The authors are to be congratulated on the thorough and factual presentation of data describing the quantities and characteristics of the residential and commercial solid wastes. Also, their discussion of the alternative methods to separate the materials should be beneficial to other communities which are interested in material recovery.

The impact of materials recovery on the design and operation of the energy recovery facility was as expected. The reporting of this and the reporting of the cost factors emphasize the benefits.

With respect to the economic evaluation:
(a) The cost per daily ton of installed capacity for large scale waste to energy power facilities should have increased with decreasing capacity.

(b) Additional information of the cost of the construction and operation of the materials separation system would add to the credibility of the results and would give others a basis for evaluating the process for their communities. Labor intensive operation is mentioned but an estimate of the amount of labor required would be enlightening.

Aside from the results of the study, also of interest to other communities would be the magnitude of the effort required to conduct this type of study. It would aid in their planning for future disposal practices.

The authors have provided us with a very comprehensive analysis of the expected economic impact of the Essex resource recovery system. While we generally review business decisions largely on their economic impact, there is an implicit “social” value in being good stewards of our natural resources. It is good when these are both on the plus side as the authors have shown here. We compliment them on their work and look forward to seeing the early implementation of the Plan.

The heterogeneous nature of municipal solid waste materials provides the boiler designer with many challenges as it does also to the materials handling equipment suppliers. The key here is understanding the nature of the fuel. The designer often has been able to extrapolate his years of experience in burning wood wastes and apply it successfully in the combustion of municipal solid waste (MSW) materials. This is largely due to the high cellulose value in MSW.

Now the authors will provide the boiler system with a waste that has a 54% higher organic content. This may lead us into an area of combustion technology that needs additional study. We are familiar, for example, with the potential changes in metal corrosion rates and effluent discharges that come from increased amounts of plastics. So we suggest that the industry may want to cautiously investigate the impact of fuel changes that come about
through the recycle process.

While I have no reason to follow the ups and downs of the value of recycled materials, I believe there are dramatic swings in short periods of time. The authors have covered this eventuality to a large extent by their range estimates on the income from selling the recycle materials. We would be interested in their comments on what the impact might be on this income, if any, if all of Northern New Jersey implemented a similar program.

We understand the Essex County contract negotiations for the resource recovery power plant are about concluded. Maybe the authors could give us a more up-to-date status on that situation.

I believe many communities around the U.S. will anxiously look forward to future reports on the Essex experience. So we wish you well on this project and hope you will continue to keep us abreast of your progress.

Discussion by

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The paper describes a type of study that we believe will be conducted in many of the heavily urbanized sections of the United States during the coming years. It raises many of the problems that will be faced and questions that will be asked in similar demographic areas. It highlights an argument that has been going on for some time. Simply stated, this revolves around a basic philosophy as to how solid waste should be managed in order to achieve maximum cost reduction along with technical satisfaction: Is it worthwhile to recover for recycling the potentially saleable materials (corrugated, newsprint, metals, glass, etc.), and to incinerate the remaining segment for energy production; or is it more practical, cost and technically effective to mass burn the entire waste stream for energy production?

The touted approach of the 1970's, in which a complicated "RDF Plant" was constructed, with front end separation of segments of the stream, was rejected by the Essex County planners in favor of some form of "source separation" that prevents the saleable materials from ever reaching an energy plant. The planners have been realistic regarding human nature. They believe: (1) residential householders are either lazy or uncooperative and do not like to separate glass, metal, paper and garbage before collection; (2) collection of residential waste that has been separated is more complicated than collection of cans of mixed waste; (3) commercial and industrial generators are more inclined to separate their waste into components as they often employ specialized haulers and it can save them money; (4) if individuals are paid to deliver separated waste to a station of some sort they may do so as the aluminum companies have discovered.

The main problem that has faced the planners is to be able to estimate for an area as large as Essex County how the waste breaks down into components by weight and how the breakdown may vary seasonally and by districts. Until this is known, it is difficult to know how much of a given component exists, and from this to be able to plan facility design and construction, marketing of the separated materials, and eventually to judge the success of the program. The tables presented in the paper show that a lot of guessing on this point is still taking place.

In looking at the major reasons the planners used for developing their approach we find that they fall into three groups: (1) by reducing the total amount of waste to be incinerated for energy production, a smaller and less costly incinerator plant could be constructed; (2) the fuel for combustion would have a higher heat value; (3) the volume of ash would be reduced and quality affected.

Having gone through a similar exercise for over 15 waste-to-energy plants that are now in operation, this reviewer would like to make some comments on the findings of the planners for Essex County.

(1) With several years of accurate weighing experience at these plants, all of which are of mass burning design and handling the total waste stream of a community with no preseparation, we know that the dry ash weighs between 24% and 28% of the raw waste and on a fairly consistent basis. We also know that between 75% and 80% of this ash weight is made up of metals and glass. We know that in a properly constructed furnace system the average reduction in volume from raw waste to ash is 94%. This should give a starting point average on a broad scale basis as to how much metal and glass can be expected in a stream.

(2) Does increasing source separation of corrugated, newsprint, glass and metal increase the density of the remaining segment? This study says it does. We disagree. When the heaviest fractions are removed, the remainder has lower density.

(3) We realize that the plan is still in its infancy and that firm contracts for the recovered materials have not been negotiated, and that the planners will discover that fixed or escalating long term contracts are impossible to achieve. However we suggest that the economics be re-studied on two items. They found that corrugated and newsprint made up the heaviest components of the total stream. The plan is to extract these two items for scrap sale. The paper does not analyze the trade off between selling these for scrap and using either or both for fuel to
produce energy. At current steam sales average price and 73% conversion efficiency, dry corrugated (6830 Btu/lb) earns $70.69 per ton as fuel, and newsprint (7800 Btu/lb) earns $80.74. We doubt that the scrap dealers will come close to these figures during the next 15 years if the prices of the past 15 are any indication.

(4) On the opposite side of the ledger, the paper questions an improvement in the marketability of ash after source separation of metals and glass. We have found that there is a definite improvement, as has the Dade County, Florida plant. If metals are reduced to an almost nil quantity and the glass is in granular form in the ash, the marketability sky rockets, whether for cinder block and cement company use, road material, or landfill cover.