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CLEAN BREAK

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Engineer Matthew Daraskavich poses in front of a fuel cell-based system that Ford Motor Co. is developing to capture fumes from the paint shop at its Oakville assembly plant and convert it into fuel that can generate electricity.

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The car you drive doesn't just emit carbon dioxide from its tailpipe. The energy required to manufacture that vehicle's parts, assemble them and transport the finished product to customer also contributes to life-cycle greenhouse-gas emissions.

You know what happens when your car gets painted? Paint fumes, which contain volatile organic compounds (VOCs) – basically, polluting vapours that are also potent greenhouse gases – are generally captured and incinerated using a process that consumes huge amounts of natural gas.

The average United States auto plant, just to apply topcoats to new vehicles, sprays nearly 1,000 tonnes of VOCs annually. Incinerating those emissions creates significant carbon dioxide and nitrogen oxide emissions, though it's better than venting the VOCs directly into the atmosphere.

Ford Motor Co. of Canada Ltd. is trying to improve the process even further, and while its work continues to be experimental, the results so far are encouraging. This work, by the way, is being done out of its assembly complex in Oakville.

Ford has installed a system that collects fumes from its paint shop and converts it into fuel, which is then passed through a molten carbonate fuel cell to generate up to 300 kilowatts of electricity. That's enough to power more than 100 homes. Not only does it generate power, which offsets other electricity used by Ford, it can reduce CO_2 emissions by 88 per cent and eliminate nitrogen oxides.

"The Oakville stationary fuel-cell system is the first of its kind worldwide to harvest emissions from an automotive facility," says Matthew Daraskavich, the paint-systems engineer managing the research site. "Fumes-to-fuel has the potential to significantly reduce manufacturing's emissions in an environmentally sustainable process. It is very exciting in terms of its potential future applications to manufacturing."

I got a chance last week to tour the system, which is quite complex. Basically the paint fumes are vacuumed into a filter house, removing large particulates from the air. They then go through another process where millions of tiny beads of carbon — the size and appearance of poppy seeds — are mixed together with the fumes in an "absorber" chamber. The VOCs from the fumes chemically attach themselves to the carbon beads in high concentration.

The VOC-saturated beads are then blown through a tube into another chamber called a "desorber." There the VOCs are released from the beads and processed into a fuel. The fuel is stored in a large tank, and when needed is reformed into hydrogen and fed into a fuel cell, in which a chemical reaction generates electricity.

It's an impressive set-up, but many questions remain. For example, how much power does the system itself require to operate? Daraskavich wouldn't say exactly, only that there was a net gain. In other words, if you need 200 kilowatts to power a process that only produces 300 kilowatts, you're really only getting 100 kilowatts out of it.

Clearly, the system is designed first to tackle emissions and second to generate clean electricity. The latter appears to be gravy at this point. As an experiment, there are many unanswered questions, the biggest of which is whether this could ever be economical for Ford and other automotive companies.

"It's a possibility," said Daraskavich. "We're just learning what we can right now."

It's good, at least, to see such experiments continue even as the auto sector struggles. As economies move toward carbon taxes or other mechanisms for valuing carbon emissions — and they will – such technologies will become increasingly crucial for all sorts of industries.