

Increase in reliability supports 13% year-to-year growth in productivity



Strong Predictive Maintenance Program

Boosts UPTIME

to Meet Growing Demand for Recycled Papers

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As the only paper mill in North America dedicated to producing coated mechanical printing papers made from nearly 100 percent recycled materials, FutureMark Paper Company is in the enviable position of having just what customers want – environmentally-friendly products that meet high print-quality standards for magazines, books, catalogs and advertising flyers.

In fact, customer demand was so great that our one paper machine was hard pressed to keep up. We had to turn some customers away, which meant the company was essentially leaving money on the table.

To meet the growing demand for high-recycled printing paper, our plant in Alsip, Illinois, was under pressure to increase production. Investing in additional capacity was not in our budget; the mill had already invested more than \$250 million on equipment and processes over the past decade. Instead, the production increase we sought would have to come from boosting our manufacturing efficiency.

In the summer of 2009, FutureMark Paper embarked on a program to improve the time efficiency of our paper machine, i.e., the amount of time we were actually able to make paper. This meant not only improving overall manufacturing performance, but also minimizing unscheduled machine downtime. At that time, FutureMark’s maintenance was almost totally reactive, as the work-

ers went from one emergency situation to the next “putting out fires,” but never able to sustain planned maintenance for any prolonged period.

Recognizing a need for specialized maintenance expertise, mill management contracted with Emerson Process Management’s Asset Optimization Services in Nashville, Tennessee, to utilize technology as a means of “predicting” potential failures. Several factors drove the decision to use an outside source rather than develop in-house expertise:

- The time and cost to equip and develop in-house personnel in specialized disciplines, such as vibration analysis, were beyond our budget and would have delayed the start time for a much-needed reliability program by six months or more.
- Vibration signatures are not fully useful without an extensive database documenting observed changes in the vibration signature leading up to failures. We would have had to suffer many failures to build a sufficient history, whereas this knowledge base already existed.
- We were able to combine and enhance the coverage of several preventive maintenance contractors into a single contract, enabling us to get better service for a lower overall cost.

For these reasons, an Emerson employee was assigned full time as an on-site asset manager with instructions to implement a predictive maintenance program based on analyzing vibration data collected from rotating equipment throughout the mill.

The vibration level at thousands of points is measured monthly using a portable analyzer and the daily results are uploaded to a machinery managing software program. The monitoring program now encompasses about 800 pieces of equipment from

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pumps, compressors, agitators and rolling drums to hundreds of bearings on paper machine rolls.

This software provides the basis for our predictive maintenance program, which is largely responsible for early identification of mechanical faults so corrective action can be taken to avoid machinery failures. As a result, we've seen a 6.8 percent increase in time efficiency on the paper machine and the impact on productivity has been amazing. During the first six months of 2011, we recorded a production increase of 13 percent versus the same six-month period in 2010 with no change of equipment. This productivity boost means FutureMark Paper is now able to meet higher aggregate demand for our high-recycled paper products, and that translates into millions of dollars in additional revenue.

The key to this exceptional about-face, we believe, is technology that enables us to "see into the future" by an on-site asset manager who fits neatly into our organization, working closely with mill management and supervisory personnel. The asset manager provides a variety of reliability services, but they didn't materialize overnight. First, the entire asset database had to be restructured, including a number of pieces of equipment not previously monitored for excessive vibration. Additional resources were brought in to do motor current evaluations and establish vibration signatures on every piece of rotating equipment. These became baselines against which to make predictions using advanced vibration analysis.

The on-site asset manager now spends about 3 1/2 weeks each month gathering data, giving us a unique perspective on every critical point in the mill. By using this information to track trends, it can be predicted how long an asset should continue to run and perform well. The asset manager issues a monthly exception report listing five to 20 pieces of equipment that need attention because of abnormal vibration levels. The maintenance department uses this information to *prioritize and plan* work in order to prevent failures and avoid those debilitating shutdowns.


In case of a rapidly developing fault, the asset manager is free to go straight to any supervisor in any area and discuss the situation. The asset manager is also empowered to initiate immediate action if a failure is highly likely and may happen soon. With more than 800 pieces of machinery being monitored, this actually occurs quite frequently, giving managers time to formulate a plan of action to prevent costly shutdowns.

For example, not long ago, plant personnel noticed severe vibration near a drum pulper, which is a very large rotating cylinder that sits on 10 rollers. Recycled materials go up a conveyor and drop into this machine, where unwanted debris is removed and water is added to begin the pulping process. The floor was shaking, but we didn't know the root cause of the problem or how long it would be before something broke. A one-time, shaft speed abnormal frequency was identified as coming from a specific roller, so we knew exactly where to look. The machine was shut down long enough to make a visual inspection, and after removing the protective shielding, we could see that a piece of metal had broken off the roller and was scraping against the outer surface of the drum. Obviously, the roller had to be changed, but we knew this situation would not cause the machine to stop running. A decision was made to restart the drum and continue to operate until a planned shutdown in about a month. The faulty roller was eventually replaced and the drum restarted with no difficulty.

Issues like that are common, so the ability to control a potential failure is priceless. We're normally able to make timely repairs based on *knowledge*, not guesswork, to avoid unplanned downtime.

On the other hand, in an extreme situation, we will react immediately because a short-term stoppage is better than running all-out into a catastrophic breakdown. It's all about being able to quickly and accurately identify a problem and get to the root cause so it can be fixed once and for all.

Being proactive rather than reactive has meant a great deal to FutureMark. Our efficiency, all our critical factors and our productivity continue to improve.



Predictive maintenance is an effective solution based on technology that delivers actionable information which allows us to prioritize maintenance activities.



Other technologies are also employed to help save money. For example, air leak surveys using an ultrasonic measuring device frequently spot pressurized air system leaks that cannot be heard in the noisy mill, but are the sound of wasted energy. Leaks found in this way are mapped and prioritized, so maintenance crews know exactly where to go to make repairs that will save the most money. In fact, 115 leaks have been identified and fixed since this program's inception. We know this has reduced the load on two very large air compressors and had a direct impact on energy savings. The amount of wear and tear on the equipment has been reduced as well.

In addition, thermographic surveys help locate "hot spots" that indicate a potential mechanical failure, wasted energy, or both. Motor current analyses can reveal loose electrical connections or a motor going bad. The use of these technologies has also prevented unexpected downtime and saved money on repairs and lost energy.

Being proactive rather than reactive has meant a great deal to FutureMark. Our efficiency, all our critical factors and our productivity continue to improve. The on-site asset manager understands the operation of this mill, responds when necessary and works very well with our personnel. It's a great partnership.

We are now able to run the paper machine the way we want to run it as opposed to reacting to the needs of the machine. It's not just uptime; we now have much greater operating flexibility and have even been able to use our higher production capacity to develop a whole new product line. Our new high-recycled coated book paper has been greeted enthusiastically by a number of book publishers and their customers.

Recycled paper and predictive maintenance are both ideas whose time has come.



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