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GEORGIA PULP AND PAPER CONSORTIUM
FY 97 FINAL PROJECT REPORT

1. PROJECT TITLE — Pilot Scale Oxygen and Peroxide Bleaching
   Project No.: PP97-IN2

2. PRINCIPAL INVESTIGATOR — James Anderson
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3. EXECUTIVE SUMMARY OF WORK COMPLETED

A complete system for bleached pulp and liquor handling is essential to meet the goals of using oxygen and peroxide technology. The current scope of the project is to install the bleaching equipment, with capacity to expand to include the entire process. Design is on-going. Several major components, ie MC mixer and pulp dewatering equipment have been acquired. Support is still being solicited for additional equipment and installation.

4. DELIVERABLES

Major Milestones & Dates	Original Proposal	Revised
Procurement of support equipment, Phase I.	October 1996	On-going
Complete Phase I, install high shear mixer and MC pump	December 1996	Jan 1998
Installation of Reactor	March 1997	March 1998
Completion of Phase II	June 1997	May 1998
Operation of Pilot System	August 1997	June 1998

5. BUDGET

State Funds	Total FY 97	12-Month Expended
	$130,000	$3,500
Matching Funds	Original Proposal	Actual
	$0	$179,000

DESIGN FOR PILOT OXYGEN BLEACH PLANT

At the TAPPI Fall 1996 Pulping conference, it was stated that a complete system for bleached pulp and liquor handling is essential to meet the goals of using oxygen and peroxide technology. An independent pilot scale oxygen and peroxide bleaching system is an important component of the entire system. The current scope of the project is limited to the bleach process, but additional capacity could be added in the future so processes can be tested to enhance mill closure. Funding limitations will probably also limit the pressure capacity of the reaction vessel. When more funds become available, the reaction vessel pressure rating can be upgraded.

Technical specifications for a pilot oxygen/peroxide bleaching facility have been received from industry and academia. The following represent the bleaching process for bleaching Kraft softwood pulp:

Medium consistency (10 to 14 %)

Delignification (40 to 60 %)

Retention time (45 to 60 minutes)

Bleaching temperature (85 to 95°C)

Low pressure [65 psig] steam consumption (18 lb/ton)

Medium pressure [165 psig] steam consumption (18 to 80 lb/ton)

Alkali consumption (8 - 60 lb/ton)

Oxygen consumption (10 to 40 lb/ton)

Trivalent magnesium (0.2 to 4 lb/ton)

Reactor pressure (80 to 100 psi)

The system will be designed to process pulp at a rate of 3 and 4 tons per day (250 to 333 pounds per hour). Multistage bleaching may be achieved by processing a batch through the process equipment several times.

Instrumentation and data collection should provide sufficient information to characterize the process used to produce the bleached pulp

Provision will be made to collect samples at different times and at different points in the process.

Provisions must be made to handle bleach liquor as well as bleach plant effluent.

The attached Prospectus, Appendix I, has been sent out to industry to develop interest and support for the project.

The original engineering work on the project was discontinued because of a conflict of interest between several parties involved in the project. An alternative resource has offered to do the design and project management, however we are still pursuing an industrial partnership with a company experienced with oxygen bleaching technology.

The final design for the oxygen/peroxide bleaching component, using existing funds, will be limited to a non-pressurized system which can be up-graded. With support from one of our clients, we expect to be able to greatly improve the capacity of the system..

PROCUREMENT OF SUPPORT EQUIPMENT

The following key pieces of process equipment are already available:

Sunds IP10 screw press [to prepare medium and high consistency stock]

2 AHLMIX MC-chemical mixer [to blend bleaching agents with pulp]

Black-Clawson ChemiWasher [to prepare pulp for bleaching or to wash bleached pulp]

Bauer Impressafiner [to prepare pulp for bleaching or to wash bleached pulp]

The following is a partial list of pieces of process equipment which must still be acquired:

Medium consistency pumps

Up flow/down flow tower for bleach operations

Instrumentation

Chemical handling and ozone generation

Tanks and mixers

Exhaust system

INDUSTRY SUPPORT

One supplier of industrial chemicals has declined to take part in the project, because the facility would duplicate their existing pilot plant. Other partners are being pursued.

The system will be available for the companies of Georgia to aid in implementation of a oxygen and peroxide bleaching technologies.

EQUIPMENT INSTALLATION

Several of the major components of the new bleach system have been procured. Until a finalized design and engineering plan is approved, these components will not be installed. The general location of the pilot oxygen/peroxide bleaching facility has been determined, and some of the support infrastructure for chemical preparation and handling and pulp handling, has been upgraded by one of our clients. This system is designed to be used with the oxygen and peroxide bleaching system. Some funding to assist with development of the bleach plant may also be available.

Bauer Impressafiner [to prepare pulp for bleaching or to wash bleached pulp]

The following is a partial list of pieces of process equipment which must still be acquired:

Medium consistency pumps

Up flow/down flow tower for bleach operations

Instrumentation

Chemical handling and ozone generation

Tanks and mixers

Exhaust system

Engineering has been obtained to design a pilot scale oxygen and peroxide bleaching system at Herty. Design is on-going, balancing funding available, equipment costs, and design parameters. One of our clients has spent $39,000 upgrading the pulp and chemical infrastructure at Herty. This system is designed to be used with the oxygen and peroxide bleaching system. Some funding to assist with development of the bleach plant may also be available.

The final design for the oxygen/peroxide bleaching component, using existing funds, will be limited to a non-pressurized system which can be up-graded. With support from our client, we will be able to greatly improve the capacity of the system. Because the design and costs have not been finalized, the quantity of matching funds has not been established.

The system will be available for the companies of Georgia to aid in implementation of a oxygen and peroxide bleaching technologies.

BUSINESS PLAN

The bleaching pilot plant will be located at the Herty Research and Development Center, in Savannah, Georgia, and will be operated by Herty's Pilot Plant staff. Client companies will be charged a fee [time and materials] for project operations involving the oxygen bleach plant and other pilot scale operations. Herty will staff the operation with trained operators. The client companies are expected to identify goals and objectives for all project activities. Herty Project Managers will assist Client representatives to develop a trial plan for meeting the goals and objectives. A technical report will be prepared by Herty that describes trial activities.

OPERATION OF PILOT SYSTEM

As can be seen from the discussions of the desgn, engineering and installation, the pilot plant is not ready for operation.

Appendix I

PROSPECTUS FOR OXYGEN BLEACH PILOT PLANT
TO BE INSTALLED AT THE HERTY FOUNDATION
SAVANNAH, GEORGIA
March 5, 1997

OPPORTUNITY

This project adds an oxygen/peroxide/ozone pilot scale bleaching operation to Herty's Pilot Plant. Presently there is no facility in North America that has the capability to produce small quantities [between 10 and 1000 pounds] of oxygen/peroxide/ozone bleached pulp for experimental purposes. This project provides an opportunity for producers of bleached pulp and for suppliers of bleaching chemicals to expand the use of oxygen related bleaching systems.

SCOPE OF WORK

The Scope of Work for this project includes designing and engineering the pilot facility, procuring process equipment, installing process equipment, start up and initial operations to demonstrate the capabilities of the pilot plant.

TECHNICAL SPECIFICATIONS

Technical specifications are not yet firmly fixed and input from industry is needed in order to prepare a scope statement for design and engineering. The following represent a starting point for describing a process for bleaching Kraft softwood pulp:

Medium consistency (10 to 14 %)

Delignification (40 to 45 %)

Retention time (45 to 60 minutes)

Bleaching temperature (85 to 95°C)

Low pressure [65 psig] steam consumption (18 lb/ton)

Medium pressure [165 psig] steam consumption (18 to 80 lb/ton)

Alkali consumption (8 to 10 lb/ton)

Oxygen consumption (10 to 12 lb/ton)

Trivalent magnesium (0.2 lb/ton)

Reactor pressure (80 to 100 psi)

The system will be designed to process pulp at a rate of 3 and 4 tons per day (250 to 333 pounds per hour).

Multistage bleaching may be achieved by processing a batch through the process equipment several times.

Provision should be made to collect samples at different times and at different points in the process.

Instrumentation and data collection should provide sufficient information to characterize the process used to produce the bleached pulp

Provisions must be made to handle bleach liquor as well as bleach plant effluent.

EQUIPMENT NEEDS

Several key pieces of process equipment are already available:

Sunds IP10 screw press [to prepare medium and high consistency stock]

ChemiWasher [to prepare pulp for bleaching or to wash bleached pulp]

The following pieces of process equipment must be acquired:

Medium or high consistency mixer [to blend bleaching agents with pulp]

Medium or high consistency pumps

Up flow/down flow tower for bleach operations

Instrumentation

Chemical handling and ozone generation

Tankage

Exhaust system

BUSINESS PLAN

The bleaching pilot plant will be located at the Herty location in Savannah , Georgia, and will be operated by Herty's Pilot Plant staff. Client companies will be charged a fee [time and materials] for project operations involving the oxygen bleach plant and other

pilot scale operations. Herty will staff the operation with trained operators. The client companies are expected to identify goals and objectives for all project activities. Herty Project Managers will assist Client representatives to develop a trial plan for meeting the goals and objectives. A technical report will be prepared by Herty that describes trial activities.