RESEARCH NEEDS IN WASTE UTILIZATION

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DISCUSSION by J. Keith McCartney, Occidental Research Corporation, La Verne, California

Inasmuch as a large number of Resource Recovery Systems require at least primary shredding, should not a program to reduce this cost ($2-4/Ton O & M only) be suggested? Is there a better (i.e. less costly) way to "homogenize" trash?

DISCUSSION by Jon L. Peacy, Fluor Pioneer, Inc., Chicago, Illinois

Was the cost quoted of $3.86 to $12 per ton an installed, capital, and/or operating cost? Added comment—"liked talk."


This is not a critical comment upon the paper since it springs from a study conducted for ERDA and was critiqued by ERDA personnel while still in draft. Therefore, it has, to a measure, ERDA’s thinking within its framework. For that reason, I will confine my remarks to the effect of the paper upon ERDA’s policy formation. A good point of departure might be this chart. It depicts the interface between the various sources of waste, the various processes and the end products. The paper was, in part, the basis of this chart. Perhaps a word of explanation is in order. Displayed on your left are the four sources of waste — urban, agricultural, forestry and industrial. The qualities are those developed by L. L. Anderson for Bu Mines in 1971. They are not presented as an attempt to reinforce their accuracy but to indicate an order of magnitude of available energy. In any specific application, the available waste will require individual and localized development. The next basic column indicates the processes. We have set preprocessing first to show that, in most instances (less mass burning, manure and sewage), some sort of processing is required. In fact, we recognize, as has been pointed out by M. Rofe, that this may also be the final step as far as the producer is concerned. Techniques to process waste are being studied. To avoid being exceptionally repetitious, we have found that the techniques being tried are adaptations of other technology (shredding from the rock and materials industry, sorting from the food industry, etc.). They require specific updating and optimization when operating in the waste environment. We view this point as crucial. Too many people and agencies advance the theory that the technology is here. All we must do is demonstrate it. Disproof of this is the single most important point in the paper. The combustion, pyrolysis and bioconversion techniques are fairly evident. Perhaps the enzymatic hydrolysis step is not. It is, simply stated, the conversion of cellulose to glucose by a natural enzyme. The most fascinating premise is that it would be possible to get drunk from the Boston Globe.

Of more importance, and this is a partial outcome from the paper, are the status colors of the processes. The only demonstrated waste-to-energy technique in our opinion is the direct combustion
chain, and this has basically been done in Europe, not in the United States. The rest require optimization and demonstration and, therefore, RD&D effort. Even the direct combustion chain requires some work in corrosion prevention and control. We are considering efforts in this area. As you can note, different processes can produce varying end products. Combustion is limited to producing heat, energy or electricity. The other processes are more flexible in product options.

The MIRE study has helped to develop a balanced program. In 1976, we are initiating efforts in all the processes noted. In numbers, they are fairly evenly split, running like 2-2-3-4 between the processes. In dollars, of course, our program is weighted to the ERDA Advanced System Experimental Facility at Pompano Beach, Florida. This is a 50 to 100 TPD proof of concept facility to anaerobically digest the light fraction of urban waste and sewage sludge.

In conclusion, we at ERDA have found the data in this paper of great use during the formulation of our first year’s program and expect to use it in the near future as we expand our efforts.

COMMENTS by W. J. Martin, Munich, Germany.

Referring to another consultant’s opinion Mr. Rofé had said that “the wider the incineration unit is, the higher is the corrosion rate”, giving as reason for it the stratification of gases and indicating as operating hours of superheater tubes at Paris-Ivry plant 10,000 hours and at Duesseldorf plant 35,000 hours.

I made the remark that there would be many more parameters to be regarded to evaluate such difference in operational hours. Some of these parameters are:

- Average steaming rate over referred-to period of time
- Percentage of C1 (and F) in refuse
- Who is the operator (private enterprise or municipality)?
- Must plant be operated to follow program for supply of steam and/or electricity into third party’s network (supply contracts with penalties or not)?
- Superheater tube material used
- Tube surface temperature (steam flow sequence through superheater packages)
- Is Secondary air used? Where and how powerful?
- Gas inlet temperature to superheater

But the question referred to by Mr. Rofé is even more complex when you consider that for instance two units with the same overall characteristics and virtually fed out of the same refuse pit, but equipped with different incinerator grate systems, behave very differently with regard to corrosion (rate as well as location).

And further, to prove wrong the statement in question and innocently cited by Mr. Rofé:

1. According to our information, all boilers of the Duesseldorf plant showed corrosion damages on the platen-type superheater tubes after a few thousand operating hours. Only after decrease of the superheated steam temperature from originally 932°F to approximately 895°F (superheater outlet pressure = 1138 psia) and replacement of part of the platen-type superheater by austenitic tubes (material: X8 Cr Ni Nb 16 13), approximately 25,000 operating hours have been achieved up to now.

2. The three very wide units in Munich North and South, each having about 37’ inside width, have shown NO corrosion!

COMMENT by Ross E. Hofmann, Ross Hofmann Associates, Coral Gables, Florida

In examining research possibilities and directions to follow, all processes should be reviewed as total systems. Whether the results are to be an improvement in economics envision mental impact effect, or total energy savings (or production) the bottom line of the total system must always be the primary point of such research. Example — if a total system or process requires almost as much energy input overall as is obtained in the output, it should be rated accordingly. Similarly, if total ownership costs (capital plus all operating costs) leave no bottom line profit in a “reasonable” number of years, it is not too viable even though it may save some energy overall. If environmental problems are created on a net basis over other alternate processes, regardless of net energy savings of fossil fuels, this effect should be rated on the same basis as profit and resource recovery. Only a multi-prong advantageous bottom line for the total system as well as the researched system, should determine the viability of a direction to follow in starting and applying such research.
I would like to commend the author for introducing this subject to the conference. At conferences such as this we spend too much time talking about what we have done and not enough time talking about where we should be going.

There are two points raised by the author which I particularly applaud, and on which I offer further discussion. The first point concerns the “difficulty of adequate technology transfer.” If our industry is to move forward and meet the challenges facing it, we must improve our communications. I do not feel we are doing an adequate job of using what we already know in designing new Energy Recovery facilities. There is still a great deal to be learned from our existing facilities. We must learn from our mistakes as well as our successes.

The second point concerns the differentiation between short term and long term research needs. When financial constraints force us to limit our research programs we must choose those that are the most critical. For this industry that means short term needs. Public demand for resource recovery systems is moving at a faster pace than the technology needed to satisfy that demand. We are being called on to build resource recovery facilities even before the technology is ready. So, with limited resources, we must work on the problems confronting the near term technologies. This means insuring the effective utilization of waterwall incineration, and the extension of our RD&D effort to assure the success of those technologies which are on the threshold of availability.

It is ironic to think that the contract effort from which this paper is drawn even had to be undertaken. The purpose of the Federal RD&D programs is to develop the data and information needed by the professionals represented at this conference to design and implement advancing technology. But the government agencies involved in this work are staffed by people who, although they may have a technical background, are basically administrators. “Generalists” might even be an appropriate description. We haven’t designed resource recovery plants, or built them or operated them. Yet, we must decide what research is necessary! I think I can honestly say that the various government agencies are doing their part, but if we are to serve you effectively, then you must help us. We must not just eliminate the roadblocks that keep us from determining the needs of this industry. Instead you must tell us what your needs are.

Professional organizations such as those that are sponsoring this conference can serve as your spokesman in this regard. They can serve as a focal point in identifying your needs, in setting priorities and in defining the specifics of necessary projects. We must know what specific projects are necessary, why they are necessary, how they fit into the existing data base and how they should be structured. Mr. Rolfe’s paper suggests many general areas needing additional research. Let’s use that as a starting point to define specific projects necessary to keep this industry moving forward.


There is no question that, as Mr. Rolfe states, opportunities for research in the utilization of wastes are essentially unlimited. The environment for undertaking such research, however, is clouded by many issues. Should the research be done by the public or private sector? What is the use of such research and who is to benefit from its results — the process developer, the user of waste derived products or the consumer? How can the sometimes seemingly conflicting priorities of government, citizen groups and free enterprise be resolved? Can better solutions be accepted and implemented while ultimate solutions, if they exist, are evolving? Can progress be put in proper perspective rather than being ballyhooed by the optimistic or planned by the prophets of gloom?

Until the environment clears, there will be little progress. Research by the public sector will be diffuse and slow and the private sector will be reluctant or unable to invest research money with little evidence of adequate return on their expenditures. Also, it appears that even if the results of all this proposed research were available today, the institutional barriers would still remain.

AUTHOR’S REPLY

RESPONSE to Jon L. Peacy

The costs I quoted for shredding during my presentation were recalled from an article appearing in the April 1976 issue of Solid Wastes Management Magazine. I refer you to “Solid Wastes Shredder Facilities in the U.S. and Canada” by Richard E. DeZeeuw et al, in which the costs of some 20 shredding facilities (some of which include ferrous
extraction and other resource recovery) are reported and their makeup is explained.

RESPONSE to J. Keith McCartney

Indeed, programs to investigate means of reducing the costs of shredding (whether through the development of innovative systems or through the improvement of existing ones) should be strongly supported. Along these lines, R&D should also be performed in

1. determining the preferred particle size for process application (i.e., don’t shred to 1” if 6” will do!),
2. developing new materials for increased hammer wear, and
3. increasing the safety of size reduction equipment.

As you are aware, some system suppliers are getting away from the hammer type shredders; one supplier uses a flail mill followed by a ball mill normally used in size reduction of coal. For their purposes, this appears to be sufficient and enables a considerable energy savings.

Innovative work in “homogenizing” waste has been performed at MIT under the direction of D. G. Wilson. Using infrared sensors, a system concept has been developed where waste can be separated into its individual constituents, eliminating the need for shredding. A potential benefit of this type of system is that when materials are recovered in their original form, they may command a higher price.

IN REPLY to Thomas Lamb

The perplexing issues raised by Mr. Lamb have no simple answers. I would, however, like to briefly address some of these questions.

It is true that the private sector will invest in R&D in waste processing and utilization when it perceives new business opportunities, reasonably certain to provide adequate returns on its investments. While this is probably the most important reason for industry’s involvement in such research, other factors come heavily into play. Foremost is that the economic viability of a resource recovery system is dependent upon the revenues from the sale of products recovered from solid waste and industry must perform R&D to ensure their successful sale. Environmental concerns may also force private industry to invest in R&D to ascertain that its systems comply with environmental regulations.

Also, firms seeking to diversify their interests — and there are many who have entered the resource recovery business (e.g., Union Carbide, Grumman, Occidental, Carrier, Boeing, American Can) — must, of necessity, perform R&D if they are to provide new products and services.

The basic justifications for federal or public sector involvement in conducting R&D for waste utilization are much the same as for performing research in other areas addressing national needs. These include the following:

- high cost of R&D,
- high risk associated with project development,
- uncertain payoffs and long time until pay-off, and
- the need for widespread dissemination of R&D results.

Indeed, R&D must be performed by both the public and the private sector. The entire waste utilization field is in an early stage of development, and how it matures depends upon the uncertain actions of a number of government organizations who will be regulating resource recovery facilities and private companies who will be supplying them. Government must ensure that its regulations do not deny private industry the benefits of its technological developments through investments in R&D. Government must also ensure that incentives associated with use of products recovered from wastes do not disappear with changing regulations.

I believe that both the private sector and the public can and will benefit from R&D results. The process developer, (aided perhaps by legislation) will find the means to ensure adequate ROI while providing the public with technically sound and environmentally safe waste disposal.

Finally, I would like to add that in discussions with municipal officials, I have found that many are reluctant to go to a specific technology for fear that a more promising technology will come along. I believe that this is the wrong attitude since the systems we now have, have taken quite some time to develop and some cities simply cannot afford to wait any longer. I think we should continue to build on the information and experience we’ve gathered thus far, since it is the basic knowledge for wastes, waste handling and processing which will enable the development of more exotic technologies.

In reply to Mr. Hofmann, his question is actually a statement of opinion with which I agree.