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"Engineering Technology Students Rise to the Challenge of Cooling Bread"

ABOUT GEORGE BROWN COLLEGE

George Brown College, with 30,000 full- and part-time students and more than 900 faculty in more than 150 programs, aims to be a top community college of choice for applied research investment by industry and other partners. Its applied research strengths include advanced engineering and microelectronics; nursing and the social sciences; health informatics; IT; and design and new media. George Brown is currently allied with nine other Ontario colleges in the Colleges Ontario Network for Industry Innovation, started with a $3.5m grant from the Ministry of Research and Innovation. CONII is building college capacity to bring research to the marketplace.

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Lisa E. Boyes

When Professor John Camarda of the Mechanical Engineering Technology Design (METD) program asked his project design students a question—can technology designed to cool pastries be adapted to cool bread—they thought the research project would be, well, a piece of cake.

But now his third-year thesis students are finding out that there's a lot more to bread, and to the vacuum cooling chamber they are studying, than they realized. The Ontario Centres of Excellence (OCE) in Materials and Manufacturing brought the research problem to Camarda and his students. The OCE's role is to support Ontario-generated research, commercialization and talent. The third partner, the company with the problem, is Rudolph's Specialty Breads. Rudolph's makes more than 28 varieties of double-crusted and hearth-baked rye and sourdough breads from natural ingredients, using untreated flour and without preservatives.

Such substantial breads are particularly difficult to cool. Rudolph's purchased a commercially available vacuum cooling chamber with the goal of improving on the traditional cooling method, air drying, in order to get more bread, more quickly to grocery shelves. This is far from a trivial question for Rudolph's. Bread manufacturing is a multi-billion dollar business in Canada, one that was hard hit by the Atkins low-carbohydrate diet. Now that bread is back on the table for consumers, bakeries like Rudolph's want to do everything they can to keep it there, plentiful, fresh, and true to the Rudolph's recipes for taste, texture and ingredients.

But thus far, in their attempts to cool their bread more quickly using the chamber, Rudolph's bakers are finding that the technology is full of holes—literally, when it comes to bread. Perfectly good loaves are coming out of the chamber resembling Swiss cheese. For the moment, they are back to air drying.

The problem may appear to be an applied research question, making a piece of equipment work differently. In fact, says Camarda, "What the students are being asked to do is quite theoretical: to conduct a systematic analysis of Rudolph's testing methodology, and to design a system of experiments to manipulate the variables that we can, like rate of cooling in the chamber; and to identify and factor in variables that can't be controlled but that affect bread, like ambient air temperature outside the chamber." The proposed experiments will then be recommended to Rudolph's to implement. Right now it is an open question as to whether the existing technology can be operated or retrofitted to cool Rudolph's bread quickly and properly.

Camarda has a number of other such interesting questions on his plate as coordinator of the METD program, many of them curiosity-driven: from utilizing specific system designs to capture wind for power generation; to developing a wall-climbing robot and a power-assisted wheelbarrow; to converting a 1950s Vespa to electric power. The projects give his senior students the chance to input into projects as a team for the completion of their theses. In many cases, research will be advanced by other students under Camarda's supervision in subsequent years. The project design course itself is a relatively new addition to the program, which now enrolls about 120 students across the three years. Camarda foresees the METD program continuing to develop through both curiosity-driven and industry-driven research projects into the future.

As for Rudolph's breads, the design students are about to meet with the company's bakers onsite to review their cooling methodology using the chamber. The students have to come up with their recommended experiments by winter, 2008.

Whichever way it's sliced, the project will advance their understanding of industrial needs and technology processes, and contribute to the bakery's operations. All of which makes it, in the words of one student-researcher, "well…a pretty cool project."