

Methods for generating strength in tissue

When it comes to creating strength in your tissue base sheet, all strength is not created equal.

Tissue makers face unique challenges and demands related to their product quality requirements.

These demands make traditional strength improvement approaches like refining and DSR, borrowed from the flat sheet industry, problematic.

Click on the challenges below to learn more about creating strength efficiently.



Challenge #1

Unintended consequences of refining

When strength is needed, it's common practice to turn to refining. It's a reasonable stance to take. Operators need to make specification or risk rejected production. Increasing refining will get the tissue to its desired tensile, but it causes downstream negatives that cannot be recovered and cascades into problems that must be managed at extra cost.

That's because driving more and more fibrillation via increased intensity of mechanical refining results in more and more fiber cutting, too.

Fiber cutting results in reduced fiber length, increased fines, reduced tear, sheet breaks, densification that suppresses absorbency and bulk, increased stiffness and drying requirements, as well as increased dusting and fines, which could cause fires.

As a result, tissue makers spend more money to remedy these issues by using more long fiber or dry strength resin, slowing reel speeds, changing blades, increasing basis weight, over-sheeting, increasing cleanups and adding retention programs.

The Solution:

Modify fibers without increased refining

You want to attain maximum fibrillation without fiber cutting and fines creation. By using Buckman's Maximyze® technology, you'll be well equipped to make this happen.

Maximyze works at the molecular level to sculpt the fiber, allowing for fibrillation of the fiber at lower refining energy. This results in more hydrogen bonding sites without creating fines via fiber cutting.

With Maximyze you could get the strength you need without the negative side effects associated with extra refining. You wouldn't be creating fines, so bulk and absorbency would be preserved, and dust would not be created. You could avoid stiffening the sheet and adding to wet-end complexity. The result would be that your costs, and even your CO₂ footprint, would be reduced.

Maximyze is more gentle on your fibers than refining.

Get the tensile you need without fiber cutting and fines.

Same strength, fewer negative consequences.

When you use Buckman's Maximyze technology, it's possible.



Reduce customer complaints about dust and reduce your risk of operational fires



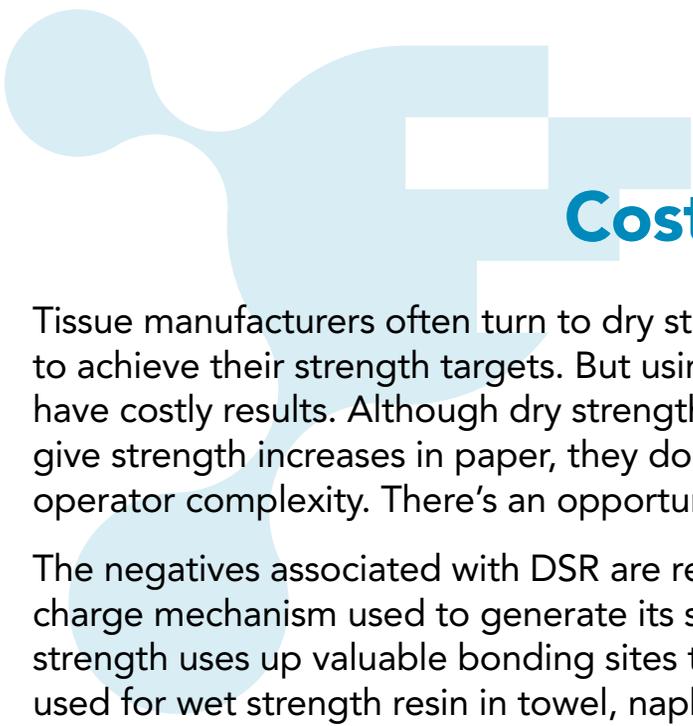
Get better drainage and drying with improved bulk and absorbency



Change your fiber mix to reduce softwood or increase recycled fiber



Leverage bulk to reduce basis weight, eliminate over-sheeting, reduce crepe ratio or make a higher quality product



Challenge #2

Costs associated with DSR

Tissue manufacturers often turn to dry strength resin to achieve their strength targets. But using DSR can have costly results. Although dry strength resins can give strength increases in paper, they do add cost and operator complexity. There's an opportunity cost, too.

The negatives associated with DSR are related to the charge mechanism used to generate its strength. Dry strength uses up valuable bonding sites that could be used for wet strength resin in towel, napkin and facial grades. DSR's affinity for fabrics can cause felt filling, which is a headache for operators to deal with.

As the wet end charge demand changes due to variable pulp quality, the DSR performance changes, too, and must be adjusted, again requiring operator intervention. This increases operator complexity.

Also, DSR bonds are significantly stronger than hydrogen bonds. Creating these stronger bonds reduces sheet flexibility and increases stiffness. A sheet at a given tensile using hydrogen bonding will be more flexible than one using a combination of hydrogen bonding and the ionic and covalent bonds of dry strength.

The Solution:

Increase strength, efficiency and potential—simultaneously

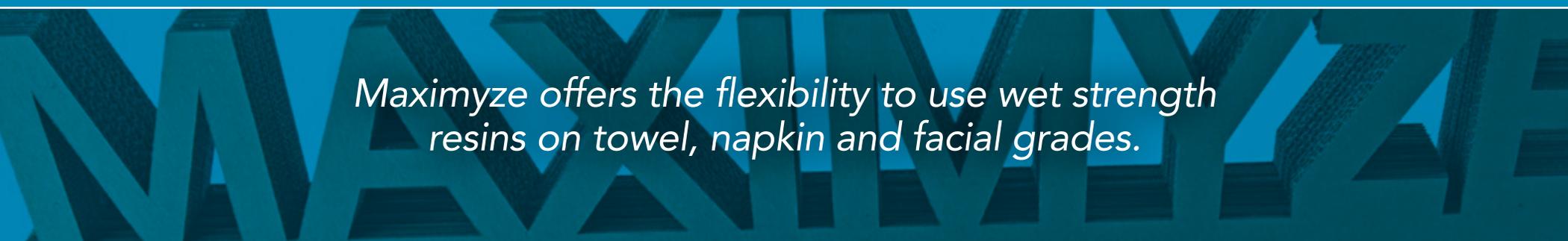


You want to make strong tissue without the costly results of using dry strength resins. Maximize[®] fiber modification enzyme can deliver the strength you need without these negative consequences.

Maximize is non-ionic, so it does not compete with other chemistry for bonding sites on the fiber. It is not

impacted by the continually changing wet end charge demand conditions.

Maximize does not have any affinity for tissue machine fabrics, so it doesn't cause felt filling. Also, it does not contribute to microbiological loading like starches.



Maximize offers the flexibility to use wet strength resins on towel, napkin and facial grades.

Get the strength you need and the results you want.

Same strength, fewer negative consequences.

When you use Buckman's Maximize technology, it's possible.



Reduce costs and operator complexity



Free up more bonding sites for other functional chemistries



Avoid felt filling and charge imbalances



Eliminate sheet stiffness



Approximately **83% of respondents** said they felt it was **"important or extremely important"** that companies design their products to be more environmentally friendly.¹

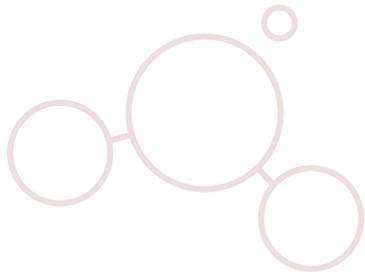


Challenge #3

Energy costs associated with refining

Energy is a main cost driver in manufacturing tissue. Over the last decade tissue manufacturers have been placed under increasing pressure to reduce energy consumption and subsequently their carbon footprint.

The refiner's electrical load on a modern tissue machine can be up to 33% of the total machine draw. Refining is a significant electrical cost driver in areas with high energy costs, and energy costs are politically driven to increase over the next decade.



The Solution:

Achieve maximum fibrillation at minimum refining energy

Tissue makers want to use the least amount of refining energy in order to meet their strength targets. By using Buckman's Maximize[®] technology, you'll be well equipped to make this happen.

Maximize enzymatic technology allows tissue manufacturers to achieve tensile targets while reducing energy consumption.

Reduced refining energy then plays a positive impact in improved drainage, and subsequent advantages can be taken here in reduced Yankee/hood energy while maintaining speed or taking the drying capacity to increase productivity, which then reduces the kWh/ton figure.

Maximize technology offers maximum fibrillation and strength.

Headline here? (to be parallel with other sections)

Same strength, lower energy costs. When you use Buckman's Maximize technology, it's possible. With Buckman, you could substantially reduce your energy costs and carbon footprint.



Achieve your strength target



Improve drainage



Reduce Yankee/hood energy



Increase caliper/bulk with less refining

Challenge #4

Evaluating suppliers for fiber modification enzymes

Early on there were very few suppliers of FME to the tissue industry. As more and more enzyme companies started to produce cellulase for the textile industry market, they offered a generic product to companies wanting to resell it in other niche markets.

Because of this, companies of various sizes are selling cellulase-based products. Very few have knowledge of tissue making and the pitfalls that accompany using the wrong product.

Trials often fail due to lack of knowledge and experience in how to apply enzymes in the tissue

making process. This uses valuable resources and creates resistance to change. Enzymes are highly specific substrates that must be chosen based on the fiber source and process conditions, but few suppliers have this capability.

Poorly formulated products lose activity quickly once applied into the process or even prior to application, reducing effectiveness and increasing cost of application. Many suppliers cannot measure whether the enzyme is active in the bin, much less in the process.

The Solution:

Choose a supplier that is unlike any other

You want a supplier with expertise in enzymes and in tissue making. Buckman is the market leader in fiber modification enzymes for tissue. We are basic in enzyme expression, characterization and formulation. We have been developing and applying enzymes in the tissue industry since the 90s. Technical capabilities have progressed from simple enzymes towards formulated packages that provide cost effectiveness through stabilization, fiber affinity and improved performance.

Our novel Fiberlytics™ provides insight into fiber surface changes and predictions of final sheet strength based

on crystalline vs amorphous ratio of cellulose and hemicellulose content. This allows Buckman to quantify which enzymes work best in which furnishes to ensure product selection is optimal, and we have right first-time success.

These scientific core competencies needed to be developed in order to solve the negative WSR interaction problem so that the industry could use Maximize to its advantage across all grades.

The on-site enzyme activity monitoring test we developed is an industry first that takes the guess work out of the application.

Maximize offers a combination of enzymes, potentiators and a stabilization package for maximum effectiveness.

Third Generation Maximize is not like other products.

Performance and sustainability. When you use Buckman's Maximize technology, it's possible. You can depend on Buckman's experience with enzymes and tissue making expertise.



Get a stable, high performance enzyme designed for your furnish mix



Have it applied in the right manner



Be supported with monitoring capability that tracks enzyme activity



Apply the enzyme on all tissue grades, including those using WSR

Interested in learning more?
Then [visit us online](#) to get started.



1. Most Consumers Want Sustainable Products and Packaging, Andrew Martins, Business News Daily, June 4, 2019

© 2020 Buckman Laboratories International, Inc. All rights reserved.