

Renewable agricultural seed fibers strengthen tissue, lower cost

In response to manufacturers' demands for creating softer-yet-stronger tissue without raising costs, researchers have turned to renewable agricultural seed fibers as a solution. Taking a closer look at this solution reveals a process that is both economically advantageous and earth friendly.

Historically, lower sheet strength is one issue many tissue makers run into – lower sheet strength typically leads to production losses (due to wet web breaks and breaks during creping, reeling and converting operations) and lower quality of the finished product. As more and more tissue makers are turning to recycled fibers to reduce their fiber costs, the resulting lower strength of the sheet is further impacting their operations and products. However, remedying the situation by adding more chemicals to the process leads to increased production cost, lower product quality (loss of softness, for example) and higher biochemical oxygen demand (BOD) for waste water. Consumers demand softness and strength wrapped into one.

After exploring the use of agricultural seed fibers as a solution to this longtime problem, Cargill is launching a product line called HemiForce™ enhanced fiber additives this November. The technology applied to the new product line uses a hemicellulose-rich enhanced fiber additive made from corn that would be added to the wet end of the paper machine.

How do HemiForce enhanced fiber additives work?

The high level of hemicellulose in the product enhances the cellulose fiber in the paper furnish and increases the number of hydrogen bonding sites by building bridges in between the wood fibers, thus increasing the strength of the fiber matrix.

The positive impact of hemicellulose on cellulose fibers has been well documented for decades. Study after study has shown improved hydration rates, higher strength properties and enhanced fiber-to-fiber bonding. When the lignins are minimized and the hemicellulose/cellulose combination in fibers is maximized, tissue makers gain both strength and product softness. Cargill's patented manufacturing process takes an innovative approach to making the hemicellulose-rich fibers and delivering them to the fiber furnish on the tissue machine. To manufacture HemiForce enhanced fiber additives, Cargill uses renewable agricultural seed-based fibers such as those found in corn kernels. During wet milling, they are soaked and steeped to soften and release their components, the germ is removed for oil, and materials in the endosperm are extracted for use in various food, feed and industrial products. Fiber in the outer covering of the seed (the pericarp) is used to make HemiForce enhanced fiber additives.

Environmental benefits

HemiForce enhanced fiber additives are agricultural based-fiber products, made using a totally chlorine-free (TCF) process that provides a natural alternative to the typical chemical/synthetic additives for achieving tissue properties required by customers and paramount for efficient manufacturing operations.

In addition, case studies have shown that by providing stronger fiber-to-fiber bonding, HemiForce enhanced fiber additives allows the tissue makers to take advantage of the benefits in several ways depending upon how they may gain the highest level of value - increase the recycled fiber content,

reduce softwood fiber usage, reduce or eliminate refining, lower the basis weight and decrease the percentage of crepe at the Yankee dryer. These all provide a net positive impact on raw material consumption and energy usage.

Business benefits

In tests, HemiForce enhanced fiber additives have been shown to consistently deliver significant cost savings while positively impacting many aspects of the production process including increased productivity, decreased refining demand and reducing the need for chemical additives. Results have shown that HemiForce enhanced fiber additives can maintain the required strength properties at significantly lower refining demand. This provides the benefit of increased bulk at a higher freeness level and lower energy cost. The net financial impact for tissue manufacturers has been verified to be \$8 per ton for tissue and towel producers.

An additional benefit to tissue manufacturers is that HemiForce enhanced fiber additives do not require capital investment or process modifications in the paper mill. The product can be added at many optional stages in the stock preparation system or wet end of the paper machine with the same increased strength result. The product is added in cake form directly to the furnish. If it's added near the refiner, it can be slurried and pumped in. Other additives require product make-down or metering systems that require additional feed equipment, process control and maintenance.

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