# Hillier cases essay

Reconsider the case study presented In the supplement to Chap. 8 (on the CD-ROOM) Involving the Texaco Corp.. Site selection problem. Texaco management has tentatively chosen SST. Louis as the site of the new refinery. However, management now is addressing the question of whether the capacity of the new refinery should be made somewhat larger than originally planned.

While analyzing the site selection problem, the task force had been told to assume that the new refinery would have the capacity to process 120 million barrels of crude oil per year. As indicated in Table 3, this then would increase the total capacity of all the corporation’s refineries from 240 million barrels to 360 million barrels. According to marketing forecasts, Texaco would be able to sell all its finished product once this new capacity becomes available, but no more.

Therefore, the choice of 120 million barrels as the capacity of the new refinery would enable all the corporation’s refineries to operate at full capacity while also fully meeting the forecasted demand for Texas products. However, to prepare for possible future Increases In demand beyond the current recasts, management now wants to also consider the option of enlarging the plans for the new refinery so that it would have the capacity to process 150 million barrels of crude oil annually.

Although this would force the corporation’s refineries collectively to operate below full capacity by 30 million barrels for awhile, the extra capacity then would be available later if Texaco continues to increase its market share. This might well be worthwhile since the capital and operating costs incurred

by enlarging the plans for the new refinery would be far less (perhaps 40 percent sees) than constructing and operating another refinery later to process only 30 million barrels of crude oil per year.

Furthermore, management feels that this extra capacity might be needed within a few years. The extra capital needed to increase the capacity of the new refinery by 30 million barrels Is estimated to be $1. 2 billion. The could change depending on future interest rates. If some of this extra capacity is used at the new refinery, the total operating cost for the refinery would be somewhat larger than the amount shown in Table 6, but decreasing the production rate by the name amount at another refinery would decrease its total operating cost by a comparable amount.

Since the operating cost per million barrels of crude oil processed is roughly the same at all the refineries, including the new one, the total operating cost for processing 360 million barrels should not be substantially affected by the allocation of this work to the refineries. However, management feels that having some flexibility for where to allocate this work might enable substantially reducing the cost of shipping crude oil and fleshed product. Since Table 7 Indicates hat the total annual shipping cost for crude OLL and finished product would be $2. 92 billion with SST.

Louis as the site for the refinery, management hopes that substantial reductions can be achieved in this way. Figures 4 and 8 show the optimal shipping plans Tort crude 011 Ana Tallness product, respectively, when ten new ornery Is In Louis and has a capacity of processing 120 million barrels of crude oil per year. Management now is asking the task force to analyze the

situation under the option of increasing this capacity to 150 million barrels. In particular, management wants the following questions addressed. Under the new option, how should the shipping plan for crude oil in Fig. Change, and how much reduction in the total shipping cost would be achieved? How should the shipping plan for finished product in Fig. 8 change, and how much reduction in the total shipping cost would be achieved? Finally, assuming that the differences in operating costs shown in Table 6 would continue to apply under the new option, would the financial comparison of the three sites given in Table 7 be altered substantially if this option were to be adopted? As the head of the task force, you have decided to lead the way by executing the allowing steps with the new option.

Thus, each of the following parts assumes that the capacity of the new refinery will be 150 million barrels instead of the 120 million barrels assumed in the original Texaco case study. (a) Formulate and solve a model to find an optimal plan for shipping 360 million barrels of crude oil per year from the oil fields to the refineries, including the new one in SST. Louis, where the amount of crude oil each refinery will receive (up to its 15 16 ADDITIONAL CASES capacity) is based on minimizing the total annual cost for these shipments. Hint: If o are using a spreadsheet model, you can save some time in this and subsequent parts by using the live spreadsheets for the Texaco case study in this chapter’s Excel files as a starting point and then making the adjustments needed to reflect the increased capacity of the new refinery. ) Compare the resulting total annual cost for these shipments with the results obtained in Fig. 4 under the original assumption of a smaller refinery in SST. Louis. (b) Assume that the plan found in part (a) will be used.

Since this plan specifies how much crude oil each refinery will receive, it also dictates how much final product each refinery will supply. On this basis, formulate and solve a model to find an optimal plan for shipping finished product from the refineries to the distribution centers. Compare the resulting total annual cost for these shipments with the results obtained in Fig. 8. Also calculate the total annual cost of shipping both crude oil and finished product under this plan and compare it with the corresponding total of $2. 92 billion obtained from Table 7. C) You realize that the cost of shipping final product tends to be somewhat larger than the cost of shipping crude oil. Therefore, rather than having the decisions on the amount of rude oil each refinery will receive and process be dictated by minimizing the total annual cost of shipping crude oil [as in parts (a) and (b)], you decide to check on what would happen if these decisions are based on minimizing the total annual cost of shipping final product instead. Formulate and solve a model to find an optimal plan for shipping final product from the refineries (including the new one in SST.

Louis) to the distribution centers, where the allocation of the 360 million barrels of crude oil per year to the refineries is based on minimizing the total annual cost for these hinters. Compare the resulting total annual cost for these shipments with the results totaled In part (D) Ana In Hag. B (0) Assume Tanat ten plan Tuna In part (c) will be used. Since this plan specifies how much final product each refinery will ship, it also dictates how much crude oil each refinery will receive. On this basis, formulate and solve a model to find an optimal CASE 8. PROJECT PICKINGS I plan for shipping crude oil from the oil fields to the refineries. Compare the resulting total annual cost for these

shipments with the results obtained in part (a) and in Fig. 4. Also calculate he total annual cost of shipping both crude oil and finished product under this plan, and compare it with the corresponding total obtained in part (b) and in Table 7. (e) You realize that, so far, you have been only supplementing overall problem by optimizing only one part of the problem at a time, so now it is time to get down to serious business.

Formulate a single linear programming model that simultaneously considers the shipping of 360 million barrels of crude oil per year from the oil fields to the refineries (including the new one in SST. Louis) and the shipping of final product from the refineries to the distribution centers. Use the objective of minimizing the grand total of all these shipping costs. (This kind of linear programming problem is referred to as a transshipment problem. Since the refineries collectively have a capacity of processing 390 million barrels of crude oil per year, the decisions on the amount of crude oil each refinery will receive and process (up to its capacity) also is to be based on this same objective. Solve the model and compare the resulting total of all the shipping costs with the corresponding total calculated in parts (b) and (d) and from Table 7. (f) Repeat part (e) if the new refinery (with a capacity of recessing 150 million barrels of crude oil per year) were to be placed in Los Angels instead of SST. Louis.

Then repeat it again if Galveston were to be selected as the site instead. Using the operating costs given in Table 6 for the three sites, construct a table like Table 7 to show the new financial comparison between the sites. (Although the operating costs will be larger than given in Table 6 if the new refinery processes more than 120 million barrels of crude oil per year,

management has instructed the task force to assume that the differences in operating costs shown in Table 6 would antique to apply, so the differences in the total variable costs in the table being constructed would still be valid. (g) You now are ready to submit all your results to management. Write an accompanying memorandum that summarizes your results and recommendations in the language of management. I Taker, a pharmaceutical manufacturing company, entered the pharmaceutical market 12 years ago with the introduction of six new drugs. Five of the six drugs were simply permutations of existing drugs and therefore did not sell very heavily. The sixth drug, however, addressed hypertension and was a huge success.

Since Taker had a patent on the hypertension drug, it experienced no competition, and profits from the hypertension drug alone kept Taker in business. During the past 12 years, Taker continued a moderate amount of research and development, but it never stumbled I upon a drug as successful as the hypertension drug. One reason is that the company never had the motivation to invest heavily in innovative research and development.

The company was riding the profit wave generated by its hypertension drug and did not feel the need to commit significant resources to finding new drug breakthroughs. Now Taker is beginning to fear the pressure of competition. The patent for the hypertension drug expires in 5 years, and Taker knows that once the patent expires, generic Aragua maturating companies wall swarm Into ten market like I c PROJECT PICKINGS 17 vultures. Historical trends show that generic drugs decreased sales of branded drugs by 75 percent.

Taker is therefore looking to invest significant amounts of money in research and development this year to begin the search for a new breakthrough drug that will offer the company the same success as the hypertension drug. Taker believes that if the company begins extensive research and development now, the arability of finding a successful drug shortly after the expiration of the hypertension patent will be high. As head of research and development at Taker, you are responsible for choosing potential projects and assigning project directors to lead each of the projects.

After researching the needs of the market, analyzing the shortcomings of current drugs, and interviewing numerous scientists concerning the promising areas of medical research, you have decided that your department will pursue five separate projects, which are listed below: Project Up I Develop an antidepressant that does not cause serious mood swings. I Project Stable I Develop a drug that addresses manic- I depression. Project Choicely Develop a less intrusive birth control method for women. I Project Hope I Develop a vaccine to prevent HIVE infection. I Project Release I Develop a more effective drug to lower blood I pressure.

For each of the five projects, you are only able to specify the medical ailment the research should address, since you do not know what compounds will exist and be effective without research. You also have five senior scientists to lead the five projects. You know that scientists are very temperamental people and will work well only if they are challenged and motivated by the project. To ensure that the senior scientists are assigned to projects they find motivating, you have established a bidding system for the projects. You have given each of the five scientists 1000 bid points.

They assign bids to each project, giving a higher number of bid points to projects they most prefer to lead. The following table provides the bids from the five individual senior scientists for the five individual projects: Project Dry. Kavas Dry. Gunner Dry. -Rasa Dry. Mackey Dry. Rollins 267 Project Up 153 Project Stable 200 Project Choice 33 Project Hope 451 Project Release 30 You decide to evaluate a variety of scenarios you think are Project Up 20 keel. (a) Given the bids, you need to assign one senior scientist to each of the five projects to maximize the preferences of the scientists.

What are the assignments? (b) Dry. Rollins is being courted by Harvard Medical School to accept a teaching position. You are fighting desperately to keep her at Taker, but the prestige of Harvard may lure her away. If this were to happen, the company would give up the project with the least enthusiasm. Which project would not be done? (c) You do not want to sacrifice any project, since researching only four projects decreases the probability of finding a breakthrough new drug. You decide that either Dry. Gunner or Dry. Mackey could lead two projects.

Under these new conditions with Just four senior scientists, which scientists will lead which projects to maximize preferences? (d) After Dry. Gunner was informed that she and Dry. Mackey are being considered for two projects, she decided to change her bids. The following table shows Dry. Gunner’s new bids for each of the projects: Project Stable | 450 | Project Choicely 451 | Project Hope | 39 | Project Release | 40 | Under these new conditions with Just four scientists, which scientists will lead which projects to maximize preferences? E) Do you support the assignment found in part (d) ? Why or why not? (f) Now you again consider all five scientists. You decide, however,

that several scientists cannot lead certain projects. In particular, Dry. Mackey does not have experience with research on the immune system, so he cannot lead Project Hope. His family also has a history of manic-depression, and you feel that he would be too personally involved in Project Stable to serve as an effective project leader. Dry. Mackey therefore cannot lead Project Stable. Dry.