

Plasma technology takes aim at garbage



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You don't have to be a fanatic environmentalist to feel a twinge of guilt when you throw away plastic and high-tech e-waste, knowing it will likely choke up some landfill site forever.

But what if you knew that this kind of garbage could actually become useful? Or even profitable?

John Wright wants it that way.

Mr. Wright has created a system that turns certain kinds of garbage into a gas rich in hydrogen, which can be used to generate electricity. Put enough garbage through the system, and you can significantly reduce the amount of electricity used by the company that makes the waste in the first place. Or you can sell the electricity back to the power grid.

Mr. Wright, CEO of Plasma Environmental Technologies Inc., has developed the system — called plasma-assisted gasification — to take care of garbage that is usually not recycled by traditional means. His secret is plasma, a superheated oven running at 10,000 degrees Celsius operating on graphite electrodes.

Mulch up non-recyclable things such as certain kinds of plastics, circuit boards, cellphones, disc drives or printer cartridges, feed them to the burning fiery furnace, and they turn into a hydrogen-rich synthetic gas called "syngas." Then use the gas to run a generator.

Another form of the technology, called plasma arc conversion, can be used to deal with hazardous chemicals, such as PCBs and CFCs. The high heat of the plasma furnace, Mr. Wright says, can reduce them to "five-nines purity," meaning 99.999 per cent clean.

The beauty of the system is that it replaces traditional incineration of many of these materials, a process done at lower temperatures that releases toxic gases which are harmful to the environment. With plasma, the gasification process breaks down the molecular bonds of the waste and reforms them into non-hazardous products for commercial use. The hydrogen can be used to run a generator without toxic fallout, Mr. Wright says.

The trick is to sort the garbage beforehand, Mr. Wright says. His prototype system, just being completed in Toronto, is directed at municipal waste that includes non-recyclable plastics — plastic bags, for instance, or liquid containers used for motor oil, detergent or margarine, and tetra-paks (cardboard or plastic containers for such things as milk, fruit juices and soups). These items form the single largest group of non-recyclable products after glass, paper and simple plastics.

All these items have one thing in common, Mr. Wright says: They all burn at high temperatures and can, using plasma, be converted into syngas.

Mr. Wright's prototype, developed with Kinectrics Inc. of Etobicoke, Ont., formerly a division of Ontario Hydro, is designed to sit on a flatbed truck.

It wasn't profitable to develop the technology earlier, Mr. Wright says, because of the costs involved. These days, however, a number of factors have converged to make the costs practical.

Top of the list is the cost of hauling waste to a recycling centre, and sorting it, called a "tipping fee." The tipping fees are rising every year; currently they are on average \$60 to \$70 a tonne, and sometimes as much as \$130 a tonne. Tipping fees are expected to rise dramatically in the next few years, as landfill sites begin to disappear under pressure from increasingly ecological awareness. A decade or so ago, there were 8,000 landfills in North America, Mr. Wright says; today there are about 2,100 to 2,200.

"The rest," he says, "are just full, which is why Toronto is trucking its waste to Michigan."

But Michiganders are beginning to grumble about Toronto seeing their state as a garbage dump, and besides, that state's landfills are not inexhaustible. Moreover, Toronto has given itself a goal of diverting 100 per cent of its waste away from landfills by 2010.

Mr. Wright thinks that goal is "very ambitious," but will happen sooner or later.

Furthermore, large-scale incinerators are being shut down out of the same concern for the environment.

He says that recently, during the hottest part of July when the power grid that includes Toronto was taxed to its limit by air-conditioning systems, Ontario was forced to buy extra electricity from Michigan at 37 cents per kilowatt-hour, but is limited to charging its Ontario customers 5.2 cents. Suddenly, creating your own sources of electricity while cleaning up the environment is starting to look not only good, but profitable too.

He sees his system as generating revenue from both the tipping fees and the generation of electricity. He also figures that with the plasma-assisted gasification system, 50 tonnes of waste can produce five megawatts of power, enough to significantly help power a General Motors plant in Oshawa with the waste the GM factory produces, for example.

Without his system, Mr. Wright estimates that over a five-year period, a company with a 40-tonne a day waste stream, operating for 21 working days a month, will have to pay \$3-million for waste removal and \$12-million for electrical energy, for a total of \$15-million. Using plasma gasification, the company's expenses can be reduced to \$10-million over the same period of time.

On a slightly smaller scale, Mr. Wright sees the system being used for commercial greenhouses, such as those that grow tomatoes near Chatham, Ont. These greenhouses eat up electricity for their grow lights, heat for year-round production and carbon dioxide for plant food — and all are by-products of the gasified waste his system produces.

His first commercial contracts have been signed to start operation later this year. International licensing agreements will be undertaken in the first quarter of 2006, with the first commercial installation in the second quarter of 2006, reaching net profitability by the last quarter of 2006, he says.

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