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IVEY

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AGGREGATE PLANNING AT GREEN MILLS

Owen P. Hall, Jr. and Kenneth Ko wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

Bob Thomas, director of operations at Green Mills Inc., had recently been put in charge of developing an aggregate plan for the coming year. This assignment was the result of a recent Green Mills board meeting where Tim Stanley, chief executive officer, had presented his idea of expanding operations to Chile. Specifically, this backward vertical integration initiative could significantly reduce Green Mills's raw materials costs. For two reasons, the key to this initiative was timing. First, the next year's planning cycle was at hand, and second, Thomas did not wish for Green Mills's competitors to hear about his proposal until it was too late for them to act. The board meeting concluded with the CEO tasking Thomas with developing a feasibility analysis and reporting back his findings to the board at the next meeting.

BACKGROUND

Green Mills Inc. operated several lumber mills throughout the Northwestern United States that produced a variety of wood products. The management was considering the possibility of a backward vertical integration strategy through the purchase of forestlands. This initiative was due, in part, to the escalating costs for raw wood. Green Mills procured raw softwoods locally at $400 per thousand board feet. However, there existed an opportunity to purchase forestlands in Chile with an estimated production cost of $150 per thousand board feet. The cost for transporting lumber from Chile averaged $50 per thousand board feet. The maximum available shipping capacity was 1,500,000 board feet per month. The lead-time for harvesting and shipping raw wood from Chile to Green Mills was one month.

The operations manager was interested in developing a minimum total cost aggregate plan for producing raw lumber from Chile in the amounts needed by Green Mills. Specifically, the manager wanted to contrast the costs associated with a chase plan, a level plan and a mixed aggregate plan.[1] Monthly demand projections were developed using a time series forecasting system that combined the expected monthly

[1] *Chase strategy — matches demand during the planning horizon by varying the work force level via hiring and layoffs or varying the output rate. This strategy minimizes inventorying, backordering and subcontracting.*
Level strategy — maintains a constant work-force level and output rate during the time horizon. Employs inventorying, backordering, overtime and undertime during demand peaks and troughs.
Mixed or Combo strategy — utilizes a combination of chase and level tactics to arrive at a minimum total cost solution that meets demand.

orders of each of the company's five mills. The demand forecast (thousands of board feet) for the next 12 months is reported in Exhibit 1.

In Chile, one worker could harvest 50,000 board feet of raw lumber per month based on a 160-hours-per-month work schedule. The forest property under consideration currently had 20 employees and a maximum inventory capacity of 3,000,000 board feet per month. In the lumber industry, workers were hired on a monthly basis. This means that undertime was paid. Overtime was limited to 25 per cent of the regular-time hours worked. Exhibit 2 summarizes the production costs. Backordering was not permitted due to the competitive nature of the lumber products market. Hiring and training costs in Chile were $1,000 per new employee. Layoff costs were $500 per employee. Exhibit 2 summarizes the various cost factors.

Exhibit 1

MONTHLY DEMAND FORECAST (000 BOARD FEET)

Month	Demand (000)
Jan.	1,000
Feb.	1,100
Mar.	1,300
Apr.	1,500
May	1,800
Jun.	2,200
Jul.	2,500
Aug.	2,400
Sep.	2,000
Oct.	1,600
Nov.	1,200
Dec.	800

Exhibit 2

COST SUMMARY (PER 1000 BOARD FEET)

Cost Factor	Cost ($)
Regular Time	150
Overtime	200
Holding	25
Shipping	50
U.S. Spot Market	400