POTENTIAL FOR CONVERSION
OF AN EXISTING INCINERATOR TO
WASTE-TO-ENERGY AND CODISPOSAL SERVICE

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Discussion by

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The publication of this paper is appreciated. It should be considered as one of the historic and technical references in the evolution of study procedures in the field of energy resource recovery for the practice of solid waste and sewage sludge disposal.

The indepth critique of the existing incinerators highlights the critical combustion requirements for the burning of solid waste as compared with conventional fossil fuels. The high glass and moisture contents require separately controlled underfire air feeds to the grate. A powerful jet penetration of overfire air is needed to achieve an adequate hydrocarbon/air mixture for complete oxidation of carbon monoxide which, upon stratification, could cause corrosion of a boiler retrofit. Incinerator wall air-cooling along with careful control of the combustion temperatures are needed to prevent clinkering and slag accumulations.

Although it is important to keep the combustion gas temperature above 1,400 F (760 C) for stack gas odor prevention, it is also essential to avoid melting the glass and excessively volitilizing the salts contained in and formed with the combustion of solid waste and sewage sludge.

The economic analysis is based upon costs and interest rates that are considerably lower than those which would be estimated today. However, there is sufficient detail for the reader to update the costs and revenues. Financing cost is a far more complicated issue and most probably would not be along the lines of a simple amortization. Private equity, fast depreciation and tax credits must be considered to approach feasibility.

Other items which could impact the economic analysis and which would be investigated if the study were to be conducted today are:

1. Cost of Residue Disposal may be zero. The value of incinerated residue (ash) is recognized as an ore from which iron, aluminum and nonferrous metals may be reclaimed. Its remaining content can be considered an aggregate. A private entity may remove the residue without charge.

2. Generation of Electric Power may be obtained from a back pressure turbine/generator. The power can be generated at conditions of 600 psig (4,230 kPa), 600 F (316 C) from which a turbine can extract 1 kWh from 60 lb/hr (27.3 kg/hr) of steam. It is estimated that $2.54 \times 10^6$ kWh/year could be produced from $152.5 \times 10^6$ lb steam/year ($69.3 \times 10^6$ kg/year) contributing a revenue credit for in-house use of $101,600 per year (at 40 mils average rate). This electric power would be produced at a steam sale sacrifice of about $8 \times 10^6$ lb/year amounting to $27,000/year revenue (at $3.37/1,000$ lb, $7.41/1,000$ kg). At a 1980 capital cost for the electric generating equipment of $250,000, the 6 percent annual amortization cost would be $25,700 resulting in a net annual revenue of $48,900.
3. **Drying of sludge** may be reduced by finding a lower cost capital equipment arrangement. Use of solar energy and epoxy bound granular vacuum filters may be considered to assist in dewatering and drying. It should be noted in Table 7 that the unit sludge tipping fee is based upon a 1980 quantity of 4,710 DTPY whereas the system is conceptualized for the 1990 quantity of 6,388 DTPY. On the latter basis, the sludge tipping fee would be $171.57/DT instead of $233.70. A comparable "base case" value for stabilizing 8 percent sludge and spreading it on farm land would be about $150.00 - $175.00 per dry ton.

The conclusions which would be reached in conducting a more extensive study today would probably not be greatly different. Comments on the conclusions are:

1. If the cost of maintenance and operation along with an adequate allowance for continuing to meet air pollution regulations are included in the $15/t ($33/1,000 kg) cost, then there should be no change in the solid waste disposal practice.

2. Yes, additional "on call" solid waste sourcing would make the economics more favorable.

3. If and when modular conversion is made, the existing refuse incinerators should be replaced. However, the codisposal of sewage sludge does not appear to be economic as conceptualized in this paper.

4. Air pollution control equipment for codisposal incineration must perform in compliance with regulations for heavy metal emissions. The sludge must be carefully examined to determine the required performance. If there is a significant presence of mercury, lead or cadmium, there may not be a proven equipment solution at this time. Legislation and enforcement may first be required to control industrial sewage effluents.

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**Discussion by**

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The paper is essentially an engineering report (feasibility study) for a specific project with given constraints. As such, it cannot serve as a model for projects of similar nature, especially since the recommended or contemplated solutions are not necessarily valid in all aspects, such as, some of the cost estimates, the use of a multitude of small replacement units, etc.

Being intimately familiar with numerous incinerator rehabilitation projects over the past 13 years, I believe that the paper could lead to dangerous and erroneous generalizations by the uninitiated.

**AUTHOR'S REPLY**

To Donald F. Crego

These contributory comments are well taken, and most appreciated.

To Miro Dvirka

As concluded above, the paper is simply a report on the methodology used, the subjects considered, and the results of a case study. If such studies are assumed to produce universally applicable results, surely the engineering profession would have had little to do for many years.

To cite the paper is possibly leading "to dangerous and erroneous conclusions by the uninitiated" is obviously a true statement, but one which perhaps has no place in a professional journal.