DONCASTER PROJECT — A U.K. WASTE RECLAMATION PLANT: NEW PRODUCTS FROM DOMESTIC WASTE

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Discussion by

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I have reviewed this paper and I thought it was difficult to follow because of the author’s sentence structure and word choice. Terminology varies from country-to-country and it was not always clear what the author intended by some expressions, i.e., “conurbation” which is a network of urban communities. Although his usage was correct, the term is not commonly used in this country.

I offer the subjects below as discussion items.

1. The paper lists the Doncaster waste stream composition. It was of interest to compare it with U.S. waste. The general statement can be made that it is approximately the same. However, the waste generation rate (1.2 lb/person per day) is low by U.S. standards. Categories differ in name, thus making direct comparisons difficult. Refer to table below. It should be noted that even within the U.S.A., quantities and categories vary, depending on the organization conducting the analysis. I suggest the Solid Waste Processing Division poll the membership for expressions of interest for standardizing Municipal Solid Waste categories recommended for use in future studies.

2. The Doncaster plant has an unusually high number of electro-mechanical devices. Our experience has shown that the economics do not justify extensive separation and cleanup of the products by successive processing through high technology machines, such as the optical sorter, stoner, rising current separators, pelletizers, and laser controlled blower.

3. The paper gave no information on the separating efficiency of the rotating screen (trommel). Doncaster participated in a recent DOE sponsored study of trommels. That information would have been timely and of interest to the membership. Perhaps the data was not available because this paper appears to have been written in 1980 and presented two years later.

4. The glass produced at the Doncaster plant met a U.K. industry specification that had major differences from the U.S. specification. Both specifications are listed below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Doncaster</th>
<th>U.S.A.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>Plastic</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Textiles</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Unclassified</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Yard Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables &amp; Putrescibles</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>– ½ in. fines</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>– ¼ in. fines</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Ferrous</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Glass</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Nonferrous</td>
<td>trace</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Moisture</td>
<td>30</td>
<td>25-35</td>
</tr>
</tbody>
</table>

* Composite of several studies.
<table>
<thead>
<tr>
<th></th>
<th>U.K.</th>
<th>U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>15-40 mm</td>
<td>100 percent — X in.</td>
</tr>
<tr>
<td></td>
<td>(0.6-1.6 in.)</td>
<td>&lt;15 percent — No. 140</td>
</tr>
<tr>
<td>Moisture</td>
<td>NIL</td>
<td>0.5 percent</td>
</tr>
<tr>
<td>Contamination:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrous</td>
<td>0.01 percent Max.</td>
<td>0.05 percent Max.</td>
</tr>
<tr>
<td>Organs</td>
<td>0.05 percent Max.</td>
<td>0.2 percent Max.</td>
</tr>
<tr>
<td>Non-Magnetics</td>
<td>0.01 percent Max.</td>
<td></td>
</tr>
<tr>
<td>Solids</td>
<td>0.05 percent Max.</td>
<td></td>
</tr>
<tr>
<td>Refractories</td>
<td>0.01 percent Max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+20 Mesh, 1 particle/40 lb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-20 x 40 Mesh, 2 particles/1 lb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40 x 60 Mesh, 20 particles/1 lb</td>
<td></td>
</tr>
<tr>
<td>Organs</td>
<td>0.05 percent Max.</td>
<td>0.2 percent Max.</td>
</tr>
<tr>
<td>Color (Mixed)</td>
<td>White — 85 percent</td>
<td>0.1 percent Fe₂O₃</td>
</tr>
<tr>
<td></td>
<td>Green — 5-10 percent</td>
<td>Cr₂O₃</td>
</tr>
<tr>
<td></td>
<td>Amber — 5-10 percent</td>
<td>0.0015 percent</td>
</tr>
</tbody>
</table>

As can be seen, terminology differs. However, it is worth noting that the U.K. specification does not consider refractories, a major consideration of U.S. glass companies.

5. No information was given on the structure of the contracts with industry to buy the recycled materials. Because of the U.K. government participation in many industries, it would have been interesting to know the kind of contract an industry would offer the Doncaster plant. Would they be used as a way to subsidize resource recovery plants?

6. Hook does not make a clear statement as to the economic success of the plant. He discussed proposed and accomplished changes, but never summed up the overall economic picture. I get an impression that it is not profitable. If that is the case, it is hard to justify spending additional capital to increase processing to make the products more marketable. Does the tipping fee float to achieve a monetary balance?

7. A major plant product is pelletized refuse-derived fuel. U.S. experience, both economically and technically has been mixed, at best. Hook should have discussed this product in more detail.

8. I had some difficulty justifying all the data in Appendix II. They did not add up to 100 percent as they should, in some cases. Also, Table I shows ferrous metal is 11 percent (by weight) of the waste stream and Appendix II lists 7 percent.

9. Another difficulty I had with the paper was understanding the author’s style and word usage. Sentences such as “No costs had been made for the fact that the glass material could not be utilized elsewhere in other product streams, without prejudicing that products utilization,” were difficult to place in context, or the phrase “totally energy efficient” went undefined.

**AUTHOR’S REPLY**

1. The points made regarding standardizing solid waste categories applies equally to the United Kingdom.

   The experience of design for the Doncaster Plant showed the need for such basic agreement. Consistent classification, types and sampling methods are essential if any design comparison or economics of waste treatment systems are to be attempted.

   A further important aspect of such classification is to define the intention of the analysis, and indicate how it may be used.

2. Our experience confirms that the comment made is correct, but I would suggest that two critical factors have also become known:

   a. The quality of operator employed by Local Authorities in the U.K. is not, at present, adequate for the various devices. The performance of the equipment has often been seriously reduced by this factor.

   b. These devices are needed only because of attempting to obtain compatible resources from the waste to the virgin feedstock wanted by existing industries. It is my belief that this requirement will never be economic, but the waste material must be utilized in a simpler form in new products or material combinations. The basis of the paper was an attempt to illustrate this is possible for such a commodity as glass-rich aggregate.

3. The separating efficiency of the trommel is fully described:


   In general terms the efficiency of the primary trommel in separation is good providing the rotation speed is correct for the material being fed into it.

   However, at Doncaster we have had problems with the binding of the screen due to the removal of the rag conveyor for redesign.

   Tied, high strength plastic sacks are also decreasing efficiency within the trommel, but the installation of a bag-splitter is now in hand, and expected to remove this problem.

4. Our contracts for the selling of the products has been seriously curtailed in range and number due to the economic recession, and many of the original outlets have ceased to exist.

   However, with the outlets that still exist, and
because of the comparative consistency, standard of the recycled material, the usual type of supply contracts are being made with the proviso at the present time, no guarantee of quantity is given. In effect, this means a lower rate value for the recycled material is being obtained.

It is also a requirement on the project that many trials and outlets for the recycled materials are made.

5. The economics of this type of plant in the United Kingdom, with the complexity of the organizations, etc., means that discussion of this subject in a brief reply is practically impossible.

The data now coming from the plant shows that within the limits defined in the paper [$13-$19/ton (1978)] the cost will be at the top limit of this range in present day costs. The plant is therefore still equivalent to the alternative cost of a transfer station and landfill at 15 km within United Kingdom.

Tipping fee floats, subsidizing resource recovery plants from industrial costs, are not included in the above rate. These possibilities, etc., have not at present been seriously discussed or debated in the U.K.

I would suggest, however, that if any additional capital is introduced, it should be to increase the range of products. As such, the costs are marginal, but very cost effective.

6. The paper set out to illustrate a particular material, glass, and it was not intended to discuss deeply the fuel aspect as it was felt that this was known.

In general terms, therefore, I would suggest our experience at Doncaster shows that it is possible to extend the range of fuel products. The returns in the U.K. for these are better when marketed as a low-grade fuel using new energy conversion equipment (fluidized beds) rather than in competition with coals and the related older installed burning equipment for that fuel.

7. The Table 1 data was obtained using area sampling techniques in 1976, but experience has shown that the Appendix II value is reasonably correct. This appendix II survey was made in 1978 and unique at that time in the U.K. It used very precise hand-sorting and classifying techniques using specific samples. Perhaps the difference proves the points made in Mr. Parker's Comment (1) on the paper!

The failure for Appendix II to add to 100 percent is due to rounding up of the figures in the small percentage range materials.

8. I apologize for any U.K. terminology which was used in the paper but for the examples given:

a. In the requirements to produce material from waste to specification means that, e.g., in the case of fuel, glass cannot be tolerated in its adverse effect in the fuel usage. When calculating the actual cost of the glass obtaining circuit, it can be considered a marginal cost to the fuel production since it must be done, and make the unit cost of the glass very attractive. In the cost given in the paper this method was not used.

b. "Totally energy efficient" was copied verbatim from the original project brief! It was defined by the group as meaning that if fuel was a product of the plant, then the energy contained within it must exceed the whole energy used in the plant, in processing all the waste not just the fuel circuit itself.