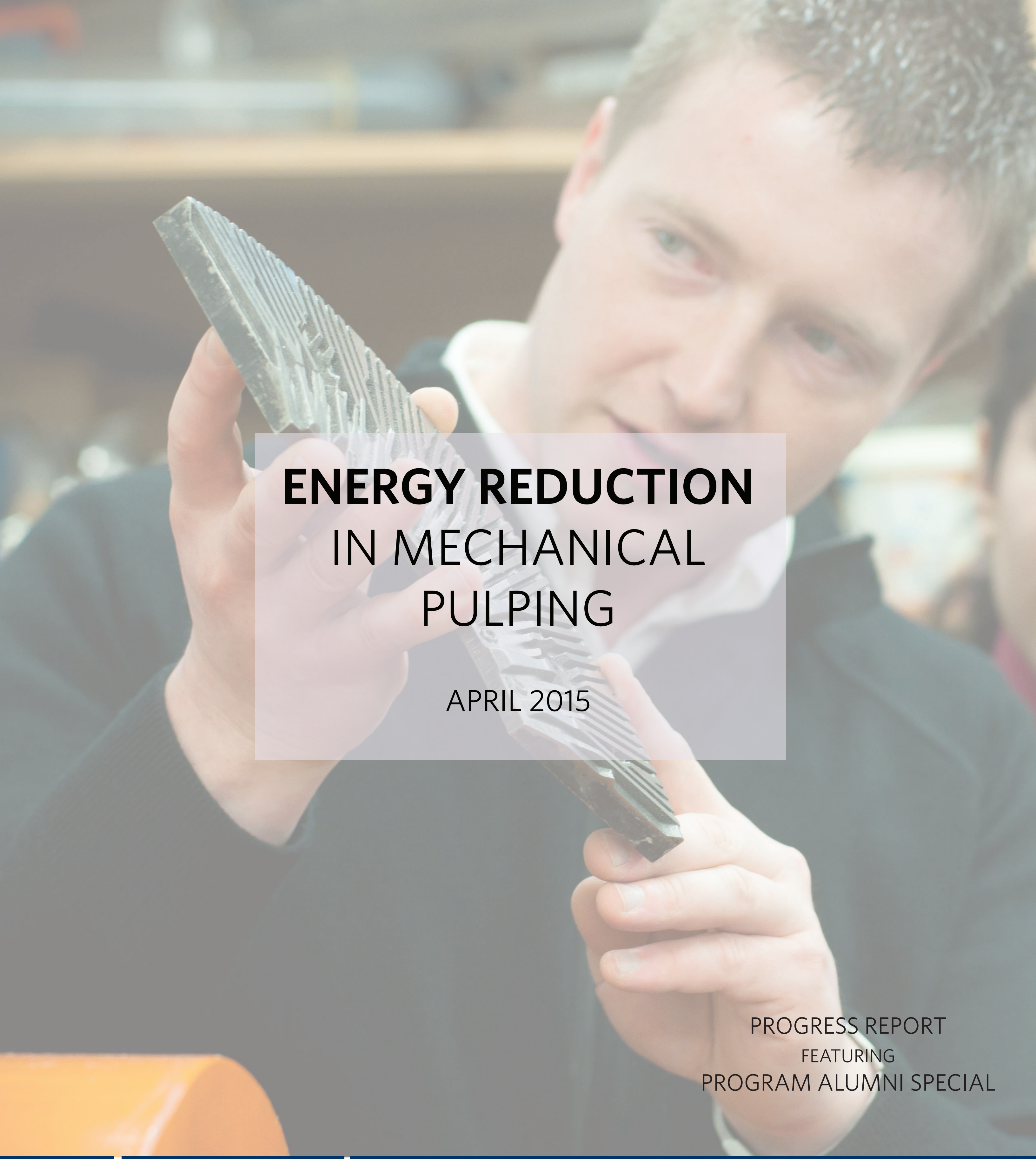


ENERGY REDUCTION IN MECHANICAL PULPING

APRIL 2015

PROGRESS REPORT
FEATURING
PROGRAM ALUMNI SPECIAL

a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

Welcome Message

Dear partners in the Energy Reduction in Mechanical Pulping research program,

It is a great privilege for us to be part of a partnership that sees industry coming together around grand challenges like energy conservation. Our research program continues to be in a unique position that brings together members from industry with university to work together towards making lasting changes. One of the ongoing challenges continues to be the renewal of the workforce with those who will bring a strong understanding of technical fundamentals. I believe this program gives us the opportunity to leverage the wealth of experience from our industrial partners to engage and inspire this next generation of leaders.

On that note, it is exciting to see so many of our excellent past students being hired into key positions within the local and global pulp industry. It provides a sincere feeling of tremendous pride to know that our alumni are successful and making a positive impact on this strategically important industry. We hope you enjoy reading the *Program Alumni* feature in which we revisit how they are influencing the industry and making big contributions. It is even more satisfying to continue to work with our alumni who are still involved with the program, but now as industry partners.

I hope to see many of you at the June 10th Steering Committee meeting in Whistler, British Columbia.

Sincerely yours,

James Olson
Principal Investigator, Energy Reduction in Mechanical Pulping Research Program
Professor and Associate Dean, UBC

ON THE COVER
Program alum, Jens Heymer, in 2011. At the time Postdoctoral Research Fellow, now working as Product Engineer at Aikawa Fiber Technologies (AFT).

CURRENT PROGRAM PROJECTS:

Process Optimization

PROJECT 1.1 - Compression screw feed optimization and energy savings in HC refining. Nicholas McIntosh, James Olson & Mark Martinez, UBC

PROJECT 1.3 - Optimization of chemical charge distribution throughout the process. Yu Sun, Harry Chang & Rodger Beatson, BCIT, UBC

PROJECT 1.4 - Optimal LC refining. Jorge Rubianom James Olson & Mark Martinez, UBC

Advanced Sensors & Control

PROJECT 2.1 - Optimization and control of integrated HC and LC refining. Hui Tian & Bhushan Gopaluni, UBC

PROJECT 2.2 - LC refiner bar force sensor based control strategies. Reza Harirforoush & Peter Wild, UVic

PROJECT 2.3 - Advanced pump performance monitoring system. Ramin Khoie & Boris Stoeber, UBC

New Product Development

PROJECT 3.2 - LCR pulp for packaging papers. Hanya Ettefagh & Ramin Farnood, UofT, UBC

NICHOLAS McINTOSH

1.1 - COMPRESSION SCREW FEED OPTIMIZATION AND ENERGY SAVINGS IN HC REFINING

To begin to better understand how the operation of a screw compression device affects the product properties, a wood-structure characterization method has been developed by Nick. The characterization method relies on light-transmission microscopy to obtain photographs of the wood structure. These photos are a two-dimensional projection of the three-dimensional wood structure the dimensions of which are responsible for dictating fluid uptake capacity of the wood sample. It is hoped that by being able to quantify the structure of a wood sample and directly link it to compression-screw device operating conditions, an optimum may be determined with respect to chip de-structuring level and chemical uptake.

Development of a new method to determine pore size distributions of wood

Following the collection of images of each wood sample by way of light microscopy, it is possible to use the developed image analysis routines to obtain pore size distributions and estimates of the surface area available for fluid contact which may, in turn, be used to model the fluid uptake capacity of a given wood sample. Sample images are shown below and show the progression of the analysis method from raw image to pore size distribution.

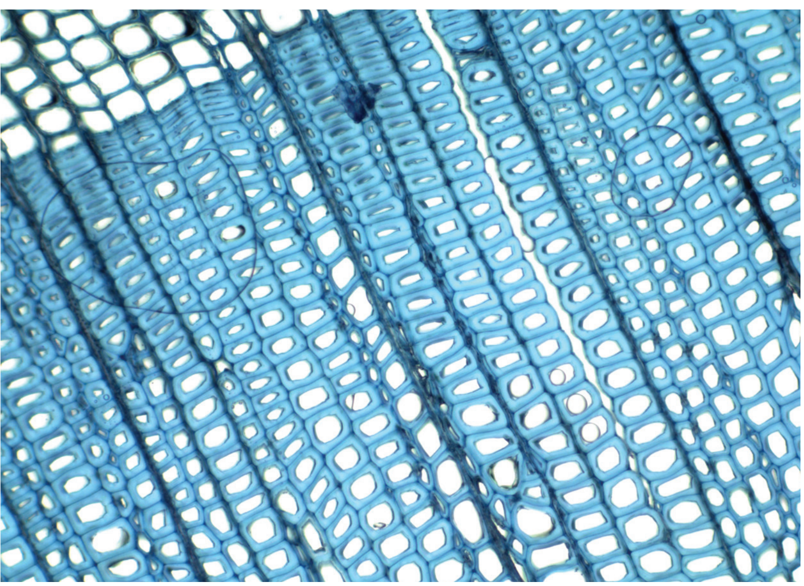


Image 1

Firstly, a thin-section is made of a treated wood chip, dyed, and a picture taken using a light microscope for magnification (Image 1 above). Using this photograph it is possible to detect the contours (Image 2) in the image corresponding to voids in the thin section and calculate the area and perimeter of these voids.

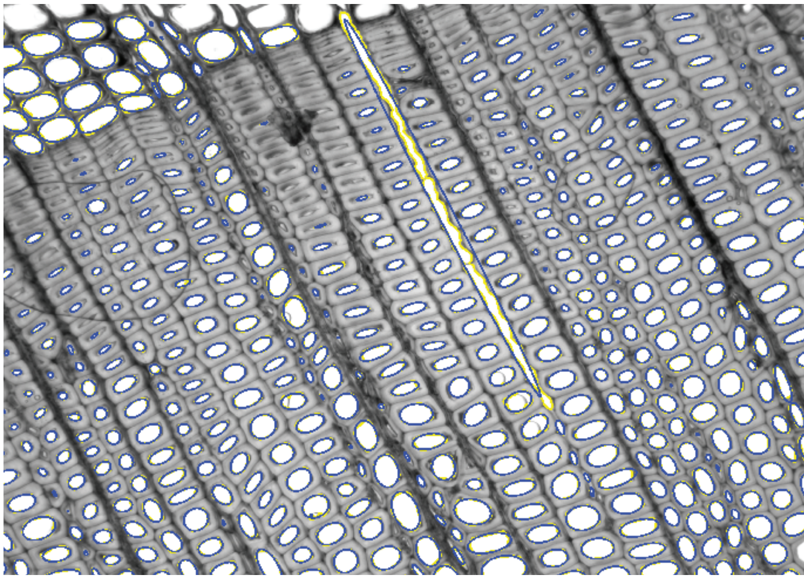


Image 2

Using these areas it is possible to build a pore size distribution (Image 3 below) unique to the particular compressive treatment applied to the wood sample being considered; this distribution may then be compared to that obtained from other wood chip samples and be used as a quantitative metric for screw compression device operation.

Pilot-scale trials and current work

Wood chips were collected from a pilot scale compression screw device and the structural analysis (via the image analysis method described above) of those products is currently underway. The quantitative determination of the changes to the fluid transport properties of wood due to compression in a screw compression device, coupled with operation data (e.g., screw motor load) of those devices, will provide new insights into the mechanism and general operational philosophy of the screw compression device's success in reducing the energy of mechanical pulping operations.

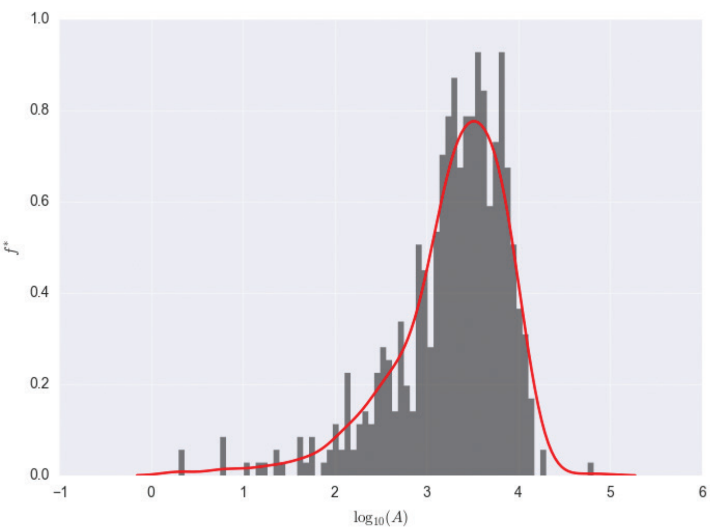
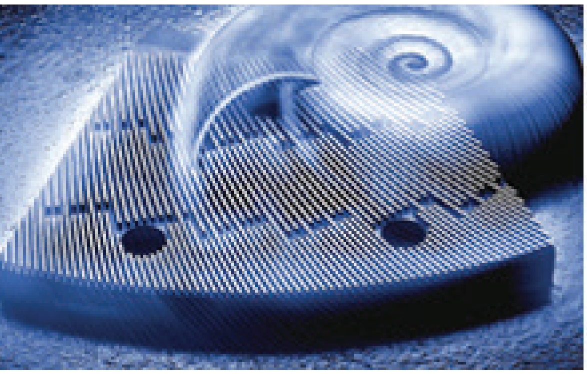
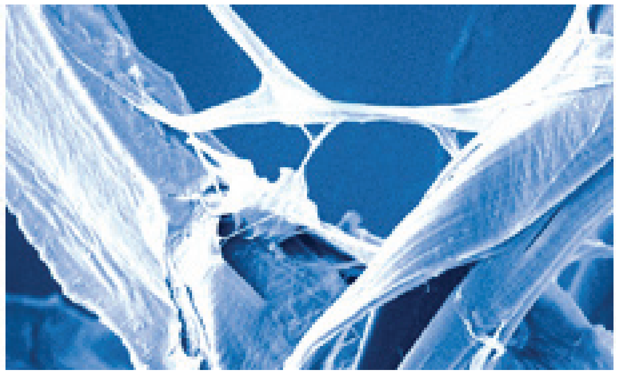


Image 3

YU SUN & HARRY CHANG

1.3 - OPTIMIZATION OF CHEMICAL CHARGE DISTRIBUTION THROUGHOUT THE PROCESS





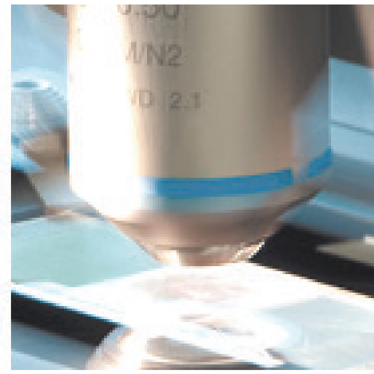


Image c/o Andritz

The overall objective of project 1.3 is to determine the chemical charges and treatment conditions that are required at various locations in the 'future low energy' mechanical pulping process to obtain the desired pulp properties at the lowest energy and costs. Since our October 2014 report, progress has been made in understanding the effects of several chemicals on different mechanical pulps. The experiments were carried out both on lab-scale (BCIT & UBC) and pilot scale (Andritz, Springfield, OH).The chemicals investigated included alkaline oxygen, sulfite and alkaline peroxide.

Effect of alkaline oxygen treatments and subsequent LC refining on high freeness mechanical pulp

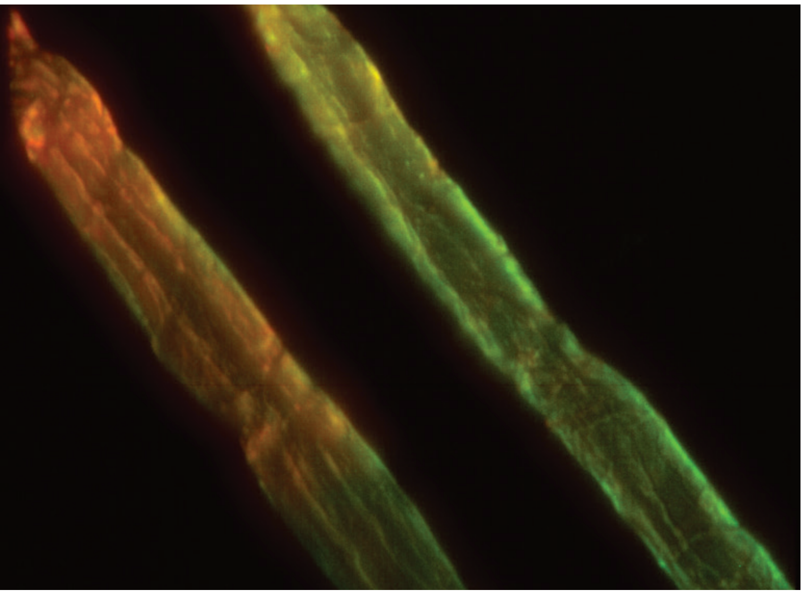
This research aims to evaluate the effects of alkaline oxygen treatment on primary mechanical pulp, as well as to determine the main factors controlling the chemical reaction. Based on literature reviews, three parameters were considered; temperature (60oC, 95oC), pressure (50psi, 90psi) and the addition of sodium hydroxide (NaOH: 2%, 6%). The study was carried out following a full factorial experiment plan which contained 8 trials in total, plus two control trials. Pulps with or without alkaline oxygen treatment were LC refined on a lab-scale for two different refining time (10 minutes, 20 minutes) prior to evaluation. Results show that an inter-stage alkaline oxygen treatment could lead to increased pulps strength properties with and without LC refining. Among the three parameters of the oxygen reaction, the effects of temperature and NaOH were much greater than the effect of pressure. The highest strength properties were obtained under the treatment conditions of 95oC, 90psi and 6% NaOH addition. A paper, 'Effect of alkaline oxygen treatments and subsequent LC refining on high freeness mechanical pulp', is under preparation. The disadvantage of this treatment is an obvious drop in brightness. Therefore, in the future work, more effort would be focused on understanding the mechanism of the deterioration on brightness by alkaline oxygen treatment. Meanwhile, more work will be done to find solutions to mitigate this loss in brightness while maintaining the gain on strength properties.

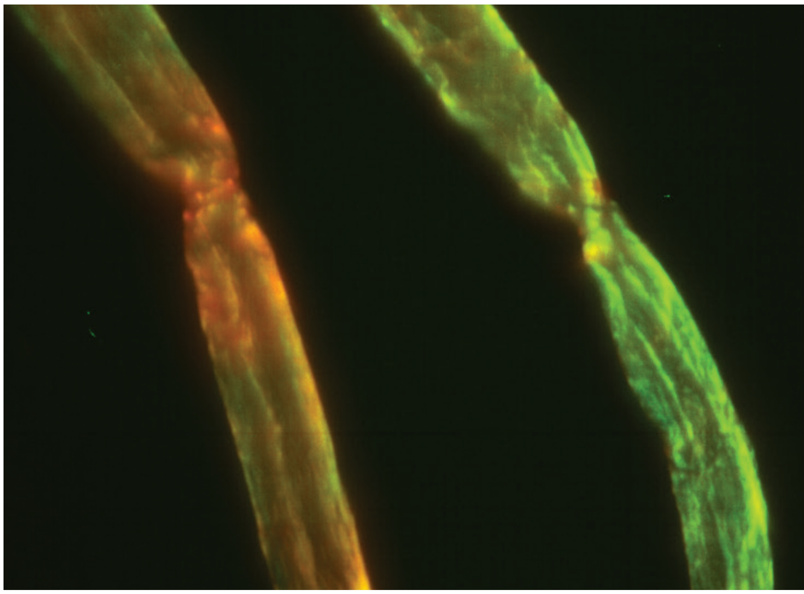
Pilot scale trial at Andritz, Springfield, OH

The trial goal for project 1.3 is to apply different chemical treatments to chips prior to high consistency (HC) refining. The resultant chemical treated and untreated pulps are to be used in further study. Details of the reaction conditions and the properties of these primary pulp will be found in 'Andritz Trials Report 2014' (to be issued shortly). Design of further research approaches on these primary pulps is ongoing.

JORGE RUBIANO

1.4 - OPTIMAL LC REFINING





Images of stained fibres taken using a confocal microscope. The green areas correspond to non-damaged parts whereas the red areas are internally delaminated caused by refining.

The objective of this project is to determine the optimal LC refining conditions for a broad range of fibre coarseness and length, and to determine the energy saving potential of fractionation and multi-stage LC refining.

Since the October 2014 progress report, Jorge's research proposal has been arranged and sent to his supervisors for revision. It is expected to be defended within the next month or two. The document includes a literature review, hypothesis formulation, the intended approach with the mathematical model, the methodology and the expected contribution to the field.
Additionally, work has been done in the following two sub-topics:

Internal Delamination

The protocol to measure the fibre internal delamination due to refining using the Simons staining technique combined with image analysis is under development. We intend to develop a protocol to be able to determine the degree of internal delamination per fibre and thus be able to construct a distribution (histogram) over the fibre length range. A number of images have been acquired using a confocal microscope, showing good degree of detail in the fibre structures (see figure). Also, the image analysis routines involving image segmentation by color have been written and tested with the preliminary images.

The results obtained with the staining procedure will be compared with the traditional water retention value (WRV). All equipment needed for the WRV is expected to be ready and operational in the next few weeks.

Fibre Length

The comminution model has been analyzed in order to determine the different ways of solution. Preliminary results using data from previous trials showed that it is possible to reduce the complexity of the problem by implementing experimental data received from industry. Furthermore, in order to validate the results, the design of future LC refining trials are under consideration. For example: An experiment involving a long-fibre fractionated pulp sample with a very narrow length distribution. Also, a closed-loop refining operation.

HUI TIAN

2.1 - OPTIMIZATION AND CONTROL OF INTEGRATED HC AND LC REFINING

Modelling and Control Techniques

In previous work, Hui developed a nonlinear Economic Model Predictive Control (economic-MPC) strategy for the high consistency (HC) refining process. With this advanced control method, a significant reduction in the specific energy for one HC refiner was reported at the November 2014 Steering Committee meeting. However, due to the lack of industrial data at that time, the proposed control strategies were only applied to the HC refining process.

Since the last report, Hui has been working with several industrial partners on the model identification for a conventional TMP production line, which includes a primary refiner, a secondary refiner, a latency chest and a low consistency (LC) refiner. With the data provided by the industrial partners, she has developed the dynamic nonlinear models for each operational unit of the TMP process. Based on these models, the economic-oriented nonlinear MPC was extended to the multistage TMP process. In this economic MPC technique, the specific energy, which is defined in Eqn. (1), was considered as the stage cost. The simulation results show that compared with the traditional MPC, the proposed economic MPC technique can reduce 10% of the total specific energy consumption in producing the pulp with the same qualities.

$$\text{Specific Energy} = \frac{\text{Total Motor Load (MW)}}{\text{Production Rate (tonne/day)}}$$

On the other hand, in order to meet the process safety and pulp quality requirements, the constraints for both the manipulated variables and the controlled variables have to be taken into account in the control of the TMP process. For instance, in order to avoid the pads collapse and minimize the fibre cutting, we have to ensure that the gaps of the refiners are larger than the critical level. In addition, some other operating constraints, such as the maximum motor load and the maximum chip transfer screw speed, have to be taken into consideration as well. Besides, by using the pulp quality constraints, the pulp quality in each stage can be guaranteed within their specific ranges.

Simulation Results and Analysis

The objective of this simulation was to show the control performance and economical benefits of the proposed economic MPC technique in the TMP process. In this simulation, the screw speed, gap size, and dilution water flow rates for the primary HC refiner, the gap size and dilution water flow rates for the secondary HC refiner, the gap size, dilution water flow rates and the temperature for the latency chest, and the gap size for the LC refiner are chosen to be the manipulated variables. The pulp qualities, including Canadian Standard Freeness (CSC), long fibre content (LFC), and shive content (SC) after each refiner are considered as the controlled variables. The purpose of economic MPC for TMP process is to find the optimal manipulated inputs by minimizing the stage cost while maintaining the pulp qualities and keeping all the variables within their constraints.

Fig.1 (a)-(b) show that in order to save energy and achieve the pulp quality requirements, the economic MPC techniques will calculate the optimal inputs around the setpoints. From Fig. 2(a)-(b), we can see that all the pulp qualities are guaranteed within certain ranges or in some cases, even improved. By comparing with standard MPC, Fig. 3 demonstrates that the proposed economic MPC will reduce approximately 10% of specific energy used.

Fig. 1 Manipulate variables:

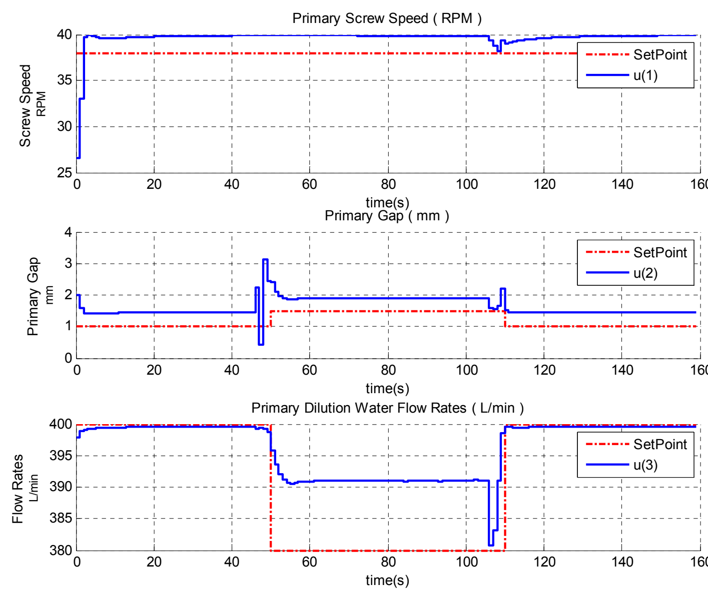


Fig. 1(a)

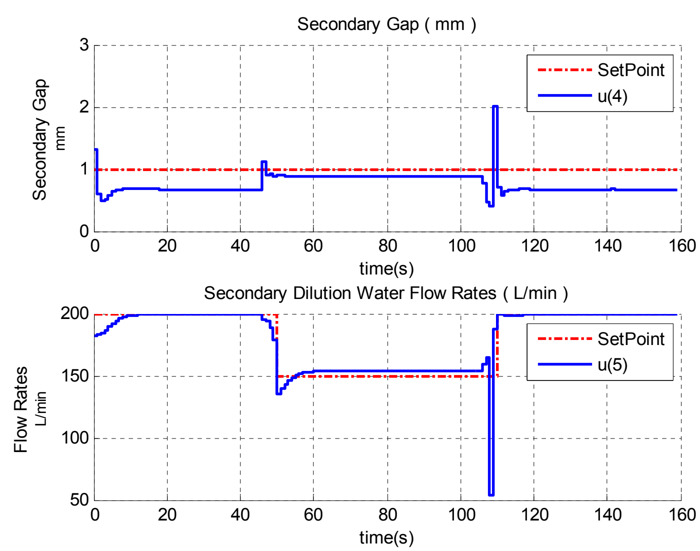


Fig. 1(b)

2.1 CONT.

Fig. 2 Pulp property variables:

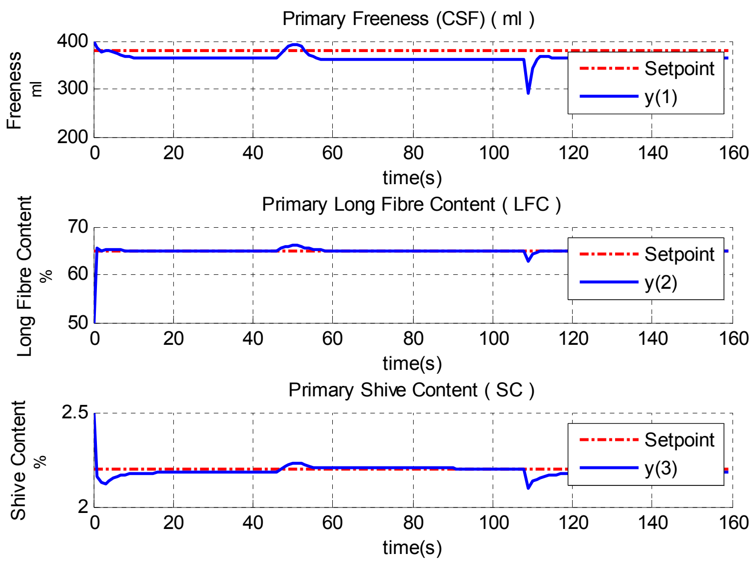


Fig. 2(a)

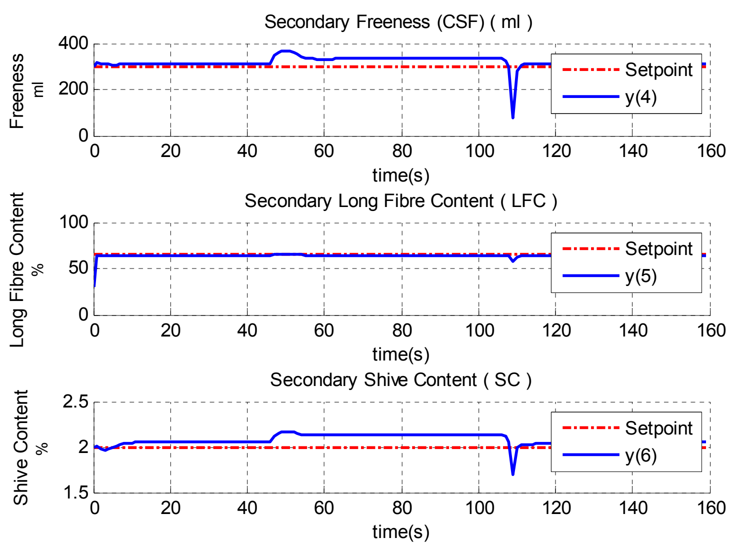
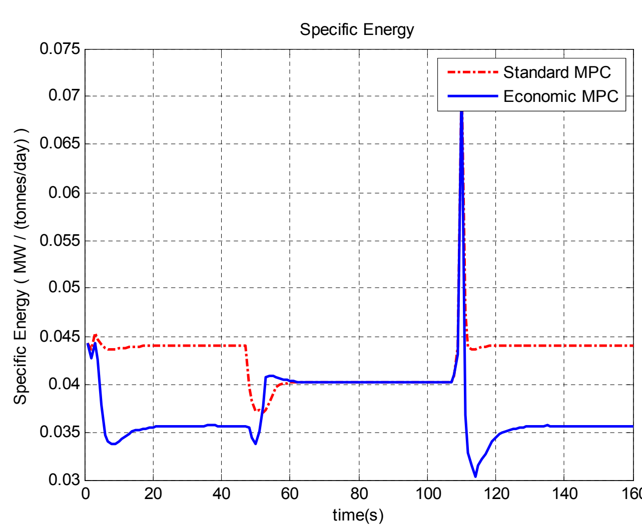


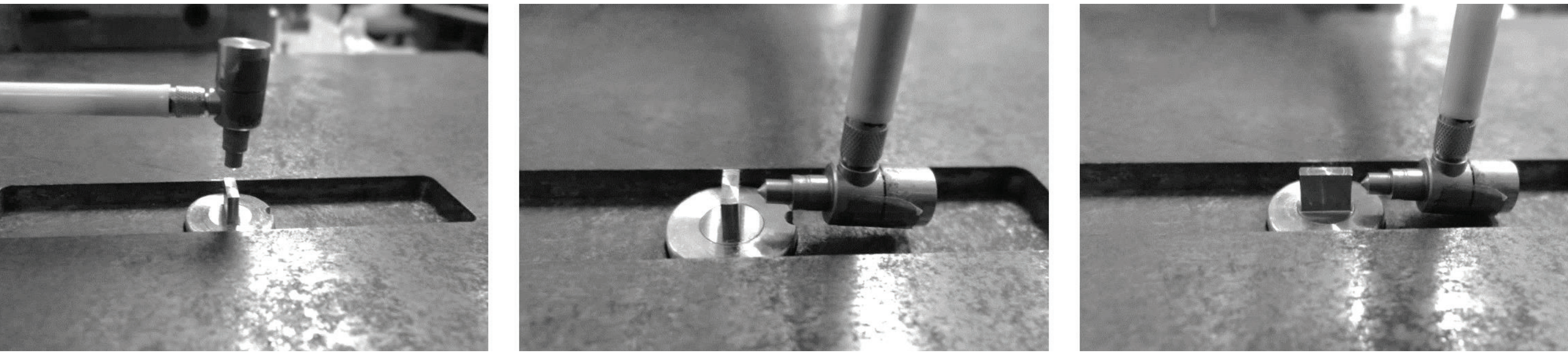
Fig. 2(b)

Fig. 3 Specific energy using standard MPC and Economic MPC respectively:



REZA HARIRFOROUSH

2.2 - LC REFINER BAR FORCE SENSOR BASED CONTROL STRATEGIES



Normal Impact

Shear Impact

Figure 1 - Calibration of the RFS

Current refiner control strategies are based on global process variables such as rotational speed, flow rate, and inlet pulp consistency. These control strategies ignore the details of the mechanical interactions between the refiner bars and the pulp. The Refiner Force Sensor, developed at UVic, (RFS) measures these interactions as normal and shear forces applied to fibers by the refiner bars [1-3]. This sensor offers opportunity to incorporate knowledge of these interactions into refiner control.

Two RFS-type sensors were custom designed and fabricated to measure normal and shear forces, perpendicular to and parallel to major axis of the refiner bars, in the AIKAWA 16″ single-disc LC refiner at the Pulp and Paper Center. These sensors include a tip that replaces a short length of the refiner bar and the sensors measure shear and normal forces applied to this tip. These sensors were calibrated by applying successive impacts with a modal hammer to the probe tip of the sensors in the normal and shear directions (Fig.1). Environmental tests were also performed to ensure that the sensors operate under refiner conditions. The test was done with the sensors inside a water-filled custom pressure vessel located in an oven set to the temperature of the planned refiner tests. The sensors were installed in a stator plate with BEL=2.74 km/rev (Fig.2). The force-sensing tip of each sensor replaces a short length of a refiner bar, as shown in Fig. 2 (lower inset). In December 2014, commissioning trials were run using 350 CSF softwood pulp at 3.5% consistency. Based on the results of the commission trials, a number of improvements were applied and the first experimental trial was planned and carried out in February 2015.

Figure 2 - The RFSs installed in the stator plate with BEL=2.74 km/rev

2.2 CONT.

A linear relationship between the net power and the inverse of the plate gap has been observed in previous experimental studies [4]. However, this relationship deviates from linearity for gap sizes smaller than a critical gap, Gc. To investigate the cause of this transition from linear to non-linear behaviour, the first experimental trials (February 2015) were used to gather force data for three rotational speeds (1200, 1000 and 800 rpm) and a range of gap sizes, spanning Gc. The same consistency and pulp mentioned in commissioning trials were employed. The pulp was sampled at regular intervals and mean fibre length was determined for each sample.

Typical unfiltered shear force data for these trials is shown in Fig. 3. As shown in Fig.2, the bars of the rotor and stator are grouped in three-bar clusters. Therefore, bar-crossing events (i.e. crossing of a rotor bar over the force sensor) appear in Fig. 3 as clusters of three peaks, an example of which is highlighted in the dashed rectangle.

The power spectrum of the data recorded at 1200 rpm and gap size of 0.25 mm shows peaks at frequencies of 3.82, 2.87, 1.90 and 0.95 kHz (Fig. 4). The first peak, 3.82 kHz, corresponds to passage of the leading edge (or trailing edge) of adjacent bars within each three-bar cluster. The second peak, 2.87 kHz, corresponds to passage of the leading edge and then the trailing edge of adjacent bars within each three-bar cluster. The third peak, 1.90 kHz corresponds to the passage of the leading edge (or trailing edge) of the first and third bars within each three-bar cluster. The final peak, 0.95 kHz, corresponds to the passage of equivalent edges in adjacent three-bar clusters. In future, analyses will be performed to establish correlations between RFS data and pulp properties. In addition, RFS data, pulp property data and refiner operation data will be assessed, in collaboration with Dr. Bhushan Gopaluni, UBC, to identify system models and possible control strategies that make use of the RFS data.

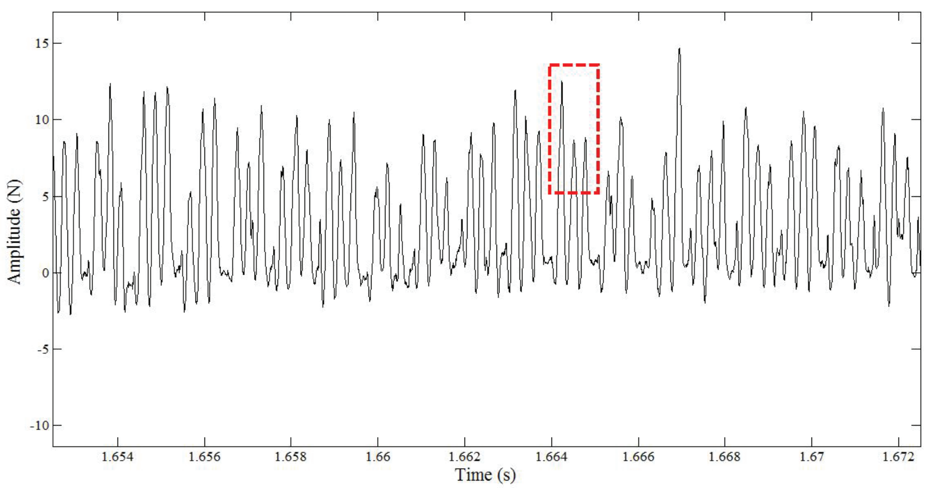


Figure 3 - Typical unfiltered shear force profile from first experimental trials (1200 rpm)

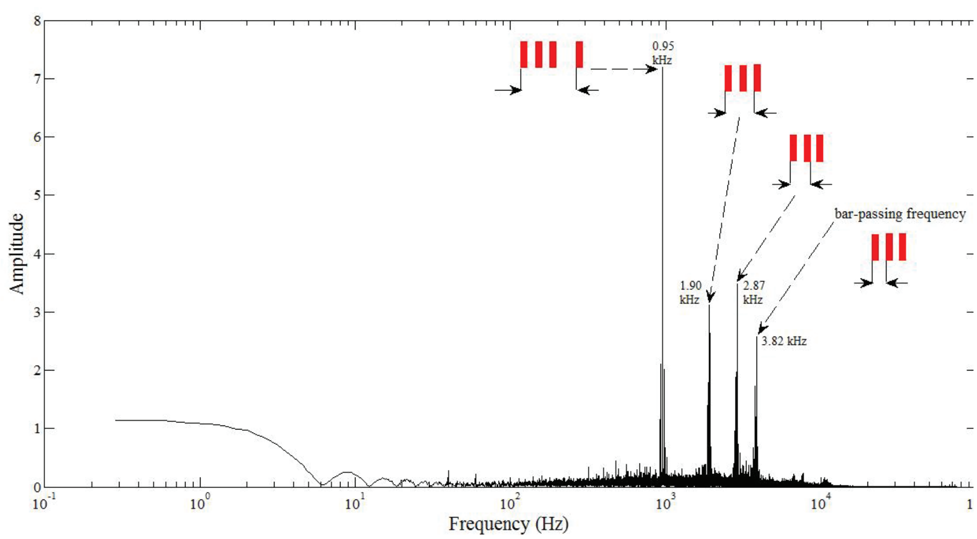


Figure 4- The Spectrum of normal force for one of the sensors mounted in the stator plate

References
[1] Senger, J., et al., J. Pulp Pap. Sci., 2004, 30(9).
[2] Olender, D., et al., J. Pulp Pap. Sci., 2007, 33(3).
[3] Prairie, B., et al., Pulp Pap. Can., 2007, 108(9).
[4] Elahimehr A., PhD thesis. University of British Columbia, 2014.

RAMIN KHOIE

2.3 - ADVANCED PUMP PERFORMANCE MONITORING SYSTEM

One of the main objectives of this project is to measure and monitor the structural wear on impeller blades of centrifugal pumps in the pulp and paper industry in order to schedule pump maintenance for reduced efficiency loss and plant downtime. As wear occurs on the impeller blades, the gap between the impeller and the pump body increases and this in turn will increase the volumetric losses inside the pump. To measure this varying gap a magnetic sensor is being developed that does not require modification of the pump housing itself. This sensor closes a magnetic loop with the pump and as wear occurs, the varying gap increases and so does the reluctance of the magnetic circuit. The reluctance of the circuit can then be measured to determine the size of the gap.

The reluctance of the magnetic circuit is measured through the inductance of a coil

$$L\,(l_{gap}) = \frac{c_1}{l_{gap} + c_2} \qquad \text{(Eq.1)}$$

where l_{gap} is the varying gap size and c_1 and c_2 are constants derived from Maxwell's equations.

The inductance of the magnetic coil can be measured by exciting the coil at a constant AC voltage. Since the voltage signal is at a high frequency, the parasitic capacitance between the windings of the coil is also considered. This creates resonance in the circuit at a specific frequency called the self-resonant frequency or the SRF. This phenomenon can be used to achieve a significant sensitivity of the sensor when operating close to the SRF. The value of the SRF can be adjusted by addition of external capacitance in parallel with the magnetic coil. The magnitude of the voltage across the resistor R in Figure 1 can then be used to measure the inductance and hence the varying gap between the impeller and the pump body.

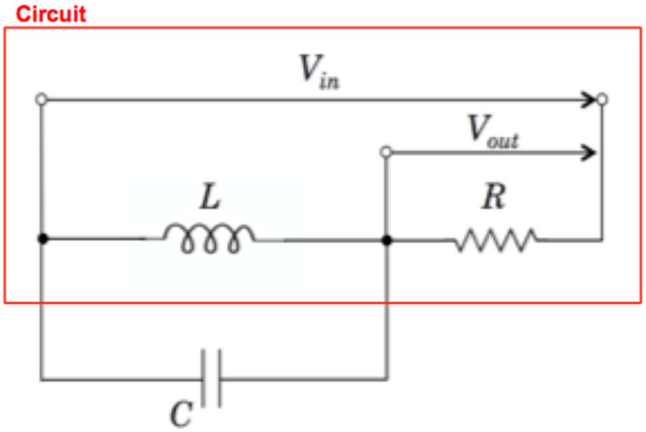


Figure 1: RLC circuit created with the coil L, shunt resistor R and the combination of the parasitic and external capacitance C

After the coil was analytically modeled, the magnitude of the gain of the system

$$|G| = \frac{V_{out}}{V_{in}} = \frac{R(1-\omega^2 CL)}{\omega^2 L^2 + (R-\omega^2 CLR)^2} \qquad \text{(Eq.2)}$$

was derived as a function of L. The first prototype of the sensor was then built as shown in Figure 2 to validate the analytical model of the coil and also to verify the geometry and the design of the sensor. The circuit elements in Equation 2 were fitted to match the gain of the physical prototype as a function of frequency, as shown in Figure 3, in order to determine the self-capacitance of the coil. Figure 3 illustrates the experimental curve and the analytical model fit very well. Using the validated analytical model, the gap can be determined by measuring the change in the gain of the system as wear occurs on the impeller blades.

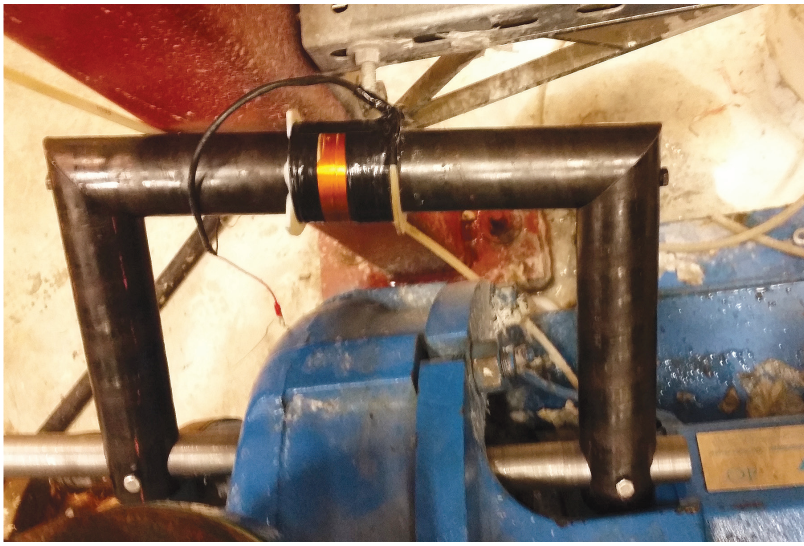


Figure 2: Initial prototype of the sensor (black) installed on a centrifugal pump (blue)

2.3 CONT.

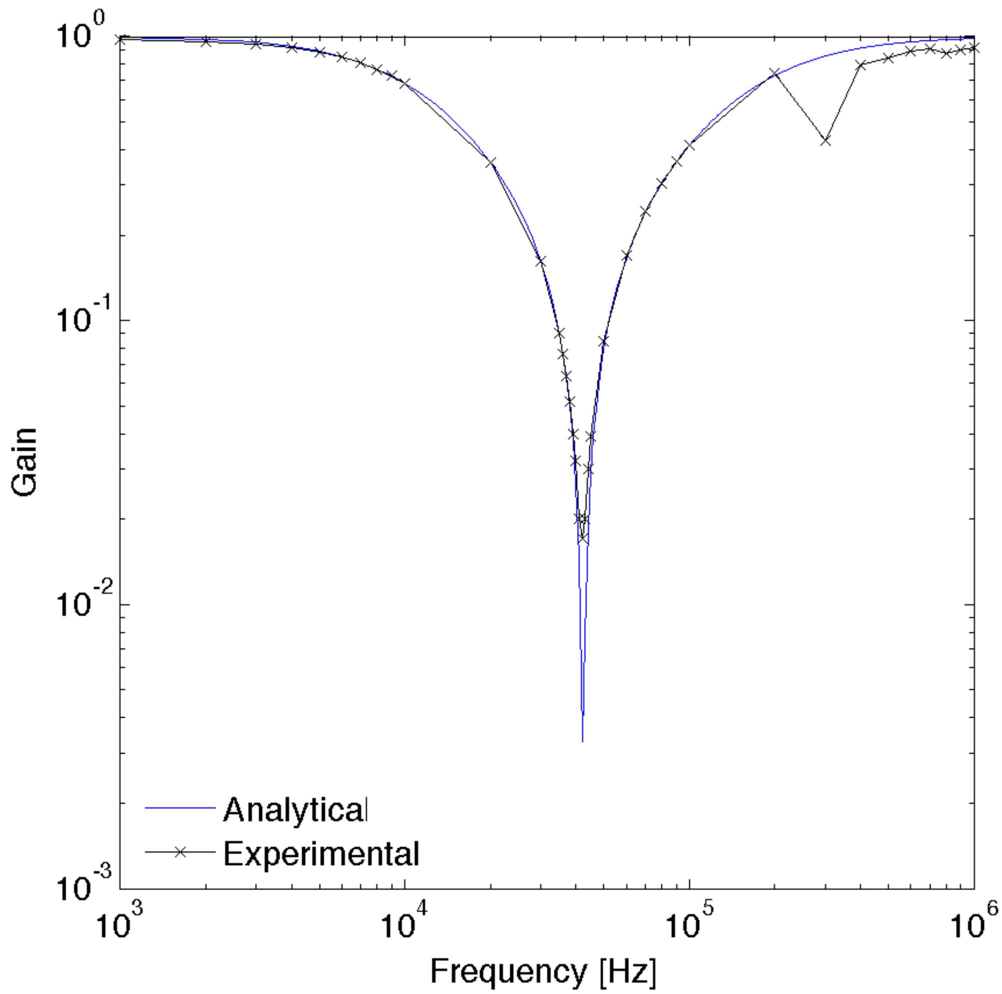


Figure 3: Frequency response of the magnetic coil for both the analytical calculations and the experimental measurements

HANYA ETTEFAGH

3.2 - LCR PULP FOR PACKAGING PAPERS

Winstone Pulp International (WPI)

The main goal of this project is to evaluate the use of LCR rejected radiata pine pulp as one of the sources to produce three-ply folding boxboards (FBBs). The best folding boxboard will be selected according to optimum refining energy consumption as well as its mechanical strength properties. The goal of the first phase of this project is to evaluate the mechanical strength of the middle layer of the FBBs, whereas the second phase will target understanding the effect of rejected pulp amount in the middle layer furnish of three-ply FBBs.

WPI Pulp Refining

WPI rejected pulp was delivered to UBC's Pulp and Paper Centre in October 2014. The pulp had been refined at high consistency and screened at WPI, and was then LC refined at UBC at two different refining conditions. Refining was completed with the plate with BEL: 2.74. SEL and power during refining were 0.31 and 35 kW, respectively. Five different samples were collected during the refining at different energy levels that lead to pulp obtained with different freeness and other properties.

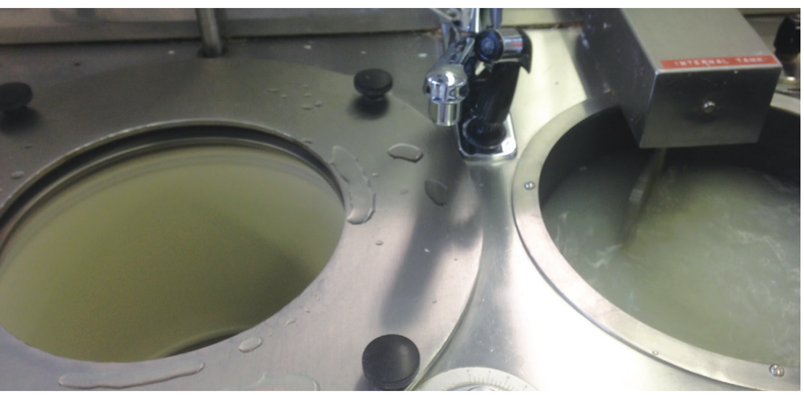


Figure 1 - Making middle layer of FBBs by Dynamic sheet former

Preparing board samples of the first WPI trial

Since the last update in October, Hanya has been making board samples with Dynamic sheet former (DSF) at FPInnovations in Montreal (Figure 1). There were five different pulp samples from the UBC trial and they were combined with three other commercial pulps, including WPI commercial board, West Fraser's Spruce, and West Fraser Aspen pulp, for making the middle layer of folding boxboards. For each pulp sample, seven to nine boards were made, with a total of 77 boards to date. The objective is to measure the mechanical strength of the folding boards' middle layer. Therefore, no top or bottom layer were included in making these sets of boards (Figure 2). The mechanical and physical tests, as well as the microscopic analysis will be conducted May through June, 2015.

Figure 2 - Middle layer of FBB made by DSF

Completing the proposal of the second WPI trial

After completing the first trial, a proposal on the second trial has been submitted to WPI for review and feedback. We aim to conduct LC refining of the pulp at UBC's Pulp and Paper Centre in May, 2015. The main goal is to change WPI's LC refined rejected pulp to match the three commercial pulp ratios and use that to make three-ply FBBs. During this phase of the project, the top and bottom layer will be made from kraft pulp.

Andritz/ QRP project

Completing the Andritz/QRRP proposal

The other part of this project is about the effect of chip pretreatment on the three-ply FBB's mechanical and physical properties. The proposal related to this part has been written and confirmed by QRP, UBC, and FPInnovations and the refining will be conducted at UBC in May 2015. The plan for this part of the project is to use the pulp that was obtained from the pretreated chips and refined at high consistency. This pulp will be refined at low consistency at different refining conditions. Also the no chemical pulp obtained from the same process will be LC refined to compare the pretreatment effect. The LC refining conditions are listed at (Table 1).

Trial #	1	2	3	4	5
Pre-treatment	No-chem	No-chem	No-chem	Sulphite	Sulphite
SEL	0.25 J/m	0.25 J/m	0.6 J/m	0.25 J/m	0.6 J/m
BEL	5.59	5.59	2.74	5.59	2.74
Initial Freeness	600 ml	500 ml	600 ml	600 ml	600 ml
Target freeness	400 ml	400 ml	400 ml	400 ml	400 ml

Table 1 - Summary of UBC LC refining plan. All trials: 1200 rpm, 250 l/min

PROGRAM ALUMNI

FRANCISCO FERNANDEZ

Francisco was the program manager from May 2013 to July 2014 before accepting a TMP Technical Assistant position with Howe Sound Pulp and Paper Corporation. While at UBC, his main focus was low consistency refining of reject pulp under the supervision of James Olson and Mark Martinez. The valuable skills he gained while with the program, such as mechanical pulping and data analysis, now help his current role overseeing the mechanical pulping process which includes monitoring and tracking quality and reliability; identifying gaps, inefficiencies, and cost saving opportunities; performing trials, analyzing data and determining optimal process conditions. Francisco also works with maintenance, operations and technical personnel troubleshooting quality issues or process related equipment failures. He has also been successful implementing new methods, equipment, and techniques in keeping with the latest industry developments.

His advice to current students in the program would be to seek contact with our industrial partners – ask them what their major challenges are since research should be oriented to solve these industrial issues.

NICI DARYCHUK

Nici played an instrumental role not only in the research program, but in the Pulp and Paper Centre overall. She was a Research Assistant and Laboratory Technician for Dr. Olson's research program from January 2012 to August 2014. She ran and maintained the low consistency refining pilot plant, participated in pilot screening trials, performed lab scale peroxide brightening of mechanical pulps, and performed laboratory testing of pulp and paper properties. This training and experience led her to her current role as Operations Specialist, Stock Preparation and Bleaching at Catalyst Paper, Powell River Division. Nici is still involved in numerous energy reduction initiatives in her current role, mainly around pumping efficiency and low consistency refining, and supervises crews and manages operations in the Stock Preparation and Mechanical Pulp Bleaching departments.

Photo: Alum Nici Darychuk

ALI ELAHIMEHR

Ali has been a Process Engineer, Projects, with Quesnel River Pulp, a division of West Fraser Mills since July 2013. He is responsible for evaluating existing processes to reduce cost and improve efficiencies, yields and changeovers; improve process capability and production volume while maintaining and improving quality standards; he develops innovative solutions and best practices to maintain reliable and safe manufacturing systems; and works with equipment designers and manufacaturing firms to develop cost effective and working production processes. He also performs research, assesses performance of, and purchases new manufacturing technologies. He credits much of his success to the ERMP program, "participating in the steering committee meetings provided me with an opportunity to meet with our partners and benefit from their experience and expertise. It helped me become familiar with the challenges that today's mechanical pulping process is dealing with as well as to fill the gap between theory and practice".

JIYANG GAO

Jiyang was part of the program for just over five years from late 2007 to early 2013 under the supervision of Mark Martinez and James Olson. At that time he worked on modelling latency removal in mechanical pulping processes, which gave him the necessary experience in pulp and paper and improved his abilities in research and problem solving which lead him to a career with Neucel as a Process Engineer. These days Jiyang spends his time process troubleshooting and optimization, as well as working towards a mill-wide water saving project.

Photo: Alum Francisco Fernandez

PROGRAM ALUMNI

ERANDA PUWAKKATIYA-KANKANAMGE

Eranda was with the program from May 2007 to August 2012 under the supervision of Guy A. Dumont working on the refiner control project with partners BC Hydro, Catalyst and Honeywell. Eranda continues to work in academics as a Postdoctoral Associate working on advanced control strategies for continuous pharmaceutical manufacturing processes at the Novartis-Massachusetts Institute of Technology (MIT) Center for Continuous Manufacturing. He credits the program with allowing him the opportunity to gain experience working on multidisciplinary projects, as well as with opportunities to visit other leading research groups in various universities which helped him establish successful research collaborations.

JENS HEYMER

Jens worked as a Postdoctoral Research Fellow under the supervision of James Olson from 2009 to 2011. In that time, he designed and installed the LC refining loop (16″ Aikawa refiner), supervised student trials and projects, and conducted industrial trials for the program partners. Jens is now a Product Engineer at Aikawa Fiber Technologies (AFT) and continues to work with the program as a representative of AFT. His main roles fall into four categories including applications, support, product design and optimization. He continues to conduct mill trials and devises solutions for customers; responds to technical inquiries about products; supports the development of the next generation of refining products and improving current products to serve customer needs; and applying value-engineering principles to enhance the design of current FINEBAR products while reducing manufacturing costs and increasing reliability. Jens recognizes that being part of the research program got him into contact with key players of his current employer, and gave him the opportunity to showcase his talents and work ethic.

Photo: Alum Jens Heymer

ANTTI LUUKKONEN

Antti worked on low consistency refining of mechanical pulp from 2007 to 2011 under the supervision of James Olson and Mark Martinez. Working closely with Andritz, he also conducted trials at several local mills. "Without the group I would not be in the position I am today, neither would I have met my loving and caring wife" says Luukkonen. He currently works with Andritz as the Director of the Research & Development Center in Springfield, OH. His advice to current students is to utilize this opportunity to gain as much practical experience as possible since employers are looking for talented, young individuals with multiple skills.

TAEGEUN KANG

Taegeun worked with the research program from 2007 to 2009 on novel mechanical pulping, at the time working closely with Quesnel River Pulp. He is now the Energy Manager at Howe Sound Pulp and Paper Corporation, and has been for close to three years. His role involves developing energy saving projects, verifying savings, analyzing billings and promoting employee awareness programs for energy conservation. "Energy reduction in the mechanical pulping industry is the biggest issue. The experience I gained from the ERMP group provided me with the opportunity to expand my skills further in this dynamic industry environment" says Kang. Taegeun is still an active member of the program representing HSPP and is always willing to chat with students and give advice and constructive feedback.

Photo: Alum Antti Luukkonen

LABORATORY & COMMUNITY OUTREACH MANAGER

On April 1st the research program welcomed Emiliano Vargas as newly appointed Laboratory and Community Outreach Manager. Emiliano's position is split 50/50 working directly for the ERMP program, as well as the Pulp and Paper Centre.

Emiliano received his B.S in Chemical Engineering from Oregon State University, Corvallis OR in 2006. He then joined Weyerhaeuser/International Paper, Albany, OR, for over three years as the Process Control and Optimization Engineering where he planned and managed process trials, analyzed results, reported and implemented improvements. He then joined Longview Fibre/Kapstone Inc, Longview, WA, as Optimization & Process Control Engineer where he implemented new designs and leading technologies, as well as implementing and mainintaing new control strategies. He ultimately became the Paper Mill Shift Coordinator, managing employees and the operation of five paper machines.

The chief objective of Emiliano's position as the laboratory and community outreach manager is to assist in the planning, developing and design of research activities to help achieve research goals. With his experience in the paper industry he is able to help advise on research and findings to benefit industry partners. He will be developing a project to compare the effects of LC refining in the pilot plant and the mill. Findings will be available to help our partners optimize LC refining operations and understand the results of pilot plant trials. Emiliano will also be taking part in the operations of the pilot plant as well as pursuing upgrades to the process. Finally, he will explore and develop funding and business opportunities for future ERMP projects.

MEETINGS & SITE VISITS

UPCOMING:
STEERING COMMITTEE MEETING
Wednesday, June 10, 2015
8:30-5:30 pm
Location: Fairmont Chateau
Whistler, BC

**Please contact Anna Jamroz to RSVP*

The week of October 13, 2014, Prof. Rodger Beatson, Harry Chang, Nicholas McIntosh and Meaghan Miller travelled to Springfield, OH, for a week-long visit to the ANDRITZ facility. They observed trials with chip impregnation and compression, chemical treatments, and high consistency refining, all using chips from Quesnel River Pulp. A large quantity of samples were shipped to Vancouver for further work on LC refining, chip compression, and chemical treatment.

On November 13, 2014, Prof. James Olson, Prof. Rodger Beatson and Meaghan Miller travelled to Slave Lake Pulp in Slave Lake, Alberta to tour the mill, present ongoing program work, and discuss future collaborations between UBC and SLP. The UBC group met with Allison Moeller, Tony McWhannel, Darin Lovelace, and Bob Jackle.

Following the ERMP Steering Committee meeting on November 25th, 2014, Christer Sandberg from Holmen in Sweden gave a presentation to the ERMP group entitled "Energy reduction in Mechanical Pulping - Mill experiences of chip pre-treatment and low consistency refining". Following his presentation, Christer met with the ERMP group to discuss future collaborations between UBC and Holmen. He has since sent the group samples of chips and pulp from the Braviken mill, as well as mill refining data for ERMP researchers to use in their project work.

Robert Gooding of Aikawa visited UBC the week of December 8th, 2014 and again April 21st, 2015. Jens Heymer (a PPC and ERMP alum) stopped by UBC to chat with ERMP researchers on March 11th, 2015.

On December 13, 2014, Prof. Boris Stoeber, Ramin Khoie and Meaghan Miller visited Westcan Industries in Port Coquitlam. They met with Tom Pape, toured the facility, and discussed work on project 2.3 "Advanced Pump Performance Monitoring System." John Borskey from Westcan also came to UBC on March 20, 2015 to work with Ramin on the pilot plant pump.

We look forward to continued visits with program partners in 2015.

Left: Harry Chang and Prof. Rodger Beatson at the ANDRITZ facility in Ohio, 2014.

CONFERENCE PROCEEDING

Prof. James Olson and Meaghan Miller attended the PaperWeek Conference in Montreal from February 3-7th, where Prof. Olson presented his work on a separate project involving novel cellulose foam material. To learn more about this exciting project and its potential, visit: www.fibrenetwork.org/commercialization/foam-paper/

During the conference they had a chance to speak with colleagues from the pulp and paper industry, including program partners QRP and FPInnovations.

PILOT PLANT TRIALS

Meaghan Miller and Emilia Jahangir (lab technician and refiner operator) have been busy at UBC's Pulp and Paper Centre low-consistency refining pilot plant, conducting several trials over the last several months, including:

Numerous LC refining trials with pulp shipped to UBC from the Andritz trials last October. The group is now working on testing the large number of samples and handsheets from these trials.

As part of project 2.2, "LC refiner bar force sensor based control strategies" with Prof. Peter Wild and Reza Harirforoush of University of Victoria, two sets of LC refining trials to test the bar force sensors have been conducted, in November 2014 and February 2015.

Working with partner Winstone Pulp International to investigate LC refining of reject pulp, initial trials were conducted in October 2014 and again in March 2015, with several additional trials planned for April 2015.

Working with partner QRP, the group conducted a trial to investigate the effect of operating LC refiners in series is ongoing.

COURSE: INTRO TO PULP & PAPER TECHNOLOGY

A three-day course sponsored by the Advanced Papermaking Initiative (API) at UBC's Pulp and Paper Centre is an annual introductory-level course suitable for current engineering students along with recently hired engineers working in BC pulp and paper mills and supporting industries. The April 2015 course offered a new LC refining component, and ERMP researchers were involved in giving 30 students a refining lecture describing the principles of LC refiner operation and plate design, as well as an overview of the pilot plant setup and operation. The lecture was followed by a refining demonstration, during which kraft pulp was refined, and pulp samples were collected for later testing.

More information on course can be found at www.ppc.ubc.ca/api/course

Left: ERMP member Robert Gooding, Aikawa, shows plates to API course participants.

CONTACTS

Please feel free to contact any of the faculty or staff:

Meaghan Miller
Program Manager
604-827-2390
meaghan.miller@ubc.ca

James Olson
Professor, UBC
604-822-2693
james.olson@ubc.ca

Mark Martinez
Professor, UBC
604-822-2693
mark.martinez@ubc.ca

Rodger Beatson
BCIT
604-432-8951
rodger_beatson@bcit.ca

Peter Wild
Professor, UVic
250-721-8901
pwild@uvic.ca

Bhushan Gopaluni
Professor, UBC
604-827-5668
bhushan.gopaluni@ubc.ca

Boris Stoeber
Professor, UBC
604-827-5907
boris.stoeber@ubc.ca

Ramin Farnood
Professor, UofT
416-946-7525
ramin.farnood@utoronto.ca

Anna Jamroz
Communications, UBC
604-827-2117
anna.jamroz@ubc.ca

Emiliano Vargas
Lab & Community Outreach Manager
604-822-0956
emiliano.vargas@ubc.ca

www.EnergyReduction.ppc.ubc.ca

PARTNERSHIP IS OUR STRENGTH

The supporting partners of this research program are:

AFT-Aikawa Group, Alberta Newsprint Company, Andritz, BC Hydro, BCIT, Canfor, Catalyst Paper, FPInnovations, Holmen, Howe Sound Pulp and Paper Corporation, Millar Western, NORPAC, NSERC, The University of British Columbia Pulp and Paper Centre, The University of Victoria, The University of Toronto Pulp and Paper Centre, West Fraser, Westcan Engineering, and Winstone Pulp International.