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Introduction to Session 1

Thermal, Chemical, and Biological Processing

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This session was planned to cover complete development of biomass conversion technology from feedstock supply to product marketing. In addition, the session covered a wide range of activities from fundamental research through development to commercial application.

Development of a control model providing for inventory and supply information on biomass utilized in processing facilities was covered on the basis of a practical field investigation. Although focused on plantation wood supply on a short-rotation basis, this same technique can be applied to a wide variety of biomass feedstocks from the standpoint of field processing, collection, storage, and transfer to process facilities.

From the process standpoint, information was presented on a substantial variety of biotechnical conversion methods. These included the use of microbial agents in fuel cells to produce electricity from carbohydrates. Tested on a very small scale, with specially designed fuel cells, technical feasibility was apparent. However, ongoing work must be done to determine potential economics of this unique application of microbial organisms in fuel cells.

Another technique presented was utilization of extractive fermentation technology, which has proceeded from the research stage to pilot plant operation. This is a potentially useful means of minimizing the inhibitive effect of ethanol concentration on fermenting organisms. Ongoing pilot plant work should yield sufficient data for a technical and economic evaluation of this technology for comparison with current industrial applications of sugar, starch, and grain fermentation. However, this technology could be particularly useful in the conversion of cellulosic residues to ethanol, where the cellulolytic enzymes that are utilized are particularly susceptible to ethanol concentration inhibition.

Another unique approach was outlined in which fuel ethanol production in concentrated form could be improved with respect to thermal use by "boiling point elevation loop" technology. This has been evaluated in the laboratory from a technical standpoint but also has to be carried through on a larger scale to determine economic feasibility.

Another area of biomass conversion, outside the field of biotechnology, pertains to production of gas from straw in a fluidized-bed gasifier. Gas quality and composition were evaluated under a wide variety of conditions. It was indicated that conversion of straw residues to low Btu gas was quite feasible and could provide a means for conversion of such wastes in local areas to useful fuel for nonpipeline direct utilization.

Finally, information was developed on factors pertaining to market penetration of biomass-derived liquid transportation fuels. This included the use of ethanol, not only as a gasoline additive but also as a direct fuel, and products providing for partial replacement of diesel oil fuels. Indications from this work are that market penetration has already occurred by the use of ethanol as a gasoline additive; further penetration can also be effected by its potential use as ethanol tertiary butyl ether (ETBE) and as a potential neat fuel. On the other hand, diesel oil replacement fuels are still in the development and test phase and have not yet reached commercial utilization and any noticeable market penetration.