PRIMA
Advanced Materials Moving Forward

A **SUCCESS** STORY

HIGH-RATE LASER SURFACE TEXTURING OF 3D INJECTION MOULDS FOR THE MANUFACTURING OF FUNCTIONALIZED EASY-FLOW POLYMER CONTAINERS (LAMOFLO)

As part of the M-ERA.NET 2019 call for proposals, partners from Québec and Germany sought to address the issues surrounding waste container drainage due to the environmental benefits associated with the thorough draining of these containers. Non-stick, self-draining containers would provide a very useful innovation.

The research group, led by **Professor Anne-Marie Kietzig** of **McGill University**, in collaboration with **Professor Nicole Demarquette's** research group at the **École de technologie supérieure (ÉTS)**, along with **Professor Udo Loeschner** at the **Laser Institute** of the **Mittweida University of Applied Sciences (LIM)**, teamed up with **two companies**, including a world-class manufacturer of bulk and food packaging **(IPL Inc.)** and a leading manufacturer of plastic injection moulds **(Moulexpert Inc.)**, to develop an industrially viable laser mould texturing process for the production of functionalized polymer surfaces. A secondary objective involved testing and improving the functional microscopic structures for use in easy-flow self-draining plastic containers.

To achieve these ambitious objectives, the participants assessed the fundamental flow relationship of polymers on laser-textured microscopic mould steel structures at micro and nanometric scales through rheological studies. They also established a machining protocol for mould surface laser texturing with functional microscopic features intended for the damage-free moulding and demoulding of container sidewalls to provide polymer parts with the desired self-cleaning functionality. The participants also evaluated the infusion of lubricants (SLIPS) into textured polymer surfaces to help manufacture robust, slippery and self-repairing container walls. The project brought mould surface laser texturing from a laboratory context to an industrial one by increasing processing speeds and throughput. This led to the creation of an actual, laser-textured injection mould provided by the industrial partners. Finally, the laser-textured mould was used in industrial environments to validate the reliability of the moulding process while demonstrating the benefits of functionalized plastic surfaces in everyday applications. The project helped train two master's students, one doctoral student, one postdoctoral student, and two undergraduate students.

> *We were delighted to work with McGill University and Professor Anne Kietzig, along with a few students, on the laser texturing project. Their expertise, dedication, and passion were invaluable assets throughout our partnership. We wish to express our gratitude to the university for its support, as well as for the valuable resources that were made available to us. This fruitful collaboration will be remembered as a milestone on our journey, reinforcing our determination to pursue such mutually beneficial partnerships.*
>
> - **Stéphane Mercier**,
> IPL Inc.
> Technology Centre Manager

> *Overall, our involvement in this project was modest. I am pleased to have referred our main machining equipment supplier, GF Machining Solutions. This link to a world-renowned equipment manufacturer will help accelerate the research technology's deployment toward its industrial phase. We are fully convinced of the results and their application potential in the field of plastic packaging. We are eager to help put these results into practice using our injection moulds.*
>
> - **Steve Nadeau**,
> Moulexpert Inc.
> Chairperson and Chief Executive Officer

SECTORS
Environment

APPLICATIONS
Surface treatment

TRL
Start 4, end 6

DURATION
36 months
(2020-2023)

McGill · ÉTS Le génie pour l'industrie · Hochschule Mittweida University of Applied Sciences · IPL · Moulexpert