

Monthly Review

February 2014

New Faces

Please join us in welcoming some new faces to the Pulp and Paper Centre



Sima



Yu

Sima Motiee

A recent MASC graduate from Chemical and Biological Engineering. Currently a Research Engineer working with Professor Mark Martinez, Sima will work on manufacturing microfines (MF) using a low-intensity refining process. During this project, the strength enhancing properties of MF in Market Pulp and the effect of MF on Downstream Operations will be characterized.

Yu Sun

Yu received her BSc in Environmental Science from Beijing Forestry University, followed by a MASC in Environmental Engineering from the Chinese Academy of Forestry, in 2005 and 2009 respectively. Yu recently received her PhD from Quebec University at Trois-Rivières where her research focused on reducing the high-energy consumption of TMP by introducing O3, with pulp qualities maintained or ameliorated. Yu is currently a Postdoctoral Research Fellow and she will continue to work in the area of mechanical pulping technology.

PaperWeek 2014



Pictured: Ehsan Zaman, Abbas Nikbakht, Paul-André Gagnon, Converting Manager, Cascades, Mohamad ShanbGhazani, Xue Feng Chang at the CASCADES facilities.



Pictured: Abbas Nikbakht, Ehsan Zaman, Mohamad ShanbGhazani, Sudipta Kumar Mitra at PaperWeek 2014 Student Poster Session

This year marked the 100th anniversary of the PAPTAC annual conference of the Canadian pulp and paper industry, **PaperWeek 2014**. The event brought together key players from pulp and paper mills and head offices, equipment and service suppliers, government, research institutes, universities, consulting firms, utility service providers, and allied industries. Five PPC researchers attended the conference on Feb. 3-6 in Montreal: Ehsan Zaman, Mohamad Shanbghazani, Sudipta Kumar Mitra, Abbas Nikbakht, and Xue Feng (Harry) Chang.

The team of researchers attended FIBRE day presentations, presented at the student poster session, one presented a technical paper, attended key note speeches where they learned about the future of the pulp and paper industry, and took the initiative to organize several tours while in Montreal.

First up was a tour of Cascades, a tissue company. The team toured the factory and observed first-hand the start to finish process of making tissue. Next up was a visit to University of Quebec at Trois-Rivières where the team toured a research lab and pilot plant. The last tour was given by John Schmidt, Manager University Partnerships and Research Planning at FPIInnovations. The FPIInnovations labs were very impressive, especially the paper machine which is very unique in the industry. Back at the conference the student poster session not only provided an excellent networking opportunity, but also allowed for some healthy competition. The following posters were presented by the PPC research team:

"Observation of the turbulent transition of a fibre suspension in hagen-poiseuille flow"

by Abbas Nikbakht

"Fractionation of MFC using two viscoplastic fluids: Towards continuous device"

by Mohammad ShanbGhazani

"Numerical Study of Hydrocyclone Flow Field: Effect of Geometrical and Flow Parameters"

by Ehsan Zaman

****Congratulations to Ehsan on his award winning poster presentation ****



PaperWeek 2014 - Winning Poster

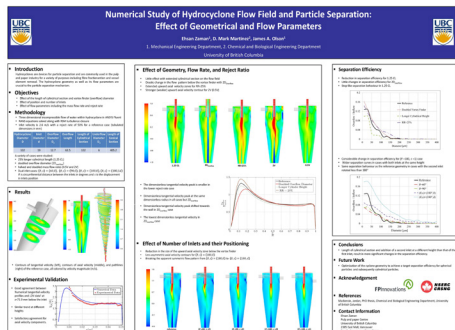
Ehsan Zaman is a PhD candidate in Mechanical Engineering and has been conducting research and experiments at the PPC for the last three years. This was Ehsan's first time at the PaperWeek conference, and also his first time winning the top prize for his poster:

Numerical Study of Hydrocyclone Flow Field: Effect of Geometrical and Flow Parameters

Hydrocyclones are used in the pulp and paper industry for a wide range of purposes including removal of waxes, stickies and adhesives from recycled pulp stock; separation of high and low density contaminants; removal of dirt, grit, and sand; shive, bark, and stone cell removal; pulp stock deaeration; plastic contaminant removal; and fibre fractionation.

The current work presents numerical simulations of hydrocyclone flow field performed by means of ANSYS FLUENT. The influence of geometrical and flow parameters on removal efficiency was investigated. This study provides insight into the hydrocyclone fractionation mechanism with particular application to vessel element removal.

Due to the multiple issues they cause, vessel element removal from a fibrous suspension has historically been desirable. Vessel picking phenomenon is the most notorious problem vessels cause. It is interesting to know that the benefits of the vessel element removal can potentially be twofold. While the vessel element poor stream (the accepts) is passed on for further processing for paper production, the vessel element rich stream (the reject) can be used in the development of 'next generation' pulp and paper products. In other words, the undesirable low-value vessel element pulp fraction in the rejects may be used as raw material for Cellulose Nano Crystalline (CNC) production. CNC can be used in banknotes, passports, and certificates and generally in intelligence inks capable of storing digital information. It also has applications in automotive, aerospace, and construction industries as reinforcement in Nano composites of various polymer matrices, and pharmaceutical tablets and food production additives, such as stabilizers, texturing agents and fat replacers.



Pictured: Ehsan's winning poster at PaperWeek 2014 Feb. 3-6, Montreal

PaperWeek 2014 - Technical Paper



Pictured: Xue Feng (Harry) Chang

Xue Feng (Harry) Chang received his MASc in Wood Science from UBC in 2007 and worked as a Research Scientist until the end of 2011. Harry is currently working as a Research Associate at the Pulp and Paper Centre. The following is an abstract of the technical paper presented at PaperWeek 2014:

OPTIMIZATION OF ALKALINE PEROXIDE TREATMENTS ON PRIMARY REFINED TMP PRIOR AND SUBSEQUENT TO LOW CONSISTENCY REFINING

Xue Feng Chang¹, James A. Olson¹, and Rodger P. Beatson^{2,*}

Reducing electrical energy consumption in mechanical pulping is strategically important for cost reduction and the sustainability of the pulp and paper industry. Alkaline peroxide treatments of high freeness thermomechanical pulp (TMP) in combination with low consistency (LC) refining have been shown to be effective in reducing the energy requirements to a given tensile strength. The optimization of these alkaline peroxide treatments would help maximize energy savings and reduce the treatment costs. A primary TMP, refined at high consistency, was treated with different combinations of sodium hydroxide (NaOH) and hydrogen peroxide (H₂O₂) at 15%, 20% or 30% pulp consistency at a temperature of 60°C for one or two hours. Chemical treatment was followed by laboratory-scale LC refining as using a Waring blender. Multivariate analysis of variance (MANOVA) and canonical correlation analysis were conducted to reveal the relationship between the process variables of the alkaline peroxide treatments and pulp properties before and after subsequent LC refining. It was found that high alkalinity and the presence of peroxide were critical to pulp tensile strength enhancement by alkaline peroxide treatments. With high alkalinity, the amount of peroxide, pulp consistency and treatment time had no significant effects on pulp tensile strength prior to LC refining. However, high peroxide charge and pulp consistency benefited brightness and the former was two times more significant in the correlation than the latter. On subsequent LC refining the peroxide charge had a significant positive impact on tensile strength. This is thought to be due to a high amount of acid groups being generated on the fibre surface during alkaline peroxide treatments with high dosage of peroxide. On removal of the surface material during refining, these fragments contribute to increased bonding.

Publications

Journals

Salem, Hayder, Martinez, D.M., Gooding, Robert, Olson, J.A., "Experimental Study of a Time-Varying Turbulent Cross-Flow Near a Two-Dimensional Rough Wall with Narrow Apertures" accepted by The Canadian Journal of Chemical Engineering, 2014.

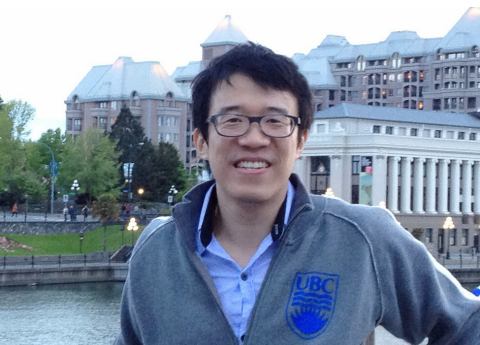
Abstract: Turbulent flow over a rough wall with suction or blowing is an industrially important fluid mechanics problem. In the screening of wood pulp fiber suspensions, for example, turbulent flow is induced by a rotor adjacent a perforated screen cylinder. To better understand the complex hydrodynamics in the critical region between the pulp screen rotor and the perforated screen wall, the stream-wise velocity and aperture velocities were measured using particle image velocimetry. The vortex generated above the aperture is shown to be strongly dependent on aperture velocity and wall roughness. The vortex diminishes in size at higher aperture velocities and increased exit layer height. The experiments also show that the reversal flow in the slot decreases with lower rotor speeds and increased mean slot velocities. This observation challenges the existing models of apertures being cleared by flow reversal driven by a Bernoulli-type suction pulse. In its place, this paper identifies elements of a more sophisticated flow model that considers the depletion of the zone below the rotor as well as the flow in the wake of the foil.

Jahangiri, Pouyan, Madani, Ario, Zeinoddini, S.Sadaf, Martinez, D.M., Olson, J.A., "On the filtration and heat insulation properties of foam formed cellulose based materials", submitted to Nordic Pulp and Paper Journal, 2014.

Summary: Novel biodegradable, low-density porous materials based on wood fibres are produced in foam laid media called foam-paper. Applications of foam-paper are studied in sub-micron aerosol filtration and heat insulation. The effect of foam air-content and fibre type on the variation of final product properties is determined.

In the first study, the effect of fibre morphology and crowding number are investigated on the major filtration parameters such as pressure-drop, air-permeability and filtration-efficiency. The results show that increasing fibre specific surface and crowding number and decreasing pulp freeness leads to increasing both filtration efficiency and pressure-drop of foam-papers. Different combinations of additives and two methods of drying are applied in order to optimize filtration characteristics. The best filtration properties are obtained using air-dried samples with 10% and 30% weight ratio of Northern Bleached Softwood Kraft (NBSK) valley beaten fibres and freeze-dried Nanofibrillated Lyocell Fibres at high air-contents. In the second study, variations of thermal conductivity of standard foam-papers with respect to foam air-content are investigated. The results of foam-papers at higher air-contents are comparable with the results of commercial heat insulators.

Fellowship

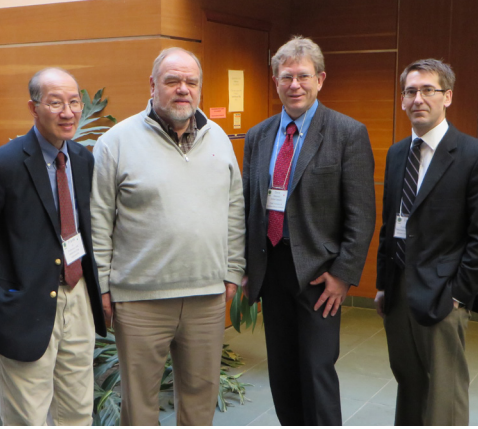


Pictured: Wisarn Yenjaichon

Mitacs Elevate supports postdoctoral fellows and Canadian companies and partners to collaborate on cutting-edge research projects and build capacity for the next generation of R&D management leaders. PPC researcher **Wisarn Yenjaichon**, postdoctoral fellow at Chemical and Biological Engineering, received a two-year Mitacs Elevate Postdoctoral Fellowship of \$57,500 per year. He will work on a project that focuses on "Refining of Kisolite Clay for Pharmaceutical and Cosmetic Applications" with industry partner Kisameet Glacial Clay Inc., and under supervision of John Grace, Professor at Chemical and Biological Engineering and Loretta Li, Professor at Civil Engineering. The project focuses on particle separation to provide better understanding of antimicrobial activity in relationship to particle size and mineralogical properties of the Kisolite clay. This will allow an assessment of the clay for various potential applications, as well as optimization of refining processes for applications. For details on the Mitacs Elevate fellowship, please visit: www.mitacs.ca/elevate



FIBRE Western Canada Workshop



Pictured: Frank Ko, AFML Director, Theo van de Ven, Chair of FIBRE Networks, Dave Peterson, Chief Forester & Assistant Deputy Minister, and PPC Faculty Associate James Olson

The FIBRE Cross-Country/Cross-Linking Workshops were held over the last several months with a goal of bringing together regional members of FIBRE from all eight networks to enhance FIBRE's mission to further develop the synergies between networks, which have been fostered over the past year. The Pulp and Paper Centre helped organize the FIBRE Western Canada Workshop that was held at UBC on February 20th.

The workshop was attended by over 110 participants. The day started off with guest speakers Dave Peterson, Chief Forester & Assistant Deputy Minister; Michael Rushton, COO at Lignol Innovations; and Theodorus G.M. van de Ven, Chair of FIBRE Networks. In this special session, the "future trends of the Canadian forest industry" were discussed from their varying perspectives: government, industry and academia. Over 20 Network PI's then presented an overview of their research – potentially garnering links between networks that could lead to future research, new ideas and funding. Over 30 posters were presented during the student poster session. PPC researcher Ata Sina, member of the Green Fibre Network, presented a poster on creating complex 3D paper folds (Origami) out of 2D sheets of paper. You can read more about his research at www.ppc.ubc.ca/folded.

The afternoon included a break-out session where groups made up of various FIBRE network members discussed various issues in small groups. The workshop ended with a tour of the Bioenergy Research & Demonstration Facility (BRDF) including Nexterra. The BRDF is a community-scale heat and power system fuelled by biomass, the first of its kind in the world. "The system provides heat and power to The University of British Columbia's Vancouver campus. It facilitates research to develop feedstock (fuel) and process innovations, set new global standards for performance and emissions and lowers the campus's greenhouse gas emissions (GHGs) and fossil fuel consumption".

To learn more about FIBRE networks, visit www.fibrenetwork.org

Upcoming API Course



A two-day course sponsored by the Advanced Papermaking Initiative (API) at the University of British Columbia: **Introduction to Pulp and Paper Technology**, APRIL 10-11, 2014 (Registration is limited)

Who should attend:

This introductory-level course is suitable for current engineering students, including coop, along with recently hired engineers working in BC pulp and paper mills and supporting industries. Suitable for both technical and non-technical individuals who want to understand basics of BC's natural resource, chemical and mechanical pulping, bleaching, recovery, papermaking, and paper grades and properties.

Description:

This hands-on course will consist of lectures during the mornings, and lab exercises in the afternoons to re-emphasize material and enhance understanding of process.

The course will provide an overview of:

- Natural Resources
- Mechanical Pulping history, theory and comparisons with chemical pulping
- Kraft Pulping, Bleaching and Recovery
- Pulp processing equipment, theory and operation of pulp screening, cleaning and low consistency refining
- Papermaking theory of forming, pressing and drying
- Chemical additives in the wet end of the paper machine
- Future bio-products and the transformation to a sustainable bio-economy

For more information and registration, please visit: www.ppc.ubc.ca/course

Seminar



Students, researchers and professors alike gathered in the mechanical engineering department on February 13th for a seminar by PPC Faculty Associate James Olson, Applied Science Associate Dean, Research and Industrial Partnerships, on **"Transforming BC's Forest Sector into a Vibrant Bio-products Industry"**.

Abstract: The social demand for sustainability brought on by global climate change and the depletion of non-renewable resources is transforming the forest sector into a diverse and robust bioproducts industry capable of supplying the world with energy, fuels, chemicals and advanced materials. The successful transformation from a fossil economy to a bio-economy requires the integration of thermo-chemical, biochemical and physical conversion of forest biomass to develop a wide range of high value products. This presentation provided an overview of the National, Provincial and UBC's bio-economy innovation strategy and future direction and then examined some of the unique cellulose materials that have been created through a combination of low consistency refining and novel foam forming process.

Professor Olson also gave presentations at PaperWeek 2014, Montreal, and at the FIBRE Western Canada Workshop, UBC.

Upcoming Events

Environmental Science Student Association Career Fair

March 6, 5:00-7:00 pm, Earth Sciences Building, UBC

ESSA hosts their annual career fair. This event is a great opportunity for anyone curious about working in jobs related to environmental science. There will be over 20 guests including WWF Canada, BC Ministry of Environment, Living Oceans Society and more! \$5 for non-ESSA members.

Celebrating Women at UBC

March 7, 9:00-4:00 pm

Celebrating Women at UBC is a blog started by the Equity Ambassadors dedicated to the promotion and visibility of some of the interesting, intelligent, creative and passionate women-identified bodies at UBC. They will have a booth in Irving K. Barber Learning Centre.

CHBE Speaker Series

March 10, 12:00-1:00 pm, CHBE 202

Professor Susan Muller of University of California, Berkeley will give a seminar on "Microfluidic tools for the manipulation and analysis of molecules, vesicles, capsules, and suspensions".

PACWEST

May 28-31, Jasper, AB

The Program Committee for the 2014 Pacwest Conference invites you to submit your interest in presenting a technical paper at the conference. The final selection of papers will be based on several criteria including originality, technical and mill relevance, and support of the chosen theme "Improving Mill Results - Keys for Success".

Paper submission deadlines:

March 14 - abstract

May 1 - complete papers

More info on pacwestcon.net

International Day of Forests

March 21, PPC

The United Nations General Assembly has declared March 21 as the International Day of Forests. The day celebrates and raises awareness of the importance of all types of forests. PPC invites you to join us for an informative lunch-time walk in the UBC forest to learn about tree species from our own PPC Research Assistant, Nici Darychuk.

President Toope Open House

March 26, 1:30-3:30, UBC

Come out to enjoy a snack, mingle with the President and sign the guestbook. Join the UBC community at this open house to thank Professor Stephen Toope for his eight years of service at the university. The celebration will be held at the Richard S. Hallissey Atrium, EME Building.

Earth Hour

March 29, 8:30-9:30 pm

Earth Hour is a worldwide grass-roots movement for the planet organized by the World Wide Fund for Nature (WWF). On March 29, join the millions of people across the world taking part in Earth Hour by shutting down power in a show of concern for the environment.

The 9th Asian-Australasian Conference on Composite Materials (ACCM-9)

October 15-17, Suzhou, China

Theme of "Composites: innovation, sustainable development and expanding application", ACCM-9 will provide a high quality technical program and serve as an international networking opportunity for engineers and scientists working in the field of composite materials.

Abstract submission deadline is March 31st. The conference website is now open for registration: www.accm9.com



Reminder

The PPC has gone keyless. The Keyless System has been installed at both the front and back doors which means your key no longer works. Please register your UBC Student/Employee/Faculty card or FOB in-person with George Soong, located in office #114.

Social Media



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Thanks for all your TWITTER support. Below we share a few of our recent tweets:

UBC Engineering @ubcengineering 20 FEB
RT: @ubcPPC: Frank Ko, Theo van de Ven, BC's Dave Peterson, Chief Forester and ADM, and James Olson at FIBRE workshop pic.twitter.com/suAeyc9kak

FIBRE Canada @FIBRECAN 20 FEB
RT: @ubcPPC: Theo van de Ven, Chair of @FIBRECAN networks: 'there is lots of room for research' @ubcforestry @ubcengineering pic.twitter.com/TuQ3JU5E8j

UBC Pulp & Paper Centre @ubcPPC 20 FEB
After hearing from government and industry, now we get an academic point of view of the future of the CDN forest industry @FIBRECAN

UBC Pulp & Paper Centre @ubcPPC 20 FEB
Michael Rushton, Chief Operating Officer at Lignol talks future trends of Canadian forest industry @ubcengineering pic.twitter.com/Z1P-619W76d

UBC Pulp & Paper Centre @ubcPPC 19 FEB
RT: @sustainUBC: Drop by the #UBC Sustainability Fair on February 24th: engaging activities and stimulating displays <http://bit.ly/SustFair> #RippleEffectUBC

Contact

To submit items to *PPC's Monthly Review*, please contact **Anna Jamroz, PPC Communications Coordinator** at: anna.jamroz@ubc.ca or **604.827.2117**

