INTERNATIONAL MAGAZINE AND WEBSITE ON TISSUE PAPER MACHINERY AND TECHNOLOGY

TissueMAG

This issue is distributed to Tissue Paper Mills and Tissue Converters in **Europe, Middle East, Africa + bonus countries**

www.tissuemag.com

MAY 2023

Safer and more sustainable broke repulping for towel operations

By: Mark Christopher, Global Market Manager Tissue, Buckman

Towel products account for approximately 20% of all global tissue production. The production and converting of this towel inevitability result in a significant amount of waste that tissue makers need to recycle back into their process as opposed to sending to landfill. The key property of the towel is, of course, its ability to wipe up wet spills, which requires it to maintain its strength, and thereby its very structure, while wet. This property is endowed with the use of polyamide epichlorohydrin (PAE) resins. As might be expected, the very thing which renders its strength in use, inhibits its re-use, since it will resist breaking down into individual fibers that can be effectively re-used in the tissuemaking process.

For the longest time, the industry has relied on the oxidative power of hypochlorite (OCL^-) to break down wet strength paper so that it could be recycled into the process. The hypochlorite oxidant functions by cleaving the polyamide backbone of the wet strength that holds the sheet structure together when wet. Unfortunately, hypochlorite and the caustic soda it is typically used with both have serious drawbacks for tissue makers related to operator safe handling due to their NFPA health rating of 3. Furthermore, the residual hypochlorite remaining in the stock after its repulping must be neutralized in order to prevent the oxidation of other chemistries, damage to machine clothing and increased potential for corrosion. In the end, the pulper mix used has disadvantages that tissue makers are familiar with.

Disadvantages of hypochlorite to break down wet strength towel:

- Causes alkaline yellowing of fibers.
- Has a negative impact on Yankee coating performance.
- Increases conductivity.
- Contains hazardous materials.
- Requires neutralization.
- Can cause metal corrosion.
- Contributes to AOX in the effluent.

> “Buckman can help you improve both the **quality** of your tissue and the **efficiency** of your operation”

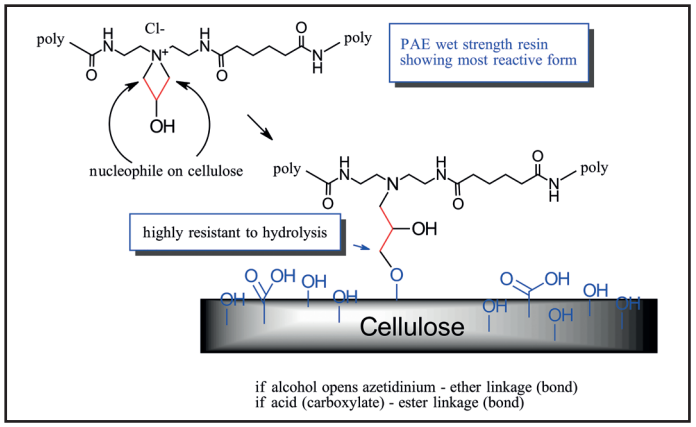
The specialty chemistry industry has devoted years of R&D manpower to finding a more efficient and less onerous way to break down the PAE linkages in towel with limited success. Less aggressive oxidative materials like persulfates have been used with some success but at the expense of increased time and cost while still presenting their own safe handling and neutralization requirements. There was a need for a truly safe and effective approach, and development would require a completely different approach if it was to be successful. It was time to stop trying to solve this problem by attacking the polyamide backbone itself.

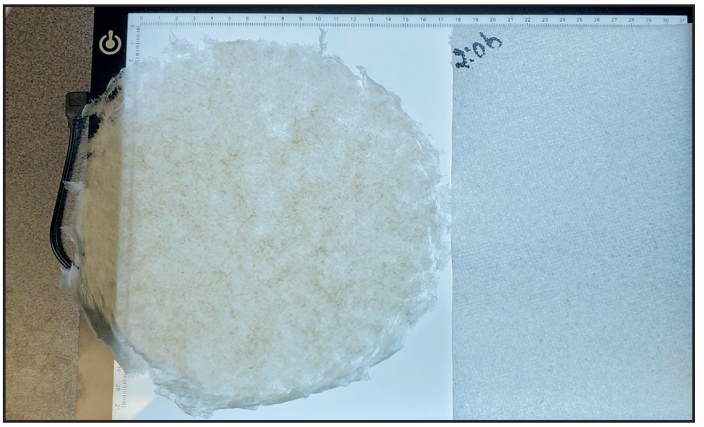
“Do not engage an enemy more powerful than you. And if it is unavoidable and you do have to engage, then make sure you engage it on your terms, not on your enemy’s terms.” ~ Sun Tzu.

With fiber modification enzymes, cellulases having been accepted as commonplace for strength development in tissue; they were an obvious potential technology to solve the wet strength broke problem.

CASE HISTORY *VS* MONOPERSULFATE

Process conditions	Chemistry changes	Mill benefits
pH reduced from 10.5 to 7.5 Temperature 35-40 ºC	Eliminated monopersulfate and caustic addition Maximyze® 3511 added at 0.5 kg/ton of high wet broke into pulper	Reduced chemical spend of over $10.00 USD per ton of broke Reduced pulper time by 30 mins Total ROI of over $100,000 USD/annum Increased strength of broke pulp





▲Picture of hand sheet and production towel made from enzyme repulped towel broke.

It sufficed to identify the right cellulases that would target the cellulose fibrils to which the polyamide resins were attached. In this way, the bonding sites of the resins and not the resin itself, could be attacked. Eventually, scientific inquiry began to elucidate a specific set of cellulases that can target the cellulosic structure around the wet strength bond. They were successful at cleaving the portion of the fiber linked to the wet strength of the fiber and breaking the linkage network that provides the wet tensile. Using this approach, wet strength broke can be repulped at ambient temperatures, without acids or caustic additives and does not require any neutralization step prior to use. Products like the commercially available Maximyze® 3511 do not have the safe handling concerns associated with the oxidants, acids and caustics and are fed at very low addition levels. These newer enzymes also maintain excellent activity at the typical tissue mill process temperatures so that additional steam heating of the broke pulper is not needed. The result is an approach that is greener, safer for operators, simpler to use and highly effective. ●

BUCKMAN

1256 N. McLean Blvd. - Memphis, TN 38108 USA

- **website:** www.buckman.com
- **phone:** 1-901 278-0330
- **contact person:** Mark Christopher, Global Market Manager Tissue
- **email:** mchristopher@buckman.com