

Both incineration and composting are volume reduction methods and additional areas are necessary for the final disposition of those materials which cannot or were not incinerated and those materials which cannot be composted nor have salvageable value. Using present techniques those additional areas required would be approximately equal for the two methods considered. We would predict that the amount of land for each type of operation, at least for the initial facility installation, is expected to change with the development and introduction of need salvage and recycling techniques. These techniques are expected to become increasingly important to solid waste management officials during the next decade.

Question 4. What is the present status of the operations of composting plants in the United States? What has been the experience over the last ten years? What have been the fiscal experiences for plants serving less than 50,000 and more than 500,000 people? Realistically, how applicable are such procedures as composting in the economy of the United States?

Answer. An evaluation of the composting plants status in the United States over a period of ten years reveals that of the 17 composting plants proposed to compost municipal wastes only 4 are presently maintaining a reasonably continuous operation. Two of the 17 were never constructed—the other 15 plants have had varying operating experiences ranging from less than one year to five years. We have been unable to discover any correlation between the size of population served and fiscal experience of the plant. Reliable technical and economic data on composting is not presently available—it is possible that a correlation could exist.

Dr. Samuel A. Hart in his report to the United States Public Health Service upon the subject of "Solid Waste Management: Composting—European Activity and American Potential" summarizes the potential for composting and compost utilization in the United States as follows: "It appears to the author that there are no real technological barriers to making compost. It does appear, however, that the utilization of compost is limited. There are successes in luxury agriculture, as evidenced in vineyard, flower, and landscaping uses, but basic agriculture cannot be expected to absorb the material. Further, the concept of composting must be considered from the municipality's viewpoint. Most municipal officials recognize that it is not possible to make money from garbage. The most that can be expected, with regard to composting, is that the net cost to the city for garbage disposal by composting will be less, or no greater, than the costs of disposing of the garbage by landfilling or incineration. The gross cost of composting could be more if a return could be realized on the sale of the compost, or a value could be put on the intangible factors of reduced rate of consumption of burial sites or reduced air pollution relative to incineration.

It does appear that in the United States there are three specific areas in which refuse processing and discharge through composting have real potential:

- (1) Small amounts of compost can be marketed for luxury agriculture, in which case the overall economics—to the producing municipality and to the user—are favorable.
- (2) The finished compost has value, but the economics—for the producer or for the user—must be related to intangible values.
- (3) The finished compost is either not valuable or only marginally so, but the overall economics are nonetheless favorable. . . .

At this stage it is impossible to estimate what percentage of the nation's garbage might be so managed. It would appear that this system might have merit for communities with populations between 10,000 and 100,000. There are 1,760 such communities in the United States, with a total population of nearly 50 million, or 25% of the nation. If this method of refuse disposal were appropriate or even one-third of them, it would be a substantial avenue of waste disposal."

Question 5. Are there any results available as yet on system analysis or operations research, which would improve collection procedures or would provide more economical handling? What significance have the studies in California and elsewhere had by the application of systems analyses to the problems of collection and disposal?

Answer. Exceptionally few significant systems analysis projects in solid wastes have progressed beyond the first phase; analyzing present systems and developing conceptual models. Preliminary results from some first phase attempts indicate that meaningful results will be forthcoming. Much of the work is in the descriptive stage and problem solving is not significantly present in either the California studies or elsewhere.

Question 6. Are there any examples in the United States as elsewhere of new collection techniques or equipment or both?

Answer. Very few new collection techniques have been developed within this country or abroad. National efforts have been towards the improvement of cur-