

# Solutions to Quality and Performance Issues

**PULP, PAPER AND PACKAGING**

**Unique tools  
and expertise**

**Specialized  
services**

**Science-driven  
approach**

Address issues pertaining to bagginess by quantifying the cross-direction (CD) tension of the web with our Roll Testing Facility (RTF).

**WEB  
UNIFORMITY**

5

Improve your roll structure by assessing the wound-out-tension curves and other roll data with the Roll Testing Facility (RTF).

**ROLL  
STRUCTURE**

6

**STRENGTH  
UNIFORMITY**

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Discover where your paper stands in terms of strength uniformity—an often overlooked cause of web breaks in pressrooms.

Detect the properties' variations in cross-direction (CD) or machine-direction (MD) through the high-resolution measurements of the TAPIO Paper Machine Analyzer.

**PROPERTIES  
UNIFORMITY**

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**DIMENSIONAL  
STABILITY**

9

Tap into our extensive knowledge of the dimensional stability of papers to solve issues such as curl, cockling, and fluting.

**PRINT QUALITY**

10

Find out about our extensive portfolio of tools to troubleshoot or benchmark the surface and print quality of paper and board.

Predict box performance and characterize paperboard through our expertise in fold cracking, creep, glueability, and barrier properties.

**PACKAGING**

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Find your optimum coating formulation with a limited number of laboratory trials, thanks to Coatlab™, a software tool integrating customized designs of experiments.

**COATING**

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**CHEMICAL ANALYSIS**

13

Diagnose troublesome deposits by tracing back their origins in the papermaking process. Several services are available, including solutions to quality-related problems and support of product development.

**PRODUCT PERFORMANCE TESTING**

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**INTERLABORATORY PROGRAMS**  
Validate your testing instruments against several others by testing pulp and paper samples that are monitored and delivered three or four times a year.

**REFERENCE MATERIALS**  
Calibrate your physical and optical laboratory instruments. The reference materials are available on a monthly, bimonthly, or quarterly basis.

**PHYSICAL AND PULP TESTING**  
Ask us to test pulp, paper, paperboard, or tissue. We are fully equipped to conduct tests on any fibrous product. We issue IR3 Standards and offer ISO 17025-accredited testing.

Investigate the causes of acute toxicity issues and find out about our cost-saving technologies in biotreatment nutrient optimization and sludge dewatering enhancement.

**ENVIRONMENTAL SERVICES**

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**PILOT PLANTS**

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- Make use of our pilot paper machine to test new grades, equipment, or chemicals in real operation conditions. Our machine can produce paper, board, and tissue.
- Prepare mechanical pulp in our plant, which includes a chip impregnation system, refiners, a pressure screening and cleaning system, and a reject refining installation.

# Complex, persistent quality problems can defy common troubleshooting methods.

## **That's where FPInnovations comes in.**

On going quality and performance issues take a heavy toll on competitiveness, and have an impact on operational efficiency, customer satisfaction, and the bottom line. FPInnovations specializes in getting to the root causes of complex, long-standing issues for all pulp, paper, and board grades.

Our research efforts over many years in understanding and solving complex operational and product performance issues allow us to offer a depth of expertise that differentiates our troubleshooting and problem-solving approaches. FPInnovations can pinpoint the right combination of testing and analyses to get to the heart of any specific issues which can lead to breakthroughs that permanently resolve long-standing issues.

“ We have often leveraged the combination of analytical services and technical expertise at FPInnovations to address end-use performance issues and to help guide our development activities. Pulp and paper operations across the industry can be well-served by embracing their unique skill set. ”

Peter Ham, Technical Director, **Temboard, Tembec Inc.**

## Key advantages of working with FPInnovations:

- Solutions that involve little or no capital costs
- A unique, science-driven approach that integrates years of expertise with research insights, advanced facilities, and testing for every need
- An extensive range of unique and standard tests and analyses that enhance our troubleshooting capabilities
- Comprehensive knowledge and in-depth understanding of many different papermaking, printing, and converting processes

# Web Uniformity in Cross Direction

## Roll Testing Facility

Common converting problems, such as misregister, tracking and the ultimate undesired web breaks are often caused by a baggy sheet in cross direction.

FPIinnovations' Roll Testing Facility (RTF) was specifically designed to quantify the cross direction tension of the web. It equally measures paper properties. The RTF has been operating for 15 years, serving customers from all over North America.

Paper producers turn to RTF analyses when they are faced with complaints and claims from their own customers, the printers. We suggest quick fix and inexpensive solutions, but also the more thorough long-term solutions.



“ We have utilized FPIinnovations' expertise and equipment on many occasions to help troubleshoot problems in our customers' pressrooms, including the use of laser Doppler technology to understand web shifts in a printing press drying oven and using the RTF to help improve sheet stability and reduce web breaks. ”

Richard Lefebvre, Corporate Director, Product Quality,  
Resolute Forest Products Inc.

# Roll Structure

## Roll Testing Facility

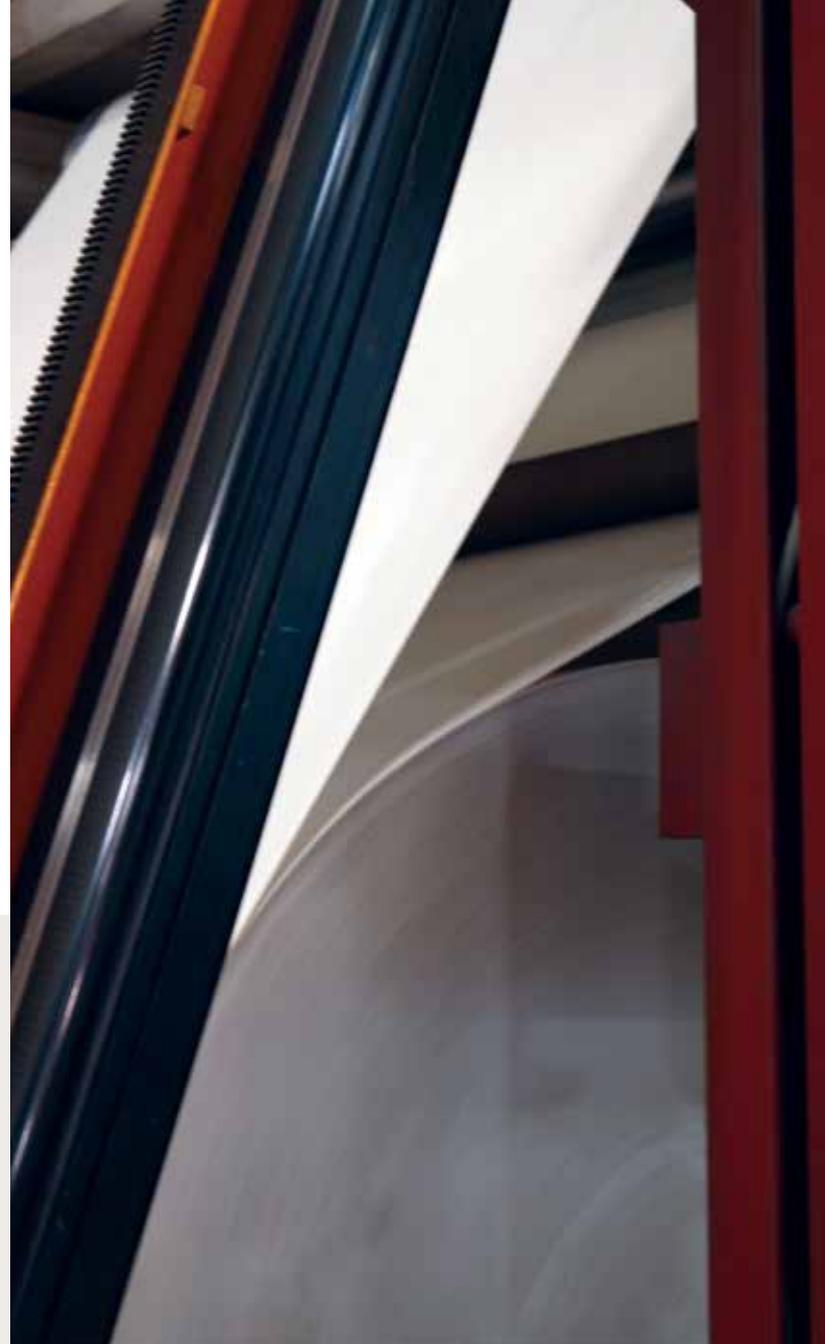
Inappropriate winding can lead to an array of problems, such as crepe wrinkles and bursts, roll deformation, wrinkles, corrugations, and telescoping.

FPIinnovations' RTF evaluates roll structure parameters such as wound-out-tension and roll density curves. We can assess the quality of a given winding curve. We provide pertinent recommendations on how to optimize tension, nip, and torque curves to improve roll structure.

Other structure properties measured with the RTF: exact paper length, out-of-round, web weaving, and telescoping.

*The clients of a major lightweight coated grade producer reported a significant increase in web breaks. An RTF analysis showed that the rolls were so tightly wound at their surface that bursts and crepe wrinkles were generated, causing the web breaks.*

*In a teamwork effort between FPIinnovations and the mill, new winder operating parameters were defined to optimize the wound-out-tension curve of rolls. With these improved rolls, the number of claims dropped.*



# Web Tensile Strength Uniformity

## PapTune™

Why can papers with similar average strength have very different web break rates on the same press? FPIInnovations' research has shown that in addition to average machine direction (MD) tensile strength and stretch, strength uniformity ("m-factor") is another important factor affecting web break rates.

FPIInnovations has developed a unique software, PapTune™, that calculates the m-factor from mill databases generated by Autoline paper testers or from laboratory tensile testing that can be done at FPIInnovations.

We offer services to benchmark the strength uniformity and compare it to our database. If strength uniformity is found to be an issue, we can work with customers to identify potential causes. Increased strength uniformity can help improve pressroom runnability. Cost reduction opportunities may even be possible as the mill could lower its strength target and avoid overdesigning the paper.



“ Strength uniformity (m-factor) analysis has provided us with a better understanding of the pressroom performance of our publication papers. ”

Balazs Tolnai, General Manager of Technology,  
Kruger Industry Products Division

# Web Properties Uniformity (CD & MD)

## TAPIO Paper Machine Analyzer

Non-uniform web properties can be at the origin of a wide array of problems. This is true for both CD and MD properties.

The TAPIO is an instrument that measures various properties at high resolution: basis weight, caliper, ash, gloss, transmission, and optical fibre orientation. These data provide a well-defined time trend. With integrated fast Fourier transform (FFT) analysis, variations in wavelength and frequency can be identified, and these can help detect the potential sources of the non-uniformity.

This powerful instrument, combined with FPInnovations' expertise in papermaking, can help find root causes of problems. Common issues for which TAPIO is used to diagnose include corrugations, wrinkling, marking in the MD, calender vibration, impact of paper machine upgrades, and coating variations.

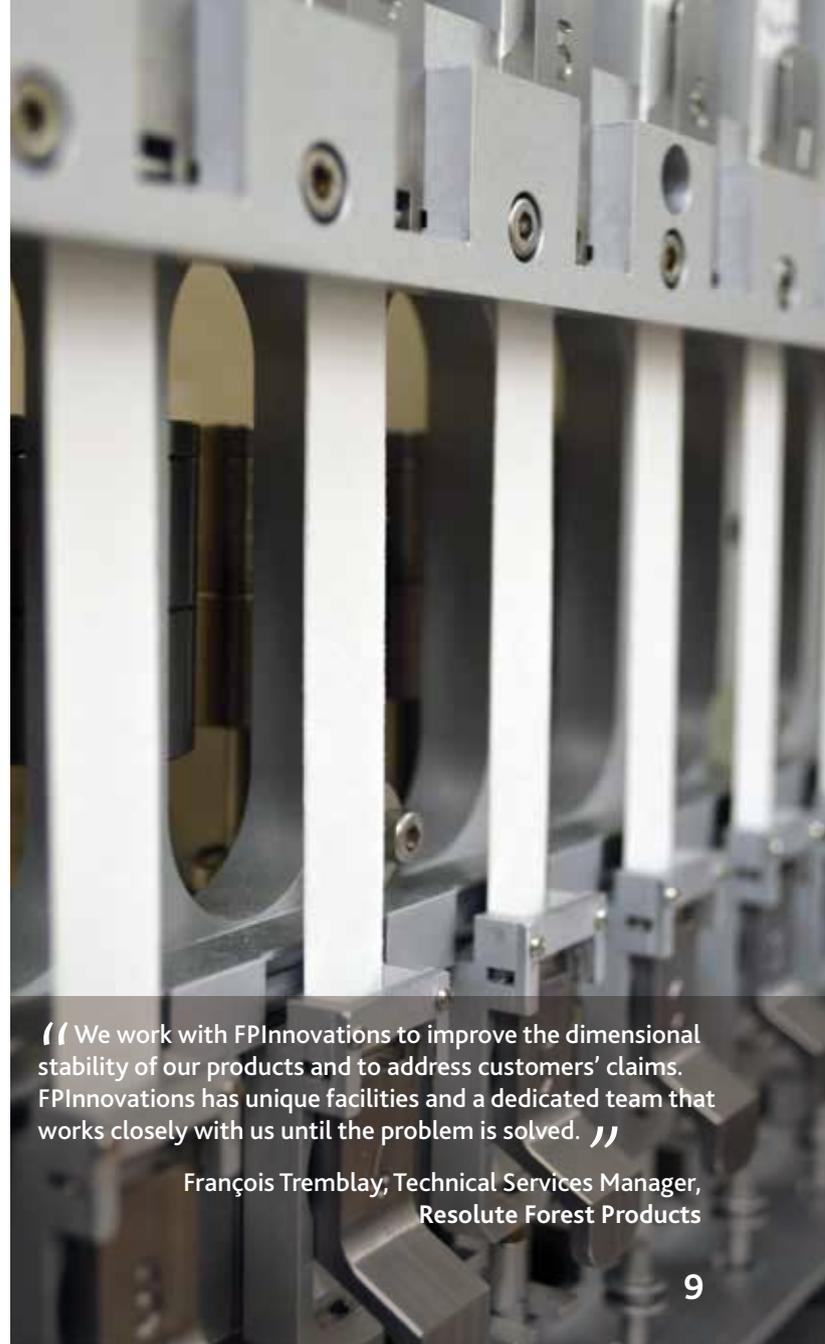


# Dimensional Stability of Paper

Issues relating to the dimensional stability of paper can occur during converting (stacking problems and paper jams), or in the finished products in the hands of customers (curl, cockling, and fluting). These can be costly. Papermakers may find themselves with few available resources to refer to.

Dimensional stability issues are complex because they can develop from the combined effects of papermaking, converting, storage, and handling by the end-user. FPInnovations' proven know-how and well-equipped laboratory are there to simplify them:

- Our unique curl-characterizing method is an effective tool to identify the origin of curl, either from structural two-sidedness and/or uneven drying.
- FPInnovations' sheet-splitting method allows for assessment of fines distribution, fibre orientation, and fillers in the thickness direction. Such data are invaluable in understanding sheet structure non-uniformity.
- Our laboratory is equipped with several other instruments for testing hygroexpansivity, fibre orientation, cockling-fluting, and optical profilometry.



“ We work with FPInnovations to improve the dimensional stability of our products and to address customers' claims. FPInnovations has unique facilities and a dedicated team that works closely with us until the problem is solved. ”

François Tremblay, Technical Services Manager,  
Resolute Forest Products

# Print Quality Services

Over 90% of paper is printed. Printing and writing papers and paperboard require specific surface characteristics to perform well in the various printing processes, from the traditional (offset lithography, flexography, and rotogravure) to digital (dry and liquid toner electrophotography, and web inkjet).

FPIInnovations can assist its customers with the different printability issues that occur in the pressroom. Over the years, we have developed an extensive portfolio of tools to benchmark surface and print quality, assist in grade development, and troubleshoot pressroom problems.

Printers and papermakers take advantage of our experience for issues such as the following:

- Linting and piling
- Ink and fountain solution problems
- Visual quality defects
- Paper surface defects and marks
- Press and blanket contamination analysis
- Paper structure: fibre/filler distribution



“ We frequently use FPIInnovations’ services for print quality problems including optical issues, linting, print through, printed mottle, skipped dots in rotogravure and press contamination issues in all types of printing. Their instrumental capabilities combined with their years of experience have helped us solve many customer complaints. ”

Richard Lefebvre, Corporate Director, Product Quality, Resolute Forest Products Inc.

# Packaging

## Characterizing Paperboard

## and Predicting Box

## Performance

### **Fold cracking**

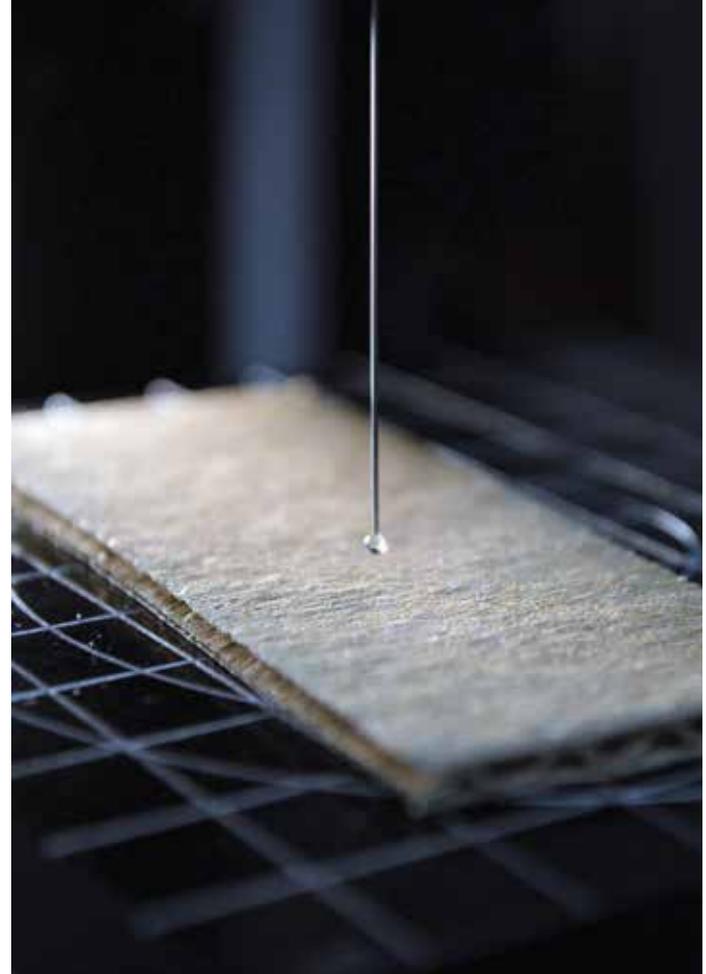
Boxes that crack at the fold, often at low ambient humidity, are not acceptable for converting plants and end-uses. FPIInnovations can examine the crack and analyze the sheet structure at the fold to identify the potential causes of cracking. FPIInnovations has also developed a laboratory method to predict the fold-cracking tendency.

### **Creep: Predicting the End-Use Performance of Boxes**

In real-life performance, boxes are subjected to varying humidities and loads during shipping and storage. Under such conditions, creep phenomenon can lead to premature failure of boxes. FPIInnovations has the expertise and the equipment to characterize the creeping tendency of linerboard and medium. Understanding these properties allows for lightweighting and cost-saving opportunities, as well as the ability to troubleshoot existing issues.

### **Barrier Properties Expertise**

We offer a suite of analytical tests as well as expertise in evaluating and improving barrier properties. Tests include Cobb, contact angle, pore size distribution, oil and grease resistance, oxygen transmission rate, and water vapour transmission rate. We also offer assistance to significantly improve these properties.



### **Glueability**

Board surface characteristics can influence glueing behaviour in converting processes. An adhesion that is too strong or too weak may not be desirable. We have a laboratory glueability tester to assess the glueability of paperboard. We can help troubleshoot hot-melt or cold-set glueability issues.

# Coating

## Performance and Cost

## Optimization with Coatlab™

Developing a new coating formulation or optimizing an existing one to maintain performance while reducing cost has always been a challenge, as this usually requires time-consuming and costly laboratory and pilot trials.

FPIInnovations has developed a unique approach and software tool (Coatlab™) which incorporate a customized set of design of experiments. With a limited number of laboratory trials, the optimum coating formulation can be identified in terms of both performance and cost.

Coatlab™ is ideal for optimizing target properties such as brightness, gloss, or surface strength. Cost reduction can be achieved, for example, by reducing binder content or by optimizing pigment ratios. We can also help verify if claims for cost and/or performance benefits are valid.

“ With the help of Coatlab™, we were able to skip pilot coating trials and go straight to paper machine trials to achieve our product quality improvement targets, saving a significant amount of time and cost. ”

Peter Ham, Technical Director, Temboard, Tembec Inc.



# Chemical Analysis & Microscopy

Identifying Contaminants

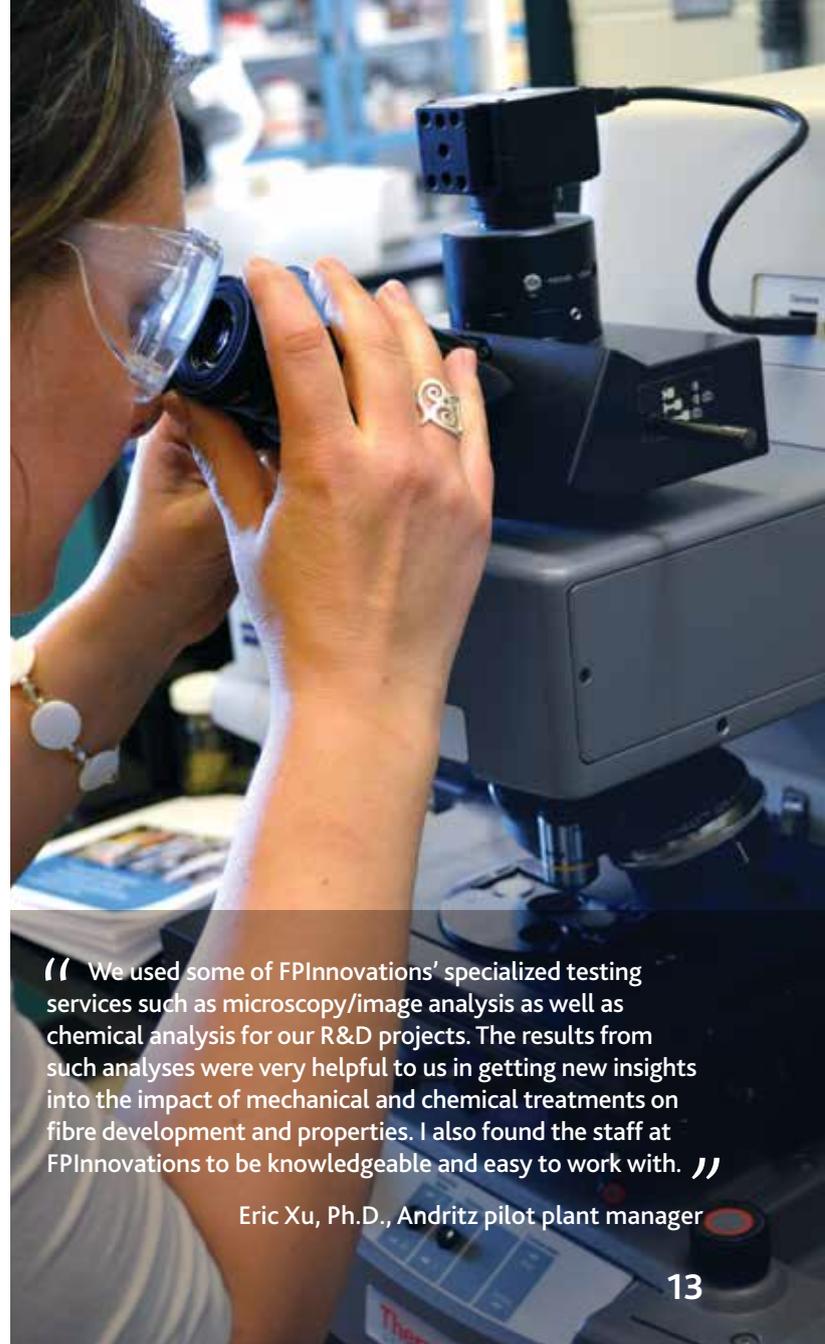
Characterizing Bioproducts

FPIinnovations' Chemical Analysis and Microscopy group provides customized technical services, resolution of process- and quality-related problems, support in development of new products, and unbiased expertise for settling customer disputes.

We resolve these issues by drawing on our depth of expertise, and use specially designed analytical schemes and instrumental techniques, including FTIR spectroscopy, ion chromatography, inductively coupled plasma (ICP-OES), pyrolysis/GC/MS, field emission scanning electron microscopy (FESEM), X-ray (EDS) analysis, and light microscopy.

From basic testing to addressing complex issues, we have the knowledge and experience to deliver the highest value to our clients.

- Diagnosis of deposit, scaling, and contaminant problems
- Molecular weight distribution
- Characterization of products such as lignin, black liquor, cellulose nanocrystals, and bio-oils
- Analysis of additives and assessment of their impact
- Analysis of odours in end-use products



“ We used some of FPIinnovations' specialized testing services such as microscopy/image analysis as well as chemical analysis for our R&D projects. The results from such analyses were very helpful to us in getting new insights into the impact of mechanical and chemical treatments on fibre development and properties. I also found the staff at FPIinnovations to be knowledgeable and easy to work with. ”

Eric Xu, Ph.D., Andritz pilot plant manager





# Product Performance Testing

## Interlaboratory Programs

Know where your laboratory stands, by validating your testing instruments against several others. Participants' identities are confidential. These programs are commonly used as a means to validate quality control.

### **Bleached Pulp (Kraft) Monitor Program**

Bleached pulp (Kraft) samples provided alternate between softwood and hardwood, with three tests per year. Data includes: CSF, fibre length, caliper, burst, tensile, and tear at various PFI beating levels.

### **Mechanical Pulp Monitor Program**

Mechanical pulp samples are provided, three times per year. Data includes: CSF, Somerville and Pulmac rejects, BauerMcNett fractions, caliper, burst, tensile, and tear.

### **Paper Monitor Program**

Paper samples provided alternate between newsprint, fine paper, and groundwood specialties, with four tests per year. Data includes: caliper, burst, tear, tensile, optical properties, PPS, and Sheffield roughness.

# Product Performance Testing

## Reference Materials

An easy way to calibrate your lab equipment: the reference material comes to you. Join these popular standard reference materials programs. Subscriptions are available on a monthly, bimonthly, or quarterly basis.

### **Standardized Aluminum Foil**

Standardized aluminum foil for validating the overall performance of Burst Testers.

### **Standard Reference Materials**

FPIInnovations offers standard reference materials for the verification of test instruments. They include: pulps (bleached eucalyptus and NBSK) and papers (fine paper or newsprint).

### **Optical Calibration**

One of only four ISO-Authorized laboratories worldwide for issuing IR3 Standards, we offer ISO 17025-accredited testing of pulp, paper and paperboard products.



# Product Performance Testing

## Physical and Pulp Testing

FPIInnovations' Product Performance Testing group offers ISO 17025–accredited testing of pulp, paper and paperboard, and tissue. We are fully equipped with all necessary equipment to conduct any test on any fibrous product. Just send in your samples!

Additional services include testing consulting services, product benchmarking programs, laboratory audits, and operator training services.

“ I use FPIInnovations' testing services on a regular basis. It always deliver high-quality testing results, with solid data analysis and interpretation which helps us resolve customer issues. FPIInnovations' knowledge in different standards (e.g., ISO, TAPPI, and PAPTAC) has also been valuable to us, particularly in dealing with customers in Asia. ”

Tom McDonald, Technical Service Managers, Tembec Inc.



# Environmental Services

Toxicity Troubleshooting

Treatment System Optimization

FPInnovations' Environmental Services group has over 20 years of experience in the investigation of causes of regulatory acute toxicity issues for the pulp and paper industry. We have developed proven approaches and analytical techniques that allow the causative agents to be quickly identified and remediated. We offer both consultative and diagnostic services, including fish and invertebrate toxicity testing and chemical analyses.

Almost all North American pulp and paper mills biotreat their process effluents and dewater/manage the generated solid residues (sludges). For a typical mill with an activated sludge system, the overall effluent treatment cost could fall in the range of \$4 to \$8 per tonne of mill production. We have developed environmental cost-saving technologies in the areas of biotreatment nutrient optimization and sludge dewatering enhancement. We have implemented these technologies at several Canadian mills at low capital and operational costs, and these have resulted in typical cost savings of \$1.50 to \$2 per tonne of mill production, or approximately \$400 000 per year.



# Pilot Plants

## Paper machine, Mechanical Pulping Plant



### **FPInnovations' Pilot Paper Machine**

Our in-house, unique pilot paper machine allows producers, equipment manufacturers, and chemical suppliers to test new products in real operating conditions. Our machine can produce paper, board, and tissue.

### **Mechanical Pulping Pilot Plant Facilities**

We have both atmospheric and pressurized refiners as well as a chips impregnator. Pulp stock preparation can be simulated using our pressure screening and cleaning system and reject refining installation. We also provide specialized testing, including wood chips classification, wood species quality evaluation, and pulp linting propensity index.



FPInnovations is a world leader that specializes in the creation of scientific solutions in support of the global competitiveness of the forest industry. We are ideally positioned to innovate and deliver state-of-the-art solutions for every area of the sector.



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