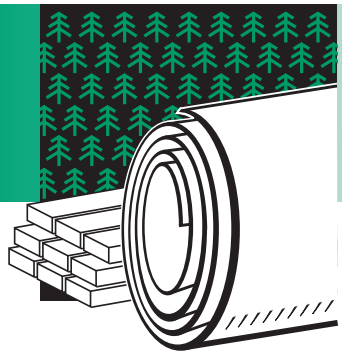
# FOREST PRODUCTS

**Project Fact Sheet**



## LONG WAVELENGTH CATALYTIC INFRARED DRYING SYSTEM FOR WOOD FIBER

### BENEFITS

- Reduces operating and capital costs compared to conventional dryers
- Projected energy savings of up to 80% over conventional drying systems
- Decreases residence time in the dryer providing increased productivity
- Reduces $NO_x$ and VOC emissions
- Reduces amount of scorched (wasted) product

### APPLICATIONS

Catalytic infrared drying to reduce the moisture content of material can be applied in a variety of industries such as forest products, agriculture, chemical processing, brewing and distilling, animal products, and horticulture. Tremendous energy savings are expected to result at full-scale because it is not necessary to heat the air and all of the surfaces in contact with the air as is the case with convection dryers used in the forest products industry today.

## LONG WAVELENGTH CATALYTIC INFRARED DRYING WILL SAVE ENERGY AND WASTE

Conventional drying systems for wood particulates, typically in the form of sawdust or chips, currently employ a rotary drum dryer that shoots a raw flame through a 20'-30' rotating drum while tumbling the wood product around. Product scorching and air emission problems, particularly with $NO_x$ and VOCs, are prevalent because the rotary drum operates at up to 1,000° F as it reduces moisture from 50-60% to 12-15%.

The long wavelength catalytic infrared drying system uses infrared energy in the 4-7 micron range to transfer energy directly to the water, activating it to a gaseous form at temperatures in the 135°-220° F range. Catalytic combustion of the natural gas creates the infrared energy that drys the wood product without the need for a direct flame, which can damage the product. Reducing the moisture content with infrared drying by transferring energy directly to the moisture instead of heating the air and surrounding metal structure requires less energy, reduces air emissions, and allows utilization of more dried product compared to conventional drying. When coupled with the advancement in remote sensing technology and programmable logic systems, wood fiber processors will have the ability to carefully control the units that accomplish moisture reduction.

### CATALYTIC INFRARED DRYER

**View of top-mounted catalytic infrared dryers in the prototype unit.**

## Project Description

**Goal:** The goal of this project is to develop a dehydration system that significantly improves the economic viability of using forest products efficiently and/or reduce dehydration costs for other types of value added goods using biomass as a major component.

Catalytic combustion occurs by allowing fuel (natural gas) to enter the back of the air tight heater pan and then dispersing it through a catalyst pad at the face. At the same time, oxygen from the air diffuses through the catalyst pad from the front, causing oxidation where they meet. Combustion occurs without burning the wood product because catalytic combustion occurs at a temperature below the flame ignition temperature. Drying takes place at a temperature and wavelength of the infrared energy. A large prototype unit has been constructed and tested with sawdust, wood chips, and a variety of agricultural products. The catalytic combustion system was proven to dehydrate forest and agriculture products efficiently, so the current focus has been on the conveyance system for distributing the product evenly throughout the dryer to achieve consistent drying. In addition to perfecting the conveyance system, the project will document the energy, waste, and economic benefits resulting from the construction and operation of a full-scale dehydration unit.

## Progress and Milestones

- A 30' prototype catalytic infrared unit was constructed and has undergone testing with a variety of forest products and agriculture products.
- A variety of conveyance systems were developed and tested with a variety of products.
- A partnership was developed with a major forest products company to dehydrate wood chips and fines that will provide 20% more usable product after drying compared to conventional dehydration systems.
- Test results from the wood chip/fines drying will be presented at a forest products conference in February 1999.
- A full-scale catalytic infrared unit will be designed and constructed and demonstrated on-site to dehydrate wood chips and fines prior to oriented strand board construction.

## *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*

*For each of these areas, task groups including industry, university and government representatives have developed detailed research agendas called research pathways—all of which are consistent with Agenda 2020's goals.*

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NICE$^3$—National Industrial Competitiveness through Energy, Environment and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies.Total project cost for a single award must be cost-shared at a minimum of 50% by a combination of state and industrial partner dollars. The DOE share for each award shall not exceed $400,000 to the industrial partner and up to $25,000 to the sponsoring state agency for a maximum of $425,000. Each award may cover a project period of up to three years.

### Project Partners

NICE$^3$ Program
U.S. Department of Energy
Washington, DC

Catalytic Industrial Group, Inc.,
Independence, KS

Kansas Department of Health
and Environment
Topeka, KS

Processed Fuels Institute
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