LAKELAND, FLORIDA: A SIMPLE APPROACH TO BURNING REFUSE AS A POWER PLANT FUEL

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Mr. Claude Hiers made an interesting presentation of the paper dealing with the innovative project that was put together to handle resource recovery from municipal solid waste for the Lakeland, Florida area. This project, falling in the 200 to 250 tons per day range, would normally be considered too small to be viable for an RDF processing facility for use with a dedicated boiler. Most present-day thinking would indicate a project of this size employing something like a modular combustion technology instead. It is a credit to all the organizations concerned in the design of this system to keep the whole operation simple, employing a minimum of operating staff in order to keep the operating and owning costs in a range that would make the whole project viable. From the information presented in this paper, it appears that all of these objectives were achieved with great success.

One of the most attractive features of these ASME National Waste Processing Conferences is the free exchange of ideas and information on projects of this type. It benefits all those involved in this industry. It is like a practical continuation of our formal college education where we can truly say that “experience is our classroom”. The work done and contemplated regarding the various aspects of operating a resource recovery system with or without an air classifier is a typical example.

In the same vein of sharing information on the design and implementation of systems of this type and how certain decisions were arrived at in putting a project together, it would be extremely helpful to others in the industry if certain aspects in this decision-making process could be shared with the rest of us if they have been looked into.

It would be interesting, for instance, if the decision-making process looked into the overall energy balance situation for this project to compare the amount of energy in the incoming raw solid waste, together with the energy expended in processing and transporting this MSW, as well as evaluating the amount of energy saved from the recycled commodities, the energy produced from the processed waste, as well as the net energy gainfully used, such as in the utility boiler, resulting in an overall coefficient of performance for this type of arrangement.

Had alternate RDF preparation systems been considered, such as using flail or knife mills in lieu of hammer mills for shredding purposes, or even going to other recently proposed arrangements, such as the Vicker’s Seerdrum process or the AENCO Rotary Drum Classifier devices as a means of reducing processing horsepower requirements and minimizing explosion or fire hazards in the processing plant?

Relative to the material handling aspects of a resource recovery system with the comparatively high maintenance associated with pneumatic conveying systems and erosion that has been experienced at elbows and other items of equipment,
and the hazards of mixing a combustible material with large volumes of oxygen, had any considerations been investigated to transport the waste and RDF products in purely mechanical conveyors, gravity chutes, slides, hoppers, etc., throughout the entire train and even feeding into the boilers as a possible energy-saving measure and to enhance safety?

Any other aspects in a system of this type that the designers and owners of the project may have looked into, such as comparing the efficiencies of the rotary disc screens versus trommels and their relative location either before or after shredding or different boiler configurations, in addition to suspension firing, such as spreader stokers, fluidized beds or cyclone furnaces, would be enlightening and helpful to all in the industry.

Again, we feel that the City of Lakeland's Department of Electric and Water Utilities and their consultants are to be commended on the innovative system that they have designed for this area and their willingness to share with other members of the industry its features and characteristics.

**AUTHOR'S REPLY**

We wish to thank Mr. Bush for his comments. The paper did not address the detail design criteria and the decision making process for selecting plant design. However, we are glad to outline the rationale used in these areas.

Experience has proven that a 200 to 250 ton per day refuse derived fuel (RDF) plant is not normally feasible. The reason has been primarily due to a new technology and trying to upgrade the fuel. Lakeland felt that with fuel prices escalating as they were in the 1975-1980 period and the sanitary land fill areas in Florida becoming scarce, another look should be taken to see if there is any way to build and operate a small, economical RDF plant. The feasibility study indicated that a simple, low-cost facility to prepare RDF for a large, modern pulverized-coal electric utility boiler could be technically and economically feasible.

The Lakeland boiler which burns the RDF is not dedicated to burning refuse only. It is a utility boiler for a 364 MW steam electric power plant. The boiler will burn coal as a primary fuel, oil as a backup fuel and 10 percent RDF as a supplemental fuel. At full load the boiler will burn 125 tons/hr of pulverized coal and 30 tons/hr of RDF supplemental fuel.

It was determined that the refuse energy balance in the preparation plant was not good, but it was good enough to burn the refuse rather than send it to land fill. For every 35 Btu's of RDF delivered to the boiler, it takes one Btu of motor energy to process the fuel.

The flail or knife mill were considered in lieu of the hammermill but were rejected because of reliability and experience of operation.

We recognize that pneumatic conveying RDF has erosion problems. For this reason we have installed erosion resisting elbows in the pneumatic lines to minimize the problems.

Belt conveyors were investigated for this project, but there was no proven method to inject the RDF in the boiler at the 100 ft level after the material drops off the belt conveyor. There was no hardware available, and the boiler manufacturers did not propose any solution to this alternative. The RDF pneumatic conveying system has an advantage. The Environmental Protection Agency has set maximum nitrous oxides (NOX) emissions for large utility boilers. Air from the pneumatic conveyor system is used to reduce NOX in the boiler. NOX forms in the boiler at high temperatures due to the nitrogen in the air used for combustion. Additional air is sometimes blown into the boiler at the top of the fire ball to reduce the flame temperature and reduce the formation of NOX. The RDF pneumatic conveyor air helps perform this function.

The modern large utility boilers are now almost all pulverized coal suspension fired. The spreader stoker design is not applicable to the 364 MW boiler. I believe the maximum stoker size boiler is 100,000 lb of steam per hour. The Lakeland boiler is rated at 2,500,000 lb of steam per hour. The fluidized bed boiler is still in the research and development stage and is not being offered commercially by any major manufacturers. The cyclone furnace is not being used in modern boilers primarily due to the high temperature in the cyclone and the large amount of NOX formed.