduce distortion in the calculated product costs.

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Including occupancy costs results in a product cost profile whereby P-A costs 38.32% of P-B. Excluding occupancy costs changes this product cost profile to P-A costing 39.82% of P-B. Therefore we can conclude that the impact of including an arbitrary allocation of a facility sustaining cost – occupancy- has a very slightly distorting effect of P-A subsidizing P-B.

Another interesting observation regards the under/over allocation of MOH. As seen in the table below, the non GAAP ABC model significantly reduces the amount of over-allocated MOH by approximately \$260,000, in fact reversing it to under-allocated. This is logical because the occupancy costs were 25% of total MOH and these costs were allocated based on MHs which were in excess of budgeted MHs.

Unit Product Costs	P-A	P-B	(Under)/Over Allocated MOH
ABC- GAAP	\$150.59	\$393.00	\$248,906.67
ABC non GAAP	\$128.75	\$323.36	(\$10,666.67)

PART F

39. Comment on the potential strategic consequences for P-A and P-B resulting from the use of an inaccurate product costing system.

The following table summarizes the changes in product costs as MMI has evolved it's costing system from an actual plant-wide MOH rate to an ABC model.

Unit Product Costs		P-A	P-B	(Under)/Over Allocated MOH	P-A cost/P-B Cost
Actual plant-wide	PART A	\$305.42	\$225.72	none	135.30%
Normal plant-wide	PART B	\$200.29	\$194.19	(\$2,733,242)	103.14%
Normal dept - direct	PART C	\$163.64	\$340.80	(\$534,009.06)	48.02%
Normal dept - step-down	PART C	\$163.32	\$342.05	(\$515,280.84)	47.75%
ABC -ABM	PART D	\$150.59	\$393.00	\$248,906.67	38.32%
ABC- costing	PART E	\$150.59	\$393.00	\$248,906.67	38.32%
ABC non GAAP	PART E	\$128.75	\$323.36	(\$10,666.67)	39.82%

There was initially a very significant subsidization of P-B by P-A, grossly overstating P-A and understating P-B's costs. Comparing the actual plant-wide costs with the normal plant-wide costs reveals that a significant amount of under- utilized capacity was absorbed by both products, particularly P-A since MOH was allocated by DLHs and P-A was labor intensive relative to P-B.

The movement to departmental MOH rates significantly reduced the amount of product subsidization of P-B by P-A. This was further reduced by the adoption of the ABC syst. The movement from the actual plant-wide system to the ABC almost completely reverses the product cost profiles for P-A and P-B.

This miscosting has significant strategic consequences given prices are marked up from calculated costs. P-A is a commodity which competes on price. The over-costing of P-A would lead to an over-pricing of P-A which would lead to a loss of market share which explains why actual sales of P-A are 50% of budgeted sales. As seen in the table below, the markup for P-A is 51% or 32% of sales price, far above the intended 10% markup.

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P-B is a differentiated product and therefore has more pricing power. However since it was under-costed it would be under-priced. This explains why the actual sales of P-B are double the budgeted sales. As seen below, whether utilizing the original prices based on either the actual sales mix or the budgeted sales mix, P-B does not recover its product costs and sells at a loss.

	P-A		P-B
Sales Price	\$305.42		\$293.44
Direct Costs	(\$66.00)		(\$153.90)
MOH			
ABC	(\$84.59)		(\$239.10)
Total Costs	(\$150.59)		(\$393.00)
Gross Profit	\$154.83	50.69%	(\$99.56)

	P-A		P-B
Sales Price	\$220.32		\$252.44
Direct Costs	(\$66.00)		(\$153.90)
MOH			
ABC	(\$84.59)		(\$239.10)
Total Costs	(\$150.59)		(\$393.00)
Gross Profit	\$69.73	31.65%	(\$140.56)