FOREST PRODUCTS
Project Fact Sheet

PREVENTING STRENGTH LOSS OF UNBLEACHED KRAFT FIBER

BENEFITS

- Increased recycling rate of kraft fiber-based paperboard
- Reduced net energy use
- Increased value of OCC as source of secondary fiber
- Decreased landfilling of OCC
- Lower use of chemicals
- Reduced basis weight needed to achieve strength specifications

APPLICATIONS

The project will be beneficial to integrated paper mills by increasing the strength of their product and reducing its variability when broke levels change. Treatment of never-dried fibers will lead to energy savings and improved paper quality.

Treatment of Never-Dried Fibers Will Lead to Energy Savings and Improved Paper Quality

The reuse of old corrugated containers (OCC) as fiber feedstock reduces net energy use when compared to use of virgin fiber and keeps OCC out of landfills. The pulp and paper industry would like to increase the domestic recycling rate of OCC, increase the recycled fiber content, reduce the weight, and/or reduce the variability of recycled paperboard. However, it must first overcome the irreversible loss of strength that occurs to the kraft pulp during its first exposure to the refining, pressing, and drying operations associated with paperboard manufacture. These changes reduce the bonding potential of the fibers and make it less economical to recycle kraft paperboard for subsequent paperboard production.

Researchers will explore methods to prevent the loss of bonding potential in kraft pulp by treating it before it is used initially to manufacture paperboard. They are looking for simple chemical treatments using non-toxic products that require few changes in a plant's capital equipment.

The new technology will benefit industry by increasing the recycling of paperboard, lowering net energy use, and reducing the amount of chemicals or basis weight required to meet the strength specifications for the product.

OFFICE OF INDUSTRIAL TECHNOLOGIES
ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

PROJECT DESCRIPTION

Goal: To identify the chemical conditions that interrupt or compensate for the loss of strength in never-dried kraft fibers when they are formed into paper for the first time.

Researchers are looking for low-cost techniques of blocking the chemical mechanisms that cause strength loss in fibers. They will use never-dried, unbleached kraft fibers for most of their investigations. Selected experiments will be conducted on commercial secondary OCC pulp obtained from a paper machine producing secondary linerboard.

The first phase of the effort will be a screening of various chemical treatments to determine their effect on the dry strength of handsheets formed from never-dried pulp. Products to be evaluated include guar, starch, acrylamide, urethane, surfactants, dye-analogues, and enzymes. Variables will include dosage levels, time of exposure, and degree of agitation. In the second phase, these sheets will be compared to recycled paper with paper formed after repulping and repeating the forming and drying processes. Variables will include freeness, water-retention value, fiber length distributions, and colloidal charge.

PROGRESS & MILESTONES

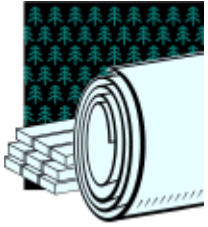
- Researchers have shown that the initial temperature used to dry kraft pulp should be as mild as practical to avoid the changes in fibers that prevent their successful recycling.
- They have also learned that the loss of fiber strength is associated with changes on the fiber's surface and in its pore structure.
- Intermediate tasks that are considered potential milestones include the following:

  – Phase I: Screening test of candidate treatments vs. the strength of virgin handsheets

  – Phase II: Recycling tests, looking at residual effects of treating the virgin pulp

  – Phase III: Verification of results with full simulation of wet-end chemistry

  – Phase IV: Paper machine trials of the most promising candidate treatments



PROJECT PARTNERS
North Carolina State University
Department of Wood & Paper Science
Raleigh, NC

Hercules Incorporated
Wilmington, DE

International Paper
Tuxedo, NY

FOR ADDITIONAL INFORMATION PLEASE CONTACT:

Valri Robinson
Office of Industrial Technologies
Phone: (202) 586-0937
Fax: (202) 586-3237
e-mail: valri.robinson@ee.doe.gov

Dr. Martin A. Hubbe
Department of Wood & Paper Science
North Carolina State University
Box 8005
Raleigh, NC 27695-8005
Tel.: (919) 513-3022
Fax: (919) 515-6302
e-mail: m_hubbe@ncsu.edu

Please send any comments, questions, or suggestions to webmaster.oit@ee.doe.gov

Office of Industrial Technologies
Energy Efficiency and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

October 2000