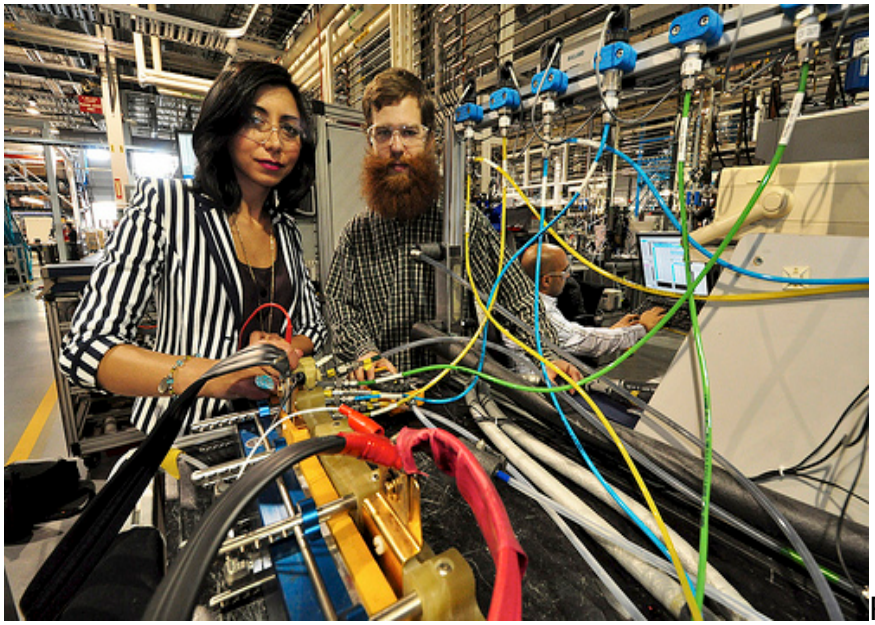
Tests lead to doubling of fuel cell life

Simon Fraser University



Researchers working to improve durability in fuel cell powered buses, including a team from Simon Fraser University, have discovered links between electrode degradation processes and bus membrane durability.

The team is quantifying the effects of electrode degradation stressors in the operating cycle of the bus on the membrane lifetime.

The findings of the study, led by SFU graduate student Natalia MaCauley, are the latest in a long-term study at Burnaby-based Ballard Power Systems and funded by Automotive Partnership Canada that aims to make fuel cell buses competitive with diesel hybrids.

To improve fuel cell module durability and predict longevity, researchers are studying the degradation mechanisms of the fuel cells that occur under real-world transit bus conditions.

Says SFU project lead Erik Kjeang: “Our strong multidisciplinary collaboration between chemistry and mechatronic systems engineering (MSE) is bearing fruit. The fuel cell is a mechatronic device, and the bandwidth of this project allows advances in chemistry to be engineered and implemented into Ballard’s products.”

Adds Ballard lead Shanna Knights: “We are pleased with the progress that our multidisciplinary team from SFU and UVic is making to develop improved membrane lifetimes for our next-generation fuel cell bus module and to understand the details of these complex failure mechanisms.”

“With continued work, this research will permit significant product costs savings and

improved fuel cell lifetimes so we can directly compete against incumbent diesel technology."

The research team, comprising 40 highly qualified personnel (HQPs) – graduate students, undergraduate co-op students and post-doctoral fellows – is also developing simulation tools that can eventually be used by industry partners in their testing protocols and operations of fuel cell buses.

SFU post-doctoral fellow Amir Niroumand, who heads the research on system level reliability and lifetime for fuel cell buses, says their objective is to operate fuel cells safely with extended lifetimes by studying how and why these fuel cells work.

"Our algorithms can be used for repair and maintenance, following through something like the check engine light in the car," explains Niroumand. "When onboard diagnostics indicate maintenance is required, the check engine light goes on and tells you to take the car to the shop; however, the car would not stop and would continue to operate. This requires the capability to detect potential issues and determine operating capabilities."

Ballard has been developing successive generations of products with improved durability for more than 15 years. Testing to improve the understanding of membrane failure mechanisms and validate developed predictive models is underway in labs at Ballard, SFU and UVic.

Project manager Kourosh Malek says the work to date has met all of its 18-month milestones, including a substantive effort devoted to training students. "This has formed an industry-driven platform for our hired HQPs," he says.

Kjeang adds: "This is not only research that will lower costs, extend product life and address sustainability issues. These HQPs, vital to the project, are creating tomorrow's workforce."

Simon Fraser University is Canada's top-ranked comprehensive university and one of the top 50 universities in the world under 50 years old. With campuses in Vancouver, Burnaby and Surrey, B.C., SFU engages actively with the community in its research and teaching, delivers almost 150 programs to more than 30,000 students, and has more than 120,000 alumni in 130 countries.

Source: http://www.sfu.ca/pamr/media-releases/2013/tests-lead-to-doubling-of-fuel-cell-life.html [1]

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