

"OVERVIEW OF ENERGY RECOVERY FROM MUNICIPAL WASTE"

by

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The primary objective of this panel is to explore some of the operating problems of systems designed to recover energy from municipal solid wastes. As chairman of this session, I want to set the stage by presenting an overview of the state-of-the-art in energy recovery from waste. I will try to emphasize areas not specifically covered by members of the panel.

The era of cheap and abundant energy in the United States has passed. The National Academy of Science has warned us that our fossil fuels and mineral deposits are being depleted. With this as background, the energy that is available in municipal solid waste is welcomed. The question is how can the energy best be utilized and should it, in light of our dwindling resources, be considered separately or should material recycling be considered as part of the proposed system.

Resource recovery from municipal solid waste is an attractive option. It offers a viable solution to the growing problem of solid waste disposal while contributing to energy and material supplies. Our attention should be directed to the total resource recovery scheme, where possible, not just energy recovery.

We must accept the fact that there are few resource recovery systems in existence today and most have not lived up to their expectations. Some have been very expensive, costing the community nearly twice that was originally projected. In many instances, this resulted because assumed markets were nonexistent. How do we fairly evaluate these successes and failures? What research is needed to improve our batting average in this area of resource recovery? What is the per capita production of municipal solid waste? What are the normal sources of this waste (residential, commercial, light industrial, bulky demolition, yard waste, etc)? What are the composition and quantity from the various sources? What are their variations from day to day and season to season? These are some of the many questions that must be answered. In the past, we have accepted averages and talk in generalities about the tremendous quantities of energy and materials available from solid waste. Yet, if we were required to supply uninterrupted energy using solid waste as the energy source, is the present data sufficient to guarantee this at a fixed cost?

Converting by-product wastes to energy in a steam generator is not a new or unique process. The major boiler manufacturers have been burning high moisture, high ash waste fuels for many years. These include bark, wood waste, rice hulls, bagasse, black liquor and many others. Many years of experience have been accumulated in utilizing these fuels and much of what has been learned can be applied to the burning of municipal solid waste.

The burning of prepared refuse in a utility steam generator has been proven at St. Louis, There it has been burned with minimum difficulty when combined with coal firing. What are the prospects of burning prepared refuse in oil and gas fired steam generators?

Resource recovery is not the only method of solid waste disposal. There are alternatives. The most obvious and commonly used is the sanitary landfill. Where it is possible to properly utilize this solution, it is usually the least expensive means of disposal. However, it does little for our energy shortage and shrinking resource supply. This, coupled with the question of society's willingness to allow available land to be used as a landfill site instead of a higher valued use, lessens the attractiveness of this option. To be a practical solution for urban areas, the sanitary landfill must be located near an urban center. Usually the most attractive locations are in suburban areas. Other serious shortcomings include leaching of contaminants into the existing water table and land pollution in general.

Straight incineration is another alternative, however, the expense of including the necessary sophisticated air pollution control equipment and operating it is increasing steadily. This and other factors increase the attractiveness of waste preparation with separation and material recovery and incineration with steam generation. It is possible to fire unprepared refuse in a steam generator, but corrosion of heat transfer surfaces severely limits operating pressures and temperatures. It also offers a minimum material recovery. A recent study by the Bureau of Mines (Report RI 8147) discussed the recovery of ferrous metal from the residue of incinerators and stated the following: "Municipal waste processing systems should be designed to avoid excessive oxidization or contamination of the ferrous product and to provide for chemical and physical preparation prior to charging to a steel making furnace ... For the best utilization of ferrous scrap, urban waste recycling installations should be designed to remove the ferrous components prior to incineration and the tin cans should be subject to a detinning operation followed by a physical modification, such as briquetting, bundling or fragmenting."

Preparation of solid waste and recovery of materials remove potentially hazardous material from the burning process and allow the use of lower excess air, especially when suspension firing is used. Also, preparation and recovery coupled with gas cooling by steam generation, reduces the quantity of pollutants and the gas volume to be cleaned, which directly affects the size and cost of the pollution control equipment.

Electrostatic precipitators, if properly designed, installed, maintained and operated, do an exceptionally good job of removing the particulate matter. But what about gaseous components? A recent German report stated that incinerator stack emissions include sulfur oxides, nitrogen oxides, chlorine and fluorine compounds and other halogens, heavy metal vapors and chemicals that are highly corrosive. It should be noted that these are present in very low concentrations and one should not jump to the conclusion that they are serious health hazards. The report also indicated that a high efficiency electrostatic precipitator, plus a washer,

i.e. a low energy scrubber absorber, can remove soluble compounds in the exhaust gases. However, additional development work needs to be done in the area of minimizing objectionable vapors and gases from incinerator and refuse fired steam generators.

As practical and exciting as energy recovery and material recycling from municipal refuse appears to be, neither is possible unless there is a market for these products. With no market, we would essentially have an incinerator, possibly a steam generating incinerator that would allow the use of smaller, less expensive pollution control equipment. But the energy would be wasted because of the lack of a market. Also, the effect of recovered by-products on the existing markets should be considered prior to a heavy commitment in resource recovery. Will existing businesses be affected? Will the value of the recovered by-products remain stable or become worthless because supply far exceed demand?

Other considerations include firm supply and product commitments. There must be long-term contracts with the buyers of the energy and long-term take-or-pay contracts with the sources of the municipal solid waste.

Education of and communication with local officials must be an on-going effort, starting with a discussion of the economics of solid waste disposal. Many officials have no meaningful idea of the cost of solid waste disposal. Also, the use of prepared solid wastes by utilities might be increased if the concept was supported by the State Public Utilities Commission and Federal Power Commission. However, the only way support is going to be forthcoming is to show that there are benefits to the utility and to society.

We should not lose sight of the fact that the successful implementation of a resource recovery program requires the solution of financial, legal and institutional problems that are, in many cases, more difficult and time-consuming to solve than the technical problems. Many organizations are affected, secondary market dealers, as well as financial institutions. Questions include: who should own and finance the resource recovery system? Should it be private, public or a mixture of the two? Institutional and legal concerns over establishing a 20-year binding agreement to ensure a long-term supply of wastes can provide problems for communities which may not have the authority to bond for that length of time. There may be a need to resolve legal issues, relating to bonding, through appropriate legislation.

Another area that requires attention is compliance with Federal, State and local regulations. EPA has, for example, recommended health and safety protection for shredder plant workers. This protection is not just for noise, but respirators or other devices must be worn to reduce the inhaling of particulates carrying bacteria, chemicals, and other possible health hazards. Additional testing has begun to determine if prepared refuse processing plant activities are serious health hazards.

Another issue is that of risk. Utilities, for example, must produce power on an economical and reliable basis, therefore, they feel that long-term contracts and consistent fuel compositions are necessary. Communities are uncertain as to how much they should rely on the private sector to handle a responsibility that has been traditionally theirs. If the private sector fails, the community must "pick up the pieces."

The emphasis here has been on energy conversion through direct burning and generation. However, the energy in municipal solid waste can be converted to oil or gas by pyrolysis, biodigestion and other processes. What is the status of these processes? Do they compare favorably with direct burning of prepared refuse from economic and technical standpoints? What about anaerobic digestion? Is it a strong competitor in this field?

Hopefully, this brief introduction has set the tone for this session and raised some questions. The solid waste disposal field is not without its problems and there are many areas of the business where further work must be done, both technical and nontechnical.

Let's approach our discussion today in a forthright manner. Nothing will be gained by glossing over or pushing aside these problems. By bringing them out in the open, solutions are more apt to be found quickly.