

SUCCESS STORY



CQFA CARREFOUR QUÉBÉCOIS
DE LA FABRICATION ADDITIVE

A “CONCRETE” PARTNERSHIP

Professor Ammar Yahia from the Faculty of Engineering at the Université de Sherbrooke is the director of the Natural Sciences and Engineering Research Council (NSERC) Industrial Research Chair for the development of flowable concrete with adapted rheology. This chair helps advance knowledge by channelling information from various experiments involving new types of concrete. The chair is funded by the NSERC and the Université de Sherbrooke, along with eight industrial partners who are central to its activities. The chair seeks to improve the pace of construction while promoting an efficient and rapid industrial transfer of innovative technologies. This new knowledge is intended to improve the life span of concrete infrastructures while training highly qualified personnel in vital sectors of the nation’s economy.

A WINNING COMBINATION OF PERSEVERANCE AND RESILIENCE

As a rheology specialist with boundless ambition, Professor Yahia sought to steer his work toward 3D concrete printing. He joined forces with the robotics department at the Université de Sherbrooke, where he teaches in the hopes of developing a 3D concrete printer prototype. This collaboration has since benefited a number of engineering departments at the Université de Sherbrooke, including civil, construction and robotics engineerings. The robotics department’s involvement in the project also provided access to specialized expertise, which contributed a highly to the project’s advancement. Through hard work, Professor Yahia was able to validate his proof of concept and request funding for a full-scale 3D concrete printer.

“Currently, we’re in the development stage with material validation for a small-scale printer,” says Professor Yahia. “Next year, we’ll work on a more ambitious project using a large-scale printer.”

COMPLEMENTARY EXPERTISE

“The Cement and Concrete Research Group at the Université de Sherbrooke has successfully developed a new 3D concrete printer after more than two years of work. According to them, it is the first prototype of its kind to be designed in Canada.”

The 3D concrete printer developed by Professor Yahia and his team is known as a “cartesian gantry”. Unlike the standard black box robot, it allows for the nozzle’s movement. This technology offers greater flexibility for printed elements, along with greater control over the printing parameters. Designed to create near-real structural elements with extreme complexity, it can also be used to validate material performance. This new technological tool combines the knowledge and know-how of robotics and materials in a rich collaboration built upon multidisciplinary.

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“3D concrete printing has extraordinary potential. I’m adapting to every situation to achieve objectives that will benefit all of society, and I’ve surrounded myself with people who believe in the project. Their trust pushes me forward.”

– Ammar Yahia, professor in the Faculty of Engineering at the Université de Sherbrooke, NSERC industrial research chairholder on flowable concrete with adapted rheology.

The adoption of technology like 3D concrete printing provides many advantages. Research activities associated with 3D concrete printing developments promote Quebec and Canadian know-how while positioning the country as a leader in the field. For Quebec’s construction community, the technology would reduce manufacturing times when compared to standard processes, reduce construction costs for certain types of structures, and reduce waste, thus improving the province’s environmental record. Plus, 3D concrete printing is not labour intensive during its use, providing a significant advantage during worker shortages in a booming sector.

Professor Yahia and his team’s tenacity and dedication will make a significant difference over the long term while contributing to the development and growth of an industry that remains slow to adapt to new and innovative processes.

Credit: Michel Caron, Université de Sherbrooke
Caption: 3D concrete printer

