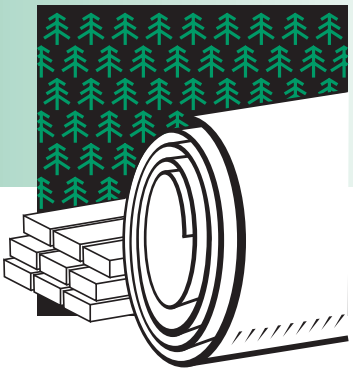
FOREST PRODUCTS

Success Story



THERMODYNE™ EVAPORATOR – A MOLDED PULP PRODUCTS DRYER

New Technology Revolutionizes Pulp Product Drying

Benefits

- Uses up to 50% less energy than some conventional dryer applications and with the use of a condenser can recover an additional 40% of the energy consumed
- Suppresses oxygen, reducing the chance of scorching or burning the product under higher and faster drying temperatures
- Reduces case hardening, warping, and scorching of the product through the use of steam drying
- Promotes easier stacking and wrapping thus reducing shipping costs and product losses
- Captures volatile organic compounds, reducing emissions by containing condensable gases

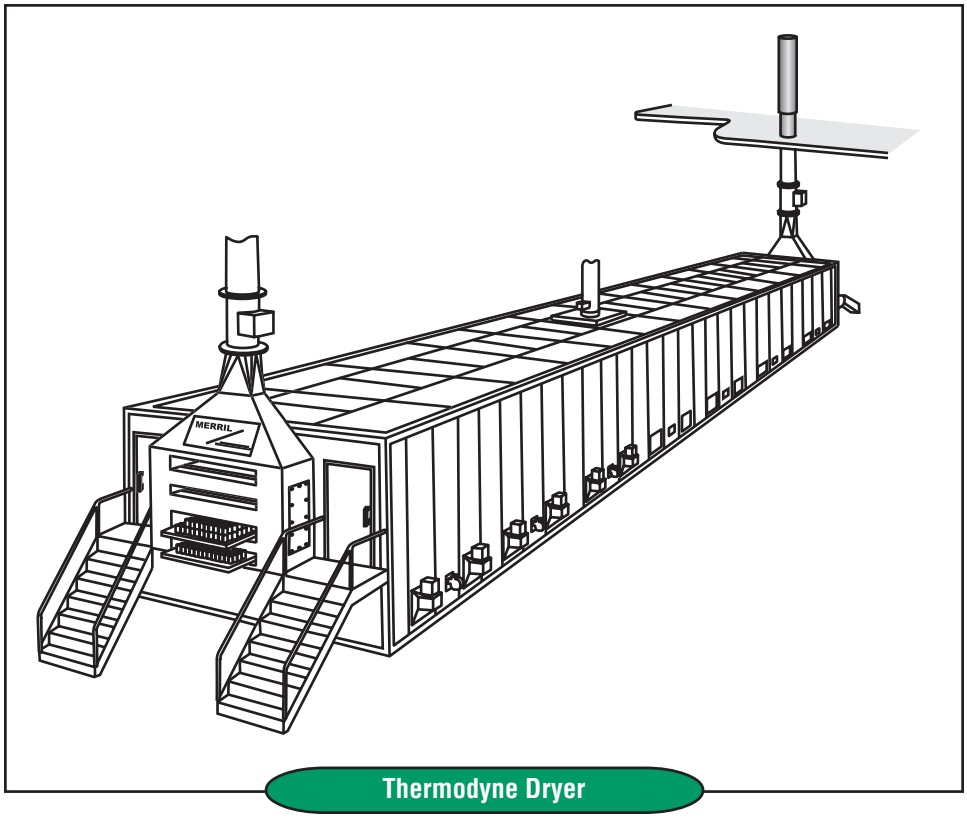
Applications

Can replace conventional dryers in the forest products industry for manufacturing molded fiber articles and for drying pulp, wood, cotton, cellulose, torrefied wood and wood veneer.

"Thanks to funding from DOE, we were able to commercialize this technology which not only improves product quality but also cuts energy requirements for drying in half!"

– Don Curry
Thermodyne Inventor
and President
Merrill Air Engineers

Processes for drying materials in industrial applications have basically remained unchanged for a century. For example, molded paper products, such as egg cartons are dried by forcing heated dry air, usually heated with steam from boilers, past the wet articles using recirculating fans. Exhaust fans continuously remove the water and volatile organic compounds generated and exhaust them to the atmosphere. Air drying produces stresses in a product when the surface is dry and shrinking while the interior is still wet. In addition to this warpage problem, surface discoloration also adds to the quality control problems with hot air drying of various products. The Thermodyne™ process, developed by Merrill Air Engineers, uses superheated steam not only addressing the traditional problems associated with drying but also the finished product quality.



Thermodyne Dryer

With assistance from the U.S. Department of Energy's Inventions and Innovation Program, Merrill Air Engineers demonstrated that its Thermodyne dryer outperforms conventional molded pulp dryers. Unlike other dryers, the Thermodyne dryer reheats water vapor released from the product being dried to create superheated steam that is directed onto the material being dried. Conventional paper dryers exhaust this liberated water outdoors, causing a large visible plume and dumping valuable heat.

Technology Description

The Thermodyne dryer is sealed so internal vapor (moisture) cannot escape into the insulated dryer walls. The retained water vapor passes through indirect integral heaters to raise its temperature to a level that allows for substantially faster drying rates than drying in relatively dry air. An absence of oxygen in the dryer also allows the drying temperature to be higher and the retained water vapor to help protect and evenly dry the material. The released water vapor also helps control internal temperatures by mixing with the superheated steam, dropping its temperature to a more desirable level. Finally, the system recovers heat and harmful volatile organic compounds from the dryer's condensate, substantially reducing the emissions released into the atmosphere.

Energy Savings and Pollution Prevention

The Thermodyne dryer reduces energy requirements by using the water evaporated off the product as the source of steam for additional drying and more evaporation as opposed to a direct-fired conventional dryer that exhausts the energy and brings in fresh air that requires heating. The new dryer uses up to 50% less energy than a conventional dryer, offering potential savings of up to 7 million Btu/ton of pulp. One unit has saved 11.31 billion Btu since its installation in January 2001 compared with a conventional dryer that uses 13 million Btu/ton of pulp.

In addition to energy savings, the system greatly reduces the amount of volatile organic compounds, nitrogen oxides, and particulate matter released into the atmosphere. Reducing emissions provides substantial benefit to local citizens, especially high-risk people such as children, senior citizens, and those suffering from respiratory problems.

System Economics and Market Potential

The Thermodyne evaporator can replace conventional drying systems in the forest products industry. It handles a wide variety of forest products and can also be used in agricultural applications. It can be used for drying pulp, cotton, cellulose, wood, torrefied wood, and wood veneer, as well as agricultural wastes prior to energy conversion, e.g. gasification, fast pyrolysis, carbonization, and torrefaction.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to 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.

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