Scharffen Berger Chocolate Maker
Case Study Analysis

EMBA 220
Operations Management
Professor Sanjay Jain

2/28/2010
Robert Paul Ellentuck
EMBA 2011
This paper is an analysis of the production processes outlined in the case of Scharffen Berger Chocolate Maker. The case was written by Daniel C. Snow, Steven C. Wheelwright and Alison Berkley Wagonfeld. It was published on 25 September 2007 for Harvard Business School. The goal of this paper is to answer four questions posed by Professor Jain. Those questions are italicized in the main body of this paper to simplify the reading and analysis of this assignment.

The first question posed by the subject of the case, Mr. Jim Harris, Chief Operating Officer for Scharffen Berger Chocolate Maker, relates to the challenge of trying to increase the current production capacity at Scharffen Berger Chocolate Maker to meet the increasing demand forecasts. Mr. Harris worried about this challenge and was quoted in the case as saying, “How long have we got before our retailers come to think of us as uncooperative, unresponsive to their marketing needs, maybe more trouble than we’re worth?” The four questions posed by Professor Jain, seek to address Mr. Harris’ production capacity concerns at Scharffen Berger Chocolate Maker.

The analysis of this paper begins with the first question: Comment on the alignment of product quality (and brand image) with process quality for Scharffen Berger Chocolate Maker.

Since its founding in 1996 by Robert Steinberg and John Scharffenberger, the vision of Scharffen Berger Chocolate Maker has been to produce “America’s finest dark chocolate, from beans to bar.” Mr. Steinberg and Mr. Scharffenberger demonstrated (in every aspect of their chocolate making), that quality took precedence over all other factors. This was clear in the careful melding of product quality with process quality.

From the beginning, Mr. Steinberg and Mr. Scharffenberger committed to their vision by producing chocolate using only the highest quality cacao beans. Mr. Steinberg and Mr. Scharffenberger personally selected the beans for their chocolate from the finest ones available in the world from Ghana, Trinidad, Jamaica, Dominican Republic, Madagascar and other countries. While most chocolate was made of 2 or 3 beans, all of Scharffen Berger Chocolate Maker’s products were made of 9 beans.

Mr. Steinberg and Mr. Scharffenberger expanded their business in May 2001 by moving their factory to a building that offered the cool environment needed to make chocolate. The new building also provided space for them to create a visually appealing area for tour groups to see, smell and understand their chocolate-making process. The new building, while manufacturing chocolate and educating consumers about the quality of Scharffen Berger Chocolate Maker’s product, also became a significant retail outlet accounting for 10% of their sales. This location enabled the firm to demonstrate product quality, process quality, and the finished product.

Mr. Steinberg and Mr. Scharffenberger’s vision of controlling quality from “beans to bar” was unlike most other manufacturers in the fine chocolate making industry. Product quality was the most important factor Scharffen Berger Chocolate Maker strived for, while constantly experimenting with reducing time for each process step to improve capacity. Mr. Steinberg and Mr. Scharffenberger quickly abandoned any changes that did not preserve the Scharffen Berger Chocolate Maker quality.

The details of Scharffen Berger Chocolate Maker’s production processes were set in a series format. Scharffen Berger Chocolate Maker cleaned their own cacao beans using the Bean Cleaner to ensure the delivery of high quality chocolate. Scharffen Berger Chocolate Maker removed unwanted objects from the beans using the Bean Cleaner to further demonstrate their strict commitment to quality. Their alignment efforts also included traveling to remote locations to ensure farmers were fermenting, drying, and shipping the beans to their facility in Berkeley, California properly.

The next stage of production was the Roaster. This was the process in which Scharffen Berger Chocolate Maker used artisan methods adapted from a trip Mr. Steinberg made to France to learn the practice of manufacturing fine chocolate by utilizing tasting as the best method of measurement at each stage in the process. Scharffen Berger Chocolate Maker roasted each kind of bean separately to optimize the flavor, as roasting times and temperatures varied according to the kind of bean. Tasting was done to take into account the huge variation among beans in producing Scharffen Berger Chocolate Maker’s quality chocolate.
After the roasting process, the beans moved to the Wo. This piece of equipment cracked the beans and separated the nibs from the shells. The nibs were stored in labeled bins and then transferred to the Melangeur for grinding. The Melangeur’s grinding process turned the nibs into a chocolate paste. Operators determined when the grinding process was completed based on the look, feel, and taste of the nibs. Scharffen Berger Chocolate Maker’s Melangeur was a replica of the late 19th century European machines. Use of this machine, distinguished them as the only chocolatier in the United States using a replica of this historical machine to perform the grinding process and was clear evidence of the artisanal approach to quality that Scharffen Berger Chocolate Maker utilized throughout the manufacturing process.

The next step in the Scharffen Berger Chocolate Maker production process was the Conche. This piece of equipment refined, mixed, and aerated the cocoa paste. Other premium ingredients (vanilla beans, granulated sugar, and lecithin) were also added to the Conche during this stage of production. These additional ingredients were not manufactured by Scharffen Berger Chocolate Maker. Aeration was an important attribute in the production process to eliminate the small bubbles of air in the chocolate. It was in this area that Scharffen Berger Chocolate Maker had experimented with powdered instead of granular sugar to decrease process cycle-time. Scharffen Berger Chocolate Maker immediately abandoned the use of powdered sugar after discovering the taste was unacceptable to their quality standards. Finally, the Conche operator used a measuring tool during this process to measure the level of desired smoothness of the chocolate.

The Tempering and Molding processes next turned the liquid chocolate into a solid. This process gave the chocolate a desired level of stability, glossy surface, smooth feel in the mouth and the snap of chocolate (another highly effective quality discriminator for Scharffen Berger Chocolate Maker among the other fine chocolatiers). This was a complex process that had to be done in a specific sequence to ensure the raising and lowering of the temperature of the chocolate was handled appropriately to ensure consistency.

The final production stage before shipping the chocolate was the packaging. It was important for Scharffen Berger Chocolate Maker to do some of their own packaging (35%) to keep a close eye on the product quality. Scharffen Berger Chocolate Maker also made a capacity decision to outsource the remaining (65%) to co-packers who were carefully chosen to ensure their processes were at consistently high-quality levels.

It’s evident that the quality of Scharffen Berger Chocolate Maker’s chocolates was the principle motivator in keeping their products and brand aligned with their process throughout the source, make and deliver stages. At every stage of their production process, quality was measured by examining the product’s look and texture or by blind tasting. As noted on page eight in the case, “Both Mr. Steinberg and Mr. Scharffenberger believed that skilled operators were better at judging quality than any form of mechanical measurement. Although these subtleties were imperceptible to many consumers, they were considered important elements of creating premium chocolate.” Quality of the product at every stage was the most important part of assuring an end-end process control even in areas that could be imperceptible to most customers. The bottom line for Scharffen Berger Chocolate Maker is quality control.

The length that Scharffen Berger Chocolate Maker goes to for quality assurance in their chocolate even appeared in their testing of new equipment. Scharffen Berger Chocolate Maker tested the ball mill four times before considering integration of it into their production process. When Scharffen Berger Chocolate Maker noticed a taste difference in the first test batch from the ball mill, it was because the ingredients of a prior company’s chocolate had not been cleaned out. This caused Scharffen Berger Chocolate Maker’s beans to be mixed with an inferior product. Any expansion of capacity to their production processes clearly required an unwavering commitment to quality control to ensure the Scharffen Berger Chocolate Maker brand sustained its established fine chocolate identity.

After being asked to comment on Scharffen Berger Chocolate Maker’s product & brand quality alignment with their process, the second question posed by Professor Jain was: What are your
conclusions regarding the proposed ball mill? As Jim Harris, would you proceed with the implementation of that change? How would you do so?

After the fourth test of the ball mill, and its successful passing of quality control tests, the need to implement it appeared necessary due to the demand needs facing Scharffen Berger Chocolate Maker. However, the Ball Mill alone was not sufficient to meet all of the increasing demand at Scharffen Berger Chocolate Maker. Implementation of the Ball Mill was simply a step in the right direction for being able to sustain Scharffen Berger Chocolate Maker’s competitive advantage by maintaining alignment of their product and process. As noted previously with Mr. Harris’ concern about being able to meet demand, he was fully aware of the magnitude of the challenge in trying to expand capacity by as much as 150%.

The choice to supplement the Conche with the ball mill was estimated to reduce cycle-time between the processes of grinding, mixing and aerating by as much as 60 hours and was likely to increase quality as well. The Conche machine was time consuming requiring between 48 to 72 hours of time refining, mixing and aerating the beans. Additionally, the 99% chocolate had to be interspersed into the Conche production process to increase the efficiency of the process.

The ball mill would be most valuable for products with higher sugar content and would provide quality benefits by decreasing the amount of flavor degradation that can occur when a premium product is over processed and excessively manipulated. To successfully integrate the remaining Conche operation with the ball mill operation, would require a consideration for splitting tasks and using parallel workstations with skilled workers to reduce task time (Jacobs & Chase, 2nd Ed., pp 82).

After integrating the combined Conche and ball mill operation and gaining new capacity through reduced process cycle-time, a complete rebalancing of the production line would be necessary to determine where the next area for improvement and/or investments could be made to increase efficiencies in the Scharffen Berger Chocolate Maker production process.

The third question posed was: Assuming that all of the production is of semi-sweet (62%) chocolate, what changes beyond addition of the ball mill would you need to consider for increasing your capacity by 150%?

To begin, please reference Exhibit 1 “Figure 1 – the Current-State Capacity Expansion for the 62% Cocoa Recipe.” This chart focuses on the recipe for 62% cocoa and displays how the initial expansion of the current Conche output of cocoa beans was adjusted to include its ratio of cocoa to other ingredients. This was done to identify the Conche’s limitations to meet the 150% increase in nib production that Mr. Harris is considering. Once adjusted to account for the other ingredients used in the Conche production (with an output of 816 KG/Day of nibs), the Conche is the largest bottleneck in production for Scharffen Berger Chocolate Maker.

After the Conche, the Roaster and the Melanguer emerged as the next two constrained resources that would need to operate for more hours each day to approach the output goal. However, at this point, it was necessary to normalize the outputs at the bottlenecks to that of the lowest yield process of the Winnower. This is where the relative cocoa weight decreased per batch with just nibs and not the entire bean. Realizing this, and then trying to also integrate the new Ball Mill, it was necessary to broaden the analysis to the future state. Please reference “Figure 2 – the Future-State Capacity Expansion for the 62% Cocoa Recipe”, which indicates the 150% increase in production that is desired, and what will be needed to obtain that goal. The 150% increase in expansion is considered based on the current Conche nib production of 2,040 KG/Day.

To ensure the comparison between each process was consistent, it was useful to adjust all the processes to nib-equivalent production. This was the lowest yield process that was limiting the rest of the production output. The baseline for the 150% capacity expansion in the current-state is 816 KG/Day of Conche nib production, which Harris wanted to increase to 150%. To increase to this level, the average daily production output would need to be 2,040 KG/Day of nib production from the Conche. As shown in Figure 1, the current-state is far below this capacity goal. The Conche is only capable of 816 kg/day of nib equivalent output. The analysis in Figure 2 was to determine whether the capacity (with the addition
of the Ball Mill), could increase across the entire production process by increasing nib production in the Conche to the desired 2,040 KG/Day.

Initially, no adjustment was made to the Cleaner. Its current capacity has the highest margin of all other processes that could require expansion. The Cleaner currently produces 6,144 KG/Day. This output is more than adequate for meeting production needs. With only one shift per day, the output is more than the 150% increase in output being contemplated with the addition of the Ball Mill.

The Roaster, Winnower, and Melangeur all need to increase their production output, in order for Schwarffen Berger Chocolate Maker to increase their capacity to 150%. The Roaster needs to increase production from 1,185 KG/Day of nibs to 2,072 KG/Day. The Winnower’s production output needs to increase from 1,971 KG/Day of nibs to 2,218 KG/Day. The Melanguer needs to increase production from 1,472 KG/Day of nibs to 2,208 KG/Day.

The Conche, currently the major time consuming bottleneck, would now have an output batch rate of 2,040 KG/Day of nibs. This is adequate for production needs at Scharffen Berger Chocolate Maker, considering the 150% increase that is being contemplated with the addition of the Ball Mill for the 62% Cocoa Recipe. The Ball Mill would also produce 2,040 KG/Day of nibs.

The last step in the production cycle that should be considered for increasing capacity to 150% is the Tempering/Molding. Production in this area needs to increase from 1,360 KG/Day of nibs output to 2,040 KG/Day of nibs. Though the physical differences of Tempering and Molding could be difficult to integrate; a long term option integration option could be developed. A shorter amortization for return on investment at these stages of production might be to improve the design of the molding machine. The Molding machine was a cumbersome process that could be made more efficient. Similarly, the Tempering machine was operating at less than capacity therefore; making it available for processing each hour to match the pace of the molding machine. Improving the molding operation to be able to process 200 kg per hour for three shifts seven days per week as needed, may also be a process improvement. As noted in the paper by Mr. Harris, another option to reduce Molding cycle-time would be to use more third party co-packers since they had excess capacity.

The packaging operation could outsource additional demand, investigate automated tools, or have more shifts added to the operation. Currently, 65% of this process is outsourced. To allow more outsourcing, Scharffen Berger Chocolate Maker could increase third-party co-packer training to maintain high quality levels of chocolate. Standardizing or automating quality monitoring would also free up the capacity of workers or machines.

Scharffen Berger Chocolate Maker also assessed the option of transferring liquid chocolate to the co-packers in special tanks. This would avoid the need for duplicate Tempering, enable better control of Molding, and would free-up capacity on their current Tempering operation. Scharffen Berger Chocolate Maker acknowledged the difficulty of this option and the marginal increase in risk it presented for controlling quality at the third party facility. One way to mitigate that risk, would be to place a Scharffen Berger Chocolate Maker representative or an independent agent on-site at the third party facilities to closely monitor the quality. This would provide greater assurance over the risk outsourcing posed by having to maintain quality objective measures and to preserve their brand image.

The fourth question was: *Given your answer to the third question, what expansion step(s) would you consider are the greatest concern? Why? How would you address such concerns?*

The option for adding shifts to some of the operations, especially on the older machines is a concern. It is inconsistent with lean manufacturing principles. This option would also add cost instead of reducing their process cycle-time by making them more efficient. Scharffen Berger Chocolate Maker does apply some continuous process improvement principles by reducing their end-of-life waste stream such as using rejected nibs for bird seed however; Scharffen Berger Chocolate Maker could realize better gains by focusing on their entire supply chain to determine ways to make it leaner.

Scharffen Berger Chocolate Maker could also investigate lean principles in their warehousing operations and/or eliminate non-value added steps in their production processes (Jacobs & Chase 2nd Ed.,
pp 275-276). Unless it is essential to their operation, Scharffen Berger Chocolate Maker could seek ways to reduce their inventory, such as their current one-to-two months of stock. Scharffen Berger Chocolate Maker could also couple inventory reduction with producing more just-in-time products on the delivery side for domestic retailers and domestic suppliers on the source side.

Weighing the cost-benefits of adding shifts is a challenge. Although it raises cost, the overtime for employees brought in $30,000 in sales per Conche run, giving them an average of 40% contribution on industry sales. While overtime yielded higher revenues, it far outpaced increased costs, something that had not been realized until Mr. Harris arrived. A potential concern is possibly combining the machines that perform similar processes. This could result in more downtime and create more complex operations and/or scheduling challenges. Any combining of machines (or other changes) could possibly detract from the artisanal style in which the chocolate in manufactured.

Scharffen Berger Chocolate Maker could also address this concern by creating flow patterns for each process to be used as a basis for reallocating equipment and identifying parts no longer needed (Jacobs & Chase, 2nd Ed., pp 76-77). The many artisanal machines Scharffen Berger Chocolate Maker uses makes combining equipment significantly more difficult. Scharffen Berger Chocolate Maker would be better suited to increase shifts to increase productivity until they can add additional equipment to meet demand.

Similarly, as seen in their factory tours, the artisanal attributes are critical to retaining the alignment between product process and vital to sustaining the Scharffen Berger Chocolate Maker quality brand image. Seeking to standardize testing or other quality measures presents concerns that would diminish the value of operator tasting and the artisanal image. One potential compromise would be to integrate auto-sampling with random taste sampling to retain the value proposition. Some of these methods regarding the use of statistical quality control and sampling techniques such as frequency, number taken and control limits should be used (Jacobs & Chase, 2nd Ed., pp 146-147 and 159).

Sourcing more capacity to the co-packers presents a risk to quality. However, it could be mitigated through careful management such as placing Scharffen Berger Chocolate Maker representatives or independent representatives on-site or establishing a program where Scharffen Berger Chocolate Maker representatives would make random visits similar to random sampling that could be employed at the factory. As noted in the case, Mr. Harris should prepare a longer-range set of projections of the entire process to ensure the co-packers understand the volumes that would be coming to them. To accomplish any of the expansion steps in the third question, Scharffen Berger Chocolate Maker should validate the accuracy of the marketing forecasts so Scharffen Berger Chocolate Maker can use this to better calculate equipment capacity and labor requirements over the horizon. Scharffen Berger Chocolate Maker should compute capacity utilization to determine the best operating level for each piece of equipment (Jacobs & Chase, 2nd Ed., pp 44, 45, 48-49).

Scharffen Berger Chocolate Maker was paying overtime to their employees to increase their capacity levels. Yet, this may not have been the most efficient means to increase long term capacity. This has to be balanced against the cost of adding new or additional machines, and finding the space to place additional machines.

Scharffen Berger Chocolate Maker could consider moving non-manufacturing employee’s offices out of their production facility. This space could be used for additional manufacturing equipment, to expand volume, and to increase shift sizes instead of using overtime. Scharffen Berger Chocolate Maker should determine the optimum way to scope their focus on where to increase capacity and avoid taking on every aspect of their manufacturing performance (cost, quality, speed and reliability).

By selecting a limited sets of tasks to change that contribute to the corporate objectives more effectively; Scharffen Berger Chocolate Maker will be able to better manage the ongoing production along with the capacity expansion efforts. This will enable Scharffen Berger Chocolate Maker’s ability to sustain moderate flexibility and increase or decrease production level capability as needed (Jacobs & Chase, 2nd Ed., pp 46-47). Scharffen Berger Chocolate Maker could consider implementing the analytical
tools of Six Sigma into their production processes. They could take advantage of flowcharts, run charts, Pareto charts and cause & effect charts to better control their capacity to meet demand (Jacobs & Chase, 2nd Ed., pp 143).

To summarize, it is prudent to note the importance Scharffen Berger Chocolate Maker places on sustaining their brand image by sourcing, making and delivering fine chocolate products consistent with their vision to produce “America’s finest dark chocolate, from beans to bar.” This unwavering resolve gave Scharffen Berger Chocolate Maker the ability to truly distinguish a competitive advantage in the fine chocolate industry. However, if Scharffen Berger Chocolate Maker doesn’t increase production to meet demand, Scharffen Berger Chocolate Maker will not be able to sustain their competitive advantage over the long term, especially as the demand for their fine chocolate continues to rise. Scharffen Berger Chocolate Maker needs to act carefully to meet the demand and their retailers’ needs and to build the business relationships that Scharffen Berger Chocolate Maker cultivated as purveyors of fine chocolates in upscale markets. The competitive advantage which Scharffen Berger Chocolate Maker achieved through deliberate growth rates and measured success is something Scharffen Berger Chocolate Maker must preserve through maintaining their commitment to manufacturing the finest chocolate, and then grow by carefully increasing production to meet the demand levels that clearly exist for their unique product. It is obvious from Mr. Harris's statements that they cannot wait too long to meet the demand.

Resources


**EXHIBIT 1**

### Figure 1. Current-State Capacity for the 62% Cocoa Recipe

<table>
<thead>
<tr>
<th>Process</th>
<th>Cleaner</th>
<th>Roaster</th>
<th>Winnower</th>
<th>Melanguer</th>
<th>Conche</th>
<th>Temper/Mold</th>
<th>Package/Ship*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Batch Size (kg)</td>
<td>200</td>
<td>250</td>
<td>450</td>
<td>115</td>
<td>1400</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Average Cycle-time (hours)</td>
<td>0.25</td>
<td>1.25</td>
<td>1</td>
<td>1.25</td>
<td>50</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>No. Machines</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Capacity (kg/hour)</td>
<td>96</td>
<td>100</td>
<td>74</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td>Yield (%)</td>
<td>768</td>
<td>200</td>
<td>333</td>
<td>92</td>
<td>56</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Machine Utilization (hours/day)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>16</td>
<td>N/A</td>
</tr>
<tr>
<td>Output Batch Size (kg)</td>
<td>6144</td>
<td>1600</td>
<td>2664</td>
<td>1472</td>
<td>1344</td>
<td>2240</td>
<td>N/A</td>
</tr>
<tr>
<td>Nib Equ. Output Batch Rate (nib-kg/day)</td>
<td>N/A</td>
<td>1184</td>
<td>1971</td>
<td>1472</td>
<td>816</td>
<td>1360</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes: *65% Outsourced

The Production Expansion Goal is 150% of the Current-State Conche Output Rate, which is 2040 nib-kg/day

### Figure 2. Future-State Capacity Expansion for the 62% Cocoa Recipe

<table>
<thead>
<tr>
<th>Process</th>
<th>Cleaner</th>
<th>Roaster</th>
<th>Winnower</th>
<th>Melanguer</th>
<th>Conche</th>
<th>Ball Mill (Estimate)</th>
<th>Temper/Mold</th>
<th>Package/Ship*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Batch Size (kg)</td>
<td>200</td>
<td>250</td>
<td>450</td>
<td>115</td>
<td>1400</td>
<td>2100</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Average Cycle-time (hours)</td>
<td>0.25</td>
<td>1.25</td>
<td>1</td>
<td>1.25</td>
<td>10</td>
<td>15</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>No. Machines</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Capacity (kg/hour)</td>
<td>96</td>
<td>100</td>
<td>74</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td>Yield (%)</td>
<td>768</td>
<td>200</td>
<td>333</td>
<td>92</td>
<td>280</td>
<td>140</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Machine Utilization (hours/day)</td>
<td>8</td>
<td>14</td>
<td>9</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>N/A</td>
</tr>
<tr>
<td>Output Batch Size (kg)</td>
<td>6144</td>
<td>2800</td>
<td>2997</td>
<td>2208</td>
<td>3360</td>
<td>3360</td>
<td>3360</td>
<td>N/A</td>
</tr>
<tr>
<td>Nib Output Batch Rate (nib-kg/day)</td>
<td>N/A</td>
<td>2072</td>
<td>2218</td>
<td>2208</td>
<td>2040</td>
<td>2040</td>
<td>2040</td>
<td>N/A</td>
</tr>
</tbody>
</table>