municipal wastewater sludge combustion technology

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Chapter I, Sludge Incineration Facilities. D.C. Bergstedt, Consultant, Pleasant Hill, CA; R.I. Dick, Cornell University, Ithaca, NY; K.S. Feindler, Quantum Assocs., Wheatley Heights, NY; S. Kyosai, Japanese Ministry of Construction, Tsukuba, Japan; C.H. Nels, Umweltbundesamt, Berlin, West Germany; J.L. Smith, Jr., Center for Environmental Research Information, EPA, Cincinnati, OH.

Chapter II, Improving Sludge Incineration Methods. R.G. Forbes, Zimpro/Hydro Clear, Rothschild, WI; P.F. Gilbert, Metropolitan District of Hartford County, Hartford, CT; R.T. Haug, Consultant, Torrance, CA; S. Kyosai, Japanese Ministry of Construction, Tsukuba, Japan; F.M. Lewis, Consultant, Mountain View, CA; J.P. Micketts and T. Watts, Envirotech Operating Services, Greenwood, IN and Gulf Breeze, FL, respectively; C.H. Nels, Umweltbundesamt, Berlin, West Germany; C.J. Wall, Dorr Oliver, Inc., Stamford, CT; and E. Waltz, Indianapolis Center for Advanced Research, Indianapolis, IN.

Chapter III, Cocombustion of Sludge and Solid Wastes. E.G. Carlson and A. Baturay, Carlson Assocs. Technical Services, Redwood City, CA; D.C. Bergstedt, Consultant, Pleasant Hill CA; W.F. Cosulich, W.F. Cosulich Assocs., Woodbury, NY; K.S. Feindler, Quantum Assocs., Wheatley Heights, NY; K.M. Koch, Greeley & Hansen, Inc., Philadelphia, PA; S. Kyosai, Japanese Ministry of Construction, Tsukuba, Japan; C.H. Nels, Umweltbundesamt, Berlin, West Germany; J.A. Semon, City of Stamford, Stamford, CT; L. van der Burg, Gevudo, Dordrecht, Holland.

Chapter IV, The Management of Ash and Air Emissions. E.G. Carlson and A. Baturay, Carlson Assocs. Technical Services, Redwood City, CA; D.C. Bergstedt, Consultant, Pleasant Hill, CA; J.B. Farrell, Municipal Environmental Research Laboratory, EPA, Cincinnati, OH; S. Kyosai, Japanese Ministry of Construction, Tsukuba, Japan; C.H. Nels, Umweltbundesamt, Berlin, West Germany; L. van der Burg, Gevudo, Dordrecht, Holland.

Chapter V, The Role of Regulatory Agencies. R.K. Bastian and C. Spooner, Office of Water, EPA, Washington, D.C. and H.T. Chase, Dept. of Environmental Protection, State of New Jersey, Trenton, NJ;

The following individuals also contributed to this publication by making a technical review and/or providing more complete or updated information: O.E. Alberton, Enviro Enterprises, Inc., Salt Lake City, UT; R. Avendt, Greenhorne & O'Mara, Inc., Riverdale, MD; H. Bastian, C.A. Brunner, Howard Wall, and L. Rossman, Water Engineering Research Laboratory, EPA, Cincinnati, OH; J.L. Smith Jr. and O.E. Macomber, Center for Environmental Research Information, EPA, Cincinnati, OH; C.S. Spooner, Office of Water, EPA, Washington, D.C.; D.C. Bergstedt, Consultant, Pleasant Hill, CA; B.E. Burris, Culp/Wesner/Culp, Santa Ana, CA; B. de Vries, Quad Environmental Technologies Corp., Kettering, OH; P. Doe, Havens & Emerson, Inc., Saddle Brook, NJ; DS Garvey, City of Philadelphia, Philadelphia, PA; S. Howard, Lurgi Corp., Belmont, CA; T. Kato, NGK-Locke, Inc., New York, NY; M.A. Kreiser, Swatara Township Authority, Hummelstown, PA; J. Klein, Metro WWTP, St.Paul, MN.

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INTRODUCTION

This publication contains material prepared in association with the U.S. Environmental Protection Agency's International Conference on Thermal Conversion of Municipal Sludge. The conference was held in Hartford, Connecticut, March 21-24, 1983.

This publication describes and evaluates the various municipal sludge combustion systems. It also emphasizes the necessity for considering and evaluating the costs involved in the total sludge management train, including dewatering, combustion, air pollution control, and ash disposal processes. It is intended to supplement but not replace EPA technology transfer publications on sludge treatment and disposal, dewatering municipal wastewater sludges, municipal sludge landfills, and land application of municipal sludge. It also answers questions that have been raised about incineration as a means of processing sludge solids for ultimate disposal and presents factual answers supported by case histories.

The primary objectives of this document are (1) to assess the current status of municipal sludge combustion technology as to performance of in-place systems, environmental concerns, and regulatory agency viewpoints; (2) to determine what needs to be done to make municipal sludge combustion more economical, including upgrading the performance of present and future systems; and (3) to discuss technology in the R&D stage.

Many different, plausible schemes exist for treating municipal wastewater treatment plant sludge, but no single method is appropriate for all municipalities. Sludge properties, project size, and location are the primary considerations that enter into the identification of prudent approaches to sludge management. Common to all is the need to concentrate the collected solids and then to process them to minimize any adverse impact on the environment in ultimate disposal. Sludge concentration can be characterized in two steps: (1) the solids are taken out of the wastewater so that the plant's discharge permit can be met, and (2) a portion of the remaining water is removed from the solids so that processing for ultimate disposal can be achieved economically. This latter step becomes very important economically if a combustion process is chosen.

Sludge management is a difficult environmental control problem. The complexity of sludge processing decisionmaking is caused by factors such as the diversity of sludge characteristics, the wide range of processes available for use in sludge management, the interrelations between those processes, the interactions between the solids handling and wastewater treatment processes, the potential environmental and public health effects of sludge solids, the frequently high capital and operating costs involved, and the limitations imposed by concerns of the public.

However, given the quantities of wastewater sludge generated annually, an effort to reduce costs causes us to examine whether the energy potential of this sludge could be exploited by utilizing it in thermal processes. It is estimated that approximately 19 kg organic dry solids of wastewater sludge (0.080 kg $\times$ *365* $\times$ 0.65) are generated annually per inhabitant. If one considers that 1 kg of organic dry substance may have a calorific value of about 25,000 kJ (about 7 kWh), the energy value can be calculated to be about $19 \times 7 =$ 133 kWh per inhabitant per year. Excessive auxiliary fuel is necessary if dewatering is not performed effectively. This is a consequence of the high energy requirements for water evaporation. As experience indicates, the successful utilization of wastewater sludge energy often means solving the problem of sludge dewatering. It takes far less energy to mechanically dewater sludge before incineration than it does to evaporate the same amount of water during incineration.