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BRIEF CASES

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WILLIAM BRUNS

JULIE H. HERTENSTEIN

KELVIN LIU

Danshui Plant No. 2

In August 2010, Wentao Chen, manager of Danshui Plant No. 2 in southern China, was anxious. The plant was in the third month of a 12-month contract to assemble the Apple iPhone 4. The contract called for Danshui to assemble 2.4 million iPhones in the period between June 1, 2010, and May 31, 2011, but now in the third month of the contract, production was only 180,000 units per month. Chen called Jianye Ma, the plant controller, to request a summary of monthly operations for August as soon after the end of the month as possible.

Danshui was a contract manufacturer that assembled electronic products for companies wishing to save labor costs by locating in southern China where semiskilled labor was available for less than one dollar an hour. Manufacturers like Danshui assembled parts in large plants using assembly line techniques according to specifications of the international companies that contracted with them for assembly and final testing. The largest contract manufacturer in China was Foxconn, a division of the Hon Hai Group of Taiwan, with more than 800,000 workers in China alone and contracts to supply Apple, Dell, and Hewlett Packard among others.

In expectation of high demand for the iPhone 4, Apple had contracted with Danshui to assemble iPhones in Plant No. 2, which had been assembling computer hard drives on a contract that was fulfilled at the end of May 2010. Although the assembly of hard drives was different than assembly of iPhones, Danshui was confident that its workers would adapt to the new assembly tasks and that it could hire and train the additional workers as needed. Chen's job was to get Plant No. 2 up to speed to fulfill the Apple contract and earn a profit for Danshui's parent company, located in Hong Kong, China.

Danshui Plant No. 2 was a profit center that was credited for each iPhone produced and shipped, and charged for parts, labor, overhead, and shipping. Because the contract was for a year, an annual budget was established soon after the iPhone contract was signed. This budget was divided by 12 to establish equal monthly budgets to which actual revenues and expenses could be compared. All budgeting and monthly reporting was done in U.S. dollars.

Professor Emeritus William J. Bruns of the Harvard Business School and Associate Professor Julie H. Hertenstein and Assistant Professor Kelvin Liu of Northeastern University prepared this case solely as a basis for class discussion and not as an endorsement, a source of primary data, or an illustration of effective or ineffective management. Despite occasional references to actual companies, this case is fictitious and any resemblance to actual persons or entities is coincidental.

As the plant manager, Wentao Chen was responsible for control of all costs in his plant. Materials, labor, and overhead were his responsibility. This was done to provide incentive to control all costs whether caused by use waste, damage, theft, or inefficiencies.

The Apple iPhone 4

The iPhone 4 contained more than 100 components manufactured in plants located in Europe, Asia, and the United States. For examples, Samsung supplied flash memories and application processors, and Infineon (a German chip maker) supplied chips that send and receive phone calls and data. A gyroscope, new to the iPhone 4, came from STMicroelectronics, based in Geneva, and a touch-screen module came from Taiwan. Contract manufacturers assembled these parts in assembly line plants that required each worker to focus on one or more tasks in a short period of time as each phone moved along an assembly line toward completion. Estimates of the material cost of each iPhone were around $180, assembly labor around 7% of total cost, and Apple's profit margins about 60% of the selling price to customers. (See **Exhibits 1** and **2** for estimated standard costs and overhead budgets for the Danshui Plant No. 2.)

The assembly process at Danshui Plant No. 2 was almost entirely based on handwork by workers. There were about 140 steps in the assembly process for an iPhone 4, and each phone was handled by 325 individuals during the five days required for assembly. Apple released the iPhone 4 on June 24, 2010 and more than 1.7 million units were sold in the first three days it was available. It was the most successful product launch in Apple history. Apple fanatics around the world waited in long lines to get their hands on the new phone.

The August Report

On September 2, Chen arrived at his office and found a report on August operations. (See **Exhibit 3**). The controller, Jianye Ma, had attached a note which Chen read with interest.

To: Wentao Chen
From: Jianye Ma and Bingqian Li
Date: September 1, 2010

Per your request we have compiled a preliminary report on August operations. At first glance, revenue was below budget, material usage seems good, and labor costs were above budget. In terms of plant profit, our budget was $100,000, but we actually had a loss of $672,000. The main reason for the shortfall may be that we have been unable to produce 200,000 iPhone 4 units in any of the three months we have been working on this contract.

Our major obstacle is hiring enough qualified labor to get production up to 200,000 units per month. We cannot find people to hire, even though we have raised our factory wages by almost 30% since July. (A friend at Foxconn in Shenzhen told Li that they raised their starting pay by 35% since March, and they are building new plants elsewhere where unemployment is high.)

In addition, we continue to have trouble with the Samsung flash memory installation. Unless these are handled very carefully, they can be damaged by heat during installation. One thousand flash memories were damaged in August and had to be replaced after inspection. Samsung is aware of this problem and has begun to install a shield to prevent

some of the damage; however, as a result, Samsung raised the price of each unit $2.00 starting in mid June. Fortunately, Apple raised our revenue recovery by an equal amount, so this should be neutral. We apparently had a favorable variance on flash memories and other parts.

Li is uncomfortable with this report. She feels we should prepare a new budget showing what we would have spent using standard costs and a production volume of 180,000 units. She says that the current report (**Exhibit 3**) distorts how we did, and that until we prepare a "flexible budget" to compare our actual performance to that budget we run the risk of misinterpreting our performance.

It will take Li a couple of days to prepare and evaluate a flexible budget because she is working on a tax report that is due September 7. I will talk with you next week once we receive the flexible budget from Li.

Some data on the iPhone 4 is adapted from David Barboza, "Supply Chain for iPhone Highlights Costs in China," *New York Times*, July 6, 2010.

Required:

1. Using budget data, how many Apple iPhone 4's would have to have been completed for Danshui Plant No. 2 to break even?
2. Using budget data, what was the total expected cost per unit if all manufacturing and shipping overhead (both variable and fixed) were allocated to planned production? What was the actual cost per unit of production and shipping?
3. Prepare a flexible budget for 180,000 iPhone 4's and calculate flexible budget variances using actual costs for August.
4. Estimate material price and usage for flash memories, labor rate and usage (efficiency) variances, and the overhead spending variance for August.
5. What are some strategies or decisions that Wentao Chen should consider in trying to solve the problems with the Apple iPhone 4 contract in the next nine months? How would these change the costs and profitability of Danshui Plant No. 2 and the iPhone 4 contract?

Exhibit 1 Standard Variable Costs for iPhone 4 (U.S. Dollars)

Bill of materials (per unit)		
Purchased chips:		
Flash memory (Samsung)	$27.00	
Application processor (Samsung)	10.75	
Chip for phone calls (Infinion)	14.05	
Gryoscope (STMicroelectronics)	2.60	
8 other purchased chips	70.95	
		$125.35
Variable supplies and tools		62.54
		187.89
Labor:		
Assembly and packaging (per unit)		13.11
Shipping (per unit)		1.06

Source: Casewriters and David Barboza, "Supply Chain for iPhone Highlights Costs in China," *New York Times*, July 6, 2010, p. B1.

Exhibit 2 Budgeted Fixed Overhead per Month

Factory rent	$400,000
Machine depreciation	150,000
Utility fee and local taxes	52,000
Supervision	127,000
Monthly fixed costs	$729,000

Source: Casewriters

Exhibit 3 August 2010 Preliminary Report on the Results of Operations
(Thousands of U.S. Dollars)

	Monthly Budget (200,000 units)	Actual (180,000 units)	Variance (20,000 units)
Revenue (transfer from Shenzhen)	$41,240	$37,476	$3,764 U
Variable costs			
Materials			
Flash memory	5,400	5,249	151 F
Application process	2,150	1,935	215 F
Chips—phone	2,810	2,529	281 F
Gyroscope	520	468	52 F
8 other chips	14,190	12,643	1,547 F
Variable supplies and tools	12,507	11,305	1,202 F
Subtotal	37,577	34,129	3,448F
Labor			
Assembly and packaging	2,622	3,092	470 U
Shipping	212	191	21 F
Total variable costs	40,411	37,412	2,999 F
Fixed Costs:			
Factory rent	400	400	--
Machine depreciation	150	150	--
Utility fee and taxes	52	52	--
Supervision	127	134	7 U
Total fixed costs	729	736	7 U
Total costs	41,140	38,148	2,992 F
Net income	$ 100	$ (672)	$ 772 U

Source: Casewriters.