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RECYCLING: WHY, WHEN AND HOW?

by

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The Challenge

Over the years, Toronto has disposed of its garbage by dumping it into Lake Ontario in the thirties, incinerating it in the forties and fifties, and burying it in the sixties and early seventies. Now, with Metro's ability to dispose of garbage within its own boundaries virtually exhausted, Toronto is casting longing glances at land fill sites in Minto, Hope and Pickering Townships -- to the dismay of local residents. Understandably enough, these municipalities display little enthusiasm at the prospect of being Toronto's garbage cans.¹

Is there an economically and technically feasible alternative? The non-availability of land fill sites, coupled with the prospect of an impending fuel shortage and a growing awareness of the scarcity of many primary resources, all point to recycling. An increasingly pollution conscious public demands it. There is even the enticement of a possible profit, assuming the technological problems can be solved.

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1. The Metro Toronto Act of 1960 gave Metropolitan Toronto the right to expropriate any land within the Metropolitan Toronto planning area. An appeal against expropriation for land fill purposes, launched by Pickering residents, is yet to be heard by the Ontario Municipal Board.

The 3,500,000,000 pounds² of garbage generated last year by Metropolitan Toronto had the heating potential of 80 million gallons of oil. At a time when a fuel shortage is emerging as a reality south of the border and a possibility in Canada, we produce in Toronto an ever increasing tonnage of waste materials most of which are combustible and therefore a potential source of energy.

Paper, food wastes, vegetation, plastics, rags and wood jointly account for about 85% of city refuse. At 5,000 B.T.U.'s per pound, Toronto's 1,750,000 tons of garbage have an annual heat value of seventeen and one-half trillion B.T.U.'s, or enough to heat 100,000 single family homes for a full year.

Garbage can be converted to fuel, or recycled into consumer products. Some 40% of the total consists of paper which, at current pulpwood prices has a potential value of \$48 million. Glass, about 8% of city garbage, could add another \$1 million to Metro's revenues. Most waste metal is already being recycled, thanks to an established commodity market for scrap steel. Our obsolete automobiles find their way back to the steel companies' electric furnaces. Miscellaneous steel products and tin cans account for less than 6% of the city's refuse; at a nominal price of \$15 a ton, they would yield about \$1,575,000 per annum.

Garbage, in brief, is a marketable resource providing it can be separated into its various components.

At a stage in history when man has learned to build electronic brains, transplant human organs and explore outer space, it is difficult to believe that he could be stumped by the recycling of garbage. In fact, most of the technology exists and is waiting to be applied.

The Technology

Recycling technology is the subject of constant discussion, but the depressing fact is that more than 80% of North America's waste ends up in open dumps. Sanitary land fill sites only account for about 5% of the total incinerators (most of them obsolete) for another 10% or less. As of now, no one on this continent is recycling solid waste efficiently and economically, although there are several pilot plants and experimental systems in operation.

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2. Approximate current rate of garbage generation. See Solid Waste Management, Metropolitan Department of Works, June 1970: for forecasts. Probe Policy No. 2 Garbage, Pollution Probe, University of Toronto, Toronto 181, Ontario.

The applied technology of disposal is primitive. A Metro Toronto Department of Works report³ said in June 1970: "In a decade that has man walking on the moon, there are few grounds for complacency in the fact that the methods used by municipal governments all over the world for disposal of refuse are basically the same as those in vogue at the dawn of civilization -- namely incineration and/or burial in the ground".

All this in spite of the fact that various recycling systems have been designed and are now available commercially. The simplest of these provides for incineration in a power boiler which harnesses steam for heating or electricity. There is nothing new about this method. It was used in Holland as far back as 1912, and power producing incinerators have been common for decades throughout most of Europe. Former Alderman Tony O'Donohue proposed the same system for Toronto many years ago, and the city of Montreal recently installed a large heat producing incinerator to be used as a district heating plant.

A common rule of thumb is that one ton of refuse will produce two tons of steam which will in turn generate 300-500 kilowatt hours of electrical energy⁴, sufficient to light about 500 lamps for 8 hours. While the exact yield depends on combustion and generator efficiency, there can be no doubt that the sale of electrical energy or steam will reduce the overall cost of refuse disposal.

The next level of recycling provides for the separation of easily removable components such as tin cans from the refuse. Here again, the major commodity produced would be power. Where a ready market exists for steam, as for instance in a city with a pulp and paper industry, the obvious course of action is to build a steam producing incinerator complete with the latest and best emission controls.

Where there is a potential market for corrugated paper products, newsprint and ferrous metals, further recycling is advisable. Corrugated box board and newspapers can be removed manually, and the balance incinerated. This system has the advantage of simplicity, relatively low capital cost and flexibility. It can be adapted to fit most municipal conditions. Corrugated paper and newsprint provide a fairly uniform fibre for repulping and recycling into pulp and paper products. While the system has the disadvantage of relying on manual separation which is labour intensive and therefore expensive, costs can be reduced by selling the heating value of the combustible fraction wherever there is a market for it.

3. Metro Toronto Department of Works, Solid Waste Management, June 1970

4. Brown-Boveri & Company Ltd. - Refuse Incineration Combined with Energy Production.

Iron can of course be separated from city wastes by a magnetic belt. However, the removal of tin, aluminum and clinging paper from metal cans is a difficult task.

A third system provides for the separation of six commodities; selected paper, shredded mixed paper, fibre fuel, ferrous metals, non-ferrous metals and glass. It is a dry process, highly mechanized but based on reasonably simple and proven technology. After removal of corrugated paper and newsprint bundles from the refuse the remainder is shredded and separated in an air classifier into light and heavy fractions. The light fractions are paper, garden wastes, food particles and plastics, all of which can be incinerated or reprocessed into pulp. If suitable markets for the separated products can be found or expanded, the revenue should be sufficient to cover all operating costs as well as depreciation and amortization of capital costs.

Finally, the most sophisticated systems are designed to recycle iron, aluminum, copper and other metals, to repulp paper and recycle all fibre into paper products, and to reclaim glass so that it can be used as culk or aggregate. Separated organic matter can provide the raw materials for a compost or fertilizer industry; most plastics are combustible and make a good fuel. This ultimate form of recycling is a complex process which requires highly sophisticated management and marketing skills.

Any review of the profitability of various recycling systems must allow for the fact that collection accounts for 75% of total garbage costs, regardless of the disposal method. Though the use of containers, pneumatic tubes and remote control one-man pick-up trucks has been explored, it seems that waste collection from single family dwellings has reached at least a temporary limit of mechanization. Only a reduction in the total volume of garbage will reduce collection costs.

With this proviso, and assuming markets can be found for the products, there is every indication that recycling is a good investment for the disposal operator and a cost saving measure for the city. Where markets are difficult to establish so that only part of the waste can be recycled while the balance is incinerated or land filled, there is a diminishing return; in such a case, a municipality would have to pay a dumping charge to the disposal operator. All situations are sensitive to local costs and markets. The precise rate of return which a recycling operation might realize will vary from one city to another. However, the profitability of all such systems will depend on the revenue obtained from the generation of heat or electricity. Heat is a key factor in the economics of recycling. There are social benefits as well as profits. Each municipality should undertake a detailed evaluation of costs and benefits to accrue from a recycling system.

What Are The Deterrents?

To judge by public pronouncements, recycling is as unassailable today as motherhood was ten years ago. The Honourable James Auld, Minister of the Environment, said last March: "I believe that the best possible way of dealing with waste disposal is to have all waste recycled if at all possible." According to Alderman Reid Scott, "recycling has come of age". Here at last is one issue on which Metro Council, Toronto City Council, Pollution Probe, everybody is in sublime agreement. Why then is there no action?

The main deterrent seems to be the failure of our society to build an administrative structure capable of performing this complex type of industrial public service. We have a resource but no agency equipped to sell it. The required production/marketing relationship does not exist within governments, yet our legislators are unwilling to withdraw from the field on the grounds that waste management has always been a government responsibility.

Some factors retarding progress:

Fear of failure. Although recycling processes are technically simple and based on sound principles, many of them are new and only experimentally tested. In private business, the prospect of high potential returns on investment counterbalances risks and fear of failure. Governments, on the other hand, are almost equally afraid of embarking on an unsuccessful venture as they are awarding a profitable contract to private industry. In the former case, they will be blamed for having failed; in the latter, for letting success slip through their fingers. Obviously, the course of safety is to do nothing.

Land fill sites are relatively simple to operate and therefore ideally suited to bureaucratic management. Expropriation powers aid and encourage the land fill solution of the garbage problem. Why would any municipality face the risks of more complex systems when the alternative is so simple and obvious?

Recycling calls for considerable marketing know-how. Various grades of fibre for the pulp and paper industry must be provided on a sustained production basis to specific quality requirements. If fibre is to be used for heat, the heat must be distributed for processing, heating or cooling, the generation of electricity or conceivable a combination of all three. This requires complex contacts between municipalities, commissions and private or public utilities.

Environmentalists have been guilty of a certain amount of overkill by insisting that waste should be recycled into products rather than energy. Threatened power shortages have focused our attention on the finite nature of fossil fuels. The energy producing potential of city refuse is of interest; the burning of a renewable tree instead of a non-renewable gallon of oil

makes sense from a conservation point of view.

At present as in the past, Canadians are remarkably indifferent to the violation of their land. With admittedly plenty of room to stand, most people tend to forget how little of that standing room is suited to agriculture or settlement. They accept, with apparent equanimity, the irreversible destruction of some of the country's finest agricultural land for the sake of garbage disposal.

Because the technology of recycling is constantly changing, authorities are afraid of being caught by obsolescence. It is natural to postpone today what may be changed tomorrow.

In Ontario we have, in addition to the federal Ministry of the Environment, a provincial Ministry of the Environment and two tiers of municipal government charged with collecting waste products and disposing of them. There are also numerous commissions and regulatory bodies whose cooperation is needed. It is a ponderous structure, pregnant with inertia.

Creation of a recycling system is a complex industrial development task. Success will require diverse management skill in engineering, finance and marketing. Management consultants can provide many talents. The technology exists, the economics encourage recycling and environmental concerns demand action. The time has come for all levels of government and private industry to join hands, apply their combined managerial skills to the challenge and translate wishful statements into plant, equipment and an industrial organization which can do the job.