

Enzymatic Technology: The Leading Edge

Your guide to gaining a competitive advantage in pulp and paper.

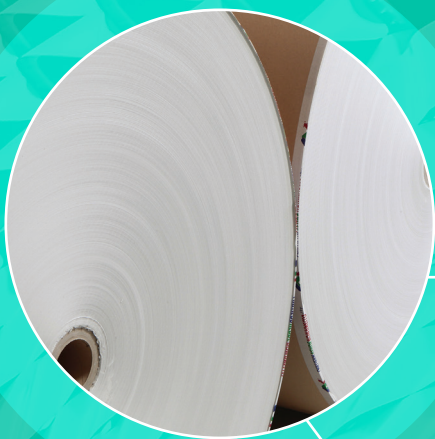


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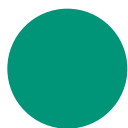
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INTRO

ENZYMATIC TECHNOLOGIES:

They aren't "what's next." They're "what's now."

Perhaps you are resistant to change. Worried about the cost of transitioning to new technologies. Or just worried about the nature of enzymes themselves. These are perfectly reasonable positions to take until you learn the facts about enzymes and enzymatic technologies.

This eBook is for anyone working in the pulp, paper, tissue or packaging industries who may be interested in trying new technology or maybe already has.

In this mini book you will learn what enzymes are, their successes and what they can do for you. You'll be able to use this information in your journey to achieve higher product quality, lower manufacturing cost and reduced energy consumption.

Continue reading to see some common questions and straightforward answers about enzymes, enzymatic technologies, and the impact they can have on your mill's long-term success.

CHAPTER 1

WHAT ARE ENZYMES?

Enzymes are naturally occurring, protein-based molecules that catalyze – accelerate – the various chemical reactions in all living things. Enzymes are true catalysts in that they are not consumed in the reaction, and each enzyme molecule can catalyze thousands upon thousands of reactions per second.

Enzymes are very specific to the reaction that they drive; each type of enzyme does one thing and one thing only. That makes them especially effective tools for achieving specific results in such diverse processes as fiber refining and stickies reduction.



CHAPTER 2

HOW LONG HAVE THEY BEEN AROUND?

Forever. Thousands of years ago, long before man knew what enzymes were, we were applying dung to animal hides. We didn't know why or how, but chemical reactions took place to condition the hides and give them the properties we needed for clothing and shelter. These reactions were caused by enzymes. It was all natural and extremely effective.

Today, the power of enzymes is all around us. We know a lot about enzymes now. About how they work and what they can do for us. And we've come to recognize that they can help us make products that are often superior to conventional chemistry.



Enzymes

are all around us

Enzymes are used to make:

- Laundry detergent more effective
- Animal feed more digestible
- Papermaking more sustainable
- Blue jeans "stone washed" / textiles
- Beer, wine
- Sweeteners (starch into sugar)
- Biodegradable plastics
- Bioethanol

CHAPTER 3

WHY ARE ENZYMATIC TECHNOLOGIES BETTER?

While most commercial chemicals can be effective, they can also be nonspecific in their action, meaning they can have many more effects than the one we intend. They can also require high temperatures or pressures and can lead to high energy use and undesirable byproducts.

Enzymes, on the other hand, are specific. They can be selected and used to do a particular task without unintended side effects. They create high reaction rates even in small amounts and are easier to control, making them very efficient. And because they are derived from natural sources, they are a much more sustainable option than most conventional chemicals.

With thousands of different enzymes to choose from, each with its own specific action, there are an equal number of opportunities to apply them in innovative ways to improve products and manufacturing processes.

CHAPTER 4

HOW DO ENZYMATIC TECHNOLOGIES IMPROVE PULP, PAPER, PACKAGING AND TISSUE PRODUCTION?

Here are a few areas where enzymatic technologies are superior to conventional chemistries and the benefits you can expect:

Production Enzymatic technologies can improve the efficiency and productivity of your mill, giving you the ability to:

- Improve drainage
- Reduce starch use
- Save energy and reduce CO₂ emissions
- Run at faster machine speeds
- Reduce dusting
- Improve porosity
- Reduce vessel picking

Fiber Conditioning Enzymatic solutions condition fibers more efficiently than conventional methods, helping to preserve the strength of the fiber and enhance its performance. This can allow mills to:

- Reduce refining energy—conserve resources, reduce costs and preserve the integrity of the fiber
- Improve tissue, paper and packaging strength
- Improve tissue softness
- Use less expensive fiber and still achieve target results
- Improve weight-to-strength ratio

Reducing Refiner Energy in a Packaging and Bleached Board Mill	
The Challenge:	A mill was using four refiners at maximum energy input with little room for controlling stock parameters (freeness, breaking length, etc.).
The Solution:	While the machine was producing Kraft Liner Board grades, three trials were run using Maximize [®] enzymatic fiber modification technology with goals of reducing refiner energy and eliminating the need for one of the four refiners.
The Return:	After the trials, the solution made it possible to take one of the four refiners off, resulting in a 26% reduction in refiner energy, a 25% reduction in the use of wet strength resin, and an overall ROI of \$10,000 per year.

HOW DO ENZYMATIC TECHNOLOGIES IMPROVE PULP, PAPER, PACKAGING AND TISSUE PRODUCTION?

Stickies Control

Enzymatic technology can efficiently break the bonds of glues and pitch to keep them out of your process and away from your equipment and your finished sheet. Enzymatic solutions for stickies control can help your mill:

- Reduce breaks and paper losses
- Increase machine speeds and production
- Improve deinking
- Improve heat transfer on dryer surfaces to reduce energy costs
- Reduce fiber consumption
- Replace solvents high in VOCs

STICKIES CONTROL CASE STUDY:

A mill making Kraft liner wanted to decrease the cost of its stickies and pitch program and reduce the number of breaks. Buckman applied Optimize® Plus at the tower inlet where short fiber and recycled fiber mixed. As a result, paper machine production increased by 11% in one machine and 9.8% in another. Costs were significantly reduced, and the mill saw an ROI of \$870,000/year.

Pulp Brightness

Enzymatic solutions are available for your pre-bleaching and post-bleaching needs. In pre-bleaching, specially selected enzymes work to make Kraft fibers more receptive to bleach, helping your mill achieve a higher final brightness without additional stages or equipment and with far less chlorine dioxide. In post-bleaching, specific enzymes are used to safely remove chromophores in bleached pulp, helping you achieve brightness targets and significantly reduce reversion while reducing or even eliminating the expense of optical brighteners and other bleaching chemicals. Enzymatic solutions for pulp brightness help your mill:

- Improve effluent
- Save money
- Reduce ClO_2
- Make food-safe products
- Improve production

PULP BRIGHTNESS CASE STUDY:

A bleached eucalyptus Kraft mill had a reversion problem that was keeping them from reaching their 88 brightness target. Using Vybrant®, the mill was able to obtain a 1.0 ISO final brightness gain after a reversion test. The mill saved 1.5 kg/ADMT of peroxide and reduced chlorine dioxide use by 6%.

Deposit Control and Boilout Programs

Enzymatic deposit control and boilout programs use highly effective natural enzymes and other low-risk ingredients to keep paper machines clean and running at their optimum level, while reducing risks to people and planet. Enzymatic deposit control can help your mill:

- Reduce slime to keep machines cleaner
- Reduce shutdowns for washups
- Reduce the use of biocides
- Improve pitch control
- Reduce sheet defects
- Increase runnability and tonnage

DEPOSIT CONTROL CASE STUDY:

A fine paper mill using softwood and hard-wood Kraft furnish had a problem with starch deposits in its size press system. After replacing their caustic boilout with Buckman's enzymatic boilout program, the mill saw a quick and complete removal of starch deposits.

CHAPTER 5

WHAT ABOUT STORAGE AND SHELF LIFE?

Advancements in stabilization have increased the shelf life of enzymatic technologies to months or even years without cold storage. This longevity, coupled with the fact that enzymatic solutions take up less space and contribute to safer working conditions, make them extremely practical and an easy choice for many mills.

The cost of a typical enzymatic product is comparable to the cost of products that utilize conventional chemistries. The economic impact, however, can be quite different.

- Trials with enzymatic technologies have shown a ClO_2 reduction by as much as 18%.
- Eliminating the use of chemical treatments during production has led to safer working conditions.
- With smaller dosages and more control, enzymes require less time and energy.

These result in an improved Return on Investment (ROI) and Return on Environment (ROE).

DO ENZYMATIC PRODUCTS COST MORE?

CONCLUSION

ENZYMATIC TECHNOLOGIES FROM BUCKMAN—PAPER'S LEADING EDGE.

Would you like to learn more about enzymatic solutions developed specifically for the pulp and paper industry?

As the global leader in enzymatic technologies, Buckman is uniquely qualified to help you enter the enzyme age. Our Maximize[®] line for fiber conditioning, Optimize[®] line for stickies control, Vybrant[®] technologies for pulp brightness and Buzyme[®] products for deposit control can give your mill a competitive advantage that will keep you on the leading edge of pulp and papermaking.

Contact a Buckman representative for more information or visit buckman.com to find out more about our company and our solutions.

We look forward to seeing you on the leading edge!