Southern New Hampshire University

QSO 520 Midterm Case Study

Case Study: Coastal States Chemicals and Fertilizers

The Model

Six plants of Coastal States Louisiana Division were to share in the "pie." They were all located in the massive Baton Rouge–Geismar–Gramercy industrial complex along the Mississippi River between Baton Rouge and New Orleans. Products manufactured at those plants that required significant amounts of natural gas were phosphoric acid, urea, ammonium phosphate, ammonium nitrate, chlorine, caustic soda, vinyl chloride monomer, and hydrofluoric acid. Bill Stock called a meeting of members of his technical staff to discuss a contingency plan for allocation of natural gas among the products if a curtailment developed. The objective was to minimize the impact on profits. After detailed discussion, the meeting was adjourned. Two weeks later, the meeting reconvened. At this session, the data in Table 4.3 were presented (see page 159).

Coastal States' contract with Cajan Pipeline specified a maximum natural gas consumption of 36,000,000 cubic feet per day for all six member plants. With these data, the technical staff proceeded to develop a model that would specify changes in production rates in response to a natural gas curtailment. (Curtailments are based on contracted consumption and not current consumption.) You have been given the Solver output reports from this model. The output is based on a 20% and a 40% natural gas curtailment along with the sensitivity reports for each.

Bill Stock would like to know what the impact of a larger curtailment would be. If the shortages are greater than expected, what are the impacts to Coastal States?

Discussion Questions

1. Rework the model and specify the production rates for each product for the following scenarios:
    A. 25% natural gas curtailment
    B. 45% natural gas curtailment

2. What impact will the natural gas shortage have on company profits?

3. Develop the sensitivity report for the 25% natural gas curtailment model. Use this report to answer the following questions. Each question is independent of the others.
    A. Interpret the shadow prices for the natural gas availability constraint.
    B. Interpret the shadow prices for the two constraints that limit the maximum phosphoric acid and chlorine that Coastal can produce.
    C. Brenda Lamb, Bill Stock's marketing manager, believes that due to increased competition she may have to decrease the unit profit contributions for all products by 3.5% each. What is the impact of this decrease on the production values? On the total profit?

D. Jose Fernandez, Bill Stock's production manager, thinks that he can increase the maximum production rate for chlorine and vinyl chloride monomer to 80% of capacity. For all other products, he thinks he can increase the maximum production rate to 100% of capacity. What would be the impact of this change on the total profit?
E. Bill Stock thinks he can persuade Coastal's Mississippi Division to give him 1,000,000 cubic feet of its allotment of natural gas from Cajan Pipeline. However, due to the Mississippi Division's pricing contract with Cajan Pipeline, this additional amount of natural gas will cost Stock an additional $1.50 per 1,000 cubic feet (over current costs). Should Stock pursue this option? If so, what is the impact of this additional gas on his total profit? What is the impact if Bill Stock can persuade the Mississippi Division to give him 3,000,000 cubic feet of its allotment of natural gas from Cajan Pipeline?

4. Redo question 3 using the sensitivity report for the 45% natural gas curtailment model. In addition, interpret the reduced cost for caustic soda.