ENVATEC has addressed a major problem for paper producers with its ENVAIR 4000, a sensor and control technology that optimizes DC motor drive operations by simultaneously monitoring and analyzing eight inputs on DC motors. Attributes, such as motor air temperature, speed, vibration, relative humidity, presence of corrosive gases, airflow, and amperage, are measured for irregularities and then a signal is transmitted across the customer's facility on any network interface. This eliminates unscheduled motor shutdowns, thereby cutting energy costs tied to restarting. Based on successful prototype testing, the ENVAIR 4000 promises a 70% reduction in repair and replacement costs, an 80% reduction in unscheduled downtime and pulp waste, and a 43% drop in CO₂ emissions.

By monitoring selected operating attributes of DC motor drives, the ENVAIR 4000 introduces a cost-effective troubleshooting system that increases efficiency while reducing energy consumption and production losses.
Project Description

Goal: The goal of this project is to demonstrate commercially the capability of the ENVAIR 4000 to monitor and improve DC motor performance by dramatically reducing downtime and to provide an equipment failure warning up to 10 weeks prior to the failure of DC motor drive systems.

In conventional paper manufacturing, DC motor systems usually fail without warning. In 1996, such failures led to an estimated nationwide loss of $6.08 \times 10^{12}$ Btu. The ENVAIR 4000 system minimizes this loss through preemptive failure analysis by:

- Monitoring and analyzing eight inputs, including motor speed, vibration, relative humidity, commutator/brush temperature, corrosive gases, airflow, and amperage
- Using a polynomial distributive function to analyze the data from the inputs
- Indicating malfunctions or degradation of performance up to 10 weeks prior to total failure, giving ample time for replacement of parts
- Transmitting any information on abnormal motor functions via radio to a central computer for analysis and alerting appropriate maintenance personnel
- Transmitting monitored information over the Internet to other facilities to serve as a heads up for potential problems utilizing the same monitoring technology on other DC motor drives.

ENVATEC is demonstrating this new technology with assistance from the Maine Department of Economic and Community Development and the NICE³ Program in the Department of Energy’s Office of Industrial Technologies.

Progress and Milestones

Tasks to be conducted under the NICE³ grant for ENVATEC include:

- Development, field testing, and implementation of a manual tracking system
- Design, construction, and pilot testing of polynomial analysis structure
- Construction of ENVAIR 4000 prototypes
- Testing of the DC Motor Drive
- Pilot testing of the polynomial analysis structure and artificial intelligence (LCPD) between JAVA computers
- Installing ENVAIR 4000 units at demonstration site
- Implementation of communication and artificial intelligence capabilities between two demonstration sites.

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

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