

The Florida Sustainability Case Study Series

A Project of the Educational Alliance for a Sustainable Florida

2004

RAYONIER

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June 2004

This case was initiated by the author at the March 11-12, 2004 Case Writing Workshop at the University of Central Florida under the supervision of Professor James A. Erskine, Richard Ivey School of Business, The University of Western Ontario, London, Canada, and was subsequently expanded with assistance from Rick Bunch, Executive Director, Bainbridge Island Graduate Institute, Bainbridge Island, Washington. It was prepared solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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The Sustainability Case Study Series is a collection of Florida-specific teaching cases produced through the Educational Alliance for Sustainable Florida (EASF), a project funded by the Florida Department of Environmental Protection and implemented by the Council for Sustainable Florida. For more information on the EASF Project, please visit the project website:

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Investing in Tomorrow's Business Leaders

Relationship of Key Members of the EASF Network

Florida Department of Environmental Protection and Council for Sustainable Florida

A Unique Partnership-

The Network is made up of 10 universities, industry, and government. Together, the Network works to

- Raise awareness
- Share resources &
- Build capacity

among Florida's graduate programs of business on the role of and practices for integrating social and environmental sustainability into the curriculum.

The EASF Program includes a variety of activities including:

Speakers' Forum that brings leaders in the field – from business or the academe – to share their expertise on cutting-edge issues.

A Clearinghouse located on the Council for Sustainable Florida's web site - www.sustainableflorida.org - makes materials, methods and minds available to faculty, students and business throughout the state.

Monitoring the project tracks change in the programs offered by participating schools using a modified form of the BELL survey.

Council for Sustainable Florida

ENVIRONMENTAL COMPLIANCE AT RAYONIER CASE STUDY

Dick Hopper, Manager of Environmental Operations for Rayonier's Fernandina Beach, FL, Performance Fibers Mill, looked at the report on water quality in the nearby Amelia River that had just been delivered to his office on August 10, 2001. This was the last in a series of reports that would indicate whether a redesign of the mill's wood pulping process had been successful in reducing ammonia concentrations in its wastewater discharge. If the new report indicated that water quality in the Amelia River had not improved, Rayonier would have to either incur additional expenses to meet discharge limitations, drastically change the mill's product mix, or curtail production.

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RAYONIER

Rayonier was founded in 1926 in the Pacific Northwest to produce rayon and other fibers from wood pulp. The company derived its name from the union of the word rayon with Mt. Rainier, the 14,410-foot mountain visible from the company's first pulp mill in Shelton, Washington. When the company's stock became publicly traded in 1937, Rayonier was already the largest producer of dissolving pulps in the world. During the succeeding decades, Rayonier expanded to include forest holdings in the U.S. and New Zealand and developed markets for its high-grade cellulose fiber products throughout the world.

The company initially began operating a pulp mill in Florida in 1939 and opened a sister mill in Jesup, Georgia in 1954. In 2000, Rayonier had 2.1 million acres of timber and land in the U.S. and New Zealand of which 1.7 million acres were in Florida, Georgia and Alabama. Rayonier moved its corporate offices from Stamford, CT, to Jacksonville, FL, in 2000 to strengthen the company's commitment to its employees and assets in the region. In 2000, Rayonier had worldwide sales of \$1.0 billion with approximately 51 percent from sales of high performance fibers. Approximately 40 percent of the company's sales were outside the U.S. to customers in more than 50 countries.

RAYONIER'S ENVIRONMENTAL PERFORMANCE

As a company that relied on healthy forests and the environment for its primary business activity, Rayonier developed a corporate environmental management strategy that focused on sustainable practices. In 2000, Rayonier's U.S. forest lands and wood procurement practices in the U.S. were certified under the Sustainable Forestry Initiative®, an internationally recognized forestry standard. Rayonier was also actively involved in wildlife management programs for its forestlands with educational and environmental groups and to protect environmentally sensitive lands. One example of this involvement was Rayonier's cooperation with the Nature Conservancy and the Florida Department of Environmental Protection (FDEP) to convert 57,000 acres of the company's forestlands in Northwest Florida into the Pinhook Swamp Nature Preserve.

THE MARKET FOR CHEMICAL CELLULOSE FIBERS

A large number of pulp mills in the U.S. and other countries produced paper, paperboard and absorbent materials from wood, but only a few supplied the market for high-value dissolving pulps and specialty fibers. These fibers, which contain cellulose of a much higher purity than other wood pulp products, were used as a raw material in a variety of products. The earliest uses were for rayon cord used in tires and other industrial applications. Other products that used dissolving pulps included photographic film, filters, food products, pharmaceuticals, impact resistant plastics, and even rocket propellants and explosives. Because of the unique processes required to manufacture these products, dissolving cellulose fibers were typically developed and produced under contract to meet the material specifications of each customer rather than mass produced for a spot commodity market.

Worldwide demand for chemical cellulose fibers had been stable reflecting the mature nature of customer's demand for this raw material. Producers of cellulose fibers in Brazil and South Africa had increased their production capacity and expertise to capture a share of the global demand. Other suppliers of natural and petroleum-based fibers provided substitutes in an increasingly competitive market.

FERNANDINA BEACH, FL PERFORMANCE FIBERS MILL

The Fernandina Beach Mill, a dissolving sulfite pulp mill located on Amelia Island about 30 miles northeast of Jacksonville, FL, first opened in 1939. It chemically cooked, washed and bleached wood chips to dissolve the non-cellulosic wood components and produce highly purified cellulose fibers. In 2000, the mill accounted for 21 percent of Rayonier's total capacity of 720,000 metric tons of performance fibers. Most of the mill's output was custom produced to meet customers' specifications and over two-thirds of output was exported. The mill was important to Rayonier because the majority of its production was high-value specialty fibers. The mill was also a major employer with a significant economic impact on Amelia Island, a local economy dominated by fishing, tourism and other service sector jobs.

WATER QUALITY AND EMISSION PERMITS

To make high purity cellulose fibers from wood, the Fernandina Beach Mill used a chemical pulping process to separate lignin from cellulose fibers. The cellulose fibers were collected, washed and refined in the process, but the lignin and other organic materials created a large quantity of by-products and waste materials. Much of the waste materials were recovered and used to generate steam and power for the mill while others were treated and then discharged in wastewater to the nearby Amelia River. The mill had successfully implemented an extensive treatment lagoon system in the 1970s to control conventional pollutants in wastewater discharged to the river.

New concerns about the effects of wastewater discharges on the river were raised in 1993 when Rayonier sought to renew the wastewater permit for the mill. The permitting agency, the FDEP, had conducted some limited sampling in the river near the mill's discharge and found elevated levels of ammonia and lower-than-expected levels of phytoplankton. The mill's existing permit, however, did not directly specify limits on ammonia concentrations or phytoplankton populations, a source of food for zooplankton, in the river.

Dave Tudor, a corporate environmental affairs manager at Rayonier, was initially in charge of responding to FDEP's concerns. Tudor had formed an advisory committee in 1992 composed of citizens and local officials from Fernandina Beach and Amelia Island to assist in identifying and responding to environmental issues and problems facing the Fernandina Beach Mill. Dick Hopper joined Tudor in 1993 as the mill's manager for environmental operations. Both Tudor and Hopper, along with other Rayonier staff, believed they could work cooperatively with the FDEP to identify the potential sources of the water quality problem and develop a solution.

Based on input from the advisory committee, mill managers and corporate officers, Rayonier initiated a water quality study in 1994 to provide further information about the potential effects of the mill's wastewater discharges on phytoplankton levels in the river. The study, conducted by a noted biologist from a nearby university, would provide a complete analysis of environmental conditions in the Amelia River and a comparison with other nearby rivers that did not receive wastewater discharges. The study was also approved by the FDEP.

Results from the water quality study and a subsequent study in 1998 indicated that phytoplankton levels in the Amelia River were significantly lower near the mill's wastewater discharge. The mill would need to reduce peak-flow ammonia concentrations in the discharge by more than 2/3 to assure improvement in the river. Based on the results from these studies, the FDEP stipulated as part of the mill's permit renewal in 1998 that reductions in ammonia concentrations would need to be achieved before the permit could be renewed again. Managers and production engineers at the mill and in Rayonier's corporate headquarters would need to develop and evaluate alternatives to change the mill's production processes in order to keep the mill in operation. Rayonier had already spent nearly \$1 million for these water quality studies but the real challenges were still ahead.

AMMONIA REDUCTIONS AND WASTEWATER MANAGEMENT

Dick Hopper worked with the mill's staff and other Rayonier specialists to develop several ammonia reduction strategies. The mill's chemical pulping process used ammonium bisulfite as a buffer for the sulfur dioxide and other acids that separated cellulose fibers from lignin and other organic materials. Ammonia was also used in the recovery boiler scrubber to remove sulfur dioxide. With the old production process, excess ammonia was lost in the wastewater. Any changes in the production process would need to reduce the loss of ammonia but still maintain the purity of the fibers produced by the mill to satisfy Rayonier's customers in the market for performance fibers.

One strategy focused on the addition of an amine scrubbing system that would reduce the need for ammonia in the pulping process and make it possible to recycle sulfur dioxide. In addition to reducing ammonia losses in the wastewater, this strategy also provided operating savings from the recycled sulfur dioxide and reduced use of water. The major drawback, however, was the initial capital expenditures to purchase new equipment and to integrate the amine system into the existing pulping process.

A second strategy considered the use of caustic soda as a substitute for ammonia. The soda would reduce ammonia used for scrubbing and thereby minimize ammonia losses in the wastewater. This strategy could be implemented with relatively minor capital expenditures for new equipment, but it required higher operating expenditures to purchase caustic soda rather than ammonia.

A summary of the capital and operating costs (savings) for the two strategies is provided in the table below along with the expected reduction in ammonia discharges from existing levels for each strategy. Capital costs would be incurred in the first year and operating costs (savings) would be incurred in the first and each subsequent year. The net present value for each alternative over a 5-year planning period based on a cost-of-capital (discount rate) of 10% is also provided. The table shows that while the amine system would reduce operating costs, these savings were not sufficient to overcome the initial capital outlay resulting in higher overall costs for the amine system.

Ammonia Reduction Strategy	Expected Ammonia Reduction (in %)	Initial Capital Cost	Annual Operating Costs (Savings)	Net Present Value of Capital and Operating Costs
Amine Scrubbing System	56%	-\$13,000,000	+\$1,800,000	-\$5,615,076
Caustic Soda Substitution	65%	-\$1,200,000	-\$750,000	-\$3,675,536

In addition to the benefit/cost considerations, there was also the risk that each strategy might not achieve the expected reduction in ammonia and reduce concentrations in the Amelia River. Most of the equipment used in the pulping process was part of the original design of the mill and it was not clear how this equipment would respond to the proposed changes. The amine scrubbing system had never been used before in a pulp mill to

remove sulfur dioxide. On the other hand, caustic soda had been used in other chemical pulp mills so the outcome was more predictable.

Based on the technical and economic analysis of the ammonia reduction strategies, Dick Hopper and Dave Tudor recommended that the mill pursue the caustic soda alternative and conduct another water quality study to determine the effects in the Amelia River. While Rayonier was concerned about the effects of implementing the ammonia reduction strategy on the mill's operating profit, they believed the strategy was the best alternative to restore phytoplankton in the river, minimize costs, and keep the mill in full operation. In August, 1999 the mill began the process of converting the pulping process to the new system.

THE FINAL REPORT

As Dick Hopper picked up the report on water quality in the Amelia River, he reflected back on the events and decisions over the past 8 years. Rayonier and the mill's staff had worked cooperatively with the FDEP to identify the source of water quality problems in the river and the most cost-efficient strategy had been selected to correct the problem. The strategy of substituting caustic soda for ammonia in the pulping process had been implemented on schedule and on budget. Initial results indicated that ammonia discharges had actually been reduced by 85 percent rather than the expected 65 percent. The final test was whether these reductions had benefited the River.

Hopper opened the report and read the executive summary. Ammonia concentrations in the Amelia River had dropped by nearly two-thirds over the past two years as a result of the ammonia controls. More importantly, the levels of phytoplankton and zooplankton in the river were now the same as in the nearby Nassau River where there were no wastewater discharges. By working collaboratively with the FDEP, Rayonier had achieved its goal of restoring the environmental quality of the river while assuring a sustainable future for the Fernandina Beach Mill.

ENVIRONMENTAL COMPLIANCE AT RAYONIER TEACHING NOTE

CASE SYNOPSIS

Dick Hopper, Manager of Environmental Operations for Rayonier's Fernandina Beach, FL Performance Fibers Mill, was preparing to review a final report that would indicate whether a redesign of the mill's wood pulp dissolving process had been successful in reducing ammonia concentrations in its wastewater discharge to the nearby Amelia River. Fiber products from the mill were an important component in Rayonier's sales but the redesign could jeopardize the viability of the mill. The report indicated that Rayonier had successfully restored water quality in the river while assuring a sustainable future for the mill.

TEACHING OBJECTIVES

This case was written for a MBA course in managerial economics but it could also be used in business strategy and policy courses. The material is designed to focus on quantitative and qualitative analysis of production costs and how production decisions are related to profitability and other corporate objectives. The discussion in the case also allows the instructor and students to consider how production decisions have external effects and the extent to which managers should be concerned about sustainable business practices.

IMMEDIATE ISSUE

Whether the company's decision to redesign the mill's production process had improved water quality and the costs associated with this decision.

BASIC ISSUES

Production processes, input/output relationships
Fixed and variable costs
Environmental management
Sustainable practices and business policy

SUGGESTED STUDENT ASSIGNMENT

1. Do you agree with the approach and recommendations that Dick Hopper and other managers at the Fernandina Mill made to deal with the water quality problem? What other information would you like to have to consider this recommendation?
2. If you were Dick Hopper or any other manager at Rayonier, how concerned should you be about the environmental impacts of the mill and the company's responsibility to work with environmental permitting officials? How concerned should you be about the mill as a major employer on Amelia Island?

CASE ANALYSIS

The student will focus on the cost figures and the comparison of the two production processes. Some discussion may also focus on the tradeoffs between capital costs and variable costs and how the company should equate these costs using net present value. Additional discussion, and possibly new computations, could consider how the choice of discount rates and the planning horizon (e.g. more than 5 years) could influence the recommendation.

Other issues to consider would be the costs and benefits of relocating the Mill's production to a different location. Although no information is presented in this case about such a decision, discussion could address:

- how capital and variable costs would change with a new facility,
- how the product market for specialty fibers would influence the location decision,
- whether the new facility might be located out of the U.S. to reduce transportation costs for exports, and
- whether Rayonier would face similar environmental concerns in a different location.

Students should be encouraged to discuss the manager's role in dealing with problems such as the environmental impacts of production decisions and community involvement. Also, principal-agent issues such as the difference between Rayonier's concerns about these problems in comparison to a manager's concerns. Discussion could also focus on whether Rayonier had a responsibility to be concerned about water quality in the Amelia River even though this specific problem was not covered by the mill's permit. The case study could conclude with a broader discussion of Rayonier's obligation to maximize returns to their stockholders versus other corporate objectives.