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Southern Pulp and Paper

It was late on a Friday evening in April, 1996. Curtis Shelton, mill manager of the Toccoa mill, was driving out of the plant gates in a hurry. He was already late for his son's high school basketball game, but as he drove away from the mill his thoughts kept returning to the problems which had been keeping him so busy lately.

Corporate executives from Southern Pulp and Paper would be visiting next week to hear him give a presentation on the future of the Toccoa mill. They were expecting improvements in output, profitability, and quality. Two areas of particular concern were the proposed computer systems for the paper machines and recent conflicts over how the scheduling process was organized. Shelton had spent the last few months trying to analyze the issues, but as he headed towards the stadium he was still undecided on exactly what his position would be the following week.

Company Background

Southern Pulp and Paper was a regional manufacturer of pulp and paper products. Founded in 1949, Southern operated twelve mills in five states across the southeastern United States. Many of the mills in the Southern system had been acquired at various points in the company's history. Sales in 1995 were $1.1 billion and net income was $94 million.

The Toccoa Mill

> *"This mill has been here since I can remember. My dad gave forty two years of his life here, and he survived all of the changes. I like the work here and hope the mill can survive another fifty years."*
>
> - Ricky Morris, woodyard

Located in Toccoa, Georgia, a small college town, the Toccoa mill originally opened in 1941. It was acquired by Louisville Paper Company in 1959, and under the new managers the mill grew and diversified into new products. In 1967, Louisville invested considerable capital in Toccoa, scrapping four older pulp dryers and installing a new pulp dryer and bleached board paper machine. Despite the new investment, many parts of the mill were still very old. Plaques in the mill conference room proudly exhibited chunks of pulp produced when the original machines started running in 1941.

William H. Bolen, Jr., MBA '96, and Professor David Upton prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Southern Pulp and Paper purchased the Toccoa mill from Louisville Paper Company in 1984. For Southern, the acquisition represented a new direction in paper products. The Toccoa mill produced market pulp, which Southern had produced for many years. However, Toccoa also produced bleached board products, which was a new product line for Southern. In 1985, Southern purchased a mill in Crawford, Mississippi which also produced bleached board. Despite these acquisitions, Southern still focused primarily on market pulp production. The Toccoa and Crawford mills were the only mills in the Southern system not dedicated to market pulp, and this uniqueness, for better or worse, brought added attention from corporate headquarters for Curtis Shelton.

Shelton had been promoted to mill manager in June 1995. He had previously served in various mill management positions in Toccoa and at another company's mill in Savannah. The Toccoa mill comprised a relatively flat organization, with superintendents in charge of Operations and Maintenance reporting directly to Shelton. There were additional staff functions reporting to the mill controller and human resources manager. The various functions within operations (such as the Woodyard, Power & Recovery and Bleaching) were comparatively independent, there was little coordination across them except at higher levels. (see **Exhibit 1** for a mill organization chart).

The Art of Making Paper

"It is easy to draw a huge flow chart of how this whole mill works. There is a lot of science and engineering involved here. But at the end of the day we are artists, like a Monet or Picasso. I'd get laughed at for calling anyone here Monet, but it's true. There is a lot of experience and fine tuning that you have to have for this plant to run well."

- Al Matthews, maintenance superintendent

The process of making paper was almost two thousand years old. Wood was converted to fibers ("cooking"), processed to make the fibers hold together well, and dried to remove excess water. However, in a modern mill this was accomplished using huge machinery and monitored with complex computer systems. Output of the mill was measured in tons per day (Toccoa produced approximately 1,700 TPD).

A modern integrated pulp and paper mill was a continuous operation. Timber and wood chips were brought in constantly to the woodyard, where they were stored until ready for the pulping process. Once the wood had been reduced to pulp, it was mixed with various chemicals and bleached to the needed brightness level. Then the pulp moved through the pulp dryers or paper machines (depending on the final product). The pulp or paper was rolled or baled and shipped to customers in trucks, railcars, or ship containers.

While newspapers or copier paper came to mind when most people thought of "paper", Southern Pulp and Paper had never owned a newsprint or communications paper mill. Until the Toccoa acquisition, Southern had specialized in market pulp, which looked like bales of paper but was in fact pulp prepared for *re*pulping by other paper producers. Such producers were not part of a "fully integrated" mill (i.e. a mill with a pulping plant) and therefore had to buy pulp on the open market. Southern had done well in market pulp over the years but moved into bleached board products with the purchase of the Toccoa and Crawford mills. These products traditionally contributed higher and more stable profits over the business cycle than market pulp.

Bleached board products were sold in rolls to producers of paper cups, plates, cartons, and other products requiring a bright white finish. The paper going into these products was not produced using dramatically different processes from market pulp, but the quality specifications were tougher and product complexity was greatly increased because of the downstream operations.

Machines and Process Technology

"I still remember when they [Louisville Paper Co.] scrapped the #1, #2, #3, and #4 Machines back in 1967. They bought two brand new machines, #5 and #6 that were real giants. The new machines were so pretty I felt bad when they got dirty. Now, when you compare them to the fancy machines at some other mills these old suckers are looking ready for the museum! But between you and me, though, I think they run better anyway."

- Walter Fordham, #5 machine engineer

The two remaining paper machines, #5 and #6, were a real problem for Shelton. About six months previously, a team of highly-respected operations consultants had helped Shelton analyze his mill. Their goal had been to determine where the bottlenecks were and understand the potential capacity at each stage in the process. One of the problems with paper mill equipment was that much of it ran at a capacity far beyond the "rated capacity" of the unit when it was purchased. This was especially true in older mills like the Toccoa mill. Shelton had realized that his paper machines were often the bottleneck, but the consulting report still surprised him. The results indicated that the overall capacity of the mill was completely determined by the output of the machines. Every other part of the mill could run at least 200 TPD more than the machines could produce, even on a perfect day. It was this finding that had prompted Southern Pulp and Paper to recommend investigating capital improvements for the machines, and the big meeting scheduled for the following week would focus primarily on how Shelton planned to improve machine performance.

The machines were certainly not state-of-the-art, but over the years many capital investments had helped increase their capacity. The #5 machine produced market pulp, which was baled for shipment to other paper producers. The #6 machine produced bleached board, which was trimmed into various roll sizes to fit particular customer orders. Both machines used only minimal computer technology, although neither machine was considered particularly archaic in this respect. A machine superintendent was responsible for each machine and could authorize adjustments and maintenance as needed.

The key issue on the #5 machine was running without breaks. Breaks, which occurred when the paper actually broke apart in the winders, were the most obvious quality (and output) problem for a machine. Breaks could be caused by almost anything, although speed variations or moisture changes were two major culprits. If the paper broke, the rolls would have to be threaded again; the lost time hurt daily output significantly. As a result, anything which could help reduce breaks, given that the machines were the plant bottleneck, was guaranteed to generate interest.

The #6 machine was different from #5 in many ways. Instead of just one product running at one basis weight, the #6 machine produced many products running at many basis weights (see **Exhibit 2** for a summary of production on both machines). The basis weight indicated the weight of 500 sheets of the paper (25" x 38"). Some products such as 99# Print Liner and 100# Plate Stock were virtually identical in weight, so switching between these two products on the continuously running machine was simpler (no real change in the amount of fibers in the paper). However, big jumps in basis weight were much tougher and could involve extensive waste before the product met specifications. Grade change (switching between different products or different basis weights) was the key issue on the #6 machine. This was both a scheduling and production issue. Better scheduling could help cut down on grade changes, while better production practice could minimize the costs of making a change.

The Computerization Proposal

Shelton had been considering options for improving the machines. The primary proposal involved installing a computerized machine control system which could offer greater consistency and easier grade changes. If this had been proposed five years previously, it would have been approved

without much discussion. Historically, capital investment had been the primary solution to operating problems in the paper industry. However, in the previous few years, Southern Pulp and Paper had joined the rest of the industry in cracking down on questionable investments. The computer investment still looked good, but was more controversial now because of the new focus on Economic Value Added (EVA) as the key measurement of the mill's success. If these investments destroyed value, Shelton and everyone else would feel it in their bonus check. However, many worried that EVA might also discourage people from investing in long-term capital projects.

The engineering firm which was offering the computer integration package was certainly convincing. Flexibility was the key - the computerization could offer quick grade changes, fewer quality problems, and the ability to run all grades for short or long periods of time without having to figure out all of the sequencing in advance. The machine operator could simply enter the sequence of grades needed for the day and watch the machine run. Lowering and raising of speed to avoid breaks would be carried out automatically. Shelton believed that the computerization would provide flexibility and consistency for his process, but $15 million was a hefty price to pay, particularly for something as nebulous as "flexibility". The engineers had also presented forecasts showing how the new system would increase the throughput of the #5 machine by 25 TPD and the #6 machine by 40 TPD. It would be important for the executives from Southern Pulp and Paper to see this investment as a positive Net Present Value (NPV) project, but even more important was guaranteeing flexibility for the future.

Plant Personnel

"I'm not sure about adding all of these computers. What if the thing breaks? I just don't think computers can run this machine better than I can."

- Raymond Todd, #6 machine

The workforce in the Toccoa mill was very experienced. Turnover was low, and company benefits were excellent compared to many of the other jobs in the area. Despite being a unionized workforce, the relationship between management and labor was very good. Safety had improved remarkably since Southern bought the mill, and the workers appreciated the investment in a safer environment.

Most of the operators in the Paper-machine area of the mill had over 10 years of experience. Many of them had gradually moved up the union ladder and were very loyal to their particular machine. Their machine-based team spirit was evident even across shifts, and many of the operators would try to avoid leaving a mess for the next shift to clean up (unfortunately, in other areas of the mill, this teamwork across shifts was not common). When interviewed, many of the union leaders pointed to the Paper-machine area as one of the strongest in the plant. Many of the people who worked with the machines felt that there were some good ideas for improvements floating around, but that no one really took the initiative to coordinate the implementation of anything.

The idea of computer integrated manufacturing received mixed reviews. First, while everyone realized that the machines were the bottleneck, not everyone believed more computer-automation would solve the problem. Many of the workers felt that the schedulers were partly to blame, because their last-second changes in the run schedule always made it harder to make smooth grade changes. Second, some workers felt that the Toccoa mill ran the worst grades, and that the Crawford mill should help out by running some of the grades which might run better on their machine. Finally, there was always a fear of being replaced by the computer. No one believed that there would be immediate layoffs, but there was certainly an undercurrent of apprehension about what this might mean for the future.

Quality Standards

Market pulp was essentially a standard product, and there were few special customer specifications on the #5 machine. However, bleached board customers had various special requests for their rolls, including width, thickness, strength, and smoothness. This created even more complexity beyond the variation due to different chemical compositions and basis weights. Rolls which did not conform to the customer specifications would ultimately be returned, and if the customer was in a crisis situation the production schedule might have to be interrupted to deliver the product. Unfortunately, the customer might also order the products from another supplier.

Toccoa was known as a good quality mill and there were only certain grades which caused problems. However, there was a rumble of skepticism about some of the more troublesome customer specifications. Some of the engineers who were familiar with the customers' processes felt that the specifications were either unnecessary or not really related to the performance characteristics the customers actually needed. Customers often felt that using tight specifications would guarantee higher quality, although the specifications also raised the costs of making the paper and ultimately were reflected either in their cost or on Toccoa's bottom line. The issue of whether these costs were being recovered in the pricing was something Shelton was thinking about bringing up at the meeting with corporate the following week. However, when he had done so in the past, he had been lectured at length about the importance of "customer-focus," and was keen to avoid a recurrence.

The Scheduling Process

> *"I don't think they trust us to schedule the machine. They want all of the power in Birmingham. Of course we have to train every new scheduler up there so they don't screw up our machine too bad. There are some things we just know better because we see the machine running every day."*
>
> - Harvey Wilson, Toccoa scheduler

The process for scheduling the sequence of products on the machines (primarily #6, since #5 ran market pulp full-time) was a rather complicated one (see **Exhibit 3** for a simplified list of the process steps). When the mill was purchased by Southern, almost all planning was moved to the corporate headquarters in Birmingham, Alabama. Because all sales and marketing personnel were based in Birmingham, Southern felt it made sense to have the production planners there as well. They felt this would ensure that customer and business priorities were considered when scheduling production. Unfortunately, this did not always mean that the schedule was even close to facilitating low cost, smooth production runs.

Harvey Wilson had seen his share of corporate production planners over the years, thought the current planner, Dean Munyon, was a shade better than most. In his job as mill scheduler, Wilson checked the schedule sent down from Birmingham by Munyon. Many times he would have to call Munyon and inform him of potential problems with the requested sequence. Over time, planner and mill scheduler had come to understand each other, and better "compromise" schedules resulted. However, it always seemed that the production planner would be promoted to a new job at about this time, and a new person would start the whole learning process over again. Wilson wondered how much longer Munyon would be around.

Some of the mill management team felt that Shelton should lobby for a change in the scheduling process. They felt that the mill should have control over the schedule, since Birmingham did not care about optimizing production runs to minimize grade changes (see **Exhibit 4** for a summary of grade change information). Shelton was not sure whether production planning should be moved to Toccoa. He realized that a "perfect" schedule for the mill would not necessarily match

up with when customers wanted shipment. The mill had little room for inventory and he was happy not to have the room, since it helped combat the mentality of keeping inventory to solve delivery problems. However, he did feel that there had to be a better way to balance the needs of the mill and Birmingham.

The Visit From Headquarters

When the headquarters crew flew in for their visit the following week, Shelton had to be ready: they would be expecting some answers. Should he recommend the computerization project to improve flexibility and cost performance? What should be done about output issues? Could making changes in the scheduling process help improve the quality and output of the machines? If he could not get approval for major capital expenditures, what else could be done to improve throughput and profitability? Shelton knew that Southern Pulp and Paper expected him to do well in his new position. But the steps he needed to take didn't seem at all clear.

Exhibit 1 Toccoa Mill Organization Chart

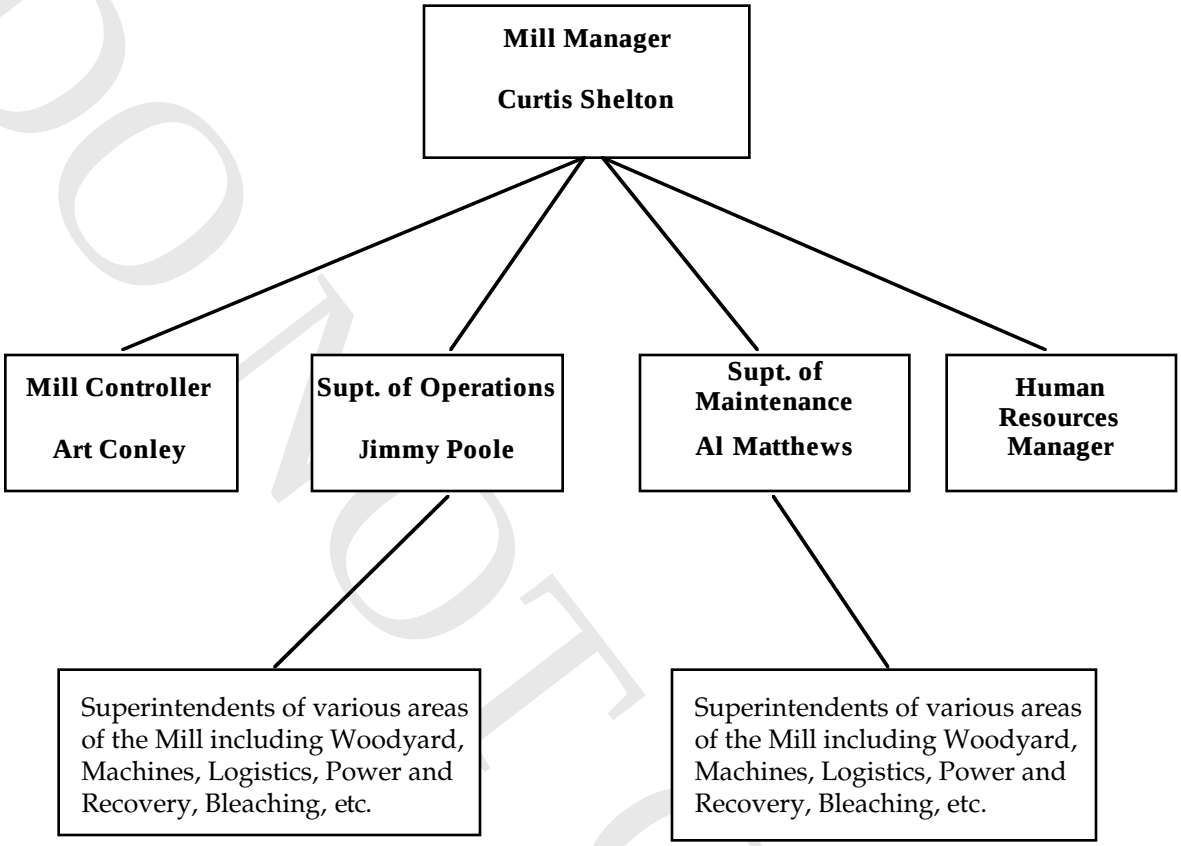

Exhibit 2 Toccoa Mill 1995 Products for #5 and #6 Machine

#5 Machine Grades	Annual Volume (tons)
Market Pulp	332,193
Market Pulp (Customer Spec A)	9,548
Market Pulp (Customer Spec B)	4,174
TOTAL	345,915

#6 Machine Grades	Annual Volume (tons)
Poly Cup 145#	13,150
Poly Cup 155#	12,020
Poly Cup 165#	35,055
Poly Cup 175#	4,032
Poly Cup 201#	3,476
Wax Cup 120#	25,420
Wax Cup 133#	35,045
Core Stock 98#	1,236
Core Stock 99#	7,504
Plate 100#	40,097
Plate 110#	2,372
Plate 120#	1,152
Liner 99#	45,070
Liner 126#	30,285
Liner 207#	5,004
TOTAL	260,918

Note: Average contribution per ton in 1995 for the #5 machine was $250/ton and for the #6 machine was $350/ton. These numbers were close to the average contribution over the business cycle. The grades for the #6 machine are classified by product and basis weight, with special customer specifications grouped together with their regular grade for volume purposes. The liner grades are traditionally known in the industry as 33#, 42#, and 69# instead of their actual basis weights.

Exhibit 3 Scheduling Process Steps for Toccoa Mill Machines

1. Customers place orders with Customer Service

2. About eight days before the beginning of the next month, Customer Service sends report of all orders to be filled for next month by Toccoa to the production planner.

3. Production planner enters order amounts, roll sizes, and delivery dates into a computer model which gives him the theoretically optimal sequence and trim settings for the month. This is used as the overall guideline for the sequence of runs during the month (i.e., plan to run 3 days of linerboard, 4 days of cup stock, 2 days of plate, etc.)

4. Production planner sends down to the mill scheduler the planned overall monthly sequence and the specific schedule for the first week of the month (specific schedules usually are sent to the mill about two days before the start of the week to allow for last minute changes and orders).

5. Mill scheduler reviews the overall sequence for the month and makes sure there are no conflicts with planned maintenance or other mill events.

6. Mill scheduler reviews the specific weekly schedule for potential problems or safety issues.

7. If any changes are needed the mill scheduler must get agreement from the production planner before the weekly schedule begins.

8. During the actual production run, the mill scheduler does have authority to make changes to the schedule if unforeseen problems occur (if the machine goes down at 2 am on the night shift no one has to call the production planner).

Note: Sequence refers to the order of production of various products. On the #5 machine there are only a few sequence changes per month since all production is market pulp and there are only a few customers which require special characteristics. On the #6 machine there are many different products based on basis weight and product. Here an optimal sequence usually avoids big jumps in basis weight because this creates wasted time (and pulp) on the machine while transitioning between the two grades. Trim refers to the actual orders to be filled from each roll of paper. Usually three or four rolls are cut from the parent roll which comes off of the paper machine. Since any excess product is either sold as waste or repulped, it is important to maximize the amount of the parent roll which is used for the customer rolls. So once the sequence of production is determined, the specific trim has to be determined for each product in the sequence.

Exhibit 4 1995 Grade Change Summary for #6 Machine

Average number of grade changes	38 changes/month
Average cost of a grade change	17.3 tons/change lost production
Average length of a grade production run	465 tons/grade
Shortest run length	53 tons
Longest run length	1,365 tons