

# econoTalk

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## Calculating Black Liquor Solids Loadings

In the fall 1998 Issue of EconoTalk (see [www.econotech.com](http://www.econotech.com) for back issues of our Newsletters), we described how to measure pulp yield increases from lab anthraquinone (AQ) pulping experiments. Because of bottlenecks in the recovery furnace, many pulp mill process engineers are not only interested in the pulp yield gains from AQ but have asked us to determine the reduction in black liquor solids loading (i.e. kg of black liquor solids per odmt of screened pulp) possible at the recovery furnace when using AQ.


In our pilot plant cooks we can accurately measure the solids content of the black liquor at the end of the cook and can relate this to the black liquor solids production per odmt of screened brown stock after determining pulp yield from the cook. We are careful to obtain representative black liquor samples to avoid variable results.

Another way to determine the black liquor solids loading is to use the cooking yields from our pilot plant cooks with the white liquor charge and composition to calculate the expected black liquor loading. This method is basically a mass balance calculation, which is incorporated into an Excel spreadsheet. The inputs necessary for calculating the black liquor solids production per odmt screened brown stock include: EA charge, white liquor sulfidity, total yield, screened yield, furnace reduction efficiency for converting sulfate to sulfide, causticizing efficiency, EA consumed, and volatiles.

Input Parameters	Kraft	Kraft/AQ
EA charge, % on wood	17.0	16.0
Total pulp yield, %	47.0	48.0
Screened yield, %	46.3	47.3
Sulfidity on AA, %	30	30
Furnace reduction efficiency, %	90	90
Causticizing efficiency, %	80	80
EA consumed, %	88	90
Volatiles loss, %	1	1
<b>Calculated black liquor solids,</b>		
<b>kg/odmt screened brown stock</b>	<b>1688.5</b>	<b>1595.2</b>

This information is used to calculate the cooking liquor composition before and after a cook. The EA consumed is expressed as the percent of EA consumed in neutralization reactions after compensating for the residual EA in the "end of cook" black liquor. The spreadsheet calculations compensate for volatiles loss (such as turpentine) during a cook and organic hydrogen loss from the neutralization reactions. Wood organics generated is the difference between wood charged and total pulp yield.

The black liquor solids calculations for pilot plant kraft and kraft/AQ cooks are shown in the Table. The AQ cook gave a 1% higher yield and used 1% on wood less EA charge. Black liquor solids loading per odmt was reduced by 5.5% using AQ.


This Excel spreadsheet is also useful in studying the impact of causticizing efficiency or furnace reduction efficiency on the solids loadings. If you are interested in a copy of this spreadsheet, please send me an email request. 

Randy Lowe  
*Vice President*  
*Pulping & Bleaching*  
[randy@econotech.com](mailto:randy@econotech.com)

## A Reminder to Our U.S. Clients

When sending samples or having samples returned to you by Econotech, you are required by U.S. Customs to include the nine

digit Employer Identification Number (E.I.N.) issued by the IRS. Samples without the EIN # invariably get delayed.

For more on this matter, please contact Lesley Twibill at [receiving@econotech.com](mailto:receiving@econotech.com) 

## Econotech Offers a Two Day Seminar

Econotech is now offering a two day course on Understanding Paper Properties. This course, intended for entry and mid level technicians and anyone working in pulp sales, will provide a good understanding of the laboratory pulp refining process and the effects that various paper properties have on resulting paper products. This is not a papermaking course.

### Seminar Overview:

**Day 1:** Basic pulp refining theory, various paper grades using chemical pulps, and strength properties.

**Day 2:** Optical properties, surface properties and printability. The basic course outline can be tailored for specific applications.

### Course Presenters:

Don McDermid and Sandra Fodor.

For more information on dates and cost, please contact Don McDermid by email [don@econotech.com](mailto:don@econotech.com), telephone 1-800-463-5700 or by fax (604) 526-1898. ☎



## My Thoughts About Paper

Recently, on our family trip to Taipei, we had the opportunity to visit the Museum of Paper. Each visitor was given hands-on experience in making pulp and paper. The children were thrilled with this experience and so was my wife, who happened to marry a pulp and paper guy.

Inside the museum there are displays representing the history and progress of Paper Making, and displays of ancient paintings and calligraphy by famous artists, dating back to the 14th and 15th century. Apparently, with proper care, paper can last for many centuries. Museum staff regularly covers the artwork to keep it dark and give it time to rest – or they are taken out of their frames to give them a breath of fresh air. Just like human beings, they need to breath and time to rest too.

Another reason ancient paper lasts longer is because the ancient paper makers used very primitive equipment, and no chemical additives were used. Most of the papers were neutral pH in those days. With today's technology, we use different chemical additives to make the paper stronger, brighter or higher yield, but these additives also add alkalinity or acidity to the papers and may shorten their life span. Eventually, books printed on these papers will cause a crisis for our libraries, it's not known if the books will survive for our children or grand children (actually, some U.S. libraries are looking into this issue).

Another display in the museum uses statistics to demonstrate the amount of chemicals added and how many trees are needed to produce one ton of paper, and how many tons of paper we consume in one day in this world. What struck me were the pictures showing children in some under-developed countries who still cannot afford this common commodity. They have to learn by writing on the sand or a mud wall, yet some countries are still wasting tons and tons of paper each day.

It was a good lesson for all of us, especially our children. We realized that we should show more respect to paper, trees and the environment, and that despite all our effort, we need to recycle and conserve more to save trees and help our environment. ☎

Thomas Yuen

*Supervisor, Analytical (Pulp & Liquor)*  
[tomy@econotech.com](mailto:tomy@econotech.com)

## Frequently Asked Question: Deposit Analysis/Ash

Here at Econotech, we are frequently asked "when ashing a sample in the muffle furnace, what materials are lost at each different temperature?" The three most common temperatures which are applied to samples are – 105°, 525°, and 900°C.

Here is a brief explanation of what fractions of materials are lost at each reported temperature.

### 105°C

The temperature test that appears most often on reports is called "Moisture Loss at 105°C". The reason for running this test is to determine the moisture content of the sample. The materials combusted (losses) at this temperature are moisture content, slime, microorganisms, and any volatile organic solvents.

### 525°C

If a client has an unknown sample, we frequently recommend that we run an ash test at 525°C. At 525°C organics are burnt off, leaving only inorganic material. We often report the result as a ratio of organic/inorganic components of the sample.

The inorganic components that are left are metals such as calcium, magnesium, iron, silica and the carbonates of some of these metals.

### 900°C

If metals analysis is required on the sample, a strong acid (microwave or hot block) digestion is used with Hydrofluoric acid to finish. Any insoluble material is filtered, ashed at 525°C, then fused with sodium carbonate at 900°C and dissolved into an acid

solution which can be run by Inductively Coupled Plasma (ICP) to determine its inorganic components. Elements are reported as a percentage of the ash in the form of oxides.

Components which are lost at 900°C are fibers, sliver, starch, plastics, rubber, retention aids (polymers), lignin residues, coal and carbon, carbonates and oxalates.

All this information is used to give our pulp mill customers an indication of how to clean up the deposits – whether to use high-pressure water or some type of acid to dissolve the oxide deposits. ☎

If you would like any further information please feel free to contact:

Thomas Yuen  
*Supervisor, Analytical (Pulp & Liquor)*  
[tomy@econotech.com](mailto:tomy@econotech.com)

or

Bill Warning  
*Analytical Manager*  
[bill@econotech.com](mailto:bill@econotech.com)



*Dr. & Mrs. Becker – Wedding*

## Ed Becker: Still Going Strong!

People sometimes ask if Ed is still working at Econotech. The answer is yes, he still works part-time and still owns the company.

Dr. Becker's 47 years experience in Pulp and Paper Technology include:

- 4 years in graduate school working on wood extractives, chemical engineering and pulping courses.
- 15 years in Research and Development management at Rayonier, Union Camp and Columbia Cellulose.
- 28 years as co-owner, then sole-owner (1988) of Econotech. For most of these years he actively managed pulping and bleaching projects using many types of raw materials and pulping and bleaching processes. He has had a lot of experience in applying lab results to mill operations.


Ed and Norma just celebrated their 50th wedding anniversary on March 18, 2001. We wish them many happy years together! ☎

## EXFOR 2001

The 87th Annual Pulp and Paper week, EXFOR 2001, was hosted by the beautiful city of Montreal. Econotech had two representatives hosting the exhibit booth, Bill Warning, Manager, Analytical and Sandra Fodor, Supervisor, Pulp and Paper Testing.

A special attraction this year was a new exhibit from the Microscopy Department – Photomicrography. This display featured many digital photographs using the Nikon ES400 Eclipse microscope and the Nikon CoolPix 990 digital camera. Some of the display pictures included vessel elements laden with resin and pitch, (although the photograph was mistaken for a shrimp more than once), shives, pulp fibers and mill contaminants. If you would like to receive any copies of the photographs that were displayed, contact Graham Vandegriend via email at [graham@econotech.com](mailto:graham@econotech.com).

As in past years, Econotech looked forward to attending the conference. It gives us an opportunity to visit with existing clients as well as introducing ourselves to new clients. We would like to thank everyone who came by and visited us at the exhibit booth this year.

We look forward to seeing you next year at EXFOR 2002. 

### EXFOR 2001 Salmon Winners

*A special congratulations to the winners of our British Columbia smoked salmon draw:*

**Gary Samek**  
*Process Engineer  
Daishowa-Marubeni International Ltd.  
Peace River, AB*

**Joseph Schaefer**  
*General Manager  
Kentain Products Ltd.  
Kitchener, ON*

**Bob Leslie**  
*Mill Manager  
Millar Western Pulp (Meadow Lake) Ltd.  
Meadow Lake, SK*

## Picture This – With Our Compliments!

You'll remember from our Fall 2000 issue that the Microscopy department is bursting with pride over our new microscope and digital camera set-up. We've been impressed with the quality of the photomicrographs taken over the past six months, and we know you will be too.


During the month of June 2001, we'd like you to see your sample as you've never seen it before. We are offering each client of Econotech one free photomicrograph of a pulp or contaminant with a sample sent for species content or material identification in June.

Simply specify which sample you would like photographed and we'll send the photomicrograph either as an email attachment or a hardcopy document.

To reiterate, everyone gets one free photo of one sample sent to Econotech for species or contaminant identification in the month of June.

Please specify:

- Which sample you would like photographed
- The method you would like the photo sent to you, either email or printed photograph

If you would like to discuss photomicrographs further, please contact Graham Vandegriend in the Microscopy department. He'll answer any questions you may have. 

**Graham S. Vandegriend**  
*Senior Technologist  
Microscopy & Wood Technology  
[graham@econotech.com](mailto:graham@econotech.com)*



*Sandra Fodor, Supervisor, Pulp and Paper Testing and Bill Warning, Manager, Analytical*



**econotech**  
INTERNATIONAL PULPING TECHNOLOGY

852 Derwent Way, Delta BC Canada V3M 5R1  
TEL (604) 526.4221 (800) 463.5700 FAX (604) 526.1898  
[www.econotech.com](http://www.econotech.com) [info@econotech.com](mailto:info@econotech.com)