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CASE STUDY

BioPharma, Inc.[1]

In 2013, Phillip (Phil) Landgraf faced several glaring problems in the financial performance of his company, BioPharma, Inc. The firm had experienced a steep decline in profits and high costs at its plants in Germany and Japan. Landgraf, the company's president for worldwide operations, knew that demand for the company's products was stable across the globe. As a result, the surplus capacity in his global production network looked like a luxury he could no longer afford.

Any improvement in financial performance was dependent on having the most efficient network in place, because revenues were unlikely to grow. Cutting costs was thus a top priority for the coming year. To help design a more cost-effective network, Landgraf assigned a task force to recommend a course of action.

Background

BioPharma, Inc. is a global manufacturer of bulk chemicals used in the pharmaceutical industry. The company holds patents on two chemicals that are called Highcal and Relax internally. These bulk chemicals are used by the company's pharmaceutical division and are also sold to other drug manufacturers. There are distinctions in the precise chemical specifications to be met in different parts of the world. All plants, however, are currently set up to be able to produce both chemicals for any part of the world.

For 2013, sales of each product by region and the production and capacity at each plant are shown in Table 6-18. The plant capacity, measured in millions of kilograms of production, can be assigned to either chemical, as long as the plant is capable of producing both. BioPharma has forecast that its sales for the two chemicals are likely to be stable for all parts of the world, except for Asia without Japan, where sales are expected to grow by 10 percent annually for each of the next five years before stabilizing.

The Japanese plant is a technology leader within the BioPharma network in terms of its ability to handle regulatory and environmental issues. Some developments in the Japanese plant had been transferred to other plants in the network. The German plant is a leader in terms of its production ability. The plant has routinely

[1]This case was inspired by *Applichem (A)*, Harvard Business School Case 9-685-051, 1985.

TABLE 6-18 Sales by Region and Production/Capacity by Plant of Highcal and Relax (in Millions of Kilograms)

			Highcal		Relax	
Region	Plant	Capacity	2013 Sales	2013 Production	2013 Sales	2013 Production
Latin America	Brazil	18.0	7.0	11.0	7.0	7.0
Europe	Germany	45.0	15.0	15.0	12.0	0.0
Asia w/o Japan	India	18.0	5.0	10.0	3.0	8.0
Japan	Japan	10.0	7.0	2.0	8.0	0.0
Mexico	Mexico	30.0	3.0	12.0	3.0	18.0
U.S.	U.S.	22.0	18.0	5.0	17.0	17.0

had the highest yields within the global network. The Brazilian, Indian, and Mexican plants have somewhat outdated technology and are in need of an update.

Current Plant Costs at BioPharma

After considerable debate, the task force identified the cost structure at each plant in 2013 as shown in Table 6-19. Each plant incurs an annual fixed cost that is independent of the level of production in the plant. The fixed cost includes depreciation, utilities, and the salaries and fringe benefits of employees involved in general management, scheduling, expediting, accounting, maintenance, and so forth. Each plant that is capable of producing either Highcal or Relax also incurs a product-related fixed cost that is independent of the quantity of each chemical produced. The product-related fixed cost includes depreciation of equipment specific and other fixed costs that are specific to a chemical. If a plant maintains the capability to produce a particular chemical, it incurs the corresponding product-related fixed cost even if the chemical is not produced at the plant.

The variable production cost of each chemical consists of two components: raw materials and production costs. The variable production cost is incurred in proportion to the quantity of chemical produced and includes direct labor and scrap. The plants themselves can handle varying levels of production. In fact, they can also be idled for the year, in which case they incur only the fixed cost and none of the variable cost.

BioPharma transports the chemicals in specialized containers by sea and in specialized trucks on land. The transportation costs between plants and markets are as shown in Table 6-20. Historical exchange rates are shown in Table 6-21 and the regional import duties in Table 6-22. Given regional trade alliances, import duties in reality vary based on the origin of the chemical. For simplicity's sake, however, the task force has assumed that the duties are driven only by the destination. Local production within each region is assumed to result in no

TABLE 6-19 Fixed and Variable Production Costs at Each BioPharma Plant in 2013 (U.S.$)

				Highcal		Relax	
Plant	Plant Fixed Cost (million $)	Highcal Fixed Cost (million $)	Relax Fixed Cost (million $)	Raw Material ($/kg)	Production cost ($/kg)	Raw Material ($/kg)	Production cost ($/kg)
Brazil	20.0	5.0	5.0	3.6	5.1	4.6	6.6
Germany	45.0	13.0	13.0	3.9	6.0	5.0	7.0
India	14.0	3.0	3.0	3.6	4.5	4.5	6.0
Japan	13.0	4.0	4.0	3.9	6.0	5.1	7.0
Mexico	30.0	6.0	6.0	3.6	5.0	4.6	6.5
U.S.	23.0	5.0	5.0	3.6	5.0	4.5	6.5

TABLE 6-20 Transportation Costs from Plants to Markets (U.S.$/kg)

From/To	Latin America	Europe	Asia w/o Japan	Japan	Mexico	U.S.
Brazil	0.20	0.45	0.50	0.50	0.40	0.45
Germany	0.45	0.20	0.35	0.40	0.30	0.30
India	0.50	0.35	0.20	0.30	0.50	0.45
Japan	0.50	0.40	0.30	0.10	0.45	0.45
Mexico	0.40	0.30	0.50	0.45	0.20	0.25
U.S.	0.45	0.30	0.45	0.45	0.25	0.20

import duty. Thus, production from Brazil, Germany, and India can be sent to Latin America, Europe, and the rest of Asia excluding Japan, respectively, without incurring any import duties. Duties apply only to the raw material, production, and transportation cost component and not to the fixed cost component. Thus, a product entering Latin America with a raw material, production, and transportation cost of $10 incurs import duties of $3.

Network Options Under Consideration

The task force is considering a variety of options for its analysis. One option is to keep the global network with its current structure and capabilities. Other options include shutting down some plants or limiting the capability of some plants to producing only one chemical. Closing down a plant eliminates all variable costs and saves 80 percent of the annual fixed costs (the remaining 20 percent accounts for costs that are incurred related to the plant shutdown). Similarly, if a plant is limited to producing only one chemical, the plant saves 80 percent of the fixed cost associated with the chemical that is no longer produced. The two options being seriously considered are shutting the Japanese plant and limiting the German plant to a single chemical.

Study Questions

1. How should BioPharma have used its production network in 2013? Should any of the plants have been idled? What is the annual cost of your proposal, including import duties?
2. How should Landgraf structure his global production network? Assume that the past is a reasonable indicator of the future in terms of exchange rates.
3. Is there any plant for which it may be worth adding a million kilograms of additional capacity at a fixed cost of $3 million per year?

TABLE 6-21 History of Exchange Rates in Currency/U.S.$1 (at the Beginning of Each Year)

	Brazilian Real	Euro	Indian Rupee	Japanese Yen	Mexican Peso	U.S. Dollar
2013	2.15	0.75	58.44	97.58	12.75	1.00
2012	1.95	0.78	53.46	79.79	13.15	1.00
2011	1.67	0.72	46.85	79.70	12.42	1.00
2010	1.75	0.75	45.72	87.78	12.63	1.00
2009	1.99	0.72	48.42	93.58	13.48	1.00
2008	1.83	0.68	43.62	103.42	11.13	1.00
2007	1.94	0.73	41.34	117.77	10.92	1.00
2006	2.17	0.80	45.18	116.29	10.89	1.00

TABLE 6-22 Import Tariffs (Percentage of Value of Product Imported, Including Transportation)

Latin America	Europe	Asia w/o Japan	Japan	Mexico	U.S.
30%	3%	27%	6%	35%	4%

4. How are your recommendations affected by the reduction of duties?
5. The analysis has assumed that each plant has a 100 percent yield (percentage output of acceptable quality). How would you modify your analysis to account for yield differences across plants?
6. What other factors should be accounted for when making your recommendations?

CASE STUDY

Global Supply Design for the Future: Nokia

In 2011, telephone users numbered more than 4.6 billion worldwide. Until 2010, Nokia was the market leader with 29 percent of total market share, and it is still the leader in emerging economies such as China and India. Apple recently took first place in terms of revenue. In 2010, 1.6 billion cell phones were sold, a net increase of 37 percent from 2009, and 250 million handsets were delivered in the first quarter of 2011. Nokia, a Finish company, originated in the mid-19th century as a paper manufacturer. The conglomerate expanded into the electronics sector in the 1960s and finally into the mobile manufacturing business in the 1980s. The company currently employs more than 132,000 people in 120 countries, conducts business in more than 150 countries, and has annual revenues of $42 billion and operational profits of $2 billion. Over the past 30 years, the industrial outsourcing trend has stretched manufacturing facilities from in-house production of almost all components to global sourcing, keeping in house only the design and the assembling of final products.

With customers all over the world and suppliers from the United States to China, Nokia faces challenges in the operation of its supply chain and sometimes has some difficult choices to make.

Global Supply Chain Challenges

In 2000, in the facility of a New Mexico subcontractor of integrated circuits, a fire started but was rapidly managed. Integrated components plants require highly sterilized environments, and the fire plus the intervention compromised several months of integrated circuits supply to Nokia. Researchers at the Massachusetts Institute of Technology calculated that when publicly listed companies announce disruption in their supply chains, share prices drop on average 8 percent and take a long time to recover. In addition to the financial element, the rest of the supply chain has to support the strain from replacing a supplier in a minimum amount of time. Furthermore, with wide product ranges and multiplicity of parts, the challenges are growing every year. The lean concept, when pushed to the extreme, could also be a cause of supply chain rupture when an issue arises. Academics and consultants agree that these issues can be overcome, if not avoided, thanks to early and constant communication.

Nokia has to decide to either stay with this integrated circuit supplier or source an alternative plant in China. The expected cost of sourcing a new supplier and implementing the necessary quality assurance procedures is estimated at $2 million. Once in place, this partnership has a 50 percent chance of yielding $100,000 in savings for each of the three following years and a 50 percent chance that it will yield $150,000 for each of the three following years. For this scenario, the discount rate is 3 percent.

The other alternative is to stay with its supplier in New Mexico. The cost of the damage to Nokia's supply chain is estimated at $1.5 million. Supply chain risk assessors have estimated that there is a 60 percent chance the New Mexico's supplier will not yield any additional savings for the three following years and a 40 percent chance that it will result in a yearly $50,000 loss (additional cost) for each of the three following years. For this scenario, the discount rate is 9 percent.

Global Supply Chains Environment

Hundreds if not thousands of suppliers are involved with Nokia globally. The supply chain environment is by nature complex and uncertain. Supply chain designers have started to implement robust communication systems coupled with geo-localization devices and RFID technologies. These technologies enable Nokia to track and monitor shipments' progress around the world, thereby accurately managing its inventory levels. IT is the answer to efficiently managing complex global supply chains;