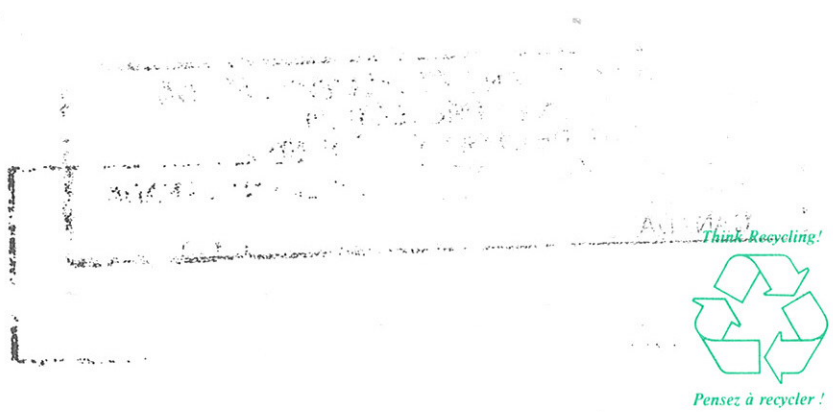
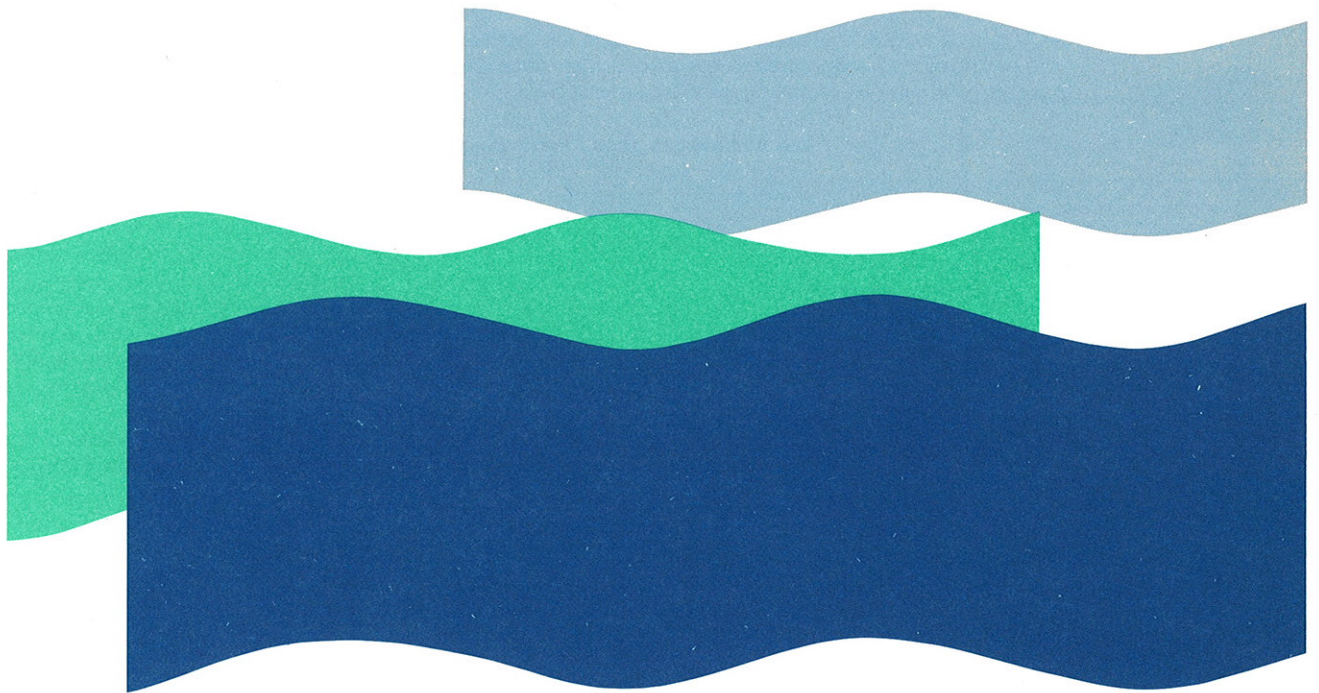


Creating Fuel Oil from Sewage Sludge

1

Environmental technology



Environment
Canada

Environnement
Canada

Canada

Environment Canada has found a way of producing usable fuel from a most unlikely substance—sewage sludge. This technique produces fuel oil in much the same way that nature produces crude oil, but the process is accelerated so that it is completed in 30 minutes, instead of millions of years.

The concept of generating energy from wastes has intrigued both scientists' and homeowners for years. We usually think of the idea of recovered energy in connection with the incineration of municipal refuse—a reality in many countries. But Environment Canada has now found a way of producing useable fuel from a most unlikely substance—sewage sludge.

Sewage sludge is a by-product of the wastewater treatment processes used to render industrial and municipal wastewaters less harmful to the environment. Canada alone produces over 500 000 tonnes of sewage sludge each year. Disposal of these vast amounts of sludge is cumbersome and expensive. The sludge from large cities is often incinerated, but it is also widely used as a fertilizer in agricultural applications, or occasionally disposed of in landfills. Some municipalities, such as New York, dispose of their sewage sludge by dumping it into the ocean. Whatever the method used, the annual costs of disposing of sludge are often as high as 50 per cent of the annual cost of treating wastewaters. Annual sludge disposal costs for Canada are around \$100 million.

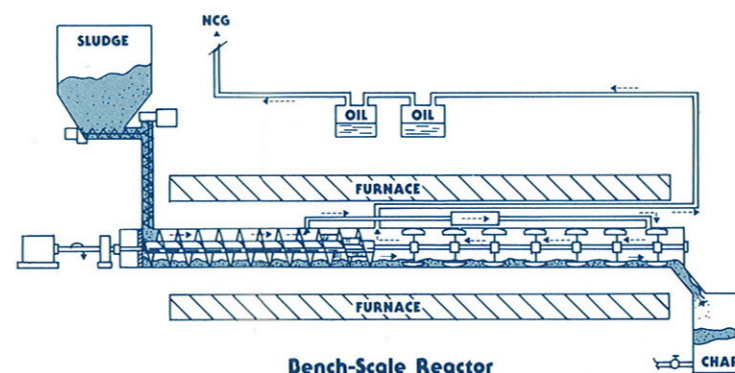
The problem of sludge disposal posed a challenge to Environment Canada's Wastewater Technology Centre (WTC). The WTC, which is located in Burlington, Ontario, develops new cost-efficient processes to deal with wastewaters produced by industry and municipalities. The aim of the WTC's research and development activities is to better protect the Canadian environment, while at the same time assisting the environmental industry. The WTC is equipped with unique and complex research facilities for conducting chemical analyses, preliminary laboratory experiments, and pilot plant studies.

An Accelerated Natural Process

The WTC used the full range of its research and development facilities when it began in 1982 to look into the question of converting sludge to usable energy. Researchers examined a technology that had been developed at Tübingen University in Germany, and which focussed on creating usable energy by heating the sludge. The process involved heating dried sludge to temperatures of 300° to 350° Celsius, for about 30 minutes in an oxygen-free environment. The conversion process produces several by-products—oil, char, reaction water, and noncondensable gas—which are collected separately. The main product is oil, but the gas and char also have usable energy value and can be used as fuel for the drying/conversion process. This technique produces fuel oil in much the same way that nature produces crude oil, but the process is accelerated so that it is completed in 30 minutes, instead of millions of years.

The WTC conducted laboratory-scale batch and continuous reactor tests of the conversion process, testing different sewage sludges from Canada, the United States, and England. Once researchers were satisfied that the process was viable, the WTC conducted pilot-scale tests, at the rate of one tonne of sludge per day. The next step will be the full-scale demonstration of the process at a wastewater treatment plant. Such a demonstration facility will be designed to convert 40-50 tonnes of sludge per day into usable fuel. The WTC hopes to have an operating system by mid-1991.

The oil could be sold for about \$30. per barrel, creating annual savings of \$20 million from the 700 000 barrels of oil that Canada could produce each year.



Versatile System Saves Energy and Disposal Costs

The WTC process for transforming sludge into fuel has many benefits. Both raw and digested sludges can be used, and the oil produced is storable and transportable, unlike energy recovered from methane or steam that must be used quickly on site. The product is suited for use as fuel oil, and may be upgraded to a transportation fuel. The oil could be sold for about \$30 per barrel, creating annual savings of \$20 million from the 700 000 barrels of oil that Canada could produce each year. This sale revenue could be applied to offset wastewater treatment costs. Although capital costs of conversion equipment are comparable to those of incineration, operating and maintenance costs for the conversion process are lower. For example, the process is 95 per cent thermally efficient. In other words, up to 95 per cent of the thermal energy present in the sludge can be recovered.

The conversion process currently can be applied only to municipal sewage sludges, but potentially may be applied to sludges from industrial processes as well. This process is so economical and innovative that it is of interest to municipalities all over the world, especially in Europe, where disposal costs are particularly high. Recent surveys have shown that Canada, the U.S. and Europe spend \$2 billion a year on sludge disposal—and sludge production is expected to double in the next decade. Large sums in disposal costs can undoubtedly be saved through this sludge conversion process.

Environmental Benefits

Aside from its economic advantages, sludge conversion is an attractive disposal alternative for environmental reasons. The WTC researchers have identified no environmental problems with the process, which avoids the potential pollution associated with ocean dumping or landfilling of sludges. Potential restrictions on the agricultural use of sludges, and on the licensing of landfill and ocean disposal sites, add to the conversion process' attractiveness as an environmentally-sound disposal method. It is estimated that over 350 000 tonnes of sludge could be converted each year in Canada alone, which means 350 000 fewer tonnes being disposed of in the environment.

The WTC process of producing fuel oil from sewage sludge has been patented by Canadian Patents and Development Ltd. and is licensed to EnerSludge Inc.

For more information on this process, or on other research activities of Environment Canada's Wastewater Technology Centre, contact:
H.W. Campbell
Wastewater Technology Centre
Environment Canada
867 Lakeshore Blvd.
Burlington, Ontario
L7R 4A6

Tel.: (416) 336-4717

emergy