HARVARD | BUSINESS | SCHOOL

9-189-163
REV. APRIL 18, 1990

ANIRUDH DHEBAR

Merton Truck Company

At Merton's monthly planning meeting in July 1988, the company's president expressed dissatisfaction with Merton's financial performance during the six-month period January-June 1988. "I know we are operating at capacity in some of our production lines," he remarked to Merton's controller and sales and production managers. "But surely we can do something to improve our financial position. Maybe we should change our product mix. We don't seem to be making a profit on our Model 101 truck. Why don't we just stop making it altogether? Maybe we should purchase engines from an outside supplier, relieving the capacity problem in our engine assembly department. Why don't the three of you get together, consider the different options, and come up with a recommendation?"

Production Possibilities and Standard Costs

The Merton Truck Company manufactured two specialized models of trucks, Model 101 and Model 102, in a single plant in Wheeling, Michigan. Manufacturing operations were grouped into four departments: engine assembly, metal stamping, Model 101 assembly, and Model 102 assembly.

Capacity in each department was expressed in manufacturing machine-hours available (net of maintenance downtime). Machine-hours available, in conjunction with machine-hours required for each truck model in each department, determined Merton's "production possibilities." For example, the company's engine assembly capacity was sufficient to assemble engines for either 4,000 Model 101 trucks per month (4,000 machine-hours available ÷ 1 machine-hour required per truck) or 2,000 Model 102 trucks per month (4,000 machine-hours available ÷ 2 machine-hours per truck), if devoted fully to either model. Of course, Merton could also assemble engines for both models: for example, if 1,000 Model 101 trucks were produced, sufficient engine assembly capacity was available for 1,500 Model 102 trucks ([4,000 - 1,000 * 1.0] / 2.0). Data on the machine-hour requirements for each truck model in each department and the monthly machine-hour availability in the departments are given in **Table A**. The company could sell as many trucks as it could produce.

Merton's production schedule for the first six months of 1988 had resulted in a monthly output of 1,000 Model 101 trucks and 1,500 Model 102 trucks. At this level of production, Model 102 assembly and engine assembly were operating at capacity. However, metal stamping and Model 101 assembly were operating at only 83.3% and 40% of capacity, respectively. **Table B** gives standard costs at this level of production; **Table C** gives details on overhead costs

Professor Anirudh Dhebar prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. The case is based on Sherman Motor Company, HBS case #9-107-010.

Meeting of the Controller, Sales Manager, and Production Manager

"I have been studying the figures for standard costs for the two truck models," the sales manager began. "Why don't we just stop making Model 101 trucks? As I see it, we are losing $1,205 for each Model 101 truck we sell." (A Model 101 truck sold for $39,000, a Model 102 truck for $38,000.)

The controller objected. "The real problem is that we are trying to absorb the entire fixed overhead of Model 101 assembly over only 1,000 trucks. We would be better off increasing production of Model 101 trucks, cutting back if necessary on Model 102 production."

The production manager entered the discussion. "There is a way to increase Model 101 production without cutting back on Model 102 production," he said. "We can relieve the capacity problem in engine assembly by purchasing Model 101 or Model 102 engines from an outside supplier. If we pursue this alternative, I suggest we furnish the necessary materials and engine components, and reimburse the supplier for labor and overhead."

Table A Machine-hours: Requirements and Availability

Department	Machine-hours Required per Truck Model 101	Machine-hours Required per Truck Model 102	Total Machine-hours Available per Month
Engine assembly	1.0	2.0	4,000
Metal stamping	2.0	2.0	6,000
Model 101 assembly	2.0	-	5,000
Model 102 assembly	-	3.0	4,500

Table B Standard Product Costs

		Model 101		Model 102
Direct materials		$24,000		$20,000
Direct labor				
Engine assembly	1,200		2,400	
Metal stamping	800		600	
Final assembly	2,000		1,500	
		4,000		4,500
Overhead[a]				
Engine assembly	2,525		4,850	
Metal stamping	3,480		3,080	
Final assembly	6,200		3,500	
		12,205		11,430
Total		$40,205		$35,930

a. See *Table C.*

Table C Overhead Budget for 1988

Department	Total Overhead per Month[a] ($ millions)	Fixed Overhead per Month[b] ($ millions)	Variable Overhead/Unit Model 101	Variable Overhead/Unit Model 102
Engine assembly	9.80	1.70	$2,100	$4,000
Metal stamping	8.10	2.70	2,400	2,000
Model 101 assembly	6.20	2.70	3,500	-
Model 102 assembly	5.25	1.50	-	2,500
	29.35	8.60	$8,000	$8,500

a. Based on a monthly production rate of 1,000 Model 101 trucks and 1,500 Model 102 trucks.

b. Fixed overhead was distributed to the two truck models in proportion to degree of capacity utilization.

Problems

1. (a) Find the best product mix for Merton.

   (b) What would be the best product mix if engine assembly capacity were raised by one unit, from 4,000 to 4,001 machine-hours? What is the extra unit of capacity worth?

   (c) Assume that a second additional unit of engine assembly capacity is worth the same as the first. Verify that if the capacity were increased to 4,100 machine-hours, then the increase in contribution would be 100 times that in part (b).

   (d) How many units of engine assembly capacity can be added before there is a change in the value of an additional unit of capacity?

2. Merton's production manager suggests purchasing Model 101 or Model 102 engines from an outside supplier in order to relieve the capacity problem in the engine assembly department. If Merton decides to pursue this alternative, it will be effectively "renting" capacity: furnishing the necessary materials and engine components, and reimbursing the outside supplier for labor and overhead. Should the company adopt this alternative? If so, what is the maximum rent it should be willing to pay for a machine-hour of engine assembly capacity? What is the maximum number of machine-hours it should rent?

3. Merton is considering the introduction of a new truck, to be called Model 103. Each Model 103 truck would give a contribution of $2,000. The total engine assembly capacity would be sufficient to produce 5,000 Model 103s per month, and the total metal stamping capacity would be sufficient to produce 4,000 Model 103s. The new truck would be assembled in the Model 101 assembly department, each Model 103 truck requiring only half as much time as a Model 101 truck.

   (a) Should Merton produce Model 103 trucks?

   (b) How high would the contribution on each Model 103 truck have to be before it became worthwhile to produce the new model?

4. Engines can be assembled on overtime in the engine assembly department. Suppose production efficiencies do not change and 2,000 machine-hours of engine assembly overtime capacity are available. Direct labor costs are higher by 50% for overtime production. While variable overhead would remain the same, monthly fixed overhead in the engine assembly department would increase by $0.75 million. Should Merton assemble engines on overtime?

5. Merton's president, in arguing that maximizing short-run contribution was not necessarily good for the company in the long run, wanted to produce as many Model 101s as possible. After some discussion, it was agreed to maximize the monthly contribution as long as the number of Model 101 trucks produced was at least three times the number of Model 102s. What is the resulting "optimal" product mix?