Innovations in Advanced Manufacturing and Collaboration Opportunities with the Canadian Government's Largest R&D Organization

Date: February 26, 2020 (Wednesday)

Time: 09:30-13:45 (Doors open at 09:15)

Location: TKP Premium Nagoya Lucent Tower 16F Lucent Tower in Nagoya

Language: Simultaneous English<->Japanese Interpretation

Fee: FREE of Charge

Registration deadline is **February 21, 2020.** Seating is limited to 70 participants based on a first-come, first-served basis.

- If you have a request for one-on-one meeting with one of NRC speakers, please register from "Registration for Seminar" on web site.

  Registration: https://forms.gle/oAB9KvafajgdFRio6

Emi Kawai, NRC, Japan Office
TEL: 03－6269－3440 Email: Emi.Kawai@nrc-cnrc.gc.ca

Program Outline

09:30-09:40	**Opening** Mr. Chenier La Salle, Consul and Senior Trade Commissioner
09:40-09:50	**Collaborating with National Research Council Canada** Mr. Shigeru Sasaki
09:50-10:15	**Enabling Low-Cost, Mass Production of Composite Structures** Dr. Simon Baril-Gosselin
10:15-10:40	**Automated Composite Manufacturing: A Way Forward** Dr. Ali Yousefpour
10:40-11:05	**NRC's Parallel Finite Element Platform: Optimization through Modelling and Simulation of Manufacturing Processes** Dr. Marjan Molavi-Zarandi
11:05-11:15	**Coffee Break**
11:15-11:40	**Advanced Processing of Metals: Technologies for Next-Generation Transportation Vehicles** Dr. Priti Wanjara
11:40-12:05	**Additive Manufacturing of Magnetic Materials for Advanced Electric Motors** Dr. Fabrice Bernier
12:05-12:15	**Finding Canadian Startups for your Open Innovation Initiatives** Mr. Perry Quan
12:15-13:45	**Networking Lunch on the same floor**

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09:40-09:50 Collaborating with National Research Council Canada

National Research Council Canada (NRC) is the Government of Canada's largest R&D organization, with 4,000 employees in 22 locations. In October 2019, NRC opened in Tokyo its first office outside Canada, with the objective of increasing R&D collaboration with Japanese organizations.

NRC has over 100 years of R&D history, making key contributions to society such as the development of Canola oil, synthetic insulin, and the space robotic arm dubbed Canadarm.

Within NRC, hundreds of researchers are dedicated to advancing technologies in partnership with manufacturing industries such as Automotive, Rail, and Aerospace, which are major components of both Canada's and Japan's economies.

NRC is also and funder and advisor to Canadian Small and Medium Companies, and can connect your organization to Canada's most innovative startups.

NRC is the largest funding organization and advisor to early stage startups and can connect your organization to most technology startups in Canada.

Please join us to learn how NRC can work with your organization to advance the development and deployment of new technologies.

Mr. Shigeru Sasaki

Shigeru Sasaki has been the head of the National Research Council's office in Japan since its establishment in August 2019.

Previously, Mr. Sasaki served as CEO of Fujitsu Laboratories Ltd. from April 2016 to December 2018 and CTO of Fujitsu Ltd. from January 2018 to December 2018. He also served as Corporate Executive Officer (2008) and Corporate Senior Vice President (2010) in Fujitsu Laboratories. He concurrently served as Chairman of Fujitsu Laboratories Group's global R&D sites in China (2009), the U.K. (2013), and the U.S. (2014; former CEO: 2015). His long career with Fujitsu Laboratories started in 1981.

As a technical R&D pioneer in the fields of image recognition and biometric authentication, Mr. Sasaki has been recognized for his innovative technical achievements in such fields as video/image-processing, 3D computer graphics and software, biometric authentication, and for the development of such milestone technologies into commercial products and services.

Mr. Sasaki received his M.S. in Computer Science from Iwate University in Japan in 1981. He is a Fellow of the International Association for Pattern Recognition (IAPR), a Member of the Council for Science and Technology Policy (ICT-WG) of Japan, a former association member of the Innovation Creation Subcommittee under the Information and Communications Policy Committee/Information and Communications Council of the Ministry of Internal Affairs and Communications of Japan, a member of the Information Processing Society of Japan (IPSJ), and former Director of the Institute of Electronics Information and Communication Engineers (IEICE) of Japan.

09:50-10:15 Enabling Low-Cost, Mass Production of Composite Structures

Over the last decade, NRC has evaluated and developed technologies to bring high performance composite manufacturing towards mass production. These technologies help alleviate several barriers that limit composite adoption, such as their relatively long processing time and cost. NRC works closely with OEMs and their supply chain to develop and transfer these new technologies, enabling greener and more energy efficient modes of transportation.

NRC has successful industrial partnerships for developing conventional manufacturing processes specifically modified for reaching higher production rates, such as high-speed RTM and stamp-forming.

Additionally, NRC is developing single-step processes for manufacturing hybrid components that are much more cost-competitive thanks to their smart use of composites. For example, NRC works on co-stamping metal sheets with composites, where the metal provides the low-cost structure while the composite provides local stiffening. NRC is also a leader in the development of composite injection overmoulding, where net-shape, highly integrated components featuring complex geometries can be mass produced at rate of 500 000 units per year.

During the talk, NRC will present an overview of the main manufacturing solutions that it has developed to enable the low-cost, mass production of high performance composite structures.

Dr. Simon Baril-Gosselin

Simon Baril-Gosselin is a Research Officer in the field of advanced polymer composites, working in the Automotive and Surface Transportation Research Centre at National Research Council Canada (NRC).

At NRC, Simon assists SMEs, Tier 1 and OEMs that want to adopt or improve their capabilities in composite manufacturing. Simon currently develops and evaluates cost-effective manufacturing technologies for the mass production of thermoplastic composites used in the automotive industry. For example, Simon combines stamp-forming of composites with injection moulding to produce net-shape components of high complexity, at a rate of one unit per minute (500 000 units per year), making composites cost-competitive with current metallic alternatives.

Prior to working for the automotive industry, Simon obtained a Ph.D. in Mechanical Engineering from the University of Ottawa, where he specialized in composite manufacturing for the aerospace industry, and collaborated with Bombardier Aerospace and NRC's Aerospace Research Centre. Simon is also the Thrust Leader of Personal Protection for the Security Materials Technologies program where he supervises research in personal protection and vehicle armours for the Canadian army and first responders.

10:15-10:40 Automated Composite Manufacturing: A Way Forward

NRC plays an important role in developing and conducting innovative R&D projects in the field of composite materials and its related manufacturing processes. In this role, NRC collaborates with industry, academia, and government, both nationally and internationally.

This presentation introduces major NRC composite materials' capabilities and competencies with an emphasis on materials, processes, structures, and products. Two successful examples of typical national and international collaboration projects elaborating the nature of collaboration and its outcomes will be presented. The first example includes one of the major national/international demonstration projects focused on automated fiber placement technology and its related processes. The other example will introduce the NRC's novel in-process inspection system for automated composite manufacturing.

At the end, our way forward views of "automated composite manufacturing" will be introduced with the aim of recognizing topics of mutual interests for our near future collaboration projects.

Dr. Ali Yousefpour

Ali Yousefpour has a Ph.D. degree in Mechanical Engineering. Since 1995, he has been working on designing, analyzing, manufacturing, and testing polymeric and ceramic matrix composite materials and structures for marine, automotive, space and aerospace applications.

In 2002, he joined National Research Council Canada's (NRC) Aerospace Research Center. His focus has been on developing advanced manufacturing and joining techniques for aerospace structures with emphasis on thermoplastic and thermoset composite materials. He has several technical journal/conference papers in the areas of joining and advanced manufacturing of composite materials and was a General co-Chair of the 55th International SAMPE Symposium and Exhibition held in Seattle/Washington in May 2010.

Currently, Ali is the Team Leader and a Senior Research Officer of the Composites Products Team at the Aerospace Manufacturing Technology Center of NRC. His team's interests lie in aerospace R&D and demonstration projects in the areas of automated composite manufacturing, novel and nano-materials, in-process sensing, composite forming/joining processes, simulation/digitalization, composites repairs, non-destructive inspection and structural and full scale testing and performance evaluation.

10:40-11:05 NRC's Parallel Finite Element Platform: Optimization through Modelling and Simulation of Manufacturing Processes

Over a period of more than 25 years, the Simulation and Numerical Modeling team at NRC has developed models for complex multi-physics applications involving free surface flows, heat transfer, phase change and non-linear solid mechanics which are recognized as among the most advanced worldwide. Those capabilities were implemented in DFEM, an in-house parallel finite element platform allowing the rapid implementation of complex multi-physics analyses.

The software is used for applications ranging from the simulation of manufacturing processes such as plastic injection molding, die casting for metals and additive manufacturing, to thermal management of electric vehicle batteries and the management of continuous galvanizing baths.

NRC will present an overview of the application of numerical simulation tools for modelling and optimization of industrial processes and our current research activities on multi-objective and multi-physics topology optimization, composite forming and advanced manufacturing simulation such as laser powder bed fusion additive manufacturing.

Dr. Marjan Molavi-Zarandi

Marjan Molavi-Zarandi, is a Research Officer at the National Research Council of Canada and has significant experience in modelling and numerical simulation research applied to fluid mechanics, heat transfer, finite element method, process optimization, composite forming and additive manufacturing.

She holds a master's degree in Mechanical Engineering (Concordia University, Canada) and a Ph.D. in Mechanical Engineering (McGill University, Canada).

After finishing her doctorate in 2013, she contributed to the first industrial research consortium in Canada for additive manufacturing (CRIAQ604). She worked as a Postdoctoral Fellow in the Advanced Structure Core Engineering Department, at Bombardier Aerospace, where she performed topology/size optimization for light-weighting of various aircraft parts for additive manufacturing. In 2015, she joined Siemens Canada as a Postdoctoral Fellow for the development of a high fidelity finite element model to simulate the laser powder bed fusion additive manufacturing process on a gas turbine component.

Since joining the Numerical Modelling and Simulation team at the National Research Council in 2016, Marjan is pursuing her R&D activities while supporting various manufacturers through numerical modelling for fluid and structural mechanics, heat transfer, optimization, composite forming and additive manufacturing processes.

11:15-11:40 Advanced Processing of Metals: Technologies for Next-Generation Transportation Vehicles

With increasing production volumes expected in aerospace through the growing demand for unmanned electric vertical-takeoff-and-landing (eVTOL) cargo vehicles, and higher performance requirements from an automotive industry looking to push the limits of conventional vehicles, we are seeing a convergence of technologies that can be applied to the development of next-generation transportation vehicles.

NRC will present its observations on this convergence, and the work being done on combinations of metal processing technologies such as Friction Stir Welding, Linear Friction Welding, Electron Beam Additive Manufacturing, and Ultra High Speed Machining, to satisfy the demands of high-volume, high-performance manufacturing applications.

Dr. Priti Wanjara

Priti Wanjara started working at the National Research Council of Canada in 2002, where she is now a Senior Researcher and Project Manager.

Throughout her career, Priti has been concerned with the physical metallurgy of metals/alloys, and in particular with how this knowledge can be applied to welding process design for advanced manufacturing in the aerospace, automotive and power generation industries. Her work has emphasized the understanding of solidification and microstructural phenomena during welding of various aluminum, magnesium, iron, zirconium, nickel and titanium-based materials. Her most significant research contributions include her pioneering work on electron beam additive manufacturing, linear friction welding and friction stir welding (FSW).

Priti is the author or co-author of over 200 papers published in refereed journals or conference proceedings and 100 NRC reports. Recognized internationally as a leading material scientist in advanced manufacturing technologies, she is enabling the establishment of innovative processing capabilities in Canada through industrialization of her research and technology developments.

Priti is a Fellow of ASM International, the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) and also the Canadian Welding Bureau. She has been awarded the ASM Silver Medal; ASM Canada Council Brian Ives Lectureship and G. MacDonald Young Award; Metallurgy and Materials Society Brimacombe Award and Silver Medal; and the Queen Elizabeth II Diamond Jubilee Medal from the Government of Canada for her contributions to materials processing technology.

Priti received her B. Eng. and Ph.D. in metallurgical and materials engineering from McGill University.

11:40-12:05 Additive Manufacturing of Magnetic Materials for Advanced Electric Motors

NRC has developed several technological solutions to fabricate hard and soft magnetic components using additive manufacturing. In particular, cold spray additive manufacturing (CSAM) can be used to effectively build complex-shaped permanent magnets directly on the rotor surface without the need for assembly, with a high build rate, and with very high mechanical strength. The access to this technology enables design possibilities for new electric motor topologies that take advantage of this unique manufacturing capability.

NRC designs that can achieve better performance than leading commercial motors have already been developed. Further improvements in the magnetic properties of the sprayed materials are promising even greater performance gains in the near future. NRC will present the properties of the sprayed magnets, the comparative performance of new topologies, and our current research activities on the topic.

Dr. Fabrice Bernier

Fabrice Bernier is the Thrust Leader of the Advanced Electric Motors group in the Automotive Surface Transportation Research Center of the National Research Council Canada. The focus of the group is to promote the use of electric motors in transportation by addressing technology gaps through advanced R&D initiatives. His responsibilities encompass harmonizing key NRC expertise to answer electric motor industry needs; engaging industrial, academic and other governmental organization partnerships to support the Canadian electric motor supply chain.

Fabrice is also a research officer within the powder forming team at NRC. He led several projects on the development of advanced characterization techniques and on the development and optimization of different powder forming processes.

More specifically, he developed an expertise related to novel materials and manufacturing methods such as magnetic components produced by additive manufacturing.

Fabrice holds a Ph.D. in Metallurgical Engineering from École Polytechnique de Montréal.

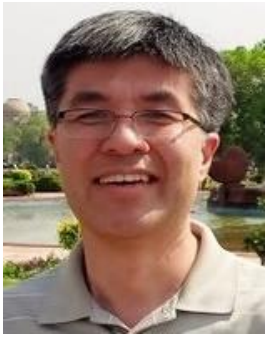
12:05-12:15 Finding Canadian Start-ups for your Open Innovation Initiatives

For more than 70 years, the National Research Council Industrial Research Assistance Program (NRC IRAP) provides Canadian startups with customized business solutions, financial assistance, expert advice, and access to national and international networks in all technology sectors. It is Canada's largest funding organization for small and medium-sized technology companies.

NRC IRAP's advisory services are delivered by a network of 255 Industrial Technology Advisors, all with senior level backgrounds as Engineers, Scientists and Business Management. The advisors are located in over 120 communities across Canada and generate relationships with startups to help turn their ideas into commercial successes.

NRC IRAP's initiatives in Japan are focused on working with large Japanese companies to identify technology partnerships with start-ups across Canada. This scouting is done through an AI search engine of IRAP's start-up database and through the network of advisors across Canada. NRC IRAP's goal is to generate joint research and development projects between Japanese and Canadian companies, and will assist by providing funding to Canadian companies to engage in these projects.

Mr. Perry Quan



Perry Quan is a veteran of the telecommunications and Internet industries with over 25 years of experience in strategic planning, business development, product development and operations. He is a seasoned international business executive having conducted business throughout Asia Pacific, EMEA and the Americas.

He founded a mobile infrastructure software company, and as President/CEO led the company's successful entry into China, the world's largest mobile market. Earlier in his career, Perry held several senior management, consulting and software engineering positions in Canada in multi-national enterprises and Government of Canada agencies including Mitel Corporation, Canadian Marconi, Transport Canada and the Department of National Defence.

Perry is currently the Director of International Programs & Partnerships at NRC IRAP where he oversees IRAP's funding programs and Advisors for co-innovation activities worldwide. Perry holds a Bachelor of Applied Science Degree in Electrical Engineering from the University of British Columbia.