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Energy savings in the pulp and paper industry

ID and FD fans performance optimization

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ID and FD fan optimization with a Variable Frequency Drive

A competitive mill demands increased performance and reduced operating costs. Siemens has identified the optimization of boiler fans as a low risk solution to answer this demand. Boilers in the pulp and paper industry have typically been fitted with dampers to control the airflow, while the fans are connected to a constant speed motor and run continuously. The motor is run at 100 percent only for the air flow to be throttled back mechanically. These induced draft (ID) and forced draft (FD) fans that provide the air for combustion have a strategic role in defining boiler efficiency and the accurate control of the air is critical for the combustion process. This mechanical method of control via dampers is inaccurate and slow to respond to changes, often leading to excess air. This excess air lowers boiler efficiency and can affect the level of pollutants in the flue gas. Therefore, the optimization of the air to fuel ratio to create the most efficient combustion is very important.

The introduction of flow (air volume) control by Variable Frequency Drives (VFDs) instead of conventional dampers will increase performance and efficiency of the boiler and save approximately 30% of the energy used by constant speed motors. The Perfect Harmony drives are unique in the market by allowing the use of existing motors and cables in retrofit applications, greatly reducing the install cost and associated downtime. Using a Siemens Perfect Harmony VFD will yield a typical return on invest of one to two years in energy costs alone.

Unique features of the Siemens Perfect Harmony Drive

The inherent design of the Perfect Harmony Drive allows the drive to be simply inserted between the existing starter and motor. With a Siemens VFD, a standard, existing motor can be utilized along with the existing cables, breakers, auxiliary transformers and foundations. All weather enclosures even allow the drive to be placed outside of the electrical room. Additionally, Siemens speed control solutions effectively isolate the motor, eliminating the impact of electrical short circuits, mechanical damage and structural imbalances. This means that the scope of the retrofit solution is substantially smaller compared to competitor options. Typically, project cost is reduced by at least 50%.



- Existing motors and cabling can be used
- All motor types and voltages are supported
- 400 to 43,500 HP
- Very low harmonic input
- 0.95 P.F. at any operating point
- Extensive local service for start-up and support
- Over 3,000 Perfect Harmony Drives installed to date

Siemens is a global leader for medium-voltage drive system solutions and sets the benchmark around the globe. Our market share, depth of application experience and portfolio is unsurpassed.

The Siemens advantage

- Innovative products: Siemens has a unique solution with the Perfect Harmony drive
- Saves you time and money: Only supplier of medium voltage drives that can use existing motors and cables
- Proven solution: Over 3,000 Perfect Harmony medium voltage VFDs installed
- Experienced partner: 160 years of delivering innovative solutions and services for the pulp and paper industry
- Personal contacts: Dedicated pulp and paper team to serve the industry's needs
- Dependable service: Life long support of all our products with local experts

Gaining a competitive advantage with the Siemens Perfect Harmony Drive

VFDs save energy and provide the most efficient and effective method for adjusting ID and FD fans to achieve optimized boiler control. With the Siemens patented six-step regeneration feature, the ability to slow down extremely high inertia loads, even in the case of the largest fans, is assured to happen quickly and properly under full boiler control while saving energy.

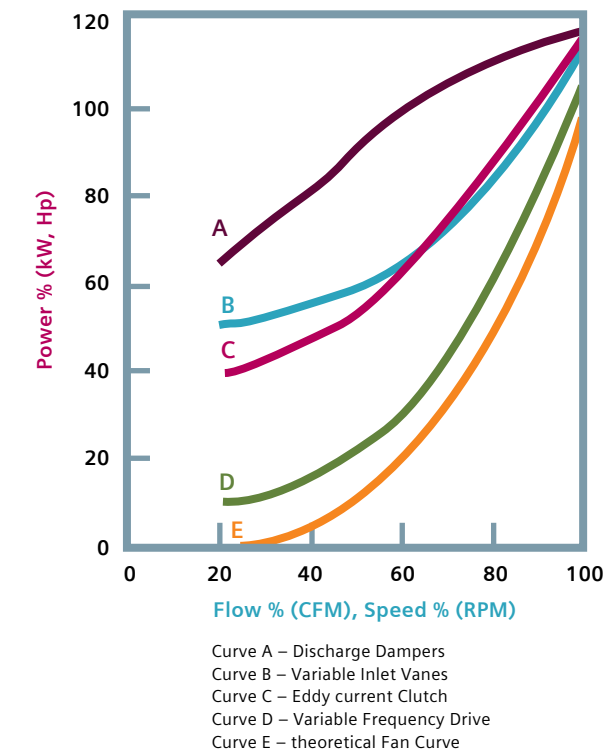
Controlling air flow by reducing the fan speed has the potential to save substantial amounts of energy. This is possible since the power required is proportional to the cube of the shaft speed, while the air flow is directly proportional to the shaft speed. For example, a 1000 hp fan run for 75 percent air flow will only require approximately 422 hp, saving over 50 percent of the original energy consumption (see Exhibit A). This means that to achieve the proposed 30 percent energy savings, the fan will only need to be reduced by 13 percent and be run for 87 percent air flow, which from initial studies, is widely necessary and easily achievable.

The advantage that Siemens offers allows this savings to pay back the investment faster than any other option. This is due to the unique design of the Perfect Harmony Drive that does not require new cabling or motors and can be installed in less than one day.

Benefits seen from the Perfect Harmony Drive

- 30% energy savings
- Return on investment of 1 to 2 years
- Increase in boiler performance and efficiency of up to 10%
- At least 50% lower installation cost than competitors
- Installation completed in one shift

Exhibit A - Power usage comparison



Source: White Paper by Stephen Prachyl, "Variable Frequency Drives and Energy Savings" 2010

