TORONTO STAR
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Jun. 23, 2003. 07:05 AM

Final garbage frontier: Recycling dump itself

New technology permits its re-use, even removal
Organic wastes are tamed, the rest is mined, often used

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SPECIAL TO THE STAR

Jason Kryk for the toronto star
John Baxter with a substitute for wood, made from matter 'mined' from a dump. The system he advocates is

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LONDON, Ont.—About 20 miles south of Nashville, Tenn. amid the rolling hills and pastures of Williamson County, you'll find a large rectangular mound resembling a truncated pyramid. The mound measures about 3 hectares acres wide and 10 metres tall. Its sides are grassy and blend with the scenery.

On top is a large clay cover, out of which metal pipes, connected to various pumps and machines, stand straight as soldiers. What's inside the mound is about to be mined, but it's not precious metals, it's garbage.

This mound is a landfill site—the final resting place of much of what we throw away. A mucky, moist assortment of used Q-Tips, chairs, carpets, car engines, washing machines, typewriters, eggshells and fruit peelings — you name it.

But the messy mélange of detritus hidden underneath the grassy blanket is going to be turned into new and sellable products: compost, metals for cars and trucks, ferry bumpers, marine docks and seawalls. In effect, the landfill will be recycled. An outrageous idea to most people, but not to John Baxter of London, Ont.

Baxter is president of Environmental Plastic Solutions Inc., a Canadian company that holds the patents to a technology that can reduce, reuse and recycle up to 85% of the material in the municipal solid waste site.

The technology has been used, mostly on a pilot basis in Canada, The United States, Europe and Japan, as well as in a recent full-scale commercial operation in South Carolina. "It's not a panacea," he says, "but it is the most economically and socially cost effective way to get more out of a traditional landfill that what's presently being used."

Dumping and dumps, as we now know them, are costly and controversial. Each day, 185 truckloads of garbage, mostly from Toronto, travel down our provincial highways to a Michigan dump because our own sites are jam-packed. Apart from congesting the highways, burning fuel and costing municipal taxpayers millions of dollars, our dumping on Michigan has many Michiganites trashing Toronto.

With landfill recycling, the same dumpsite can be used four or five times, meaning, "you don't have to keep finding new places to store the trash," says Baxter. Not that he advocates this as a replacement to traditional recycling; instead, it's a means to transform the plentiful landfills already in existence from environmental and social liabilities into sustainable community assets.

Baxter's landfill recycling technology works in three phases. First he installs an aerobic bioreactor, somewhat akin to a giant composter. The bioreactor consists of a series of vertical wells drilled into the top of the landfill's six-foot clay cover in a grid-like formation, connected to one another and to a series of tanks. The tanks contain bacterial elements collected from the landfill's own leachate (liquid seeping from garbage), as well as oxygen and water which, when injected into the landfill at a gradually increasing temperature to about 55 degrees Celsius, fully decompose the organic matter within 18 to 24 months.

In conventional, anaerobic landfills, where oxygen and moisture are absent, organic matter can take up to 100 years to decompose. Here's where you may find fruit and vegetable remains flawlessly preserved, long after the people who consumed them have died, notes Baxter, recalling a site he studied in Atlanta. "After 60 years, the bananas were still yellow and the lettuce was still green."

Anaerobic landfills have been the norm for decades. "The understanding was if we kept the stuff dry, we could treat the landfill like a big storage facility," explains John Jackson, coordinator of the Citizens' Network on Waste Management, who also teaches waste management at Trent University.

The reality, of course, is different. "You can't really keep it dry and you can't put a cover on it that will keep all the liquids out, so all it does is increase the decomposition time, and we're passing the problem on to the next generation."

With the aerobic bioreactor, on the other hand, organics are usually fully decomposed after two years, by which time the entire landfill mass has settled, stabilized and shrunk in size by 15 per cent. Now the site is ready for phase two, the mining phase. A backhoe unearths the rubbish using what Baxter describes as "mature open pit mining technologies."

The exhumed trash is then fed through a trommel screen — a large rotating structure, resembling an oversized cement mixer. As the refuse travels down the twirling screen, the smaller, organic elements are sifted out through the screen's holes into awaiting containers. The larger elements proceed to the end of the screen, where giant magnets separate the ferrous metals (iron and steel) from the waste stream, and an eddy current system removes the non-ferrous metals such as copper, magnesium and aluminum.

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With the organic and metal elements separated, about 55 per cent of the landfill is recovered, recycled and ready to be taken off site. The composted organic matter, having been cooked and sterilized through the bioreactor, is independently tested and classified for use, either as cover material for landfill use, as "fill material" for construction projects or sometimes as high-quality compost for

agricultural products.

But that leaves some landfill critics concerned. "I don't understand how you can separate the hazardous waste," says John Jackson. "It's not like a piece of metal that you can separate, it's dispersed, and often in liquid form."

Baxter explains that the high heat of the bioreactor renders the pathogens inert. "To date, on sites that have been tested, the compost material has been classified as benign, and consequently capable of being used in all three possible applications." (landfill cover, fill material or agricultural compost)

At the same time, a fair amount of hazardous waste is contained—either in cans, drums or, in the case of batteries, self contained. "Of course, this stuff shouldn't have got there in the first place," says Baxter. But being an end-of-pipe problem, it requires an end-of-pipe solution, and few would be willing to root around and fish out these items prior to the landfill being sterilized through the bioreactor.

A quartet of workers extract the remaining `hazards' that have passed through the trommel screen, separate them and send them to appropriate hazardous waste disposal sites. A typical landfill, explains Baxter, "contains about 15 per cent hazardous material."

The remaining 30 per cent is a muddled assortment of inorganic waste—commingled plastics, glass, paper, rubber and tires, carpets and aggregates—something which Baxter's technology deals with during the third and final phase.

The inorganics get dried, mixed and melted in another specialty machine called a high-speed kinetic mixer at a rate of 5,000 pounds per hour. The machine is the brainchild of Ramesh Gupta, a polymer expert at the National Research Council, in the Industrial Research Assistance Program (NRC-IRAP), whom Baxter credits with showing him the way to make this technology cost effective.

Once mixed, the inorganic materials go into a proprietary intrusion molding system, where they are reincarnated into large pieces resembling wooden blocks that Baxter says are strong, environmentally safe, impervious to water and cheap.

"They may not look great, but they can compete favorably with natural products on both a cost and performance basis," he says. "A piece that is 6 by 8 inches by 12 feet long would cost about $25.00 to make," says Baxter. (Similar pieces made from wood run in the $60 to $75 range.) They can be used in sound barriers, safety devices, marine docks, retaining walls and landscaping.

With 85 per cent of the landfill now recycled and removed, it can now be reused up to four more times. Baxter is trying to get his technology commercialized in Canada and is currently discussing licensing arrangements with a few third party candidates. It would take about $800,000 to get one started.

Like many purveyors of green technologies, Baxter is frustrated that there isn't more interest at home for what he believes to be a win-win solution. "It has so many advantages not only for the environment and the local economy, but also for public safety," he says.

The ultimate costs and cost-savings, says Baxter, are a complex question. "But on average, our estimate is that a landfill's cost will be about quarter of the then current costs. And that, over time, we

can effectively reduce total life costs by about 75 per cent."

He forecasts diverse, tangible benefits to municipalities. The technology "minimizes offsite leachate treatment costs, groundwater cleanup costs, transportation costs and will allow the millions of dollars in capital costs of a landfill to be spread over many more tons of municipal solid waste," says Baxter.

Assuming the landfill is recycled four times, "it will avoid the millions in expenses of at least four landfill closures." He also feels the technology could gain Canada some points for innovation on the international stage.

Being innovative with waste management doesn't always bode well with regional decision makers. "Trying to choose different landfill or waste management technology is incredibly complex," says Colin Isaacs, president of Contemporary Information Analysis Ltd., a management consultancy specializing in pollution prevention and private-sector planning for sustainable development. "In my view, one of the problems Toronto made a few years ago when they called for proposals for management of Toronto's waste, is they took an extremely conservative approach to selection of the various technologies that were put forward and went with something that was tried and true for many decades, rather than looking at the many innovative technologies that are available today."

Baxter wonders whether he may have to move the business to the United States if he's unable to raise capital here. "That's really a last resort for me. I want to keep this whole thing here and promote it as a made-in-Canada technology." It does make you wonder: With Ontario's garbage situation growing more desperate, who would object to giving conventional landfills the old heave ho?