CONFERENCE CHAIRMAN'S OVERVIEW

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Introduction

The need to tap new sources of energy to replace older diminishing fossil fuel supplies has become a problem of national concern since the October 1973 oil embargo. Municipal and industrial wastes have been identified as a potentially significant near term (now to 1985 and beyond) source of supplemental energy (1,2). At the same time these "wastes" represent a substantial disposal burden if not utilized as a mineral and energy resource. EPA has estimated that 113 million metric tons of municipal waste were generated in 1971 (3) and this will grow to approximately 145 million metric tons in 1980. However, not all of this waste is available for processing to energy. It has been suggested that it is only feasible to recover energy in densely populated areas such as the Standard Metropolitan Statistical Areas (SMSA's). If maximum energy recovery had been carried out in all SMSA's in 1971, an estimated $.977 \times 10^{15}$ kJ (0.926 quads) could have been recovered. By 1980 the corresponding quantity is near 1.277×10^{15} kJ (1.21 quads) (2). The diversity of industrial waste streams is broader than that of municipal wastes although the streams are individually more homogeneous. In 1971 approximately 39.9 million metric tons of industrial organic solid waste were generated. It is estimated that 4.72 million metric tons were available for conversion to 0.072×10^{15}kJ (0.068 quads) of energy (4). The corresponding energy value in 1980 has been estimated to be 0.082×10^{15}kJ (0.078 quads). Only the organic solid component is reflected in these figures. Energy recovery from industrial waste gases and liquids would significantly increase the potantial of this source. Obviously, energy recovery from municipal and industrial wastes is an important aspect for meeting our nation's near term energy needs.

Economic recovery of this potential energy source is strongly dependent on the level of technical capability in areas of waste handling and preparation, thermal conversion, and effluent treatment. Any human endeavor results in waste which must be disposed of. Since the onset of widespread urbanization there has been a history of development of disposal methods which are economical and which have the least impact on the environment. In recognition of this history of development, an Engineering Foundation Research Conference entitled "Solid Waste Research and Development" was held at University School, Milwaukee, Wisconsin in 1967. The purpose of the conference was to provide an opportunity for free and informal exchange of information, opinions, and ideas between researchers engaged in solid waste research, training, and demonstration projects.

This conference not only provided an opportunity to focus on important technological problems in the solid waste area but also stimulated individuals and organizations to develop both basic and applied research projects in this field.

Recently energy recovery from waste has received increased attention and application. Numerous energy recovery oriented waste disposal systems have been commissioned during the decade since the 1967 conference. Operation of these facilities has resulted in the isolation of a spectrum of technical problems whose solution is required to make present and future energy recovery systems economically and environmentally attractive.

The present Engineering Foundation Conference was developed to provide a forum in which representatives from academic, consulting, governmental, industrial, and research communities could discuss and define these problems. The primary goals of the 1976 Hueston Woods Conference, entitled "Present Status and Research Needs in Energy Recovery from Wastes Conference," were to : 1) provide a forum and focal point in order to isolate the major basic and applied research needs in both liquid and solid industrial and municipal solid waste processing; and 2) stimulate research on major problem areas associated with waste processsing. Special attention was placed on energy and other resource recovery and environmental aspects of both small and large scale waste processing systems.

Due to the pressing need for energy and resource recovery as well as environmentally sound waste disposal, primary emphasis was placed on near term technologies. Most sessions were organized to concentrate on waste preparation, conversion and environmental protection in systems which primarily use the combustion process. For this reason less time and participant energy was devoted to long term technology waste utilization processes.

Summary of General Priorities:

The four and a half day conference at Heuston Woods was attended by 99 participants representing every sector of professional involvement. The conference included a keynote speaker, eight technical sessions, and one summary session. Each of the sessions was led by a chairman and/or a co-chairman. The format of the sessions varied according to the topic and the intentions of the session participants. A combination of formal papers and panel discussion as well as open discussion from conference participants was used during the course of the sessions.

The session topics were: (1) Emissions and Pollution Control in Municipal Scale Incinerators, (2) Corrosion in Waste Fired Systems, (3) Waste Separation and Preprocessing, (4) Practical Operating Problems of Energy Recovery from Municipal Wastes, (5) Production of Fuels from Waste, (6) Characterization and Properties of Industrial Wastes, (7) Anticipated Trends and Needs in Industrial Waste Utilization, (8) Energy

Release Characteristics and Controls. In addition, a keynote address was used to set the tone of the conference and a final summary session was used to discuss and finalize the research priorities brought forward during the course of the formal and ad hoc sessions.

The outcome of this effort is summarized below while the summaries by the individual session chairman and co-chairman for both the formal and corresponding ad hoc sessions appear with the formal papers in subsequent sections of the conference proceedings.

Research Priorities

During the course of the conference research needs and priorities were obtained from the following sources; the session summaries, the ad hoc discussions, written material from individuals, and a survey of the participants. A post-conference review of all this material was made by the conference chairman. This review resulted in the following general prioritization of research needs in the area of energy recovery from wastes:

A. Development of methods for the measurement, characterization and control of effluent stream pollutants

B. Development of methods for sampling, analysis, and classification procedures for waste fuels

C. Examination and elucidation of the machanisms of corrosion of materials-of-construction of waste fuel fired systems

D. Development of a uniform and equitable energy and resource recovery system economic analysis procedure

E. Development of materials handling, processing, and separating systems specific to waste fuel utilization

F. Establishment of a mechanism for the acquisition and dissemination of technology relating to waste to energy systems

Discussion:

The research priorities listed above are general in nature. Specific priority topics are detailed in the individual session summaries. The general priorities will be briefly discussed below and reference will be made to appropriate session summaries for details.

By far the highest priority was for development of techniques for characterizing the constituents in all of the gas, liquid and solid streams flowing to or from resource recovery systems. This encompasses much of priority A and B above and if pursued would make the other part of priority A, control of pollutants, substantially easier to bring to fruition. The need for this development and some specific recommendations came out of every session of the conference and the session summaries reflect this.

The development of a standard method to obtain a representative sample of a heterogeneous waste stream which can be subsequently analyzed for physical and chemical properties of the waste fuel is required. Once this technique or sample size specification is available, then an instrument, such as a large calorimeter, is needed to obtain the heating value and combustion rate of the sample.

Information obtained from fuel property measurements will greatly facilitate the systematic characterization of the physical and chemical properties of the effluent streams. Information about the waste water out flow from refuse conversion facilities will undoubtedly provide a firmer basis for the development of improved treatment methods. Species concentration in the gas phase and size distribution and chemical composition of the particulate is vitally needed. Studies should be immediately initiated to characterize the effluent at each point along its flow path, out of the furnace, into the air pollution control equipment (APC), and into the stack. These data will provide a better understanding of emission characteristics and a much more rational basis for the design and development of APC equipment.

Since only 10-15% of the approximately 33 presently installed wet scrubber type particulate collectors have been accepted by regulatory agencies as being in compliance with their emission codes, it is essential that both basic and applied research be pursued on these devices. Better characterization of the input streams is essential.

Priority C, corrosion of waste recovery system materials, was the topic of session 2. The importance of corrosion research was also reiterated and highlighted in sessions 4,6,7 and 8. Research in high temperature corrosion of superheater and reheater tubes of waste fired boilers should receive significant attention immediately. Low temperature corrosion of air pollution control equipment is also essential if design performance of these devices is to be economically maintained for the system life time.

Priority D, development of an economic analysis procedure, was not the specific topic of any of the sessions and, indeed, only mentioned in one of the formal papers. However, it was clearly a topic in discussion, particularly is session 4 and in the discussions and ad hoc sessions. Many industrial organizations have developed their own technical and economic criteria for waste to energy systems. Unfortunately, in most municipal applications system capital cost often is the predominant criteria

for judgement. It is essential that a generally accepted methodology which includes technical benefits, capital costs and operating costs, be developed which can be embraced by all sectors. The development and acceptance of this methodology will provide a framework for rational evaluation of cost-benefit ratios in waste to energy systems.

Materials handling, processing and separating was the title topic of session 3 and a topic of concern in sessions 5, 6 and 8. This is a problem in any waste utilization system but becomes much more significant in the production and use of refuse derived fuels. Problems of shredding, separating, and classifying as well as storage and containment of dusts, odors and potential bacteria or virus contamination are pressing problems.

Priority F, the establishment of a mechanism for acquisition and dissemination of technology relating to waste to energy systems, again was not the topic of a specific session. The requirement for this technology transfer between the academic, consulting, governmental and industrial and research sectors became apparent in each formal discussion period and ad hoc session. This is not a research priority, per se, but is so necessary to the attainment of the other research priorities that it obviously deserves to be included.

Closure:

Research priorities were the topic of this conference and are given above and in the session summaries. Funding to pursue these research needs must come from either the private or public sector. Market forces and technical advantage will be the driving force in funding decisions made by the private sector in waste to energy research programs. Funding for research from the public sector, especially the federal government, must be provided for those areas which are not perceived by the private sector as resulting in a direct market advantage. It is clear that much of the research that is called for above will not be funded by the private sector. Therefore, a substantial and aggressive funding program by the public sector is imperative to increase the scope of research and development to a level which will insure the availability of waste-to-energy to replace some fossil fuel in the near term.

This research conference represents one step in the isolation of problems and initiation of mechanisms for their solution. It is strongly recommended that groups of concerned and knowledgeable individuals be drawn from existing committees in the technical societies to assist and work with their counterparts in government in a continuing and meaningful way on identified research needs. This assistance would consist of further refinement of research priorities, establishment of study program scope and goals, and monitoring, oversight and advice during implementation of specific research programs.

References:

1. A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future 1976, Volume 1: The Plan, ERDA 76-1.

2. Energy Conservation Waste Utilization Research and Development Plan--MITRE Technical Report No. MTR-3063, July 1975.

3. Low, R. A., Energy Conservation Through Improved Solid Waste Management, U.S. EPA (SW-125), 1974.

4. Anderson, L. L., "Energy Potential from Organic Wastes: A Review of the Quantities and Sources," U.S. Dept. of the Interior, Bureau of Mines IC-8549, 1972.