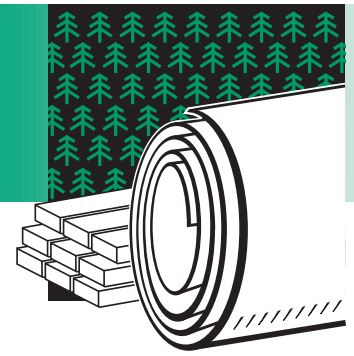


FOREST PRODUCTS

Project Fact Sheet



LINEAR CORRUGATING

BENEFITS

- With 20% implementation, saves approximately 240 million therms of energy or about 4 million barrels of oil per year
- Reduces landfill tipping fees by an estimated \$20 million per year
- Reduces wood fiber content substantially while maintaining crush strength
- Lower fiber content means higher source reduction and substantial direct and indirect energy savings
- Provides three- to six-month payback in a conservative industry with strict economic standards
- Complementary to, rather than competitive with, “microfluting” and other new corrugated products

APPLICATIONS

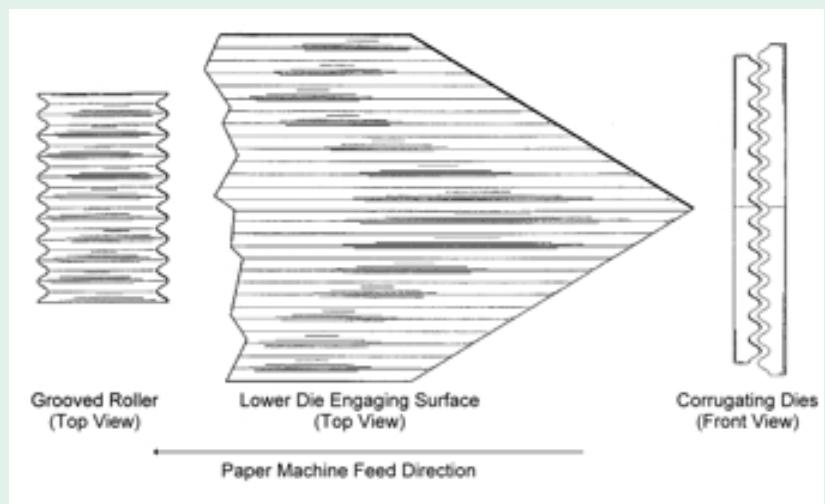
Because of the position of the finished container board as it moves through the machinery, the technology’s best initial application will be smaller boxes with a perimeter of 60–65 inches. This market segment constitutes approximately 20% of the overall box market.

A SIMPLE PROCESS INNOVATION REDUCES COST AND WASTE WHILE MAINTAINING CRUSH STRENGTH IN CORRUGATED CONTAINERS

The paper industry, like many others, is operating on lower margins and a higher level of competitiveness than ever before. Even with these incentives, however, the mechanics of producing corrugated container board for cardboard boxes have changed little for many years. New technology is emerging in response to the need for more efficient and cost-effective processes. One such technology is a process known as linear corrugating.

In the conventional process, a layer of wood fiber spread over a fine-wire mesh is drawn through drying equipment. This process stretches the wet web and orients the wood fibers in the “machine direction”— parallel to the direction the web is moving through the equipment. The sheet is then corrugated by crimping it between interlocking, gear-shaped rolls that extend across, or perpendicular to, the wood fibers. The resulting corrugated paperboard is secured between two layers of smooth paperboard to produce finished rolls of cardboard material, which are then cut into various-size boxes. Early results indicate the linear corrugating process will save significant amounts of the wood fiber and energy presently used in box production, while still maintaining industry-acceptable crush strength standards.

LINEAR CORRUGATING



Unlike the conventional approach to producing corrugated cardboard for boxes, the new linear corrugating process uses equipment that aligns the flutes parallel to the wood fibers, imparting an estimated 25% greater crush strength to the finished product.



Project Description

Goal: Current efforts are directed toward scaling the linear corrugating equipment to fit in an actual production line. The next critical steps are to complete the design for an engineering prototype and to fabricate models of different sizes for advanced testing.

The linear corrugating process is based on changing the orientation between the wood fibers and the corrugations, or flutes, in the finished product. In the conventional approach, the flutes run perpendicular to the wood fibers, which are oriented in the machine direction. In contrast, the linear corrugating process uses equipment that aligns the flutes parallel to the wood fibers.

Inventor Lloyd Chapman is developing this new technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies.

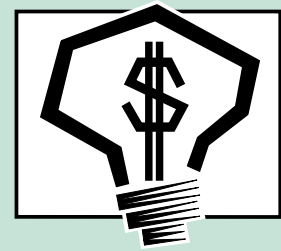
Progress and Milestones

- The linear corrugating process is protected under U.S. patent 5,508,083.
- Chapman has worked closely with industry associations, including the American Forest & Paper Association and the Fibre Box Association to verify the performance characteristics of cardboard product produced through the linear corrugating process.
- Currently, Chapman is working to demonstrate that the stress imparted on the paperboard by the 90° change in the flute direction will not result in increased tearing or weakness of the sheet.

Economics and Commercial Potential

Corrugated cardboard is a high-volume, low-margin commodity operating in an industry in which even small efficiencies can make a difference in profitability and competitiveness. If the linear corrugating process could reduce the amount of wood fiber going into the finished product by even 5% to 10%, it would be a welcome enhancement to any production line. That different independent assessments have confirmed the potential for 25% savings, however, means this new process could revolutionize the way corrugated cardboard is made in the future.

The linear corrugating equipment is expected to cost no more than conventional corrugating equipment installed in a new facility. Retrofits could likely be installed for no more than \$2.5 million, with a payback period of three to six months.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

PROJECT PARTNERS

Lloyd Chapman
Jesup, GA

Inventions and Innovation Program
Washington, DC

FOR PROJECT INFORMATION, CONTACT:

Mr. Lloyd Chapman
100 Morgan Drive
Jesup, GA 31545
Phone: (912) 427-4977

FOR PROGRAM INFORMATION, CONTACT:

Sandy Glatt
Program Manager
Inventions & Innovation Program
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
Phone: (202) 586-2079
Fax: (202) 586-7114
sandy.glatt@ee.doe.gov

Visit our home page at
www.oit.doe.gov

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

INDUSTRY OF THE FUTURE—FOREST PRODUCTS AND AGENDA 2020

*In November 1994, DOE's Secretary of Energy and the Chairman of the American Forest and Paper Association signed a compact, establishing a research partnership involving the forest products industry and DOE. A key feature of this partnership was a strategic technology plan—**Agenda 2020: A Technology Vision and Research Agenda for America's Forest, Wood and Paper Industry.** Agenda 2020 includes goals for the research partnership and a plan to address the industry's needs in six critical areas:*

- Energy performance
- Environmental performance
- Capital effectiveness
- Recycling
- Sensors and controls
- Sustainable forestry

OIT Forest Products Team Leader: Valri Robinson (202) 586-0937.



DOE/GO-102000-0964
Order# I-FP-723
January 2000