



a place of mind

FACULTY OF
APPLIED SCIENCE

ADVANCED PAPERMAKING INITIATIVE (API)

ANNUAL REPORT

for the period April 1, 2014 - March 31, 2015

Prepared for API

Dr. Mark Martinez, Director

Professor in Chemical and Biological Engineering

Director of the Pulp and Paper Centre

Your support continues to
make a vast difference to
our students, faculty and
community.

Thank you.

For more information, please contact:

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Introduction

The mission of the Advanced Papermaking Initiative (API) is to enhance postsecondary education and research for the paper industry of British Columbia. The Initiative supported the creation of two faculty positions at UBC (Professors James Olson in Mechanical Engineering and Mark Martinez in Chemical and Biological Engineering) and one at BCIT (Dr. Rodger Beatson). Professor Peter Englezos, a faculty member and Head of the Department of Chemical and Biological Engineering at UBC, is also a member of the API.

This 17th Annual Report describes the activities of the API-funded faculty as well as the Director's for the period 1 April 2014 to 31 March 2015. Leading edge and industrially relevant research is carried out at UBC's Pulp and Paper Centre. I invite you to contact Professors Beatson, Englezos, Martinez and Olson directly to learn more about their exciting research projects.

The annual API sponsored course "Introduction to Pulp and Paper Technology" was once again a success, selling out far in advance of the registration closing date. In addition to the course, over the last year API faculty members initiated multiple Professional Development courses aimed at current engineering students to enhance their technical knowledge and provide them with hands-on experience ahead of graduation. UBC's new Master of Engineering (MEL) in Green Bio-Products has also been a major educational component of API faculty. The degree is designed to answer human resources needs in this critical time of rapid sector evolution and provide industry with highly qualified personnel with both the technical fundamentals and leadership skills needed to lead the industry towards to a more sustainable bio-economy. As the forest sector continues to evolve, companies who have access to advanced education, for all employees, will be those able to take the next step and continue to compete in the global marketplace.

API Structure



Mark Martinez
Director, API

The Initiative is led by a Director, appointed by the Dean, and advised by a Management Committee consisting of API faculty. An industrial Advisory Group provides advice to the Director and Dean on the API’s activities in meeting its mandate.

The key personnel are:

Dean, <i>Applied Science</i> :	Marc Parlange
Director of API:	Mark Martinez

Management Committee:

This committee consists of the faculty associate with the API

- Rodger Beatson
- Peter Englezos
- Mark Martinez
- James Olson

Advisory Group:

- Mr. Carlo Dal Monte, Catalyst Paper
- Mr. Carol Lapointe, Domtar
- Ms. Gail Sherson, *FPIinnovations*
- Mr. Frank Van Biesen, *Kruger Inc.*
- Mr. Paul Watson, *Canfor Pulp Ltd. Partnership*
- Mr. Tobias Ziegenbein, *Mercer International*

API Faculty - Biographies

Rodger Beatson Rodger Beatson holds a B.Sc. Honours (1968) in Chemistry from the University of Exeter, Devon, England. He obtained his Ph.D. (1975) in Organic Chemistry from the University of Western Ontario, London, ON. In 1976 he joined Consolidated-Bathurst subsequently becoming Group Leader Product Development in the Packaging Division. Rodger joined Paprican in 1979 holding research positions in mechanical pulping and fibre and paper physics. He also served as the Director of the Papricourse. Rodger joined Canadian Forest Products as a Senior Research Scientist in 1990 before joining the API in 1999 as a Faculty member at BCIT. Rodger served as the Chairman of the PAPTAC Research committee in 1994 and has been an Adjunct Professor in the Faculty of Forestry at UBC since 1995. Beatson's current research interests are dissolving pulp production, the use chemicals to reduce energy consumption in refining, recovery of hemicellulose from mill residues and their use to enhance paper strength and the identification of the genes that control fibre morphology and lignin content.

Peter Englezos holds a Ph.D. in Chemical Engineering from the University of Calgary (1990). During his Ph.D. studies, Peter was the recipient of an Izaak Walton Killam Memorial Scholarship. In September 1990, he joined the Department of Chemical Engineering at UBC as an Assistant Professor. He was awarded a UBC Izaak Walton Killam Memorial Faculty Research Fellowship for the period 1997-98. In 1999, he was named Fellow of the Tokyo Electric Power Company Endowed Chair at the Faculty of Science and Technology of Keio University in Japan. He served as Coordinator of the non-thesis Pulp and Paper Master of Engineering Program for the period 1992-1999. Peter served as the Director of the Advanced Papermaking Initiative between July 1, 2015 and August 2011. On December 1, 2007 he became the inaugural holder of the Advanced Papermaking Professorship. In July 2009 Peter was appointed Head of the Department of Chemical and Biological Engineering. He is a registered Professional Engineer in British Columbia and a member of the Canadian Academy of Engineering (2009). His current research interests are in the fields of papermaking chemistry, natural gas hydrates, thermodynamics, and carbon dioxide capture.

Mark Martinez holds a Ph.D. in Chemical Engineering from The University of British Columbia (1995) and a Docent in Paper Technology from the Royal Institute of Technology (1999). He joined the Chemical Engineering Department at UBC in 1999 after four years at the Swedish Pulp and Paper Research Institute, where he was group manager for the paper technology group. Mark was appointed Director of the UBC Pulp and Paper Centre as of January 1, 2014, and has been the Director of the Advanced Papermaking Initiative since 2011. His research focuses on the fluid mechanics of fibre suspensions, and has been awarded numerous awards including the 2009 BCIC Lieutenant Governors Award for Innovation. He is a registered Professional Engineer in BC.

James A. Olson holds a B.A.Sc. in Engineering Physics (1991) and a Ph.D. in Chemical Engineering from The University of British Columbia (1996). He worked at the Pulp and Paper Research Institute of Canada from 1995 to 1999 to lead a research project on fibre fractionation and contaminant control. He joined the Mechanical Engineering Department in July 1999 as an Assistant Professor. James was appointed as the Director of the UBC Pulp and Paper Centre from 2011 to the end of 2013 and has been newly appointed as the Associate Dean of Research for Applied Science. His research is in the areas of advanced pulp processing, screening, LC refining, fibre and paper properties, and the fluid mechanics of fibre suspensions. He currently leads a \$4M research program to reduce electrical energy in mechanical pulping. In recognition of his research he has been awarded two NSERC Synergy awards for industry collaboration, 2 I.H. Weldon awards for best papers, the Van den Akker medal from the Fundamental Research Committee, and the 2009 BCIC Lieutenant Governors Award for Innovation, as well as several best paper awards. He is a registered Professional Engineer in BC.

API Faculty - Teaching

The API presents a number of courses at three different post-secondary institutes in BC.

This year Professor Martinez delivered CHBE 230, *Computational Methods*, to 115 students. 39 hours of lectures were delivered, along with 6 tutorials. He also delivered CHBE 251, *Transport Phenomena I*, to 117 students with 39 hours of lectures and 6 tutorials.

Professor Englezos delivered two courses - Introduction to Chemical and Biological Engineering Process and Technology to second year students; and Chemical Engineering Thermodynamics as a graduate course. He was also a guest lecturer in the Chemical Laboratory course as well as CHBE 597/697 MSc and PhD Thesis Proposal Development.

Professor Beatson delivered three BCIT diploma courses in the past year:

Paper and Chemicals from Renewable Resources: 90 hours of lectures and labs to 17 students. Covered the production of pulp, paper, extractives, dissolving pulps, biopolymers and ethanol from wood.

Research Projects: 60 hours with 17 students. Student groups were guided in a laboratory based research projects. The group conducts a literature search and develops a program of experimentation, in consultation with the instructor and the industry sponsor when applicable.

Process Simulation: 60 hours of tutorials to 16 students. In this course, students worked with computer simulations of chemical processes (CADSim) to develop an understanding of the impact of manipulating process variables on the products from the process.

UBC Instructor Dr. Barbara Dalpke delivered MECH 450, *Pulping and Papermaking*, to UVic students, and Instructor Dr. Nuwan Sella Kapu delivered CHBE 402, *Chemical Pulping Technology*.

API Faculty - Teaching

Masters of Engineering Leadership (MEL) in Green Bio-Products

The Faculty of Applied Science offers a suite of new Masters of Engineering Leadership (MEL) programs that focus on sustainability and industry. The eight new post-secondary degree programs will commence January 2016, including the **Green Bio-Products** program championed by Dr. Mark Martinez.

Offered by Applied Science in collaboration with the Faculty of Forestry and the Sauder School of Business, the one-year, full-time program is designed for practicing professionals who want to invest in their careers, broaden their technical perspectives and gain new business and leadership skills.

Unique in North America, each MEL degree has been developed in close collaboration with industry and is designed to equip participants with a suite of practical, hands-on skills in demand by top employers. In addition to advancing participants' technical skills, the programs offer co-op work placements, professional development workshops and individual coaching to enhance leadership skills.

GREEN BIO-PRODUCTS

BECOME A GREEN BIO-PRODUCTS ENGINEERING EXPERT

If you're thinking about concentrating your career in the green bio-products sector, think about the difference a year at UBC can make. Build knowledge. Cross disciplines and boundaries. Gain confidence. Master the leadership skills that will take you to the next level. Invest in yourself, and in the growing bio-economy, at UBC.

mel.ubc.ca

MEL

Master of
Engineering
Leadership

API Faculty - Research

The research contributions of the API faculty members are quite broad. API faculty members currently conduct research in the following areas:

- Mechanical pulping
- Stock preparation
- Papermaking and papermaking chemistry
- Chemical pulping
- Novel materials

Over this year, API members have supervised a combination of over 25 graduate students, research assistants and postdoctoral research fellows. They published 6 scientific journals, and participated in 5 conference proceedings.

Professors Olson, Martinez and Beatson are working on the collaborative Energy Reduction in Mechanical Pulping research group. The group was featured in **UBC's Annual Report 2013-14** as the exemplar of Research Excellence. Please see Appendix A: PULP FRICTION for the full story. The following projects are just a sample of the research that API faculty have been involved in over the past year:

Energy Reduction in Mechanical Pulping – Application of Chemical and Enzymatic Treatments in Low Consistency Refining, Dr. R.P. Beatson (BCIT), Research Associate Harry Chang

Reducing electrical energy consumption in mechanical pulping is strategically important for cost reduction and the sustainability of the pulp and paper industry. In Phase I of the program we demonstrated energy savings of 1000 kWh/t through the treatment of primary stage pulp with of alkaline peroxide prior to low consistency refining. One of the goals of Phase II is to determine the best position to apply various chemical treatments in the mechanical pulping process to obtain the desired pulp properties at the lowest energy. To this end a trial was conducted at the Andritz pilot plant in October 2014 in which spruce and spruce/pine/fir chips were treated with alkaline peroxide alkali and sulphite, prior to first stage refining. The primary stage pulps so produced will serve as feedstock for further chemical treatment and low consistency refining.

Work under Phase I also demonstrated that oxidation of the pulp was the major reason for pulp strength enhancement. With this as a basis, primary stage pulps have been treated with oxygen and alkali under high temperature and pressure on a laboratory scale prior to low consistency refining. Results show that this inter-stage alkaline oxygen treatment leads to increased pulps strength properties with and without LC refining. Among the three parameters of the oxygen reaction, the effects of temperature and sodium hydroxide were much greater than the effect of pressure. The disadvantage of this treatment is a drop in brightness. Therefore, in the future work, effort will be focused on understanding the

API Faculty - Research

mechanism of the deterioration of brightness during alkaline oxygen treatment with the aim of solving this problem.

Recovery of hemicellulose from mill residues and their use to enhance paper strength, Dr. R.P. Beatson (BCIT), Prof. H. Trajano (UBC)

Mill residues such as hog fuel are generally burnt in boilers to provide a source of heat and steam. These residues contain high-value chemicals such as extractives and hemicelluloses. If the hemicelluloses could be successfully extracted from hog fuel their addition to pulp might promote pulp strength and beatability. This project is funded by a NSERC Collaborative Research and Development Grant with Canfor as the industrial partner.

Hydrolysis of three different softwood residues, chip fines, hog fuels and primary sludge, have been investigated as a mean of producing hemicellulose polysaccharides for use as strength additives. The influence of hydrolysis temperature, time, and consistency on the production of polysaccharides from chip fines was determined. Hemicellulose polysaccharides degraded into monomers at higher temperature or with increased residence time. Polysaccharide yield decreased with increasing consistency. A maximum polysaccharide yield, 19% of initial hemicellulose in dried chip fines (11.6% based on dry wood), was achieved during these initial experiments.

Production of Dissolving Pulp from Bamboo, Dr. R.P. Beatson (BCIT), Prof. M. Martinez (UBC)

As a fast-growing species, bamboo has been widely used for industrial applications, and recently has been demonstrated to be an attractive alternative feedstock for dissolving pulp. However, the high silica content in bamboo is a major obstacle in using bamboo as a raw material. In pulping applications, silica precipitation causes scaling problems in multiple effect evaporators. In addition, residual silica in pulp deteriorates viscose filterability and interferes with the spinning process. Our research has determined the silica content and distribution in bamboo and developed methods of reducing the silica content in bamboo chips. Other work has focussed on producing higher quality dissolving pulp from bamboo by reducing the hemicellulose content. Kinetic expressions have been developed for hemicellulose removal during the

API Faculty - Awards

Professor James Olson received the 2014 Meritorious Achievement Award from APEGBC for his outstanding technical achievements and leadership in advancing BC's pulp and paper industry. An industry leading expert in the application of physics and fluid mechanics, Olson's research has led to revolutionary developments in the pulp and paper industry.

Every year, APEGBC recognizes eight engineering and geoscience leaders who have made outstanding contributions in their professional fields or community service.

API Faculty - Selected Publications

pre-hydrolysis step and the application of enzymes to remove residual hemicellulose has been explored.

J. Qazi, D.M. Martinez & J.A. Olson, "Multistage fibre fractionation of softwood chemical pulp through smooth-holed screen cylinder and its effects on paper properties", accepted TAPPI J., 2015

J. Gao, D.M. Martinez & J.A. Olson, "Characterizing latency removal in the mechanical pulping process. Part 2: Characterization", submitted to TAPPI J, 2015

J. Gao, D.M. Martinez & J.A. Olson, "Characterizing latency removal in the mechanical pulping process. Part 1: Kinetics", submitted to TAPPI J, 2015

Y. Sharma, A.B. Phillion & D.M. Martinez "Automated segmentation of wood fibres in micro CT images of paper", submitted to J. Microscopy, 2015

A. Oko, D.M. Martinez, & A. Swerin, "Infiltration and dimensional scaling of droplets in thick isotropic porous media", *Microfluidics & Nanofluidics* 17(2), 413-422, 2014

A. Madani, D.M. Martinez, I.A. Frigaard & J.A. Olson, "The stability of spiral Poiseuille flows of Newtonian and Bingham fluids in an annular gap", *J. Non-Newtonian Fluid Mech*, 193, 3-10, 2014

A. Madani, S. Zeinoddini, S. Varahmi, H. Turnbull, A.B. Phillion, J.A. Olson & D.M. Martinez, "Ultra lightweight paper foams: processing and products" accepted *Cellulose* DOI 10.1007/s10570-014-0197-3, 2014

A. Nikbakht, A. Madani, J.A. Olson, D.M. Martinez "Fibre suspensions in Hagen-Poiseuille flow: transition from laminar plug flow to turbulence", *Journal of Non-Newtonian Fluid Mechanics*, 212, 28-35, 2014

Englezos, P., and D. Sun, "Storage of CO₂ in a partially water saturated porous medium at gas hydrate formation conditions", *Int J Greenhouse Gas Control*, 25, 1-8, 2014

H. Salem, R.W. Gooding, J.A. Olson & D.M. Martinez, "Theoretical model of pulp screen capacity", accepted *Can J Chem Eng*, 2014

P. Jahangiri, R. Korehei, S.S. Zeinoddini, A. Madani, Y. Sharma, A. Phillion, D.M. Martinez and J.A. Olson, "On filtration and heat insulation properties of foam formed cellulose based materials", *NPPRJ*, 29 (3), 2014

R.A. Khan, R. Korehei, H.J. Salem, N. Darychuk, D.M. Martinez, J.A. Olson, "Fabrication and Characterization of Microfibrillated Cellulose Reinforced Sodium Alginate TE-Based Biodegradable films for packaging applications", *J-For* 4(1) 2014

Saville F., Martinez D.M., Olson J.A, "Variables Affecting Specific Energy Requirements for Repulping", *CJChE* accepted May, 2014

API Faculty - Conference Proceedings

N. S. Kapu, J. Kumlin, C. Song, X. Chang, H. L. Trajano, R. Beatson, D.M. Martinez “Kinetic Model of the Autohydrolysis and Dilute Acid Hydrolysis of Bamboo Hemicellulose” Annual Meeting of the Pulp and Paper Technical Association of Canada, February 2-5, 2015, Montreal, Quebec, Canada

Z. Yuan, N.S. Kapu, R. Beatson, D.M. Martinez “Removal of Silica from Bamboo for Biorefinery Applications” Annual Meeting of the Pulp and Paper Technical Association of Canada, February 2-5, 2015, Montreal, Quebec, Canada

Majid Targhagh, A. B. Phillion & D. M. Martinez, “3D Modeling and Analysis of the Damage and Strength of Inter-Fibre Bonds in Paper” International Conference of the Mechanics of Complex Solids and Fluids, France (2015)

V. Gunka, P. Soltani, G. Astrakianakis, M Martinez, A Dube, A. Albert & T. Kavanagh, An Estimate of ChloroPrep Drying Time before Neuraxial Anesthesia in Elective Cesarean Delivery Patients. Prospective Observational Study. Society of Obstetric Anesthesia and Perinatology (SOAP) Colorado (2015)

N. Sella Kapu, X. Chang, J. Kumlin, C. Song, Z. Yuan, R. Beatson, D.M. Martinez & H.L. Trajano, “Pre-Hydrolysis of Bamboo: A Kinetic Study”, Pulp and Paper Technical Association of Canada Annual Meeting, Montreal (2015)

N. Rajabinisab, T. Mithrush, J.A. Olson & D.M. Martinez, “On the relationship between plate pattern and flow field in LC refiners: Insight into the beating effect and no-load power”, International Mechanical Pulping Conference, Helsinki (2014)

J. MacKenzie, D.M. Martinez, & J.A. Olson, “Measurement of the Flowfield in a Hydrocyclone using LDA”, TAPPI PaperCon, Atlanta Ga (2014)

R. A. Khan, R. Korehei, H. J. Salem, J.A. Olson & D.M. Martinez, “Fabrication and Characterization of Microfibrillated Cellulose Reinforced Sodium Alginate Based Biodegradable Films for Packaging Applications”, Pulp and Paper Canada Technical Association PacWest Conference, Jasper (2014)

T. Mithrush, J.A. Olson & D.M. Martinez, “An Experimental Study of the Fluid Dynamics in a Low Consistency Disc Refiner”, Pulp and Paper Canada Technical Association PacWest Conference, Jasper (2014)

A. Nikbakht, A. Madani, J.A. Olson, & D.M. Martinez, “The Flow Characteristics of Wood Pulp Suspensions in a Pipe”, Pulp and Paper Canada Technical Association PacWest Conference, Jasper (2014)

M. Shanb Ghazani, D.M. Martinez, A. Madani & J. A. Olson, “Fractionation of MFC using Two Viscoplastic Fluids: Towards Continuous Device”, Pulp and Paper Canada Technical Association PacWest Conference, Jasper (2014)

E. Zaman, J. A. Olson, J. Mackenzie, D.M. Martinez, “CFD Simulations of Hydrocyclone Flow Field: Study of Geometrical and Flow Parameters Effect” Pulp and Paper Canada Technical Association PacWest Conference, Jasper (2014)

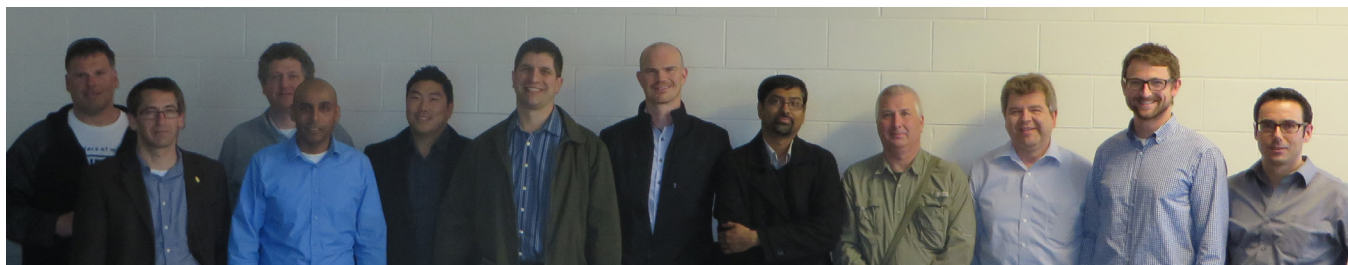
Community Outreach



2014 API course participants.

Introduction to Pulp and Paper Technology - API Course

The API sponsored a successful 2-day course on “Introduction to Pulp and Paper Technology” delivered on April 10-11, 2014. 18 students from BC Hydro, Alberta Newsprint Company, and Spraying Systems Co. among others attended the hands-on course. Consisting of lectures in the mornings followed by lab exercises in the afternoons, the course was structured in a way to re-emphasize material and enhance understanding of the processes. Units of the course were taught by API faculty, along with Robert Gooding, VP Technology at Aikawa, and Nici Darychuk, RA at UBC assisted with the laboratory portions.



Visitors from Catalyst Paper discuss research and collaborations.

Catalyst Paper Information Day

On April 28, 2014 the Pulp and Paper Centre welcomed guests from Catalyst Paper ranging from Process Engineers to the Director of Energy. In this inaugural “Information Day”, Professors from Chemical and Biological Engineering, Mechanical Engineering, Department of Chemistry, and from the Department of Wood Science in Forestry gathered together for thoughtful discussions and spent the day presenting research on topics ranging from UBC’s Bio-economy network, Energy Reduction in Mechanical Pulping program at the Pulp and Paper Centre, the forest products biotechnology/bioenergy group in Forestry, and using catalysis to access value-added forest products.

It was a day filled with information on advanced research conducted at UBC and served as a backdrop to an innovation strategy that Catalyst Paper is preparing.

Community Outreach



A. Nikbakht, M. Shanb Ghazani, E. Zaman, Kyle Wells (Session Chair), T. Mithruth, Y. Sharma. Not pictured: R. Khan.

PACWEST Conference

The PACWEST Technical Conference symbolizes the interdependence of those who develop technology in the pulp and paper industry and the many suppliers of related materials and equipment. It provides an opportunity to network with peers, industry leaders and technical experts while enhancing professional development.

In an inaugural UBC Student Presentation session, six UBC students and researchers presented their technical papers and presentations to a large audience on May 30, 2014.

Along with the six presenters, PPC had an additional three researchers showcase their posters throughout the week. All students are co-supervised by API faculty.

INNOVATE 2014

Innovate 2014 was the inaugural UBC Applied Science dialogue series focusing on bringing applied research to the community and providing a pathway for industry to partner. Through several thought-provoking, seven-minute presentations, engineering and architecture faculty shared why they are passionate about their work.

James Olson delivered a talk on 'Our Forests; Our Future'. James' research focuses on transforming the BC forest sector into a vibrant bio-products industry. His work developing new materials and products provided a glimpse into the future role of forests in a sustainable world.

Professional Development Seminars

HANNES VOMHOFF, Research Manager, Paper Technology Group, Innventia AB joined the Pulp and Paper Centre on November 7, 2014 to deliver a talk on "OVERVIEW ON STOCK PREPARATION AND TISSUE RESEARCH AT INNVENTIA". An overview on the on-going activities in the field of stock preparation and tissue research at Innventia (formerly STFI) in Stockholm (Sweden) was given. The present work in traditional stock preparation, i.e. non-CNF related topics, focuses on pulp characterization, fractionation and pulp treatment.

CHRISTER SANDBERG, R&D Specialist at Holmen Paper joined the Centre on November 25, 2014 to deliver a talk on REDUCING ENERGY CONSUMPTION IN MECHANICAL PULPING. Mill experiences of chip pretreatment and low consistency refining in the Braviken Paper Mill were reviewed.

Community Outreach

Professional Development Courses

Professor Mark Martinez and his team have developed several professional development courses to enhance the undergraduate educational experience. The goal is to enrich the undergraduate students experience by offering technical and hands-on training in focused areas of Introduction to Machine Shop, Fluid Systems, and a more comprehensive Technical Training Course. Corporate sponsorship was secured to provide toolkits for student projects. Over the last year, three 18-hour courses, and an additional two 9-hour courses were offered to approximately 30 undergraduate students. All courses were instructed by a Certified Machinist and Engineering Technician.

TECHNICAL TRAINING COURSE

LEARN MORE

As part of the Pulp and Paper Centre's (PPC) Professional Development Series, Engineering students now have an opportunity to enroll in a 3-day, hands-on course which will provide an orientation of the workshop, safety training, and an overview of:

- Safe Operation of Machine Shop Tools
- Hand tools
- Precision Measurement and Layout
- Pipe and Tube fittings
- Pumps and Valves
- Swagelok Fluid System Components

Comprised of theoretical lectures, demonstrations and videos, learning will be reinforced by building a project from start to finish using industry standard tools and methods. The course instructor is a Certified Machinist and Engineering Technician.

Once completed you will have a competitive edge over others. Your employer will directly benefit from the focused, comprehensive safety and technical training you received from a reputable University. You now have hands-on experience using hand tools as well as technical skills and knowledge relevant to a career in industry.

3-day Crash Course
May 3-6, 2015
8:30-4:30pm daily

OR

3-day Crash Course
June 8-10, 2015
8:30-4:30 pm daily

Cost is \$300/student.
Limited availability
Register at: www.ppc.ubc.ca/Courses
To be added to the wait list, please email ppc.info@ubc.ca

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INTRODUCTION TO MACHINE SHOP

LEARN MORE

As part of the Pulp and Paper Centre's (PPC) Professional Development Series, Engineering students now have an opportunity to enroll in a 9 hour, hands-on course.

Introduction to Machine Shop will teach participants the fundamental skills required for basic machine shop operations. Through a combination of lectures and project work, students will learn how to use precision measurement tools such as micrometers and vernier calipers, learn the processes required for semi-precision layout, cutting speeds and feeds, Horizontal Band Saw operation, Sensitive Drill Press and drilling operations, threads types and thread cutting.

Comprised of theoretical lectures, demonstrations and videos, learning will be reinforced by building a project from start to finish using industry standard tools and methods. The course instructor is a Certified Machinist and Engineering Technician.

3 Friday afternoons
Feb. 20, 27, March 6
1:00-4:00 pm

Cost of course is \$200/student.
Limited availability
Register at: www.ppc.ubc.ca/Courses
To be added to the wait list, please email ppc.info@ubc.ca

DO MORE





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THE UNIVERSITY OF BRITISH COLUMBIA

FLUID SYSTEMS COURSE

LEARN MORE

As part of the Pulp and Paper Centre's (PPC) Professional Development Series, Engineering students now have an opportunity to enroll in a 9 hour, hands-on course.

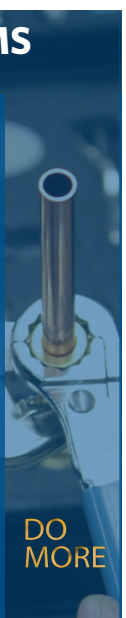
Fluid Systems will teach participants the fundamental skills required for rudimentary pipe and tubing assemblies. This course focuses on pipe and tube, and an introduction to pumps and valves. Students will learn how to identify sealing thread types, the differences between pipe and tube, pipe fitting basics including pipe thread cutting and assembly, compression tube fitting and bending, and methods for fluid system leak testing. Learn how to identify and apply different types of pumps and valves.

Comprised of theoretical lectures, demonstrations and videos, learning will be reinforced by hands-on work using industry standard tools and methods. The course instructor is a Certified Machinist and Engineering Technician.

3 Friday afternoons
March 13, 20, 27
1:00-4:00 pm

Cost of course is \$200/student.
Limited availability
Register at: www.ppc.ubc.ca/Courses
To be added to the wait list, please email ppc.info@ubc.ca

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Finances

The financial statement for Year XVII is given in the table below.

(1 April 2014 - 31 March 2015)

2014-2015 Budget	\$255,551.00
Opening Balance (from 2013-2014)	\$66,984.48
Available Budget 2014-2015	\$322,535.48
TEACHING	
CHBE, MECH and BCIT API Faculty Appointments	\$211,294.40
	\$211,294.40
RESEARCH	
Instrutor & Res salary	\$10,000.00
	\$10,000.00
COMMUNITY OUTREACH	
Travel (Conferences)	\$1,736.10
Travel (General Expenses)	\$2,129.82
API Course & Meetings	\$1,347.95
Misc. Charges	\$65.83
	\$5,279.70
DEAN'S OFFICE	
API administration	\$92,088.11
OFFICE EXPENSES	
	\$1,998.96
TOTAL EXPENDITURES (2013-2014)	\$320,661.17
Uncommitted Balance (2015-2016)	\$1,874.31

What's Next

The API Advisory Group will meet in June 2015. The mandate of the Advisory Group is to provide advice to the University regarding the program, its purposes and funds. It is comprised of up to ten individuals representing the stakeholders of the province and members will normally be appointed for three year terms.

"Introduction to Pulp and Paper Technology" will be expanded to a 3-day course, and will be offered on April 13-15, 2015. It will now include a new LC refining component describing the principles of LC refiner operation and plate design, as well as an overview of the PPC pilot plant setup and operation. The lecture will be followed by a refining demonstration, during which kraft pulp will be refined, and pulp samples collected for later testing.

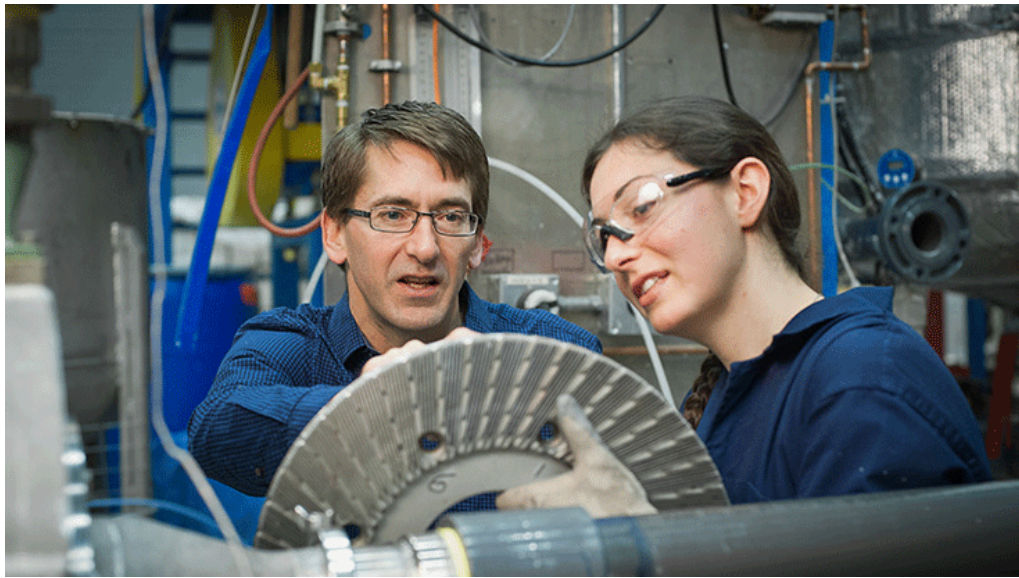
API will have a strong presence at the 2015 PacWest Conference in Whistler, BC. Six UBC students and researchers were invited back for a second year for the UBC Student Presentation session. There will also be a full-day Steering Committee meeting for the Energy Reduction in Mechanical Pulping research group which will consist of PI presentations, guest speakers, and a roundtable discussion.

PULP FRICTION

The Energy Reduction in Mechanical Pulping research program is featured as the exemplar of *Research Excellence* in **UBC's 2013-14 Annual Report**.

**This has been modified from its original version*

Right: Professor James Olson &
Nici Darychuk, Research Assistant
Photo: Martin Dee



The path to advances in research in the forestry sector are being discovered and developed by Professor James Olson, associate dean for Research and Industrial Partnerships and former director of the UBC Pulp and Paper Centre (PPC). The way forward is clear: significantly reduce energy consumption while meeting economic and sustainability goals through innovative engineering design. To explain the scope of the project, Olson uses the analogy of replacing Victorian-era machinery with today's high-performance technology.

His team's ultimate goal: trim the sector's energy consumption by 20 percent or 1,000 gigawatt/hours a year (the equivalent of 100,000 homes) and cut the sector's

greenhouse gas emissions in half by 2020.

"What we're doing is providing home-grown technical solutions to directly impact the competitiveness of the industry and provide highly qualified personnel for the industry" says Olson.

intensive and cuts deep into the sector's margins, reducing its global competitiveness and affecting the many rural communities whose own economies – and jobs – depend upon this industry.

Olson notes that the forest industry is strategically important to Canada and is reasonably integrated to extract full value from the trees or in industry speak, 'units of value'. He goes on to explain that dimensional lumber or building material has

the most value but can't support the industry alone; coupled with pulping revenue however, it can and if the pulping sector is to extract full value, it must make the most efficient use of the fibre.

"WE'RE TRYING TO DEVELOP TECHNOLOGY, DEVELOP PEOPLE AND DEVELOP SOLUTIONS FOR THE MECHANICAL PULPING SECTOR.

Chemical pulping requires comparatively little electric power but it "dissolves away half the tree" and although the residue is used to generate thermal/electric power, it is not as resource efficient in terms of 'lost' fibre.

Courtesy of its "monster machines" or chip refiners, mechanical pulping literally shreds the chips into 100-percent useable fibre. However, the energy intake is ravenous; each of the 70 or so chip refiners in BC consumes 25 megawatts of power or collectively (and depending on demand) more than 10 percent of all power produced by BC Hydro.



Above: Nici Darychuk and Francisco Fernandez handle pulp suspension in preparation for a pilot scale energy reduction experiment.
Photo: Martin Dee

Softwood pulp is among BC's largest and most economically crucial industries, but Mechanical pulping is energy



Above: James Olson, Francisco Fernandez and Nici Darychuk examine an experimental refiner plate on the PPC's low consistency refiner
Photo: Martin Dee

Among other refinements, Olson and his team have proposed the wide-scale replacement of the old power-hungry chip refiners with multi-stage, new-tech, 'high consistency' machines that get the job done with far less energy: "It's like taking an old steam engine and replacing it with a couple of smaller, high-performance engines."

Powered by a \$2.7-million National Sciences and Engineering Research Council of Canada (NSERC) grant, backed by a consortium of 16 mechanical-pulp companies and assisted by the universities of Toronto and Victoria, the result is a focused, five-year university/industry research collaboration.

In addition to funding the latest equipment, the NSERC grant will help attract and support the best graduate students who, along with professors and senior researchers, will target almost a dozen inter-related projects to develop new processes with novel sensors and advanced computer control.

The aim: add to PPC's roster of innovative technologies.

Currently, the list includes PPC's high-performance pulp-screen rotors that cut power consumption in half (now used worldwide with an even more efficient version in the works), new fibre separation and refining processes for mechanical and chemical pulp, and Olson's own work in the development and commercialization of a fibre-quality analyzer that to date, has sold 150 units and reached \$25 million in sales.

Upping the competitiveness and reducing power demand in the pulping industry by even a fraction has big down-stream payoffs, notes Olson. Not just environmentally but economically. The clean 'surplus' hydroelectric power can be sold over the borders to everyone's collective benefit.

"We're trying to develop technology, develop people and develop solutions for the mechanical pulping sector" says Olson.

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