The paper offers an excellent comparative discussion of five waste processing/disposal alternatives for the Roanoke Valley Regional Solid Waste Management Board. The technological feasibility of two landfilling alternatives, shred-fill, balefill, two alternatives for mass burn incineration with energy recovery (steam) and composting are discussed. The authors cite problems and costs of parallel operations elsewhere in the U.S. They also discuss two other solid waste management considerations - resource recovery by private enterprise (existing operation) and use of a transfer station.

The paper would have been strengthened by an explanation of the method used to determine costs. One wonders what noncapital costs have been included for each alternative. The landfill alternative is best documented, but even there, there is some doubt as to what all is included. The year of the estimate and noncapital costs would be helpful. Environmental considerations could be more clearly set out in the presentation.

Source separation is not discussed, raising the question of whether it is feasible for this area. Recovering recyclables in the Transfer Station may be feasible but the condition of the recyclables in the incoming waste stream and the volume of incoming traffic will be of considerable importance. To suggest removing 10-25 percent of the wastestream at a transfer station is a disservice to the industry.

Landfill calculations for high use landfills (90 ft in this case) appear light. Construction techniques on such fills in open areas will require cover rather in the range of 2.5 to 211 based on experience at Riverdale, Michigan.

This paper outlines various approaches to solid waste management considered by the Roanoke Valley Regional Solid Waste Management Board of Roanoke, Virginia. A study was undertaken to determine the best management technique.

The final recommendation to the board by the study group was to begin planning to construct and operate a solid waste bale and balefill as the most effective way to manage the region’s waste.

1. The authors state that in addition to other cost advantages the balefill operation has the advantage of, and I quote . . . . “increasing the amount of recycle, which is possible in reducing the material placed in the landfill.” How does balefilling increase recycling?
2. The authors further state that an increase in source separation would further improve the economics of balefilling. However, there is no analysis of the existing recycling program in Roanoke and no recommendations on ways to improve the program and thereby increase source separation. In addition, there is no recommendation to include in the bale facility an area for separating out recyclables.

3. In the section on resource recovery, the authors state that only 54 to 70 t/day of combustible waste was available in the region. Yet, in a prior section on landfilling, weight records kept by the Board indicate that 350 t of refuse a day were landfilled in the regional landfill. Another landfill accepted demolition type waste. Why the large disparity in numbers? Municipal waste usually contains more than 17 percent combustible materials.

Discussion by

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The consideration of various alternatives for solid waste disposal faces a large number of decision making governmental bodies these days. They are universally concerned with the technical and economic feasibility of the numerous choices offered to them and are seeking realistic and practical guidance. This paper sets out to provide such guidance through the case study approach.

There are several aspects relative to the decisions made that are not addressed in the discussion of this case study which should be mentioned. They are as follows:

1. In the discussion of the possibility of expanding the capacity of the existing landfill at its present site by raising its final elevation, no mention is made of the availability of cover. Is adequate cover material available on site or would it need to be imported? This will have a great influence on the economics of such a possibility.

2. What is the location of the existing site with respect to the center of gravity of the waste generation area? Will transportation costs be greater using this site because of its location? Another site more centrally located may be more economical in the long run.

3. While discussing the use of baling and disposal into a balefill the greater density of the refuse in place is used to establish a longer useful life of the landfill (an increase of 4 years is mentioned). Is there a way to determine the number of years that will be required to pay back the additional cost of the baling equipment based on the additional space available due to this increase in density (reduced volume)? Otherwise how is one to know whether it is worth while to spend the extra money for baling?

4. The paper included the alternative of resource recovery by private enterprise. The recovery of 50 to 75 tons of paper per day is indicated as being the capability of a private firm. It would seem that 14 percent to 21 percent of the waste stream (based on 350 t/day) would be a significant reduction in the amount of waste requiring handling and disposal and would increase the life of the landfill proportionally. If up to 20 percent of the waste can be diverted to resource recovery, would it not seem reasonable for the city to recognize this fact and to provide some form of credit (a subsidy perhaps) to the private firm since the cities costs will be reduced by such removal?

The final recommendations of the study are not at all apparent if based on Table 1. It is stated that, "during the initial years, the unit cost of disposal would favor conventional landfill; however, due to the longer life expectancy of a balefill, a life cycle cost analysis (Table 1) indicated that the cost of disposal on a per ton basis favors a balefill operation over the life expectancy of the fill operation." The data presented in Table 1 are plotted in the accompanying graph to illustrate what is stated in the table. Specifically, that the unit costs per ton of a balefill start out higher than a conventional landfill and remain higher throughout the expected life of the fill. There is in fact no convergence in evidence; if anything, there is a wider spread as time goes on. An explanation of the conclusions based on this data is in order.

It is also not clear as to how baling refuse in a very dense bale (1500 lb/cu yd) will increase the amount of recycle which is possible. It could seem to be quite the opposite.

AUTHORS' CLOSURE

The paper discusses alternatives for waste management in the Roanoke Valley region of Virginia. Alternatives are considered which utilize local markets and which heavily emphasize the existing regional philosophy and political leanings for solid waste management. For reasons other than cost, a
recommendaion was made to install a baling operation at the existing sanitary landfill. This recommendation was made even though it was not the least cost alternative. Even using life cycle analyses and extending the life of that existing facility, other alternatives were less costly.

However, lack of availability of land and political problems associated with siting a new landfill in only one political jurisdiction of a regional board lead to this recommendation.

Several reviewers raised the question of source separation and its feasibility and impact in the area. Presently, a private enterprise separation system exists and a considerable amount of newsprint is pulled from the waste stream. Source separation was recognized as a way of reducing waste volume, and recommendations for increasing the material recycled were made in the report. However, it is expected that the weight of recycled materials will not be increased dramatically over that which is already removed from the system. Roanoke is faced with the same questions of improving resource recovery at the source as encountered in other jurisdictions. There does not appear to be any unique feature in Roanoke which would lead to enhanced source separation.

One of the proposals which was placed in the report was to enhance recycling through separation at a transfer station. It is recognized that such an operation would impinge upon the efficiency of the transfer station and would require additional manpower. It is not the intent of a design system to process solid waste before bailing. Hence, any material which would be removed at the transfer station must be separated prior to the collection vehicle unloading at the transfer station. If storage facilities are provided, source separation can be improved by encouraging collectors to provide separate storage areas for recoverable items. When no such storage facilities exist, it is unlikely that any cooperation will be gathered from collectors, especially those in the private sector. Incentives to encourage source separation might also improve the effectiveness of the systems.

Baling systems will help to improve recycling by mandating certain bulky items be removed from the system before the baler. Items such as white goods and recoverable metallics would be withdrawn from the system and not landfilled, even at an added expense for disposal. Charcoal production provides an outlet for wood recovery from the waste stream at the transfer station as well. If one approaches a transfer station as the simple intermediate point of continuity between collection and disposal, then its effectiveness is not being utilized to its potential. If a true solid waste management system is implemented, a transfer station is an excellent point for diverting waste streams to their respective points of alternate disposition. In attempting to define the costs associated with implementing such a management system, it was quickly discovered that productivity factors for work assignments were not available in order to predict accurately what the resulting system costs would be for operation. These are data which should be generated in the future by existing municipalities who are enhancing the recovery and recycling of materials within their individual solid waste management system.

The authors do not agree with the assessment that increased amounts of cover material will be required for the higher landfill. The topography of the existing fill is such that containment does exist and slope stability is not a problem similar to that required for a free standing high rise disposition site. In the case of Roanoke, disposition and slope stability are a problem only in a single direction along a given plane. Because of the
unique construction situation, efficiencies are not surrendered by going to the high rise design technique.

The authors would like to thank the discussers for the time which was seriously devoted to evaluating and commenting on the paper. All of the comments were excellent and several presentation errors were accurately pointed out by the respective commentators. Specifically, the ultimate cost of the system based on life cycle analyses was erroneously presented. The cost of the system for baling is not the least cost alternative. The balefill option was selected for reasons other than total system economics.