

Aggregate Planning

The Paris Paint Company is in the process of planning labor force requirements and production levels for the next four quarters. The marketing department has provided production with the following forecasts of demand for Paris Paint over the next year:

Quarter	1	2	3	4
Demand forecast (in thousands of gallons)	380	630	220	160

There are currently 280 employees with the company. Employees are hired for at least one full quarter. Hiring costs are \$1,200 per employee and firing costs are \$2,500 per employee. Inventory costs are \$1 per gallon per quarter. It is estimated that one worker produces 1,000 gallons of paint each quarter.

Paris currently has 80,000 gallons of paint in inventory and would like to end the year with an inventory of at least 20,000 gallons.

- Determine the minimum constant workforce plan for Paris Paint and the cost of the plan. Assume that stock-outs are not allowed.
- Determine the zero inventory plan and the cost of that plan.
- If Paris Paint were able to backorder excess demand at a cost of \$2 per gallon per quarter, determine a minimum constant workforce plan that holds less inventory than the plan you found in part (a), but incurs stock-outs in quarter 2. Determine the cost of that plan
- Formulate this problem as a linear program.

Due to safety regulations, the plant has capacity to employ a maximum of 370 workers. Regular-time employee costs are \$12.50 per hour. Employees work 7-hours a day, 5-days a week and 4-weeks a month. Overtime is paid on a time-and-a-half basis. Subcontracting is available at a cost of \$7 per gallon of paint produced. Overtime is limited to 3 hours per employee per day, and no more than 100,000 gallons can be subcontracted in any quarter.

- Determine a policy that meets the demand and the cost of that policy. (Assume stock-outs are not allowed.)
- Formulate this problem as a linear program.