

# e c o n o T a l k

The latest news from Econotech and friends • Fall 1998

## Fiber Length & Fiber Strength

Reducing fiber length, apart from improving formation, has little effect on the sheet structural and optical properties. This reduction in fiber length however, does reduce the physical strength properties. The loss of fiber strength has little effect on the sheet structural and optical properties.

Three basic fiber properties - length, strength and coarseness, affect the papermaking process and quality of the products. There are two other properties, whose effects are understood to a lesser extent. They are kinks and curls. All of these properties can be measured with two instruments, which are the zero

span tensile tester and the Fiber Quality Analyzer (FQA).

The FQA determines the length and shape of the fiber. Through image analysis developed by Paprican, accurate and reliable measurement of fiber properties is now possible. The fiber length is defined as the contour length of the fiber as opposed to the end-to-end projected length. Fiber curl is defined as the gradual and continuous curvature of a fiber, while kink is the abrupt change in the fiber curvature.

Fiber length and shape change during pulping, bleaching and refining. These qualities can greatly affect the quality and performance of your final product. Therefore, it is beneficial to track the change in fiber length and shape throughout the pulping, bleaching and refining processes. Many customers request only FQA on the finished pulp. It is equally important to know if fiber shortening is taking place within the process - and where.

The wet zero span tensile test measures the average strength of the fibers which are carrying the tensile load when the failure occurs. There is likely some correlation between kink indices and fiber strength with lower fiber strength relating to higher kink indices.



*Stephen Berghold*  
Berghold Training  
& Consulting Inc.

## BCIT Pulp & Paper Technology Summer Institute

The force behind the BCIT (British Columbia Institute of Technology) Summer Institute is Stephen Berghold.

The BCIT Summer Institute began in 1978 as the brainchild of Gordon Harris and Steve Berghold. Arie VanDonkelaar and Garth Decker were instrumental on behalf of industry to make the first Summer Institute a reality. The goal from the outset was to help people who were working in the pulp and paper sector to advance their knowledge of the field. The founders also envisioned taking the training to industry rather than making industry come to them. The first four years of the Summer Institute were held at BCIT's Burnaby campus, but after that, it went to the pulp and paper centers in BC - Prince George, Kamloops and Nanaimo.

The course has changed over the years to keep abreast of advancements in the industry. During each session, the steering committee meets to plan next year's program, that way students get the latest information. The speakers are always practitioners in the field and not academicians. Econotech's own Don McDermid, Manager of Pulp and Paper Testing, who presented a paper on the importance of fracture toughness, fits the bill as a paper testing practitioner.

The course also appeals to secretaries who want to learn more about the vocabulary of pulp and paper; it is of interest to operators, head office staff, mill technical staff and suppliers. A number of Econotech employees have attended over the years. Comments from attendees of the Institute show a great deal of satisfaction with the content and format. This past summer marked the 20th anniversary of the BCIT Summer Institute. We at Econotech extend our congratulations to Steve for continuing this valuable resource to the pulp and paper industry.

If you are interested in receiving more information or registering for the 1999 BCIT Pulp & Paper Summer Institute, please contact Stephen Berghold at 604-466-3117 (phone) or 604-466-3118 (fax).

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### Tensile Strength

Tensile strength, also called breaking length, relates to fiber strength. However, it is not a single property, as it involves tensile, shear and flexural forces acting on the fibers and bonds in the sheet. Tensile strength is a direct indication of the durability and potential end use performance of a number of papers that receive direct tensile stresses in use such as wrapping and printing papers. Of all the strengths run in the paper industry, tensile is said to be the most fundamental.

### Stretch or Elongation

While being stressed during the tensile test, paper undergoes deformation. This is called stretch or elongation. This is an important property in many papers because it affects the way they withstand sudden impacts.

When paper is used to form a bag or wrapper, it is clear that if the paper can yield enough when subjected to a force, it will not rupture. Usually longer fibers have greater stretch; shorter hardwood fibers have less stretch.

**Tensile Energy Absorption (TEA)**  
Tensile energy absorption, or TEA as most of the industry calls it, refers to the area under the tensile-stretch curve (stress-strain). The value is proportional to the energy that the paper can absorb up to the breaking point. Therefore, for a given tensile breaking strength, if the stretching ability of the paper is increased, this also increases the TEA. Conversely, for a given stretch, if the tensile strength is increased, the TEA is also increased.

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Lorentzen & Wettre Tensile Strength Tester

Three values are usually calculated for a given fiber length test; the arithmetic or numerical average (AFL), the weighted average fiber length (WAFL) and the weight weighted average fiber length (WWAFL). Historical data has most often used the WAFL value, also referred to as the length weighted average fiber length (LWAFL). Each value is obtained through the following calculations:

$$AFL = \frac{\sum (l_i \cdot n_i)}{N}$$

Where:  
x = bin #  
l = bin median length  
n = bin fiber count  
N = total number of fibers counted

$$LWAFL = \frac{\sum (l_i^2 \cdot n_i)}{\sum (l_i \cdot n_i)}$$

$$WWAFL = \frac{\sum (l_i^3 \cdot n_i)}{\sum (l_i^2 \cdot n_i)}$$

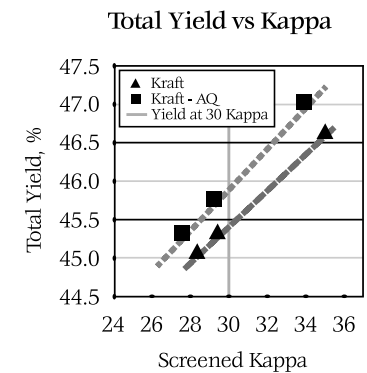
Hardwood / Softwood Fibers

LWAFL has historically been the favored value since it gives emphasis (weight) to the longer fibers in the sample. This imparts less emphasis to the shorter fibers and fines that, in most cases, have much less of an impact on final strength properties.

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Next issue: Part 3  
- Some typical values. Table of pure species LWAFL and coarseness values.

We are frequently asked to evaluate the pulp yield gain from using anthraquinone or other additives. This normally involves performing three lab cooks over a kappa range without anthraquinone and repeating the process in three cooks using anthraquinone. A total yield versus kappa curve is prepared for the two series of cooks. The yields are then obtained from the curves for the mill kappa target. The difference between the two yields is the expected yield gain at the mill kappa.



We prefer to plot the total yield, rather than the screened yield, against screened kappa because the correlation coefficients for the linear regression line fit are higher. Using screened yield, the variability of the amount of overthick chips adds more to the variability of the screened yield than the total yield data. Screening of overthick chips before cooking can be used to reduce variability in the total yield and screened yield data.

Randy Lowe  
Vice President  
Pulping & Bleaching  
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At an early age, Tim expressed a keen interest in traditional Westcoast art. His mother and father, both creative people, encouraged him to experiment with various mediums. At 10, Tim was adopted by Agnes Edgar into the band at Bella Coola and given the name Tik-anik-sta (brace of a longhouse). He grew to love the people and the art, and expressed it on canvas. Although he constantly watched local carvers work their magic, it wasn't until Tim was in his thirties that he picked up his first chisel.

Tim is continually influenced and inspired by the artists of the Valley, as is evident by the Nuxalk style which remains a constant element in his work, as shown here.

Tim James  
Supervisor  
Maintenance

On March 13, 1998, industrial hemp (*Cannabis sativa*) was legalized for production in Canada. This hemp has very low concentrations of THC (tetrahydrocannabinol - the active component of marijuana) and does not produce any psychoactive effects when consumed. It is used mainly for hemp clothing, oil, food byproducts and some paper products. Environmentalists have been touting the use of hemp to save trees. Hemp grows quickly producing six to 16 feet of stalk in three to four months, giving three to eight tons biomass per acre.

Hemp can be readily pulped by the kraft process but there will be a learning curve and added costs. The material is bulkier than wood chips. Pulp produced contains long bast fibers ranging from five to 55 mm in length, compared to

two to three mm for softwood pulp. These fibers are difficult to screen and could potentially cause "roping" in centrifugal cleaners. The pulp fibers have to be shortened before papermaking, using cutting equipment such as hollanders or pulpers with Clafin refiners. Currently this equipment is only available in specialty mills using hemp, flax and cotton linters.

Hemp may see limited use in specialty papers, but more work needs to be done before it would be an economical replacement for kraft softwood pulps for paper products production.

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## Twibill's Twavels

In the 1960s, I came to the east coast of Canada, when my husband, a marine engineer, brought a ship from Britain to Louisbourg, Cape Breton Island, Nova Scotia.

During that time, a French fortress was being rebuilt. Many interesting artisans had been brought there to ensure the rebuilt fortress was historically correct. Our milkman, who was a deep-sea diver, located the wreckage of a French payship that had gone down. He found a trunk with gold coins that was to have paid the soldiers serving the original fortress.

We came to Vancouver by train in order to see something of Canada before returning to Britain. Vancouver was so lovely that we decided to stay. My husband sailed on one of the last whaling ships out of Port Hardy. Home became Langley, where we raised four children.

Nine years ago, I began working at Econotech, which is a multi-cultural place of employment. It's a great place to learn about other countries and their culture.

Over the past few years, I have been fortunate enough to visit some of these places. Hong Kong was very fast-paced and exciting. Australia was spectacular, with unexpected things like fairy penguins. Several of us from Econotech went on a Caribbean cruise, going ashore on some lovely islands. We ended our trip with a few days in Florida, visiting the Kennedy Space Center and Disneyworld.

My primary responsibilities at Econotech involve shipping and receiving our customer's samples. If you have any questions about how to ship liquor or other samples to Econotech, please give me a call.

*Lesley Twibill*  
Lab Assistant  
Analytical-Pulp  
& Liquor



Don McDermid  
Manager, Pulp & Paper Testing

Randy Lowe  
VP, Pulping & Bleaching

Greg Nichvalodoff  
CEO

look forward to seeing you at  
**Exfor 99 - Montreal**  
January 26, 27, 28  
at booth 2609

## Western Red Cedar (*Thuja plicata*)

Western red cedars are the giants of the West Coast. Magnificent and powerful, these massive trees can grow up to 180 feet (60 m) in height. They dominate the surrounding landscape with their majestic, almost mystical presence.

The red cedar is sacred to BC's First Nations people. The tree's healing and spiritual powers are greatly respected and it is used to treat a wide variety of ailments. They also use the aromatic branches for purification, both in ceremonies and in the home.

For centuries, First Nations people have used red cedar for fuel and shelter, to make tools and implements for fishing, hunting, gathering and cooking, and to make important cultural items such as totem poles, dugout canoes, bentwood boxes, baskets, clothing and hats.

Red cedar is widely used by western herbalists and modern research confirms traditional uses. The fan-like branches have a strong lemon-pine scent and contain a variety of chemicals with antifungal, antibacterial and immune-stimulating properties. They are strongest medicinally when gathered in summer and fall from younger trees.

Topically, the tea or diluted tincture is an effective remedy for external fungal infections such as athlete's foot or ringworm. Internally, red cedar is used for a wide variety of respiratory, urinary tract and reproductive problems. It can increase the body's resistance to infection and is helpful in treating many chronic conditions.

**NOTE: Red cedar is contraindicated for internal use in pregnancy or for those with a kidney weakness. A strong herb, it is best to take under the guidance of a trained professional.**



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