Pending deregulation of the electric utility industry presents new challenges for companies. Southern Company, originally a single source provider, saw the trend toward competition and decided to take a proactive stance.

Its goal is to be the most reliable low-cost producer. "The keys to achieving a competitive advantage are reliability and lower capital and operatingmaintenance costs," says Ed Holland, vice president of generation and transmission for Gulf Power. Randy Jones, senior engineer, explains, "We strive to use the lowest-cost equipment to satisfy demand at all times. All our plants must be as reliable as possible so that we have the flexibility to operate the plants that satisfy demand at the lowest possible cost. We needed the ability to monitor equipment, determine repair needs in advance and then plan maintenance only when needed and preferably when demand for electricity is low."

Southern Company supplies energy to a 120,000 sq mi service territory spanning most of Georgia and Alabama, southeastern Mississippi, and the panhandle region of Florida. It is the parent firm of five electric utilities--Alabama Power, Georgia Power, Gulf Power, Mississippi Power, and Savannah Electric.

Around 1991, Southern Company deployed a task force to look at how it conducted business and to compare the company with the best practices of other utilities and industries. The task force identified predictive maintenance as one of its top four priorities. Several plants quickly embraced the technology as a means to achieve their goals. Based on this positive response and to realize the maximum benefits, the task force sought a unified approach to predictive maintenance. It recommended standards for the company that have resulted in significant savings and benefits for each plant and for the company as a whole.

As a result of the recommendations, Southern Company established a two-year pilot program to apply predictive maintenance best practices, investigate technologies, and develop cost-effective implementation approaches. The group selected the Entek IRD Emonitor for Windows and Motormonitor software as company standards for vibration analysis and motor current signature analysis.

Company-wide monitoring

Today, Southern Company uses the software at 20 sites, 17 of which are connected via a wide

area network. Jones adds, "At some sites, we also interface our oil analysis data into the database so that we can analyze all condition-based monitoring information for a piece of equipment on one screen. We get a complete picture of equipment performance, so that we can diagnose negative trends and potential problems.

Individual Plant Results From Condition-Based Maintenance

- $1 million savings and avoided costs across five-site pilot program
- Reduced planned outage maintenance hours 54 percent
- Reduced costs of oil changes by$70,000 in 6 months
- Saved over $400,000 in maintenance deferrals and avoided failures in first year of condition-based
- Vibration analysis saved $4,000 in annual electric charges for one 200 HP service water pump
- Reduced system costs by using a wide area network implementation
- Reduced start-up and training costs
- Improved communication and equipment trouble shooting across plants

The wide area network has also allowed Southern Company to implement its condition-based monitoring program effectively. "We have implemented 20 sites for about the cost of four stand-alone plants," estimates Jones. ìNot only do we get the benefits of integrating all sites which facilitates communication, but we also reduce our systems costs significantly.

According to Holland, "The general impact of condition-based maintenance is that it makes us more effective at identifying and planning required maintenance." Jones adds, "In slightly more than one year, potential savings and avoided costs of about $1 million resulted from deferring planned maintenance on healthy machines and from identifying problems in time to schedule repairs and avoid equipment failures.

Eliminating preventive maintenance

Condition-based maintenance has had a significant impact on our philosophy toward preventive maintenance," says Holland. "In areas where we have implemented condition-based maintenance, we have virtually eliminated the need for time-based maintenance." Jones continues, "Instead, we collect vibration and motor current signature data, take oil samples, perform infrared scans, record bearing temperatures and other operating parameters, and make a visual inspection. If the equipment is running fine, then we don't perform any work. If a problem is detected, we plan and schedule the required maintenance. This saves us a lot of money and time, as it allows us to plan required maintenance only as it is needed."

For example, time-based preventive maintenance has been eliminated for major plant fans.

Technicians now rely on vibration, oil, motor current, and temperature analysis techniques to determine which gearboxes and motors to change. In one planned plant outage, this saved 340 man-hours because fans did not have to be individually tested because of condition-based monitoring. Jones states, "That's a tremendous savings in man-hours and wear and tear on perfectly good bearings compared to our traditional time-based processes."

Reduced costs, improved reliability

Predictions of a more competitive environment have forced the company to reduce costs and personnel. Condition-based maintenance processes allow the company to run more effectively and to use the work force in other areas of importance. According to Jones, "In one of our plants, staffing levels have been reduced by 30 percent in five years. We are performing the same amount of work, if not more, but we are able to do it with fewer people. These reductions are fairly typical for many of our plants."

Jones cites a few examples of where condition-based maintenance has paid off:

- Oil changes reduced. At a single plant, $70,000 has been saved on oil changes in 6 months. All changes are now performed based on the condition of the lubricant and the machine. Oil analysis is performed onsite using a desktop analyzer for quick and accurate results.
- Rapid return on investment. During its first year of operation, the predictive maintenance team at one plant documented more than $400,000 in maintenance deferrals and failure avoidance. This was slightly more than the salaries and overhead for the predictive maintenance team personnel, as well as the program start-up costs of analyzers, hardware, software, and computers. Future benefits are expected to be even greater.
- Equipment efficiency improved. Following an upward trend in axial vibration, a service water pump alignment was checked. Laser alignment took less than 1.5 hours. Vibration was reduced, equipment operation was improved, and electrical requirements of the motor were reduced, resulting in annual station electrical savings of $4,000.

Improved communication

Jones says, "While each plant has implemented its predictive maintenance program in the way that works best for it, the cooperation between plants allows our predictive maintenance processes to be successful in a way that we don't think would have been possible otherwise. We have seen benefits through the efficient use and sharing of company resources to reduce costs and increase effectiveness. The idea is if one part of our company knows something that will make us more effective, then every part should know.

"Since we can easily share information between locations, it is very simple to set up a new machine if there is a similar machine at another plant. We have also found it useful for two or more people at different company locations to be able to work together in solving a difficult problem. With the network installation, technicians from various plants can look at the same data as they discuss possible causes and solutions over the telephone."

In addition, information sharing has resulted in the acceleration of implementations, as well as formal standards based on what is working well at other locations. Another benefit of unified efforts is effective training. "Since most locations are using common software, hardware, and processes, we have enough interest to host in-house training courses on many predictive maintenance subjects," notes Jones. "We tailor the classes to our issues and topics and also save money on travel and expenses."

The predictive maintenance efforts at Southern Company are benefiting from the cooperative efforts across the entire company. By approaching predictive maintenance and other areas as one company with common goals, Southern Company is realizing benefits that would have been much harder and more expensive to achieve through individual efforts. **MT**

Information supplied by Entek IRD, Milford, OH (513) 576-6151.