FOREST PRODUCTS

Project Fact Sheet

A Motor Challenge Technical Case Study

IMPROVING SEVERAL FAN-DRIVEN SYSTEMS IN AN ORIENTED-STRAND BOARD MANUFACTURING FACILITY

BENEFITS

- Yielded electrical savings of $85,000
- Payback period of 6 months
- Saves 2.5 million kWh annually

APPLICATIONS

Many fan systems use either inlet guide vanes or outlet dampers to control flow rates. With either, energy is wasted because of the pressure drop across the vanes or dampers. Systems with variable flow requirements may benefit from the use of VFDs to control flow rates. For systems with constant flow (such as this one), opening the vanes or dampers and using a smaller fan or slowing down the existing fan will save energy. The same principals also apply to pump systems that use valves to control flow rates.

Project Summary

Louisiana Pacific Corporation, a producer of oriented-strand board (OSB) in Tomahawk, Wisconsin, completed a fan system optimization project resulting in substantial energy and cost savings. With the help of several organizations, Louisiana Pacific's Motor Challenge Showcase Demonstration project will save $85,000 per year in electrical costs with an investment of $44,000. The analysis of these implemented changes yields a simple payback period of less than six months. By eliminating several elements in the system used to compensate for off-design conditions, system performance was maintained while reducing energy consumption.

Company Background

Louisiana Pacific was established in 1973 as a spin-off from the Georgia-Pacific Corporation. With operating facilities in 29 states, as well as Canada and Ireland, Louisiana Pacific owns 1.5 million acres of timberland. The corporation is a major manufacturer of wood building products and wood pulp for commercial builders, homebuilders, and remodelers. Louisiana Pacific Corporation employs 12,500 people and has had annual sales between $2.4 and $3 billion over the last four years.

DRYER COMBUSTION FAN

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

Project Overview

Production of OSB starts by drawing aspen wood logs through a series of processes in which the logs are debarked, shaved into wood chips, and drawn through a dryer to remove moisture from the wood. Once the wood is cured in the drying process, the material goes through a series of cyclones to sort the wood chips by size. While the larger wood chips are used for OSB, the sawdust and smaller, unusable pieces known as fines, are separated out and dumped into burners used to heat the dryers.

The larger chips are mixed with resin and put into hot hydraulic presses used to make large composite sheets. These sheets are then trimmed and emerge as 4x8-foot boards. Ancillary to the manufacturing process is the process of drawing the waste air through an electrostatic scrubber before it is exhausted through the stack.Two parallel, automated process lines are operated. One line prepares wood for the outer OSB surface (the surface dryer system), while the other prepares wood for the core (the core dryer system).

This project involves optimizing three large motor-driven fan systems in each process line. The first fan system is used to control the combustion air, optimizing combustion and providing heat for the dryers. The second fan system is used to pull the wood chips through the dryer where the moisture in the wood is removed. The last fan system is used to draw the waste air through the wet electrostatic scrubber before it is finally exhausted through the stack.

Recommendations were made to (1) remove all unnecessary elements inhibiting the flow in the system, and (2) make modifications to the system to provide the required performance while reducing energy consumption.

Project Team

Along with Louisiana Pacific staff, the Energy Center of Wisconsin (ECW), Waterloo Air Specialists, and the Wisconsin Public Service (WPS) worked closely on this optimization project. The ECW coordinated the initial studies and the implementation, as well as provided partial project funding. Waterloo Air Specialists performed the more detailed feasibility study culminating in the initial set of recommendations. The WPS provided consulting on energy efficiency improvements, partial project funding, and the team with instrumentation for collecting field power measurements.

The Old System

Originally, some of the process equipment used in the Tomahawk plant was designed and installed in an OSB plant in Colorado. After the equipment was relocated to its current location in Wisconsin, several factors led to the diminished efficiency of the manufacturing systems. The most significant factors were the relative differences in the operating environment between Colorado and Wisconsin, and the regulated dryer cap temperature, as specified by the Wisconsin Department of Natural Resources.

Because the air is thinner in Colorado, fans specified for the OSB plant operated at higher speeds. When the equipment was moved to Wisconsin, the resulting airflow through some of the fans was too high. To correct this problem, dampers were installed to manually reduce the airflow so the equipment could operate correctly. The other major factor causing a reduction in system efficiency was the regulated dryer temperature cap.

Mandated by the Wisconsin Department of Natural Resources, the required lower dryer temperatures necessitated a reduction in the amount of air fed into the combustion process. As a "quick fix", Louisiana Pacific solved this problem by installing dampers in the system to reduce the airflow into the combustor.

Project Implementation

Based on the feasibility study recommendations, modifications were made to the OSB manufacturing process systems. First, the dampers for the combustion air, dryer, and scrubber fans were eliminated or fully opened to remove any components causing the flow through the system to be reduced. Second, the electric fan motors were resized and/or replaced to produce the required flow and pressure without manual obstructions in the system. Third, fan speed was reduced to match the air supplied with demand.

The New System

The following modifications were made to three fan systems on each of the process lines:

Combustion Air Fan System: Removal of the control damper and replacement of the 125-hp electric motor with a 40-hp high efficiency electric motor. Fan speed was also reduced from 2400 rpm to 1400 rpm.

Dryer Induced Draft Fan: Flow damper was fully opened and the 350-hp electric motor was replaced with a 200-hp high efficiency electric motor. Fan speed was also reduced from 1100 rpm to 700 rpm.

Scrubber Induced Draft Fan: Flow damper was fully opened and airflow was controlled by an inlet vane controller. Fan speed was not changed.

Results

An investment of $44,000, which included the cost of the feasibility study, yielded electrical savings of $85,000. With a payback period of 6 months, this project will save an estimated 2.5 million kWh annually—translating into a 40 percent improvement from the base-line annual energy use of 5.7 million kWh.

The modifications to the dryer induced draft fan system contributed 52 percent of the cost savings, the combustion air fan system 31 percent, and the scrubber fan 17 percent.

Energy and Cost Savings

Project Implementation Costs	$44,028
Annual Energy Costs Savings	$85,260
Simple Payback (years)	0.5
Annual Energy Savings (MWh)	2,436,000

Total Annual Emissions Reductions

CO_2	5,432,000 lbs
Carbon Equivalent	1,481,000 lbs
SO_x	27,300 lbs
NO_x	14,100 lbs
PM-10	490 lbs
VOC	100 lbs
CO	970 lbs

Lessons Learned

A number of lessons were learned during the implementation of this project. First, care must be taken when downsizing motors in fan systems. Smaller motors may not have enough starting torque, even though measurements indicate they are powerful enough to handle the regular operating load. Secondly, measuring power factor and using accurate clamp-on instruments is important to determine energy savings. Thirdly, electric motor systems can be optimized by removing unnecessary obstructions in the flow processes, such as dampers, and downsizing electric motors to match the reduced load. These modifications not only reduce the amount of required energy, but also translate into real cost savings.

Industries 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.

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

MOTOR CHALLENGE

Motor Challenge, administered by the Office of Industrial Technologies, is a voluntary partnership program with U.S. industry to promote the use of energy-efficient electric motor systems. Thousands of industrial partners have joined Motor Challenge and are improving their competitiveness and efficiency and, in turn, the Nation's.

Motor Challenge assists the forest products industry and other OIT Industries of the Future by identifying near-term gains in energy efficiency these industries can achieve by adopting existing technologies.

Project Partners

Louisiana Pacific
Tomahawk, WI

Energy Center of Wisconsin
Madison, WI

Waterloo Air Specialists

Wisconsin Public Service
Green Bay, WI

For Additional Information, Please Contact:

The OIT Information Clearinghouse
Phone: (800) 862-2086
Fax: (360) 586-8303
http://www.motor.doe.gov

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

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

OIT

DOE/GO-10099-709
January 1999