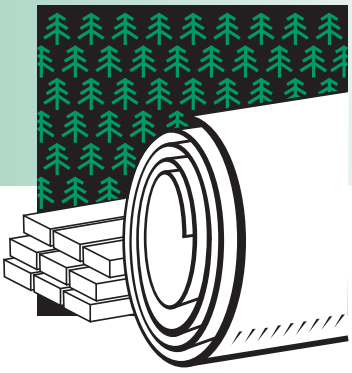
FOREST PRODUCTS

Project Fact Sheet



Long Wavelength Catalytic Infrared Drying System for Wood Fiber

Long wavelength catalytic infrared drying will save energy and waste

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.

Project Partners

NICE³ Program
Washington, DC

Catalytic Industrial Group, Inc.
Independence, KS

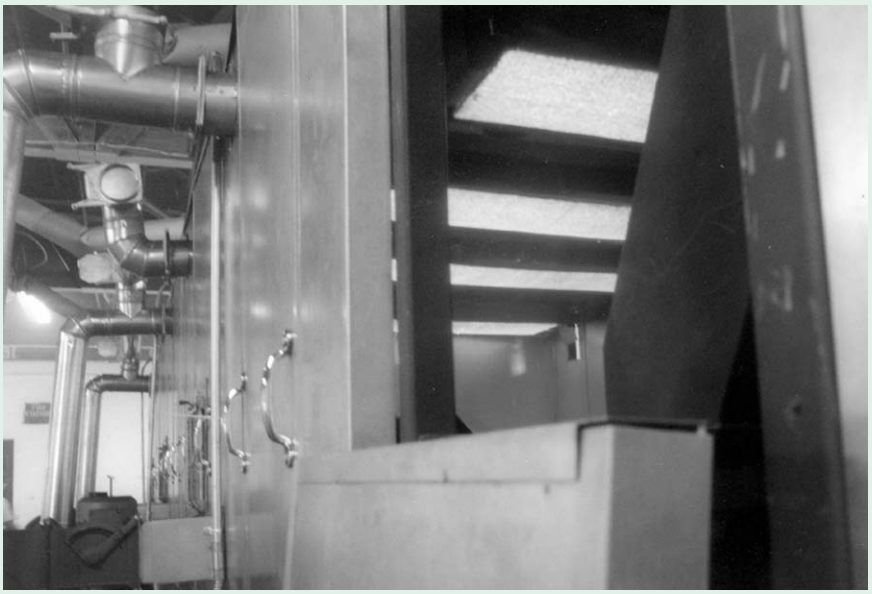
Kansas Department of Health and Environment
Toeka, KS

Processed Fuels Institute
Edina, MN

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 6-10%.

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

Catalytic Infrared Dryer



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

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.

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 reduces 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 the 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 10-15% more usable product after drying compared to conventional dehydration systems.
- Test results from the wood chip/fines drying were presented at a forest products conference in April 2001.
- Tests to date have showed that the process: evenly dries product from over 50% to less than 4% moisture content; lowers energy needs by reducing airflow demands and downsizing motors; and produces little direct VOCs, NO_x and CO.
- A full-scale catalytic infrared unit will be designed, constructed, and demonstrated on-site to dehydrate wood chips and fines prior to oriented strand board construction.
- A test of the drying process on harvested rice, conducted in July 2001, successfully dried the rice from 18% down to 12% moisture content in 3 hours, saving almost 3 days over the current process.

NICE³ – 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. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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