

Academics and Industry Come Together in Montreal

An Interview with Professor Martin Lévesque of the École Polytechnique de Montréal

AT THE CLOSE of the very successful Twelfth International Conference on Shot Peening, the International Scientific Committee for Shot Peening voted to host the 2017 conference in Montreal. Professor Martin Lévesque, Ing. PhD, École Polytechnique de Montréal, is the Chairman of the Local Organizing Committee and Dr. Hongyan Miao, also with École Polytechnique de Montréal, is the Co-Chairman. The event will be held at the Delta Hotel and Polytechnique staff members will oversee the administration of the conference and its website.

The International Scientific Committee for Shot Peening awarded Professor Lévesque the honor of hosting the conference because of his expertise in the shot peening field, especially in the forming of aerospace structures, and his experience in hosting similar events—he organized the successful Mechanics of Time Dependent Materials conference in Montreal in 2014. Professor Lévesque very generously answered our questions regarding the upcoming conference and his work at the École Polytechnique de Montréal. Our discussion will also cover the powerful synergy between the academic community and the aerospace industry in Montreal.

The Shot Peener: Why did you want to host the Thirteenth International Conference on Shot Peening?

Prof. Lévesque: The École Polytechnique de Montréal is the largest engineering school in Québec and the only school in “La Belle Province” (Québec’s nickname) to offer a full degree in Aerospace Engineering. Polytechnique has the largest volume of industry-partnered engineering research in Canada, making the university uniquely qualified to appreciate the relationship between academic research and real-life applications. This interconnection is an important component of the shot peening conferences.

The Shot Peener: Why is the Delta Hotel in Montreal a good location for the conference?

Prof. Lévesque: The shot peening conference typically attracts around 200 academics, industry leaders and students. The



*Martin Lévesque, Ing, PhD
École Polytechnique de Montréal*

Delta Hotel offers a very cozy environment to host events that size. The conference will run three parallel sessions in rooms that are located on the same floor and are less than a 30-second walk from each other. The booths and the breaks will be located in a central foyer that connects to the meeting rooms. This will create a very intimate atmosphere and will promote exchanges among attendees, which is the aim of such gatherings.

The Delta Hotel is ideally situated in downtown Montreal. It is walking distance from the business city center, the historic section of Montréal and the Mont Royal park where nature lovers can jog or walk. The Delta Hotel Chef will prepare meals with

locally sourced products so attendees will enjoy a Québécois culinary experience. The Delta Hotel will offer specially discounted rooms but, owing to its central location, attendees will have other hotel choices to meet their comfort and/or budget needs.

The Shot Peener: You are actively involved in shot peening research in your position as Chairholder of the Canada Research Chair in Multiscale Modelling of Advanced Aerospace Materials at École Polytechnique de Montréal. Why are you interested in shot peening research?



Old Montreal is within walking distance of the conference venue in the Delta Hotel.

Prof. Lévesque: I was trained in composites research and I fell into the shot peening field by accident. In 2005, when I was a young academic, my colleague Marie Bernard, who was about to retire, asked if I wanted to look at some shot peening related issues with her colleagues, Claude Perron and Simon Larose, at the Aerospace Manufacturing Technology Centre. To be quite honest, I had never heard of shot peening. My first projects were to simulate the shot stream and its effects on residual stresses and roughness. I used some of the tricks I picked in composites to propose an original model that was among the first to introduce stochastic effects in the shot stream representation. I was also involved in peen forming simulation and obtained very interesting results. I proposed a shot peening research program at the research forum of the 5th Consortium for Research and Innovation in Aerospace in Québec and immediately gained the support of aerospace companies in Montreal.

I now work with several people on this project including two metallurgists, Prof. Myriam Brochu with Polytechnique and Prof. Philippe Bocher with École de Technologie Supérieure; one material scientist, Prof. Richard Chromik at McGill University; and my long-standing collaborator, Claude Perron, now with Centre Technologique en Aérospatiale. Dr. Hongyan Miao, my former PhD student, trains students and manages the project. We study and predict the effects of shot peening on the fatigue lives of aerospace parts. This is a truly multi-disciplinary research program where we look at both the modelling of the process (shot stream, macroscopic residual stresses induced) and the effects it has on microstructure (crystal plasticity simulations, development of multi-scale fatigue prediction models).

What makes me passionate about my shot peening research is that it is a multi-scale and multi-disciplinary problem that requires expertise in computational sciences, mechanics, metallurgy and materials sciences. It allows me to learn from my collaborators in numerous fields. The strong interest from our industrial partners is also a great source of motivation since I feel that the work I do is useful.

The Shot Peener: Your last comment brings us to the enviable relationship between the École Polytechnique de Montréal and the aerospace industry. Tell us about it.

Prof. Lévesque: As I mentioned earlier, Polytechnique is working with leading aerospace companies in Montreal. In collaboration with McGill University and École de Technologie Supérieure, we lead the most intensive shot peening-related collaborative research and development project in Canada. The project involves Pratt and Whitney Canada, Bell Helicopter Textron, L-3 Communications MAS, Héroux Devtek Landing Gear, Dorval Technologies, and the Centre Technologique en Aérospatiale. The project is funded by the industrial partners, the Consortium for Research and Innovation in Aerospace in Québec, Mitacs, and the National

Sciences and Engineering Research Council (NSERC). The project has been labelled the “MANU-508” at the Consortium for Research and Innovation in Aerospace in Québec.

MANU-508 funded the procurement of a full-scale, fully robotic shot peening machine for research projects at Polytechnique. A Canablast-Genik-Fanuc consortium supplied the machine and Electronics Inc. donated two MagnaValves and controllers, including the new MagnaValve for non-ferrous media. Polytechnique is also using the shot peening machine in peen forming projects with Bombardier, Sonaca and Airbus (UK).

The Shot Peener: How did these relationships come about?

Prof. Lévesque: I approached Pratt & Whitney Canada, Bell Helicopter Textron, L-3 Communications MAS, Héroux, Bombardier, Sonaca, and Airbus and convinced them to invest in shot peening-related research. Also, collaborative research and development in Canada is funded by the NSERC Collaborative and Research Grant program that offers: 1) No limitation on funding, 2) No application deadlines, and 3) High success rates (+95%). The program requires 1\$ cash + 1\$ in-kind industrial commitment and NSERC provides 2\$ cash. So when you have five companies who donate each 1\$ cash + 1\$ in-kind, you end up with a project worth 15\$ cash and 5\$ in-kind for research. This is a fabulous leveraging system (15 to 1!) and a very successful program in Canada.

The Shot Peener: Thank you for your insights, Prof. Lévesque. We look forward to learning more about your research and ICSP13 in future issues of *The Shot Peener*. ●



The shot peening machine at École Polytechnique de Montréal is used for academic research and testing projects for the aerospace industry in Montreal.