



Pollution Prevention in Accounting

NATIONAL POLLUTION PREVENTION CENTER FOR HIGHER EDUCATION

Homework / Exam Problem: Overhead Allocation for Pollution Prevention

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Homework Problem: Overhead Allocation for Pollution Prevention

Hare and Company manufactures a variety of components. Its Toledo plant specializes in two (2) electronic components used in circuit boards. These components serve the same function and perform equally well. The difference in the two products is the raw material. The XL-D chip is the older of the two components and is made with a metal that requires a wash prior to assembly. Until the mid-1970s, the wastewater was released directly into the Maumee River. In 1974, the company was ordered to treat the wastewater before its release, and it installed relatively expensive equipment. While the equipment is fully depreciated, **annual operating expenses of \$250,000** are still incurred for wastewater treatment.

Two years ago, company scientists developed an alloy with all of the properties of the raw materials used in XL-D that generates no wastewater. Some prototype components using the new material were produced and tested and found to be indistinguishable from the old components in every way relating to their fitness for use. The only difference is that the new alloy is more expensive than the old raw material. The Company has been test-marketing the newer version of the component, referred to as XL-C, and is currently trying to decide its fate.

Manufacturing of both components begins in the Production Department and is completed in the Assembly Department. No other products are produced in the plant. The following table describes the characteristics of the two components:

	XL-D	XL-C
Units Produced	100,000	25,000
Raw Material Costs/Unit	\$12	\$14
Direct Labor Hours/Unit - Production	0.1	0.1
Direct Labor Hours/Unit - Assembly	0.4	0.4
Direct Labor Rate/Hour - (all labor)	\$20	\$20
Machine Hours/Unit - Production	1.6	1.6
Machine Hours/Unit - Assembly	0.4	0.4
Testing Hours/Unit (all in production)	3.0	3.0
Shipping Weight/Unit (pounds)	1.0	1.6
Wastewater Generated/Unit (gallons)	10.0	0.0

Annual overhead costs for the two departments are:

	Production Department	Assembly Department
Supervision	\$ 100,000.....	\$240,000
Material Handling	93,000.....	40,000
Testing.....	150,000.....	0
Wastewater Treatment	250,000.....	0
Depreciation on Equipment	400,000.....	100,000
Shipping	7,000.....	120,000
Total	\$1,000,000	\$500,000

Name: _____

The company president believes that it's foolish to continue producing two essentially equivalent products. At the same time, the corporate image is somewhat tarnished because of a toxic dump found at another site. The president would like to be able to point to the Toledo plant as an example of Company R&D working to provide an environmentally friendly product. The Controller, an accountant and, therefore, firmly grounded in reality, points out to the president that the Company's financial position is shaky and it can't afford to produce products in any way other than the most cost-efficient.

Required:

- a. The current cost accounting system at Hare and Company **charges overhead** to products **based on direct labor cost** using a **single, plant-wide rate**. What product costs will be reported for the two products if the current allocation system is used?

XL-D

XL-C

Name: _____

- b. The Controller recently completed an executive education course describing the **“two-stage allocation procedure.”** Assume that the **first stage allocates costs to departments** and the **second stage allocates costs to products.** The Controller also believes that the costs will be “more accurate” if **machine hours** are used to **allocate Production Department costs** and **labor hours** are used to **allocate Assembly Department costs.**

What product costs will be reported for the two products if the two-stage allocation process is used?

XL-D

XL-C

- c. Explain the results found in parts a and b. Use only the remainder of this page.

Name: _____

- d. The President argues that an Activity-Based Costing (ABC) system would provide even better costs. The Company decides to compute product costs assuming an ABC system is implemented *only the in Production Department*. **Overhead in Assembly will continue to be allocated based on direct labor cost.** The cost drivers selected for the experiment are:

Overhead Item	Driver
Supervision	Direct Labor Hours
Material Handling	Material Cost
Testing	Testing Hours
Wastewater Treatment	Wastewater Generated
Depreciation on Equipment	Machine Hours
Shipping	Weight

What product costs would be reported if this ABC system were implemented?
Assume that the production mix and costs would remain as reported above.

XL-D

XL-C

SOLUTION

The company president believes that it's foolish to continue producing two essentially equivalent products. At the same time, the corporate image is somewhat tarnished because of a toxic dump found at another site. The president would like to be able to point to the Toledo plant as an example of Company R&D working to provide an environmentally friendly product. The Controller, an accountant and, therefore, firmly grounded in reality, points out to the president that the Company's financial position is shaky and it can't afford to produce products in any way other than the most cost-efficient.

Required:

- a. The current cost accounting system at Hare and Company **charges overhead** to products **based on direct labor cost** using a **single, plant-wide rate**. What product costs will be reported for the two products if the current allocation system is used?

		XL-C		XL-D
Raw Material		\$12.00		\$14.00
Direct Labor - Prod.	\$2.00		\$2.00	
Direct Labor - Assy.	8.00	10.00	8.00	10.00
Overhead @ 120%*		12.00		12.00
Total		\$34.00		\$36.00

$$\begin{aligned} \text{*Overhead Rate} &= (\text{Production Overhead} + \text{Assembly Overhead}) / \text{Total Direct Labor Cost} \\ &= (\$1,000,000 + \$500,000) / (100,000 \times \$10 + 25,000 \times \$10) \\ &= 120\% \text{ of direct labor costs} \end{aligned}$$

SOLUTION

- b. The Controller recently completed an executive education course describing the **"two-stage allocation procedure."** Assume that the **first stage allocates costs to departments** and the **second stage allocates costs to products.** The Controller also believes that the costs will be "more accurate" if **machine hours** are used to **allocate Production Department costs** and **labor hours** are used to **allocate Assembly Department costs.**

What product costs will be reported for the two products if the two-stage allocation process is used?

		XL-D		XL-C
Raw Material		\$12.00		\$14.00
Direct Labor - Prod.	\$2.00		\$2.00	
Direct Labor - Assy.	<u>8.00</u>	10.00	<u>8.00</u>	10.00
Overhead - Prod. @ \$5/mh*	\$8.00		\$8.00	
Overhead - Assy. @ \$10/dlh**	<u>4.00</u>	<u>12.00</u>	<u>4.00</u>	<u>12.00</u>
Total		\$34.00		\$36.00

***Overhead Rate (Prod. Dept.)** = **Production Overhead/ Total Machine Hours**
 = $\$1,000,000 / (100,000 \times 1.6 + 25,000 \times 1.6)$
 = **\$5/machine hour**

****Overhead Rate (Assy. Dept.)** = **Assembly Overhead/ Total Direct Labor Hrs**
 = $\$500,000 / (100,000 \times 0.4 + 25,000 \times 0.4)$
 = **\$10/direct labor hour**

- c. Explain the results found in parts a and b. Use only the remainder of this page.

Since both products use machine time and direct labor time in the same proportion (in fact, in equal amounts), it is irrelevant whether machine hours or direct labor hours are used to allocate overhead costs to the final products or whether it is done by manufacturing department or using a plantwide rate.

SOLUTION

- d. The President argues that an Activity-Based Costing (ABC) system would provide even better costs. The Company decides to compute product costs assuming an ABC system is implemented *only the in Production Department*. **Overhead in Assembly will continue to be allocated based on direct labor cost.** The cost drivers selected for the experiment are:

Overhead Item	Driver
Supervision	Direct Labor Hours
Material Handling	Material Cost
Testing	Testing Hours
Depreciation on Equipment	Machine Hours
Shipping	Weight

What product costs would be reported if this ABC system were implemented? Assume that the production mix and costs would remain as reported above.

		XL-D		XL-C
Raw Material		\$12.00		\$14.00
Direct Labor - Prod.	\$2.00		\$2.00	
Direct Labor - Assy.	<u>8.00</u>	10.00	<u>8.00</u>	10.00
Overhead - Prod.*				
Supv. @ \$8/direct labor hour	\$0.80		\$0.80	
Mat'l Hand @ 6% mat'l. cost	0.72		0.84	
Testing @ \$0.40/ test hour	1.20		1.20	
Waste Treat. @ \$.25/gallon	2.50		0.00	
Depreciation @ \$2/mach. hr	3.20		3.20	
Shipping @ \$0.05/pound	<u>0.05</u>		<u>0.08</u>	
Total Production Overhead		8.47		6.12
Overhead - Assy. @ \$10/dlh**		<u>4.00</u>		<u>4.00</u>
Total		\$34.47		\$34.12

***Production Overhead Calculations:**

Activity	Driver	Driver Volume	Rate
Supervision	Dir. lab hrs	$100,000 \times .1 + 25,000 \times .1 = 12,500$ hours	\$8.00
Materials Handling	Mat. cost	$100,000 \times \$12 + 25,000 \times \$14 = \$1,550,000$	6%
Testing	Test hours	$100,000 \times 3 + 25,000 \times 3 = 375,000$ hours	\$0.40
Wastewater Treatment	Waste	$100,000 \times 10 + 25,000 \times 0 = 1,000,000$ gal	\$0.25
Depreciation	Mach hrs	$100,000 \times 1.6 + 25,000 \times 1.6 = 200,000$ hrs	\$2.00
Shipping	Weight	$100,000 \times 1.0 + 25,000 \times 1.6 = 140,000$ lbs	\$0.05

****Overhead Rate (Assy. Dept.) = Assembly Overhead/ Total Direct Labor Hrs**
= \$500,000 / (100,000 × 0.4 + 25,000 × 0.4)
= \$10/direct labor hour



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The mission of the NPPC is to promote sustainable development by educating students, faculty, and professionals about pollution prevention; create educational materials; provide tools and strategies for addressing relevant environmental problems; and establish a national network of pollution prevention educators.

In addition to developing educational materials and conducting research, the NPPC also offers an internship program, professional education and training, and conferences.

The NPPC provides educational materials through the World Wide Web at this URL: <http://www.umich.edu/~nppcpub/>
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