Case 53

Problems in Pasta Land

by

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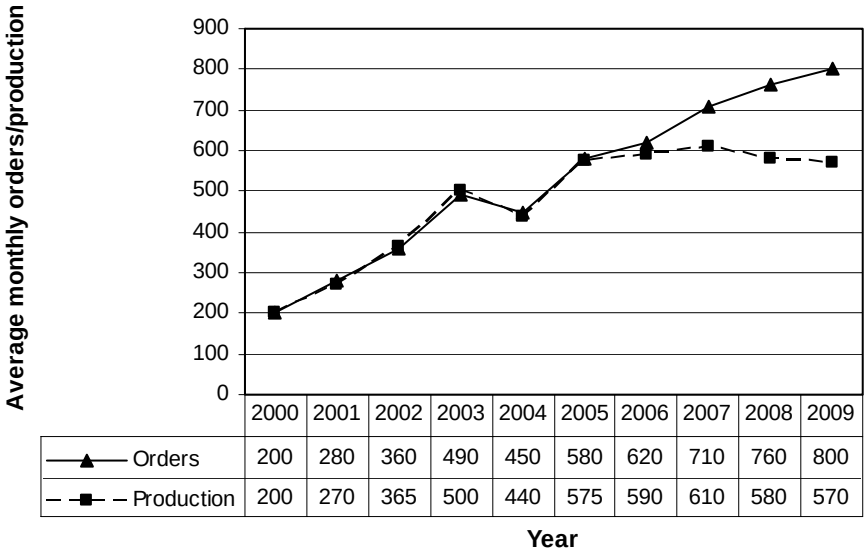
The Food Factory has been operating in an underdeveloped country for approximately 10 years.[1] Its parent corporation specializes in wheat milling, and it started the pasta factory as a "side-line" operation to process lower quality wheat flour, which is a by-product of the normal milling process. This low-gluten flour is generally not suitable for the production of bread or for direct sale to consumers.

In 2009, the pasta division is confronted with a major problem. It is too successful!

The factory was designed around the mill. Production capacities matched the amount of effluent from the mill rather than coming from a sound marketing strategy. As shown in Table 53-1, by 2006, the pasta plant was no longer able to effectively serve existing customers. The plant that was designed to produce 600 tons of pasta per month on two production lines is now facing average monthly orders of approximately 800 tons. Furthermore, the corporate director of marketing estimates that orders could easily be increased to 1400 to 1800 tons per month.

[1] All monies used in this case are in the local currency, which is one of the more than 40 countries in the world that use the $ symbol and most of which are called dollars.

Table 53-1 Average Monthly Orders/Production



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Orders	200	280	360	490	450	580	620	710	760	800
Production	200	270	365	500	440	575	590	610	580	570

Another challenge facing the factory is that the initial equipment was refurbished, not new, and it is now antiquated and seriously dilapidated. Unless the plant is shut down, equipment replacement is going to be required. The existing equipment was already a technological generation behind when it was bought. During the last 10 years a new generation of equipment has been developed based on high-temperature drying. The new technology is much more suited for use with low-quality (low-gluten) flour and semolina. New machinery is significantly more efficient. It requires fewer workers, has lower relative energy consumption, and produces less waste. The pasta plant still maintains a price lead through the low cost at which it is able to obtain raw materials from the corporate wheat mill, but this barely compensates for the plant's low efficiency.

The new technology is also enabling competitors to use low-quality, low-cost raw materials and still produce a reasonably high-quality end product. Ultimately, this means that the cost of higher quality pasta has dropped significantly in price, *and* the quality of the low-cost pasta is increasing significantly. The pasta factory's market is customers with a

preference for low cost. Serious threats that the marketing director is possibly not including in the potential sales forecast include (1) the encroachment of traditionally high-quality producers into the low-cost markets, and (2) the increase in the quality expectations of customers that traditionally have been classified as "cost-conscious consumers." In general, the plant's cost advantage is no longer enough to secure a strong market niche. Only the most steadfast price-oriented consumers can be counted on as a stable market group.

Expanding the factory would mean that the mill would no longer be able to supply sufficient raw materials. Production above 600 tons per month would require the purchase of flour or semolina from the open market, at market prices. It is suggested that some of this increased cost could be dissipated through internal accounting practices, namely by charging the pasta division less for the use of the mill's low-quality flour. The mill's manager is strongly opposed to this, even though it has been done in the past. He argues that a further decrease in the costing of low-gluten semolina would seriously distort the mill's operating figures. He argues that the effluent flour should be sold to pig farmers, since they are willing to pay more than the pasta plant is now being charged.

While everyone (the board of directors and managers) concurs that something has to be done, little analysis has been done. The board of directors has traditionally made major investments based on a heuristic of keeping the initial capital costs low. The logic behind this is that it tends to reduce risk, since the time needed to achieve a net positive cash flow is shorter (short payback period). The general manager is not convinced that this is the best approach now. He feels that the threat introduced by new technologies, the deviation from the initial intent, the stance taken by the milling manager on costing, the cost and quality demands being placed by customers, as well as operational efficiency and effectiveness considerations, make it imperative that new technology and a new decision approach are used.

The general manager needs to develop a solid business case for each alternative. He needs to present these in a manner that would be accepted and understood by the board of directors for his recommendations to be considered. He is sure that this will require better financial metrics. The inclusion and consideration of so many "soft" and barely quantifiable variables is confounding him.

General Alternatives

At a very high level, there are not too many alternatives. Continuing the operation "as is" is not possible. While shutting down is possible, it is very undesirable. The use of the factory as

a value-added function within the firm is still very positively viewed, and even though the mill manager is definitely not in favor of reducing the cost of the low-gluten semolina, at the organizational level there are considerable cost benefits. Furthermore, the factory provides jobs in a community where alternate employment is not possible. The corporation as a whole is the largest local employer, hiring approximately 40% of the eligible workers. This is the basis of the company's good reputation, and, possibly more importantly, the reason that no local taxes are being levied on the firm. The buildings to house the mill and the pasta factory are also being provided for free. The firm as a whole is better off given the benefits the pasta plant provides the mill—even if the pasta division runs at a mild loss.

Therefore, something must be done to replace the existing equipment. The main questions seem to lie in the technology and the organizational objectives. Associated with the technology alternatives are issues related to employee skills that would be required for the new production systems, customer expectations, and whether the expected performance promised by new technology could be achieved. Associated with the organizational goals are customer demands. The organizational intent for the pasta plant did not place the customer in a central position. Customers expect that, at the least, orders that are accepted will be adequately serviced. The factory's original intent to use the mill's effluent doesn't match customer demands that exceed the approximately 600 tons per month of low-grade semolina provided by the mill. Furthermore, customer expectations of pasta quality are changing drastically. Operating the pasta factory as a "side-line" operation is deterring the organization from making customer-centric decisions.

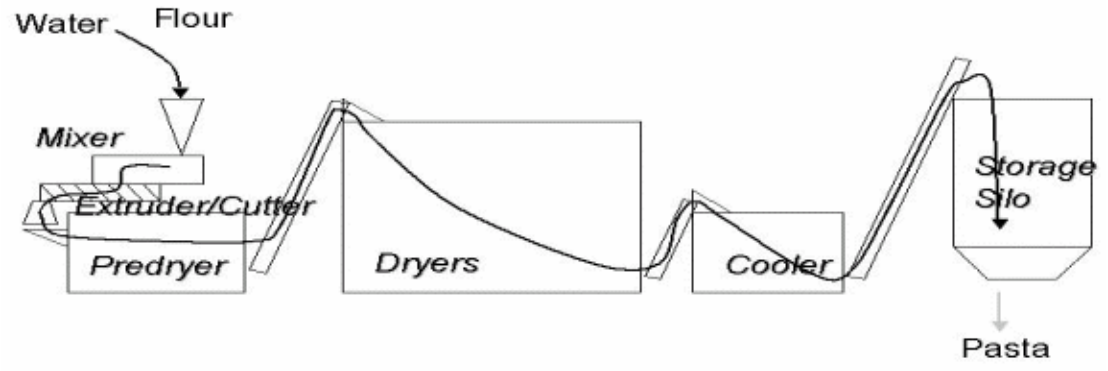
Technology and Equipment

Pasta is made with a process that has remained virtually unchanged for hundreds of years. What has changed over the centuries is the manufacturing technology. Pasta is made by mixing durum wheat semolina with water to achieve a moisture content of about 32%. Durum semolina is in essence coarse flour made from hard-grained wheat. It has a high gluten (protein) content, approximately 11% moisture, a distinctive "nutty taste," and an appealing yellow color. This mixture is kneaded and formed. Finally, the pasta is allowed to dry in drying rooms or in the outdoors.

In modern facilities, continuous feeding/dosing apparatus and paddle troughs accomplish mixing. Kneading and shaping is carried out using screw extruders and extrusion molds to give the pasta its characteristic shapes. Short pastas, such as elbow macaroni, penne, and fusilli, are cut short at the extruder. Long pastas, such as spaghetti and linguine, are draped

over rods and cut to length once dry. The extruded pasta is dried in a series of dryers that bring the moisture content down to approximately 11.5% to 12%. The pasta is then cooled and stored before being packaged.

Figure 53-1 Short Pasta Production Line



Possibly the greatest advances in the last decades have been made in the manner that pasta is dried. In older operations, the drying cycle can take 24 hours or more. This extended drying period is required to ensure that drying takes place evenly across the profile of the pasta. If drying takes place unevenly, stresses are caused in the pasta, causing it to crack and discolor. New technologies that rely on very well controlled drying environments use high temperatures that are moderated by adequate humidity levels. Drying time has been reduced to as little as 3 hours for specific pasta shapes. In addition, these high-temperature techniques can produce pasta with good coloration, texture, and cooking characteristics using flour with low gluten content (~10% or less), grayish color, and lacking the "nutty" taste of the durum wheat.

The use of flours with lower gluten content has a strong financial implication, since it is significantly less expensive than durum semolina. In most countries it is now common practice to include at least a portion of flour with the durum semolina. Many companies maintain at least a token amount of durum semolina content to be able to claim its use. In Italy this practice has been curtailed due to the "purity" laws that exist for pasta.

The general manager has found that there is a considerable difference in the prices of refurbished and new equipment. Refurbished equipment costs only 25% of the new

machinery cost when transportation, installation, and start-up are included. As shown in Table 53-2, the price does not vary as much with the machinery's capacity.

Table 53-2 Equipment Costs

	New	Refurbished
1000 tons/month	$3,560,000	$730,000
2000 tons/month	4,800,000	1,100,000

As shown in Table 53-3, new equipment, although it requires less frequent maintenance, uses parts and labor that are significantly more expensive. Refurbished equipment is more expensive to maintain as wear increases. However, power consumption is lower for the new equipment.

Table 53-3 Operating Costs

Equipment	Maintenance costs		Power consumption/ton
New	7%	of equipment cost	$69
Refurbished	6% & 1%	of equipment cost increase per year	72

Labor and Skills

A factor of great concern to the general manager is the changes that new technology would bring to the organization. According to the equipment's manufacturers, the new technologies (which include advanced process control equipment, automated product testing, and integrated machinery testing) would require fewer employees than the refurbished equipment. The high-capacity equipment requires only a few more employees than the low-capacity machines, and the manufacturer argues that this is a good reason to implement a high-capacity facility.

As shown in Table 53-4, all options employ fewer than the 80 to 90 people that currently work in production. The existing equipment has very limited packaging machinery, and the

current process is very labor intensive, particularly for the first step where individual 500g boxes of pasta are put into case packs. Adjusting the labor force size to that required for the high-capacity refurbished technology could probably be accomplished by regular attrition. The other options would very likely require some layoffs. This concerns the general manager, who realizes that a strong component of the firm's good reputation is due to the number of local people that it employs.

Table 53-4 Labor Requirements by Equipment Type

		Capacity	
Equipment	Skill Level	1000 tons/mo	2000 tons/mo
New	Supervisory	1	2
	Skilled	34	41
	Unskilled	2	8
Refurbished	Supervisory	1	2
	Skilled	2	5
	Unskilled	48	67

The new equipment also requires more *skilled* employees, who cost more (see Table 53-5). Even more important is that the local labor force does not have enough skilled employees. Hiring outsiders would exacerbate the loss of jobs for the local population. Extra training costs if locals are used are summarized in Table 53-6.

Table 53-5 Labor Costs per Month

Supervisory	$6700
Skilled	5300
Unskilled	3800

Note: Costs include benefits and training.

Table 53-6 Extra Training for New Technology

Year	1	2	3	4-10
Extra training as % of labor costs	22%	15%	8%	5%

The greatest problem in overhauling the factory, and in particular for the new equipment option, lies in the attitude and perceptions that exist within the factory—all the way from the employees to the board of directors. The following represent some of the basic attitudes that the general manager has encountered over time:

1. "If it isn't broke, why fix it?" Even initiatives aimed at improving conditions for employees have met with stiff resistance. For example, an attempt at starting a day-care facility failed. Management was not convinced that it would provide a tangible benefit. When several employees complained about the incursion on their privacy, the initiative was laid to rest.

2. "This is the way we have always done it." The installation of conveyor belts to move end product to the warehouse turned into an expensive fiasco. The employees refused to use it, and possibly even sabotaged equipment to support the claim that it was worthless. The employees seemed to fear that the workforce would be reduced.

3. "There is nothing that technology can do that a person cannot do better." When an attempt was made to introduce computers in the warehouse to log movement of incoming and outgoing materials, there was nearly an open revolt. Finally, the computers were removed from the warehouse, and the old paper system was reinstated. The loading dock supervisor would record everything on a clipboard and later enter it into the tracking spreadsheet.

4. "You cannot make cheap products on expensive equipment." It seemed that there was nearly a phobic fear of purchasing anything new. The usual excuse was that

it cost too much. In several cases where the general manager had been able to demonstrate (using sound financial and economic techniques) the benefits of adopting new equipment, other alternatives had been chosen.

5. "Training is for dummies." The Human Resource manager would complain that the only way he could get employees to attend even the most mandatory of training, such as training on hygiene techniques in the food industry, was through coercion. He would, in effect, threaten to have people fired.

6. "If the customer does not like the service, does not like what they get, does not like the quality, etc., let them find it cheaper somewhere else!"

Not surprisingly, concepts such as quality control, improvement, customer focus, hygiene, empowerment, participation, or, for that matter, customer and product are not really well understood.

Based on experience and research, the general manager also has found that introducing new equipment (particularly when new technologies are involved) requires a learning curve to realize the machinery's full capabilities (see Table 53-7).

Table 53-7 Learning Curves for Production (% of capacity)

Year	1	2	3	4	5+
Refurbished	90%	95%	98%	100%	100%
New	45%	65%	90%	95%	100%

Customers

Existing orders (some unfilled) amount to approximately 800 tons per month. The director of marketing predicts the sales levels shown in Table 53-8 for the new equipment if not limited by the equipment's capacity or the learning curve.

Table 53-8 Forecast Sales for New Equipment

	Year		
	1	2	3+
High sales target	1200	1600	1800
Low sales target	1200	1400	1400

The general manager feels that, under the present conditions, both the target range and market growth rates are feasible. He foresees some serious threats emanating from the new technologies being used. Based on past sales records, he finds that the company has six retail customers with which it has dealt on a regular basis. Of those six, one of the retailers has placed more than half of all orders (54%), with the second largest one placing another 30%, and the other four placing nearly equal portions of the remaining 16% of total orders. Independently, the general manager has talked to the customers and has found that both of the two most significant customers have plans for expanding sales, which bodes well for expanding the company's production.

These two customers are, however, quite specific in their expectations for service and indicate that they have been receiving offers from other suppliers who seemed to be in a better position to provide them with the required product. Furthermore, they indicate that consumers are beginning to show a preference for higher quality pasta. The largest customer in particular states that pasta quality would have to be increased; otherwise, they would have to seriously consider switching suppliers.

This makes it clear to the general manager that he has serious quality issues. Using the refurbished technology, he could only match competitors' quality if he uses a blend of high-quality semolina (which he would have to purchase from the open market) with the current low-quality flour. The blend would have to be approximately a 50:50 mix. This blend would obviously greatly dilute the beneficial effect of using very low-cost raw materials on the overall product costing. As shown in Table 53-9, semolina and flour are the greatest of the direct costs.

Table 53-9 Direct Costs per Ton of Product

Semolina from mill[a]	$770
Market low-grade semolina	940
Market high-grade semolina[b]	980
Other materials	128
Transportation	145

[a]A maximum of 600 tons is available.
[b]The refurbished technology requires a 50% inclusion of high-grade semolina.

The general manager is concerned with using a blend of flour and semolina since operators with the new technologies could do the same and have other advantages in market maneuvers. Since the retail customers were showing a strong preference for the product from the new technologies, he feels that he (and his competitors) could charge a small premium for the increase in product quality (see Table 53-10).

Table 53-10 Price of end product

Present price & price using refurbished technology	$1,450
Price of product using new technology	1,470

After discussing cost and quality issues in depth with the customers he feels that although the target values of 1400 to 1800 tons/month are reasonable, there is in effect a very high likelihood that he might lose at least one of the major customers if he uses the refurbished technology. If this occurs, the most likely scenario would be that he would have to revert to competing on a cost basis. The limitation on this is of course the amount of flour that he can obtain at a discounted price from the mill. Consequently, he feels that with the refurbished technology the likelihood of having a long-term sales outcome of approximately 600 tons/month is nearly as likely as the higher targets. Furthermore, there seems to be the danger

of losing all the anticipated increase should the trend in pasta consumption shift further toward quality and away from price, although he feels that this is not quite as likely.

On the other hand, with the new technology it is much more likely that he can compete with other producers on a "level playing field" and achieve sales between 1200 and 1800 tons per month.

Financing

The finance director states that loans are available at 8% over 10 years to cover the full cost of equipment purchases. The director has used this leverage to its full extent. In general, projects hava been financed by paying 10% of the investment using retained earnings (although the director expresses reservations about exceeding $100,000 in this case).

The company pays taxes at approximately 35% of net earnings. Net losses for the project would reduce the firm's overall income and its tax burden. This type of equipment is depreciated to a salvage value of zero at 8 years with straight-line depreciation.

Finally, the director of finance informs the general manager that it is common for the firm to expect a minimum return of 20% on a project of this duration and scope, and that a 10-year planning horizon could be used. With this horizon it is reasonable to assume that the equipment's salvage value approximately equals the cost of removal.

The Problem

The general manager's overall impression is that the greater cost of new equipment will make the alternatives that included it more sensitive to fluctuations in the eventual sales. On the other hand, the refurbished technologies risk failing to meet rising quality expectations. This could easily curtail any sales growth and even put this plant out of business altogether.

He also sees that no matter what the outcome, he is going to have serious labor issues to deal with, and a lot of discussion with the board of directors to determine the future focus of the pasta plant. What are your recommendations?