DESIGN, EVALUATION AND OPERATING EXPERIENCE OF THE CITY OF MADISON - MADISON GAS & ELECTRIC COMPANY ENERGY RECOVERY PROJECT

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Discussion by

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Messrs. Barlow, Boley and Smith are to be commended on an excellent paper. This paper presents research points of value to the industry and very early after their procurement. They have shared with us the discussions of some of the problems they encountered and the approach and solutions determined. This can only reflect favorably on them and our industry, and we are indebted to the authors.

I have a few minor questions. They spoke of the RDF replacement range of 15 percent. I assume this is 15 percent of the furnace’s heat release rate. I would further question: Is this 15 percent the maximum or is it 15 percent of the total heat release at any one time?

The City was very fortunate to have the convenient coal-fired boilers with sufficient electrostatic precipitation capacity to allow them to introduce the RDF fuel. I would caution that such a resource recovery solution is quite site specific, but where such a situation presents itself, it should be utilized. However, the system’s product cost is just under $22 per ton, and this will certainly give many cities cause for caution when compared to their present system for refuse disposal. This is true even though the present approach may not be viable much longer.

I wonder if, as I suspect, these are older boilers and the authors have predicated the system’s life on their continued availability? This, of course, would be reflected in the investment and carrying charges, among other things.

One other question I have is: Since there is considerable size latitude between 1/4-in. and 2-in. nominal RDF size (it could be smaller, larger or in between), was any consideration given to a nominal size other than these two? If only these two were considered, was the use of the nominal 3/4-in. sufficiently better than the 2-in. to suggest other sizes? One might consider 1 3/4-in. as a midpoint between the two which would require a little less secondary shredder power and might gain the same burn-out. What was the major justification for the move to a 3/4-in. nominal size?

Once again, I congratulate the authors on a very timely and well-presented paper.

Discussion by

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The system described bears a good deal of similarity to the Monroe County (New York) Resource Recovery Facility described in my own paper. It would appear that a pattern is developing insofar as the preparation of RDF is concerned. Minimum initial shredding is important to insure
that imbedding of glass, stone, dirt and other inorganics in the RDF is kept as low as possible. Not only does this keep the ash content low, but it will contribute to longer life for RDF conveying equipment. In our own case, this minimum initial shredding (to about a 1/2 in. matrix) is necessary to maintain the ferrous fraction in suitable form for subsequent recovery of a detinning fraction. The trick, of course, is to provide sufficient initial shredding to permit subsequent processing and initial density separation while not unduly contaminating the RDF or "balling up" the tin cans.

Inasmuch as Monroe County and RG&E have yet to burn any significant RDF at the Russell Station, the burning experience to date at Madison is particularly interesting. We will certainly be interested in the results of their 1980 stack emission testing.

The following questions were generated as I read through the paper.

1. You quote a maximum fuel replacement rate of 25.8 percent and an average rate of 15 percent. I assume that these are expressed as fractions of thermal input rather than weights. What is the limiting factor? Availability of RDF or ability of the boiler to handle RDF without deleterious effects?

2. When the total system is operating at current design conditions, what will be the RDF burn rate? In % of thermal input? In tons of RDF per day? And as a fraction of the total RDF production capacity?

3. Has there been any evidence of corrosion in the boiler as a consequence of burning RDF?

4. Turning to the processing plant, can you give any further details on the operation of the "proprietary" primary separation system?

5. Finally, has any further planning been undertaken to "mine" the non-ferrous residue for such additional recoverables as glass, non-ferrous metal, sands, other combustibles, etc?

Discussion by

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In opening, let me say that I have nothing but praise for the work put into this paper by the authors and for the clarity of the presentation. The paper includes vast quantities of data relating to the project and this information is well organized and well presented.

My comments, therefore, do not relate to what is contained in the paper but rather to what is not.

I think it would be significant for the reader of the paper to know exactly why boilers 8 and 9 were chosen. The only item which refers to the choice is that both boilers were equipped with electrostatic precipitators. Were there other reasons? Did boiler height come into it? Or configuration? Or size? Or age? In short, what were the features of these two boilers that made the choice of these boilers the best one — and do these particular features now prove important, now that some test burns have taken place? Better information on the boilers would have, in my opinion, added greatly to the value of this paper. As for the conclusion reached during the two initial test burns, the information gathered was 100 percent predictable. It has been shown at Ames that burning of RDF needs a grate if one is to avoid burning material in the ash pit. There is no question that smaller particles will burn better than larger particles when only suspension burning is employed. And the removal of glass to minimize slagging is obvious.

As far as design decisions are concerned, I am surprised that the need for a grate was not obvious before even any RDF was burned.

I would be interested in knowing how the RDF feed port location was determined. Had it to do with particle retention time in the furnace? Would a feed port set higher have reduced retention time. A higher port would no doubt have increased the amount of RDF burned in suspension and therefore reduced the amount of unburned material falling to the grate, thereby reducing fire on the grate and perhaps reducing slag problems at this location. What retention time is, in fact, accomplished within the furnace and is this adequate? These are questions which I think cry out for answers, for it is on the basis of these answers that design and success of future systems will depend.

I think this paper should have provided a great deal more information on the final processing system. First, it should have stated the percentage of combustible product lost during processing both in tons and Btu's. It would have been useful to the reader to have known the manufacturer of the flail mill, the percentage of metal in the separated ferrous material and the percentage of combustible material with it, the tons of RDF transported in each 75 yard trailer, and the amount of material
which had to be landfilled after the RDF was produced. In other words, is the process doing a good job of refuse disposal as well as producing RDF.

It appears to me that the materials which most need combustion for disposal, grass, food wastes, etc., are not being destroyed in this system and as well I suspect that a large proportion of good combustible material (wood, rubber, plastics) is being lost as a fuel.

Information on these percentages would be a good measure of the success of the system as a combined refuse disposal energy recovery system. This paper has addressed only the energy recovery aspect, but no mention is made of the energy used to operate the system. Is there, in fact, a net energy gain? Or a loss? What is the ratio of energy in, to energy out, taking all things into account (including transportation).

Although it may be true that this RDF has a very low ash content, it would be interesting to know what percentage of combustibles in the raw waste is actually being recovered. This may also be a small percentage. It is unfortunate that more detail could not have been provided on the “separation unit” due to its proprietary nature.

I would like to have seen more information on the boiler feed system, particularly with more discussion as to reasons why a variable feed rate cannot be accomplished. It would be useful for the reader to know who manufactured the bin and feed mechanism. Based on the costs shown, it appears that there is little economic benefit that has accrued either to the City of Madison or M.G.E.

I would have expected the authors to express an opinion as to the future of the whole scheme. For myself, I feel that although the project has apparently shown that RDF can be burned in suspension, and that preprocessing can produce high quality RDF, this information has already been shown before at Ames, St. Louis, Hamilton and elsewhere.

My conclusion is that the paper is well done, but the justification for the project itself is somewhat unclear.